# Lower Yolo Restoration Project

## Draft Environmental Impact Report

**April 2013**

**Volume 1**

**Main Report**

SFCWA
State & Federal Contractors Water Agency

State Clearinghouse No. 2011032001

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Volume 1: Main Report

**State Clearinghouse No. 2011032001**

**State and Federal Contractors Water Agency**
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# Executive Summary

## ES.1 Overview

The Lower Yolo Restoration Project (Project) is proposed as a tidal restoration project in Yolo County by the State and Federal Contractors Water Agency (SFCWA) on behalf of the California Department of Water Resources (DWR) and the U.S. Bureau of Reclamation (Reclamation). This Project is planned, designed, and would be implemented within the broad framework set out in the CALFED Bay-Delta Program (CALFED) and the Delta Vision Process.

SFCWA is pursuing the proposed Project to partially fulfill federal permit requirements for tidal restoration imposed on DWR and Reclamation under the biological opinions (BiOps) issued for coordinated operation (i.e., Operations Criteria and Plan [OCAP]) of the State Water Project (SWP) and the federal Central Valley Project (CVP). The Project would also partially fulfill restoration objectives under the forthcoming Bay Delta Conservation Plan (BDCP). Most importantly, the proposed Project would enhance fishery habitat restoration in the Sacramento-San Joaquin River Delta (Delta), both in terms of restored habitat and furthering the understanding of Delta restoration and ecosystem science.

## ES.2 Project Goals and Objectives

The proposed Project has two primary goals. First, it is intended to partially fulfill the federal permit obligations of DWR and Reclamation, which requires those agencies, to create or restore at least 8,000 acres (ac) of intertidal and associated subtidal habitat in the Delta and Suisun Marsh, as set forth in the U.S. Fish and Wildlife Service (USFWS) Delta Smelt BiOp (USFWS 2008) and as referenced in the National Marine Fisheries Service (NMFS) Salmonid BiOp (NMFS 2009) for coordinated operations of the SWP and CVP.

Second, the proposed Project would serve as a near-term restoration measure for the forthcoming BDCP. The BDCP conservation strategy, as currently proposed, consists of multiple components that are designed collectively to achieve the overall BDCP goal, i.e., to restore and protect ecosystem health, water supply, and water quality within a stable regulatory framework.

The conservation strategy is divided into near-term and long-term implementation stages. The near-term phase lasts until the north Delta diversion and tunnel/pipeline conveyance facilities are constructed and operational, anticipated to occur within a 15-year period. Upcoming habitat restoration projects, such as the proposed Project, fall within the near-term phase of the BDCP and would be performed in accordance with applicable provisions of the Conservation Measure No.22 for Avoidance and Minimization Measures.

To achieve these two goals, four objectives have been identified for this Project:

1. To enhance regional food web productivity in support of delta smelt recovery.

2. To provide rearing habitats for out-migrating[1] salmonids.
3. To support a broad range of other aquatic and wetland-dependent species, including Sacramento splittail.
4. To provide ecosystem functions associated with the combination of Delta freshwater aquatic/tidal marsh/floodplain/seasonal wetland/lowland grassland interfaces that once existed historically.

# ES.3 Project Components and Actions

The proposed Project would be at the southern end of the Yolo Bypass within the Delta, in Yolo County, California, and would result in the modification of approximately 1,770 ac of agricultural land that currently is used primarily for cattle grazing and related infrastructure. The intent is to provide important new sources of food and shelter for a variety of native fish species at the appropriate scale in strategic locations.

## *Project Phasing*

The proposed Project would be located on a 3,795-ac site comprised of two properties and would be completed in two phases (refer to specifics illustrated in Figure 3-1 in Chapter 3, Project Description):

1. Phase 1, consisting of the Yolo Ranch property excluding the Northeast Field in Network 4; and
2. Phase 2, consisting of the Yolo Flyway Farms property and the Northeast Field in Network 4 of the Yolo Ranch.

The Project would result in the creation of approximately 1,226 ac of perennial emergent marsh (tidal) wetlands. Subsequent to issuance of the Notice of Preparation/Initial Study (NOP/IS) on March 1, 2011, SFCWA determined that acquisition of the Yolo Flyway Farms property would not be practicable at this time. Comments received during the circulation of the NOP/IS and the public scoping meeting also promoted the concept of analyzing a reduction in the Project's size. As a result, only Phase 1 of the Project is being pursued at this time. Nonetheless, because Phase 2 may be pursued in the future, the Draft Environmental Impact Report (EIR) analyzes environmental impacts and proposes feasible mitigation measures for both phases of the Project. This approach ensures that all reasonably foreseeable impacts of the entire Project are analyzed, though no current plans exist to acquire or develop the Yolo Flyway Farms property.

## *Project Construction*

The entire restoration would include modification of up to 1,770 ac (Phase 1: 1,338 ac; Phase 2: 432 ac) of the 3,795-ac site. Construction activities would involve:

1. **Tidal marsh restoration.** Restoring about 1,226 ac of perennial emergent marsh, and enhancing approximately 34 ac of non-tidal marsh.

[1] Out-migrating salmonids (salmon and steelhead) are juveniles transitioning from a freshwater environment to a saltwater environment.

2. **Wetland enhancement.** Establishing about 233 ac in enhancement actions.
3. **Irrigation and drainage improvements.** Relocating or modifying several water control structures and irrigation and drainage ditches on 15 ac of farmland.
4. **Soils reuse options.** Reusing excavated soils to construct one of three options: a 116-ac levee toe berm and supporting structures adjacent to the west Yolo Bypass levee; a 262-ac stockpile and irrigation system; or a combination of the previous two options each smaller in soil volumes than if constructed alone.

### *Project Operations and Other Activities*

Post-construction activities would include:

1. **Long-term operations and maintenance activities.** Managing ancillary site conditions (e.g., installation and repairs of fencing, signage, and minor structures), and carrying out corrective measures to address potential problems (e.g., mosquito production, invasive plant species, and slumping of channel banks).
2. **Project outcome verification monitoring.** Observing Project performance relative to objectives via monitoring that would be in addition to the mitigation monitoring required by the California Environmental Quality Act (CEQA).
3. **Regional science support efforts.** Conducting in a cooperative effort, amongst interested stakeholders, monitoring and scientific endeavors at the Project site that may provide invaluable data and insight into future restoration efforts by other entities.

## ES.4 Alternatives

Under CEQA, the "rule of reason" (California Code of Regulation [CCR] § 15126.6) of the *State CEQA Guidelines*) requires that an EIR consider only those alternatives necessary to permit a reasoned choice. CEQA requires a description of a range of reasonable alternatives to the proposed Project that would meet most of the basic objectives of the proposed Project, would be feasible and reasonable, and would avoid or substantially lessen at least one of the significant effects of the proposed Project.

A range of feasible alternatives has been evaluated in the Draft EIR (see Chapter 5, Alternatives) and is identified as:

- Alternative No. 1 (No Project alternative).
- Alternative No. 2 (Reduced Restoration Footprint alternative).
- Alternative No. 3 (Offsite Soil Disposal/Reduced-size alternative).
- Alternative No. 4 (Tidal Marsh Complex alternative).

In comparing the alternatives with the proposed Project, it was determined that Alternative No. 4, the Tidal Marsh Complex alternative, would be the environmentally superior alternative. This alternative would avoid the Project's significant hydrological impact resulting from the

Soils Reuse Option #2 (stockpile), as well as would reduce the severity of other potentially significant impacts, such as aquatic biological resources, terrestrial biological resources, and air quality/greenhouse gases.

SFCWA also considered several other alternatives or options that were ultimately determined to be: infeasible, not reasonable, not meeting the basic goals of the proposed Project, inadequate, and/or unachievable. The discussion on why these alternatives/options were eliminated from consideration can be found in Section 5.7.

## ES.5 Areas of Controversy

Based on agency and stakeholder input, including responses to the NOP/IS (refer to Chapter 7, Consultation and Coordination), potential areas of controversy are listed below and relevant Draft EIR sections that discuss those concerns follow in the parentheses. As indicated elsewhere in the Draft EIR, these potential areas of controversy were determined to be unfounded or would result in either no impact or be less than significant, based on substantial evidence.

Additionally, under CEQA and the *State CEQA Guidelines*, economic or social effects, in and of themselves, are not treated as significant effects on the environment in an EIR. The *State CEQA Guidelines* suggest that information on economic and social effects be presented in an EIR in whatever form the Lead Agency desires (*State CEQA Guidelines*, CCR § 15131). In addition, CEQA states that "The lead agency shall determine whether a project may have a significant effect on the environment based on substantial evidence in light of the whole record" (Public Resources Code [PRC], § 21082.2(a)). Substantial evidence is described in CEQA thusly:

> "Argument, speculation, unsubstantial opinion or narrative, evidence which is clearly inaccurate or erroneous, or evidence of social or economic impacts which do not contribute to, or are not caused by, physical impacts on the environment, is not substantial evidence. Substantial evidence shall include facts, reasonable assumptions predicated upon facts, and expert opinion supported by facts" (PRC, § 21082.2[c]).

Within this context, the following potential areas of controversy are identified and addressed:

- Size of restoration effort and other offsite alternatives (refer to Chapter 1, Project Description, and Chapter 5, Alternatives).
- Changes to the hydrology (i.e., water surface elevation, flood capacity, and drainage to adjacent channels both locally and regionally) (refer to Section 4.1, Hydrology).
- Impacts to existing property owners' mineral rights, water rights, and access to gas wells (unfounded – no changes with Project implementation).
- Changes to agricultural production capacity at local and regional levels (refer to Section 4.5, Agricultural Resources).
- Consistency with the Williamson Act (refer to Section 4.5, Agricultural Resources).

- Socioeconomic effects to employment and local businesses in Yolo County (an agricultural economic analysis was separately conducted from the CEQA process [see **Appendix G** of the Draft EIR]).

## ES.6 Issues to be Resolved

Issues to be resolved related to the proposed Project include the following:

- Choosing the soils reuse option(s) to implement.
- Securing environmental regulatory permits in a timely fashion to begin construction in mid to late 2013.

## ES.7 Environmental Impacts and Mitigation

Based on the impact analysis in Chapter 4 (Environmental Setting, Impacts, and Mitigation Measures), seven environmental topics were found to be impacted significantly by the proposed Project: hydrology, terrestrial biological resources, aquatic biological resources, air quality, cultural resources, hazards and hazardous materials, and cumulative impacts. Each impact is briefly described below:

- **Hydrology.** Flood conveyance impacts would be significant if either Soils Reuse Options #2 (stockpile) or #3 (combination of levee toe berm and stockpile) would be implemented. This impact would be reduced to less than significant by carrying out proposed Mitigation Measure 4.1-1 (refer to Section 4.1, Hydrology).
- **Terrestrial Biological Resources.** Short-term, but significant, construction impacts would affect wetland communities, special-status plants species, vernal pools and their invertebrates, giant garter snakes and their habitats, western pond turtles, migratory birds and their nesting habitats, special-status birds and their nesting habitats, and foraging habitats for Swainson's hawk and other foraging raptors. The seven proposed mitigation measures (Mitigation Measures 4.3-1 through 4.3-7) listed in Section 4.3, Terrestrial Biological Resources, would reduce those impacts to less than significant. In addition, applicable regulatory permits related to the state and/or federal Endangered Species Acts would be sought as required (refer to Section 1.4, Agency Approvals and Permits).
- **Aquatic Biological Resources.** Temporary impacts from the filling of the west Yolo Bypass levee borrow ditch (Soils Reuse Options #1 or #3 [combination]) and temporary impacts from improvements to the existing irrigation/drainage systems would be significant to trapped, individual sensitive fish species. Two proposed mitigations (Mitigation Measures 4.4-1 and 4.4-2) stated in Section 4.4 (Aquatic Biological Resources) would reduce such impacts to less than significant. In addition, applicable regulatory permits related to the state and/or federal Endangered Species Acts would be sought as required (refer to Section 1.4, Agency Approvals and Permits).
- **Air Quality.** Nitrogen oxide ($NO_x$) emissions released through the tailpipes of diesel-fueled construction equipment, as well as worker vehicles and delivery vehicles, during

construction would exceed significance thresholds established by the Yolo-Solano Air Quality Management District (YSAQMD). Particulate matter ($PM_{10}$) would exceed YSAQMD significance criteria as well during the construction phase. Proposed Mitigation Measure 4.6-1 would reduce both impacts to less than significant (refer to Section 4.6, Air Quality and Greenhouse Gases).

- **Cultural Resources.** Earth-moving activities in areas not previously disturbed during construction, operation, and routine maintenance could result in the discovery of important archaeological resources and unknown human burial resources. Such occurrences would be potentially significant. With implementation of the proposed mitigations (Mitigation Measures 4.7-1 and 4.7-2) identified in Section 4.7, Cultural Resources, the impacts to cultural resources would be less than significant.
- **Hazards and Hazardous Materials.** Ground-disturbing activities during construction, operation, and routine maintenance could result in the discovery of unknown contamination or the accidental damaging of abandoned natural gas wells and/or related piping. Such occurrences would be potentially significant. With implementation of the proposed mitigation (Mitigation Measures 4.8-1 and 4.8-2) identified in Section 4.8, Hazards and Hazardous Materials, hazardous impacts would be less than significant.
- **Cumulative Impacts.** The environmental resource categories noted below would be subject to temporary but significant cumulative impacts if not mitigated. Discussions in Section 4.10, Cumulative Impacts, note how each cumulative impact would be reduced to less than significant by implementing the proposed mitigation measures invoked above:
    - **Cumulative Terrestrial Biological Resources.** Wetlands, special-status plant species, giant garter snakes and their habitats, western pond turtles, nesting by special-status bird species and migratory birds, and foraging habitats for special-status raptors.
    - **Cumulative Air Quality.** Air pollutant criteria emissions, i.e., $NO_x$ and $PM_{10}$.
    - **Cumulative Cultural Resources.** Unknown buried archaeological resources and human burial resources.
    - **Cumulative Hazards and Hazardous Materials.** Unknown soils and materials contamination, and accidentally encountering abandoned natural gas wells and/or related appurtenant facilities.

With incorporation of the proposed mitigation measures (**Table ES-1**), the significant and potentially significant environmental impacts of the proposed Project would be reduced to less than significant for all affected environmental topics. There would be no significant, unavoidable adverse environmental impacts associated with Project implementation.

**Table ES-1. Summary Table of the Lower Yolo Restoration Project's Potential Environmental Impacts, Mitigation, and Residual Impacts after Mitigation**

| Environmental Impacts | Significance Determinations Without Mitigation | Proposed Mitigation Measures | Significance Determinations With Mitigation |
|---|---|---|---|
| **Project Specific Impacts: Section 4.1, Hydrology** | | | |
| **Impact 4.1-1: Effects to Agricultural Irrigation** | | | |
| Availability of water supplies for irrigation purposes during construction and post-construction phases | No impact | None required | Not applicable |
| Modifications to irrigation patterns onsite and offsite during construction and post construction phases | Less than significant | | |
| **Impact 4.1-2: Effects to Agricultural Drainage** | | | |
| Changes to agricultural drainage volume and patterns during construction and post-construction phases | Less than significant | None required | Not applicable |
| **Impact 4.1-3: Effects to Winter Storm-water Drainage** | | | |
| Alteration of drainage patterns of winter storm and flood flows within and from the Project site during construction and post-construction phases | Less than significant | None required | Not applicable |
| **Impact 4.1-4: Impacts on Flood Conveyance** | | | |
| Changes in water surface elevations with Soils Reuse Option #1 (toe berm) during the construction phase | Less than significant | None required | Not applicable |
| Changes in water surface elevations with Soils Reuse Options #2 (stockpile) and #3 (combination of Options #1 and #2)) during the construction phase | **Significant** | **Mitigation Measure 4.1-1:** (For Soils Reuse Options #2 or #3 only)<br>• Finalize the engineering design to comply with applicable flood protection requirements in consultation with the Central Valley Flood Protection Board (CVFPB) and the U.S. Army Corps of Engineers (USACE). The engineering design shall consider a variety of categories including design flows, channel | Less than significant |

## Table ES-1. Summary Table of the Lower Yolo Restoration Project's Potential Environmental Impacts, Mitigation, and Residual Impacts after Mitigation

| Environmental Impacts | Significance Determinations Without Mitigation | Proposed Mitigation Measures | Significance Determinations With Mitigation |
|---|---|---|---|
| | | stability, scour control, protection of flood control structures, etc. The goal shall be to design the Project to meet the maximum flood water surface rise of 0.1 foot (ft) or less.<br>• Conduct additional modeling to ensure and demonstrate compliance with the applicable requirements and operations of the Yolo Bypass in consultation with CVFPB and USACE, and prior to receiving encroachment permits. Modeling shall take into account levee heights and physical condition, weir spills, and other dynamic processes that can occur during major floods. Guidance from USACE of not exceeding the base flood elevation by more than 0.1 ft shall apply with Project implementation, as based on the USACE RMA2 model for conveyance studies in the Yolo Bypass. | |
| Changes in water surface elevations during the post-construction phase | No impact | None required | Not applicable |
| **Impact 4.1-5: Impacts on Local Groundwater** | | | |
| Depletion of local groundwater supplies or alteration of groundwater movement during construction and post construction | No impact | None required | Not applicable |
| **Project Specific Impacts: Section 4.2, Water Quality** | | | |
| **Impact 4.2-1: Temporary Impacts to Water Quality from Pollutants or Soil Erosion** | | | |
| Temporary construction impacts from increased suspended sediments, sediments in waterways, runoff from construction sites, toxic chemicals from construction sites, or trash and debris; post-construction of additional tidal connection | Less than significant | None required | Not applicable |
| Temporary impacts to water quality from pollutants or soil erosion during the post-construction phase | No impact | | |

**Table ES-1. Summary Table of the Lower Yolo Restoration Project's Potential Environmental Impacts, Mitigation, and Residual Impacts after Mitigation**

| Environmental Impacts | Significance Determinations Without Mitigation | Proposed Mitigation Measures | Significance Determinations With Mitigation |
|---|---|---|---|
| **Impact 4.2-2: Increase in Methylmercury Loading** | | | |
| Local methylmercury production and transport during construction and post-construction phases | No impact<br>**Beneficial effect** | None required | Not applicable |
| Changes in water quality standards related to Delta mercury total maximum daily loads during the post-construction phase | Less than significant | | |
| **Impact 4.2-3: Potential Increases in Project Dissolved Organic Carbon/Total Organic Carbon Levels at the Barker Slough Pumping Plant** | | | |
| Degraded water quality at the Barker Slough Pumping Plant intake during the construction phase | Less than significant | None required | Not applicable |
| Degraded water quality at the Barker Slough Pumping Plant intake during the post-construction phase | No impact | | |
| **Impact 4.2-4: Contribution of Low Dissolved Oxygen Plumes or Excessive Biological Oxygen Demand** | | | |
| Construction-related dissolved oxygen (DO) or biological oxygen demand (BOD) during the construction phase and general maintenance actions | No impact | None required | Not applicable |
| Post-construction conditions (i.e., newly restored wetlands) contributing to DO/BOD and exported to the adjacent Delta via Cache Slough Complex | Less than significant | | |

## Table ES-1. Summary Table of the Lower Yolo Restoration Project's Potential Environmental Impacts, Mitigation, and Residual Impacts after Mitigation

| Environmental Impacts | Significance Determinations Without Mitigation | Proposed Mitigation Measures | Significance Determinations With Mitigation |
|---|---|---|---|
| **Impact 4.2-5: Effect on Domestic Supply Well Onsite** | | | |
| Effect to groundwater quality and the domestic supply well at Yolo Ranch during construction and post-construction phases | No impact | None required | Not applicable |
| **Project Specific Impacts: Section 4.3, Terrestrial Biological Resources** | | | |
| **Impact 4.3-1: Effects to Wetland Communities** | | | |
| Temporary effects from ground-disturbing activities to wetland communities during construction and post-construction phases, as applicable | **Significant** | **Mitigation Measure 4.3-1:** (Prior to or during ground-disturbing activities in sensitive wetland communities)<br>• Locate construction staging areas outside of sensitive wetland habitats, by having their perimeters be as small as possible, and/or within the excavation/trenching limits. All staging areas shall be clearly flagged to define the limits of the work area. No construction access, parking, or storage of equipment or materials shall be permitted outside of the established limits. This shall be achieved by limiting machinery and vehicle access to temporary tracks or pads, as necessary and direct removal of soils to temporary stockpiles, located away from sensitive areas, for transportation to the selected soils reuse site. These areas shall be identified on work plans, specifications, and other applicable engineering/ contractor documents.<br>• Define clearly on maps the boundaries of sensitive habitats not within the restoration footprint (ground-disturbing areas of the Project site), and demarcated as avoidance areas.<br>• Limit construction and post-construction actions involving ground-disturbing activities to the dry weather season (generally between April and November, but varies each year), thereby reducing the potential for export of contaminants and/or sediments.<br>• Require contractors to sign documentation stating that they have read, agree to, and understand the required avoidance measures. | Less than significant |

## Table ES-1. Summary Table of the Lower Yolo Restoration Project's Potential Environmental Impacts, Mitigation, and Residual Impacts after Mitigation

| Environmental Impacts | Significance Determinations Without Mitigation | Proposed Mitigation Measures | Significance Determinations With Mitigation |
|---|---|---|---|
| | | • Require construction crew members to participate in training sessions, which clearly identify and describe sensitive communities and other biological resources.<br>• Utilize the services of a qualified biologist onsite to observe ground-disturbing activities when such activities occur within or adjacent to sensitive habitats, and/or to monitor sensitive special-status species' locations. | |
| Permanent conversion of agricultural wetlands and other seasonal/marginal wetlands on the Project site to tidal wetlands of higher ecological value | Less than significant<br>**Beneficial effect** | None required | Not applicable |
| **Impact 4.3-2: Loss of or Disturbance to Riparian Woodland and Scrub** | | | |
| Permanent loss or trimming of some riparian woodland and scrub for tidal connections related to adjacent waterways to the Stair Step and Toe Drain during the construction phase and minor/emergency repairs during the post-construction phase | Less than significant | None required | Not applicable |
| Potential loss of some riparian woodland and scrub during the post-construction phase (except for possible related minor/emergency repairs) | No impact | | |
| **Impact 4.3-3: Effects to Special-status Plants** | | | |
| Loss or disturbance of habitat for special-status plants: Delta tule pea, Mason's lilaeopsis, and Suisun marsh aster | **Significant** | **Mitigation Measure 4.3-2:**<br>Prior to initiation of ground-disturbing activities, a qualified botanist shall conduct appropriately timed, focused botanical surveys of the Project site targeting known and potentially occurring special-status plant species, including Mason's lilaeopsis, Suisun Marsh aster, and Delta tule pea. | Less than significant |

## Table ES-1. Summary Table of the Lower Yolo Restoration Project's Potential Environmental Impacts, Mitigation, and Residual Impacts after Mitigation

| Environmental Impacts | Significance Determinations Without Mitigation | Proposed Mitigation Measures | Significance Determinations With Mitigation |
|---|---|---|---|
| | | Dependent on the Project's final design and conditions onsite, the following mitigation shall be undertaken to avoid, minimize, or reduce loss or disturbance to identified special-status plants:<br>• Adjust design to avoid or minimize impacts to special-status plants to the extent feasible.<br>• Enumerate, photograph, and flag conspicuously or mark with temporary drift fencing or other physical barriers the areas supporting individual plants or populations of special-status plants that have the potential to be impacted, prior to construction.<br>• Limit work areas including access and staging areas to the minimum area practical.<br>• Notify the California Department of Fish and Wildlife (CDFW) at least ten days in advance of any ground-disturbing activity that could impact special-status plants to allow CDFW the opportunity to salvage affected individual plants for transplanting to a suitable location outside of the disturbed area.<br>• Require construction workers to inspect their clothing, including shoes, all vehicles, and equipment for invasive plant seeds or plant material, prior to entering and leaving the Project area. Appropriate cleaning measures shall be taken to prevent the spread of invasive species into restored areas. | |
| Potential threat of noxious weed populations to special-status plants during construction and post-construction phases | Less than significant | None required | Not applicable |
| **Impact 4.3-4: Loss of Vernal Pools and Habitat for Invertebrates** | | | |
| Construction-related impacts to vernal pools, such as trampling and grading, or accidental release of fuels and construction fluids | **Significant** | **Mitigation Measure 4.3-3:**<br>• Establish and flag conspicuously a buffer area of at least a minimum of 250 ft horizontally from the edge of hydrophytic vegetation associated with the vernal pools. No construction vehicles, equipment, or personnel shall be permitted to enter this buffer zone for the duration of the Project. | Less than significant |

**Table ES-1. Summary Table of the Lower Yolo Restoration Project's Potential Environmental Impacts, Mitigation, and Residual Impacts after Mitigation**

| Environmental Impacts | Significance Determinations Without Mitigation | Proposed Mitigation Measures | Significance Determinations With Mitigation |
|---|---|---|---|
| | | • Identify the vernal pools as Environmentally Restricted Areas on all applicable engineering and construction drawings, designs, and specification/work plan documents.<br>• Control nearby grading or contouring in a manner that does not prevent hydrologic inputs to the vernal pools that are similar to what currently happens. | |
| **Impact 4.3-5: Impacts to Giant Garter Snake or Giant Garter Snake Habitat** | | | |
| Loss of habitat for giant garter snake; injury or mortality of individual giant garter snake | **Significant** | **Mitigation Measure 4.3-4:**<br>• Require construction personnel shall receive U.S. Fish and Wildlife Service (USFWS)-approved worker environmental awareness training to recognize the giant garter snake (GGS) and its habitat.<br>• Confine clearing of vegetation to only those areas necessary to facilitate construction activities and no greater. Areas designated as GGS and/or other sensitive-species habitat within or adjacent to the Project site shall be flagged as Environmentally Sensitive Areas and shall be avoided by all construction personnel.<br>• Survey the site at least 24 hours prior to the initiation of ground-disturbing activities in suitable GGS habitat. This survey shall be conducted by a USFWS-approved biologist in suitable GGS habitat. Surveys shall be repeated if a lapse in construction activity of two weeks or greater occurs. If a GGS is encountered during ground-disturbing activities, activities at that specific location shall cease until appropriate corrective measures, in concurrence with USFWS coordination, have been completed or it has been determined that the GGS will not be harmed. Sightings shall be reported to USFWS.<br>• Implement construction activity within GGS habitat between May 1 and October 1. This is the active period for GGS and direct mortality is lessened, because GGS are expected to actively move and avoid danger. Consultation with the USFWS is required for construction activities scheduled to occur in potential GGS habitat between October 2 and April 30. | Less than significant |

## Table ES-1. Summary Table of the Lower Yolo Restoration Project's Potential Environmental Impacts, Mitigation, and Residual Impacts after Mitigation

| Environmental Impacts | Significance Determinations Without Mitigation | Proposed Mitigation Measures | Significance Determinations With Mitigation |
|---|---|---|---|
| | | • Ensure that any dewatered GGS habitat shall remain dry for at least 15 consecutive days after April 15, and prior to excavating or filling of the dewatered GGS habitat.<br>• Require when working near flooded canals during the summer months, vehicle speeds shall not exceed 15 miles per hour (MPH) in areas where the line-of-site is obstructed and 25 MPH in other areas to avoid hitting the GGS and other special-status wildlife.<br>• Remove temporary fill and construction debris after construction completion, and, wherever feasible, restore disturbed areas to pre-project conditions. | |
| Stranding and trapping of individual giant garter snakes in restored tidal channels | Less than significant | None required | Not applicable |
| Long-term conversion of giant garter snake habitat to a higher ecological value | Less than significant<br>Beneficial effect | | |
| **Impact 4.3-6: Impacts on Western Pond Turtle or Western Pond Turtle Habitat** | | | |
| Injury or mortality of individual western pond turtles | **Significant** | **Mitigation Measure 4.3-5:**<br>• Survey areas prior to implementing restoration activities and/or dewatering scheduled in or adjacent to suitable aquatic habitat for the western pond turtle, by a qualified biologist.<br>• Remove western pond turtles found by a qualified biologist to a safe location outside of the work area in a manner consistent with applicable CDFW regulations.<br>• Conduct periodic monitoring by a qualified biologist of suitable aquatic habitat for the western pond turtle until ground-disturbing/ dewatering activities have ceased in those areas. | Less than significant |
| Long-term conversion of western pond turtle habitat to a higher ecological value | Less than significant<br>**Beneficial effect** | None required | Not applicable |

**Table ES-1. Summary Table of the Lower Yolo Restoration Project's Potential Environmental Impacts, Mitigation, and Residual Impacts after Mitigation**

| Environmental Impacts | Significance Determinations Without Mitigation | Proposed Mitigation Measures | Significance Determinations With Mitigation |
|---|---|---|---|
| **Impact 4.3-7: Impacts to Nesting Habitat and to Nesting Special-status and Migratory Birds** | | | |
| Vegetation removal or tree trimming in nesting habitat, for Swainson's hawk and other sensitive bird species, during Project excavation and creation of tidal connections in conjunction with the construction phase and post-construction phase | **Significant** | **Mitigation Measure 4.3-6:**<br>• Remove or trim a minimal number of trees that would satisfy the Project design and allow for minimal access by construction equipment within the construction footprint in advance of nesting season, i.e., August 16 to February 14. Should nesting by sensitive bird species occur prior to February 15, proceed with the remaining steps in this mitigation measure.<br>• Conduct preconstruction nesting bird surveys during the bird breeding season (February 15 to August 15) within the construction footprint including a 300-ft buffer, by a qualified biologist, within two weeks prior to equipment or material staging, pruning/grubbing or surface-disturbing activities, including soils grading or excavation. If no active nests are found, no further mitigation shall be required.<br>• Establish a buffer area if active nests (i.e., nests in the egg laying, incubating, nestling or fledgling stages) are found within 300 ft of the Project footprint for raptors (birds of prey), within a 0.5-mile radius for Swainson's hawk, or 100 feet of the construction footprint for all other bird species. Non-disturbance buffers shall be established at a distance sufficient to minimize disturbance based on the nest location, topography, cover, the nesting pair's tolerance to disturbance and the type/duration of potential disturbance. The size of the buffers may be adjusted provided a qualified biologist, in consultation with CDFW and USFWS, monitors the behavior of the nesting birds and determines that impacts of Project-related activities are not affecting the birds' reproductive or rearing efforts.<br>• Ensure that if rescheduling of work is infeasible and non-disturbance buffers cannot be maintained, a qualified biologist shall be onsite to monitor active nests for signs of disturbance for the duration of the construction activity. If it is determined that Project-related activities are resulting in nest disturbance, then work in those sensitive areas shall cease immediately and CDFW and USFWS shall be contacted for further guidance. | Less than significant |

**Table ES-1. Summary Table of the Lower Yolo Restoration Project's Potential Environmental Impacts, Mitigation, and Residual Impacts after Mitigation**

| Environmental Impacts | Significance Determinations Without Mitigation | Proposed Mitigation Measures | Significance Determinations With Mitigation |
|---|---|---|---|
| | | • Repeat nest surveys by a qualified biologist, if post-construction activities continue beyond one year. | |
| Vegetation removal or tree trimming outside of nesting season; and areas contemplated for Soils Reuse Options #1, #2, and #3. | No impact | None required | Not applicable |
| **Impact 4.3-8: Loss of Foraging Habitat for Swainson's Hawk** | | | |
| Loss of low- to moderate-quality foraging habitat to inundated tidal wetlands | **Significant** | **Mitigation Measure 4.3-7:**<br>• Ensure that suitable Swainson's hawk foraging habitat is preserved or enhanced at a ratio of 0.5:1 for up to 52.5 acres, based on final engineering designs, presence of Swainson's hawk, and consultation with CDFW. Preservation/enhancement may occur through one or more actions:<br>o Preservation and enhancement of habitat onsite with equal or greater quality than existing foraging habitat.<br>o Payment of a mitigation fee to a CDFW-approved mitigation bank for the preservation of Swainson's hawk foraging habitat.<br>o Purchase of conservation easements or fee title to suitable Swainson's hawk foraging habitat to protect the habitat from urban development.<br>o Participation in the Yolo County Natural Community Conservation Plan/Habitat Conservation Plan (NCCP/HCP) should it be adopted prior to the Project's start of construction.<br>o Other measures, as needed, through consultation with CDFW. | Less than significant |

## Table ES-1. Summary Table of the Lower Yolo Restoration Project's Potential Environmental Impacts, Mitigation, and Residual Impacts after Mitigation

| Environmental Impacts | Significance Determinations Without Mitigation | Proposed Mitigation Measures | Significance Determinations With Mitigation |
|---|---|---|---|
| **Impact 4.3-9: Loss of Habitat for Other Foraging Raptors and Other Special-status Birds** | | | |
| Temporary, short-term disturbance from construction; loss of riparian woodlands from tidal connections; loss of habitat with selection of Soils Reuse Option #1 (toe berm) and Soils Reuse Option #3 (combination of Options #1 and #2) | Less than significant | None required | Not applicable |
| Loss of riparian woodlands with selection of Soils Reuse Option #2 (stockpile) and implementation of the post-construction phase | No impact | | |
| **Project Specific Impacts: Section 4.4, Aquatic Biological Resources** | | | |
| **Impact 4.4-1: Effects to Aquatic and Riparian Habitats** | | | |
| Temporary alteration of near-shore, instream and bank habitats for fish and other aquatic resources during construction with Soils Reuse Options #1 (toe berm) and Option #3 (combination) | Less than significant | None required | Not applicable |
| Temporary alteration of near-shore, instream and bank habitats for fish and other aquatic resources during construction with selection of Soils Reuse Option #2 (stockpile) | No impact | | |
| Long-term substantial increase in shallow-water and tidal marsh habitats for native fish | No impact<br>**Beneficial effect** | None required | Not applicable |
| Alterations in habitat leading to increased predation on native fish | Less than significant | None required | Not applicable |

## Table ES-1. Summary Table of the Lower Yolo Restoration Project's Potential Environmental Impacts, Mitigation, and Residual Impacts after Mitigation

| Environmental Impacts | Significance Determinations Without Mitigation | Proposed Mitigation Measures | Significance Determinations With Mitigation |
|---|---|---|---|
| Effects from ground-disturbing activities to aquatic and riparian habitats during construction for Soils Reuse Options #1 and #3, as well as with post construction (i.e., additional tidal connection) | Less than significant | None required | Not applicable |
| Effects from ground-disturbing activities to aquatic and riparian habitats during construction for Soils Reuse Option #2 (stockpile), as well as with post construction (e.g., Project verification monitoring) | No impact | | |
| **Impact 4.4-2: Direct Fish Lethality or Injury** | | | |
| Temporary impacts on direct fish lethality or injury from tidal connections either during construction or post construction | Less than significant | None required | Not applicable |
| Temporary impacts on direct fish lethality or injury from Project with selection of either Soils Reuse Options #1 (toe berm) or #3 (combination) | **Significant** | **Mitigation Measure 4.4-1:** (For the filling of the west Yolo Bypass levee is Soils Reuse Option #1 is selected)<br>• Conduct biological monitoring during the filling of the west Yolo Bypass levee borrow ditch if either Soils Reuse Option #1 or #3 is selected.<br>• Develop and implement a protocol between the biological monitor and the project engineer to redirect the filling activity if special-status fishes (e.g., adult salmonids) are observed in the immediate vicinity of the fill area, until the fishes leave the site. | Less than significant |
| Temporary impacts on direct fish lethality or injury from Project with implementing irrigation/drainage improvements | **Significant** | **Mitigation Measure 4.4-2:** (Associated with irrigation/drainage improvements)<br>• Conduct biological surveys to determine if there are any fishes present.<br>• Recover fishes, if present, using appropriate techniques such as beach seining; retain the captured fishes in cooled, aerated containers; and release fishes the same day as captured into the waters of Stair Step or Toe Drain. | Less than significant |

## Table ES-1. Summary Table of the Lower Yolo Restoration Project's Potential Environmental Impacts, Mitigation, and Residual Impacts after Mitigation

| Environmental Impacts | Significance Determinations Without Mitigation | Proposed Mitigation Measures | Significance Determinations With Mitigation |
|---|---|---|---|
| Temporary impacts on direct fish lethality or injury from Project with selection of Soils Reuse Option #2 (stockpile) | No impact | None required | Not applicable |
| Potential stranding risk of fish on the Project site during construction and post construction (i.e., additional tidal connection) | Less than significant | None required | Not applicable |
| Potential stranding risk of fish on the Project site with post construction (e.g., monitoring, removal of invasive plants) | No impact | | |
| **Impact 4.4-3: Temporary Noise Impacts Impeding or Delaying Fish Migration** | | | |
| Potential noise from construction of tidal connections that would affect the movement or migration of special-status fish species | Less than significant | None required | Not applicable |
| Potential noise from post-construction (e.g., monitoring, sampling, removal of invasive plants, etc.) that would affect the movement or migration of special-status fish species | No impact | | |
| **Impact 4.4-4: Water Quality Impacts on Fish and Aquatic Resources** | | | |
| Effects of suspended solids/turbidity on fishes and habitat resources during the construction phase and during the post construction phase for an additional tidal connection | Less than significant | None required | Not applicable |

## Table ES-1. Summary Table of the Lower Yolo Restoration Project's Potential Environmental Impacts, Mitigation, and Residual Impacts after Mitigation

| Environmental Impacts | Significance Determinations Without Mitigation | Proposed Mitigation Measures | Significance Determinations With Mitigation |
|---|---|---|---|
| Effects of suspended solids/turbidity on fishes and habitat resources during the post construction phase (e.g., project verification monitoring, sampling, removal of invasive plants) | No impact | None required | Not applicable |
| Short-term and long-term effects of methylmercury exposure to and uptake by aquatic organisms and wildlife consuming aquatic organisms during construction and post-construction phases | Less than significant<br>**Beneficial effect** | None required | Not applicable |
| Short-term and long-term effects of pesticide exposure to and uptake by aquatic organisms and wildlife consuming aquatic organisms with construction and post construction | Less than significant | None required | Not applicable |
| Long-term water temperature impacts to fish(e.g., Chinook salmon and steelhead tolerances) and other aquatic resources at construction and post construction | Less than significant<br>**Potentially beneficial effect** | None required | Not applicable |
| Long-term low dissolved oxygen impacts to fish (e.g., Chinook salmon and steelhead tolerance) at construction and post construction | Less than significant | None required | Not applicable |

**Table ES-1. Summary Table of the Lower Yolo Restoration Project's Potential Environmental Impacts, Mitigation, and Residual Impacts after Mitigation**

| Environmental Impacts | Significance Determinations Without Mitigation | Proposed Mitigation Measures | Significance Determinations With Mitigation |
|---|---|---|---|
| **Project Specific Impacts: Section 4.5, Agricultural Resources** | | | |
| **Impact 4.5-1: Loss of Important Farmland and Productivity** | | | |
| Permanent loss of 170 acres of Unique Farmlands with Soils Reuse Option #2 (stockpile) during construction phase<br>Permanent loss of 230 acres of Unique Farmlands with Soils Reuse Option #1 (toe berm) or Soils Reuse Option #3 (combination) during construction phase | Less than significant | None required | Not applicable |
| Effects to Important Farmland during the post-construction phase | No impact | None required | Not applicable |
| **Impact 4.5-2: Inconsistent with Existing Williamson Act Contracts** | | | |
| Physical impacts associated with any inconsistency with the two existing William Act contracts | No impact | None required | Not applicable |
| **Impact 4.5-3: Inconsistent with Planning Requirements** | | | |
| Inconsistency with Yolo County's existing zoning, general policies, and land use designations, along with the existing Delta Protection Commission's Land Use and Resource Management Plan policies | No impact | None required | Not applicable |

## Table ES-1. Summary Table of the Lower Yolo Restoration Project's Potential Environmental Impacts, Mitigation, and Residual Impacts after Mitigation

| Environmental Impacts | Significance Determinations Without Mitigation | Proposed Mitigation Measures | Significance Determinations With Mitigation |
|---|---|---|---|
| **Project Specific Impacts: Section 4.6, Air Quality and Greenhouse Gases** | | | |
| **Impact 4.6-1: Short-term Construction Emissions of Criteria Pollutants that May Contribute to Existing Air Quality Violations** | | | |
| Short-term construction nitrogen oxides ($NO_x$) and particulate matter ($PM_{10}$) emissions of criteria pollutants that may contribute to existing air quality violations | **Potentially significant** | **Mitigation Measure 4.6-1:**<br>The mitigation measure shall be implemented to minimize emissions of $NO_x$ and $PM_{10}$:<br>• Limit construction on those days where Yolo County is predicted to exceed the "Spare the Air" Air Quality Index (AQI) for ozone >127 by the Sacramento Metropolitan Air Quality Management District (summer downwind area). Examples of limiting construction could range from stopping work that day to reducing construction to a half day or relying on electrical equipment solely. Once the AQI level of unhealthy is reached, i.e., 151 to 200 or beyond, all construction work shall cease for that day.<br>• Require haul trucks and off-road diesel equipment operators to shut down their engines instead of idling for more than five minutes, unless such idling is necessary for proper operation of the equipment. Provide clear signage that posts this requirement for workers at the entrances to the site.<br>• Require contractors' construction equipment to be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked and determined to be running in proper condition prior to operations.<br>• Limit vehicle speeds on unpaved roads to 15 MPH.<br>• Cover or maintain at least two feet of freeboard space on haul trucks transporting soil, sand, or loose materials onsite. Any haul trucks that would be traveling along freeways or major roadways shall be covered.<br>• All active construction sites shall be watered at least twice daily. Frequency shall be based on the type of operation, soil, wind exposure, and the ability to eliminate visible fugitive dust. | Less than significant |

**Table ES-1. Summary Table of the Lower Yolo Restoration Project's Potential Environmental Impacts, Mitigation, and Residual Impacts after Mitigation**

| Environmental Impacts | Significance Determinations Without Mitigation | Proposed Mitigation Measures | Significance Determinations With Mitigation |
|---|---|---|---|
| | | • Between the time of completing construction and prior to the onset of winter rains, encourage the property owner and/or property manager to reinstate typical agricultural irrigation practices as a means to wet soils so they do not generate dust, as feasible.<br>• Cover or water inactive storage piles.<br>• If Soils Reuse Option #1 or #3 is selected, then re-establish vegetation on the toe berm and buffer areas, i.e., use native grassland species seed mix on the toe berm and apply native wetland-upland transition mix in the buffer areas.<br>• Develop an emissions reduction plan that demonstrates that off-road equipment of more than 50 horsepower to be used during construction of all project- and program-level elements shall achieve a project-wide fleet-average 20 percent $NO_x$ reduction and 45 percent PM reduction compared to the most recent California Air Resources Board fleet average. Acceptable options for reducing emissions shall include using late model engines, low-emissions diesel products, alternative fuels, engine retrofit technology, after-treatment products, and/or add-on devices such as particulate filters, with specifics dependent on contractor's ability to secure such equipment in a timely fashion. | |
| $NO_x$ and $PM_{10}$ emissions of criteria pollutants that may contribute to existing air quality violations during post-construction (e.g., monitoring, sampling) | No impact | None required | Not applicable |
| Release of toxic air contaminants during construction and post construction | Less than significant | None required | Not applicable |
| **Impact 4.6-2: Conflict with or Obstruction of Applicable Air Quality Plan** | | | |
| Conflict with or obstruction of applicable air quality plan implementation during construction and post construction | No conflict or impact | None required | Not applicable |

## Table ES-1. Summary Table of the Lower Yolo Restoration Project's Potential Environmental Impacts, Mitigation, and Residual Impacts after Mitigation

| Environmental Impacts | Significance Determinations Without Mitigation | Proposed Mitigation Measures | Significance Determinations With Mitigation |
|---|---|---|---|
| **Impact 4.6-3: Greenhouse Gases and Global Climate Change Contributions** | | | |
| Release of greenhouse gases and impacts associated with global climate change during construction and post construction | Less than significant | None required | Not applicable |
| Long-term sequestration of carbon | No impact<br>**Potentially beneficial effect** | None required | Not applicable |
| **Project Specific Impacts: Section 4.7, Cultural Resources** | | | |
| **Impact 4.7-1: Loss of, or Damage to, Unknown Archaeological Resources** | | | |
| Effects to unknown(i.e., buried) archaeological resources | **Potentially significant** | **Mitigation Measure 4.7-1:**<br>Where ground-disturbing activities may occur:<br>• Conduct an environmental awareness training concerning cultural resources management utilizing the services of a qualified archaeologist for contractors and their staff prior to the start of construction.<br>• Cease ground-disturbing work in the vicinity of the area should buried archaeological resources be uncovered during construction, operation, and/or routine maintenance, until a qualified archaeologist can visit the site of discovery and assess the significance of the resource. After the assessment is completed, the archaeologist shall submit a report describing the significance of the discovery and its origin with cultural resources management recommendations if the archaeological resources are significant.<br>• Comply with Public Resources Code § 21083.2, as applicable, should buried archaeological resources be found. Avoidance or preservation in an undisturbed state is the preferable course of action.<br>Preservation methods may include:<br>o Planning construction to avoid archaeological sites. | Less than significant |

**Table ES-1. Summary Table of the Lower Yolo Restoration Project's Potential Environmental Impacts, Mitigation, and Residual Impacts after Mitigation**

| Environmental Impacts | Significance Determinations Without Mitigation | Proposed Mitigation Measures | Significance Determinations With Mitigation |
|---|---|---|---|
| | | o Deeding sites into permanent conservation easements.<br>o Capping or covering sites with a layer of soil before building on the sites.<br>o Planning parks, greenspace, or other open space to incorporate archaeological sites. | |
| **Impact 4.7-2: Impacts to Historic Resources** | | | |
| Impacts to historic resources or cultural landscapes | Less than significant | None required | Not applicable |
| **Impact 4.7-3: Impacts to Unknown Human Burial Resources** | | | |
| Effects related to accidental encounter with unknown human burial resources during ground-disturbing activities | **Potentially significant** | **Mitigation Measure 4.7-2:**<br>Where ground-disturbing activities may occur:<br>• Notify the Yolo County coroner, Yolo County Department of Public Works, and designated Most Likely Descendant (as identified by the Native American Heritage Commission) in the event of discovering human remains during construction, operation, and/or routine maintenance of the Project. The notification protocol and process shall proceed in accordance with the *State CEQA Guidelines,* California Code of Regulations (CCR) § 15064.5(e); Public Resources Code § 5097.98; and Health and Safety Code § 7050.5, as applicable. | Less than significant |
| **Project Specific Impacts: Section 4.8, Hazards and Hazardous Materials** | | | |
| **Impact 4.8-1: Effects of Soils and Materials Contamination** | | | |
| Effects from known hazardous waste contamination sites | No impact | None required | Not applicable |

## Table ES-1. Summary Table of the Lower Yolo Restoration Project's Potential Environmental Impacts, Mitigation, and Residual Impacts after Mitigation

| Environmental Impacts | Significance Determinations Without Mitigation | Proposed Mitigation Measures | Significance Determinations With Mitigation |
|---|---|---|---|
| Removal of infrastructure that may release hazardous waste (e.g., treated wood); discovery of an unknown contaminated site; or leaking polychlorinated biphenyls (PCB) transformers | **Potentially significant** | **Mitigation Measure 4.8-1:**<br>Based on final design and environmental/physical conditions onsite, one or more of the following elements of this mitigation measure shall be undertaken if evidence indicates that soil sites and/or materials are contaminated per applicable hazardous waste laws and regulations:<br>• Develop and implement a monitoring and treatment/disposal plan in accordance with all applicable hazardous waste laws and regulations.<br>• Examine soil below any pole-mounted transformers on the portion of the Project site to be graded. If there is evidence (such as discoloration of the soil) that PCBs have leaked from the transformers, then Pacific Gas & Electric (PG&E) shall be contacted. It is the responsibility of PG&E to perform a soils investigation and cleanup if any of the pole-mounted transformers are determined to have leaked PCBs.<br>• Test or assume that the wood demolished and removed from the existing irrigation system contains potentially hazardous waste (e.g., lead paint, creosote, arsenic, etc.) and then have it treated, recycled, or disposed of in accordance with applicable regulations concerning hazardous waste. | Less than significant |
| **Impact 4.8-2: Hazards with Natural Gas Wells and Related Pipelines** | | | |
| Accidental exposure to hazardous conditions (potential explosion and fire) associated with plugged wells and related, distribution natural gas pipelines during construction of tidal connections and related excavations | **Potentially significant** | **Mitigation Measure 4.8-2:**<br>• Develop and implement actions in coordination and concurrence with the Yolo County Fire and Emergency Services Department and California Division of Oil, Gas, and Geothermal Resources to comply with applicable requirements of the Well Review Program (DOGGR 2007) and other applicable public safety requirements. Such measures include contacting the California Underground Service Alert in a timely manner prior to excavation, inspecting site to look for physical evidence of underground facilities, marking off excavated areas, having an emergency plan in place, etc. | Less than significant |

**Table ES-1. Summary Table of the Lower Yolo Restoration Project's Potential Environmental Impacts, Mitigation, and Residual Impacts after Mitigation**

| Environmental Impacts | Significance Determinations Without Mitigation | Proposed Mitigation Measures | Significance Determinations With Mitigation |
|---|---|---|---|
| **Impact 4.8-3: Impacts related to Mosquito Control** | | | |
| Physical impacts from new or altered facilities for the Sacramento-Yolo Mosquito Vector Control District | No physical impact | None required | Not applicable |
| Environmental health effects from mosquito production | Less than significant<br>**Beneficial effect** | | |
| **Project Specific Impacts: Section 4.9, Energy Consumption** | | | |
| **Impact 4.9-1:-Impacts related to Natural Gas Usage** | | | |
| Consumption of natural gas during construction or post-construction; or modifications to active natural gas wells/fields | No impact | None required | Not applicable |
| **Impact 4.9-2: Impacts related to Electricity Usage** | | | |
| Usage of electricity during construction and post-construction phases, requirement for new facilities or wasteful energy practices | No impact | None required | Not applicable |
| **Impact 4.9-3: Impacts from Transportation Fuel Consumption** | | | |
| Consumption of diesel and gasoline during construction | Less than significant | None required | Not applicable |
| Consumption of transportation fuel during post-construction; or requirement for new or modified fuel facilities for storing, processing, or distributing transportation fuels | No impact | | |

## Table ES-1. Summary Table of the Lower Yolo Restoration Project's Potential Environmental Impacts, Mitigation, and Residual Impacts after Mitigation

| Environmental Impacts | Significance Determinations Without Mitigation | Proposed Mitigation Measures | Significance Determinations With Mitigation |
|---|---|---|---|
| **Cumulative Impacts: Section 4.10.1, Hydrology** | | | |
| **Flood Conveyance Cumulative Impacts** | | | |
| Increase in surface water elevation for Soils Reuse Option #1 (toe berm) | No cumulative impact | None required | Not applicable |
| Increase in surface water elevation for Soils Reuse Options #2 (stockpile) and #3 (combination) | Less-than-significant cumulative impact | | |
| **Other Hydrological Cumulative Impacts** | | | |
| Impact to agricultural irrigation and drainage onsite or indirectly to adjacent properties; impediment to winter flood conveyance; stormwater drainage; and contributing effects to sea level rise | No cumulative impact | None required | Not applicable |
| **Cumulative Impacts: Section 4.10.2, Water Quality** | | | |
| **Methylmercury Loading Cumulative Impacts** | | | |
| Increase in methylmercury loading both locally and regionally | Less-than-significant cumulative impact | None required | Not applicable |
| **Dissolved Organic Carbon Levels Cumulative Impacts** | | | |
| Increase dissolved organic carbon loading to facilities operated by municipal water purveyors | Less-than-significant cumulative impact | None required | Not applicable |

## Table ES-1. Summary Table of the Lower Yolo Restoration Project's Potential Environmental Impacts, Mitigation, and Residual Impacts after Mitigation

| Environmental Impacts | Significance Determinations Without Mitigation | Proposed Mitigation Measures | Significance Determinations With Mitigation |
|---|---|---|---|
| **Dissolved Oxygen and Biological Oxygen Demand Levels Cumulative Impacts** | | | |
| Seasonal decline in dissolved oxygen; increase in biological oxygen demand | Less-than-significant cumulative impact | None required | Not applicable |
| **Other Water Quality Issues Cumulative Impacts** | | | |
| Impacts from sediment, trash, and accidental spills; change in tidal prism; and impact to one onsite domestic well | Impacts from none to less than significant | None required | Not applicable |
| **Cumulative Impacts: Section 4.10.3, Terrestrial Biological Resources** | | | |
| **Wetlands Cumulative Impacts** | | | |
| Temporary disturbance of seasonal wetlands, vernal pools, and jurisdictional waters | **Significant cumulative impact** | **See Mitigation Measures 4.3-1 and 4.3-3** | Less-than-significant cumulative impact |
| Permanent conversion of currently degraded wetlands to higher wetland functions and values | **Long-term beneficial effect** | None required | Not applicable |
| **Riparian Woodland and Scrub Cumulative Impacts** | | | |
| Removal of some riparian woodland and scrub for tidal connections | No cumulative impact | None required | Not applicable |
| **Special-status Plants Cumulative impacts** | | | |
| Potential effects on Delta tule pea, Mason's lilaeopsis, and Suisun during construction | **Significant cumulative impact** | **See Mitigation Measure 4.3-2** | Less-than-significant cumulative impact |

## Table ES-1. Summary Table of the Lower Yolo Restoration Project's Potential Environmental Impacts, Mitigation, and Residual Impacts after Mitigation

| Environmental Impacts | Significance Determinations Without Mitigation | Proposed Mitigation Measures | Significance Determinations With Mitigation |
|---|---|---|---|
| **Giant Garter Snake Cumulative Impacts** | | | |
| Temporary disturbance of the habitat used by GGS, along with potential of injury or mortality of individuals | **Significant cumulative impact** | **See Mitigation Measure 4.3-4** | Less-than-significant cumulative impact |
| Permanent conversion of currently degraded habitat to additional habitat for GGS | **Long-term beneficial effect** | None required | Not applicable |
| **Western Pond Turtle Cumulative Impacts** | | | |
| Temporary disturbance of the habitat used by the western pond turtle, along with potential of injury or mortality of individuals | **Significant cumulative impact** | **See Mitigation Measure 4.3-5** | Less-than-significant cumulative impact |
| Permanent conversion of currently degraded habitat to additional habitat for the western pond turtle | **Long-term beneficial effect** | None required | Not applicable |
| **Nesting by Special-status and Migratory Birds Cumulative Impacts** | | | |
| Temporary disturbance to nesting habitat used by special-status birds, including Swainson's hawk and migratory birds during construction | **Significant cumulative impact** | **See Mitigation Measure 4.3-6** | Less-than-significant cumulative impact |
| **Foraging Habitat for Special-status Raptors Cumulative Impacts** | | | |
| Permanent loss of foraging habitat used by special-status birds, including Swainson's hawk and other raptors | **Significant cumulative impact** | **See Mitigation Measure 4.3-7** | Less-than-significant cumulative impact |

**Table ES-1. Summary Table of the Lower Yolo Restoration Project's Potential Environmental Impacts, Mitigation, and Residual Impacts after Mitigation**

| Environmental Impacts | Significance Determinations Without Mitigation | Proposed Mitigation Measures | Significance Determinations With Mitigation |
|---|---|---|---|
| **Cumulative Impacts: Section 4.10.4, Aquatic Biological Resources** | | | |
| **Aquatic Biological Resources Cumulative Impacts** | | | |
| Effects during construction and post construction: aquatic and riparian habitats, direct fish lethality or injury, temporary noise impacts impeding or delaying fish migration, and water quality impacts on aquatic biological resources | Less-than-significant cumulative impact | None required | Not applicable |
| Long-term substantial increase in shallow-water and tidal marsh habitats for native fish | Less-than-significant cumulative impact<br>**Beneficial effect** | | |
| **Cumulative Impacts: Section 4.10.5, Agricultural Resources** | | | |
| **Important Farmland and Productivity Loss Cumulative Impacts** | | | |
| Loss of Important Farmlands and productivity in Yolo County | Less-than-significant cumulative impact | None required | Not applicable |
| **Other Cumulative Impacts to Agricultural Resources** | | | |
| Inconsistencies with Williamson Act and related county, regional, and state planning requirements | No cumulative impact | None required | Not applicable |

## Table ES-1. Summary Table of the Lower Yolo Restoration Project's Potential Environmental Impacts, Mitigation, and Residual Impacts after Mitigation

| Environmental Impacts | Significance Determinations Without Mitigation | Proposed Mitigation Measures | Significance Determinations With Mitigation |
|---|---|---|---|
| **Cumulative Impacts: Section 4.10.6, Air Quality and Greenhouse Gases** | | | |
| **Construction Activities and Consistency with State and Federal Air Quality Plans Cumulative Impacts** | | | |
| Increases in $NO_x$ and $PM_{10}$ emissions for the Yolo-Solano region contained within the Sacramento Valley Air Basin | **Significant, temporary cumulative impact** | **See Mitigation Measure 4.6-1** | Less-than-significant cumulative impact |
| Inconsistencies with Yolo-Solano Air Quality Management District's regional plans and other adopted regional air plan | No cumulative impact | None required | Not applicable |
| **Greenhouse Gases and Global Climate Change Cumulative Impacts** | | | |
| Increases in greenhouse gases and global climate changes | Less-than-significant cumulative impact | None required | Not applicable |
| **Cumulative Impacts: Section 4.10.7, Cultural Resources** | | | |
| **Buried Archaeological Resources and Human Burial Resources Cumulative Impacts** | | | |
| Contribute to the continued loss of subsurface cultural resources, i.e., unknown archaeological resources and human burial resources | **Significant cumulative impact** | **See Mitigation Measures 4.7-1 and 4.7-2** | Less-than-significant cumulative impact |
| **Historic Resources Cumulative Impacts** | | | |
| Alterations to potential historic resources, such as levees | Less-than-significant cumulative impact | None required | Not applicable |

## Table ES-1. Summary Table of the Lower Yolo Restoration Project's Potential Environmental Impacts, Mitigation, and Residual Impacts after Mitigation

| Environmental Impacts | Significance Determinations Without Mitigation | Proposed Mitigation Measures | Significance Determinations With Mitigation |
|---|---|---|---|
| **Cumulative Impacts: Section 4.10.8, Hazards and Hazardous Materials** | | | |
| **Soils and Materials Contamination Cumulative Impacts** | | | |
| Possible exposure to isolated, contaminated sites yet discovered | **Potentially significant cumulative impact** | **See Mitigation Measure 4.8-1** | Less-than-significant cumulative impact |
| **Hazards with Natural Gas Wells/Pipelines Cumulative Impacts** | | | |
| Increased risk of upset (explosions and fires) in encountering plugged or unknown natural gas wells and related distributed pipelines | **Significant cumulative impact** | **See Mitigation Measure 4.8-2** | Less-than-significant cumulative impact |
| **Mosquito Control Cumulative Impacts** | | | |
| Potential increase mosquito production on new tidal wetland areas in the short-term | Less-than-significant cumulative impact | None required | Not applicable |
| Long-term effect would be a substantial decrease in mosquito production | Less-than-significant cumulative impact<br>**Beneficial effect** | | |
| **Cumulative Impacts: Section 4.10.9, Energy Consumption** | | | |
| Increased consumption of electricity, natural gas, and other transportation fuels during construction in Yolo County | Less-than-significant cumulative impact | None required | Not applicable |
| Increased consumption of electricity, natural gas, and other transportation fuels post construction in Yolo County | No cumulative impact | | |

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# Chapter 1 Introduction

The Lower Yolo Restoration Project (Project) is proposed as a tidal restoration project in Yolo County by the State and Federal Contractors Water Agency (SFCWA) on behalf of the California Department of Water Resources (DWR) and the U.S. Bureau of Reclamation (Reclamation) (**Figure 1-1**). This Project is planned, designed, and would be implemented within the broad framework set out in the CALFED Bay-Delta Program (CALFED) and the Delta Vision Process. SFCWA is pursuing the Project to partially fulfill federally permit requirements for tidal restoration imposed on DWR and Reclamation under the biological opinions (BiOps) issued for coordinated operation (i.e., Operations Criteria and Plan [OCAP]) of the State Water Project (SWP) and the federal Central Valley Project (CVP). The Project would also partially fulfill restoration objectives under the forthcoming Bay Delta Conservation Plan (BDCP). This Project would enhance fishery habitat restoration in the Delta, both in terms of restored habitat and furthering the understanding of Delta restoration and ecosystem science.

**AT A GLANCE**

**Purposes of the Lower Yolo Restoration Project**

Compliance with the biological opinions for the State Water Project/Central Valley Project Operations Criteria and Plan for tidal restoration in support of delta smelt and salmonids:

- Project would provide up to ~1,226 acres of the 8,000-acre requirement.

Contribute toward the Bay Delta Conservation Plan's near-term action measures for habitat restoration.

Support the ongoing Delta Stewardship Council planning and scientific processes.

Implement State and Federal Contractors Water Agency's program areas for fishery habitat restoration and advancing Delta ecosystem science.

## 1.1 Project Overview

### 1.1.1 Importance of Tidal Wetlands Restoration Projects

Prior to 19th century development, the Bay-Delta region was a vast tidal marshland spanning about 700 square-miles. With the construction of over 1,100 miles of levees, the region's original wetlands have been reduced by over 95 percent.

Historically, wetlands have provided numerous ecosystem functions, along with values desired by society that continue to evolve. While restoration efforts may not yield all functions and values of historic wetlands, under appropriate circumstances, restoration efforts can result in:

1. Habitat for fish and wildlife.
2. Cycling of nutrients and other constituents.
3. Water quality improvements.
4. Erosion control.
5. Flood attenuation.
6. Sequestration of carbon and reduction of greenhouse gases from the atmosphere.

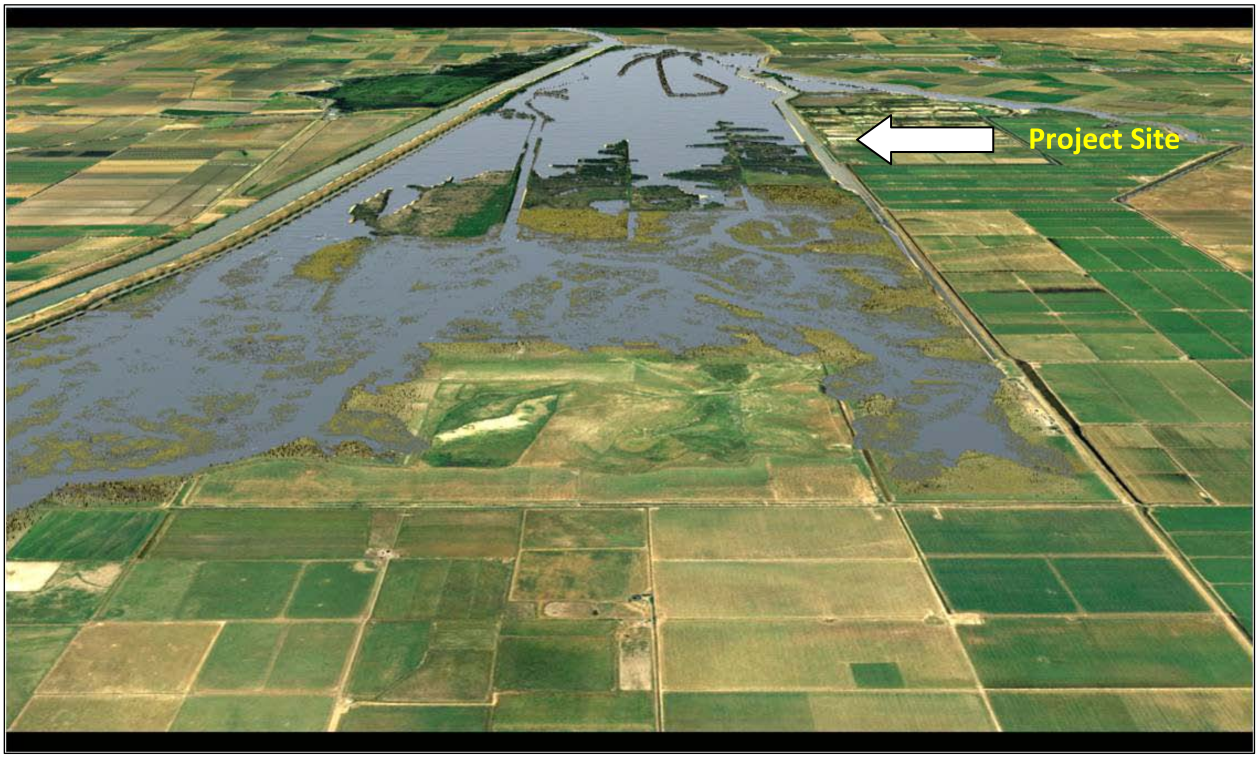


**Figure 1-1. Artist's Rendition of Lower Yolo Restoration Project[2] upon Completion (aerial view from the north looking southward)**

7. Education and scientific research.
8. Aesthetic and landscape enhancements.
9. Recreational opportunities (passive: bird watching and photography).
10. Recreational opportunities (active: hunting and fishing).

Restoring wetlands in strategic locations is now seen by many local, state, and federal agencies as part of a comprehensive approach to reversing the ecological decline of the Bay-Delta system. This approach is a cornerstone strategy in achieving co-equal goals in state law to restore the Delta ecosystem concurrent with the provision of statewide water supply reliability.

As envisioned by SFCWA, the Project would be a critical step moving forward in Delta wetlands restoration efforts in the Yolo Bypass. The Project site is ideally situated to provide ecological benefits to target fish and wildlife species, as well as to natural communities of the Delta. It is situated at the Delta's edge, at the bottom of the Yolo Bypass, within the Cache Slough Complex, and has a lengthy boundary of tidal waters.

Location at the topographic edge of the tidal Delta would allow for restoration of intertidal wetlands without grading or filling, and would provide tremendous opportunities for reconnecting the intertidal lands to tidal source waters. About 565 acres (ac) are already at intertidal elevations. By being at the bottom of the Yolo Bypass, the Project site would support

[2] Only Phase 1 of the Project is being pursued at this time; however, Phase 2 is included here as part of the reasonably foreseeable future build out. For more specifics on the phases, see Section 1.1.4 of the Draft EIR.

seasonal floodplain ecosystems under a range of flood conditions. Feyrer *et al.* (2006) found that the nature of the underlying physical habitat on the Yolo Bypass floodplain when inundated and exhibiting habitat connectivity are critical determinants in structuring fish communities, particularly for Chinook salmon smolts and Sacramento splittails. The Project site would also be within the Cache Slough Complex. This area supports many of the target ecological functions that SFCWA would achieve in implementing the Project, while discouraging invasive species from taking hold.

Ultimately, the importance of location to fish is incorporated into their life histories – tracking water quality conditions (e.g., delta smelt); positioning along a migratory corridor (e.g., salmonids); and seizing seasonal floodplain opportunities (e.g., Sacramento splittail). To the many other species and natural communities that benefit from freshwater tidal marshlands and seasonal floodplain wetlands, the space or place occupied by species is about the juxtaposition of their location to ecosystem complexes: tidal aquatic/tidal marsh/seasonal floodplain wetlands/lowland grasslands/vernal pools are in immediate proximity to the Project.

The proposed Project would achieve five ecological functions and beneficial outcomes:

1. Increased food web productivity and export to Cache Slough Complex and beyond.
2. Rearing habitat for outmigrating[3] salmonids.
3. Rearing, breeding and refuge habitats for fish and wildlife species that utilize or depend upon tidal marsh or seasonal floodplain wetlands.
4. Suitable habitat to establish diverse native plant communities, which include rare plants.
5. Minimized potential for colonization by invasive, aquatic plants.

### 1.1.2 Context of Project within Delta Regional Planning Efforts

The proposed Project is one of several habitat restoration projects that would be undertaken throughout the Delta in accordance and consistent with the broad framework first set out in CALFED in 2000 and the 2006 Delta Vision Process. These multi-stakeholder programs were designed to develop and implement strategies for: improving the Delta's ecosystem health, maintaining water supply reliability, strengthening levee system integrity, and improving water quality. For example, the CALFED Science Program has provided scientific support for the Delta Vision process, which was ordered by then-Governor Schwarzenegger and the State Legislature, to plan for the Delta's future as a sustainable ecosystem and water supply system. Accordingly, this scientific information was used by the Delta Vision Blue Ribbon Task Force to ensure their vision and strategic plan is grounded in the best science available. Data gathering beginning in 2001 and 2002 by the Yolo Bypass Working Group was funded by CALFED for further understanding of how to improve the habitat for native fish in the Yolo Bypass (Yolo Bypass Working Group 2002).

[3] Out-migrating salmonids (salmon and steelhead) are juveniles transitioning from a freshwater environment to a saltwater environment.

In 2002, CALFED also sponsored a workshop to develop long-term adaptive management plans for key areas, including the Yolo Bypass. The Project fits within this CALFED-Delta Vision planning and scientific processes. For a detailed explanation of the CALFED-Delta Vision process, along with other Delta planning efforts, refer to Section 2.4, Relationship to Regional Habitat Restoration Plans.

### 1.1.3 Project Goals and Objectives

The proposed Project has two primary goals. First, it is intended to partially fulfill the federal permit obligations of DWR and Reclamation, which require those agencies, to create or restore at least 8,000 ac of intertidal and associate subtidal habitat in the Delta and Suisun Marsh, as set forth in the Reasonable and Prudent Alternative of the U.S. Fish and Wildlife Service (USFWS) Delta Smelt BiOp (USFWS 2008) and referenced in the National Marine Fisheries Service (NMFS) Salmonid BiOp (NMFS 2009) for coordinated operations of the SWP and CVP. (For further information on this effort, refer to **Appendix F**, Memorandum of Agreement regarding the Early Implementation of Habitat Projects for the CVP and SWP Coordinated Operations and the BDCP).

Second, the proposed Project would serve as a near-term restoration measure for the forthcoming BDCP. The BDCP conservation strategy, as currently proposed, consists of multiple components that are designed collectively to achieve the overall BDCP goal, i.e., to restore and protect ecosystem health, water supply, and water quality within a stable regulatory framework. The conservation strategy is divided into near-term and long-term implementation stages. The near-term phase lasts until the north Delta diversion and tunnel/pipeline conveyance facilities are constructed and operational, anticipated to occur within a 15-year period.[4] Upcoming habitat restoration projects, such as the proposed Project, fall within the near-term phase of the BDCP and would be performed in accordance with applicable provisions of the Conservation Measure No.22 for Avoidance and Minimization Measures.[5]

To achieve these two goals, four objectives have been identified for this Project:

1. To enhance regional food web productivity in support of delta smelt recovery.
2. To provide rearing habitats for out-migrating salmonids.
3. To support a broad range of other aquatic and wetland-dependent species, including Sacramento splittail.
4. To provide ecosystem functions associated with the combination of Delta freshwater aquatic/tidal marsh/floodplain/seasonal wetland/lowland grassland interfaces that once existed historically.

[4] Taken from February 2012 Administrative Draft Bay Delta Conservation Plan, Chapter 3, Conservation Strategy, page 3-8: http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/BDCP_Chapter_3_1_and_3_2_-_Conservation_Strategy_2-29-12.sflb.ashx.

[5] Taken from February 2012 Administrative Draft Bay Delta Conservation Plan, Chapter 4, Covered Activities and Associated Federal Actions, page 4-22: http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/BDCP_Chapter_4_-_Covered_Activities_and_Associated_Federal_Actions_2-29-12.sflb.ashx.

### 1.1.4 Project Phasing, Components, and Activities

Restoring wetlands in the Bay-Delta region often necessitates excavating new channels at various depths, sizes, and configurations to reintroduce tidal flow into areas that have been artificially separated from tidal flow by levee construction or other structures. The Project's restoration efforts would take place at the southern end of the Yolo Bypass, in Yolo County, California, and would modify about 1,770 ac of agricultural land that is now used primarily for cattle grazing and agricultural infrastructure. Upon Project implementation, important new sources of food and shelter would support a variety of native fishes at the appropriate scale in strategic locations.

#### *Project Phasing*

The proposed Project would be located on a 3,795-ac site comprised of two properties and would be completed in two phases (refer to specifics illustrated in **Figure 3-1** in Chapter 3, Project Description):

1. Phase 1, consisting of the Yolo Ranch property excluding the Northeast Field in Network 4; and
2. Phase 2, consisting of the Yolo Flyway Farms property and the Northeast Field in Network 4 of the Yolo Ranch.

This Project configuration would result in the creation of approximately 1,226 ac of perennial emergent tidal marsh. Subsequent to issuance of the Notice of Preparation/Initial Study (NOP/IS) on March 1, 2011, SFCWA determined that acquisition of the Yolo Flyway Farms property would not be practicable at this time. Additionally, comments received from: the NOP/IS process, the public scoping meeting, and the subsequent consultations with regulatory agencies, promoted the concept of analyzing a reduced-size version of the Project. As a result, only Phase 1 of the Project is being pursued at this time. Under this phase, approximately 1,338 ac of agricultural lands would be modified and about 861 acres of tidal wetlands (i.e., perennial emergent marsh) would be created.

Nonetheless, because Phase 2 may be pursued in the future, this Draft Environmental Impact Report (EIR) analyzes potential environmental impacts and identifies feasible mitigation measures for both phases of the Project. This approach ensures that all reasonably foreseeable impacts of the entire Project are analyzed, even though no current plans exist to acquire or develop the Yolo Flyway Farms property.

#### *Project Construction*

The entire restoration design would involve modifying up to 1,770 ac (Phase 1: 1,338 ac; Phase 2: 432 ac) of the approximate 3,795-ac site. Construction activities would involve:

1. **Tidal marsh restoration.** Establishing about 1,226 acres of wetlands.
2. **Wetland enhancement.** Establishing about 267 acres in enhancement actions.

3. **Irrigation and drainage improvements.** Relocating or modifying several water control structures and irrigation and drainage ditches on 15 acres of farmland.
4. **Soils reuse options.** Reusing excavated soils to construct one of three options: a 116-ac levee toe berm and supporting structures adjacent to the west Yolo Bypass levee, or a 262-ac stockpile and irrigation system; or a combination of the previous two options each smaller in soil volumes than if constructed alone.

### *Project Operations and Other Activities*

Post-construction activities would include:

1. **Long-term operations and maintenance activities.** Managing ancillary site conditions (e.g., installation and repairs of fencing, signage, and minor structures), and carrying out corrective measures to address potential problems (e.g., mosquito production, invasive plant species, and slumping of channel banks);
2. **Project outcome verification monitoring.** Observing Project performance relative to objectives via monitoring and would be conducted separately from mitigation monitoring as required by the California Environmental Quality Act (CEQA).
3. **Regional science support efforts.** Conducting in a cooperative effort, amongst interested stakeholders, monitoring and scientific endeavors at the Project site that may provide invaluable data and insight into future restoration efforts by other entities.

## 1.2 State and Federal Contractors Water Agency

In August 2009, SFCWA was formed as a joint powers authority under California law, by various water agencies that receive water transported across the Sacramento-San Joaquin River Delta (Delta) through SWP and CVP facilities. The organization's mission is to assist its member agencies in assuring a sufficient and reliable high-quality water supply for their customers. The core focus of activities in pursuing this mission is on facilitating habitat conservation measures and scientific research related to the restoration of the Bay-Delta ecosystem.

Member agencies of SFCWA include: Santa Clara Valley Water District, Westlands Water District, Kern County Water Agency, The Metropolitan Water District of Southern California, State Water Project Contractors Authority, and San Luis and Delta Mendota Water Authority. Each of these entities is represented on a nine-member Board of Directors. SFCWA's offices are located at 1121 L Street, Suite 806, Sacramento, California 95814.

SFCWA intends to assist DWR and Reclamation in complying with permit requirements to restore wetland habitat in the Delta. Currently, SFCWA and DWR are negotiating a habitat credit purchase agreement for the Project in order to develop its potential crediting for the BiOps and to develop a template for funding of future habitat projects on behalf of DWR. Ongoing discussions are also taking place with Reclamation.

## 1.3 Intended Uses of Environmental Impact Report

This EIR has been prepared to analyze potential direct, indirect, cumulative, and growth-inducing impacts associated with the Project and to propose feasible mitigation measures, where required. The EIR has also examined alternatives and various options to the proposed Project. This environmental document is intended to:

1. Fully disclose to the lead agency, responsible agencies, trustee agencies, interested parties, and the general public what the significant or potentially significant impacts are in carrying out the Project;
2. Indentify possible actions to avoid or substantially reduce those impacts; and
3. Describe a reasonable range of feasible alternatives to the Project.

In accordance with CEQA (Public Resources Code [PRC] § 21000 *et seq.*), and the *State CEQA Guidelines* (California Code of Regulations [CCR] § 15000 *et seq.*), SFCWA's Board of Directors, as the decision-making body for the lead agency, will utilize the information contained in the EIR in deciding whether to approve the proposed Project. The EIR may also be considered by other public agencies in the exercise of their statutory authority to grant permits, provide approvals, purchase habitat credits derived from the Project, or fund elements of the Project during construction and post construction. A discussion of the agencies and their discretionary actions is presented in the next section.

## 1.4 Agency Approvals and Permits

Pursuant to the *State CEQA Guidelines* (CCR § 15124[d]), a number of responsible, trustee, and other affected agencies are anticipated to rely on the EIR and related documentation for discretionary actions they may take in conjunction with the Project. Even activities that increase the quantity and improve the quality of wetlands are subject to permits.

Depending on the final design of the Project and the affected environmental resources involved, the responsible and trustee agencies for this Project may include, but are not limited to the following state and local agencies and entities:

1. **California Department of Conservation, Division of Oil, Gas, and Geothermal Resources** (DOGGR)**.** PRC, § 3208, Well Review Program opinion.
2. **California Department of Fish and Wildlife**[6] (CDFW)**.** California Fish and Game Code (FGC) § 1602, Lake or Streambed Alteration Agreement; California Endangered Species Act (CESA) consultation and, if required, FGC § 2081(b) Incidental Take Permit and FGC § 2080.1 Determination; and consultation/coordination with Project elements associated with the post-construction phase, as applicable.

[6] The name of the California Department of Fish and Game has been officially changed by the State Legislature to the California Department of Fish and Wildlife (CDFW). The name change took effect on January 1, 2013.

3. **California Department of Water Resources** (DWR)**.** Potential funding mechanism and purchasing of tidal wetlands habitat credits as partial fulfillment of the two federal BiOps relating to the continued operation of the SWP.
4. **California State Historic Preservation Office** (SHPO)**.** Letter of concurrence with U.S. Army Corps of Engineers (USACE) via the National Historic Preservation Act (NHPA) (NHPA § 106).
5. **Central Valley Flood Protection Board** (CVFPB)**.** CCR, Title 23 Water Code, Floodway Encroachment Permit; and consultation on related matters associated with Project implementation and within CVFPB jurisdiction.
6. **Central Valley Regional Water Quality Control Board** (CVRWQCB)**.** Federal Clean Water Act (CWA) § 401 Water Quality Certification; Porter-Cologne Water Quality Control Act Waste Discharge Requirement (WDR); and CWA § 402 National Pollution Discharge Elimination System (NPDES) General Permit for Storm-water Discharge associated with Construction and Land Disturbance Activities (Construction General Permit), as well as possibly a General NPDES Permit under CWA § 402 for discharging biological and residual pesticides to the waters of the United States for vector control in association with post-construction activities, as needed. Coordination of pilot studies related to methylmercury (MeHg) issues as required by the Delta Mercury Program. Additionally, consultation on related matters associated with Project implementation and within CVRWQCB jurisdiction.
7. **Port of West Sacramento.** License agreements for using soil disposal sites under the jurisdiction of the Port of West Sacramento; consultation and coordination on related matters associated with Project implementation (such as vessel movement along the Sacramento River Deep Water Ship Channel).
8. **Reclamation Districts 2068 and 2093.** Agreements, endorsements, or other legal instruments associated with property interest, as applicable.
9. **Westlands Water District.** Conservation easement agreement, purchase agreement, and/or related memoranda of understanding (MOU) or agreements (MOA).
10. **Yolo County.** SFCWA will apply for all legally applicable local permits from Yolo County.

Other public agencies with a non-permitting interest in the proposed Project may include but not be limited to: U.S. Coast Guard; California Department of Conservation, Division of Land Resource Protection; California Air Resources Board; West Sacramento Area Flood Control Agency; Delta Stewardship Council; California Department of Transportation, District 3; California Department of Boating and Waterways; Delta Protection Commission; California State Lands Commission; and Sacramento-Yolo Mosquito and Vector Control District.

Additionally, the EIR may be used by federal permitting and funding agencies to support Project decisions, and to inform their review under the National Environmental Policy Act (NEPA), as applicable. Federal permitting agencies with anticipated jurisdiction over the proposed Project are listed below.

1. **U.S. Army Corps of Engineers** (USACE)**.** A CWA § 404 Permit would be required to authorize the discharge of fill material to waters of the United States. A Rivers & Harbors § 10 permit would be required for construction activities in navigable waters (i.e., all tidally influenced waters in the legal Delta). A Rivers and Harbors Act § 408 Permit or an encroachment permit may be required to authorize modification to a federal flood control project levee. USACE is the lead agency under NEPA and responsible for the preparation and processing of the NEPA documentation (i.e., environmental assessment, finding of no significant impact, and record of decision).
2. **U.S. Bureau of Reclamation** (Reclamation)**.** Potential funding mechanism and purchasing of tidal wetlands habitat credits as partial fulfillment of the two federal BiOps relating to the continued operation of the CVP.
3. **U.S. Environmental Protection Agency** (USEPA)**.** USEPA has oversight responsibility for all federal CWA permits.
4. **National Marine Fisheries Service.** NMFS has jurisdiction over all anadromous fish species listed as threatened or endangered under the federal Endangered Species Act (ESA) to issue a BiOp on the Project. NMFS also regulates Essential Fish Habitat (EFH) in accordance with the Magnuson-Stevens Fishery Conservation and Management Act.
5. **U.S. Fish and Wildlife Service.** USFWS has jurisdiction over all resident fish and terrestrial species listed as threatened or endangered under the federal ESA to issue a BiOp on the Project and a Section 7 ESA permit, if necessary. USFWS also implements the Migratory Bird Treaty Act (MBTA) and related permitting, if necessary.

This EIR would also be utilized and reviewed by the established Fishery Agency Strategy Team (FAST) for advice and guidance during Project development (see **Appendix F**). Regulatory staff from NMFS, USFWS, and CDFW, along with Reclamation and other experts, would provide feedback and work collaboratively to ensure the Project's design and compliance with applicable permitting requirements were met, along with the establishment of tidal wetlands habitat credits for the Project (i.e., FAST credit letter for the BiOps and for the near-term action measures identified in the draft BDCP).

Lastly, SFCWA could enter into leasing agreements or purchase agreements with private property owners and other entities for the storage/placement of the excavated soils in Yolo, Sacramento, or Solano counties, depending on final engineering designs and the chosen soils reuse option and/or alternative.

# 1.5 CEQA Process for Project

## 1.5.1 Overall Approach

In accordance with CEQA and the *State CEQA Guidelines*, this project-level EIR addresses those impacts that could be potentially significant, as identified through a collaborative effort. Information was gathered via the NOP/IS, public meetings, outreach, and coordination with all of the agencies and interested parties that submitted comments in response to the NOP/IS, as well as other affected stakeholders and adjacent property owners and tenants.

The environmental categories evaluated in this EIR are: hydrology, water quality, terrestrial biological resources, aquatic biological resources, agricultural resources, air quality and greenhouse gases, cultural resources, hazards and hazardous materials, and energy consumption. Other environmental categories found not to be potentially significant are discussed further in **Appendix A** of this Draft EIR and in Section 6.3, Effects Not Found to be Significant.

In cases where economic effects need to be identified to determine the likelihood and intensity of physical impacts (e.g., loss of agricultural land), those effects also are assessed. Economic impacts are not, in themselves, considered potentially significant impacts (CCR § 15131(a) of the *State CEQA Guidelines*). An analysis on agricultural economics related to the Project has been carried out and is separate from this CEQA process (M.Cubed 2012), but the report is included here for informational purposes (refer to **Appendix G** of this Draft EIR).

## 1.5.2 Notice of Preparation and Public Scoping Meeting

During the Project-planning phase, a NOP/IS was prepared and processed to indicate that an EIR would be prepared for the proposed Project (in compliance with CCR § 15082 of the *State CEQA Guidelines*). The NOP/IS was distributed for a 30-day agency review, that also included distribution to the public and affected stakeholders, beginning on March 1, 2011 (refer to **Appendix A**).

The availability of the NOP/IS was publicized locally (*Sacramento Bee*) and distributed to a wide array of government agencies both directly by SFCWA and through the Governor's Office of Planning and Research, State Clearinghouse. It was also posted with the County of Yolo Recorder's Office. The NOP/IS distribution list is included in **Appendix B**. Responses to the NOP/IS are summarized in Chapter 7, Consultation and Coordination. The written responses via letter, fax, or email are also included in **Appendix B**.

A public scoping meeting was held for the proposed Project on March 15, 2011, in West Sacramento. Oral comments made at the public scoping meeting are presented in the summary of written comments in Chapter 7, Consultation and Coordination.

Because of this ongoing collaborative effort with regulatory agencies and input from the public, aspects of the Project have been modified since the release of the NOP/IS. **Table 1-1** identifies those Project changes and explains the reasons why those changes were necessary.

## Table 1-1. Project Modifications Subsequent to the Release of the Notice of Preparation/Initial Study

| Project Element in NOP | Project Element in Draft EIR | Changes | Reason for Changes |
|---|---|---|---|
| One-phase with complete build out of both properties: Yolo Ranch and Yolo Flyway Farms | Two-phase project planning. First phase for restoration involves solely Yolo Ranch, excluding Network 4 in the Northeast Field. For the Draft EIR, both phases are evaluated in the context of a reasonably foreseeable build out scenario | No planned restoration for Yolo Flyway Farms and Network 4 of the Northeast Fields on Yolo Ranch at this time | CEQA process: comments from Notice of Preparation and unavailability at this time to acquire Yolo Flyway Farms |
| 1,100 acres (ac) of intertidal wetlands | 1,226 ac of intertidal wetlands | 125 more ac restored | Design advancement based on a number of factors including hydrology, water quality, and agricultural resources |
| 650 ac of agricultural land would not be irrigated | 270 ac of agricultural land would not be irrigated (i.e., buffer, isolated areas) | 380 more ac of agricultural lands to remain irrigated | Reduce impact to agricultural resources |
| 1.92 million cubic yards (mcy) of soil to be excavated/reused | 2.4 – 2.5 mcy to be excavated/reused (Phase 1: 1.85 mcy; Phase 2: 0.65 mcy) | 0.48 – 0.68 mcy more to be excavated/ reused | Design advancement based on a number of factors including hydrology, water quality, and agricultural resources |
| Terminology: “basin” to describe construction of tidal channel networks; “levee breach” to describe tidal connection construction | Terminology: “network” to describe construction of tidal channel groupings; simplify the phrase “tidal connection” construction | Edits from basin to network; levee breach to tidal connections | For clarification purposes |
| Construction of tidal channel network for Network #6 (Southwest): 75 ac | Construction of tidal channel network for Network #6 (Southwest): 70 ac | Five fewer acres to construct Network #6 (Southwest) | Avoid impacts to riparian habitats along existing tidal margins of property |
| Construction of channels would result in excavation to depths about 2 to 4 feet (ft) below MLLW (mean lower low water) | Construction of channels would result in excavation to depths approximately 2 to 6 ft below MLLW | An additional 2 ft below MLLW may be excavated to create channels | Design advancement based on a number of factors including hydrology, water quality, and aquatic biological resources |
| Grading internal roads and berms would result in about 6,000 cubic yards (cy) of soils | Grading internal roads and berms would result in about 15,000 cy of soils | An additional 9,000 cy of soil would be excavated | Design advancement based on a number of factors including hydrology, water quality, and terrestrial biology |
| Installation, rehabilitation, and removal of several water control structures and rerouting some irrigation/drainage ditches | Installation of new water control structures; rehabilitation, relocation, and removal of existing structures; reroute, widen, and expand existing irrigation/drainage ditches; and, provision of irrigation and drainage to adjacent properties during construction | Added new drainage ditch and new field ditch on west side of Network 1; and clarified text on irrigation and drainage to adjacent properties during the construction phase | Design advancement based on a number of factors including hydrology, water quality, and agricultural resources |

## Table 1-1. Project Modifications Subsequent to the Release of the Notice of Preparation/Initial Study

| Project Element in NOP | Project Element in Draft EIR | Changes | Reason for Changes |
|---|---|---|---|
| Soils Reuse Options:<br>• Construct toe berm to protect a portion of the west Yolo Bypass levee<br>• Place as a permanent stockpile on the fields within the northwest portion of Project site<br>• Bacon Island disposal<br>• Dutch Slough disposal | Soils Reuse Options:<br>• Construct toe berm to protect a portion of the west Yolo Bypass levee (Soils Reuse Option #1)<br>• Place as a permanent stockpile on the fields within the northwest portion of Project site at the restricted-height levees (Soils Reuse Option #2)<br>• Do a combination of the two soils reuse options above (Soils Reuse Option #3) | Deleted two potential soils reuse disposal options (Bacon Island levees and Dutch Slough restoration fill); added a combination of soils reuse at the west Yolo Bypass levee and at the northwest portion of the Project site | Transport of excavated soils to Bacon Island and Dutch Slough would have significant air quality impacts and navigation-related traffic impacts over the proposed Project; Dutch Slough is still undergoing planning/ permitting activities and may not be ready to accept the soils within the Project's schedule; adding a new combined toe berm/stockpile option allows for greater flexibility if there are site constraints or limitations |
| Construction of toe berm with a variable side slope between 25:1 and 35:1, with a sinuous relocated irrigation and drainage ditch | If Soils Reuse Option #1 is selected, construction of toe berm with gradual slopes; straight, relocated irrigation and drainage ditch; and 25-foot maintenance access corridor to separate toe berm from relocated ditch | Toe berm design to have uniform, gradual side slopes; straight relocated ditch versus sinous, and maintenance access corridor | Design advancement based on a number of factors including hydrology, agricultural resources, terrestrial biological resources, and aquatic biological resources |
| Remediation of identified hazardous waste to be done | Remediation of identified hazardous waste has been completed | No further remediation is needed | Remediation has already been carried out |
| Two-year construction period | One-year construction period | Construction to occur in one year cycle | Reduces mobilization impacts (such as re-grading access road) under a one-year versus two-year cycle; reduces greenhouse gas emissions and other related environmental impacts; and possible cost savings |
| 15 to 30 construction workers | 25 to 50 construction workers | Up to 20 additional construction workers | Needed for one-year construction schedule |
| Maximum shift hour per day= 15 hours | Depends on the Project element and conditions at site, could be up to 24 hours per day | Potential for construction work to occur throughout a 24-hour period, e.g. dewatering activities | Provides the maximum opportunity for construction activities before the rainy season begins |
| Number of construction vehicles/ equipment typically 2 to 4 of each type | Number of construction vehicles/ equipment 4 to 8 of each type | Doubling of construction vehicles and equipment | Needed for one-year construction schedule |
| Long-term operations and management plan development | Corrective measures to address potential problems identified; project outcome verification monitoring; studies for potential additional tidal connection; and support of regional science needs | Long-term operations and management plan further detailed | Clarification and additional details of long-term operations and management plan provided |

### 1.5.3 Availability of Draft Environmental Impact Report

This Draft EIR is being distributed to the public and affected government agencies for review and comment during a 45-day public review period (in compliance with CCR § 15087 of the *State CEQA Guidelines*), starting on April 18, 2013 and ending on June 3, 2013. Written comments must be received no later than 5:00 pm on June 3, 2013, at the following address:

Ms. Tara Beltran
State and Federal Contractors Water Agency
1121 L Street, Suite 802
Sacramento, CA 95814

Comments may also be faxed to (916) 476-5057 or sent via e-mail to tbeltran@sfcwa.org.

Copies of the Draft EIR are available via downloading at: http://www.sfcwa.org or at the following library locations during regular business hours as determined by each library:

Mary L. Stephens Library
315 E. 14th Street
Davis, CA 95616

Woodland Public Library
250 First Street
Woodland, CA 95695

Arthur F. Turner Library
1212 Merkley Avenue
West Sacramento, CA 95691

### 1.5.4 Public Meeting on Draft Environmental Impact Report

A public meeting will be held to receive comments on this Draft EIR on May 21, 2013 from 7 pm to 8:30 pm. Only comments and information related to the Project's environmental impacts will be accepted at the meeting. The public meeting will be held at the following location:

West Sacramento City Hall
1110 W. Capitol Ave #1
West Sacramento, CA 95691

### 1.5.5 Response to Comments and Preparation of Final Environmental Impact Report

At the end of the public review period, SFCWA will evaluate comments on environmental issues received from the public and agencies that reviewed the Draft EIR and will prepare written responses (CCR § 15088 of the *State CEQA Guidelines*). The comments and the responses will be added to the EIR, as part of the Final EIR.

### 1.5.6 Certification of Final Environmental Impact Report

At a future Board meeting with appropriate noticing, SFCWA's Board of Directors, as the decision-making body, would consider, among other things, the information contained in the Final EIR as well as determine the adequacy of the environmental documentation under CEQA.

### 1.5.7 Adoption of Findings of Fact and Mitigation Monitoring and Reporting Program

SFCWA will evaluate each of the potentially significant impacts that have been identified in the Final EIR and make findings for each one per the *State CEQA Guidelines*, CCR § 15091 to support the findings of fact (i.e., the significant impact can be mitigated to less than significant from changes or alterations to the project, the impact can be mitigated through another agency's actions and not the agency making the finding, or the impact cannot be fully mitigated because certain factors render the mitigations or alternatives as infeasible).

Pursuant to PRC § 21081(a)(1) and CCR § 15097, a mitigation monitoring and reporting program (MMRP) will be prepared. The MMRP would ensure that feasible mitigation measures proposed in the Draft EIR, and which the SFCWA's Board would adopt, would ultimately be implemented. SFCWA's Board would consider the MMRP in conjunction with the actions as mentioned above prior to making a decision on whether or not to approve the Project. The MMRP would include the following:

- The mitigation measures proposed in the Draft EIR and adopted as part of the Project.
- The party or parties responsible for implementing each mitigation measure.
- The criteria to verify the implementation of each mitigation measure.
- The documentation and reporting procedure for the MMRP.

## 1.6 Document Organization

The Draft EIR is organized into two volumes. Volume 1 contains the main report as follows:

**Table of Contents.** Location of chapters/sections, tables, figures, and technical appendices.

**Executive Summary.** Summary of Project description, impacts, mitigation measures, alternatives, and the potential areas of known controversy/issues to be resolved.

**Chapter 1: Introduction.** Project background, CEQA approach, organization of Draft EIR, and Project modifications since the NOP/IS publication.

**Chapter 2: Baseline Conditions.** Regional environmental setting, land uses, existing site infrastructure, and relationship to adopted regional restoration plans.

**Chapter 3: Project Description.** Purpose, goal and objectives, location, and Project components and elements undertaken during construction and post construction.

**Chapter 4: Environmental Setting, Impacts, and Mitigation Measures.** Existing conditions, significance criteria, effects analyses, proposed mitigation measures, and residual impacts following application of mitigation measures. Environmental topics in the Draft EIR are:

- Hydrology (Section 4.1)
- Water Quality (Section 4.2)
- Terrestrial Biological Resources (Section 4.3)

- Aquatic Biological Resources (Section 4.4)
- Agricultural Resources (Section 4.5)
- Air Quality and Greenhouse Gases (Section 4.6)
- Cultural Resources (Section 4.7)
- Hazards and Hazardous Materials (Section 4.8)
- Energy Consumption (Section 4.9)
- Cumulative Impacts (Section 4.10)

**Chapter 5: Alternatives.** Range of potentially feasible alternatives, including the No Project alternative and the environmentally superior alternative. Infeasible alternatives and options are also presented and discussed in this chapter.

**Chapter 6: CEQA Topical Analyses.** Growth inducement, unavoidable significant adverse impacts, and effects not found to be significant.

**Chapter 7: Consultation and Coordination.** Agency representatives and individuals.

**Chapter 8: List of Preparers and Contributors of the Environmental Impact Report.** Writers, technical personnel, and reviewers.

**Chapter 9: References.** Sources of information provided in the Draft EIR, i.e., reference citations and personal communications (i.e., unpublished, verbal discussions). Pursuant to CEQA requirements, materials and literature referenced in the EIR or documents incorporated by reference, but not included in Appendices, are maintained at the SFCWA offices in Sacramento, California and available upon request during regular business hours. Wherever possible, website links are provided to facilitate the exchange of information.

**Chapter 10: Acronyms and Abbreviations.** List of acronyms and abbreviations in the EIR.

**Chapter 11: Glossary.** List of definitions for certain technical terms used in the EIR.

Volume 2 of the Draft EIR contains seven technical appendices as follows:

**Appendix A.** Notice of Preparation/Initial Study for the Proposed Lower Yolo Restoration Project.

**Appendix B.** Comments Received on the Notice of Preparation/Initial Study.

**Appendix C.** Special-status Plant and Wildlife Species Tables.

**Appendix D.** Agricultural Land Evaluation and Site Assessment Model Evaluation.

**Appendix E.** Air Quality Calculations.

**Appendix F.** Memorandum of Agreement for Habitat Crediting.

**Appendix G**. Economic Impacts within Yolo County of the Lower Yolo Restoration Project. Note: *State CEQA Guidelines* § 15131 states that "Economic or social effects of a project shall not be treated as significant effects on the environment." Accordingly, social and economic impacts are not considered "effects on the physical environment" in this Draft EIR. SFCWA commissioned this agricultural economic analysis to be done separately from the CEQA process but is provided here for informational purposes only.

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# Chapter 2 Baseline Conditions

## 2.1 Overview

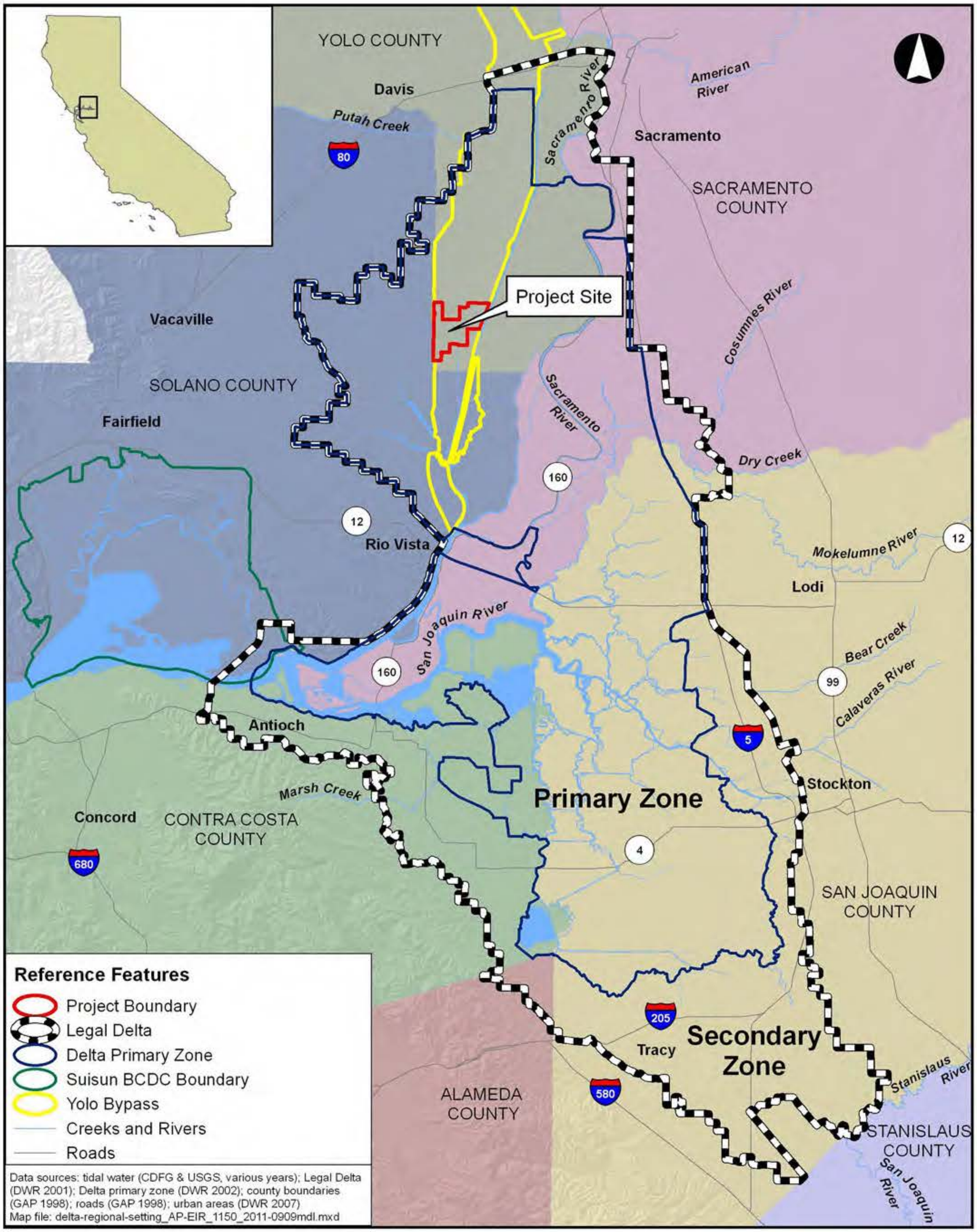
The California Environmental Quality Act (CEQA) requires that an environmental analysis be conducted on how a proposed project will affect the physical environment (Public Resources Code §§ 21061 and 21068). The *State CEQA Guidelines* (California Code of Regulations [CCR] § 15125[e]) further clarifies and requires that environmental impact reports (EIRs) include a description of the baseline conditions that exist at the time of the publication of the Notice of Preparation/Initial Study (NOP/IS), which for this Project was March 1, 2011 (*State CEQA Guidelines*, CCR § 15121[a]). Once the existing conditions are described, they "will normally constitute the baseline physical conditions by which a lead agency determines whether an impact is significant" (*State CEQA Guidelines*, CCR § 15121[a]). Thus, the environmental baseline for the Draft EIR is represented by the environmental, operational, and physical conditions associated with the Project site in 2011 (and does not consider potential long-term sea level rise).

This chapter describes the environmental setting and existing land uses for the Project. The environmental setting is the physical environmental conditions in the vicinity of the Project, viewed from a local and regional perspective (*State CEQA Guidelines*, CCR § 15121[a], [c]). More detailed environmental setting information is presented in Chapter 4 for each of the ten environmental categories listed. Chapter 2 also discusses the consistency of the proposed Project with and its relationship to regional restoration plans. Other adopted plans, such as general plans, are discussed in Chapter 4, as applicable.

## 2.2 Regional Environmental Setting and Land Uses

The Project site is located in the northwestern portion of the Sacramento-San Joaquin River Delta (Delta) in southern Yolo County (**Figure 2-1**). It is situated at the southern end of the Yolo Bypass floodway and near the north end of the Cache Slough Complex (**Figure 2-2**). The Yolo Bypass is a levee-protected, 59,000-acre (ac) floodplain west of the lower Sacramento River. Sacramento River floodwaters are directed away from the heavily developed urban and suburban areas, via the 41-mile long Yolo Bypass, and onto minimally developed farmland. Land use within the Yolo Bypass is managed to facilitate flood flow conveyance.

The Yolo Bypass land uses consist of the state-owned 16,700-ac Yolo Bypass Wildlife Area (YBWA) and mainly privately owned farmlands, all of which are subject to flood flow conveyance easements that restrict development in the Bypass. The Yolo Bypass is predominantly used for annual agricultural crops and some grazing, with the YBWA managed for emergent wetland vegetation. Bounding the Yolo Bypass on the east is the Sacramento River Deep Water Ship Channel (SRDWSC).




Only Phase 1 of the Project and not Phase 2 is being pursued at this time; however, Phase 2 is included here as part of the reasonably foreseeable future buildout.

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**Figure 2-1**

**Delta Regional Setting**

SFCWA
State & Federal Contractors Water Agency

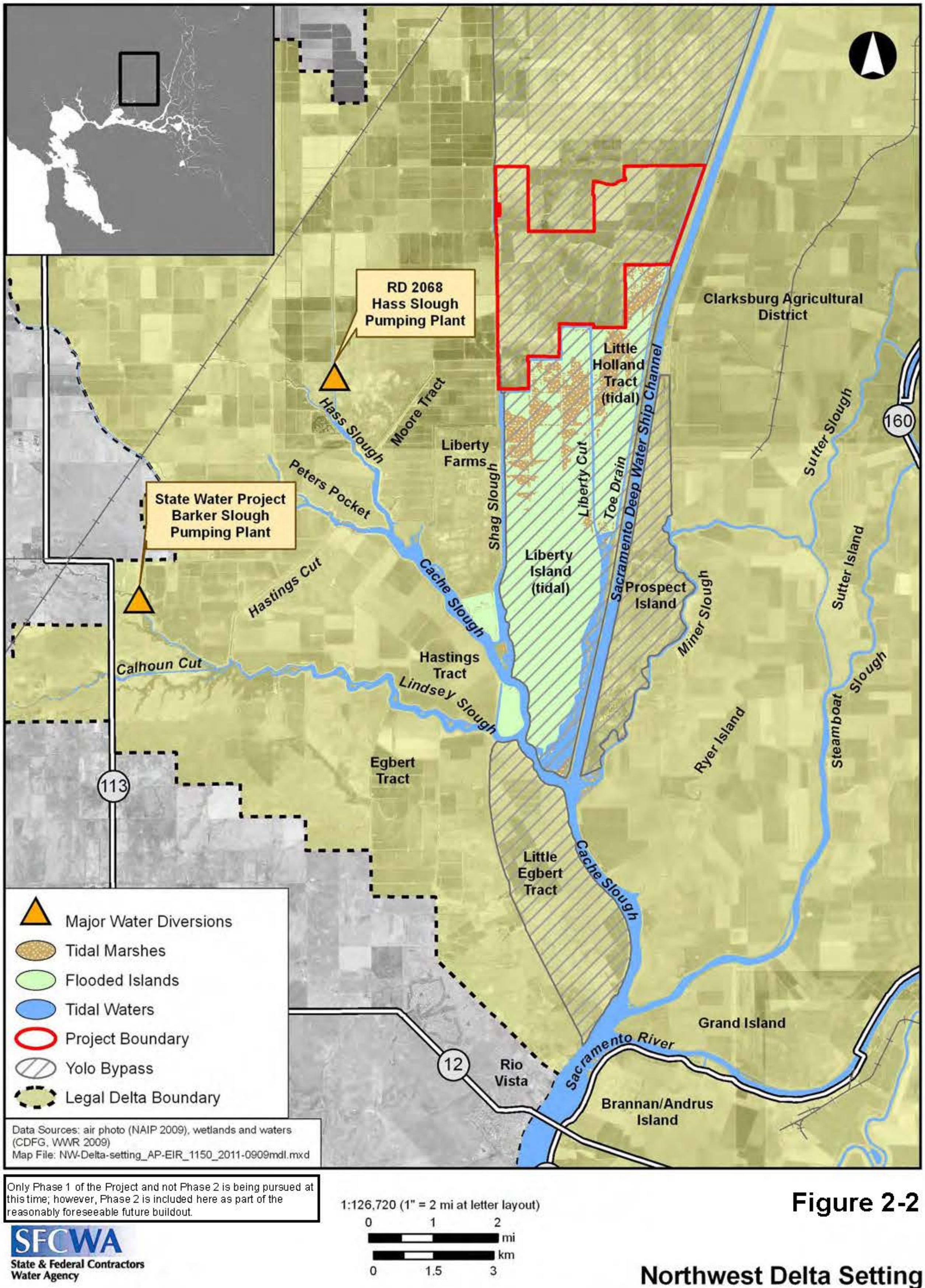



**Figure 2-2**

**Northwest Delta Setting**

Several other wetland restorations also have taken place or are in the planning stages in the Project vicinity (**Figure 2-3**). Two restorations resulted naturally from levee failures of the Little Holland Tract (nearly 1,500 ac, occurring in 1983 and 1992) and Liberty Island (more than 4,300 ac occurring in 1998), both located immediately south of the Project site. Southeast across the SRDWSC is the planned 1,600-ac Prospect Island Tidal Restoration Project, by the California Department of Water Resources (DWR) in cooperation with the Port of West Sacramento. Immediately south of the site is the 185-ac Kerry Parcel, which was constructed in 2010 as a wetland mitigation bank.

Just southwest of the Project site is the 1,700-ac Liberty Farms Diked Wetlands Enhancement Project, constructed in 2003 through the Natural Resources Conservation Service Wetland Reserve Program. At the western end of Lindsey Slough is the 160-acre Calhoun Cut Tidal Wetland Enhancement Project as planned by the California Department of Fish and Wildlife (CDFW). Just north of the Project site are some privately-owned lands used for waterfowl hunting, some with federal wetlands easements supporting those land uses. Farther north in the Yolo Bypass (but not shown in **Figure 2-3**) is the 16,700-ac YBWA managed by CDFW.

Numerous water diversions exist in the Cache Slough Complex, mostly for agricultural purposes. The State Water Project (SWP) operates the Barker Slough Pump Plant at the upstream terminus of the tidal Barker Slough (see **Figure 2-3**). This major diversion feeds into the North Bay Aqueduct, which supplies urban and agricultural water to portions of Solano and Napa counties.

## 2.3 Project Site Environmental Setting and Land Uses

The proposed Project would modify up to 1,770 ac of the 3,795-ac site (**Figure 2-4**). Located within the Yolo Bypass, the largest floodwater bypass of the federal Sacramento River Flood Control Project, the site often receives substantial flood flows during the winter-spring rainy season (roughly November through May) that can submerge the Project site by up to 15 feet (ft) of water or more. Before being diked and reclaimed for agriculture in the early and mid-1900s, the site contained a combination of grasslands, seasonal wetlands, open water “backwater lake” features, and tidal marsh (**Figure 2-5**). Consequently, the proposed Project would restore areas that historically were wetlands prior to the 20$^{th}$ century.

Agricultural lands surround the site in all directions except to the immediate south (**Figure 2-4**). To the north, agricultural lands within the Yolo Bypass are used for a mixture of cattle grazing and crop production. West of the Yolo Bypass are extensive agricultural lands (pasture and crops) in Solano County. East of the Yolo Bypass and across the SRDWSC are additional agricultural lands. Bordering the Project site to the south is the Stair Step tidal waterway. South of the Stair Step are the flooded islands of Liberty Island and Little Holland Tract, and even further south are more agricultural lands in Solano and Sacramento counties.

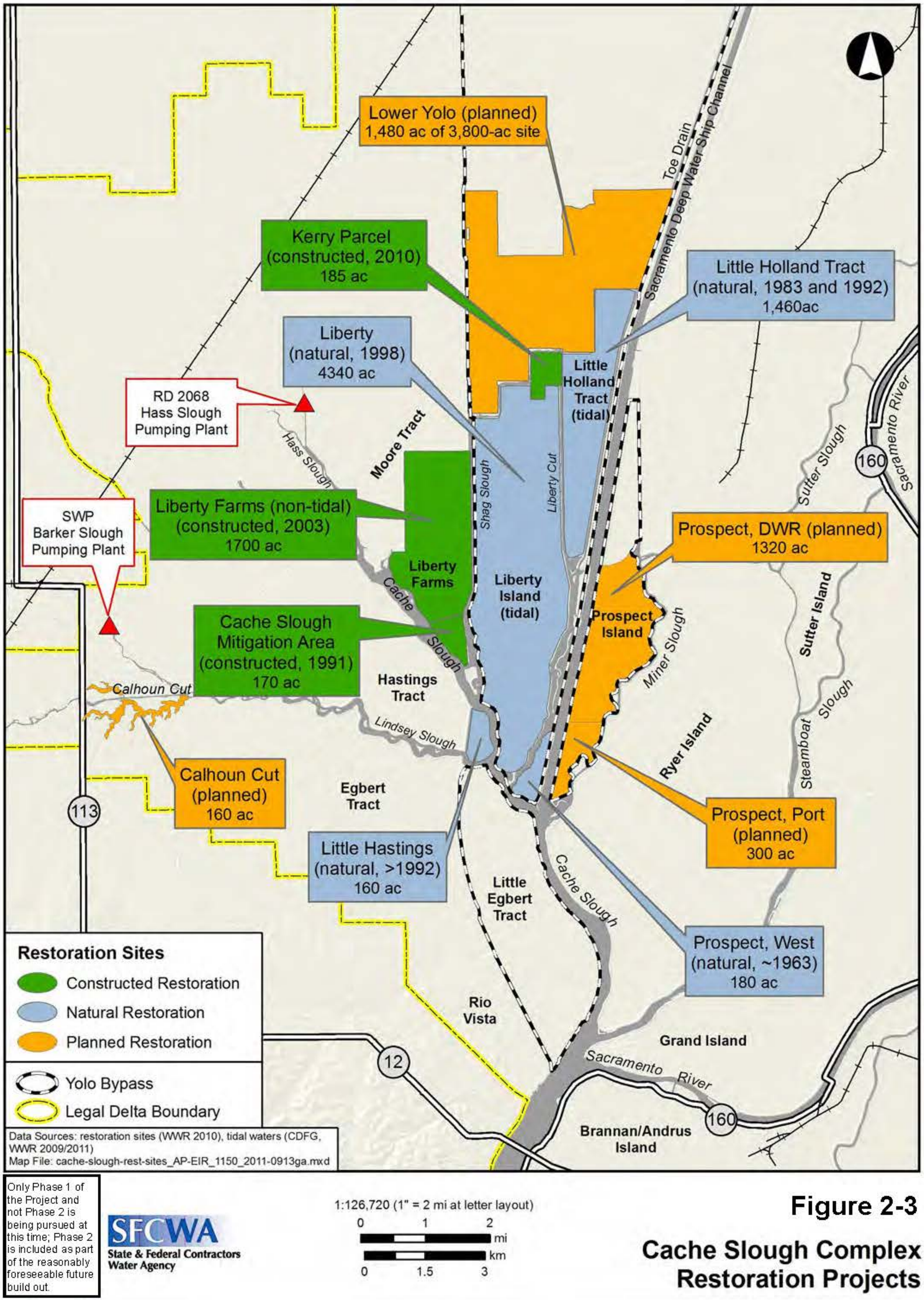



**Figure 2-3**

**Cache Slough Complex Restoration Projects**

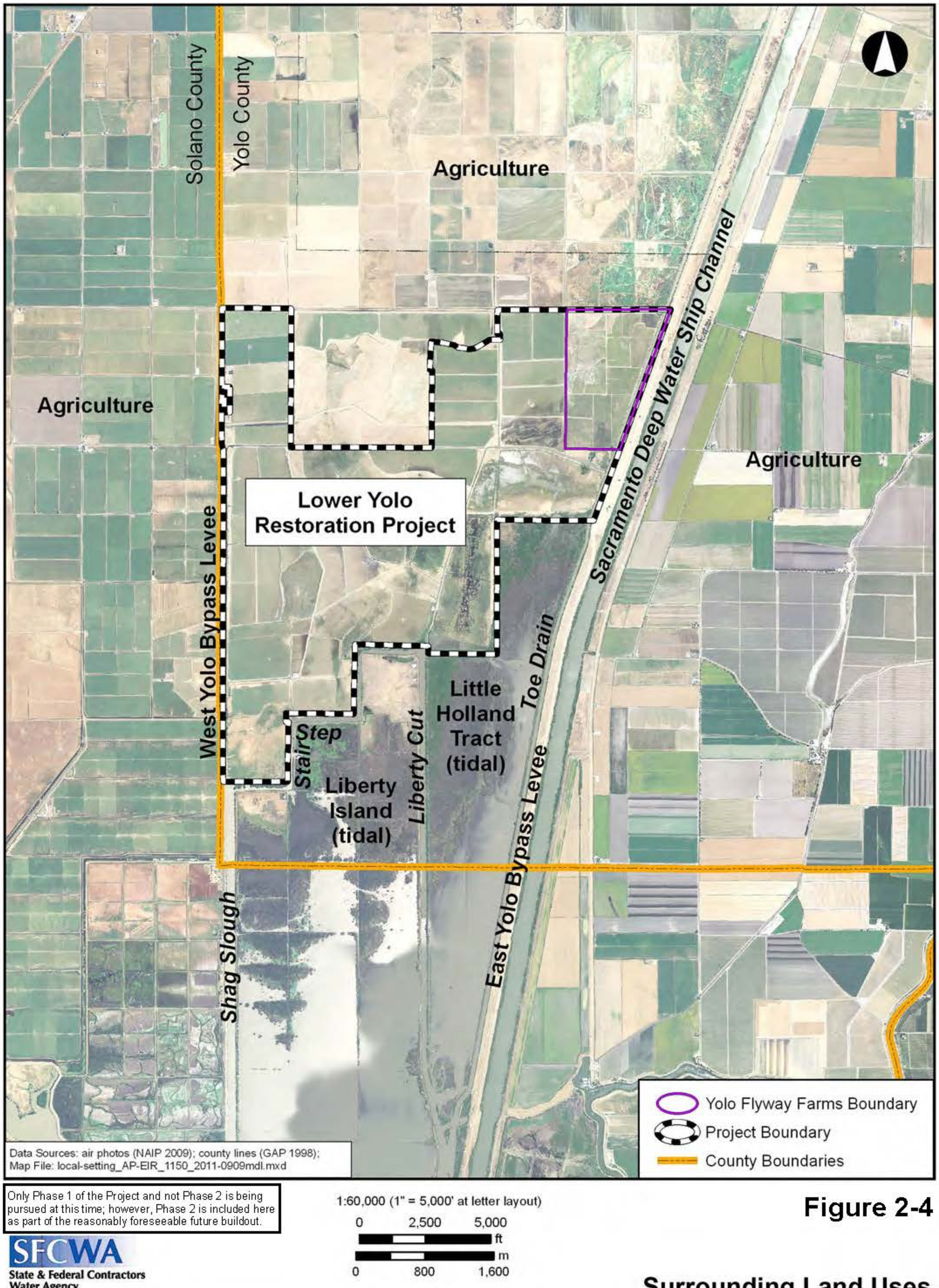



**Figure 2-4**

**Surrounding Land Uses**

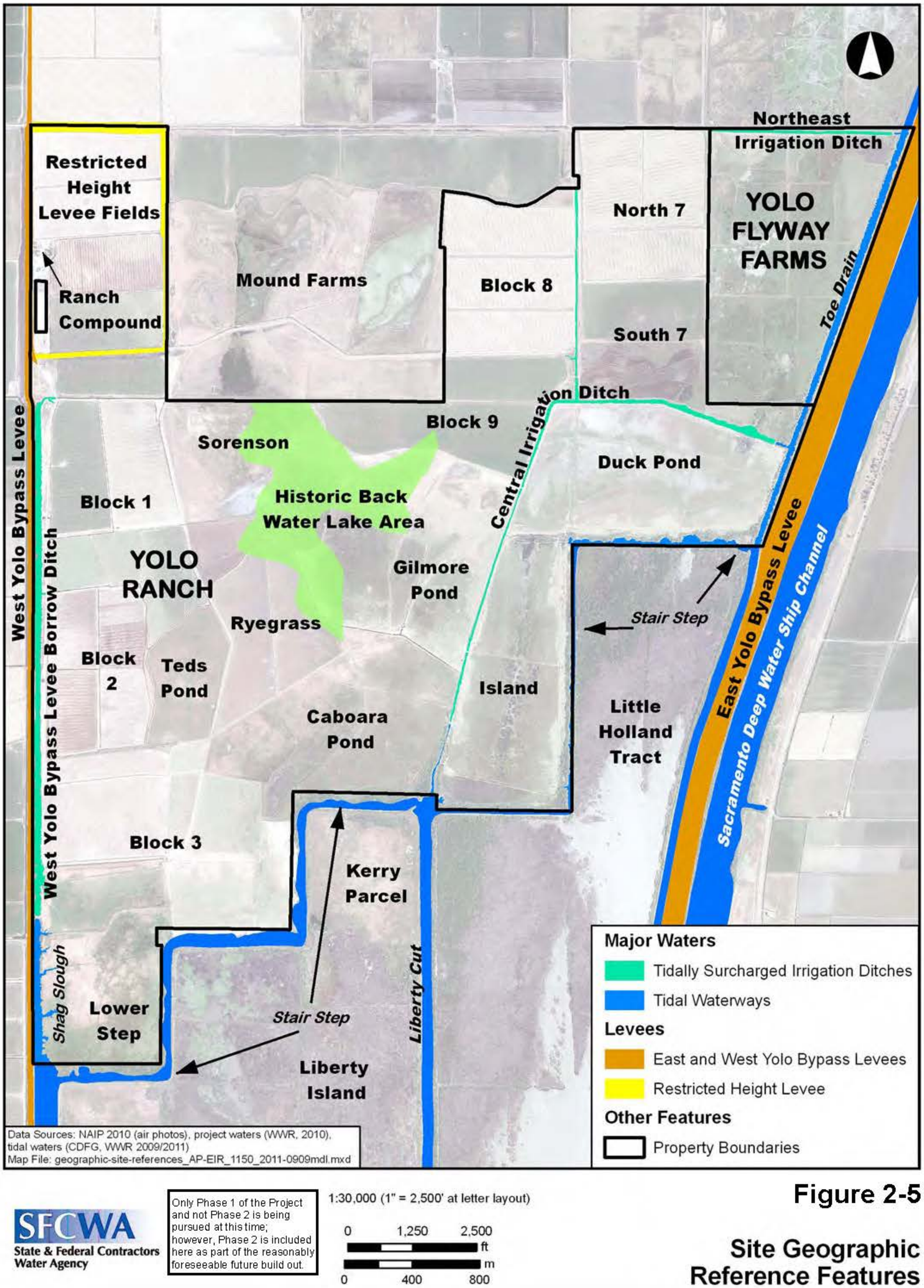



**Figure 2-5**

**Site Geographic Reference Features**

The Project site is accessed via Delhi Road. The properties comprising the proposed Project have separate accesses. The Yolo Ranch property is accessed from the northwest corner at the junction of Levee and Delhi roads, southeast of Dixon. The entrance to Yolo Flyway Farms is via County Road 155, east of County Road 104. County Road 155 intersects with Levee Road north of the entrance to Yolo Ranch.

### 2.3.1 Site Topography

The topography of the Project site is primarily flat, with an almost imperceptible slope descending from the northwest to the southeast (**Figure 2-6**). Much of the site is at elevations above modern mean higher high tide (+6.5 ft North American Vertical Datum of 1988 [NAVD88]), with elevations ranging between +6.5 to +15 ft NAVD88. Approximately one quarter of the site is within intertidal ranges of +2 to +6.5 ft NAVD88. Many pastures onsite have been graded to drain to agricultural ditches.

### 2.3.2 Site Land Uses

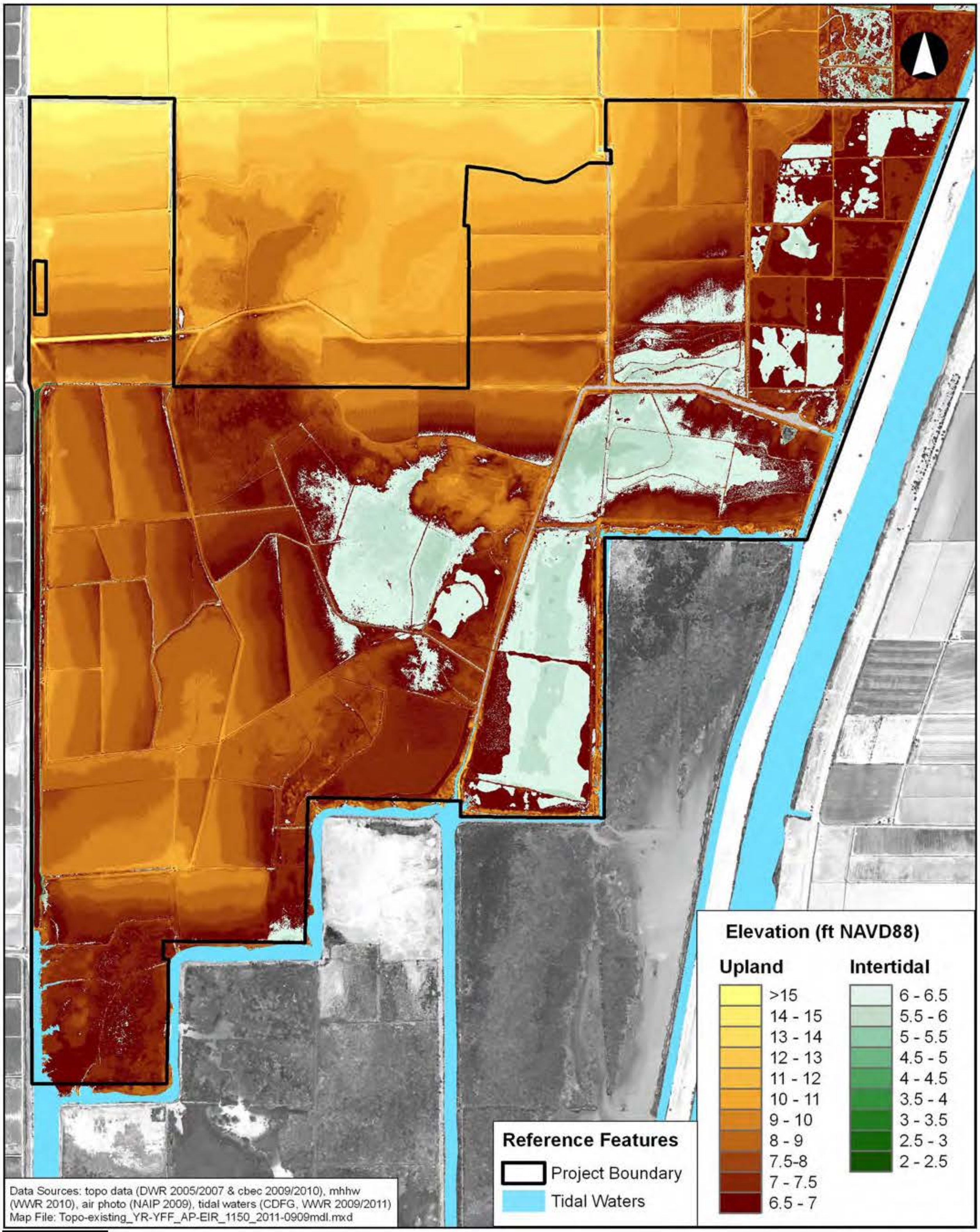
The Project site includes a ranch compound (including small seasonal residences, barns, other outbuildings, and corrals) in the northwest corner of the property and agricultural lands, including farmed wetlands, on the remainder of the property. The entire site is designated in the Yolo County General Plan as Agricultural Preserve (County of Yolo 2009).

The Project site serves as a flood bypass, with winter and spring floods occurring on average in two of every three years (California Department of Fish and Game 2008). The ranch compound and about 240 ac of adjacent irrigated pasture are protected from flooding by a restricted-height levee and flood only during major flood events on the Yolo Bypass. Most of the buildings in the ranch compound are built on raised foundations to avoid damage from flood inundation.

During the summer period, most of the site supports cattle grazing along with some hay production (**Figure 2-7**). Most of the pasture on the site is irrigated during the summer to support forage production. Cattle are removed each fall before the Yolo Bypass floods begin and are returned in the spring or summer following the end of the flood season. During the winter time, portions of the eastern half of the site (about one fifth of the total Project site) are managed as ponds and wetlands for duck hunting.

### 2.3.3 Site Infrastructure

The limited infrastructure on the Project site is primarily in support of cattle ranching and water management operations (**Figures 2-8 and 2-9**). Unpaved roads and cattle fencing cross the entire site with utility and natural gas infrastructure present mostly at the perimeter boundaries.




Only Phase 1 of the Project and not Phase 2 is being pursued; Phase 2 is included here as part of the reasonably foreseeable future build out.

SFCWA State & Federal Contractors Water Agency

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**Figure 2-6**

**Existing Topography**

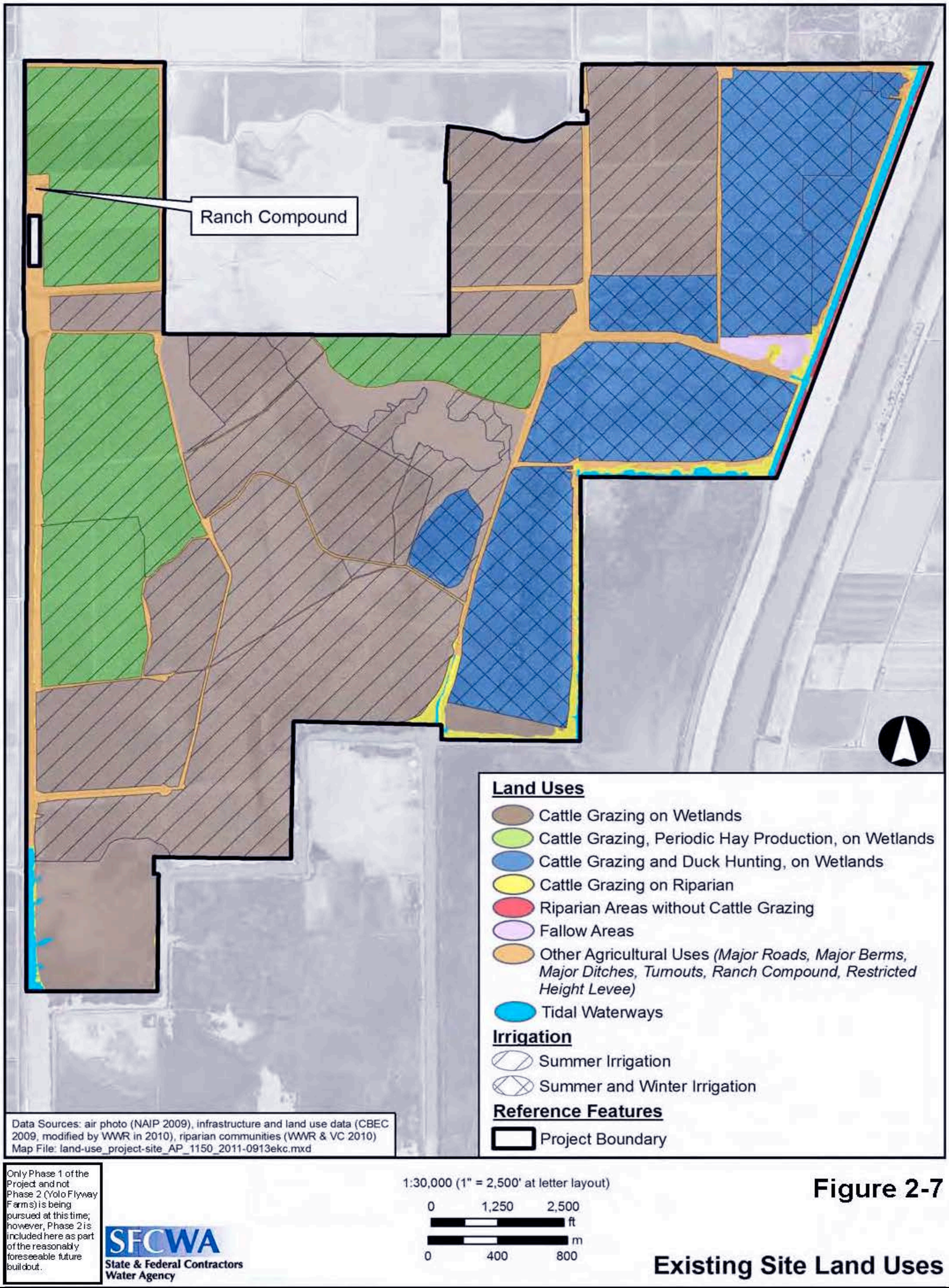


**Figure 2-7**

**Existing Site Land Uses**

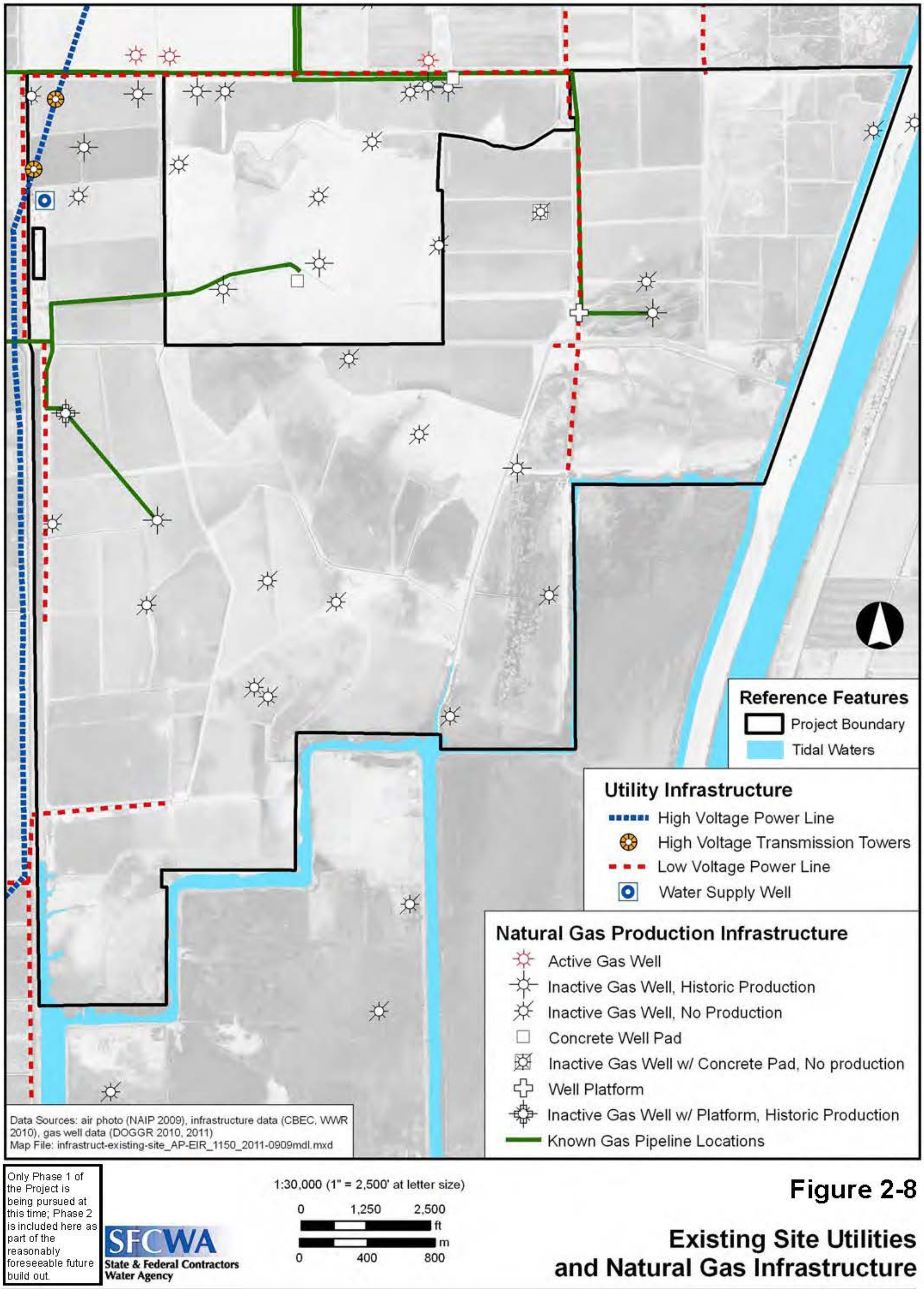


**Figure 2-8**

**Existing Site Utilities and Natural Gas Infrastructure**

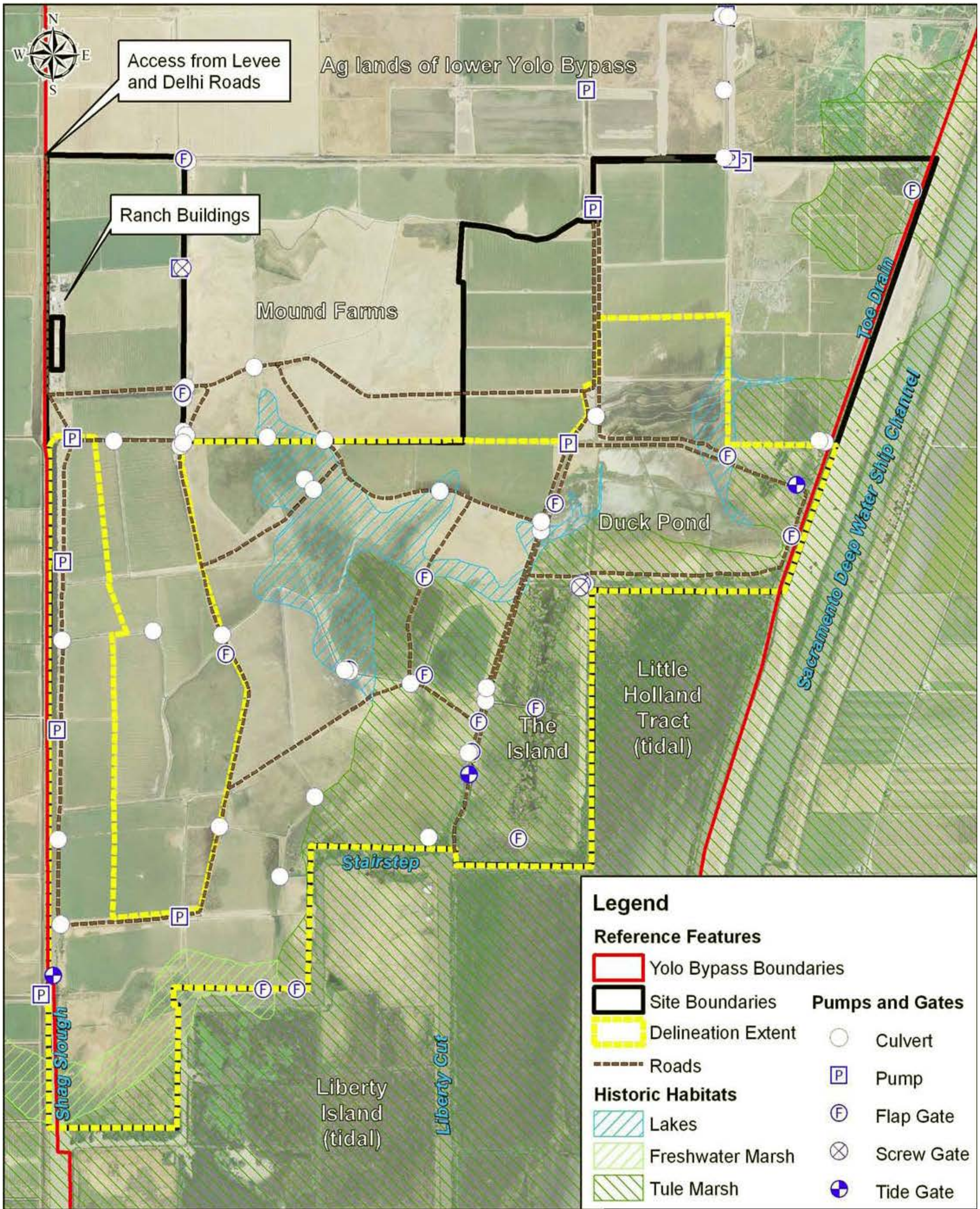


Figure 2-9

Water Control Structures and Generalized Wetland Areas on and adjacent to the Project Site

Major levees include a restricted-height levee surrounding the ranch compound and adjacent agricultural lands (outside the restoration Project footprint), along with the larger Yolo Bypass flood control levees that occur on the eastern and western edges of the Project site. The restricted-height levee is meant to protect against small Yolo Bypass floods, but allow overtopping during very large flood events to provide flood relief. The restricted-height levee consists of three segments: two, east-west running segments at the upper (northern) and lower (southern) ends, each about 2,500 ft in length, and one, north-south-running segment about 4,300 ft in length. The Project site borders about 3.4 miles of the west Yolo Bypass levee (crest elevation of about +28 ft NAVD88) and about 1.6 miles of the east Yolo Bypass levee (crest elevation of about +30 ft NAVD88), which lies across the Toe Drain from the Project site. Low, internal berms for managing irrigation water are located throughout the site.

To prevent tidal flooding, the hydrology of the site is intensively managed through a series of smaller levees, berms, tide gates, flap gates, ditches, and other infrastructure. This infrastructure is identified in **Figure 2-9**. Water exchange between the Project site and the adjacent tidal water bodies is regulated by a series of water control structures. These structures are operated differently throughout the year; during storms, some are opened to allow stormwater drainage. The remainder of the year they are closed to allow diversion of irrigation water, via tidal surcharge through one-way tide gates or weirs.

The Toe Drain (see **Figure 2-9**) is a large constructed tidal waterway that basically serves as a conduit between the floodplain of Yolo Bypass and the Cache Slough Complex. This large agricultural ditch supplies irrigation water north to agricultural lands within the Yolo Bypass and conveys stormwater south in the winter and spring, as well as agricultural drainage in the summer. The Toe Drain is located between the east fields of the Project site and the east Yolo Bypass levee.

Eighteen abandoned (plugged) gas wells exist onsite (refer to **Figure 2-8**). Additionally, high-voltage power lines cross the site's northwestern corner. The lines are supported by two metal towers set on concrete footings located within the restricted-height levee fields. Low-voltage power poles are present along the western side of the site, the ranch compound, near the "duck pond," and the Yolo Flyway Farms property.

There is one water supply well located in the ranch compound (see **Figure 2-8**). This well is 144 ft deep and is screened between 104 and 144 ft below ground surface. The well is used to supply seasonal domestic water needs for personnel involved with site agricultural operations. No changes to this well are proposed as part of the Project.

## 2.4 Relationship to Regional Habitat Restoration Plans

The proposed Project should be considered in context within the larger regional habitat restoration efforts that have been in development for many years. Since the mid-1990s, state and federal agencies and other stakeholders have worked to develop and implement a long-term program for improving the Delta's ecosystem health. A primary initial venue for that effort was the CALFED Bay-Delta Program (CALFED), which was created to achieve four interrelated objectives: levee system integrity, ecosystem restoration, water supply reliability, and water quality. CALFED was approved in 2000.

CALFED's Ecosystem Restoration Program (ERP) was established to coordinate and assist restoration activities into an integrated, long-term plan to improve and increase aquatic and terrestrial habitats in the Bay-Delta system. Within the Delta region, CALFED targeted restoration of 91,000 to 110,000 ac of aquatic, wetland, riparian, and perennial grassland habitats (CALFED 2000a, p.4-10). CALFED was evaluated in a joint Program EIR/Environmental Impact Statement (EIS) under both CEQA and the National Environmental Policy Act, and adopted a number of steps and mitigation measures to reduce the significant environmental effects of the ERP, particularly on farmland.

The ERP was envisioned as an integral component of a two-tiered system of regulatory compliance for Delta water operations and other covered activities under the state and federal Endangered Species Acts and the California Natural Community Conservation Planning Act (e.g., CALFED 2000b, pp.1-1 – 1-6). Programmatic Biological Opinions (BiOps) were prepared by the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service on CALFED, with individual project-specific BiOps to follow (CALFED 2000c, pp.79-80). Those project-specific BiOps would take into account the environmental benefits of CALFED (*id.*). The 8,000-ac habitat restoration target of the current BiOps for coordinated SWP and Central Valley Project (CVP) operations with respect to delta smelt and salmonids is consistent in this approach. The 8,000 ac may include, for example, restoration within the Suisun Marsh, which must be consistent with the CALFED Draft Suisun Marsh Plan (U.S. Bureau of Reclamation *et al.* 2010) and CALFED's strategic goals and objectives (USFWS 2008, pp.113-114, pp.283-284).

In April 2006, CALFED issued a 10-Year Action Plan to evaluate financing and governance issues and to refocus the Program based on evolving science and changing conditions in the Delta (CALFED 2006, p.13). The 10-Year Action Plan noted that, in addition to changes in governance, a new direction for CALFED is needed to respond to new scientific information becoming available and substantial changes occurring in the Delta, including new concerns about seismic stability and the Pelagic Organism Decline (*id.*, p.7). A major priority element of the 10-Year Action Plan is the development of a voluntary planning agreement and habitat conservation plan/natural conservation community plan(s) for delta smelt and anadromous species (*id.*, pp.52-53). The Action Plan notes, "…several Bay-Delta system users … are working cooperatively to explore preparation of one or more Habitat Conservation Plans…" (*id.*, p.52) and notes the first step is negotiation of a Planning Agreement (*id.*, p.53). This is the Bay Delta Conservation Plan (BDCP) currently under development.

On September 17, 2006, Delta Vision was created by an Executive Order of then-Governor Schwarzenegger to "develop a durable vision for sustainable management of the Delta" so it can support environmental and economic functions important to the people of the state of California (Delta Vision Blue Ribbon Task Force 2007, pp.68-69). The Executive Order called for creation of a Blue Ribbon Task Force charged with completing a "vision" report by January 1, 2008, and a "strategic plan" by October 31, 2008 (*id.*, p.70). The Executive Order specifically directed that the Delta Vision process "inform and be informed by current and future Delta planning decisions such as those pertaining to the CALFED Bay-Delta Program, [BDCP]" and others (*id.*, p.69).

The Task Force issued its Delta Vision report, "Our Vision for the California Delta," in December 2007, which restated as a primary recommendation the restoration of the Delta's ecosystem function as an integral part of a healthy estuary, including expanded areas of seasonal and tidal wetlands (*id.*, p.9). In October 2008, the Blue Ribbon Task Force issued the Delta Vision Strategic Plan, which contains specific recommendations for implementing the Delta Vision to "sustain the Delta in future decades while ensuring a reliable [Delta] water supply" (Delta Vision Blue Ribbon Task Force 2008, p.v). The Strategic Plan contains recommended strategies and actions including restoration of tidal and riparian habitats and increased frequency of floodplain inundation, improving migratory corridors, addressing invasive species, relocating export diversions and implementing conveyance improvements, revising flow standards and operating criteria, and improving water quality. (*id.*, pp.ix-x). Many of these actions are being pursued through the forthcoming BDCP.

On November 4, 2009, the California Legislature, then-Governor Schwarzenegger, water agencies, and environmental groups throughout the state united in an unprecedented manner to support and pass a series of Delta and water-management reform measures and funding mechanisms. Senate Bill (SB) 7x-1 (Simitian): Delta Governance bill contains requirements for the creation or re-constitution of several Delta governance entities, and directs the missions and duties of each. The bill repealed the CALFED Bay-Delta Authority and replaced it with:

1. **Delta Stewardship Council (DSC).** The DSC oversees and coordinates state agency actions in the Delta through the development of the draft Delta Plan to encompass all of the state and federal Delta ecosystem, flood management, water supply, and local economic sustainability efforts.
2. **Delta Conservancy.** The role of this entity involves investments in Delta ecosystem restoration and local economic sustainability to implement the ecosystem-centric portion of the Delta Plan. Additionally, the new 11-member conservancy is responsible for planning and implementation of local sustainability projects, such as those to promote Delta tourism, agriculture, and recreational opportunities.
3. **Delta Protection Commission (DPC).** A reconstituted DPC regulates Delta land use and is the voice of local interests. The existing 23-member DPC has been reduced to a 15-member planning and regulatory entity that makes determinations on the appropriateness of development within the Delta's boundaries. The DPC is also charged with producing a plan for the economic sustainability of the region, with an emphasis on the investments and protections needed to ensure the Delta's future as an agricultural, recreational, and economic hub.
4. **Delta Watermaster.** An appointed individual enforces the State Water Resources Control Board's actions and rulings concerning the Delta, with respect to terms and conditions relative to in-Delta water diversions and water rights permits.

5. **Delta Independent Science Board** and **Delta Science Program.** These programs impart independent scientific input and evaluation to decision-makers. Among other duties, the Delta Independent Science Board and the Delta Science Program help inform the adaptive management program also required by SB 7x-1.

With the passage of SB 7x-1, the Delta Reform Act established coequal goals of a more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem as overarching state policy. Furthermore, the Act established the policy of reducing reliance on the Delta in meeting California's future water supply needs. Federal agencies are also committed to the coequal goals, thus setting a new course for water management in the state.[7]

Drawing on information and experiences gained during the CALFED process, the Delta Reform Act created the DSC with the authority and responsibility to develop the Delta Plan, and to ensure that actions by state and local agencies in the Delta are consistent with the Plan. The DSC was directed to adequately incorporate the best available science and adaptive management principles, to improve decision-making and reduce stakeholder conflict. The DSC also was empowered to coordinate and collaborate across the myriad governmental agencies that have responsibility for some aspect of the Delta (Delta Stewardship Council 2012). With over three years of government coordination and public input, the final draft Delta Plan of November 2012 relies on a mix of legally enforceable policies and essential recommendations to prioritize actions and strategies for improved water management, ecosystem restoration, and levee maintenance. It also identifies actions that may cause harm, and provides regulatory guidance for all major plans, projects, and programs in the Delta.

SB 7x-1 also establishes criteria for the adoption of the results of the BDCP – the water export permits required under state and federal endangered species acts. Specifically, the bill would require the BDCP to be developed according to the Natural Community Conservation Planning Act, which requires ecosystem-wide biological analysis and implementation of projects for the recovery of affected threatened/endangered species.

The BDCP is nearing completion of its planning phase as of this writing. The BDCP is being prepared by a group of local water agencies, environmental and conservation organizations, state and federal agencies, and other interest groups. When complete, the BDCP will provide the basis for the issuance of endangered species permits for the operation of the SWP and CVP. The plan would be implemented over the next 50 years.

The heart of the BDCP is a long-term conservation strategy that sets forth actions needed for a healthy Delta, building upon the framework set forth through CALFED and Delta Vision processes. The draft habitat restoration conservation measures include substantial commitments to restore natural habitats, including the restoration of about 55,000 ac of tidal wetland and associated estuarine and upland habitats distributed across the Delta, restoration of 10,000 ac of new floodplain habitat along major channels, and enhancement of floodplain in the Yolo Bypass

[7] On September 29, 2009, six federal agencies – the Department of the Interior, Department of Commerce, Department of Agriculture, Department of the Army, Environmental Protection Agency, and the Council on Environmental Quality – entered into the California Bay-Delta Memorandum of Understanding (MOU). The MOU set forth a Federal Leadership Committee to coordinate the federal response to the California water crisis and to encourage a partnership with California in addressing California's water supply and environmental challenges. The MOU also mandated the federal agencies to develop an Interim Action Plan on an expedited basis.

**AT A GLANCE**

**The Bay Delta Conservation Plan Would:**

- Provide for a more reliable water supply for California by modifying conveyance facilities to create a more natural flow pattern.
- Provide a comprehensive restoration program for the Delta.
- Provide the basis for permits under federal and state endangered species laws for activities covered by the plan based on the best available science.
- Identify sources of funding and new methods of decision-making for ecosystem improvements.
- Provide for an adaptive management and monitoring program to enable the plan to adapt as conditions change and new information emerges.
- Streamline permitting for projects covered by the plan.

Source: Bay Delta Conservation Plan Website Purpose and Approach 2012 http://baydeltaconservationplan.com/BDCPPlanningProcess/AboutTheBDCP/PurposeandApproach.aspx

(Bay Delta Conservation Plan Steering Committee 2012, March 29, 2012, Draft Chapter 3.3, Conservation Strategy, Biological Goals and Objectives).

In sum, the Lower Yolo Restoration Project is one of many habitat restoration projects that would be undertaken throughout the Delta in accordance and consistent with the broad framework set out in CALFED and the Delta Vision processes, along with the draft Delta Plan and forthcoming BDCP, as required to implement the requirements of the federal BiOps for the coordinated operation of the SWP and CVP facilities. Section 4.10 (Cumulative Impacts) discusses the environmental effects of the Project as part of the larger regional habitat restoration effort in the Delta, with other restoration projects.

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# Chapter 3 Project Description

## 3.0 Overview

In describing the Lower Yolo Restoration Project (Project), this environmental impact report (EIR) communicates the course of action proposed by the State and Federal Contractors Water Agency (SFCWA) on behalf of the California Department of Water Resources (DWR) and the U.S. Bureau of Reclamation (Reclamation). The Draft EIR also establishes a basis for informed decision making by the SFCWA Board of Directors and by affected public agencies regarding how the various components of the Project may affect the physical environment in the Lower Yolo Bypass and Cache Slough Complex, which are part of the Sacramento-San Joaquin River Delta (Delta). The EIR also discloses this information to interested members of the public to solicit their input and expertise, during the overall environmental process. Refer to Sections 1.3 and 1.4 for the intended uses of the EIR, and anticipated regulatory permits and approvals.

## 3.1 Project Purpose

Restoring wetlands in strategic locations is part of a comprehensive approach to reverse aspects of the ecological decline of the Delta, as noted in recent planning efforts (e.g., Delta Plan and Bay Delta Conservation Plan [BDCP]). For the Project, this approach would provide important new sources of food and shelter for several native fish species. The Project would also advance further understanding of the relative benefits of different fish habitats, the quantification of the production and transport of food, and the manner in which fish species take advantage of new habitat. As an early action consistent with the forthcoming BDCP, the Project would partially fulfill the regulatory requirements to restore 8,000 acres (ac) of tidal wetland habitat in the Delta.

Successful restoration of wetlands requires careful consideration of critical and complex factors that can interact unpredictably at times, including elevation, hydrology, hydrodynamics, vegetation, water source and quality, soils, sedimentation and scour, climate, buffer zone management, and long-term management. During the environmental review process, final design, permitting activities, and long-term management, the Project elements may be reassessed and modified slightly to meet the Project’s goals and objectives.

The EIR project description below presents the broadest range of activities known at this time that could be implemented, including a reasonably foreseeable build out scenario. Major Project modifications triggering California Code of Regulations (CCR) § 15162 (Subsequent EIR) and CCR § 15163 (Supplemental EIR) of the *State CEQA Guidelines* would undergo additional CEQA review, and are beyond the scope of this Draft EIR.

### 3.1.1 Project Goals and Objectives

The Project’s goals would be first to partially fulfill the federally-imposed permit requirements for the tidal restoration requirements (i.e., the 8,000-ac tidal restoration obligations) on the DWR and the Reclamation contained within the Reasonable and Prudent Alternative (RPA) of the U.S. Fish and Wildlife Service (USFWS) Delta Smelt Biological Opinion (BiOP) (USFWS 2008)[8] and referenced in the National Marine Fisheries Service (NMFS) Salmonid BiOp (NMFS 2009). These obligations are tied to the continuing operations of DWR's State Water Project (SWP) and the federal Central Valley Project (CVP) by Reclamation.

Secondly, the Project would serve as a near-term action measure for partial fulfillment of tidal restoration objectives under the forthcoming BDCP (refer to Section 1.1.3, Project Goals and Objectives). On September 30, 2011, a memorandum of agreement[9] was executed between DWR, Reclamation, SFCWA, California Department of Fish and Wildlife (CDFW), USFWS, and NMFS regarding the early implementation of habitat projects, such as the proposed Project, for the CVP and SWP coordinated operations and BDCP (see **Appendix F**).

The four objectives of these wetlands restoration goals would be to:

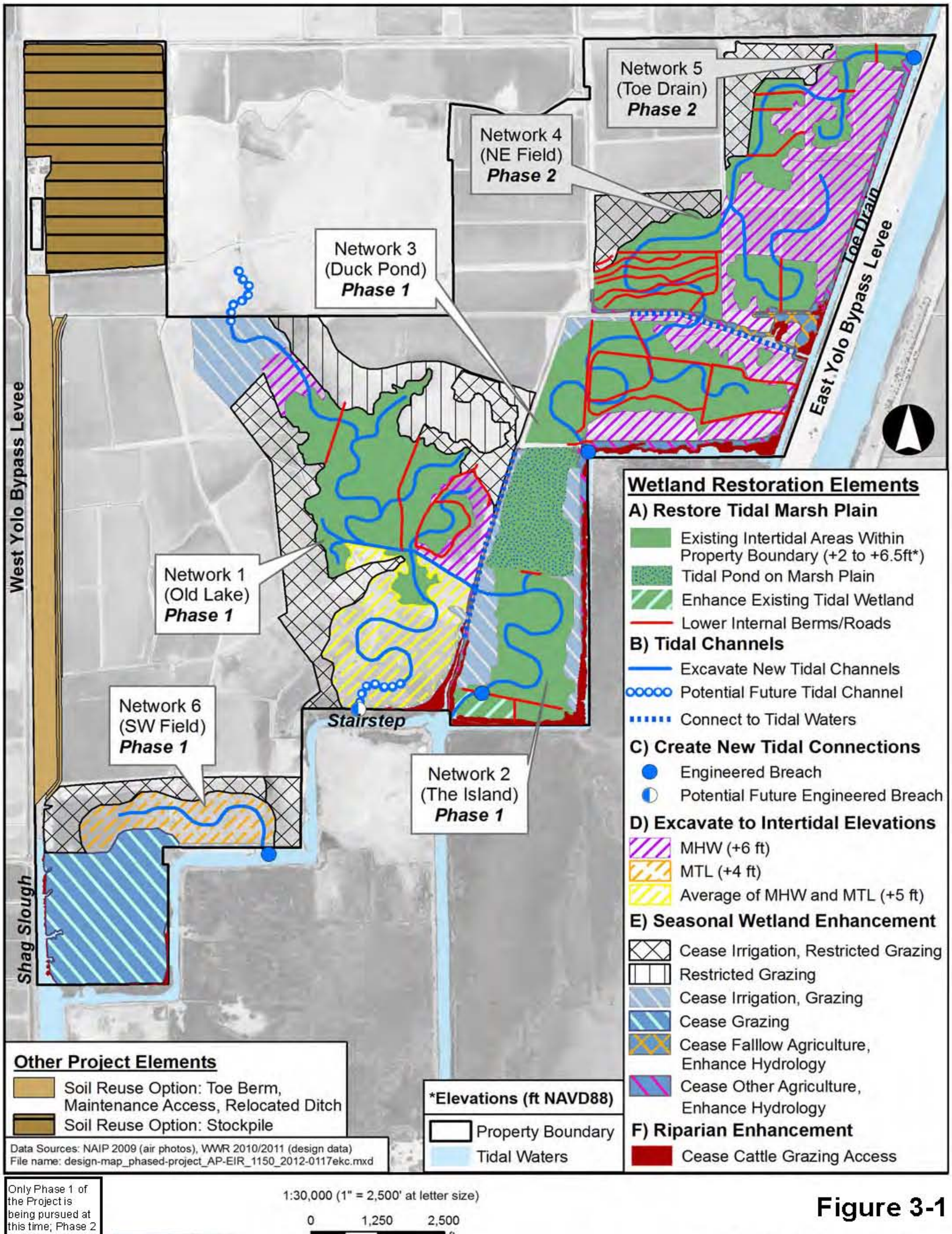
1) Enhance regional food web productivity in support of delta smelt recovery;
2) Provide rearing habitats for out-migrating salmonids;
3) Support a broad range of other aquatic and wetland-dependent species, including Sacramento splittail; and
4) Provide ecosystem functions associated with the combination of Delta freshwater aquatic/tidal marsh/floodplain/seasonal wetland/lowland grassland interfaces that existed historically.

Because of its location at the Delta margin, the Project site would provide an excellent opportunity to restore extensive wetland-upland transitional habitats (**Figure 3-1**). It would also accommodate sea level rise if marsh potentially expanded landward, and potentially result in additional acreage of wetland habitat (refer to Section 4.1, Hydrology).

SFCWA is undertaking this Project in collaboration with DWR and Reclamation based upon mutual agreement that cooperative efforts can reduce costs and facilitate satisfaction of the restoration requirements in the two BiOps. SFCWA is a joint powers authority comprised of public agencies that receive water from the SWP or the federal CVP, and SFCWA's powers specifically include entering into agreements with state and federal agencies for planning and development of conservation measures to protect species dependent on the Delta.

[8] On December 14, 2010 and on September 20, 2011, Judge Oliver Wanger of the U.S. District Court for the Eastern District of California issued decisions in the Delta Smelt Consolidated Cases and Consolidated Salmon Cases that challenged the 2008 USFWS BiOP and the 2009 NMFS BiOp addressing the impacts of the coordinated operations of the CVP and the SWP on delta smelt and salmonids, respectively. Those decisions ruled on the science support for flow recommendations and did not make any alterations to the 8,000 ac of tidal restoration within the RPAs in the BiOps. Consequently, the requirement being fulfilled by the proposed Project remains.

[9] Should the BDCP be approved, credits that have been determined for restoration projects, as described in D. 3 of the memorandum of agreement, would also be applied toward the requirements of the BDCP, where consistent with the BDCP Conservation Strategy and consistent with the credit release schedule. Such additional credit would also be applicable toward requirements of the § 7 BiOps prepared by USFWS and NMFS for purposes of the BDCP, and the findings made by CDFW with its potential approval of the BDCP under the Fish and Game Code.




Only Phase 1 of the Project is being pursued at this time; Phase 2 is included here as part of the reasonably foreseeable future build out.

SFCWA
State & Federal Contractors Water Agency

**Figure 3-1**

**Phased Project Detail
Restoration Design Features**

### 3.1.2 Project Phasing

The proposed Project would be located on a 3,795-ac site comprised of two properties and would be completed in two separate phases (refer to **Figure 3-1**):

1. Phase 1, consisting of the Yolo Ranch property excluding the Northeast Field in Network 4; and
2. Phase 2, consisting of the Yolo Flyway Farms property and the Northeast Field in Network 4 of the Yolo Ranch.

This Project configuration would result in the creation of approximately 1,226 ac of perennial emergent tidal marsh. Subsequent to issuance of the Notice of Preparation/Initial Study (NOP/IS) on March 1, 2011, SFCWA determined that acquisition of the Yolo Flyway Farms property would not be practicable at this time. As a result, only Phase 1 of the Project is being pursued at this time. Under this phase, approximately 1,338 ac of agricultural lands would be modified and about 861 acres of tidal wetlands (i.e., perennial emergent marsh) would be created.

Nonetheless, because Phase 2 may be pursued in the future, this Draft EIR analyzes potential environmental impacts and identifies feasible mitigation measures for both phases of the Project. This approach ensures that all reasonably foreseeable impacts of the entire Project are analyzed, even though no current plans exist to acquire or develop the Yolo Flyway Farms property.

## 3.2 Project Location

The Project site occurs on the northwestern edge of the Delta at the extreme southern end of the Yolo Bypass near the Cache Slough Complex (see **Figures 2-1, 2-2,** and **2-3**). The 3,795-ac site encompasses two contiguous properties: Yolo Ranch and Yolo Flyway Farms located along the historic wetland-upland edge of the Yolo Basin (**Figures 2-4** and **2-5**).

The Yolo County Assessor's Parcel Numbers (APNs) associated with the Project for both properties are as follows: 033-270-001, 033-270-003, 033-270-007, 033-280-02, 033-280-014; 033-370-001, 033-370-02, 033-380-002, 033-380-003, 033-380-007, 033-390-001, 033-390-002, and 033-390-005.

## 3.3 Project Components and Elements

### 3.3.1 Overview

The proposed Project would include modifications up to approximately 1,770 ac of the 3,795-ac site (see **Figure 3-1**). Four Project components undertaken during construction would include a two-phased approach[10]:

1. **Restoration Component.** Restoring approximately 1,226 ac of intertidal wetlands (i.e., emergent perennial marsh) (Phase 1: 861 ac/Phase 2: 365 ac) and 34 ac of non-tidal

[10] For further details on the Project phasing, refer to Section 1.1.4 (Project Phasing, Components, and Activities) in Chapter 1 and Section 3.1.2 (Project Phasing) in Chapter 3 of this Draft EIR.

marsh (Phase 1: 26 ac/Phase 2: 8 ac); creating about 100 ac of new tidal channels (Phase 1: 65 ac/Phase 2: 35 ac), and connecting 10 ac of currently diked irrigation ditches (Phase 1: 5 ac/Phase 2: 5 ac) to tidal waters.

Tidal restoration would be accomplished by excavating new channels within the restoration area including some with point bars[11], grading down some lands that are currently slightly above intertidal elevations, removing minor interior berms, and establishing tidal connections between restoration areas and the neighboring channels (i.e., controlled removal of very low level berms, by opening "plugs" in those levees). Seasonal and high marsh enhancement would be accomplished by eliminating grazing, ceasing irrigation, and improving hydrologic connectivity to high tides and smaller flood flows. Following Project construction, standard livestock fencing (such as the electrical wire and posts used currently at the Project site) would be installed surrounding the restored tidal marshes and enhanced wetlands to exclude cattle from these areas.

2. **Seasonal Wetland Enhancement Component.** Enhancing about 174 ac (Phase 1: 136 ac/Phase 2: 38 ac) of existing seasonal wetlands, 10 ac of tidal wetlands (all during Phase 1), and 59 ac (Phase 1: 48 ac/Phase 2: 11 ac) of riparian areas.

   To provide a buffer around restored wetlands that would include limited cattle grazing as a vegetation management tool, the Project would install an outer fence around designated buffer areas. The fence would be similar in composition to that existing onsite (e.g., electrical wire and wooden posts) and would include gates for managing cattle access. This action would also result in the removal of other agricultural activities (e.g., removal of roads and berms; cease fallow agricultural uses; remove irrigation inputs; and implement restricted, rotational grazing practices targeting control of invasive vegetation).

3. **Irrigation and Drainage Improvements Component.** Relocating/modifying control structures and irrigation/drainage ditches on 15 ac (Phase 1: 5 ac/Phase 2: 10 ac).

   In order to ensure that irrigation and drainage needs of the remainder of the site and of adjacent properties would be maintained, the proposed Project would relocate a number of water control structures, repair or replace some existing non-functioning water control structures, relocate some irrigation and drainage ditches, and widen and extend sections of main irrigation ditches.

4. **Soils Reuse Component.** Reusing excavated soils by employing one of three options:

   a. **Soils Reuse Option #1.** Construct a 116-ac levee toe berm with a maintenance access corridor for the toe berm and relocate 10 ac of irrigation and drainage ditches near the west Yolo Bypass levee during Phase 1, or

   b. **Soils Reuse Option #2.** Construct a 262-ac stockpile onsite (during Phase 1 or 2 or both), or

[11] A low curved ridge of sand and gravel along the inner bank of a meandering stream or canal. Point bars form through the slow accumulation of sediment deposited by water flows when the velocity drops along the inner bank.

c. **Soils Reuse Option #3.** Construct a combination of these two features each smaller in soil volumes than if constructed alone (during Phase 1 and/or 2).

Soils would be transported, graded, and compacted at each location, with appropriate erosion control measures installed. For Soils Reuse Options #2 and #3 only, the existing irrigation and drainage ditches would be reconstructed atop, and around the stockpile, and once completed agricultural uses would resume. Some of this excavated material would first be used to improve/construct access roads throughout the Project site. This material would be placed along the road alignment and graded.

Areas on the site that are outside of the Project footprint would remain in their current condition and configuration, continuing to support agricultural operations, as carried out under leasehold rights from the property owner, Westlands Water District (WWD). Additionally, Project implementation would not affect existing mineral resources or current rights. Any further activities proposed by owners or leaseholders requiring governmental authorizations, including securing mineral resources would be separate projects, and may involve environmental review under the California Environmental Quality Act (CEQA) and/or the National Environmental Policy Act, as applicable, with the appropriate lead agencies.

Three post-construction Project components would be:

1. **Long-term Operations and Maintenance Component.** Managing ancillary site conditions (e.g., installation and repairs of fencing, signage, and minor structures and equipment); and carrying out corrective measures to address potential problems (e.g., biological vector propagation, colonization and establishment of invasive species, and slumping of channel banks).

2. **Project Outcome Verification Monitoring Component.** Observing performance relative to objectives via monitoring, and would differ from mitigation monitoring requirements under CEQA. If necessary, follow-up items would be implemented (i.e., corrective actions identified under the long-term operations and maintenance).

3. **Regional Science Support Components.** Conducting and coordinating, among stakeholders, observations and monitoring efforts at the Project site that may provide invaluable data and insight into future restoration efforts by other agencies and entities.

Project acreages and excavation volumes are summarized in **Table 3-1**, and a very detailed summary of the proposed Project components and elements is provided in **Table 3-2**.

### 3.3.2 Project Design

The initial design process began by determining the locations onsite with the greatest suitability for tidal wetland construction. These locations were initially determined by examining the topography of the Project site in relation to the local tidal datums. The 2005 Delta light detection and ranging (LiDAR) digital elevation model, updated with more recent data in certain locations to improve accuracy, served as the topographic data source, while the local tidal datums were calculated. All areas of the site within intertidal elevations were prioritized for restoration. These areas were organized into discrete tidal networks by location (see **Figure 3-1**). Tidal marsh expansion (i.e., excavation) areas were located adjacent to these intertidal areas where existing topography would be just above intertidal elevations, thereby requiring minimal excavation for restoration. These expansion areas would be situated to avoid, as feasible, existing natural vegetation communities reflective of more natural wetland conditions.

The Project's final design would incorporate recommendations received by a number of technical experts and regulatory specialists that have been consulted over the past three plus years (refer to Chapter 7 (Consultations and Coordination), along with inclusion of modeling results, and onsite factors (e.g., biological, chemical, and physical opportunities and constraints). Guiding restoration design principles would include:

- Maximize tidal inundation on lands that have existing elevations within the intertidal range to reduce the amount of earthmoving required to restore wetland habitats.
- Design wetlands with high channel densities:
    - To maximize the channels' ability to flood and drain the marsh plain.
    - To promote connectivity between marsh plain and channel habitats to encourage wetland productivity exchange into aquatic habitats.
    - To provide more aquatic foraging habitat for fishes.
- Develop wetlands with high channel sinuosity:
    - To encourage the development of natural tidal marsh geomorphology and hydrologic diversity within channels and at the channel-marsh edges.
    - To provide habitat diversity for fishes.
    - To promote marsh plain-channel connectivity and exchange.
- Design different tidal excursion distances to encourage mixing and habitat variability.
- Design tidal channel/prisms dimensions:
    - To prevent the establishment of invasive aquatic plants.
    - To encourage adequate mixing and circulation.
- Determine channel invert elevations:
    - To keep channels free of invasive aquatic plants.
    - To prevent harboring predatory fishes, such as striped, largemouth and black bass.
- Utilize some existing agricultural ditches:
    - To reduce excavation for channel networks.
    - To take advantage of existing features that are well-suited for tidal restoration.
- Establish irrigation and/or grazing buffers on seasonal wetlands and upland habitats surrounding the restored tidal wetlands:

  - To create more natural habitat transitions between tidal marsh, seasonal wetlands, and uplands.
  - To provide a buffer between agricultural operations and restored/enhanced habitats.
- Utilize excavated soils locally for flood protection purposes, if feasible, given timing issues and regulatory requirements.
- Maintain existing levels of irrigation and drainage capabilities on lands remaining in agricultural operations on the Project site and on adjacent agricultural lands.

The Project's final design would also accommodate sea level rise, by examining and considering several relevant factors: existing elevation at the site, sedimentation rates and accretion, and projected sea level rise onsite. As discussed in Chapter 1 (Introduction), site selection is paramount, based on the best available science and the unique physical, chemical, and biological factors at the site. Several features would be included into the restoration efforts to achieve and maintain long-term ecological functions of tidal and seasonal wetlands. For example, encouraging tidal and seasonal wetlands to extend upslope could be done through the creation of a gradually sloping wetland/upland transition zone at interior areas onsite and then selecting restoration areas at the wetland-upland edge that would provide an elevation gradient over which the tidal wetland would shift upslope as sea level rises. Studies have found that local wetlands in the Bay-Delta region have been able to keep pace with recent rates of sea level rise through accretion rates between 2 and 5 mm per year (Orr *et al.* 2003; Callaway *et al.* 2012; PRBO Conservation Science 2012). Accordingly, it would be advantageous for tidal marsh restoration efforts, such as the proposed Project, to be implemented during the first half of the 21st century, enabling onsite marsh elevations to be high enough to continue sustainable accretion rates in response to projected increased sea level rise in the latter part of the 21st century (PRBO Conservation Science 2012).

Another action in dealing with sea level rise would be promoting early emergent vegetation to aid in the capture of sediment for marsh accretion. Such vegetation can also enhance the accumulation of organic matter in the developing wetland sediments (U.S. Bureau of Reclamation *et al.* 2010).

## 3.4 Construction Activities

Project construction would tentatively take place in 2013, pending Project approval and securing permits in a timely fashion. All construction activities would happen outside of the Yolo Bypass flood season. Depending upon the exact timing of flood conditions, work would start in June and end in November (or sooner, dependent on the onset of rain and flood inundation). Specifics below detail construction personnel and equipment, site preparation, construction of the Project components (i.e., restoration, wetland enhancement, irrigation and drainage improvements, and soils reuse).

**Table 3-1. Estimated Project Acreages and Volumes of Excavation during Construction Phase**

| Project Components and Elements: Estimated Acreages for Construction Footprint | Project Phases (in acres) | | |
|---|---|---|---|
| | Phase 1 | Phase 2[1] | Total[1] |
| **Restoration Component** | | | |
| Tidal Marsh Restoration | 861 | 365 | 1,226 |
| Non-tidal Marsh Enhancement | 26 | 8 | 34 |
| **Seasonal Wetland Enhancement Component** | | | |
| Seasonal Marsh Enhancement | 136 | 38 | 174 |
| Riparian Enhancement | 48 | 11 | 59 |
| **Total Estimated Acreage for Restoration/Enhancement Modifications to the Project Site** | **1,493** | | |
| **Irrigation and Drainage Improvements Component** | | | |
| Improvements and Modification of Water Infrastructure | 5 | 10 | 15 |
| **Soils Reuse Component** | | | |
| Options #1, #2, or #3 for Soils Reuse (Value dependent on final option selected) | 116 — 262 | | |
| **Total for Estimated Acreage for Improvements** | **1,624 — 1,770** | | |
| | | | |
| **Project Components and Elements: Estimated Volumes of Excavated Soils Onsite** | **Project Phases (in cubic yards)** | | |
| | **Phase 1** | **Phase 2[1]** | **Total[1]** |
| **Restoration and Seasonal Wetland Enhancement Components** | | | |
| Intertidal Wetlands Restoration and New Tidal Channels | 1,675,000 | 518,000 | 2,193,000 |
| **Irrigation and Drainage Improvements Component** | | | |
| Widen Existing Ditches and Establish New Smaller Ditches | 65,000 | 132,000 | 197,000 |
| **Soils Reuse Component** | | | |
| Options #1 and #3 for Soils Reuse (Value dependent on final option selected) | 0 — 110,000 | 0 cy | 0 — 110,000 |
| **Total for Estimated Volume of Excavated Soils** | **1,740,000 — 1,850,000** | **650,000** | **2,390,000 — 2,500,000** |

[1] Only Phase 1 of the Lower Yolo Restoration Project is being pursued at this time. Phase 2 includes Yolo Flyway Farms, along with Network 4 at the Northeast Field on Yolo Ranch, and was identified in the Notice of Preparation/Initial Study. However, no plans currently exist to develop Phase 2 or to acquire the Yolo Flyway Farms property. Phase 2 is included in the environmental analysis as part of the reasonably, foreseeable future build out.

## Table 3-2. Project Components and Elements of the Lower Yolo Restoration Project

| Project Elements | Phase 1 | Phase 2[1] | Project Total | Methodology for Implementation | Draft EIR Reference |
|---|---|---|---|---|---|
| **Site Preparation** | | | | | |
| **Clear and grub** | • Trim potential nesting vegetation (late winter)<br>• Clear work areas of vegetation and combine with topsoil (prior to earthmoving) | | | | Section 3.4.2 |
| **Set up construction management center** | Central location selected by contractor | None | Central location selected by contractor | Erect temporarily office trailer, storage containers, portable toilet, lights, generator. | Section 3.4.2 |
| **Set up equipment staging areas** | Ranch compound and at other areas of the Project site | None | Ranch compound and at other areas of the Project site | Use lights, generator, power pole hookup if available, storage containers, erosion control devices. | Section 3.4.2 |
| **Build access roads** | Possibly two or three road alignments | None | Possibly two or three road alignments | Construct from dry excavated fill; 12 feet (ft) wide with turnouts every 500 ft; remove after construction if requested by owner. | Section 3.4.2 |
| **Manage hazardous waste materials** | • Remove/relocate/abandon known utility infrastructure (i.e., gas wells, power lines)<br>• Identify and remediate suspected soils and materials contamination as required<br>• Prevent potential site contamination runoff<br>• Prevent or remediate existing/abandoned utilities potential contamination | | | | Section 3.4.2 |
| **Restoration Component** | | | | | |
| **Tidal marsh plain restoration (including 70-ac tidal pond restoration)** | 861 acre (ac) | 365 ac | 1,226 ac | To be determined by contractor(s); for restoration above intertidal elevations, grade/excavate to intertidal elevations (+4 ft to +6 ft NAVD88). | Section 3.4.3<br>Figures 3-1<br>3-2, and 3-4<br>Table 3-1 |
| **Tidal marsh plain restoration, areas above intertidal elevations** | 1 million cubic yards (mcy) soil excavated | 250,000 cy soil excavated | 1.25 mcy soil excavated | | |
| **Lower internal roads and berms** | 13,000 cy soil excavated | 2,000 cy soil excavated | 15,000 cy soil excavated | Grade/excavate to intertidal elevations (+4 ft to +6 ft NAVD88). | |
| **Tidal channel – creation through excavation** | 70 ac | 20 ac | 90 ac | Excavate to depths 2-6 ft below MLLW; 1:1 - 2:1 side slopes; variable channel widths. Includes berm notch for tidal pond excavated to mid to high tide elevation. | |
| | 750,000 cy soil excavated | 200,000 cy soil excavated | 950,000 cy soil excavated | | |
| | 5 channel networks created | 1 channel network created | 6 channel networks created | | |
| | 4 tidal connection points | 1 tidal connection point | 5 tidal connection points | | |
| **Tidal channel – conversion of existing ditch** | 10 ac | 0 ac | 10 ac | Install ditch blocks and connect to created tidal channels. | |
| **Seasonal marsh enhancement: remove grazing** | 136 ac | 38 ac | 174 ac | Install exclusion fencing around grazing removal areas. | |

## Table 3-2. Project Components and Elements of the Lower Yolo Restoration Project

| Project Elements | Phase 1 | Phase 2[1] | Project Total | Methodology for Implementation | Draft EIR Reference |
|---|---|---|---|---|---|
| **Restoration Component — continued** | | | | | |
| **Seasonal marsh enhancement: remove irrigation and grazing** | 60 ac | 0 ac | 60 ac | Discontinue agricultural irrigation; install exclusion fencing around non-grazing areas. | Section 3.4.3<br>Figures 3-1<br>3-2, and 3-4<br>Table 3-1 |
| **Improve hydrology of fallow agriculture areas** | 10 ac | 0 ac | 10 ac | Achieve through improved connectivity to adjacent restored marsh. | |
| **Improve hydrology of other agricultural areas** | 26 ac | 8 ac | 34 ac | Achieve through improved connectivity to adjacent restored marsh. | |
| **Riparian scrub and woodland enhancement** | 48 ac | 11 ac | 59 ac | Achieve through improved connectivity to adjacent restored marsh and remove access by cattle. | |
| **Seasonal Wetland Enhancement Component** | | | | | |
| **Cease irrigation** | 140 ac | 50 ac | 190 ac | Construct ditch blocks in certain irrigation ditches; install ditches around margins to reroute water (see Irrigation and Drainage Improvements). | Section 3.4.3<br>Figures 3-2<br>and 3-4<br>Table 3-1 |
| **Irrigation and Drainage Improvements Component** | | | | | |
| **Hydrologic management** | • Conduct potential dewatering activities<br>• Repair or replace unmaintained water control structures to allow site drainage<br>• Cease irrigation and drainage across entire site<br>• Construct temporary low berms in certain areas if needed<br>• Maintain irrigation capabilities on adjacent properties during construction | | | | Section 3.4.3<br>Figure 3-4<br>Table 3-1 |
| **Widen/extend central and northeast major ditches** | 2 ac<br>48,000 cy soil excavated | 8 ac<br>116,000 cy soil excavated | 10 ac<br>164,000 cy soil | Excavate fill to engineered dimensions. | Section 3.4.3<br>Figure 3-2<br>Table 3-1 |
| **Establish new minor ditches** | 5 ac<br>33,000 cy soil excavated | 0 ac<br>0 cy | 5 ac<br>33,000 cy soil excavated | Excave fill to engineered dimensions. | |
| **Install new infrastructure** | Culverts: 1<br>Ditch Block: 23<br>Flap Gate: 5<br>Pump: 0<br>Tide Gate: 1<br>Ditch: 6 | Culverts: 0<br>Ditch Block: 0<br>Flap Gate: 0<br>Pump: 0<br>Tide Gate: 0 | Culverts: 1<br>Ditch Block: 23<br>Flap Gate: 5<br>Pump: 0<br>Tide Gate: 1<br>Ditch: 6 | Add fill or structure (if necessary) to support irrigation infrastructure installation. | Section 3.4.3<br>Figure 3-4<br>Refer to note on next page. |

## Table 3-2. Project Components and Elements of the Lower Yolo Restoration Project

| Project Elements | Phase 1 | Phase 2[1] | Project Total | Methodology for Implementation | Draft EIR Reference |
|---|---|---|---|---|---|
| **Irrigation and Drainage Improvements Component — continued** | | | | | |
| **Rehabilitate existing infrastructure** | Culvert: 0<br>Flap Gate: 3<br>Portable Pump: 0<br>Pump: 3<br>Screw Gate: 0<br>Tide Gate: 2<br>Ditch: 1 | Culvert: 1<br>Flap Gate: 0<br>Portable Pump: 0<br>Pump: 0<br>Screw Gate: 0<br>Tide Gate: 1<br>Ditch: 0 | Culvert: 1<br>Flap Gate: 3<br>Portable Pump: 0<br>Pump: 3<br>Screw Gate: 0<br>Tide Gate:3<br>Ditch: 1 | Remove, replace, or maintain existing irrigation infrastructure. | ***NOTE:***<br>*Exact numbers of each feature to be determined in final design.* |
| **Abandon/remove infrastructure** | Culvert: 9<br>Flap Gate: 12<br>Portable Pump: 7<br>Pump: 0<br>Screw Gate: 3<br>Tide Gate: 2 | Culvert: 2<br>Flap Gate: 1<br>Portable Pump: 3<br>Pump: 0<br>Screw Gate: 0<br>Tide Gate: 0 | Culvert: 11<br>Flap Gate: 13<br>Portable Pump: 10<br>Pump: 0<br>Screw Gate: 3<br>Tide Gate: 2 | Remove irrigation infrastructure, no replacement. | |
| **Soils Reuse Component: Option #1: Toe Berm with Maintenance Access and Ditch Relocation** | | | | | |
| **Toe berm** | 96 ac<br>2.5 mcy of fill placement | 0 ac<br>0 mcy | 96 ac<br>2.5 mcy of fill placement | Place, compact, and stabilize fill excavated in wetland restoration activities; add to create gentle side slopes. | Section 3.4.3<br>Figures 3-3 and 3-5<br>Table 3-1 |
| **Maintenance access** | 10 ac | 0 ac | 10 ac | To be determined by contractor(s) | |
| **Relocate main western irrigation and drainage ditch** | 10 ac<br>110,000 cy soil excavated | 0 ac<br>0 cy | 10 ac<br>110,000 cy soil excavated | Excavate fill to design dimensions (10,000 ft long, 50 ft top width, 10 ft bottom width, 10 ft deep). | |
| **Soils Reuse Component: Option #2: Soil Stockpile Onsite** | | | | | |
| **Soil stockpile** | 262 ac<br>2.39 mcy of fill placement | 0 ac<br>0 mcy | 262 ac<br>2.39 mcy of fill placement | Place, compact, and stabilize fill excavated in wetland restoration activities. Reconstruct irrigation and drainage ditches. | Section 3.4.3<br>Figures 3-3 & 3-6<br>Table 3-1 |
| **Modify abandoned gas well pad** | 1 well | None | 1 well | Install vertical extension to the abandoned well (only if required). | Section 3.4.3 |
| **Soils Reuse Component: Option #3: Mix of Toe Berm and Stockpile Onsite** | | | | | |
| **This option will be determined with the preparation of the final engineering designs; however, the acreages would fall between the two options listed above for soils reuse.** | | | | | |
| **Long-term Operations and Maintenance Component** | | | | | |
| **Cattle exclusion fence maintenance** | Around perimeter of restored wetlands | | | Replace posts and wire as needed. | Section 3.5.1 |
| **Minor repairs of irrigation systems and drainage** | Within the Project footprint | | | Repairs to mechanical equipment and appurtenant structures as needed. | |

### Table 3-2. Project Components and Elements of the Lower Yolo Restoration Project

| Project Elements | Phase 1 | Phase 2[1] | Project Total | Methodology for Implementation | Draft EIR Reference |
|---|---|---|---|---|---|
| **Long-term Operations and Maintenance Component — continued** | | | | | |
| **Biological vector control and minimization** | • Addition of small tidal ditches connecting poorly draining areas infested by mosquitoes around upper edge of restored tidal marsh to constructed tidal channels<br>• Control of vectors through a variety of methods | | | • Rely on standard shallow mosquito control rotary ditcher.<br>• Use pesticides, traps, etc. | |
| **Invasive plant prevention and control** | • Utilize an array of removal methods to control the propagation and distribution of invasive plants within the Project site<br>• Cattle grazing, physical removal, competitive exclusion plantings, salt application, herbicide application | | | • Apply herbicide from small boats; manual removal, etc.<br>• Move cattle exclusion fencing; mowers or manual pulling; install desired plants; apply salts or herbicides as appropriate in spot locations. | Section 3.5.1 |
| **Tidal channel bank slumping** | • Develop engineering designs to minimize this issue<br>• Remove blockages mechanically by re-contouring the bank | | | Use small floating mechanical device. | |
| **Project Outcome Verification Monitoring Component** | | | | | |
| **Continuous tide stage and water quality monitoring** | Several locations within the restoration footprint | | | Install automated instruments attached to beds or banks of channels and on marsh plain. | |
| **Periodic field measurements and sampling** | Several locations in the restoration footprint and for some parameters maybe offsite: | | | | |
| | • Flows in tidal channels | | | Deploy current meters over spring-neap tidal cycles. | |
| | • Tidal channel geometry | | | Conduct topographic and bathymetric surveys. | |
| | • Sedimentation on the marsh plain | | | Study sedimentation plates, sediment pins, SETs, topographic surveys. | Section 3.5.2 |
| | • Water samples from tidal channels with laboratory analyses for phytoplankton and zooplankton composition and abundance | | | Take plankton tows. | |
| | • Sampling of tidal waters for fish species composition and abundance | | | Sample with beach seine, fyke net[2]. | |
| | • Measurement of plant species composition and abundance on the restored and enhanced marsh plain | | | Use quadrats. | |
| | • Surveys for use of the restored wetlands by birds, reptiles and amphibians | | | Conduct field observations and undertake possible trappings by a permitted biological specialist. | |

**Table 3-2. Project Components and Elements of the Lower Yolo Restoration Project**

| Project Elements | Phase 1 | Phase 2[1] | Project Total | Methodology for Implementation | Draft EIR Reference |
|---|---|---|---|---|---|
| **Regional Science Support Component** | | | | | |
| **Joint cooperative efforts among interested stakeholders** | Further observations, surveys, and modeling efforts at the site that may provide data and insight into future restoration efforts. | | | Carry out computer modeling, simulations, laboratory studies, field surveys, field investigations, etc. | Section 3.5.3 |

cy = cubic yards mcy = million cubic yards ac = acres ft = feet NAVD88 = North American Vertical Datum of 1988
MLLW = mean lower low water

[1] Only Phase 1 of the Lower Yolo Restoration Project is being pursued. Although activities at Yolo Flyway Farms (and Network 4 at the Northeast Field of Yolo Ranch) were identified in the Notice of Preparation/Initial Study for the Project, no plans currently exist to develop Phase 2 or acquire the Yolo Flyway Farms property. Phase 2 is included here, in the analysis, as part of a reasonably, foreseeable future build out. For further details on the Project phasing, refer to Section 1.1.4 (Project Phasing, Components, and Activities) in Chapter 1 of this Draft EIR.

[2] A fyke net is a long, bag-shaped fishing net held open by hoops.

## 3.4.1 Construction Personnel and Equipment

Temporary, construction staffing would consist of approximately 25-50 personnel. Depending upon permit requirements and allowable hours of operation, shift work and/or weekend work may take place. Dewatering operations may also require extended work hours/days.

Construction of the Project components would require many different types of equipment. Conditions in the field at the time of construction would influence the type of equipment that would be best suited for the work and ultimately would be chosen by the construction contractor.

The list of equipment presented below includes the entire suite of machinery that could be used:

- Tracked long-reach and standard-reach excavators (8).
- Low-ground-pressure tracked or wheeled 10-15 ton dump trucks (8).
- Wheeled 20-cubic yard (cy) or 40-cy scrapers (8); scrapers could be an alternative to excavator/articulated dump truck combination for excavation and transport.
- Tracked standard and low ground pressure bulldozers (8).
- Front end loaders (4).
- Wheeled articulated 30- or 35-ton dump trucks (8).
- Double and/or single drum pad-foot compactors (4).
- Water trucks (6).

Equipment would be delivered to the Project site by flatbed truck and transported to the work areas via existing access roads.

## 3.4.2 Site Preparation

Site preparation would consist of clear and grub, build access roads, set up of construction management center and equipment staging areas, and manage hazardous waste materials. Each activity is described below. All onsite contractors would be properly trained and certified for construction activities and best management practices (BMP) inspection prior to construction.

**AT A GLANCE**

**Examples of Potential Construction Best Management Practices**

- Limit idling time for construction and personal vehicles.
- Ensure construction vehicles are tuned and tires are properly inflated.
- Promote ride sharing programs or shuttle service to Project site based on a standard construction shift day.
- Reduce electricity use in temporary construction offices by using high efficiency lighting and requiring that heating and cooling units be Energy Star compliant. Require that all contractors develop and implement procedures for turning off computers, lights, air conditioners, heaters, and other equipment each day at close of business.
- Minimize tillage and maintain vegetation on levees and other properties to the extent possible to maximize carbon sequestration and minimize negative air quality impacts associated with erosion of bare soils.

### *Vegetation Removal*

Clear and grub would consist of removing vegetation prior to ground-disturbing activities:

1. **Trim vegetation that could be used for nesting (late winter).** Potential nesting may happen in the riparian shrubs and trees located at the edge of the Project site, adjacent to the tidal waterways, and within the wetlands or agricultural fields. To avoid nesting interference, either vegetation would be trimmed in advance of the nesting season or construction work in areas of potential conflict would be conducted after nesting season ended (roughly mid-August). The construction area within riparian woodlands or scrub would be minimized during final design to limit the trimming and/or removal of trees and scrub directly within the confines of the tidal channel transect, with an adjacent buffer restricted to permit passage of construction machinery. Additionally, the location of the tidal connections would be selected such that the minimum number of trees would be impacted or removed. Controlled excavation in the riparian areas would result in tidal connections between the restoration areas and the existing levees, as the final restoration step, and thus would occur well after the end of nesting season. Grading would occur on the site interior, during nesting season. Vegetation trimming would happen in perennial marsh, seasonal wetlands, and agricultural fields in later winter (February – March), prior to start of construction.

2. **Clear work areas of vegetation and combine with topsoil (prior to earthmoving).** Prior to earthmoving activities, after site soils have been effectively dried out, all standing vegetation within the work areas would be removed. The removed vegetation would be stockpiled onsite and mulched for later reuse.

   If Soils Reuse Option #1 (toe berm) is chosen, the top soil and mulch would be a good cover over the new levee berm (refer to specifics on this option under the subsection entitled Soils Reuse Options: Construction Activities that is located elsewhere in this section), by providing a seed bank and aiding in retaining moisture for the planted grasses used to control erosion. The berm would not be armored with rock. This top soil and seed bank would also be used as a final cover over the material placed in the stockpile, thus facilitating the resumption of grazing activities. Any sensitive or special-status plants within the work area would either be avoided by work activities, or transplanted to a suitable location, as feasible. This action would be determined at the time of construction, depending on the suitability of the habitats to support the species, and legal requirements.

### *Construction Management Center and Equipment Staging Areas*

A construction management center would be set up by the contractor and design team. Its location would allow for a connection to existing electrical lines and/or rely on generators for power supply. If connecting to existing electrical lines was desired, the center would have to be located at the ranch compound or along the west Yolo Bypass levee. For the EIR analysis, it is assumed either one large trailer (800 square feet [sq ft]) or two smaller trailers (400 sq ft each) would require about 4,500 kilowatt-hours. If a generator was used as a power source, then the center could be located as best meets the contractor’s needs.

The construction management center would consist of one or two office trailers, portable toilets, and one or two storage containers. If deemed appropriate by the contractor, temporary security fencing could be installed around the construction management center and equipment staging areas to reduce the chance of theft and vandalism. All temporary structures associated with the construction management center and equipment staging areas would be removed from the Yolo Bypass at the end of construction, prior to the onset of the winter flood season.

Equipment staging areas would be located outside of sensitive habitats (e.g., wetlands). The locations of all staging areas would be determined by the contractor and design team at the time of construction, based on field conditions and permit conditions. These areas would be clearly demarcated in the field, and erosion control structures (e.g., weed-free, rice straw wattles; silt fences; or other sediment barrier where sediment-laden water can pond as appropriate onsite) would be installed around them, in accordance with the Project’s stormwater pollution prevention plan (SWPPP) and spill prevention and control plan (SPCP), to prevent the transport of sediments and/or construction contaminants into surrounding areas.

The SWPPP would include prohibitions on littering by employees, subcontractors, and visitors. All refueling, maintenance, and storage of equipment not in use would occur within these areas. Additionally, the SPCP would describe how hazardous materials spills would be prevented, but if they did occur, how the spill would be contained, cleaned up, and how the spilled material would be disposed of. Examples of these measures would include using material transfer procedures or filling procedures for tanks and equipment that minimize spill, substituting less or non-toxic materials for toxic ones, and performing preventative maintenance on equipment.

The SPCP would also describe the location of the spill response equipment, along with instructions for the response to spills. Lights would be installed in the staging areas to allow maintenance and refueling to occur during off-hours. Temporary lighting may also be required at work sites where night work is occurring.

Potential onsite staging and storage areas would include, but not be limited to, to one or more of the following as advised by the contractor:

1. Limited parking areas (about 4 ac) at Yolo Ranch headquarters.
2. Existing staging area (about 7 ac) between the west Yolo Bypass levee and Block 10.
3. Non-irrigated field (about 50 ac) called the "Airport" within Sorenson (see **Figure 2-5**).
4. Non-irrigated field (about 88 ac) in the northeast corner of Gilmore Pond.
5. Southeast corner site (about 14 ac) of Network 3 (near Duck Pond) and close to the Toe Drain.
6. Eastern salt grass field (about 30 ac) of Block 3.

## *Access Roads*

Equipment access and excavated material transport would occur primarily along existing roads on the Project site and on adjacent Mound Farms, if access permission is obtained. Possibly two or three new road alignments may be constructed in the western area of the Project site to facilitate material transport to placement locations along the west Yolo Bypass levee. Additionally, to avoid impacting vernal pools in the Yolo Ranch area, about 2,000 feet (ft) of ranch road may need to be relocated. All roads would be constructed as gravel farm roads. Final decision on road alignments would be reached through the collaboration of the contractor and design team, in compliance with applicable regulatory permitting requirements prior to construction.

Roads would be improved or created to meet construction standards, by widening to a minimum of 12 ft and adding sufficient material (dry, excavated soils from restoration areas), to support heavy equipment use. Filter fabric would be considered for use in problematic (soft or damp) soil areas to provide a sturdy base to build the roads upon. Turnouts (minimum width of 24 ft) would be constructed about every 500 ft along the roads for two-way vehicle traffic. If desired by the landowners, all roads would be returned to their approximate original configurations following completion of construction activities. It also may be necessary to construct temporary roads within areas to be graded inside the restoration footprint. These roads would be built to similar specifications as described above for transport roads, and would be removed prior to Project completion. All actively used access roads would be watered twice daily for dust control.

## *Hazardous Materials Management and Remediation*

Remedial activities within the Project footprint, as specified in the Phase 1 environmental site assessments (Wallace Kuhl and Associates 2007 and 2008), have been completed for known contamination onsite (refer to Section 4.5, Hazards and Hazardous Materials).

Other activities dealing with hazards materials management would involve:

1. **Identify and remediate suspected soils and materials contamination.** Should additional contaminated sites be encountered during construction, the soils and materials

(such as treated wood removed from the existing irrigation system) would be tested and then either capped or excavated/transported in a manner consistent with all applicable environmental laws and regulations dealing with hazardous waste.

2. **Prevent potential site contamination runoff.** All hazardous materials (e.g., fuels, oils, lubricants, and solvents) would be stored in proper containers in secure/fenced locations within equipment staging areas. Potential site runoff containing oils and fuels from vehicles and construction equipment would be minimized by implementation of BMPs for storm water control in the required SWPPP, i.e., by preventing petroleum products or other pollutants from entering surface or ground waters under any flow. Additionally, fueling and maintenance of equipment would be performed by properly trained employees to reduce the risk of material spills. A SPCP would be prepared and employed to reduce the potential for spills. Other measures would include, but would not be limited to: stationary equipment such as motors, pumps, and generators equipped with drip pans; and, no storage of equipment or vehicle storage within natural drainage swales.

3. **Prevent or remediate existing and abandoned utilities' potential contamination.** A few abandoned gas wells and some associated infrastructure exist within the Project's construction footprint (**Figure 2-8**). The well pads, casings, and any defunct transmission lines within the area to be graded would be removed, if necessary, and disposed of in an appropriate manner in compliance with applicable hazardous waste requirements and in consultation with affected private or public entities.

   A low-voltage electrical transmission line also runs through portions of the Project area. This transmission line presumably once powered pumps along the southern project perimeter, but these pumps are no longer in use and would not be replaced by the Project. This transmission line would therefore be removed or abandoned in place, in consultation with Pacific Gas and Electric (PG&E). If soil below any pole-mounted transformers in areas to be graded would have polychlorinated biphenyls (PCB) contamination, PG&E would be responsible to initiate a soils investigation and cleanup. Current practices by PG&E would entail routinely testing a transformer when removed for service for PCB content. If it has a concentration of 50 to 500 parts per million (ppm), it would be drained and replaced with non-PCB oil, or both the body of the transformer and the oil would be shipped to an out-of-state, licensed hazardous waste disposal facility. Any soil contaminated by a spill would also be shipped to the same disposal facility. If a transformer contains a PCB concentration between 5 and 50 ppm, it could be returned to service (Palo Alto Regional Water Quality Control Plant 1997). Potential impacts from contaminated dust emissions generated during excavation activities would be minimal given stringent measures, such as applying water as a dust suppressant within the excavated area, wearing protective clothing (e.g., tyvek) to protect the workers, and implementing mandated health and safety procedures (e.g., decontamination procedures) for workers involved in clean-up efforts. While no known PCB contamination exists onsite, remediation efforts, if necessary, would be of a short duration and all soil contamination would be removed by PG&E.

> For hazardous risks related to abandoned natural gas wells, Yolo County Fire and Emergency Services Department, and California Department of Conservation (CDC) Division of Oil, Gas, and Geothermal Resources (DOGGR) would be contacted. Prior to the excavation of soil on the Project site, applicable measures would be developed in consultation with these agencies utilizing the Well Review Program (California Department of Conservation 2007). If applicable, a permit from the CDC's DOGGR would be obtained if the surface well casing/plug would be raised or lowered.

Additionally, during construction and post-construction activities (i.e., additional tidal connection), construction personnel and contractors would comply with applicable standards set by the California Occupational Safety and Health Administration.

### 3.4.3 Construction of Project Components

Once site preparation has been completed, construction of the Project components would begin. These components would include restoration, wetland enhancement, irrigation and drainage improvements for continued agricultural use, and soils reuse options.

#### *Restoration: Construction Activities*

Under the proposed Project, approximately 1,480 ac of farmlands would be modified to restore or enhance tidal wetlands, tidal channels, and riparian habitat (refer to **Table 4.5-8** in Section 4.5, Agricultural Resources). Project restoration elements would entail: excavating tidal channel networks through existing agricultural fields, grading areas currently at elevations above the tides to intertidal elevations, transporting excavated materials to soils reuse areas, and constructing tidal connections.

##### Tidal Channel Networks

Tidal channel networks would be excavated to facilitate the movement of tidal water between tidal sources along the Stair Step and Toe Drain and the restored tidal marsh. These networks would vary according to flow capacity needs. The tidal channels would be excavated to depths approximately 2 to 6 ft below MLLW to avoid colonization of the channel beds by tules. Each tidal connection would be in the range of 70 to 120 ft in width. Channel geometries would be sized to promote peak spring tide ebb flow velocities of approximately 3 ft per second (typical peak velocities found in tidal marshes in the San Francisco Estuary) throughout each network, in order to discourage colonization and establishment by invasive aquatic plants.

Channels would be constructed with side slopes, between 1:1 to 2:1 (width to height ratios), dependent on soil stability, and would result in trapezoidal cross-sections. In some locations, one channel bank may be sloped more gently to provide open water shoals well-suited to native fish species; such slopes would be located on the inside of channel bends, consistent with natural geomorphology of stream channels. The tidal channels would be sinuous in plan form to reflect the natural tidal channel morphology of historic Delta freshwater tidal marshes. They would also maintain a minimum distance to a channel from any location on the marsh plain, so as to facilitate connectivity and exchange of productivity between marsh plain and open water habitats. Where grading is employed to lower lands to intertidal elevations, graded areas would be gently sloped to drain into tidal channels and avoid developing stagnant backwater areas. Following construction, standard livestock fencing would be installed surrounding the restored tidal marsh and enhanced wetlands to exclude cattle from these areas.

The Project would include six distinctive channel networks: Old Lake, The Island, Duck Pond, Northeast Field, Toe Drain, and Southwest (see **Figures 3-1** and **3-2**):

1. **Network 1 – Old Lake.** This network would be located in a natural depression (historic backwater lake area) currently managed for cattle pasture. This network would be isolated from other tidal networks and would have its own dead-end branching (dendritic) tidal channel system. The tidal source would be a channel that crosses the existing central irrigation ditch, before connecting to the main tidal trunk channel constructed in Network 2. The exact location(s) of channel crossings with the central irrigation ditch, where it extends directly north of Liberty Cut, would be determined during final design, with consideration given to a number of factors (e.g., hydrology, topography, and sensitive biological resources).

   To promote tidal circulation, some low internal berms and roads on existing agricultural fields might be graded down. Based on the outcomes of post-construction monitoring, a second tidal connection and associated tidal channel may be constructed in Network 1 to convert a portion of the network to a flow-through channel system (see Section 3.5.2).

2. **Network 2 – The Island.** The area is an historic tidal marsh currently managed as summer irrigated cattle pasture. The tidal source would be a channel excavated through tidal marsh outboard of the existing levee to the Liberty Cut/Stair Step junction combined with a tidal connection of that levee. The northern portion of The Island already experiences occasional muted tidal connectivity with the Stair Step at its northeast corner. This northern half of The Island would be restored to an intertidal pond by retaining most of the existing east-west berm and allowing higher tides to connect with it. The result would be that the restored pond would get daily tidal flow with more volume and mixing. Removing the berm would allow for full tidal function. To ensure maximum tidal efficiency in its final design, SFCWA would conduct residence-time modeling.

3. **Network 3 – Duck Pond.** This site is another area of historic tidal marsh that is also currently managed as summer irrigated cattle pasture. The primary tidal source for this network would be a channel leading to the Stair Step with a newly created tidal connection. This network also would be tied to the Toe Drain through a tidal channel network that would flow through networks 4 and 5 to the north.

   Unlike the dendritic channel network in Network 1, this network would be a flow-though network, meaning it would join to external tidal waterways at both ends. This flow-through design would maximize the efficiency of tidal transport of primary productivity from the marsh plain to open water habitats, and would provide a fish movement corridor with more complex habitats relative to the Stair Step and the Toe Drain.

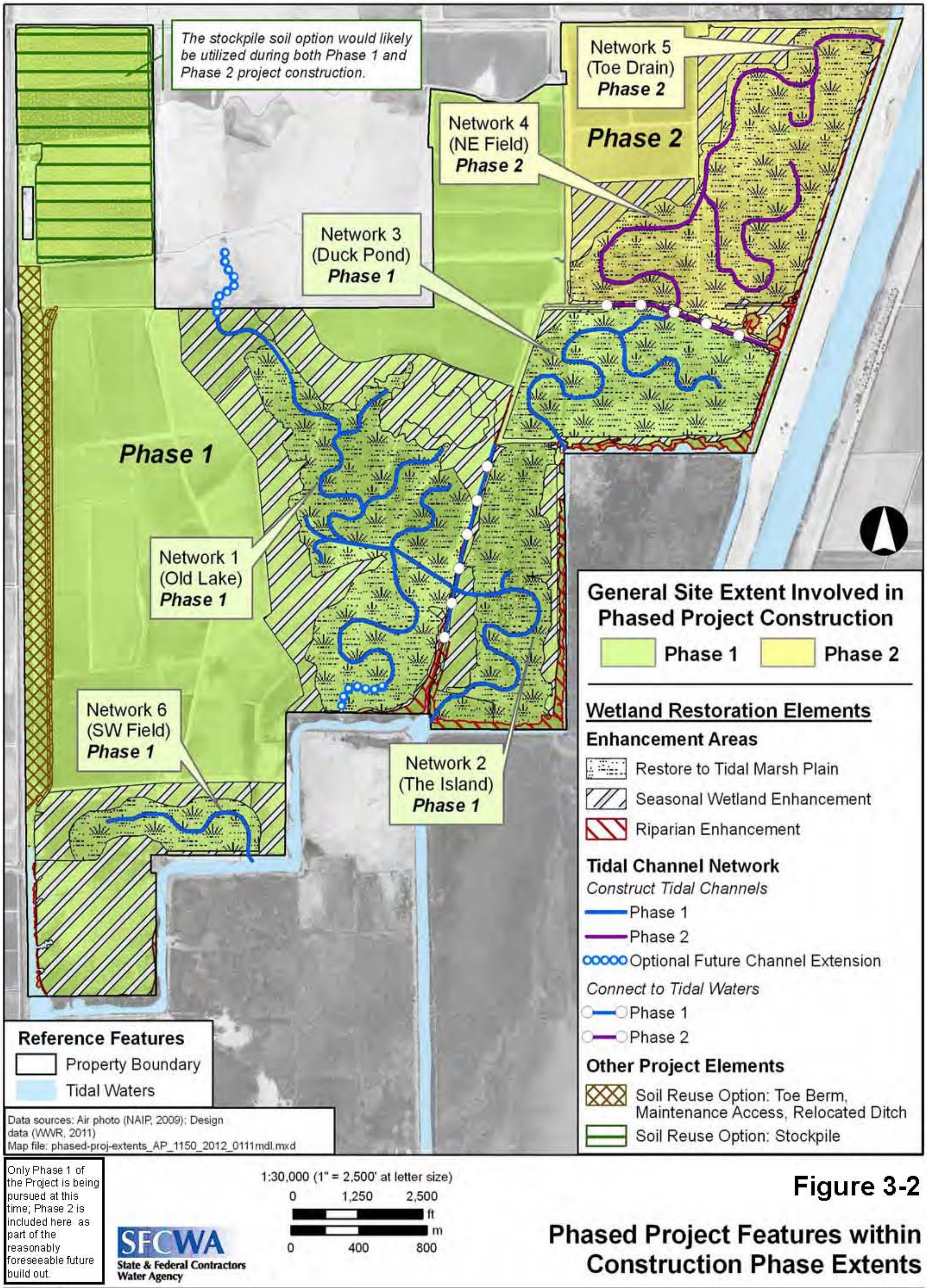



**Figure 3-2**

**Phased Project Features within Construction Phase Extents**

4. **Network 4 – Northeast Field.** This is an area of historic tidal marsh, currently managed as pasture. For Phase 2 of the Project, the tidal sources for this network would be tidal channels joined with tidal sources in Networks 3 and 5.

5. **Network 5 – Toe Drain.** This area occupies historic tidal marsh that is currently managed primarily for duck hunting and cattle grazing. For Phase 2 of the Project, this area would have a flow-through tidal channel network extending from the Toe Drain, via a tidal connection south to Network 4.

6. **Network 6 – Southwest Field.** A new 70-acre area immediately adjacent to the north side of existing grazed high marsh, in the southwest corner of the property, would join with the Stair Step through a new channel and a tidal connection.

Details for each network and its associated dendritic channels, such as current elevation, planned elevation, and related excavation, are still under development. Conceptually, the overall Project's networks/tidal channels can be found in **Figure 3-1**, **Table 3-1**, and **Table 3-2**.

## Areas Graded to Intertidal Elevations

While much of the proposed restoration area is already at intertidal elevations, an additional 445 ac would be constructed by grading down lands just above high tide elevations to a range of intertidal elevations (with a depth ranging 2 to 6 ft). All grading would be designed to drain to the tidal channels. Where grading would take place, three grading elevations would be employed for the purpose of providing a scientific evaluation of the relationship between restored marsh plain elevation and magnitude of ecosystem functions provided; such findings could be applicable to other future restoration efforts (refer to Section 3.5.3, Regional Science Support Component). Grading elevations would be to mean high water (MHW), mean tide level (MTL), and midway between MTL and MHW.

Additionally, the Project site has numerous ranch roads and internal berms that, if left untouched, could impede tidal circulation in restored tidal networks. To ensure tidal circulation, many of these berms and roads within the restoration footprint may be graded to be flush with the grade of the adjacent fields. This grading would result in the excavation of about 15,000 cy of material.

Overall, grading for the new tidal channels and lowering fields, berms, and internal roads would require the Project excavation of up to 2.5 million cubic yards (mcy) of soil.

## Excavated Materials

Excavated material would be loaded into dump trucks that would transport it to the selected soils reuse area(s) (as identified as Soils Reuse Options #1, #2, or #3 elsewhere in this section). The method of loading and transporting the excavated materials would be accomplished with two possible scenarios. One method would involve the creation of temporary, local stockpile locations (within the work area), situated along the major site access roads. From these temporary stockpiles, loaders would transfer the stockpiled material into large dump trucks, which would transport the material to the ultimate soils reuse site(s).

The second method would be to direct transport from the excavation areas to the ‘end’ soils reuse area(s). If soil conditions would be suitable (i.e., firm and dry enough to support heavy construction equipment, as determined by construction contractors), then marsh plain grading would be accomplished using 20- or 40-cy capacity scrapers. This method would eliminate the need to transfer material into dump trucks, as the scrapers themselves would be used to cut and transport material to the soils reuse site(s).

Selection of excavators and dump trucks versus scrapers would be made by the contractor and may be different for marsh plain excavation and tidal channel excavation. Whether the channel networks or marsh plains would be excavated and graded first would be determined by the contractor and design team, based on field conditions and construction feasibility. Additionally, some of this excavated material would first be used to improve/construct access roads throughout the Project site. This material would be placed along the road alignment and graded.

## Tidal Connections

Upon completion of grading and excavation of marsh plains and tidal channels, the construction of the tidal connections would begin: three for Phase 1, two for Phase 2, and one additional connection during the post-construction phase, if necessary. Each tidal connection would be in the range of 70 to 120 ft in width with the total amount of up to 720 ft. By maintaining isolation between work areas and surrounding tidal channels during construction (i.e., not removing the “plug”), the work areas would remain as dry as possible during excavation. This method would minimize the impacts to aquatic organisms and the transport of silt and construction debris/contaminants into adjacent waterways. The precise locations of these tidal connections, especially along the Stair Step or Toe Drain, would be determined during final design, with consideration given to a number of factors (e.g., tidal hydrodynamics, hydrology, topography, and sensitive biological resources).

Tidal connections would be constructed by an excavator operating from the Project site side to minimize work within tidal waters. BMPs would be implemented by the contractor to minimize the impact to riparian vegetation and shaded riparian aquatic habitat. Due to the high groundwater conditions present at the site throughout the year, it is anticipated that water surface elevations between the channels within the work area and the surrounding natural tidal channels would equilibrate prior to construction of the tidal connections, resulting in minimal if any hydraulic differential. Because there would be no substantial hydraulic differential between the constructed area and the surrounding natural channels, excavation to create the tidal connections (i.e., removing the “plug”) would not result in a surge of water into the work areas. Therefore, impacts to aquatic organisms as well as unwanted scour resulting from any such surge would be avoided. Further, construction of the tidal connections would take place during low tide stages to minimize any in-water work required when removing the material to attain the full tidal connection. Once completed, aquatic organisms would have full access to traverse the site at the end of this process.

**Figure 3-3** illustrates the general sequence for constructing tidal connections. The left photo demonstrates the early stage of construction prior to tides connecting. The center photo shows the middle stage with the berm modification. The right photo is the last stage of the tidal connection where water is flowing.

### Wetland Enhancement: Construction Activities

Enhancement activities would apply to about 174 ac of existing seasonal and farmed wetlands and marshes, along with 59 ac of riparian habitat. Grazing activities and irrigation would then be discontinued and the hydrology enhanced through improved connectivity to tidal flow and winter storm flows.

**Figure 3-3. Typical Stages in the Construction of a Tidal Connection**

Source: Blacklock Restoration Project, Suisun Marsh (DWR and Reclamation 2006).

### Irrigation and Drainage Improvements: Construction Activities

The proposed Project would be designed to operate as a self-sustaining, natural system. It would not require nor be dependent on water control structures, pipes, weirs, or tide gates. However, because this Project would be “superimposed” on a portion of existing grazing lands, the existing water control infrastructure supporting the agricultural lands would be altered.

Currently, tide gates, flap gates, and other water control structures moderate the extent to which water enters (irrigates) and leaves (drains) the site and adjacent properties to the north. Construction activities would be limited to changes to the main irrigation and drainage source ditches, along with the installation of new water control structures, rehabilitation or relocation of some existing water control structures, and removal of some existing water control structures. At this time, the exact number and placement of these structures are not known and would be determined in final design. **Table 3-2** indicates the numbers and types of water control structures based on current conceptual designs.

The proposed Project would reroute, widen, and expand some existing irrigation and drainage ditches. The relocated, widened, and extended irrigation ditches and drainage channels would be constructed using a combination of excavators and dump trucks, in the same manner as for construction of the tidal channels, described above. All repair, replacement, and installation of new water control structures would be accomplished by hand crews, with assistance from excavators (operating from the land-side of the Project site) for earthmoving and lifting of heavy structures (e.g., culvert pipes, rip-rap, concrete) as needed.

Strategically located ditch blocks would minimize the extent to which the large, linear irrigation ditches might become part of each dendritic tidal channel network (refer to **Figure 3-2**). Also, all changes in water control infrastructure would be designed to maintain irrigation and drainage capabilities for adjacent properties that rely on the current infrastructure on the Project site for their agricultural operations. Overall, there would be no changes in irrigation capacity with Project implementation.

## Hydrologic Management

Prior to initiating construction activities, the current hydrologic management of the Project site would be altered (i.e., selected reduction or cessation of irrigation) to ensure that the soils would be sufficiently dry to support heavy equipment. Subsequent to site preparation activities, should groundwater seepage occur in deeper areas of channel cuts, construction progress would not be hindered as channel excavation would be conducted from the banks, and equipment would be capable of handling wet/saturated materials.

Hydrologic management activities would include:

1. **Conduct potential dewatering activities.** If the Yolo Bypass floods late in the winter or spring prior to construction and field soil saturation is impeding mobilization, additional measures to facilitate more rapid drainage of areas proposed for grading may be utilized. These measures could include constructing temporary, small drainage swales connecting to existing drainage ditches or employing portable pumps. If swales are used, their inverts would be at or above proposed grading elevations such that when grading is complete, these swales would no longer be present.

   It is also possible that portable pumps could be utilized to empty directly to adjacent farmland onsite but not within the construction footprint. This method would not involve the discharge into wetlands or watercourses.

   BMPs and proposed mitigation measures identified in Section 4.4, Aquatic Biological Resources, would be employed to avoid potential impacts to fishes that might be onsite during construction. During post construction, the graded areas would allow for natural dewatering to natural drainages and thereby avoid impacts to aquatic biological resources.

2. **Repair or replace unmaintained water control structures to allow site drainage.** Some of the water control structures along the Stair Step and Toe Drain do not allow effective control of water exchange between these tidal water bodies and the Project site. When the Yolo Bypass flood season ends, unmaintained water control structures retained in the post-Project irrigation configuration would be repaired or replaced (see **Table 3-2**). In addition, several water control structures on the Project site would be removed (and replaced with ditch blocks), or replaced with a different type of structure to achieve the post-Project irrigation configuration (**Figure 3-4**). Flap gates would be installed on the tidal side of all control structures, and would be closed to keep tidal water from entering, while allowing any water on the site to drain. If some water control structures could not

be repaired, or continued to leak after repairs, it would be necessary to pump excess water from the Project site into the adjacent sloughs (as described above).

Construction work on water control structures would be accomplished at low tides, when a minimal amount of water would be present. Turbidity curtains would be deployed around work areas on the tidal side to reduce suspended sediments and exclude fish.

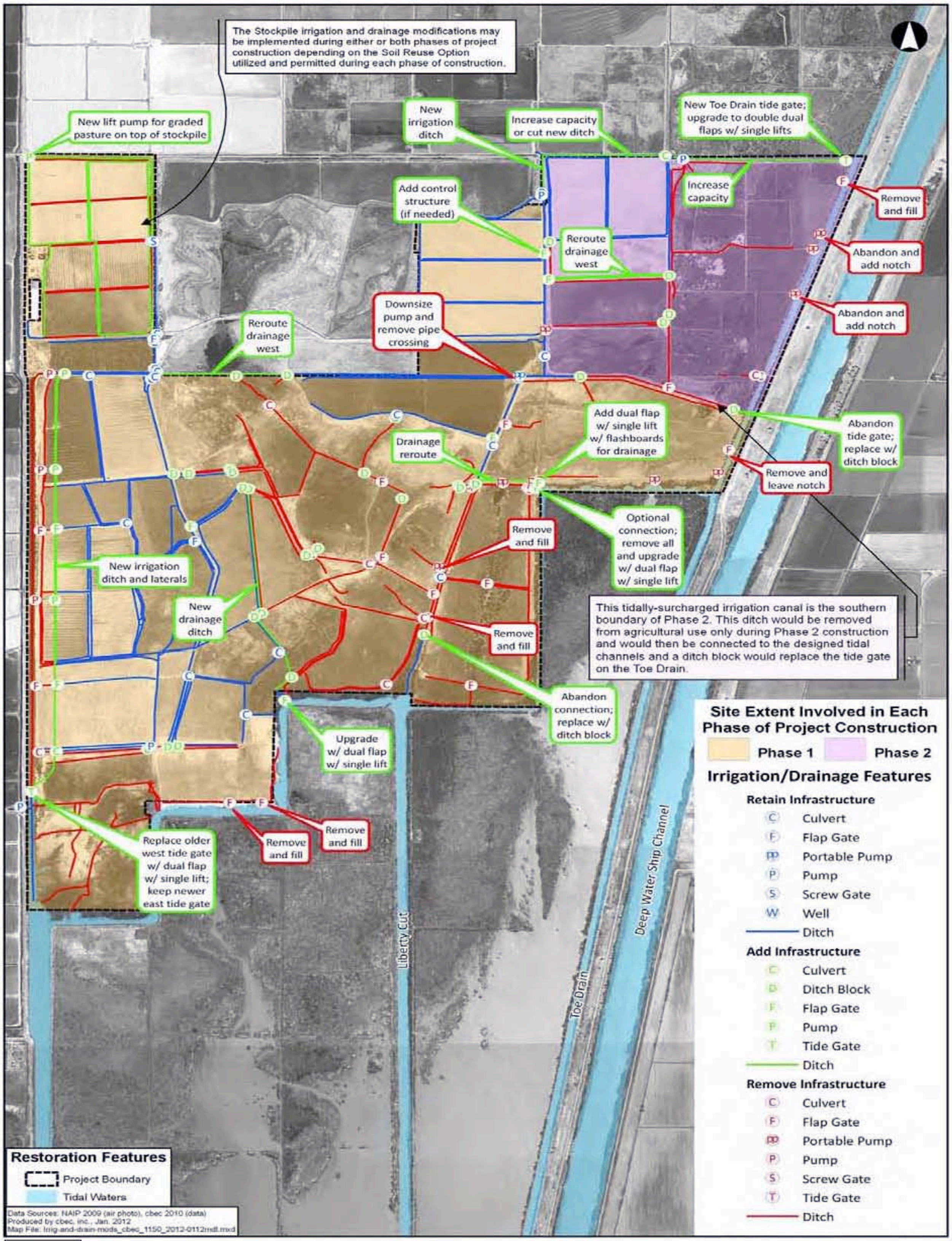
3. **Cease irrigation and grazing across entire site.** Irrigation and grazing activities would not occur on any portion of the Project site, except within the restricted-height levee during the construction period, in order to facilitate dry soil conditions and avoidance of operational conflicts between cattle and construction equipment. If Soils Reuse Options #2 or #3 would be implemented (i.e., placing soils partially or entirely into the stockpile area), then agricultural operations within the restricted-height levee area would cease as well. Irrigation ditches within the Project footprint would be kept dry to maintain dry and workable soils. It may be necessary to install earthen ditch blocks or water filled bladders in some of these ditches to ensure they remain dry. These temporary features would be removed prior to the onset of the Yolo Bypass flood season.
4. **Construct temporary low berms in certain areas, if needed.** Certain work areas situated in topographic depressions, such as along the Stair Step where extreme high tides occasionally overtop the levees, may require the construction of temporary earthen berms along their alignments to prevent inundation during high water events. These berms would be removed prior to the onset of the Yolo Bypass flood season.
5. **Maintain irrigation capabilities on adjacent properties during construction.** The reconfiguration of the central and northeast irrigation supply ditches would be implemented to avoid operational impacts to offsite agricultural operations that rely upon these two ditches and their agricultural diversions as a water source (i.e., Mound Farms and several farms to the north of Delhi Road).

Temporary, portable pumps would be employed to divert water around construction zones for adjacent property owners, while the upgraded water control structures would maintain sufficient water levels and volumes for all property owners. As such, offsite fields currently serviced by the northeast irrigation ditch would continue normal agricultural activities during construction.

Two Project elements would enable water access for continued agricultural use onsite (outside of the restoration areas) and to adjacent properties, i.e., drainage and irrigation modifications.

## Drainage Modifications

An existing central drainage ditch runs generally northwest to southeast, between the fields of Sorenson and Gilmore Pond to the north, and Ryegrass and Caboara Pond to the south (see **Figure 2-5**). Portions of each of these fields would be restored to tidal wetlands and wetland buffers (as part of Network 1) and would drain via conversion of the existing central drainage to an enlarged tidal channel, which would continue through Network 2.




Only Phase 1 of the Project is being pursued at this time; Phase 2 is included here as part of the reasonably foreseeable future build out.

SFCWA State & Federal Contractors Water Agency

1:24,000; 1 inch = 2,000 feet at B-size

0 1,000 2,000 ft

0 300 600 m

**Figure 3-4**

**Modifications to Irrigation and Drainage Structures**

To avoid water quality impacts to the proposed tidal wetlands via drain water from the irrigated pastures, the existing central drainage would be rerouted south, starting from the field junction of Sorenson, Gilmore Pond, and Ryegrass. The new central drainage would be of similar size to the existing central drainage, excavated through Ryegrass and Caboara Pond, and would join the existing drainage feature at the outlet of Caboara Pond to the Stair Step, which currently is without a control structure. The new control structure would be installed within the existing drainage feature to manage the release of drain water during the irrigation season. This structure would be opened in the winter to facilitate drainage of floodwater.

## Irrigation Modifications

The primary changes to onsite and offsite agricultural irrigation would include the following:

1. The northeast irrigation ditch, located along the north side of Yolo Flyway Farms, would be widened and deepened to provide increased irrigation flows to the Project's northern fields and to those pumps responsible for irrigating lands north of the Project site. This irrigation ditch would also be extended west to connect to the ditch between Block #8 and North/South #7, ultimately connecting to the central irrigation ditch.

   This widened and extended ditch would partially compensate for irrigation capacity that would be lost due to discontinuing use of portions of the central irrigation ditch for irrigation. In addition, the Toe Drain water would no longer be used to irrigate the portion of the Project site restored to tidal habitat.

2. About 10 ac of the central irrigation ditch would be converted to a tidal slough. The northwest corner of the ditch would remain intact and connected to the northeast irrigation ditch as described above. A new 1,350-ft long ditch and new control structure connecting the retained irrigation ditch to the Stair Step would be constructed. The new control structure would be a flap gate (with drain only function) with an interior flashboard riser (to maximize irrigation storage capacity). The central irrigation ditch would transmit irrigation water from the ditch in between Block #8 and North #7 to Pump #9. This central irrigation ditch also would transport recycled drainage water from Block #8, Block #9, North/South #7, and some offsite lands north of the Project site through the new control structure.

Associated with construction of the toe berm along the west Yolo Bypass levee, the existing levee borrow ditch (which also serves as the irrigation ditch for lands near the levee) would be moved to the east to accommodate the toe berm. Pumps #1, 2, 3, and 10 would be relocated to the east and pull irrigation water off of this new ditch. The segments of existing irrigation laterals supplied by these pumps to facilitate flood irrigation would be reconstructed to the east to maintain this irrigation approach, if Soils Reuse Option #1 were employed (see below).

Overall, these improvements would be implemented to ensure irrigation capacity for the remaining agricultural land onsite and for continued use by adjacent property owners.

## *Soils Reuse Options: Construction Activities*

The proposed Project would generate up to 2.5 mcy of soils (Phase 1: 1.85 mcy; Phase 2: 0.65 mcy), excavated from construction of the tidal marsh channel networks, grading down of lands to create tidal marsh, and modifying the irrigation and drainage systems (see **Table 3-1**).

The Project would reuse these soils by relying on one of three options:

1. Improving the Project side of the west Yolo Bypass levee by construction of a levee toe berm to reduce levee erosion (Soils Reuse Option #1),
2. Placing soils into a permanent onsite stockpile (Soils Reuse Option #2), or
3. Constructing a combination of the levee toe berm and permanent stockpile, with allocation of the 2.5 mcy of excavated soils volume split between the two (Soils Reuse Option #3).

Following construction, the toe berm and/or stockpile would be stabilized as needed, using appropriate erosion control measures (such as hydroseeding, ground covering, and stormwater drainage) to prevent damage from Yolo Bypass flood flows or wind erosion. Should this ground cover not be established before the first flooding event, then such measures would be repeated after the cessation of the flood season. Such measures would also be designed to minimize, to the extent possible, possible impacts to sensitive biological resources onsite.

More specifics for each of the three soils reuse options are discussed below.

### Soils Reuse Option #1

Excavated materials would be used for the construction of a new toe berm to buttress a portion of the west Yolo Bypass levee, adjacent to the Project site (**Figure 3-5**). The integrity of this levee is currently threatened by erosion along its eastern slope. When the Yolo Bypass is inundated in the winter, wind-waves across the flooded lands and eddies – generated on the leeward side of the restricted-height levee around the ranch compound – create erosive forces on the levee slope that require costly and fairly regular maintenance.

The excavated soils would be transported via trucks and/or scrapers and placed onto the eastern side of the levee. To construct the toe berm, the existing west Yolo Bypass borrow ditch would be relocated to the east, and the associated pumps and irrigation features would be relocated with the ditch. The existing borrow ditch itself would be drained and filled to form the base of the new toe berm. If the bottom substrate of the borrow ditch would not be suitable as base material for the toe berm, then removal of such materials prior to filling the ditch might be considered. The berm would be constructed with gradual slopes to dissipate erosive energy with the aid of a bulldozer and a compactor. Additionally, the toe berm design would include a 25-ft wide access corridor at its base for maintenance and inspections. As a result, this would require relocating the existing irrigation and drainage ditch and irrigation lateral to the east (**Figure 3-5**) and hence, about 40 ac of affected farmland would no longer be irrigated.

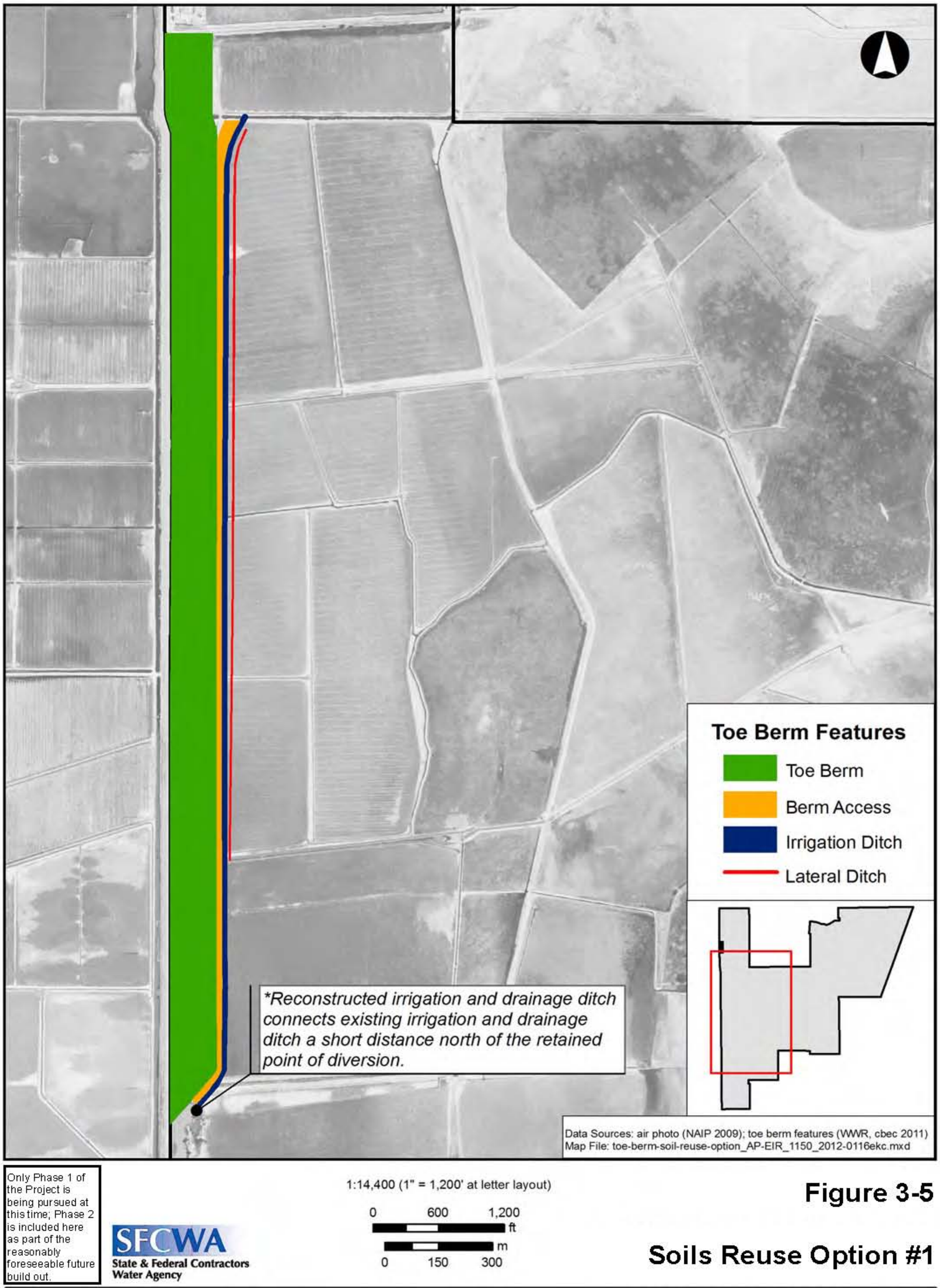



**Figure 3-5**

**Soils Reuse Option #1**

Five pumps draw irrigation water from the existing west Yolo Bypass borrow ditch to irrigate several fields on the west side of the Project site. This ditch also provides storm-water drainage.

The location of the existing agricultural diversion from Shag Slough would be retained, as would a small portion of the existing borrow ditch north of the diversion. The relocated portion of the ditch would connect to the retained portion of the borrow ditch. The rerouted portion of the ditch would be about 10,000 ft long, narrower than the current ditch, and would be sized to accommodate the peak summer irrigation demand for the remaining irrigated acres, as well as storm-water drainage. The new ditch would be about 50 ft wide at the top and 10 ft wide at the base. Fields currently serviced by the west side irrigation ditch and not restored to wetlands or converted to wetland buffer would continue normal irrigation and grazing operations.

Aside from implementing this soils reuse option, the construction of the toe berm would enhance flood protection for thousands of acres of agricultural lands that lie to the west. This would also be a beneficial effect to Yolo Bypass flood management in the Project vicinity.

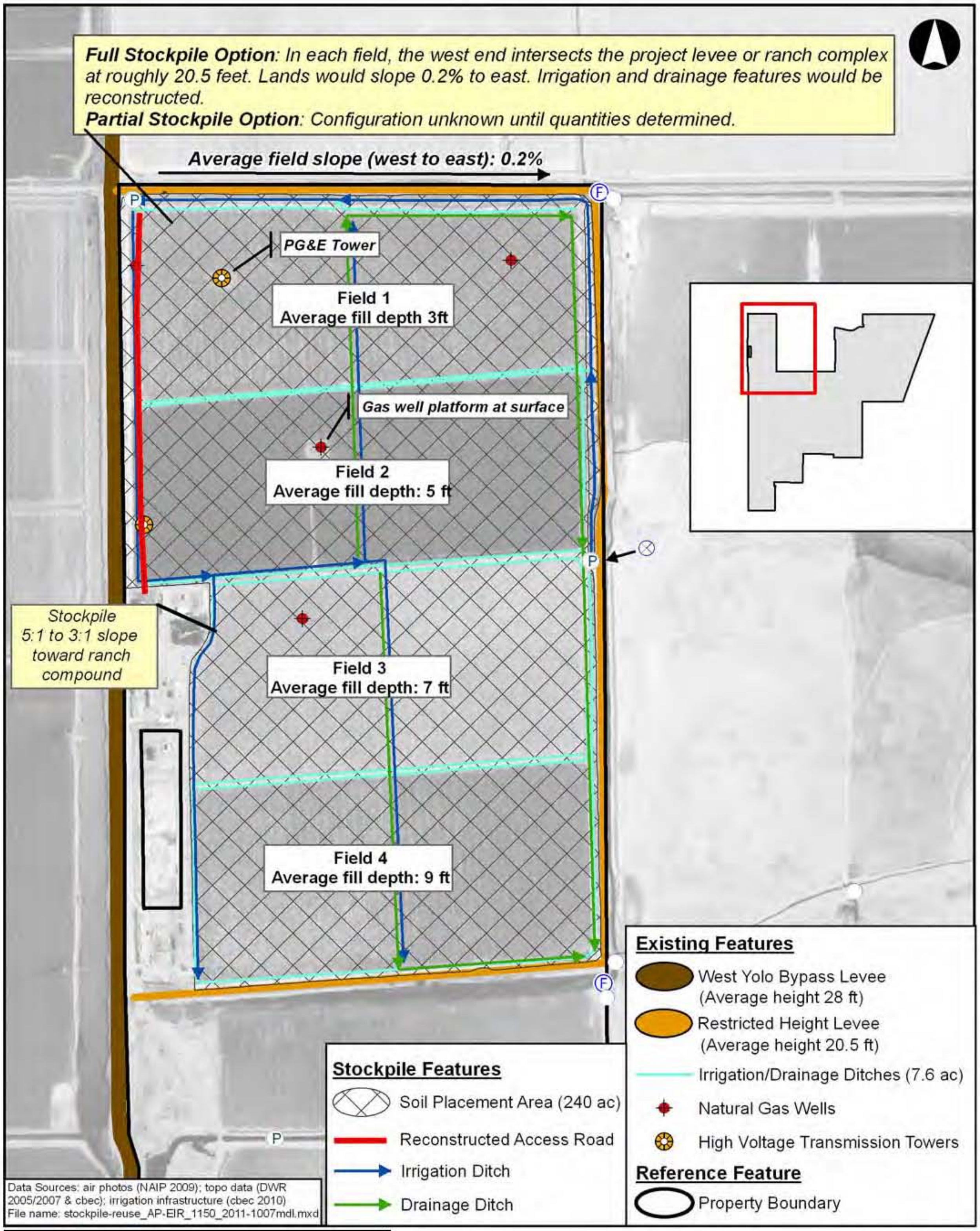
### Soils Reuse Option #2

Under this scenario, excavated soil would be placed as a stockpile up to 240 ac on the fields within the restricted-height levee, in the northwest portion of the property (**Figure 3-6**). Soils would be dumped, graded into place by bulldozer, and compressed by compactor as necessary. The design would ensure minimal to no alterations on Yolo Bypass flood flow conveyance. This option would involve excavating a lesser amount of soils, i.e., roughly 2.4 mcy of soil, because it would not involve the ditch relocation identified in Soils Reuse Option #1. The excavated soil would form a broad plateau up to the edge of the existing restricted-height levee, raised 3 to 9 ft in elevation along the existing land surface.

Under Soils Reuse Option #2, two placement activities would occur:

1. **Placement Extent.** The western extent of soils placement would be to the west Yolo Bypass levee, north of the ranch compound, and to the east side of the ranch compound elsewhere. The northern, southern, and eastern extent of soils placement would be to the restricted-height levee. The existing access road from the Delhi Road entrance to the Project site would be reconstructed atop the stockpile, with the southern end of the road at the ranch compound at a grade to support use by cars, small trucks, and large trucks.

   The stockpile extent would fill the existing borrow ditches created from construction of the restricted-height levee and used currently for irrigation and drainage purposes. The irrigation and drainage functions of these and all other existing irrigation and drainage ditches would be re-established atop and around the margins of the stockpile within the west Yolo Bypass levee and the restricted-height levee.




Only Phase 1 of the Project and not Phase 2 is being pursued at this time; however, Phase 2 is included here as part of the reasonably foreseeable future build out.

1:9,000 (1" = 750' at letter size)

0 375 750 ft

0 125 250 m

SFCWA State & Federal Contractors Water Agency

**Figure 3-6**

**Soils Reuse Option #2**

2. **Placement Elevations and Grades.** Soils would be placed, at most, up to the height of the restricted-height levee (20.5 ft NAVD88) in the west sloping down to +15.5 ft NAVD88 in the east. The placement area currently has gently sloping agricultural fields at about 0.2 percent slope irrigated at the north and drained at the south. The stockpile design would replicate this basic layout, with fields being gently sloped from the west to the east (instead of north to south), and irrigation and drainage ditches reconstructed atop and around the placed soils to facilitate continued agricultural production and drainage. The edge of the stockpile would have slopes, ranging from 3:1 to 5:1, to the north and east sides of the ranch compound. Drainage ditches would be constructed around the toe of the fill to route runoff water into the drainage ditch system.

An abandoned gas drill pad and well lie in the proposed stockpile site. Depending on the final engineering design and the applicable regulatory requirements by CDC, a vertical rise extension to the abandoned well would be constructed, or the well would be re-abandoned in place.

Construction of the stockpile would require suspending agricultural production for one growing season on the land used for stockpiling, after which it could be returned to agricultural use.

#### Soils Reuse Option #3

This option would be a combination of Soils Reuse Options #1 and #2. Relative allocations of soil quantities for each approach (both toe berm and stockpile) would be determined during final engineering design. Ultimate soils placement height at the stockpile would depend on what portion of the excavated soils would be placed there. With placement of lesser soil volumes into the stockpile, finished elevations would be lower and/or fewer fields would be used as stockpile locations. Details of sloping direction, with irrigation and drainage modifications, would be made during final design and based upon the amount of soils being placed into the stockpile. The construction methodology and timing would be consistent with the descriptions above for the other options and would yield a maximum excavated soil volume of up to 2.5 mcy.

## 3.5 Post-construction Activities

Post-construction components would include the following and are discussed in detail below:

1. Long-term Operations and Maintenance Component.
2. Project Outcome Verification Monitoring Component.
3. Regional Science Support Component.

### 3.5.1 Long-term Operations and Maintenance Component

The Project would be designed to become a naturally, self-functioning system that would not require active management or intervention. Therefore, long-term operations and maintenance aspects of the Project would be comparatively minimal. Post-construction activities would fall into two categories and discussed as below:

1. Management of ancillary site conditions.

2. Corrective measures to address potential problems.

Unless otherwise stated, SFCWA or future designees or partners would be responsible for implementing the activities described below.

### *Management of Ancillary Site Conditions: Post-construction Activities*

The property surrounding the restored wetlands would remain in agricultural production. Some management of those activities would be needed after completion of the construction phase by either WWD (the property owner) and/or its leaseholders, as these facilities/ activities may influence conditions in the restored wetlands such as:

1. General management of agricultural activities outside of the restoration footprint,
2. Maintenance and management of cattle exclusionary devices (i.e., fencing and signage) around restored areas, and
3. Maintenance/replacement and management of water control structures that support ongoing agricultural activities on the remainder of the Project site and on adjacent properties.

### *Corrective Measures: Post-construction Activities*

Long-term, operations and maintenance would also include monitoring for, and taking appropriate action as necessary to address potential problems that could arise. The most likely potential long-term issues, monitoring parameters, and corrective measures are:

1. Controlling and minimizing biological vectors,
2. Discouraging invasive plant species, and
3. Remediating potential slumping of channel banks.

#### Controlling and Minimizing Biological Vectors

Biological vectors are insects or animals that can transmit a disease to humans or other animals and are typically a public health nuisance. Examples of biological vectors include mosquitoes, ticks, and rats. The Sacramento-Yolo Mosquito and Vector Control District (SYMVCD) is responsible for controlling such vectors in Yolo County. Under current conditions, the Project site supports extensive standing water from rainfall, Yolo Bypass flood events, and irrigation. As a result, SYMVCD regularly monitors the property and controls vectors, in particular mosquitoes, as needed.

In conjunction with SYMVCD efforts, BMPs and aspects of the Project would be employed to control and minimize biological vectors, especially mosquitoes, such as, but not limited to: habitat management (e.g., wetland design and vegetation management); biological controls (fish, birds, and bats); physical controls (traps); and appropriate chemical treatments (only as a last resort, in limited areas, and based on determinations on threats to public health). For example, if high levels of mosquito production would occur at the higher elevation marsh-upland transitions, with infrequent tidal inundation, regular treatment approaches would be implemented. However, if found ineffective, then other appropriate actions would be taken such as constructing shallow mosquito control ditches to connect with the constructed tidal channels. The rotary ditchers commonly used by vector control districts would be employed, and the ditches would be dug in a sinuous pattern to approximate natural tidal marsh channels. Such measures would effectively control mosquito production, but would also be balanced in their implementation to maintain and preserve the stated goals and objectives of the Project.

### Discouraging Invasive Plant Species

For restored tidal marshes, another problem is the colonization and establishment of invasive plants. These species rapidly produce substantial populations that overwhelm the ecological, chemical, and physical aspects of tidal channels, wetlands, and upland areas. In short, invasive plants could create a nuisance for target resource benefits, along with providing suitable habitat for biological vectors.

1. **Invasive aquatic plants in the tidal channels.** The proposed Project would be designed to avoid conditions that promote invasive aquatic plants colonization and establishment, such as *Egeria densa* (Brazillian waterweed), *Ludwigia peploides* (water primrose) *Eichhornia crassipes* (water hyacinth), and *Limnobium laevigatum* (South American spongeplant).

   For Brazillian waterweed and water primrose, the tidal channel geometry would be designed to promote high water velocities of up to 3 ft per second during peak spring ebb tides. High flow velocities have been identified as a key physical condition that discourages colonization and establishment of Brazilian waterweed (Department of Water and Resources 2008) and water primrose (California Invasive Plant Council 2009). Second, the substrate of the newly constructed tidal channels would be relatively high density mineral soils, based on field sampling. Substrate conditions have been identified as a second key physical condition influencing root establishment of Brazilian waterweed (Washington State Department of Ecology 2012).

   Monitoring would be more intensive in the first year following completion of the Project so as to detect and eradicate Brazilian waterweed and water primrose before they could become widespread. Monitoring for these invasive aquatic weeds would include field-based observations and aerial imagery analysis. Corrective measures suited to tidal channels could include herbicide treatment as the primary approach, rigorous manual removal, mechanical removal, and/or limited dredging efforts.

   Water hyacinth and South American spongeplant have not been observed within the Project vicinity. Since they are easily dispersed by currents and tidal actions, these floating plants, if they are at any time present in the Lower Yolo Bypass, may be flushed out during periodic, major flood events. If present, corrective actions would involve intensive removal by hand, mechanical removal, and limited use of herbicides.

2. **Invasive wetland and upland plants.** These types of invasive plant species, if present, would be a threat to the establishment of native plant species, especially around the upper

margins of the restored wetlands. Common nuisance species are *Centaurea solstitialis* (yellow star thistle) and *Lepidium latifolium* (broadleaf pepperweed).

The overall strategy to prevent invasive species encroachment would be to conduct periodic monitoring and implement specific management measures. Such measures could include limited cattle grazing in these areas as a vegetation management tool to remove noxious weeds. A livestock grazing program would enhance and maintain desirable habitat for native and protected species, based on specific characteristics of the vegetation community or habitat. Mid-summer grazing could also be used to control exotic grasses within the upland transition area.

Other mechanisms of control (physical removal, competitive exclusion plantings, salt application, and herbicide application) may be necessary if grazing is not effective; however, all suitable non-chemical means of control would be implemented before resorting to chemical control measures. Additionally, flood irrigation may be effective for control of both invasive species of concern. Though perennial pepperweed is tolerant of moist soils, it is less tolerant of saturated soil conditions. Targeted irrigation regimes could be used for control of both species. Another measure could also be the planting/seeding of native plant material using locally derived, genetic stock to promote desirable vegetation community development in upland buffer areas, as necessary.

#### Potential Slumping of Channel Banks

Slumping of tidal marsh channel banks or the deposition of sediments from flood flows may take place, and is a natural process. Slumping and flood deposition would only become a concern if sediments deposited into the channels would reduce flows enough to limit tidal exchange to areas upstream. The Project's restored tidal channels would have banks with varying side slopes of 1:1 to 2:1, depending on the results of engineering soils analyses (to be performed during final design). As all constructed tidal channels would be large enough to navigate with a small boat, inspections could be conducted visually and through aerial imagery. Additionally, tide stage monitoring (see Project Outcome Verification Monitoring below) would indicate changes in tidal exchange that could be caused by slumping.

One remedy for smaller blockages that could be employed to clear deposited (slumped) sediment from tidal channels would be the use of a floating mechanical device to aid in re-contouring the bank. However, to minimize the risk, detailed engineering designs would be prepared to avoid channel slumping to the maximum extent possible.

### 3.5.2 Project Outcome Verification Monitoring Component

Post-restoration monitoring activities could focus on the ecological outcomes of the Project and would include verifying compliance with the tidal restoration measures contained within the Reasonable and Prudent Alternatives of the USFWS (2008) Delta Smelt BiOp and referenced in the NMFS (2009) Salmonid BiOp. This Project component would be separate from any monitoring activities that may be required to ensure compliance with proposed CEQA mitigation measures described in Chapter 4 of this Draft EIR. The following two activities of monitoring would involve:

1. Monitoring Project performance relative to its goals and objectives, and
2. Determining whether to construct an additional tidal connection to restored wetlands.

At this time, there are no specifics available on when and how often monitoring data will be evaluated and reported, in terms of protocol, frequency, format, and cost. SFCWA is currently working with the Fishery Agency Strategy Team (FAST) for advice and guidance during Project development. A preliminary crediting prospectus by SFCWA has been presented to FAST for review and comment (refer to Section 1.4, Agency Approvals and Permits). One of the components of the habitat crediting prospectus would be to develop a Conservation, Restoration and Long-term Plan. This plan would provide more specifics on verification and corrective measures monitoring to ensure that the habitats created by the Project would be protected, managed, and maintained in perpetuity.

### *Monitoring Project Performance: Post-construction Activities*

Monitoring could measure the Project's outcomes relative to meeting its goals and objectives, and therefore, its achievement in partially fulfilling the BiOps. Specific monitoring activities and protocols could be developed during the permitting process, and incorporated into a monitoring plan for the Project.

These monitoring activities could focus upon physical, chemical, and biological factors that would influence the ecosystem functions at the restoration sites. Data on these factors and processes could provide the underlying basis to demonstrate that Project objectives were being met. If the objectives were not met, then these data could be available to diagnosis what the problems were and how best to address them.

Field parameters likely to be measured could include:

- Attributes of the restored marsh that support biological productivity and tidal marsh function, such as
  - Vegetation community composition and abundance,
  - Inundation regime,
  - Marsh plain and tidal channel geomorphology,
  - Water quality (e.g., dissolved oxygen, temperature, salinity, and turbidity);
- Biological productivity itself
  - Chlorophyll *a* in tidal channels,
  - Phytoplankton and zooplankton community composition
  - Abundance and productivity rates,

    - Terrestrial, benthic, and epibenthic invertebrate community (e.g., composition, abundance, and productivity rates); and

- Fish and wildlife use (e.g., community composition and abundance).

The resulting status and trends data could indicate the extent to which the proposed Project had met its objectives. As the marsh restoration would evolve over time, from immediate post-construction initial conditions toward a naturally functioning marsh, outcome monitoring could illustrate trends toward fulfillment of Project objectives.

Field-based monitoring activities that could be conducted include, but not be limited to:

- Continuous monitoring of tide stage with automated instrumentation installed in tidal channels and/or on the marsh plain;
- Continuous monitoring of water quality parameters (e.g., salinity, temperature, dissolved oxygen, turbidity, chlorophyll *a*) with automated instrumentation installed in tidal channels and/or on the marsh plain;
- Periodic measurement of flows in tidal channels;
- Periodic measurements of tidal channel geometry;
- Periodic measurements of sedimentation on the marsh plain;
- Periodic collection of aerial imagery and analysis of vegetation community composition and geomorphic features;
- Periodic collection of water samples from tidal channels with laboratory analyses for phytoplankton and zooplankton composition and abundance;
- Periodic sampling of tidal waters for fish species composition and abundance;
- Periodic measurement of plant species composition and abundance on the restored and enhanced marsh plain; and
- Periodic surveys for use of the restored wetlands by birds, reptiles and amphibians.

Data collection activities could involve the installation and periodic visiting of support structures for automated instrumentation, and site surveys by personnel on the restored marsh, in the restored tidal channels, and in surrounding waterways to measure, sample and observe water quality, topography, plants, fish, and wildlife. Sampling locations would be distributed throughout the restored marsh, according to the details of a scientifically-based sampling program linked closely to the Project's goals and objectives. Some sample stations may be located offsite as appropriate to provide necessary related information, to the extent that such data would not be available through other monitoring efforts.

Additionally, where non-SFCWA monitoring programs already exist in the area that could be useful in evaluating the Project outcome, SFCWA would consult and coordinate with the entities of those programs to enhance existing resources and information, thereby reducing duplication in efforts and costs.

### *Determining the Need for an Additional Tidal Connection*

The Project design would include an additional tidal connection as a post-construction activity, if deemed necessary. Such connection would convert portions of the terminal Network 1 channel system into a flow-through channel network, connected at both ends to the adjacent tidal sloughs. **Figure 3-1** shows the potential location of this activity onto the Stair Step, a short distance west of Liberty Cut.

Outcomes monitoring and assessment would provide information to determine whether to construct this additional connection. That assessment would consider productivity levels within the channels, the efficacy of tidal exchange, and characteristics of and access to in-channel and marsh habitats by fish and wildlife species.

The additional connection would involve approximately 1,000 ft of tidal channel within the Network 1 area (see **Figure 3-1**). To carry out this construction, soils would be excavated to create the tidal channel, followed by constructing the tidal connection. Excavated soils generated by construction of this additional tidal channel, (accounted for within the estimated amount of up to 2.5 mcy for the Project), would be transported to the toe berm and/or the stockpile reuse areas, graded, compacted, and stabilized as needed.

The methods for excavating and transporting these soils could include:

1. Operation of low-ground pressure equipment directly on the marsh plain, solely within the path of the additional section of tidal channel;
2. Placement of wood or steel plates atop the path of the additional section of tidal channel, and use of track and/or wheeled equipment; or
3. Use of a clamshell-style, small dredge to load excavated soils into tracked trucks that move loads across the marsh.

A nearby, temporary stockpile would likely be used for interim storage from where soils could be loaded onto wheeled trucks for transport to the end reuse location(s). The construction area for this additional restoration effort would be accessed via adjacent agricultural fields, and the same construction measures would be employed as those for the initial marsh restoration construction.

## 3.5.3 Regional Science Support Component

Achieving the ecosystem improvements that underlie the USFWS and NMFS BiOps and the proposed BDCP Conservation Measures has been the subject of many years of intensive examination, beginning with the CALFED Bay-Delta Program (CALFED) and continuing today through the Delta Stewardship Council’s Draft Delta Plan and DWR’s Draft BDCP.

Though much is now known about the nature of changes needed to improve ecological conditions in the Delta and about how actions to achieve those improvements may function, uncertainties remain. The Project design would include excavation of about 445 ac of low-lying lands, which are currently just above intertidal elevations, with three treatments of excavation elevation: MHW, MTL, and midway between those two heights. Under future individual and collaborative efforts, SFCWA and/or other entities may undertake assessments of these excavation treatments relative to their effects on ecological functions associated with the Project objectives. The specific design of the assessment approach would be determined prior to construction and would likely include such parameters as: plant community composition and relative abundances, invertebrate communities, productivity on the marsh plain and in the channels, direct use by a variety of fish and wildlife species, and geomorphic evolution. Most activities would be non-invasive (i.e., observations and measurements). For those activities that would not fall within the activities identified in this EIR but may be related to CALFED or other Delta programs, additional environmental review would be conducted by the appropriate CEQA lead agency.

# Chapter 4 Environmental Setting, Impacts, and Mitigation Measures

## 4.0 Overview

During the initial planning of the Project, the Notice of Preparation/Initial Study (NOP/IS) was circulated on March 1, 2011 (State and Federal Contractors Water Agency [SFCWA] 2011). The NOP/IS identified several environmental resource topics that would be discussed in the Draft Environmental Impact Report (Draft EIR) (refer to **Appendix A and Section 6.3**). Written comments submitted to SFCWA on the NOP/IS (see **Appendix B**) and oral testimony received during the public scoping meeting on March 15, 2011 (see **Section 7.2**), along with feedback from government representatives and the public, were factors considered by SFCWA in determining which environmental topics and issues would be evaluated in the Draft EIR.

With further refinements to the Project design concept, the Project was contemplated in two improvement phases: Phase 1 (Yolo Ranch minus Network 4 in the Northeast Field) and Phase 2 (Yolo Flyway Farms plus Network 4 in the Northeast Field of Yolo Ranch). However, prior to the release of the Draft EIR, it became apparent that acquisition of the Yolo Flyway Farms was not practicable at this time. Hence, only Phase 1 of the Project is being pursued at this time.

Nonetheless, because Phase 2 may be pursued in the future, this Draft EIR analyzes potential environmental impacts and identifies feasible mitigation measures for both phases of the Project. This approach ensures that all reasonably foreseeable impacts of the entire Project are analyzed, even though no current plans exist to acquire or develop the Yolo Flyway Farms property (see Section 1.1.4, Project Phasing, Components, and Activities).

Finally, in comments on the NOP, Yolo County opined that the Project is an experiment and that its biological effectiveness was speculative. The County suggested that SFCWA should look at other alternatives (refer to **Appendix B** for the County's letter). SFCWA is confident that the beneficial effects of the Project are not speculative, because a tremendous amount of scientific work has been done or is currently being implemented by a multitude of agencies and private entities over the past few decades supporting tidal wetland restoration efforts (e.g., CALFED). Modeling of this Project has been undertaken to ensure that the final design would complement attributes in nature and incorporate the historic aspects of the Project site (including elements of the historic lake on Yolo Ranch). Results from natural breaches at Liberty Island and other sites have also been factored in and regulatory agencies have supported and permitted mitigation banks (e.g., Liberty Island Conservation Bank). The size of the Project has also been decreased due to changes in design and modeling efforts. The Project is not an experiment but an activity that requires review under CEQA and applicable regulatory requirements. A range of reasonable and feasible CEQA alternatives to the proposed Project is discussed in Chapter 5, Alternatives.

This Draft EIR chapter presents the environmental analyses associated with Project impacts on:

1. Hydrology,
2. Water Quality,
3. Terrestrial Biological Resources,
4. Aquatic Biological Resources,
5. Agricultural Resources,
6. Air Quality and Greenhouse Gases,
7. Cultural Resources,
8. Hazards and Hazardous Materials,
9. Energy Consumption, and
10. Cumulative Impacts.

For each topic (except for cumulative impacts), the discussion is formatted as follows:

1. **Environmental Setting.** Baseline conditions for the physical environment and an overview of pertinent legislative and regulatory requirements.
2. **Thresholds of Significance Criteria.** Reliance on Appendix G of the *State CEQA Guidelines* with applicable factors taken into consideration in determining whether potential environmental impacts are significant. For the conversion of agricultural lands to tidal wetlands, an alternative Appendix G method is employed known as the California Land Evaluation and Site Assessment model. This methodology is further explained in Section 4.5.2 (Significance Criteria for Agricultural Resources) and in **Appendix D**.
3. **Impact Analysis.** Discussion and supporting information to determine significance of impacts found (ranging from no impact to significant impact) for each topic. For those impacts found to be (potentially) significant or significant, feasible mitigation is proposed to reduce the impacts to less than significant. No significant impacts were found to be unavoidable with mitigation.

   Each analysis utilizes a reasonably foreseeable future build out (i.e., both Phase 1 and Phase 2) especially with respect to grading and soils reuse options during construction. For Soils Reuse Option #3, which is a combination of using the toe berm and the onsite stockpile at the restricted-height levee as disposal sites, the analysis is qualitative as the final allocations would be determined during final design. Hence, the soils impacts for grading, excavating, and placement/storage are assessed as an over estimation when compared with actual impacts due to the final design configuration.
4. **Mitigation Measures.** Identification of proposed mitigation measures and ultimately decided upon by the SFCWA Board of Directors, for (potentially) significant impacts; and assessment of the level of significance after mitigation.

This chapter also analyzes cumulative impacts of the Project in conjunction with over 55,000 acres (ac) of reasonably foreseeable future wetlands restoration projects, along with other related projects, in the Delta and Suisun Marsh, as applicable. Where (potentially) significant cumulative impacts are identified, the Draft EIR proposes feasible mitigation measures. Cumulative impacts are addressed in Section 4.10.

## *Topics Not Required Per CEQA/Not Covered in the Draft EIR*

Several issues were brought up during the NOP/IS and public scoping meeting that are relevant to the agencies, organizations and individuals who voiced these concerns; however, such topics do not fall within the purview of CEQA. The information below underscores why these topics are not required by CEQA in the environmental evaluation of this proposed Project.

### Agricultural Economic Impacts

One general comment that was expressed by local and state agencies, along with entities associated with the farming industry, was that the EIR should address the economic impacts of the Project's conversion of agricultural land to restored wetlands. They also wanted the inclusion in the EIR a discussion of mitigation for economic impacts to local entities with Project implementation. As noted in Public Resources Code [PRC] § 21060.5, the "environment" means the *physical* conditions that exist within the area that will be affected by a proposed project, including land, air, water, minerals, flora, fauna, noise, or objects of historic or aesthetic significance. Furthermore, economic effects are not significant to the environment in conjunction with an environmental analysis (California Code of Regulations [CCR] § 15131). As a result, the Draft EIR does evaluate the agricultural conversion to wetlands from a physical standpoint (see Section 4.5, Agricultural Resources), but not from an economic perspective.

SFCWA does recognize the concern over the local agricultural economy voiced by the commenting entities during the NOP/IS process (see **Appendix B** for all comments received). As a result, SFCWA commissioned an agricultural economic study be conducted separately from the CEQA process (M.Cubed 2012; see **Appendix G** of the Draft EIR).

### Ongoing Agricultural Operations at the Project Site

Roughly 2,210 ac of the 3,795-ac site would remain in use for ongoing agricultural operations with Project implementation. The Yolo Ranch property is currently owned by Westlands Water District (WWD) who leases it out. Activities that currently take place at that site or are planned for in the future by WWD and its lessee are not part of the proposed Project. Likewise, Yolo Flyway Farms is privately owned and maintains it own agricultural operations.

The Project would be designed so that it would be self-sustaining and not be dependent on the existing/improved irrigation system required for farming practices and activities. Project elements affecting the current irrigation and drainage schemes onsite and adjacent properties are evaluated in sections 4.1 (Hydrology) and 4.2 (Water Quality). Otherwise, ongoing and future agricultural activities within the Project site are not analyzed in the Draft EIR.

## Crop Depredation Effects

Crop depredation involves the loss or damage of agricultural crops by wildlife species. This economic impact is a serious concern for many farmers and ranchers throughout the United States. Conducted in 2002 by M. R. Conover, a study estimated that the economic losses attributed to crop depredation and applicable management strategies to combat this problem in the United States totals more than $4.5 billion annually (Humberg *et al.* 2007). Certain birds can cause extensive damage in California including geese; yellow-headed, red-winged, rusty and brewers blackbirds; cowbirds; grackles; crows; magpies; ravens; starlings; horned larks; golden-crowned, white-crowned and other crowned sparrows; and house finches. Mammals such as deer, gophers, and raccoons likewise can cause crop depredation.

Yolo County has identified crop depredation as a potential environmental impact based on increases of waterfowl and other wildlife that would be attracted to the restored habitat areas on the Project site. However, it is important to note that crop depredation does not lead to conversion of agricultural land to other uses as identified in Appendix G of the *State CEQA Guidelines* and which is relied on by SFCWA as a threshold of significance to determine physical changes to the environment. Physical changes relating to agricultural resources are addressed and can be found in Section 4.5, Agricultural Resources. Crop depredation, on the other hand, can be a substantial economic effect to agricultural producers. As noted previously, an economic impact is not treated as a significant impact per the CEQA statute (CCR § 15131).

Additionally, the habitat communities targeted for restoration are primarily aquatic, which would not attract a substantial number of birds and other animals that tend to forage on agricultural lands (e.g, sandhill crane or migratory geese). After Project implementation, remaining agricultural land onsite would still be utilized for agricultural purposes. Presumably, though, the managers of both Yolo Ranch and Yolo Flyway Farms would continue to employ techniques currently in use to dissuade depredators from damaging agricultural crops, as would adjacent property owners.

Finally, local, state, and federal regulations exist to aid farmers and ranchers in management strategies (e.g., hazing, habitat modification on farm lands, and lethal control) and to provide permits to control depredation (Wildlife Services 2009; 50 Code of Federal Regulations [CFR] 21.44 [depredation order]; 50 CFR 21.50 [control of resident Canada geese nests and eggs]). Sensitive species are still protected by existing federal and state endangered species laws.

With respect to depredation control, the California Fish and Game Commission's policy states: "All wildlife species shall be maintained in harmony with available habitat whenever possible. In the event that some birds or mammals may cause injury or damage to private property, depredation control methods directed toward offending animals may be implemented"(California Department of Fish and Game [CDFG] 2012). Guidance and assistance relating to crop depredation matters are provided by the U.S. Fish and Wildlife Service, Yolo County Agricultural Department, and California Department of Fish and Wildlife (formerly known as CDFG). Hence, this topic is not evaluated further in the Draft EIR.

# 4.1 Hydrology

## 4.1.1 Setting

The Project site lies at the hydrological intersection of the Putah Creek fan, historic Yolo Basin floodway and North Delta tidal marshes An overview of the geomorphology and hydrology at the regional level (i.e., Yolo Bypass and Cache Slough Complex) provides the context to understand the Project site's hydrologic conditions, i.e., local tidal conditions, irrigation and flood conditions, irrigation and drainage infrastructure, and the hydrologic connections to adjacent properties immediately to the north. This information is based on field investigations, discussions with knowledgeable individuals, hydrodynamic modeling, and computational analyses:

- Tidal datum reckoning report (Wetlands and Water Resources and cbec 2011).
- Regional tidal mixing hydrodynamic modeling (Solano County Water Agency 2010).
- Flood conveyance modeling (cbec 2011a).
- Discussions with Project site ranch managers and operators.
- Discussions with landowners of adjacent properties.
- Topographic surveys including Department of Water Resources (DWR) Light Detection and Ranging (LiDAR) mapping of the Sacramento-San Joaquin River Delta (Delta) (DWR 2007) and field-based supplements to that data.
- Soils investigation (Kelley & Associates Environmental Sciences, Inc. 2011).

### *Regional Geomorphology*

#### Yolo Bypass

The Project site is located within the Yolo Bypass, a 59,000-acre (ac) flood bypass component of the Sacramento River Flood Control Project established in the early 20th century. It is situated in the Sacramento Valley in Yolo and Solano counties, protecting the city of Sacramento and other riverside communities from inundation of flood waters. This flood protection component relies on a system of weirs that allow flood flows to be routed into the Yolo Bypass, relieving capacity constraints on the Sacramento River.

This flood control program also includes the east and west Yolo Bypass levees (for their locations, see **Figure 2-4**). Construction of the Sacramento River Deep Water Ship Channel (SRDWSC) in the 1960s relocated the east Yolo Bypass levee to a location further west. Today, the Yolo Bypass levees are at approximately +30 feet (ft) elevation. Lands within the lower Yolo Bypass gently slope to the north and west.

In the Yolo Bypass, a number of restricted-height levees overtop during extreme flood flows. Examples of these restricted-height levees include those along the northern edges of Liberty

Island and Little Holland Tract (commonly known as the Stair Step Levee), around Little Egbert Tract, and around Prospect Island.

On the east side of the Yolo Bypass is a channel known as the Toe Drain south of Interstate 80 and the Tule Canal north of Interstate 80. Tides propagate upstream in the Toe Drain to the Lisbon Weir, located about eight miles north of the Project site. The Lisbon Weir is an agricultural water supply structure that allows tidal surcharging of the Toe Drain to the north and limits ebb tide drainage. Many lands within the Yolo Bypass draw their water supply from the Toe Drain, either for agricultural uses or for habitat within the Yolo Bypass Wildlife Area. Major tributaries into the Yolo Bypass from the west side include Putah Creek, Willow Slough, Cache Creek, and Knights Landing (**Figure 4.1-1**). These drainages also provide summer irrigation water to agricultural lands of the Bypass as well as contributing to winter storm flows.

Nearby former tidal wetland areas such as Liberty Island, Little Holland Tract, Prospect Island, Hastings Tract, and Egbert Tract have subsided to varying degrees, but generally no more than five ft below low tide. With the exception of Liberty Island and Little Holland Tract, the nearby islands are surrounded by extensive levee networks that prevent tidal inundation.

A wetland mitigation bank was recently constructed on the Kerry Parcel at the north end of Liberty Island, which borders the Stair Step Levee (see **Figure 2-5**). The levee along the boundary of this parcel was lowered to facilitate restoration.

### Cache Slough Complex

Surrounding the Project vicinity to the south and southwest is the Cache Slough Complex, a region of lands also at the edge of, and in the northwest portion of the Sacramento-San Joaquin River Delta (Delta) (see **Figure 2-2**). The Delta is a vast area of approximately 350,000 ac of former tidal marshlands that have been diked, drained, and put into agricultural use, beginning in the 1850s. Because of high peat content (i.e., highly, organic soils), these lands have subsided as much as 25 ft below sea level.

Diked lands within the Cache Slough Complex have also subsided in the range of up to five to ten ft below low tide (see **Figure 5-1**). A network of major tidal sloughs winds through the complex, many retaining their natural geometry, though bordered today by levees rather than tidal marsh. These tidal sloughs connect to small upland drainages of the Jepson Prairie area.

## *Local Geomorphology*

The Project site is located in a gently sloping area once part of the natural Yolo Basin. Land elevations range from roughly +5 to +15 ft North American Vertical Datum of 1988 (NAVD88), and gradually upward to the north and west (see **Figure 2-6**). The Project site has experienced relatively little subsidence due to its location along the historic terrestrial-estuarine gradient, where soils are predominantly mineral. One restricted-height levee is found within the Project site that overtops during extreme flood flow events. It is located in the northwest corner of the Project site and encloses the ranch compound area. The onsite restricted-height levee is at about +20 ft elevation (see **Figure 2-5**).

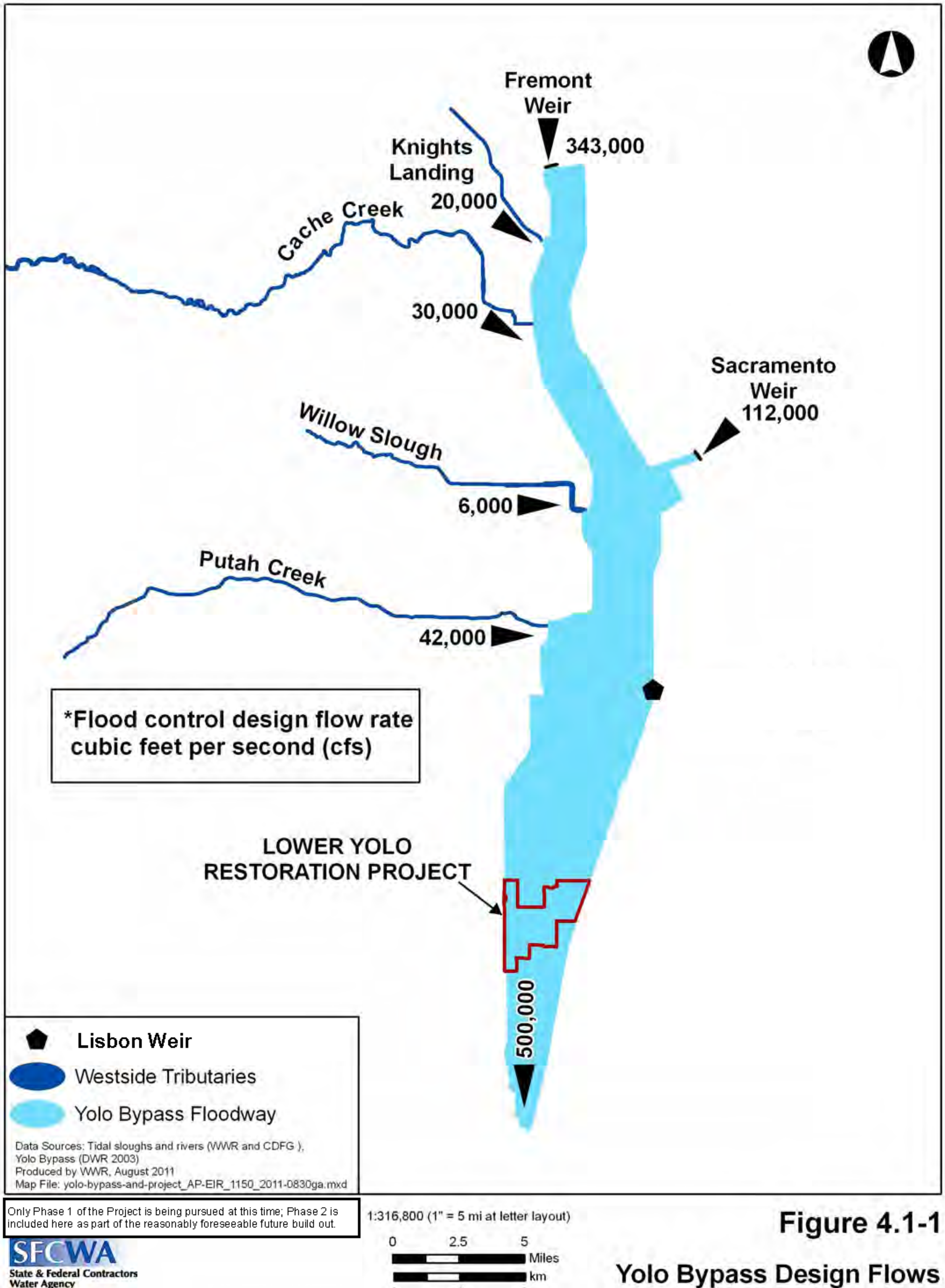



**Figure 4.1-1**

**Yolo Bypass Design Flows and Project Site**

The Project site is also surrounded by the Yolo Bypass flood control levees on the east and west. To the east of the Project site is the SRDWSC, then the Clarksburg Agricultural District, which has similar elevations to the lower Yolo Bypass and nearby lands at the edge of the Delta. Still further to the east is the Sacramento River (see **Figures 2-1 and 2-2**). To the southeast is the Delta. To the west of the Project site are agricultural lands in the Vacaville and Dixon areas. The west Yolo Bypass levee protects these lands from flooding.

The southern boundary of the Project site is the Stair Step Slough, a linear feature built in the early 20th century that "steps" north and then east several times. To the south of the Stair Step are Liberty Island and Little Holland Tract, both former agricultural lands subject to tidal flooding. Levee breaches happened on Little Holland Tract following the flooding in 1983 and on Liberty Island after the El Niño floods of 1998. Since these dates, both islands have remained tidally inundated. Time has further degraded what was left of the existing levees, leading to the development of additional breaches, especially along Liberty Island's eastern side. Today, Liberty Island and Little Holland Tract consist of extensive areas of shallow, open water of variable depths, a broad band of emergent marsh at the higher elevations, a small patch of upland (south of the western Stair Step), the Liberty Island Conservation Bank and Preserve (south of the eastern Stair Step), and remnant perimeter levees.

## *Hydrology*

### Sea Level Rise

Global sea level rise results from global warming through the expansion of seawater as the oceans warm and land ice melts. Local sea level rise is affected by global sea level rise plus tectonic land movements and subsidence, which can be of the same order of magnitude as or larger than global sea level rise. Atmospheric pressure, ocean currents and local ocean temperatures also affect near-term sea level heights.

The rate of global sea level rise is expected to continue along a global-warming-induced trajectory. The International Panel on Climate Change (IPCC) estimated rates of sea level rise during the 20th century to average 1.7 millimeters (mm) per year. Since 1993, sea level has been rising at approximately 3 mm per year, and this rate is expected to increase to 4 mm per year by the end of the 21st century (IPCC 2007). Although uncertainty exists regarding these rates, ongoing research regarding the primary factors affecting global sea level rise continues to narrow the uncertainties and refine future estimates.

The IPCC estimates of sea level rise have been analyzed by California scientists to estimate how global climate change and sea level rise might impact local sea level elevations throughout the San Francisco Estuary. For the purpose of the Draft Environmental Impact Report (EIR), the projected local sea level rise from the San Francisco Bay Conservation and Development Commission (BCDC) of 16 to 55 inches by 2100 (San Francisco BCDC 2011) are used, as recommended by the CALFED Bay-Delta (CALFED) Science Program (Mount 2007).

Given the location of the Project site at the Delta margin, sea level rise may result in the inundation of additional areas of the site. However, it is presumed that (1) due to local hydrology and topography, an annual average one inch rise would not necessarily equate to a one inch rise throughout the property, i.e., with a buffering effect occurring to some degree that the rise would be slower; and (2) the modifications of water control structures such as levees and berms onsite would involve further raising and strengthening by the property owner (Westlands Water District) so that the sea level rise would not constrain summertime agricultural operations nor impact the economic viability of the agricultural operations.

## Regional Hydrology

### Sacramento – San Joaquin Delta

The Delta is formed at the western periphery of the Central Valley, by the confluence of the Sacramento and San Joaquin rivers, and lies just east of where the rivers enter Suisun Bay. Operating within a dynamic, complex environment, the Delta is a network or maze of branching, interconnected channels and diked islands covering roughly 1,150 square miles, including 78 square miles of water area that are strongly influenced by the tides (Central Valley Regional Water Quality Control Board [CVRWQCB] 2009). The Delta receives runoff from about 40 percent of the land area of California, and about 50 percent of California's total stream flow (U.S. Geological Survey [USGS] 1999).

Flows through the Delta vary greatly between seasons and from year to year. In a typical year, the Delta receives about 28 million acre-feet (maf) of inflow from the watershed, with 75 percent coming from the Sacramento River, 15 percent from the San Joaquin River, and the rest from precipitation and the small eastern tributaries. During periods of low surface water inflow, high tide events reverse the flow in some Delta channels. Dams in the upper watershed capture water and reduce flows during winter months and release water in summer months, increasing flows.

A primary objective of the flow management regime is to reduce salinity intrusions from the Bay into the Delta by forcing the salt water out with freshwater flows (USGS 1999), all for maintaining low salinity levels for agricultural and municipal water supply purposes. Another primary objective of the flow management regime is to manage flooding within the Central Valley, particularly within the Sacramento Valley. The Yolo Bypass is a critical piece of this flood management system, and is discussed below.

Water withdrawals from the Delta occur throughout the region from local agricultural diversions and at a small number of locations for export to other geographic regions of the State. The State Water Project exports water at the Banks Pumping Plant in the south Delta and the Barker Slough Pumping Plant (BSPP) in the Cache Slough Complex in the northwest Delta. The Central Valley Project exports water at the Tracy Pumping Plant in the south Delta. Contra Costa Water District exports water at the Contra Costa Canal, Old River, and Middle River all in the southwest Delta. A handful of seasonally operated hydraulic flow structures are operated to manage Delta waters: the Delta Cross Channel (an operable gate) and four south Delta barriers (DWR 2008). These withdrawals and seasonally operated gates and barriers exert an important influence on the hydrology and hydraulics of the Delta.

## Yolo Bypass

A generalized overview of the Yolo Bypass floodplain hydrology is shown in **Figure 4.1-1**. The Bypass is 41 miles long and is bounded on the east and partially on the west by levees built by the U.S. Army Corps of Engineers (USACE) (Yolo Basin Foundation 2001). It was designed to prevent flooding of the City of Sacramento and other nearby cities and farmland by diverting up to 455,000 cubic feet per second (cfs) of floodwaters through the Fremont and Sacramento weirs, along with capturing and sending south flows from tributaries along the west side of the Bypass (California Department of Fish and Game [CDFG] 2008). The levees are designed to accommodate the calculated water surface of the design flow plus buffer for freeboard.

The extent and depth of flooding within the Bypass are influenced by the total amount of water flowing into the Bypass from the Fremont and Sacramento weirs and the west-side tributaries, along with the local topography. During the period between 1935 and 1999, inundation of the Yolo Bypass occurred in about 71 percent of the years (CDFG 2008). Outside flood events, the regional hydrology is influenced by local factors, including the Cache-Liberty-Little Holland tidal system to the south and agricultural irrigation activities. Diversion of the majority of the Sacramento River, Sutter Bypass, and Feather River high flows to the Yolo Bypass via Fremont Weir controls Sacramento River flood stages at Verona, downstream of Fremont Weir. In turn, the Fremont Weir spills when Sacramento River flows exceed about 56,000 cfs at Verona, or a river stage of 33 ft NAVD88. During large flood events, 80 percent of the Sacramento River flows are diverted into the Yolo Bypass (CDFG 2008).

Smaller flows in the Bypass generally move to the eastern side of it into Tule Canal and south into the Toe Drain. As inflows continue to rise, the Tule Canal/Toe Drain banks are overtopped, flooding the Bypass as designed. Within the northern extents of the Tule Canal, flows start to inundate the Bypass just above 1,000 cfs. In the southern reach of the Toe Drain, near the Lisbon Weir, flows start to inundate the Yolo Bypass between 3,000 to 4,000 cfs and are influenced by tidal action (see discussion of the Cache-Liberty Complex, below) (CDFG 2008). Tidal charging from the southern terminus of the Bypass and across the Lisbon Weir helps to maintain water levels in the Toe Drain high enough to allow irrigation diversions during the dry summer months. The Lisbon Weir is an inline riprap structure with three flap gates. These gates are regularly overtopped on high tides, with surplus water draining back to the Toe Drain on the ebb tide. This tidal surcharging is essential to many agricultural operations in the lower Yolo Bypass.

Early and late season inundation on the Yolo Bypass is rare. The Yolo Bypass has experienced inundation after May 10$^{th}$ in only six years between 1935 and 2010; three of these years were in the 1990s and another two were in the early 2000s (CDFG 2008). Therefore, during the period of record, the Yolo Bypass has been inundated after May 10$^{th}$ five times in the last 20 years – a sharp contrast to the single occurrence of late-season inundation during the previous 55 years. This trend would suggest that hydrology influencing the Yolo Bypass since the 1990s has changed, either as a result of climate change, changes in reservoir operations and other upstream water management efforts on the west-side tributaries and the Sacramento River and its tributaries, or a combination of both. Inundation of the Yolo Bypass during early fall is extremely rare in the period of record, having only occurred once, in October 1962.

The Fremont and Lisbon weirs have experienced inundation flows in approximately two-thirds of the years from 1934 to 2010. Available data demonstrate the role of local watershed inflows in generating floodplain inundation, presumably at drier times when Sacramento River flows are not sufficient to crest the Fremont Weir (CDFG 2008). These flood frequency data demonstrate the importance of total storm runoff in the Sacramento watershed to floodplain inundation. The year 2006 was a wet one, resulting in over 100 days of inundation at the Lisbon Weir; all other years since 2000 have resulted in less than 50 days of inundation.

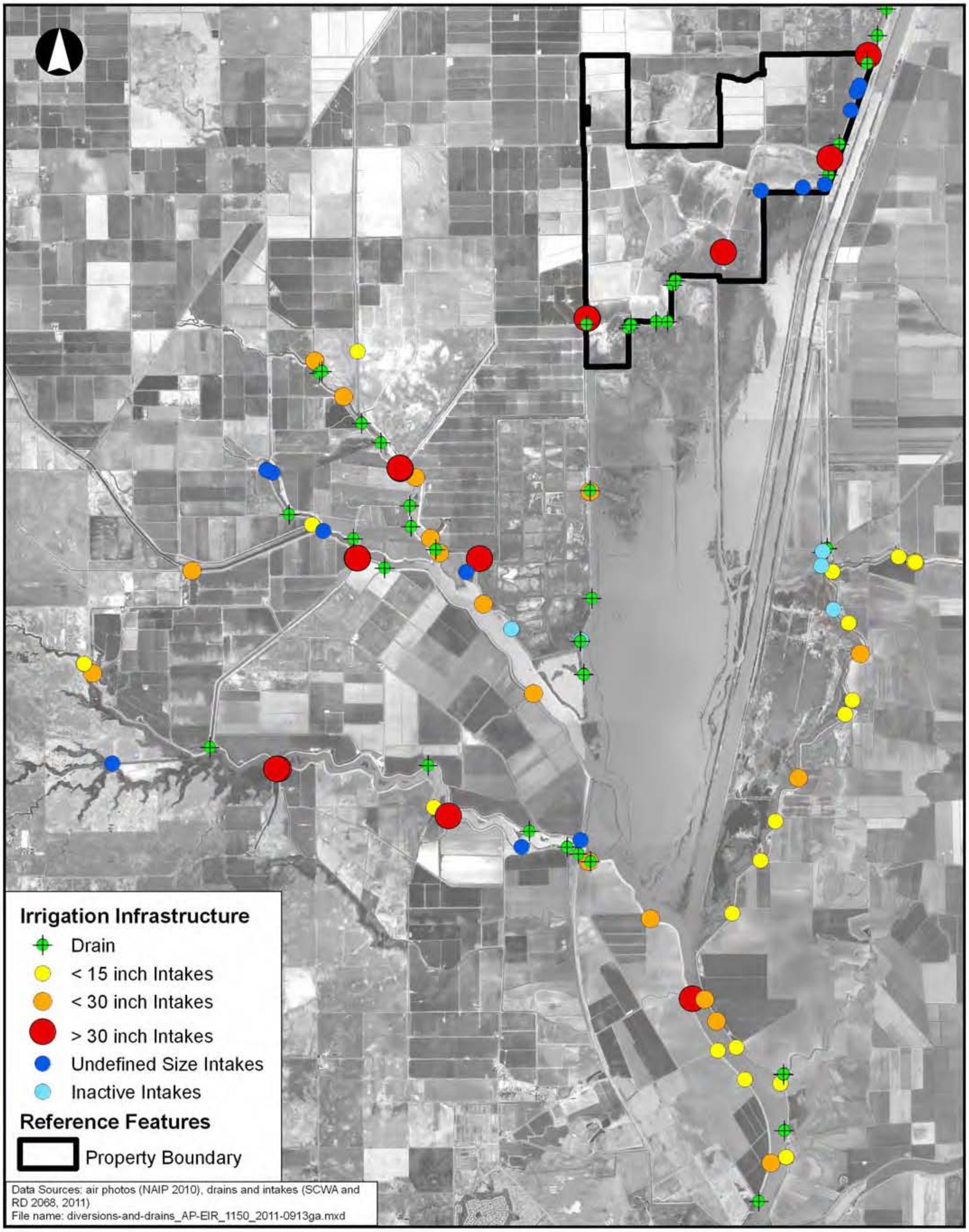
Besides the weirs, a wide array of small interior levees and berms, constructed for local agricultural practices, control localized inundation throughout the Yolo Bypass during low flows. In addition, other constructed features, such as causeways and bridge crossings along Interstate 80, Interstate 5, portions of the abandoned Sacramento Northern Railroad, and the Southern Pacific Railroad also affect floodplain inundation over a range of flows.

### Cache Slough Complex and Cache-Liberty Tidal Complex

South of the Project site is a fully tidal complex of natural and man-made tidal slough cuts and flooded (formerly diked) islands, which connect with Cache Slough (see **Figure 2-2**).This area is collectively referred to as the Cache-Liberty Tidal Complex.

Hydrologic components that most influence the Cache-Liberty Tidal Complex are the tidal regime, flood hydrology of the Sacramento River and the Yolo Bypass, regional drainage system, precipitation, exports from BSPP and Hass Slough Pumping Plant, and local agricultural diversions including the Lisbon Weir (**Figure 4.1-2**):

1. **Tidal regime.** Tidal prisms have been substantially reduced as a result of the conversion of marsh plain to agriculture, and construction of levees, irrigation diversions, and agriculture return drains. Infrastructure and landscape modifications have resulted in net upstream tidal flows outside the winter and spring runoff period. Construction of this infrastructure has also affected flood conveyance and runoff patterns and volumes, but more substantial has been the modification of Sacramento River flows and flood stages as a result of regulation by upstream dams and the construction of the Yolo Bypass.
2. **Flooding.** Comprising the southernmost extent of the Yolo Bypass, Liberty Island and Little Holland tract are flooded (formerly diked) islands immediately south of the Project site across the Stair Step. Both islands flooded historically from winter Yolo Bypass flows with occasional damage to levees that rendered them temporarily flooded by tidal flows from Cache Slough and neighboring waterways. One of the key attributes of the Cache-Liberty Tidal Complex is that during non-flood periods, the region experiences net upstream flow, as more water enters the region from tides and Sacramento River flow than leaves with the outgoing tides (Jon Burau, personal communication, 2009). Net upstream flows can result in increased aquatic productivity by providing longer residence times. In particular, tidal circulation is influenced by diversions, along and at the end of terminal sloughs. The nature of tidal circulation and mixing of certain chemical/physical constituents and water quality considerations are discussed in Section 4.2, Water Quality.




Only Phase 1 of the Project and not Phase 2 is being pursued at this time; however, Phase 2 is included here as part of the reasonably foreseeable future build out.

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0 1.25 2.5 km

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**Figure 4.1-2**

**Regional Diversions and Drains**

3. **Drainage.** Drains operate by gravity on lands at elevations above that of the Cache Slough tides and via pumps from subsided lands. One of the largest is the Reclamation District (RD) 2068 drain at the north end of Shag Slough very near the Project site. This drain pumps agricultural return water into Shag Slough immediately south of the tide gates that supply irrigation water to the west side of the Project site.

4. **Precipitation.** Late fall and winter in this region tend to be cool and damp, when atmospheric inversions result in frequent ground fog known regionally as tule fog occurs after the first significant rainfall. Average annual rainfall is 20 inches, primarily from November through March.

5. **Exports.** Several large pump intakes (over 30 inches in diameter) exist in this complex, including three intakes on Hass Slough, two intakes on Cache Slough, one on Lindsey Slough, and the largest being on the north shore of Barker Slough, about one half-mile east of State Highway 113.

   The BSPP, a component of the SWP that supplies the North Bay Aqueduct (NBA), is located about 11.5 miles to the southwest of the Project site. Diversions from the Delta at Barker Slough for delivery to the NBA range on a monthly average basis from 10 cfs in the winter to 120 cfs during the summer, with the maximum diversion rate at this location being approximately 140 cfs (DWR 2009). Water deliveries of up to 47,756 acre-feet (ac-ft) per year occur through the NBA through an agreement with DWR and Solano County Water Agency.

   The Hass Slough Pumping Plant, a local agricultural diversion operated by RD 2068, is located about ten miles to the west of the Project site (see **Figure 2-2**).

6. **Agricultural diversions.** In addition to the large diversions and intakes identified above, the Lisbon Weir effectively behaves as a diversion. This is due to tidal pumping through the flap gates in the weir structure, whereby water can be stored behind the weir to meet local irrigation demand. Tidal pumping can result in a negative discharge or net flow up the Toe Drain (cbec 2011b). This net flow up the Toe Drain occurs predominately in dry and critically dry years, begins in mid-May, and can extend through October.

## Local Hydrology

### Surface Flooding

The Project site is located within the confluence of the Yolo Bypass and Cache Slough Complex. This location is within the 100-year flood plain. Flood potentials are derived from the Flood Insurance Rate Map prepared by the Federal Emergency Management Agency (FEMA). The term “100-year flood” may be misleading. It is not the flood that will occur once every 100 years; rather, it is the flood elevation that has a one percent chance of being equaled or exceeded each year. The 100-year flood could occur more than once in a relatively short period of time with devastating consequences.

The site's hydrology is complex, driven by different influences at varying times of the year. The proposed Project site is subject to periodic winter and spring (roughly November through May) flooding, more in wetter years and less in dryer years. The extent of previous flooding at the Project site has not been monitored. However, by comparing elevation data at the Project site (from DWR 2007: LiDAR topographic data) with historic aerial photographs (1974 and 1982), high-water marks (1986 and 1997), and gage data (2010) of five known flooding events to their corresponding elevations at Lisbon Weir, the average depth of inundation at the site to the duration of inundation at the Lisbon Weir (based on DWR records), flooding onsite can be estimated. A small flood pulse that inundated the Project site in January 2010, with a corresponding flood elevation of +12.7 ft NAVD88 at Lisbon Weir, is the point at which the site began to experience backwater flooding through low points in field berms.

More recently, the Project site flooded in late March and early April 2011, completely inundating the entire Project site, with the exception of areas within the restricted-height levee on Yolo Ranch, when water levels at Lisbon Weir were at about +19 ft NAVD88. Accordingly, this would roughly correspond to a flood elevation of about +15 ft NAVD88 on the Project site.

### Tidal Regime

The San Francisco Bay Estuary (including the Delta) is a mixed-semidiurnal tidal system, i.e., two high tides and two low tides of unequal magnitude each day. This tidal exchange is a critical determinant of water surface levels, direction, and volume of flow and exerts a major influence on the biological, chemical, and physical conditions at the Project site.

The term "tidal datums" are the elevations of the tides relative to a geodetic (earth surface) datum and are among the most fundamental drivers of marsh ecology. Tides decrease in amplitude and mean sea level increases from the Golden Gate into the Delta (DWR 2004). The relationship between tidal datums and topography of a site proposed for tidal restoration determine to a large extent the design of most of the restoration features such as marsh plain elevations, tidal channels, and vegetation.

To assess the local tidal regime, tidal levels were measured at eight locations in Shag Slough, Stair Step, Liberty Island, Liberty Cut, Prospect Slough, and the Toe Drain. From these measured stage data, local tidal datums for the Project area were calculated (Wetlands and Water Resources and cbec 2011) following methods established by the National Ocean Service (NOS) (National Oceanic and Atmospheric Administration [NOAA] 2003).

**Table 4.1-1** presents the results of this analysis: the tidal datums used for designing the proposed Project. It is important to note that all tidal datums for the Delta that are calculated using the NOAA methods contain a higher degree of uncertainty than those calculated for the lower San Francisco Estuary, as no NOS continuous-recording reference stations exist upstream of Port Chicago in south-central Suisun Bay. As a consequence, all tidal datum calculations do not reflect river flows very effectively. DWR is developing Delta-wide tidal datum estimates based upon over 50 DWR tide gauges throughout the Delta, integrated with two-dimensional numeric hydrodynamic modeling. The Project's final design would include review of all applicable tidal datums and methodologies.

**Table 4.1-1. Tidal Datums at the Liberty Cut/Stair Step Junction**

| Tidal Datums | | Elevation (feet NAVD88)[1, 2] |
|---|---|---|
| **Mean Higher High Water** | MHHW | 6.4 |
| **Mean High Water** | MHW | 6.0 |
| **Mean Tide Level** | MTL | 4.3 |
| **Mean Low Water** | MLW | 2.7 |
| **Mean Lower Low Water** | MLLW | 2.0 |

[1] Tidal datum results have an estimated uncertainty of 0.1-foot based on the National Ocean Service methodology.
[2] NAVD88 = North American Vertical Datum of 1988
Source: Wetlands and Water Resources and cbec Ecological Engineering 2011

## Tidally Influenced Portions of the Project Site

Much of the Project site experienced regular tidal inundation, due to the historic terrestrial-wetland gradient onsite. Reclamation of lands changed the way that tides access the site, as the construction of levees, ditches, tide gates, and other water control structures eliminated tidal influence over most of the property. Under current conditions, tides are found on the site perimeter in the constructed tidal waterways of Shag Slough, Stair Step, and Toe Drain.

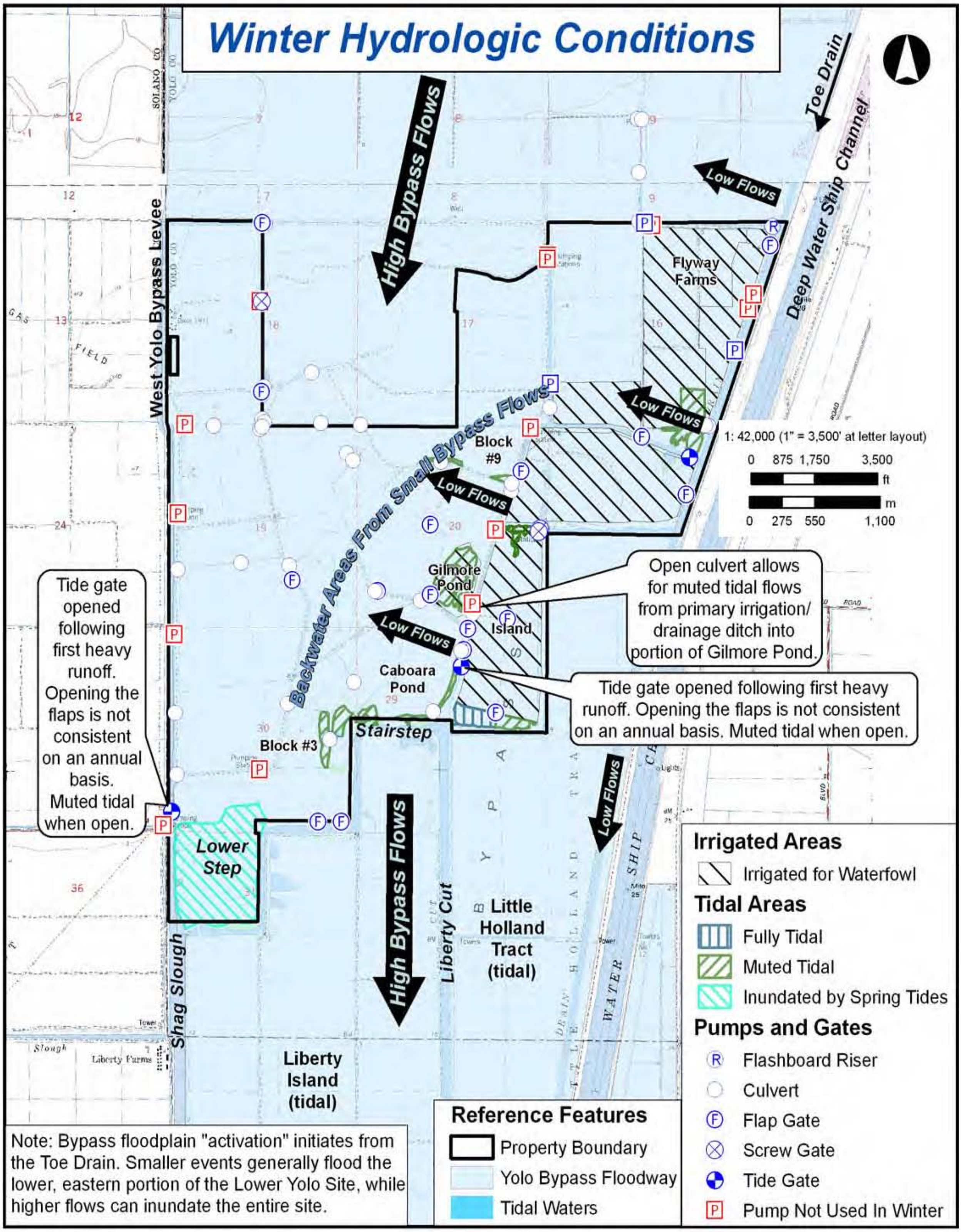
Five locations on the Project site are currently subject to full or muted tidal conditions. The Lower Step (refer to **Figure 2-5** for its location) has ground surface elevations in the range of +6.5 to +7.5 ft NAVD88, lacks water control structures, and thus is inundated by the highest spring tides typically occurring around the winter (**Figure 4.1-3a**) and summer solstices (**Figure 4.1-3b**). At the southern end of the Island, just east of the junction of Liberty Cut with the Stair Step, is a small area of tidal marsh. To its immediate east is a small area subject to muted tides. Muted tidal action also takes place in a portion of the Island area north of Liberty Cut and within a small area a short distance to the west.

## Tidally Surcharged Irrigation Ditches

Three irrigation ditches receive irrigation water from four agricultural drainage points at the Project's perimeter. These ditches are surcharged tidally via one-way tide gates: on the west is the levee borrow ditch, created from constructing the west Yolo Bypass levee; in the middle portion of the site is the central irrigation ditch, connecting to the Stair Step at Liberty Cut, ultimately connecting to the Toe Drain; and at the northeast end is an irrigation ditch, running along the north side of Yolo Flyway Farms and connecting to the Toe Drain (see **Figure 2-5**).

## Limited Winter-Time Muted Tidal Influence to Portions of Project Site

During variable time periods in winter, the flap gates and flashboards on the main irrigation ditches are opened to allow storm-water drainage by enabling incoming (high) tides to move upstream into the main irrigation ditches. With high tides, when the control structures are open and no storm-water flows are draining off the landscape, tidal water can back up into the network of irrigation/drainage ditches onsite.




Only Phase 1 of the Project and not Phase 2 is being pursued at this time; however Phase 2 is included here as part of the reasonably foreseeable future build out.

Data Sources: base DRG (USGS), infrastructure data (CBEC 2010), tidal data (CBEC 2010, WWR 2011)
Map File: site-hydrology_BL-EIR_1150_2011-1102mdl.mxd

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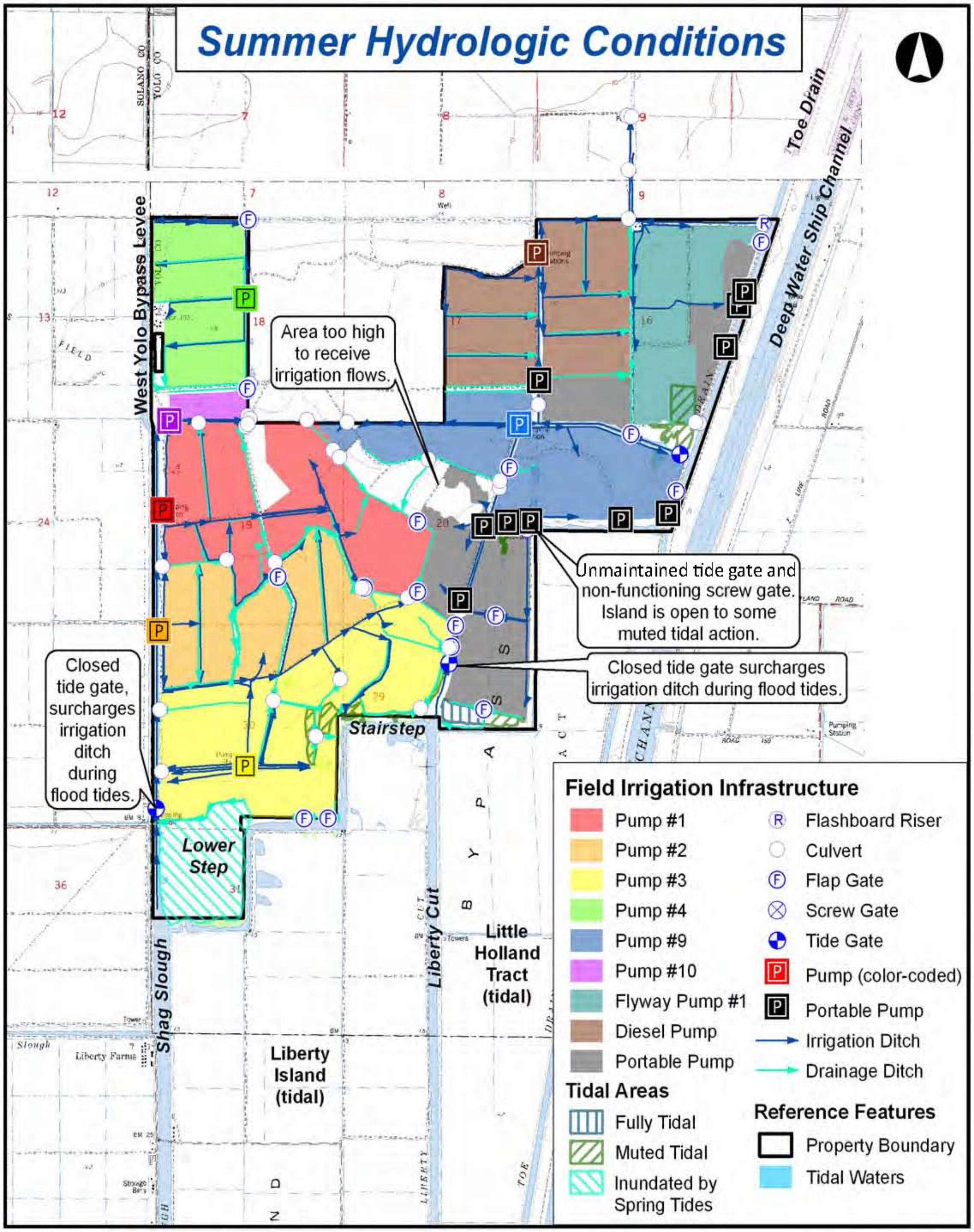
**Figure 4.1-3a**

**Existing Winter Hydrology at Project Site**




Only Phase 1 of the Project and not Phase 2 is being pursued at this time; however Phase 2 is included here as part of the reasonably foreseeable future build out.

1: 42,000 (1" = 3,500' at letter layout)

0 875 1,750 3,500 ft

0 275 550 1,100 m

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**Figure 4.1-3b**

**Existing Summer Hydrology at Project Site**

Under these conditions, a limited amount of tidal inundation can occur in three specific locations on the Project site that are connected via open culverts to the main irrigation ditch between the Toe Drain and Liberty Cut:

1. Fields within Gilmore Pond.
2. Southern end of Yolo Flyway Farms.
3. Small portions of Block #9.

Tides in these areas are muted due to the limited flow capacity of the culverts (see **Figure 4.1-3**).

### Onsite Irrigation and Drainage

Approximately 3,100 ac of the Project site are currently irrigated with 15,500 ac-ft of irrigation water, from April to October of each year, depending on weather conditions. During irrigation operations, it is estimated that Yolo Ranch and Yolo Flyway Farms irrigate their pastures with an average of 4.4 ac-ft per acre and 9.9 ac-ft per acre, respectively, based on existing water rights and crops being harvested.

The Project site is predominantly used for cattle grazing, though some areas are also utilized for hay production (see **Figure 2-7**). Cattle operations include rotational grazing between irrigated fields onsite. Grazing these fields typically runs from June 1st through the second week of October. Cattle are moved off the Project site in late October, in anticipation of the Yolo Bypass floodwaters during the winter months.

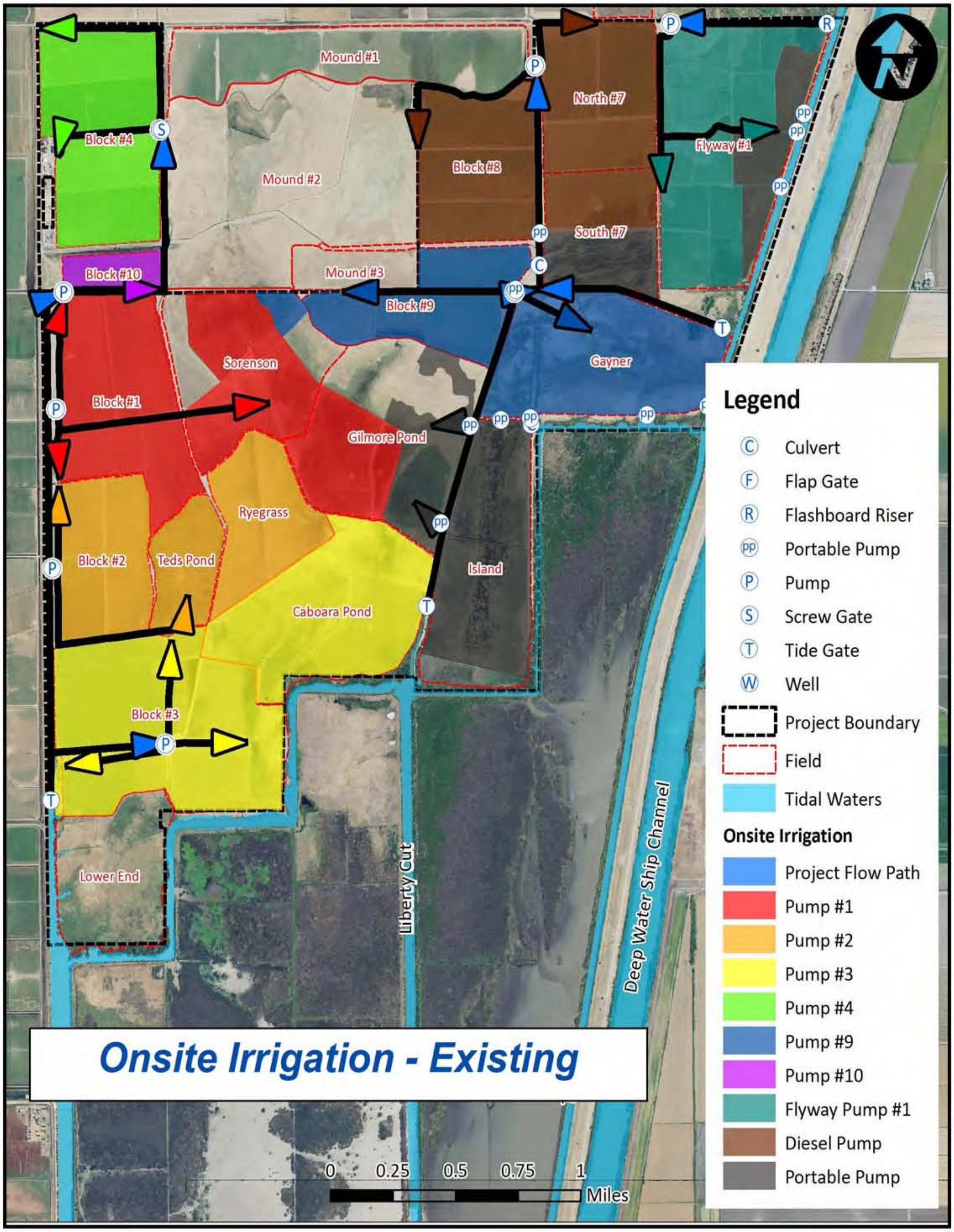
The original hydrology and hydraulics of the Project site have been reconfigured to support agriculture (**Figures 4.1-4a and 4.1-4b**). Levees and berms support an extensive network of irrigation and drainage ditches with water control structures (e.g., tide gates, culverts, and flashboard risers). Extensive field grading and construction of farm roads acting as low berms also affect movement of water throughout the site.

The Project's existing irrigation and drainage system has served to:

1. Maximize the utilization of tidal energy and minimize the need for pumps to:
    a. Raise water surface elevations in irrigation ditches so that fields can be irrigated, and
    b. Facilitate tidally-driven drainage of drainage ditches.
2. Support production of vegetation for cattle grazing.
3. Isolate fields so that their irrigation and drainage can be individually managed.
4. Continue irrigation and drainage of adjacent, up-gradient agricultural operations at Mound Farms and other locations to the north, within the Yolo Bypass.

The site has over 60 miles of irrigation/drainage ditches, with about 100 control structures. Most fields are irrigated via both fixed and portable pumps that pull water from three primary sources:

1. The west Yolo Bypass levee borrow ditch, a ditch roughly 100 ft wide that extends north from Shag Slough.




Only Phase 1 of the Project and not Phase 2 is being pursued at this time; however Phase 2 is included here as part of the reasonably foreseeable future build out.

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Data Sources: air photo (NRCS NAIP 2009), infrastructure data (CBEC, 2010/2011),
Map File: Fig4.1-4_Onsite_Irrigation_Ex+Prj_091411.mxd

**Figure 4.1-4a**

**Onsite Irrigation Existing Conditions**

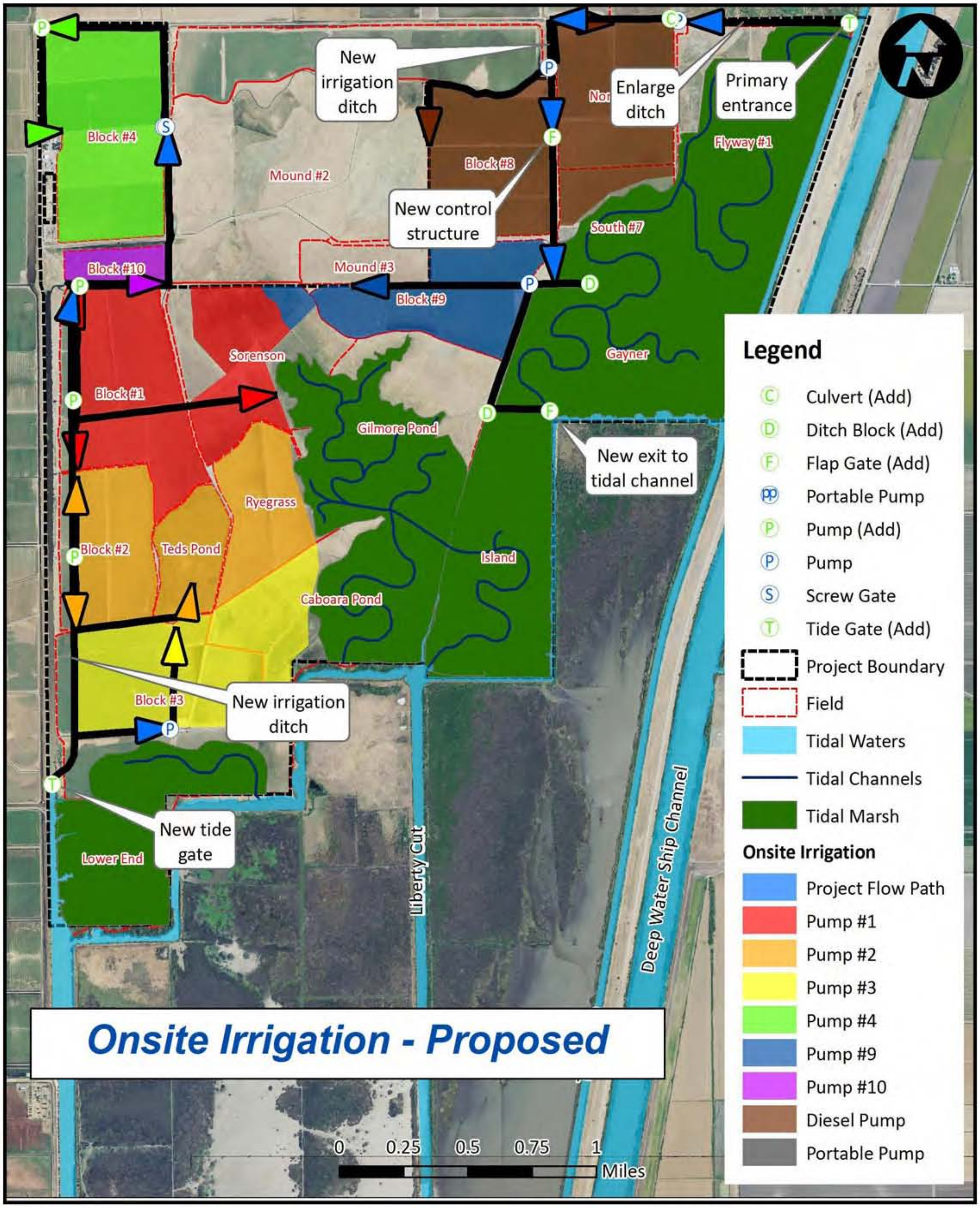


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**Figure 4.1-4b**

**Onsite Irrigation Project Conditions**

2. The central irrigation ditch, a ditch roughly 30 ft wide that extends north from Liberty Cut before turning east to the Toe Drain.
3. The northeast irrigation ditch, an irrigation ditch extending west from the Toe Drain north of the Yolo Flyway Farms fields.
4. Portable pumps are used to irrigate portions of the site, particularly the Island parcel and eastern portions of Yolo Flyway Farms. Fixed-location pumps move water into a series of irrigation ditches less than 10 ft wide. These ditches feed into fields that are gently sloped and graded to drain into drainage ditches (see **Figure 4.1-4a**). Many fields have borders of long, low, linear berms, spaced about 50 to 75 ft apart, to distribute irrigation water evenly and efficiently throughout the fields. Irrigated pastures onsite drain into the Toe Drain, the Stair Step, and the irrigation channels described above (**Figures 4.1-5a and 4.1-5b**). The latter drainage results in the recycling of slightly brackish drain water (0.5 – 2.0 parts per thousands) throughout the site in a partially closed system.

### Offsite Irrigation and Drainage

Irrigation water for approximately 1,650 ac of adjacent properties to the north of the Project site is supplied by the site's existing irrigation network (**Figures 4.1-6a and 4.1-6b**). Of the 1,650 ac, about 920 ac are supplied by four pumps extracting water off the northeast irrigation ditch, while the central irrigation ditch supplies water to the remaining 730 ac within Mound Farms. The northern U.S. Fish and Wildlife Service (USFWS) easement (160 ac) is supported by water pumped from the Toe Drain, but the US Department of Agriculture Wetland Reserve Program (WRP) easement is not irrigated.

Approximately 1,760 ac of adjacent, offsite fields drain via the Project site to the west Yolo Bypass levee borrow ditch and to the central irrigation ditch (**Figures 4.1-7a and 4.1-7b**). Another 480 ac of offsite fields drain to the northeast irrigation ditch. Hence, a total of 2,240 ac offsite are drained by the Project's existing drainage channel network. The 590 ac of the WRP and USFWS easements, directly north of Yolo Flyway Farms, are assumed to drain to the Toe Drain (**Figure 4.1-7a**).

During summer, the tide gates on the Project site are closed and drainage water is recaptured for irrigation. Drainage water from properties directly north of Mound Farms and Block #4 is collected in two oversized drainage ditches, before slowly draining toward the west Yolo Bypass levee borrow ditch. In the winter, the tide gates on the Project site are opened (with the exception of the unmaintained tide gate at the northeast corner of the Duck Pond) and surface runoff and floodwaters are generally conveyed southeast via the network of drainage ditches and culverts.

### Shallow Subsurface Hydrology

The hydrologic influences of subsurface saturation are not well documented on the Project site. Site soils are mostly clay and silty clay, which have comparatively low permeability. In many areas, a duripan (extremely hard, cemented, impermeable soil layer) is present, suggesting no deeper ground water contributions occur, and that a shallow perched water table from surface infiltration could form (Kelly & Associates Environmental Sciences, Inc. 2011).

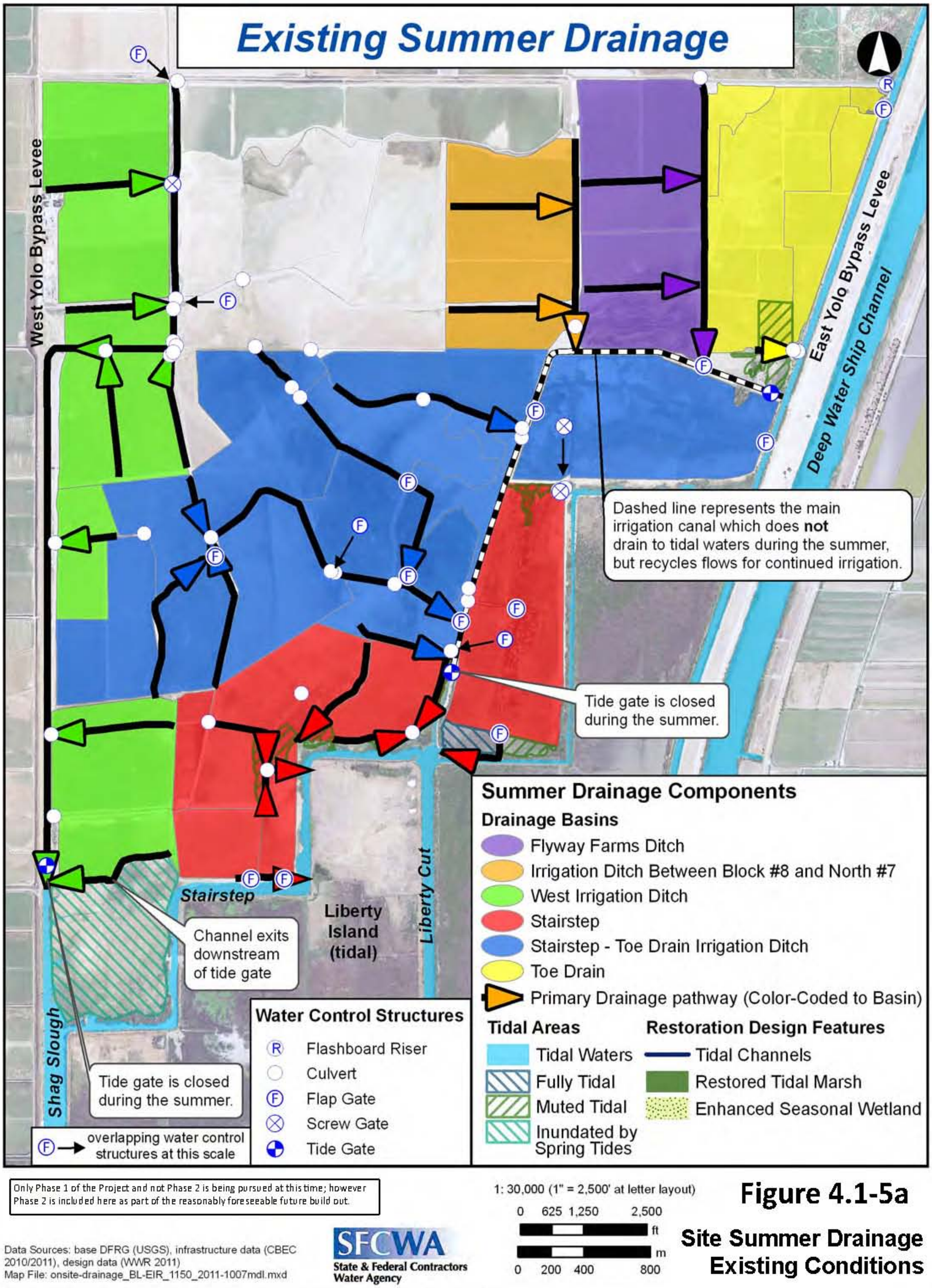
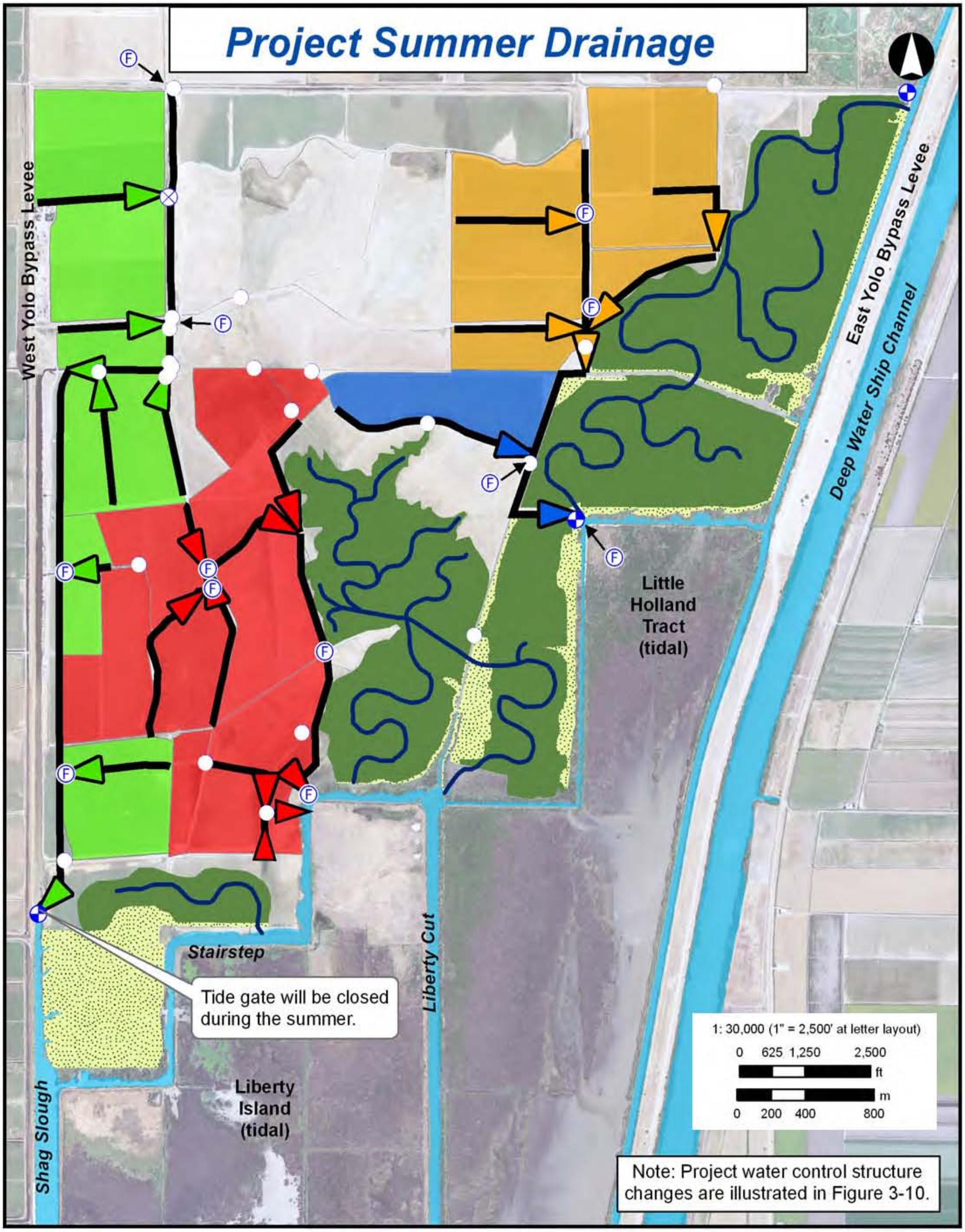



**Figure 4.1-5a**

**Site Summer Drainage Existing Conditions**




Only Phase 1 of the Project and not Phase 2 is being pursued at this time; however Phase 2 is included here as part of the reasonably foreseeable future build out.

**Figure 4.1-5b**

**Site Summer Drainage Project Conditions**

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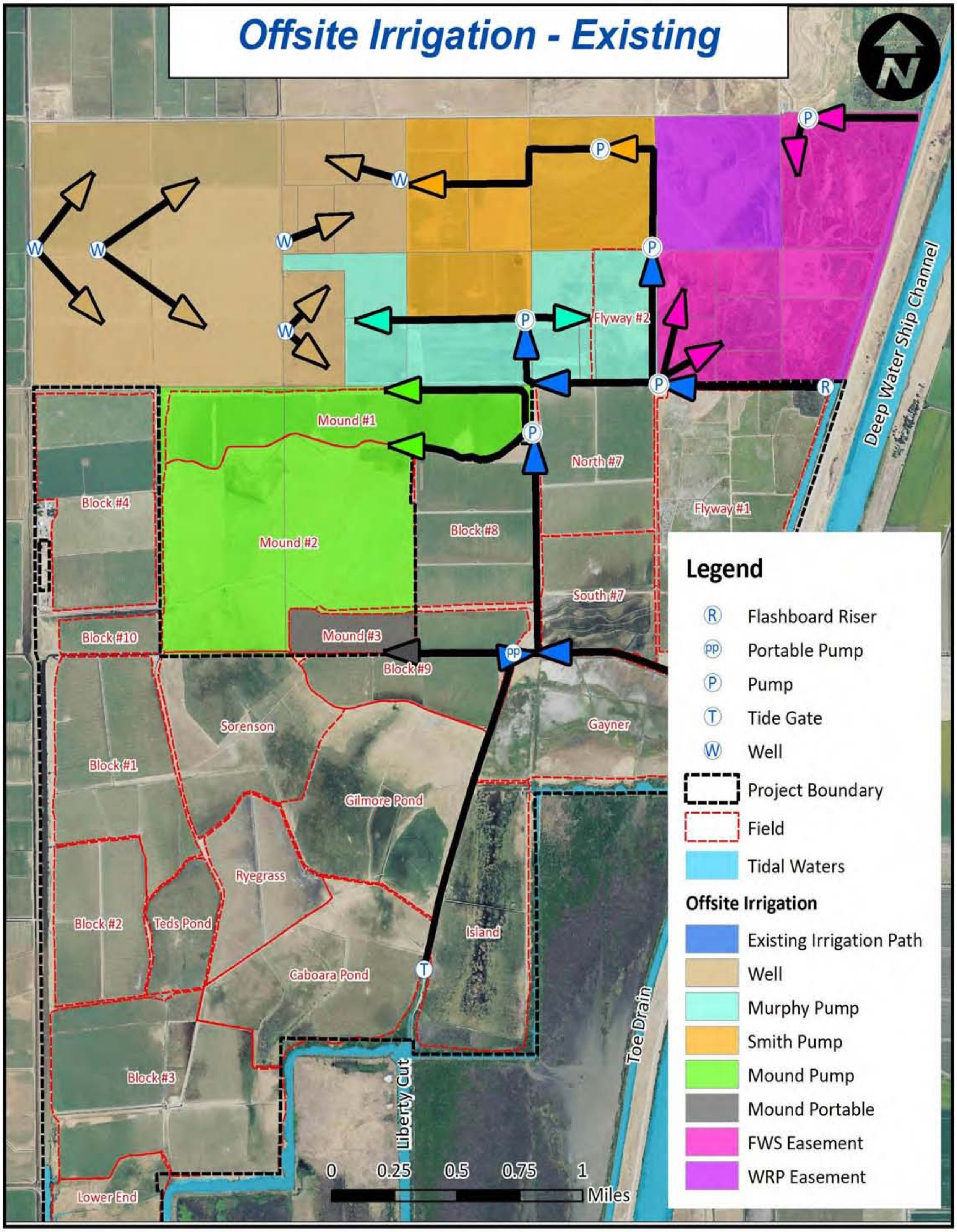


Only Phase 1 of the Project and not Phase 2 is being pursued at this time; however Phase 2 is included here as part of the reasonably foreseeable future build out.

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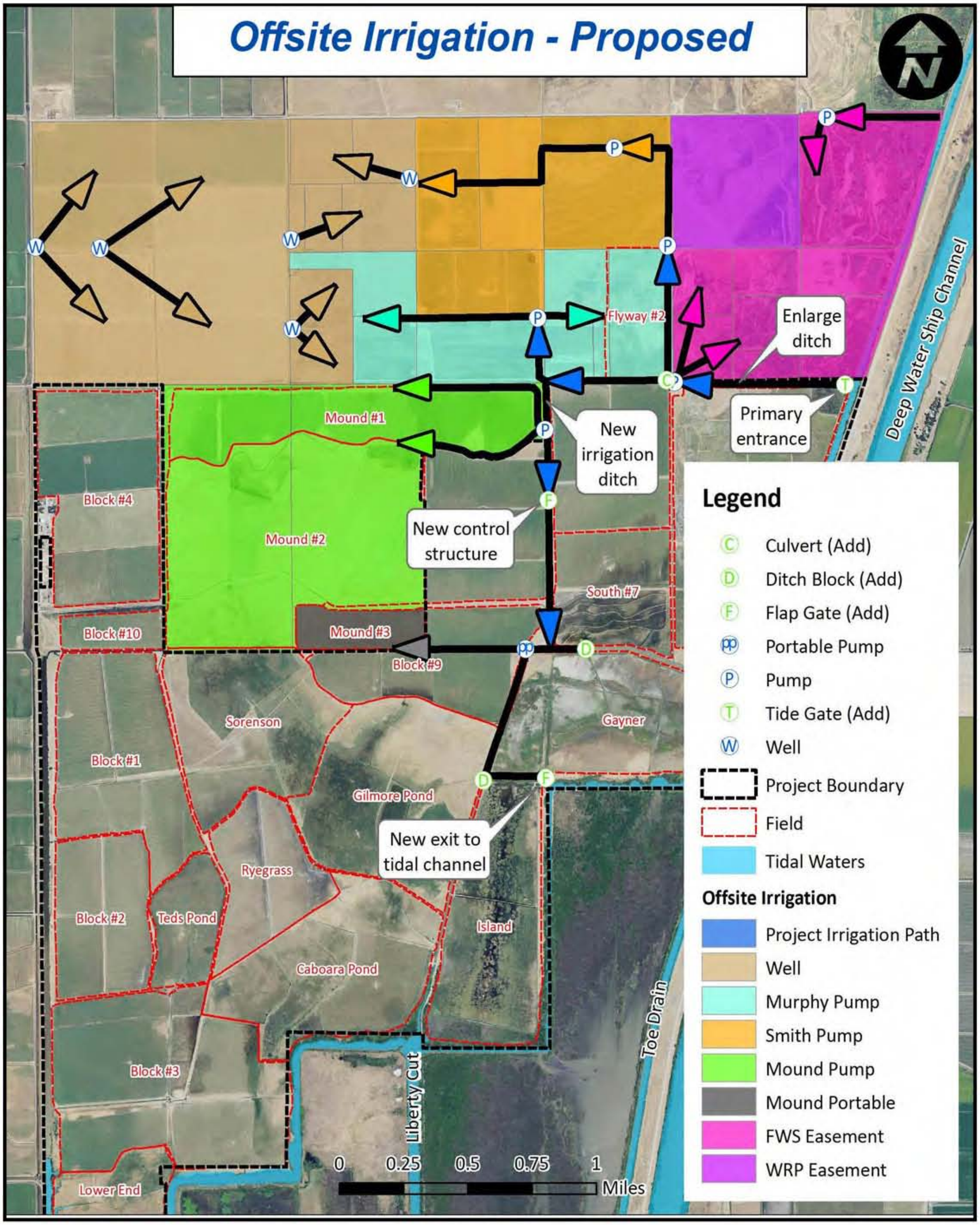
**Figure 4.1-6a**

**Offsite Irrigation Existing Conditions**

Data Sources: air photo (NRCS NAIP 2009), infrastructure data (CBEC, 2010/2011),
Map File: Fig4.1-6_Offsite_Irrigation_Ex+Prj_091411.mxd




Only Phase 1 of the Project and not Phase 2 is being pursued at this time; however Phase 2 is included here as part of the reasonably foreseeable future build out.

**Figure 4.1-6b**

**Offsite Irrigation Project Conditions**

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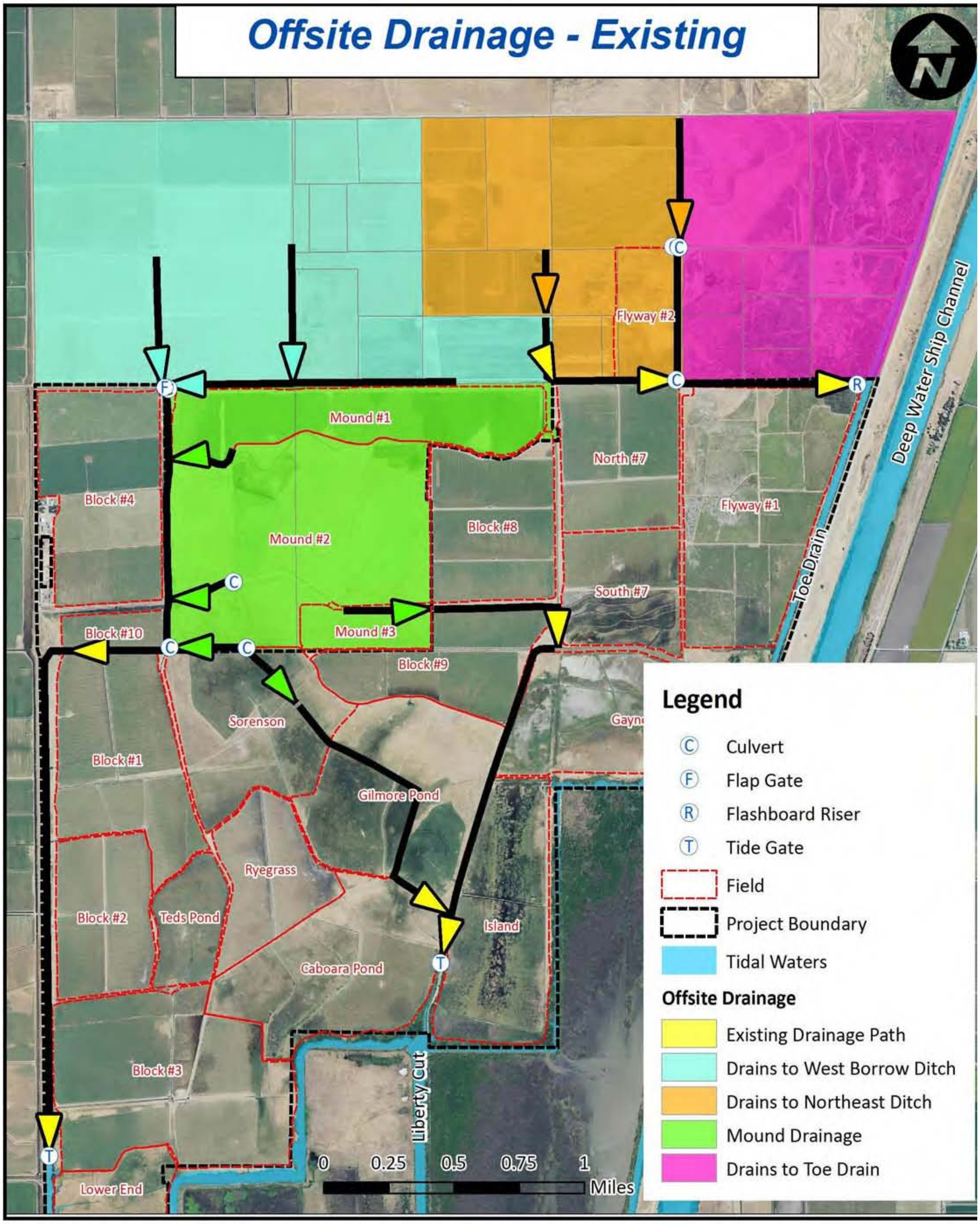
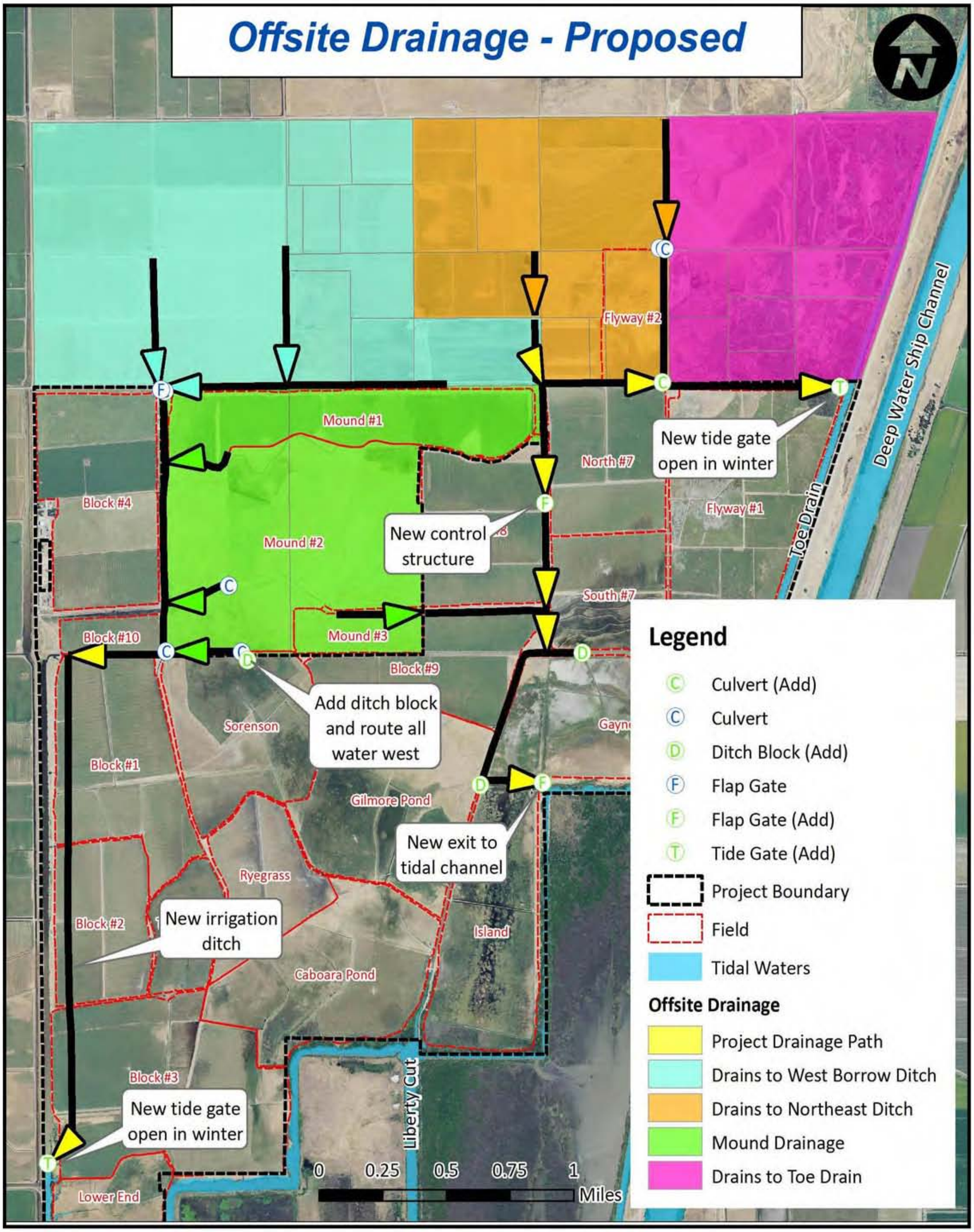



Only Phase 1 of the Project and not Phase 2 is being pursued at this time; however Phase 2 is included here as part of the reasonably foreseeable future build out.

**Figure 4.1-7a**

**Offsite Drainage Existing Conditions**

Data Sources: air photo (NRCS NAIP 2009), infrastructure data (CBEC, 2010/2011),
Map File: Fig4.1-7_Offsite_Drainage_Ex+Prj_091411.mxd




Only Phase 1 of the Project and not Phase 2 is being pursued at this time; however Phase 2 is included here as part of the reasonably foreseeable future build out.

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**Figure 4.1-7b**
**Offsite Drainage Project Conditions**

Because of the presence of cattle, it was not possible during project planning to leave excavated pits open for periods long enough to document ambient water table levels. However, subsurface saturation (moist soil profiles and/or seepage) was commonly observed at depth in the backhoe pits excavated for investigation of site soil conditions (see Section 4.3, Terrestrial Biological Resources). Observed moist soils profiles were presumed to originate from surface infiltration in most pits. However, in weeping soil pits near tidal waterways (i.e., the Toe Drain), the water also may have originated from these waterways, indicating that seepage from tidal waters is fairly restricted in horizontal extent. The presence of a duripan soil layer also suggests that subsurface saturation may occur across much of the site. This saturation likely influences surface wetland characteristics only where the duripan is within at least four or five feet of the surface.

## *Regulatory Setting*

Actions that may affect hydrology at the Project site are subject to applicable federal, state, and local laws, regulations, and policies as described below.

### Federal Laws and Regulations

#### Rivers and Harbors Act of 1899

The quality and hydrology of navigable waters and their tributaries are regulated via the Rivers and Harbors Act of 1899 (33 United States Code [USC] §§ 401, 403, 407), which is under the jurisdiction of the USACE. Pursuant to this Act, any discharge of refuse matter into navigable waters and/or their tributaries without a permit is prohibited.

Additionally, this federal law, under § 10 requires the project applicant to secure a permit prior to excavating, filling, or altering the condition, or capacity of any navigable water or federal levee., including wetland habitats subject to inundation by ordinary high waters (33 CFR § 329.11 [a]).

The proposed Project would include six tidal networks, each with its distinctive channel network. The Project design would include the excavation of new navigable waters; relocation of one diked, navigable waterway (the irrigation ditch alongside the west Yolo Bypass levee) should Soils Reuse Option #1 be selected; conversion of a diked, navigable waterway to a tidal, navigable waterway; restructure of current hydrologic conditions via berm and tidal connections; and fortification of existing levee structures with excavated materials. Accordingly, the proposed Project would be subject to applicable regulations as set forth by the Rivers and Harbors Act.

#### Clean Water Act

Alterations by the proposed Project that may impact the hydrology or affect the surface and groundwater quality on the Project site are subject to the federal Clean Water Act (CWA), and to regulations established by the U.S. Environmental Protection Agency (USEPA) and USACE. Information on CWA § 401 is described in detail in Section 4.2, Water Quality, while CWA § 404 is presented in Section 4.3, Terrestrial Biological Resources.

The proposed Project would fall within the parameters of the CWA, including both § 401 and § 404, due to the described Project actions within navigable waters and their tributaries that are regulated by USACE and also by CVRWQCB (refer to Chapter 3, Project Description).

## State Law, Regulations, and Policies

### California Code of Regulations, Title 23, Waters

Pursuant to California Code of Regulations (CCR) Title 23 Waters, the Central Valley Flood Protection Board (CVFPB) is responsible for enforcing standards for construction, maintenance, and protection of adopted flood control plans within the Central Valley, including the Yolo Bypass. A CVFPB encroachment permit is required for any project or plan of work that:

1. Is within federal flood control project levees and within a CVFPB easement;
2. May have an effect on the flood control functions of project levees;
3. Is within a CVFPB designated floodway; or
4. Is within the regulated Central Valley streams listed in Table 8.1 of 23 CCR.

The CVFPB exercises jurisdiction over the levee section, the waterward area between project levees, a 10-ft wide strip adjacent to the landward levee toe, within 30 ft of the top of the banks of non-levee project channels, and within designated floodways adopted by the CVFPB. Title 23 CCR § 107 provides for uses that may be permitted in a designated floodway, provided they will not unduly impede the free flow of water in the floodway or jeopardize public safety.

Some of these uses that may apply to the Project's activities include:

1. Open space uses not requiring a closed building, such as agricultural croplands, orchards, livestock feeding and grazing, or public and private recreation areas;
2. Fences, fills, walls, or other appurtenances which do not create an obstruction or debris-catching obstacle to the passage of floodwaters;
3. Improvements in stream channel alignment, cross-section, and capacity; and
4. Other uses which are not appreciably damaged by floodwaters.

Proposed restoration and levee work (if Soils Reuse Option #1 is selected) within the Project area would require an encroachment permit from the CVFPB. The Project site borders four RDs: 2068 to the west (Yolano), 2098 to the southwest (Cache Hass Area), 2093 to the south (Liberty Island, which is now tidal), and 999 to the east (Netherlands). Notification of these neighboring RDs would be required as part of the CVFPB permit process.

Certain sections in Title 23, including Article A, may apply to the Project, pending final design:

1. **23 CCR § 112, Streams Regulated and Non-permissible Work Periods:** Prohibits banks, levees, and channels of floodways from being excavated, cut, filled, obstructed, or left to remain excavated during the flood season for a given area. The flood season for the Yolo Bypass is roughly November 1 through May. CVFPB may allow work to be

done during the flood season provided forecasts for weather and river conditions are favorable.

2. **23 CCR § 115, Dredged, Spoil, and Waste Material:** Prohibits dredged, spoil, or waste materials from being deposited on the levee crown, levee slope, or within the limits of a project floodway without specific prior approval from CVFPB. Approval is conditioned on the effect of the deposition on the flood-carrying capacity of the stream channel, floodway, or bypass; recreational and environmental factors; and fish and wildlife.
3. **23 CCR § 116, Borrow and Excavation Activities-Land and Channel:** Authorizes the CVFPB to limit borrow and excavation activities within a floodway based on an area's hydraulics, hydrology, sediment transport, and history of the borrow sites. Borrow activities may be allowed if an activity will not cause an unplanned change of the stream's location; the sediment transport downstream will not change in a manner that produces or tends to produce increased flood or erosion problems in the area; and the activity is consistent with the overall flood control objectives for the area.
4. **23 CCR § 120, Levees:** Mandates that levees constructed, reconstructed, raised, enlarged, or modified within a floodway must be designed and constructed in accordance with the USACE Manual, Design and Construction of Levees (USACE 2000).
5. **23 CCR § 131, Vegetation:** Permits suitable vegetation, if properly maintained, within an adopted plan of flood control, provided it does not interfere with the maintenance, inspection, flood flight procedures or the overall integrity of that plan.
6. **23 CCR § 136, Supplemental Standards:** Provides supplemental standards for the Yolo and Sutter bypasses and permits the development of suitable wetlands within the Yolo Bypass. Other specifically relevant provisions indicate planting of vegetation or the impoundment of water shall not be permitted in any area where there could be an adverse hydraulic impact; planting of vegetation is generally permitted for the development of native marsh, riparian vegetation, and wetlands; and no permanent berms or dikes are permitted above natural ground elevation without a detailed hydraulic analysis.

### Local Policies

#### Yolo County General Plan

The County of Yolo 2030 General Plan (2009) contains policies that pertain to hydrology. These policies, listed individually below, deal with flood protection, while maintaining agricultural and domestic water supply, and ecosystem restoration (**Table 4.1-2**).

## 4.1.2 Significance Criteria

Potential impacts to hydrology would be significant if the Project would exceed any of the following threshold significance criteria per Appendix G of the *State CEQA Guidelines*:

1. Require new or expanded entitlements and water resources to provide sufficient water supplies to the project.

2. Substantial depletion of groundwater supplies or substantial interference with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted).
3. Substantial alteration of the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, to the extent that the rate or amount of surface runoff is altered in a manner that would result in flooding on- or off-site.
4. Creation or contribution to runoff water that would exceed the capacity of existing or planned storm-water drainage systems or provide substantial additional sources of polluted runoff.
5. Placement of structures within a 100-year flood hazard resulting in impedance or redirection of flood flows.

For Significance Criterion 5, no adopted, formal numerical guidance exist from CVFPB or USACE on what constitutes significance (i.e., flood elevation incremental changes) in the context of impedance or redirection of flood flows within the Yolo Bypass. To conduct the EIR impact analysis on flood flows, the informal guidance from USACE of 0.1 ft based on their RMA2 model[12] for conveyance studies in the Yolo Bypass was applied. However, inherent uncertainties exist in the numerical modeling, the input data to that modeling, and information currently available on the Project's design concept.

**Table 4.1-2. Yolo County 2030 General Plan: Hydrology Policies of Interest**

| General Plan Policy Number | General Plan Policy Statements |
|---|---|
| **HS-2.7** | Manage the floodplain to improve the reliability and quality of water supplies. |
| **HS-2.8** | Consider and allow for the ecological benefits of flooding while balancing public safety and the protection of property. |
| **AG-1.22** | Protect the integrity of irrigation conveyance systems and related infrastructure from the impacts of adjoining non-agricultural development. |
| **AG-2.1** | Protect areas identified as significantly contributing to groundwater recharge from uses that would reduce their ability to recharge or would threaten the quality of the underlying aquifers. |
| **AG-2.2** | Preserve water resources for agriculture, both in quality and quantity, from competition with development, mitigation banks, and/or interests from outside of the County. |
| **AG-2.3** | Work proactively with regional and watershed based groups to protect and preserve Yolo County's agricultural water supply. |

Source: County of Yolo 2009

[12] RMA2 is a two-dimensional, depth averaged finite element hydrodynamic numerical model. It computes water surface elevations and horizontal velocity components for subcritical, free-surface two-dimensional flow fields.

## 4.1.3 Impacts

### Impact 4.1-1: Effects to Agricultural Irrigation

*Applicable Significance Criterion: 1*

#### Availability of Water for Irrigation Purposes

Approximately 3,100 ac of the 3, 795-ac Project site are currently irrigated with 15,500 ac-ft of irrigation water, from April to October of each year. During irrigation operations, it is estimated that Yolo Ranch and Yolo Flyway Farms irrigate their pastures with an average of 4.4 ac-ft/ac and 9.9 ac-ft/ac, respectively, based on existing water rights and agricultural usage requirements for each site. As described in the Project Description (Chapter 3), certain areas of the Project site would remain in agricultural operations following Project implementation, and would require continuation of the irrigation.

The restoration of tidal wetlands onsite and the transition of some pastures from irrigated into non-irrigated pastures would reduce the volumes of water needed to irrigate the site. Implementation of the Project would remove approximately 1,420 ac of lands from irrigation (refer to **Table 4.5-9**). In turn, these lands would be restored to various tidal marsh and wetlands (see **Table 3-1**). Existing irrigation rates would be maintained on the remaining onsite agricultural lands, resulting in about 7,980 ac-ft per year less being applied to the site.

For Soils Reuse Option #1 (toe berm), approximately 40 ac from irrigated agriculture would no longer be irrigated, resulting in 175 ac-ft per year less of water being applied to the site. The stockpile soils reuse element (Option #2) would not have any impact upon water use, as the area would be retained in irrigated agriculture. The combination of the two options (Option #3) would involve some lands not being irrigated at the site of the toe berm.

Hence, implementation of the restoration/enhancement components and soils reuse options for the Project would result in approximately 8,155 ac-ft per year less irrigation being applied to the site (i.e., 7,980 ac-ft + 175 ac-ft). The Project would not result in an increase in water use, modifications to water supply sources, or new entitlements. The Project design would also be consistent with Yolo County's General Plan policies HS-2.7, AG-1.22, AG-2.2, and AG-2.3 (refer to **Table 4.1-2**). Based on this analysis, **no impact** of water availability for irrigation purposes, either onsite or offsite would occur. No mitigation would be required.

Post-construction operations, maintenance and monitoring would be non-invasive in nature, affect only isolated areas of tidal channels, cattle fencing, and surface waters, and require no irrigation use. Hence, **no impact** would result and therefore, no mitigation would be required.

#### Irrigation Patterns Onsite and Offsite

The Project components would alter the existing irrigation network across the site. These modifications would include changing certain diversion points, enlarging some irrigation ditches, and repairing/replacing water control structures (see **Table 3-2** and **Figures 3-4, 4.1-4a&b, and 4.1-6a&b**).

These changes are intended to:

1. Facilitate the restoration of tidal wetlands, while maximizing the amount of existing agricultural operations that can be preserved onsite; and
2. Maintain existing irrigation operations on properties adjacent to the Project site.

Several properties to the north of the Project site rely on the irrigation infrastructure network on the Project site for their irrigation needs, and would require that their current irrigation capabilities be maintained post-Project implementation.

The primary changes to onsite and offsite agricultural irrigation, due to the creation of tidal channels and wetlands, are:

1. The northeast irrigation ditch, located along the north side of Yolo Flyway Farms (part of Phase 2), would be widened and deepened to provide increased irrigation flows to northern fields on the site and to pumps responsible for irrigating lands north of the Project site. This irrigation ditch would also be extended west to connect to the ditch between Block #8 and North/South#7, ultimately connecting to the central irrigation ditch. This widened and extended ditch would partially compensate for irrigation capacity that would be lost due to discontinuing use of portions of the central irrigation ditch for irrigation.
2. About 10 ac of the central irrigation ditch would be converted to a tidal slough. The northwest corner of the ditch would remain intact (and connected to the northeast irrigation ditch as described above). A new 1,350-ft long ditch and new control structure connecting the retained irrigation ditch to the Stair Step would be constructed. The new control structure would be a flap gate (with drain-only function) with an interior flashboard riser (to maximize irrigation storage capacity). The central irrigation ditch would transmit irrigation water from the ditch between Block #8 and North #7 to Pump #9. This central irrigation ditch also would transport recycled drainage water from Block #8, Block #9, North/South #7, and some offsite lands north of the Project site through the new control structure.

Associated with construction of the toe berm along the west Yolo Bypass levee (if Soils Reuse Option #1 is chosen), the existing levee borrow ditch (which also serves as the irrigation ditch for lands near the levee) would be moved to the east to accommodate the toe berm. Pumps #1, #2, #3, and #10 would be relocated to the east and pull irrigation water off of this new ditch. The segments of existing irrigation laterals supplied by these pumps to facilitate irrigation would be reconstructed to the east to maintain this irrigation capacity.

The primary changes to onsite and offsite agricultural irrigation resulting from creation of the stockpile (should Soils Reuse Option #1 be selected), to accommodate reuse of soil from the creation tidal channels and wetlands, would be temporarily ceasing irrigation within Block #4 during stockpile construction. Post construction, the stockpile area would receive new irrigation and drainage ditches, along with a new lift pump, reconfigured in a manner to maintain the same irrigation/drainage regime as under existing conditions.

The combination of both the toe berm and the stockpile at the restricted-height levee (i.e., Soils Reuse Option #3) would involve similar activities above, but to a lesser extent at each site.

Construction of the Project wetland restoration and soils reuse components would require ceasing all irrigation and agricultural activities onsite to maintain dry working conditions. However, as described in the Project Description (Chapter 3), irrigation operations on adjacent properties that rely on the ditch and pump networks of the Project site would be maintained during construction, by relying on temporary, portable pumps to divert water around construction zones for offsite users, and by upgrading water control structures to maintain adequate water levels and volumes for all users. Accordingly, construction-related impacts to onsite and offsite irrigation would be **less than significant** and no mitigation would be required. The wetland restoration effort would not rely on the agricultural irrigation system, but would be a self-sustaining, natural ecosystem. The Project design would also be consistent with Yolo County's General Plan policies HS-2.7, AG-1.22, AG-2.2, and AG-2.3 (refer to **Table 4.1-2**).

Following construction of the Project, new and remaining pre-project irrigation infrastructure elements would be maintained and operated in the same manner as at present, prior to Project implementation by maintaining the water delivery capacity and stage (i.e., phases/timing of water distribution) of the current system. Maintaining irrigation ditch capacity would ensure that appropriated water rights would continue to be available under normal operations. Maintaining water distribution stage would ensure that water levels at existing onsite and offsite lift pumps would continue to operate as they have done historically. Therefore, potential impacts resulting from the Project's operation and maintenance separately from the onsite and offsite irrigation systems would be **less than significant**. No mitigation would be required.

### Impact 4.1-2: Effects to Agricultural Drainage

*Applicable Significance Criteria: 3 and 4*

The Project would change the existing drainage network across the site. These changes include modifying some existing drainage points, developing new drainage points, and changing water control structures (see **Table 3-2** and **figures 4.1-5a&b and 4.1-7a&b**). These changes are intended to:

1. Facilitate the restoration of tidal wetlands, while maximizing the amount of existing agricultural operations that can be preserved on the site.
2. Maintain existing drainage operations on properties adjacent to the Project site.

The Project design would be consistent with Yolo County's General Plan policies AG-2.1 and AG-2.2 (refer to **Table 4.1-2**). The primary changes to onsite and offsite agricultural drainage due to creation of tidal channels and wetlands with Project construction are:

1. An existing central drainage ditch runs generally northwest to southeast between the fields of Sorenson and Gilmore Pond to the north, and Ryegrass and Caboara Pond to the south (see **Figures 4.1-3a&b**). Portions of each of these fields would be converted to tidal wetlands and wetland buffers (as part of Network 1) and would drain via conversion

of the existing central drainage to an enlarged tidal channel (which would continue through Network 2).

2. To avoid water quality impacts to the proposed tidal wetlands via drain water from the irrigated pastures, the existing central drainage would be rerouted south, starting from the field junction of Sorenson, Gilmore Pond, and Ryegrass. The new central drainage would be of similar size to the existing central drainage, excavated through Ryegrass and Caboara Pond, and join the existing drainage feature at the outlet of Caboara Pond to the Stair Step, which currently is without a control structure. The new control structure would be installed within the existing drainage feature, to manage the release of drain water during the irrigation season. This structure would be opened in the winter to facilitate drainage of floodwater.

For Soils Reuse Option #1 (toe berm), the primary changes to onsite and offsite agricultural drainage would be the relocation of the west Yolo Bypass levee borrow ditch to the east of the new toe berm. Onsite and offsite drains (tributary to the existing west Yolo Bypass borrow ditch) would continue to be served by the relocated ditch for irrigation, drainage, and storm-water purposes. The tide gates at the southern end of the west Yolo Bypass borrow ditch would be rehabilitated to provide similar irrigation, recycled drainage, and storm-water functions.

For Soils Reuse Option #2 (stockpile), the primary changes would be temporarily ceasing irrigation/drainage within Block #4 during the stockpile construction. Post construction, the stockpile area would have new irrigation and drainage ditches, along with a new lift pump, reconfigured in a manner to maintain the same drainage regime as it does under existing conditions and ultimately drain to the west Yolo Bypass borrow ditch.

The combination of both the toe berm and the stockpile at the restricted-height levee (i.e., Soils Reuse Option #3) would involve similar activities above, but to a lesser extent at each site.

Project construction would require cessation of all irrigation and agricultural activities onsite to maintain dry working conditions. However, as described in the Project Description (Chapter 3), drainage capabilities on adjacent properties that rely on the ditch and pump networks on the Project site would be maintained by providing temporary, portable pumps to divert water around construction zones for offsite users, and by upgrading water control structures to maintain adequate water levels and volumes for all users. The drainage modifications for the wetland restoration and soils reuse elements would retain existing levels of drainage for both onsite and offsite properties by retaining the needed capacity for irrigation, and hence, recycled drainage. Irrigation water quality overall should improve, as less drain water would be recycled because the new central drainage ditch would be directly connected to the Stair Step Slough via a new control structure, rather than to a closed system. Therefore, this construction impact would be **less than significant** and no mitigation would be required**.**

Following construction of the Project, new and remaining pre-Project drainage infrastructure elements would be maintained and operated in the same manner as they have done historically. Hence, potential impacts resulting from the Project's operation and maintenance separately of the onsite and offsite drainage would be **less than significant** and no mitigation would be required.

### Impact 4.1-3: Effects to Winter Storm-water Drainage

*Applicable Significance Criterion: 3, 4, and 5*

The construction of tidal channels and rerouted drainage ditches onsite would permanently alter the way that winter storm and flood flows drain within and from the site. Currently, with the extensive network of ditches and water control structures, large portions of the site drain very slowly to surrounding tidal water bodies, during intense winter storm and flood flows. For example, the March/April 2011 Yolo Bypass flood event inundated the entire Project site (except for land within the restricted-height levee) for several weeks, followed by persistent ponding of water on the portions of the site that are at or slightly above intertidal elevations. One reason this event happened was that the areas were not connected to tidal bodies of water that drain at low tide, thus forming small pools of water. The movement of water out of these areas is dependent upon agricultural drainage ditches, many of which have culverts or other water control structures that constrict the movement of water and impede drainage, even when open in the winter.

Implementation of the Project would involve constructing tidal channels specifically designed to move water in and out of the existing and newly created intertidal networks (see Project Description, Chapter 3). These channels would facilitate the drainage of flood and storm-water flows from the site, and would likely have little effect upon flood-water drainage outside of the restoration footprint area. The redesigned irrigation and drainage ditch network would provide the same level of storm and flood-water drainage capacity as currently exists, i.e., all existing and new tide gates and exterior flap gates would remain open in the winter to promote efficient drainage of winter storm and flood flows from onsite and offsite sources.

Changes to the winter storm-water drainage patterns would occur as a result of the relocation of the west Yolo Bypass levee borrow ditch to the east of the new toe berm (Soils Reuse Option #1). Onsite and offsite drains tributary to the existing west Yolo Bypass levee borrow ditch would continue to be served by the relocated ditch for irrigation, recycled drainage, and storm-water purposes. The tide gates at the southern end of the west Yolo Bypass levee borrow ditch would be rehabilitated to provide similar irrigation, recycled drainage, and storm-water functions. These gates would remain open in the winter to promote efficient drainage of winter storm and flood flows from onsite and offsite sources.

Changes to winter storm-water drainage resulting via a stockpile (Soils Reuse Option #2) to accommodate soils reuse would be the creation of new irrigation and drainage ditches atop the stockpile. These ditches would maintain the same irrigation/drainage regime, as under existing conditions, and drain to the flap gate currently located at the southeast corner of the restricted-height levee surrounding the ranch compound on Yolo Ranch.

The combination of both the toe berm and the stockpile at the restricted-height levee (i.e., Soils Reuse Option #3) would involve similar activities above, but to a lesser extent at each site.

The Project design would be consistent with Yolo County's General Plan policies HS-2.7, AG-1.22, AG-2.1 and AG-2.2 (refer to **Table 4.1-2**). Overall, the proposed water infrastructure modifications and soils reuse options would maintain existing levels of storm-water drainage both onsite and offsite by:

1. Efficiently conveying winter storm and flood flows from the newly created intertidal networks through the newly created tidal channels.
2. Conveying winter storm and flood flows through the new irrigation/drainage channels and new/rehabilitated control structures.

The construction period would be conducted outside of the rainy season and would not affect Yolo Bypass flood inundation. The Project would have a **less-than-significant impact** on onsite and offsite storm-water drainage and localized flood flows. No mitigation would be required.

Post-construction maintenance and monitoring of storm-water conveyance would consist of onsite inspections. These could be conducted visually and through aerial imagery to determine whether bank slumping in tidal channels had occurred and if it was having an effect on the channel conveyance. Additionally, tidal channel flows, and tide stage monitoring could be conducted using automated gages, indicating changes in outflows resulting from tidal channel slumping. Actions such as the use of flotation devices to correct slumping would be employed to ensure that the constructed channels would continue to perform as designed. Maintenance, monitoring and corrective measures could be non-invasive in nature (such as sampling or inspecting) or could involve some physical aspects (such as the need for an additional tidal connection). Such post-construction measures ensure that storm-water conveyance would be maintained or improved, and, therefore, would have a **less-than-significant impact** on either onsite or offsite storm-water drainage. No mitigation would be required.

### Impact 4.1-4: Impacts on Flood Conveyance

*Applicable Significance Criteria: 5*

The Project is located within the Yolo Bypass, a major flood conveyance corridor along the Sacramento River. According to FEMA, this corridor is critical to discharge the 100-year-flood flow it receives from upstream without increasing the 100-year elevation more than one foot. The Project must be consistent with the CVFPB flood flowage easements and not substantially interfere with the role of the Yolo Bypass' role to convey major flood flows. The Project would also be consistent with Yolo County's General Plan policy HS-2.8 (see **Table 4.1-2**).

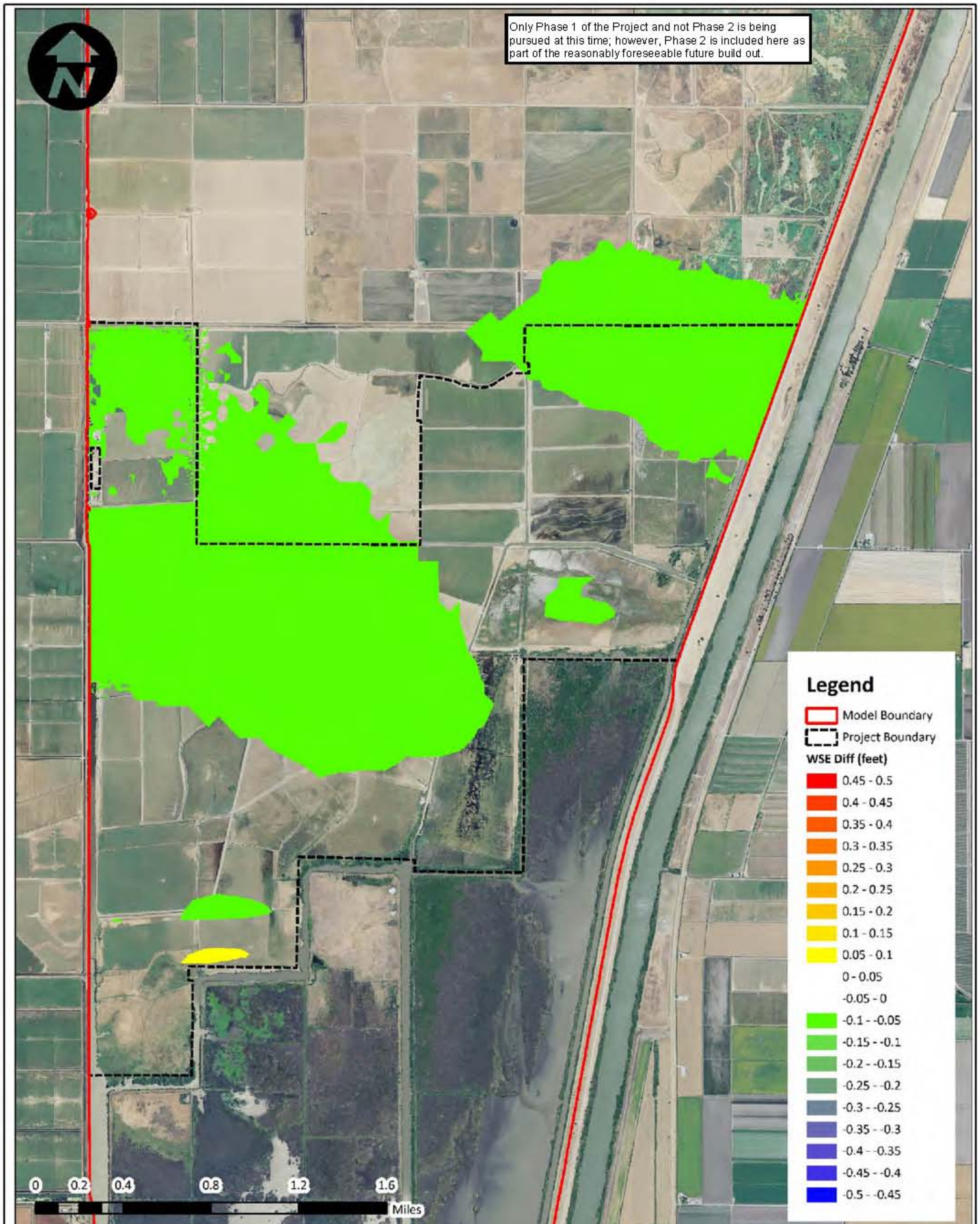
Under the proposed Project, excavated soils from the Project site would be reused to construct the selected option: a new toe berm along the portion of the west Yolo Bypass levee within the site (Soils Reuse Option #1), an onsite stockpile within the restricted-height levee onsite (Soils Reuse Option #2), or a combination of these two options (Soils Reuse Option #3). Since these options would be constructed within a designated floodway, they must not substantially impede or redirect the flood flows, thereby resulting in either exposing additional properties to flooding or weakening the levee system. Neither the CVFPB nor the USACE have formal numerical guidance on allowable incremental increases in flood elevations. Of primary importance is the potential increase in water surface elevations along the east or west Yolo Bypass levees, due to concerns about levee erosion and levee freeboard.

To assess the relative impact of the wetland restoration coupled with the soils reuse options on flood conveyance within the Yolo Bypass, an RMA2 model of the Yolo Bypass developed by the USACE Sacramento District (USACE 2007) was utilized to evaluate flood conveyance effects of the proposed Project. This evaluation is preliminary as final design has not yet been developed. The convergence criteria of the model allow water surface elevation contours from the model to be interpreted with confidence at an interval 0.01 ft (USACE 2007), based on criteria that inherently are conceptual at this time. Information on the model setup and results can be found in the *Flood Conveyance Modeling Report* (cbec 2011a).

The Project would lower ground elevations over portions of the Project site for creation of tidal channels and wetlands. Land lowering would have a positive effect on flood conveyance by lowering water surface elevations in the general vicinity of the graded (lowered) areas. In contrast, revegetation of irrigated pastureland to tules could raise water surface elevations slightly by introducing additional flow resistance. However, the model results indicated the net impact of land lowering and tule revegetation would be an overall decrease in water surface elevations of up to 0.05 ft across about half the Project site and along approximately two miles of the east and west Yolo Bypass levees (**Figure 4.1-8**). Additional model runs would be performed to confirm this when the engineering design is finalized. This change would be **beneficial** to flood conveyance and therefore would result in **no impact** to increases to flood elevations with the restoration of wetlands. No mitigation would be required.

Construction of the toe berm (Soils Reuse Option #1) and conversion of the wetlands would result in limited increases in water surface elevation (**Figure 4.1-9**). The preliminary model results indicate small areas within the restoration site interior that would exhibit increases in water surface elevation ranging from 0.05 to 0.1 ft. The area within and adjacent to the restricted-height levee area would see increases in water surface elevation between 0.05 to 0.1 ft, with a very localized area seeing increases of 0.1 to 0.15 ft. A portion of the west Yolo Bypass levee (~1.35 miles) would be projected to have an increased water surface elevation of 0.05 to 0.1 ft, with about 0.2 miles more experiencing increases of 0.1 to 0.15 ft. Finally, a small area in the southwest region of the Project site would be projected to have a decrease in water surface elevations of 0.05 to 0.15 ft.

These preliminary modeling results applied a simplistic geometry for the toe berm – a rectilinear wedge with vertical ends at the north and south, which would greatly exaggerate flood impact effects. The final toe berm would be designed to include a gently sloping transition from the southern edge of the restricted-height levee up to the west Yolo Bypass levee, which would have a considerably reduced effect on water surface elevation increases. The toe berm would protect the west Yolo Bypass levee, a considerable flood protection improvement. This benefit in combination with the localized and small increases in water surface elevation from the toe berm soils reuse element (Option #1) in combination with the wetlands restoration would result in this potential impact to be **less than significant**, and no mitigation would be required. Additional model runs would be performed to confirm this once the engineering design is finalized.




Data Sources: Yolo Bypass RMA2 Model outputs (USACE, 2007; cbec 2011)
Map File: model-result-wetlands_AP-EIR_1150_2011-1104mdl

**Figure 4.1-8**

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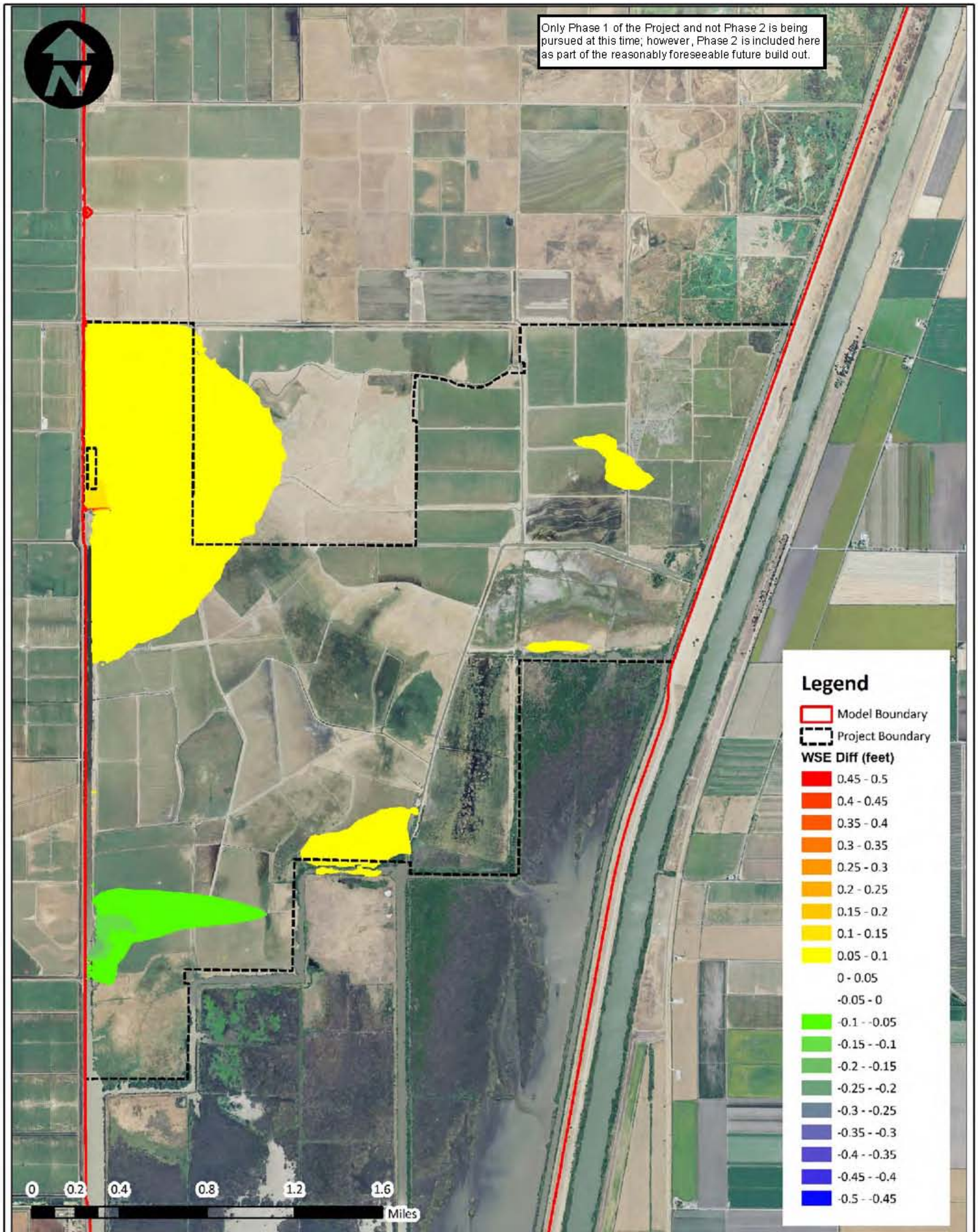
**Preliminary Flood Conveyance Model Results**
**Wetland Restoration**




Data Sources: Yolo Bypass RMA2 Model outputs (USACE, 2007; cbec 2011)
Map File: model-result-wetlands-berm_AP-EIR_1150_2011-1104mdl

**Figure 4.1-9**

SFCWA State & Federal Contractors Water Agency

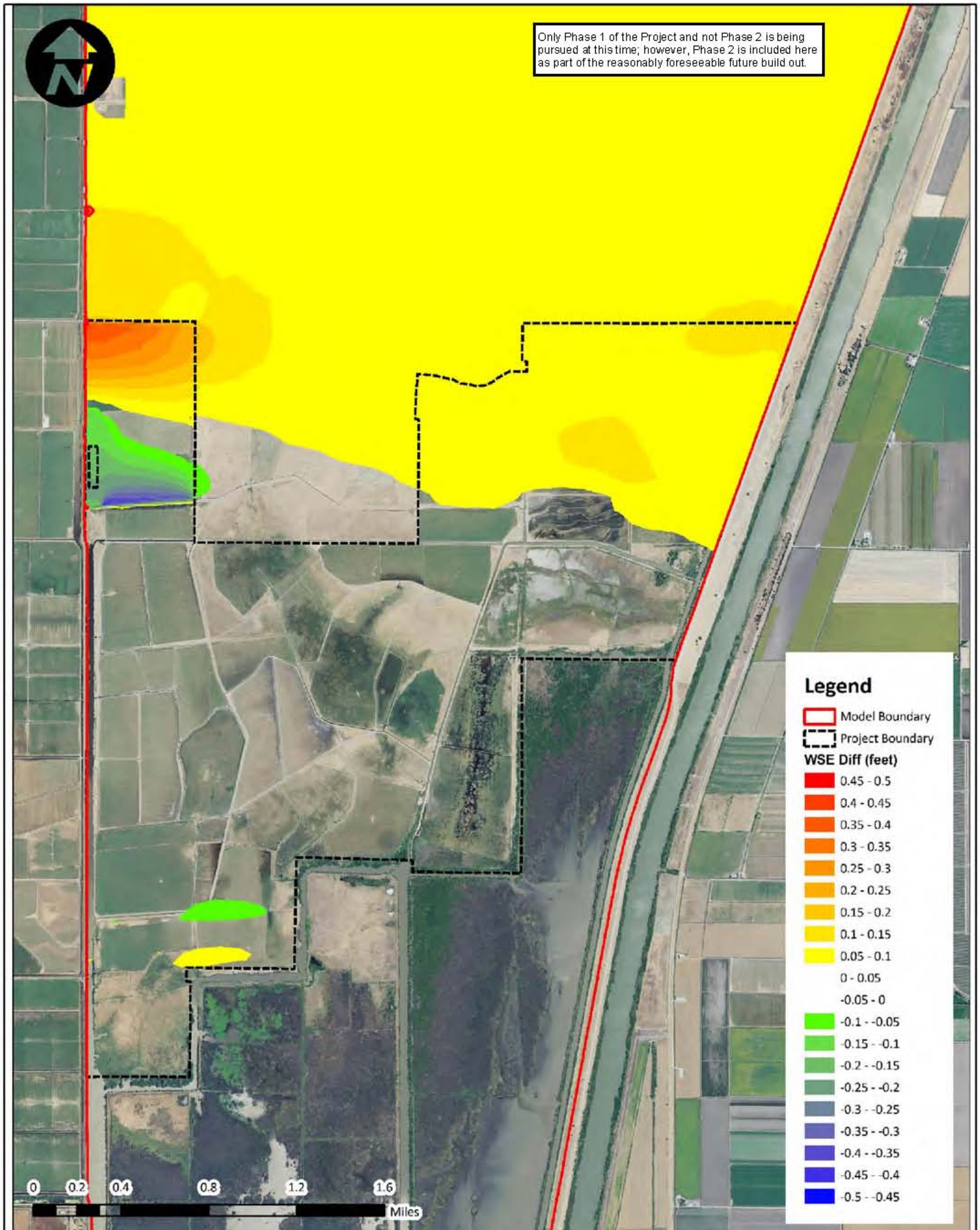
**Preliminary Flood Conveyance Model Results, Wetland Restoration and Soils Reuse Option #1 (Toe Berm)**

Construction of the stockpile soil within the restricted-height levee area (Soils Reuse Option #2) during the wetlands restoration component would result in more widespread but generally limited magnitude increases in water surface elevation (**Figure 4.1-10**). The initial and preliminary model results indicate that potential increases would result in water surface elevation across about half the area within the restricted-height levee area ranging from 0.05 to 0.45 ft, with the greatest increases limited to the very northwest corner. About 0.9 miles of the west Yolo Bypass levee adjacent to this area would be projected to have similar increases in water surface elevation. Preliminary modeling results also indicate that about a third of the areas within the restricted-height levee would experience a decrease in water surface elevation of 0.05 to 0.4 ft. This possible reduction would include about half a mile of the west Yolo Bypass levee that would experience a decrease in water surface elevation of up to 0.2 ft.

The largest modeled effect of the stockpile soils reuse option would be an increase across the entire Yolo Bypass upstream of the restricted-height levee area of 0.05 to 0.1ft. This is in fact an overestimate of the modeled result. The Project design was modeled with the stockpile in several different configurations in order to find the design with the lowest level of potential impact on flood elevations. All modeled scenarios for the full-volume stockpile (2.4 million cubic yards [mcy] for this soils reuse option) produced flood elevation results above the USACE informal significance threshold. Taken altogether and in absence of the flood protection benefits of the toe berm soils reuse option (Option #1), should Option #2 be selected as the sole approach to soils reuse, the impact would be **significant** if not mitigated. Implementation of Mitigation 4.1-1 (refer to Section 4.1.4, Mitigations) would involve further design changes, vegetation management, and additional modeling to comply with mandated flood control management requirements, thereby reducing this impact to **less than significant**.

Construction of the combined toe berm and stockpile soils reuse elements, i.e., Soils Reuse Option #3 in conjunction with the wetlands restoration was not analyzed with numerical modeling as described above. Based on the above-described preliminary modeling results, there is likely a combination of toe berm and stockpile soils reuse options that would not trigger Significance Criterion 5 (impedance or redirection of 100-year flood flows), especially given the flood protection benefits of Option #1 (toe berm). However, in absence of design-specific modeling results, it is assumed that the preliminary results of the stockpile soils reuse modeling would apply and therefore the combined toe berm and stockpile soils reuse element (Option #3) would result in a **significant impact**, if not mitigated. Implementation of Mitigation 4.1-1 (refer to Section 4.1.4, Mitigations) would involve further design changes and additional modeling to comply with mandated flood control management requirements, and thereby reduce this impact to **less than significant**.

Post-construction maintenance and monitoring could consist of onsite inspections, visually and through aerial imagery. Tidal channel flows, and tide stage monitoring could be conducted using automated gages. Project maintenance, monitoring and corrective measures would be non-invasive (with the exception of the additional tidal connection-if needed), would not place structural elements into the floodplain, nor would otherwise create flood conveyance heights greater than those existing on the Project site, and would be conducted during the dry season.




Data Sources: Yolo Bypass RMA2 Model outputs (USACE, 2007; cbec 2011)
Map File: model-result-wetlands-stockpile_AP-EIR_1150_2011-1104mdl

**Figure 4.1-10**

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**Preliminary Flood Conveyance Model Results, Wetland Restoration and Soils Reuse Option #2 (Stockpile)**

Appropriate vegetation management (see Section 3.5.1, Long-term Operations and Maintenance Component), along with encroachment permit requirements set by the CVFPB on vegetation plantings, would also maintain or reduce the potential flood conveyance height values. Therefore, maintenance, operations, and corrective measures would have **no impact** on Yolo Bypass flood conveyance capacity. The additional tidal connection would have a **less-than-significant impact** with excavated materials being placed either at the toe berm or at the stockpile sites, with substantially less materials proposed for reuse than the materials contemplated during the construction phase (i.e., 1.85 mcy of soil for Phase 1, and though not currently planned for, 0.65 mcy of soil for Phase 2). No mitigation would be required.

### Impact 4.1-5: Impacts on Local Groundwater

*Applicable Significance Criteria: 2 and 3*

Only one groundwater well exists on the Project site. This well serves as a domestic water supply for the ranch compound during the summer agricultural season. In addition, agricultural activities on the Project site depend on the ability to effectively manage surface and shallow groundwater levels for forage production and cattle grazing.

The restoration of tidal flows to the Project site may increase local groundwater elevations in areas that are not underlain by a duripan (dense, cemented, nearly impermeable soil layer) or heavy clays. Based on local soils conditions, any increase in local groundwater elevations resulting from implementation of the Project would be minimal, and would not affect post-restoration agricultural activities across the site. The site's lone groundwater well at the Yolo Ranch compound extracts water from an aquifer much deeper than the shallow surface aquifer that would potentially be affected by tidal flooding, so tidally-driven changes to groundwater would not affect this well (see Section 4.2, Water Quality). **No impact** on local groundwater would result and no mitigation would be required. The Project design would be consistent with Yolo County's General Plan policies AG-2.1 and AG-2.2 (refer to **Table 4.1-2**).

Post-construction operations, maintenance, and monitoring would be non-invasive in nature (except for the additional tidal connection, if needed); affect only isolated areas of tidal channels, cattle fencing, and surface waters; and would serve to ensure that irrigation and drainage remain at Project design levels. Furthermore, none of these activities would involve application or removal of waters from the site. Therefore, these activities would have **no impact** on local groundwater and no mitigation would be required.

## 4.1.4 Mitigations

### Mitigation Measure 4.1-1: Impacts on Flood Conveyance

The following mitigation measure shall be carried out before implementation of the Project relying on either Soils Reuse Options #2 (stockpile) or #3 (combination):

- Finalize the engineering design to comply with applicable flood protection requirements in consultation with the Central Valley Flood Protection Board (CVFPB) and the U.S. Army Corps of Engineers (USACE). The engineering design shall consider a variety of categories including design flows, channel stability, scour control, protection of flood control structures, etc. The goal shall be to design the Project to meet the maximum flood water surface rise of 0.1 foot (ft) or less.

- Conduct additional modeling to ensure and demonstrate compliance with the applicable requirements and operations of the Yolo Bypass in consultation with CVFPB and USACE, and prior to receiving encroachment permits. Modeling shall take into account levee heights and physical conditions, weir spills, and other dynamic processes that can occur during major floods. Guidance from USACE of not exceeding the base flood elevation by more than 0.1 ft shall apply with Project implementation, as based on the USACE RMA2 model for conveyance studies in the Yolo Bypass.

With adherence to all applicable laws and regulations governing hydrology/flood management (refer to Section 4.1.1, Regulatory Setting) and implementation of the above mitigation measure with applicable BMPs in Chapter 3 and post-construction activities, no unavoidable, significant adverse impacts associated with hydrologic flows would result with Project implementation. In particular, with mitigation, the Soils Reuse Options #2 and #3 would be less than significant.

# 4.2 Water Quality

## 4.2.1 Setting

Water quality at the Project site is best understood first within the context and relative influences of the Yolo Bypass and the Cache Slough Complex. Secondly, the Project's water quality is also affected by land and water management activities performed onsite, as well as by those activities on adjacent and upstream properties.

### *Regional Water Quality*

#### Yolo Bypass

Within the Yolo Bypass, water quality is affected through a complex array of temporally and spatially varying chemicals, hydrodynamic factors, and sources. As shown in **Figure 4.1-1** (refer to Section 4.1, Hydrology), depending on which hydrologic conditions exist at the time (i.e., dry season, wet season, or flood event), water can enter the Yolo Bypass from the:

1. Sacramento, Feather, and American rivers via the Fremont and Sacramento weirs,
2. Numerous westside tributaries and agricultural drains,
3. Municipal stormwater and wastewater discharges, or
4. Tidal water entering the Toe Drain from the Delta to the south of the Yolo Bypass (City of Woodland 2005).

Surface water exits the Yolo Bypass either via the Toe Drain or Liberty Cut at Prospect Slough via Shag Slough or over the southern end of Liberty Island to Cache Slough.

During the dry season, major water sources include effluent from the municipal wastewater treatment plants of the cities of Woodland and Davis, imported Sacramento River water for irrigation purposes, and water from the Toe Drain pumped onto agricultural fields for irrigation and wildlife habitat. Low flows from such sources as Putah Creek (including discharges from the campus of the University of California at Davis), Cache Creek, and Knights Landing Ridge Cut also contribute.

Throughout the wet season, pulses of urban storm-water runoff, treated sewage effluent, and higher flows in creeks are the primary sources of water. Overflow waters are often used to flood public and private lands for duck clubs, wildlife habitat, and rice fields (to decompose rice stubble remaining on the fields after harvest).

On average, biannual flood flows are directed from Sacramento River at its confluence with the Feather River, via the Fremont Weir at the northern end of the Bypass, and from the Sacramento and American rivers, via the Sacramento Weir along the east side of the Bypass. These additional flows can result in flooding much, if not all, of the Yolo Bypass.

Water quality from these sources is further influenced by land use patterns and other seasonal activities in their watersheds. Such activities include farming, grazing, managed wetlands for wildlife habitat and duck hunting, and preserves. These land uses contribute organic materials that play a role with biological and chemical oxygen demand, and common water quality contaminants such as herbicides, insecticides, fungicides, nutrients, bacteria, and metals (California Department of Fish and Game [CDFG] 2008). Several of the source waters to the Yolo Bypass are impaired water bodies on the U.S. Environmental Protection Agency (USEPA) § 303(d) list of the federal Clean Water Act (CWA) for various contaminants (**Table 4.2-1**).

### Cache Slough Complex

The Cache Slough Complex, to the immediate south of the Project site, is part of the Delta, whose water quality is affected by four major water sources (Healey *et al.* 2008):

1. Seawater intrusion and tidal oscillations from San Francisco Bay.
2. Delta inflow quantity, timing, and quality from the Sacramento and San Joaquin rivers, and other tributaries.
3. Water pumped onto and off of Delta islands and exported out of the Delta.
4. Agricultural and municipal discharges within the Delta.

## *Major Water Sources and Their Water Quality*

### Yolo Bypass

To better understand water quality conditions, the City of Woodland monitored the source waters to the Yolo Bypass over a 12-month period, between November 2003 and October 2004 (City of Woodland 2005). A summary of the water quality data collected during this study is presented in **Table 4.2-2**. Four “in-bypass” sampling locations were distributed throughout the Tule Canal/Toe Drain, while one additional site was in the Yolo Bypass Wildlife Area (YBWA), a site that is several miles north of the Project site. Generalized in-bypass water quality observations were noted:

1. **Bacteria.** All sites exceeded the water quality objective for fecal coliform on at least one occasion. Bacteria indicators did not display any clear seasonal patterns; however, the highest bacteria concentrations were in runoff from rural areas.
2. **Mercury.** No samples exceeded the applicable total mercury criterion; however, all samples exceeded the potentially applicable methylmercury (MeHg) criterion. Total mercury concentrations consistently increased from upstream to downstream sampling sites. In addition, MeHg concentrations were on average higher in the wet season than in the dry seasons.
3. **Salinity.** Water samples from the agricultural drains (e.g., Knights Landing Ridge Cut and Willow Slough Bypass) had elevated levels for salinity (i.e., for electrical conductivity and total dissolved solids [TDS]). In-bypass salinity increased downstream through the Tule Canal/Toe Drain.

**Table 4.2-1. Section 303(d) List of Impaired Water Bodies Contributing to the Yolo Bypass**

| Water Body | Pollutant | Potential Source |
|---|---|---|
| **Cache Creek** | Boron<br>Mercury<br>Unknown toxicity | Unknown<br>Resource extraction<br>Unknown |
| **Colusa Basin Drain (Knights Landing Ridge Cut)** | Azinphos-methyl (guthion)<br>Carbofuran<br>DDT (dichlorodiphenyltrichloroethane)<br>Diazinon<br>Dieldrin<br>*Escherichia coli* (*E. coli*)<br>Group A pesticides<br>Low dissolved oxygent<br>Malathion<br>Mercury<br>Unknown toxicity | Agriculture<br>Agriculture<br>Unknown<br>Agriculture<br>Agriculture<br>Unknown<br>Agriculture<br>Unknown<br>Agriculture<br>Resource extraction<br>Agriculture |
| **Delta (eastern portion)** | Chloropyrifos<br>DDT<br>Diazinon<br>Group A pesticides<br>Invasive species<br>Mercury<br>Unknown toxicity | Urban runoff/storm sewer/agriculture<br>Agriculture<br>Agriculture/urban runoff<br>Agriculture<br>Unknown<br>Resource extraction<br>Unknown |
| **Feather River (Lake Oroville Dam to confluence with Sacramento River)** | Chlorpyrifos<br>Group A pesticides<br>Mercury<br>PCB (polychlorinated biphenyls)<br>Unknown toxicity | Unknown<br>Agriculture<br>Resource extraction<br>Unknown<br>Unknown |
| **Knights Landing Ridge Cut (Yolo County)** | Boron<br>Dissolved oxygen<br>Salinity | Unknown<br>Unknown<br>Unknown |
| **Putah Creek (Solano Lake to Putah Creek sinks, partly in Delta Waterways, northwestern portion)** | Boron<br>Mercury | Unknown<br>Resource extraction |
| **Sacramento River (Knights Landing to the Delta)** | Chlordane<br>DDT<br>Dieldrin<br>Mercury<br>PCB<br>Unknown toxicity | Agriculture<br>Agriculture<br>Agriculture<br>Resource extraction<br>Unknown<br>Unknown |
| **Tule Canal (Yolo County)** | Boron<br>*E. coli*<br>Fecal coliform<br>Salinity | Natural sources/agriculture<br>Agriculture/nonpoint source/unknown<br>Agriculture/unknown<br>Agriculture |
| **Ulatis Creek (Solano County)** | Chlorpyrifos<br>Diazinon | Agriculture<br>Agriculture |

Source: Central Valley Regional Water Quality Control Board 2010; Available online at: (http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml); Updated in early 2012.

## Table 4.2-2. Water Quality Characteristics for the Yolo Bypass, November 2003 to October 2004

| Constituent | Units | Criteria[1] | Constituent Concentration[2] by Site Characterization and Season | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Agricultural Drains[3] | | | Flood[3] | In Bypass [3] | | | West Tributaries[3] | | |
| | | | All[4] | Wet [4] | Dry[4] | n/a | All[4] | Wet[4] | Dry [4] | All[4] | Wet[4] | Dry[4] |
| **Average of All Values** | | | | | | | | | | | | |
| ***Escherichia coli*** | MPN/100mL | 126 | *4,215* | *4,643* | *3,754* | *4,000* | *1,355* | *2,266* | *562* | *599* | *535* | *928* |
| **Fecal coliform** | MPN/100mL | 200 | *4,991* | *4,192* | *5,121* | *6,000* | *1,995* | *2,936* | *1,299* | *651* | *539* | *1,012* |
| **Total coliform** | MPN/100mL | -- | 43,961 | 25,045 | 61,605 | 8,000 | 25,653 | 24,146 | 25,738 | 10,222 | 5,223 | 14,474 |
| **Boron** | µg/L | 700 | *1,347* | *1,053* | *1,494* | NA | *934* | 650 | *1,076* | *1,062* | *973* | *1,106* |
| **Boron, dissolved** | µg/L | -- | 1,320 | 970 | 1,495 | NA | 818 | 610 | 921 | 926 | 940 | 919 |
| **Aluminum** | µg/L | 87 | *1,958* | *1,575* | *2,150* | NA | *2,575* | *2,400* | *2,663* | *883* | *545* | *1,053* |
| **Aluminum, dissolved** | µg/L | -- | 7.1 | 11.3 | 5.0 | NA | 11.7 | 17.5 | 9 | 7.1 | 7.5 | 7 |
| **Chromium(III)** | µg/L | 340 | 7.3 | 5.2 | 8.4 | NA | 9.0 | 8.2 | 9 | 5.4 | 5.1 | 6 |
| **Chromium(III), dissolved** | µg/L | 395 | 1.47 | 1.48 | 1.46 | NA | 1.17 | 1.60 | 1 | 2.53 | 3.73 | 2 |
| **Copper** | µg/L | 18.3 | 6.6 | 6.0 | 6.9 | NA | 7.6 | 7.3 | 8 | 3.5 | 2.8 | 4 |
| **Copper, dissolved** | µg/L | 17.6 | 2.62 | 2.75 | 2.55 | NA | 2.77 | 2.63 | 3 | 1.66 | 1.53 | 2 |
| **Lead** | µg/L | 8.68 | 1.15 | 0.95 | 1.25 | NA | 1.17 | 1.18 | 1 | 0.53 | 0.35 | 1 |
| **Lead, dissolved** | µg/L | 5.9 | 0.15 | 0.19 | 0.13 | NA | 0.15 | 0.19 | 0.1 | 0.14 | 0.19 | 0.1 |
| **Methylmercury** | ng/L | 0.06 | *0.34* | *0.28* | *0.38* | NA | *0.33* | *0.49* | *0.26* | *0.33* | *0.38* | *0.30* |
| **Total Mercury** | ng/L | 51 | 9.4 | 6.7 | 11.7 | 22 | 13.7 | 12.6 | 14 | 10.5 | 10.3 | 10 |
| **Selenium** | µg/L | 5 | 2.8 | 2.6 | 2.9 | NA | 0.91 | 1.13 | 1 | 1.13 | 0.73 | 1 |
| **Selenium, dissolved** | µg/L | -- | 2.5 | 2.3 | 2.6 | NA | 0.98 | 1.00 | 1 | 0.85 | 0.93 | 1 |
| **Nitrate** | mg-N/L | 10 | 0.73 | 0.41 | 0.89 | NA | 1.72 | 0.60 | 2 | 3.10 | 2.98 | 3 |
| **Total organic carbon** | mg/L | -- | 8.6 | 10.5 | 8.0 | NA | 7.5 | 7.5 | 8 | 4.8 | 4.8 | 5 |
| **Dissolved organic carbon** | mg/L | -- | 8.2 | 7.8 | 8.3 | NA | 7.1 | 7.5 | 7 | 4.7 | 4.8 | 5 |
| **Electrical conductivity** | umhos/cm | 700 | *797* | *786* | *787* | 120 | 607 | 548 | 661 | 532 | 514 | 542 |
| **Total dissolved solids** | mg/L | 450 | *494* | *485* | *498* | NA | 381 | 335 | 400 | 328 | 328 | 329 |

### Table 4.2-2. Water Quality Characteristics for the Yolo Bypass, November 2003 to October 2004

| Constituent | Units | Criteria[1] | Constituent Concentration[2] by Site Characterization and Season | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Agricultural Drains[3] | | | Flood[3] | In Bypass [3] | | | West Tributaries[3] | | |
| | | | All[4] | Wet [4] | Dry[4] | n/a | All[4] | Wet[4] | Dry [4] | All[4] | Wet[4] | Dry[4] |
| **Average of All Values - continued** | | | | | | | | | | | | |
| **Total suspended solids** | mg/L | -- | 69 | 55 | 74 | NA | 58 | 62 | 56 | 21 | 22 | 21 |
| **Average of Detected Values[5, 8]** | | | | | | | | | | | | |
| **Diuron** | µg/L | 10 | 0.32 | 0.55 | 0.17 | NA | 0.30 | 0.40 | 0.10 | ND | ND | ND |
| **Methomyl** | µg/L | 0.52 | ND | ND | ND | NA | ND | ND | ND | *0.7* | *0.7* | ND |
| **4,4'-DDE[6]** | µg/L | 0.00059 | *0.01* | ND | 0.01 | NA | ND | ND | ND | ND | ND | ND |
| **Chlorpyrifos[7]** | µg/L | 0.009 | *0.03* | *0.04* | *0.01* | NA | ND | ND | ND | *0.02* | *0.02* | *0.02* |
| **Diazinon[7]** | µg/L | 0.1 | 0.03 | 0.03 | ND | NA | ND | ND | ND | 0.04 | ND | 0.04 |

Source: City of Woodland 2005

[1] Indicating lowest potentially applicable water quality criteria, as presented in the City of Woodland (2005) report.

[2] *Italicized values exceed stated criterion.*

[3] "Agricultural Drains" = Knights Landing Ridge Cut, Willow Slough Bypass, and the "Z" drain; "Flood" = flood waters over the Fremont and Sacramento weirs; "West Tributaries" = Putah and Cache creeks.

[4] "Wet" season includes December-April; "dry" season is all other months.

[5] While entire classes of pesticides were monitored, only five were ever detected and are listed in the table.

[6] DDT is classified as an organochlorine pesticide (OC). DDT breaks down to DDE in the environment. This class of compounds is generally characterized as having a high tendency to partition to particles, to be bioaccumulative, and to persistent in the environment. 4,4'-DDE was detected in three samples, all of which exceeded the applicable criterion. The only detected pesticide in sediment samples was 4,4'-DDE, but in Putah Creek (*not* one of the three sites where DDE was detected in the water column). DDT was not detected in any samples.

[7] Chlorpyrifos and diazinon are organophosphate pesticides (OP). In recent years they have been widely used insecticides in agricultural and urban areas. These pesticides are used on orchard crops during the dormant season (i.e., the wet season). Diazinon and chlorpyrifos are being phased out by a federal ban for most residential and commercial uses, although agricultural uses continue. Diazinon was never measured as exceeding its applicable criterion, while the four samples with detectable concentrations of chlorpyrifos all exceeded its applicable criterion.

[8] The pesticides detected in westside tributaries likely come from current, legal uses on farmland or from soil in the case of legacy pesticides such as DDE. While DDE was detected in one soil sample, all other pesticides were below detection limits in all other sediment samples. Diuron (a carbamate pesticide used on a variety of crops) was detected more often and at more sites than any other pesticide. Sinks or losses of pesticides include volatilization, degradation, trapping in local soil, and bio-uptake. The dominant loss mechanism is likely degradation for OPs and sedimentation for OCs.

"NA" indicates that no data are available; no samples were collected.
"ND" indicates that all samples were not detected.
"MPN" is an abbreviation for mean probable number.
Units: mg/L: milligrams/liter; mg-N/L: milligrams nitrogen/liter; ug/L: micrograms/liter; umhos/cm: micromhos/centimeter

4. **Organic Carbon.** Organic carbon appears to originate from a variety of sources that contribute to water quality throughout the year. Elevated in-bypass for total organic carbon (TOC) and dissolved organic carbon (DOC) were measured in samples from agricultural and toe drains.

5. **Total Suspended Solids (TSS).** In general, TSS concentrations increased during the wet season for westside tributaries and in-bypass sample sites. Elevated TSS samples were measured from agricultural drains during the dry season.

The three major water sources affecting this region are the Sacramento River, westside tributaries, and agricultural drains. These sources are discussed below.

### Sacramento River

The Sacramento River drains an extensive area of northern California including parts of the Sierra Nevada, the Coast Range, and the Central Valley, which receive higher annual precipitation than the San Joaquin Valley. From 1921 to 2003, the average annual Sacramento River outflow has been approximately 22 million acre-feet (ac ft) for the 27,000-square-mile (17 million acres) watershed — about 16 percent of California's land area.

The watershed contains a diverse mix of agricultural, open space, and urban land uses. More than two million acres of watershed lands are in agricultural production (Central Valley Regional Water Quality Control Board [CVRWQCB] 2009). As indicated in **Table 4.2-1**, the Sacramento River, at the point where it spills into the Yolo Bypass, is classified as "impaired" by mercury and unknown toxins by the USEPA. A total maximum daily load (TMDL) for the control of mercury for the Sacramento River and Delta has been adopted by the CVRWQCB (CVRWQCB 2010). Detailed discussions on mercury and TMDL are presented elsewhere in this section.

Additionally, Sacramento River flood-waters had bacteria levels (measured as total coliform, fecal coliform, and *Escherichia coli*) that far exceeded the CVRWQCB's water quality objectives. Salinity in the flood-waters was the lowest measured at any of the sampling sites throughout the entire area, whereas agricultural drainage water salinities were the highest and exceeded the CVRWQCB criterion for TDS. DOC levels were similar across all samples (flood waters were not sampled) except for wet-period agricultural drain levels, which were three orders of magnitude higher than all the other samples.

Since most water from the Sacramento River enters the Yolo Bypass directly during extreme high flows (i.e., periodic flood events), the quality of the water during these events may be different than under normal flow conditions.

### Westside Tributaries

The westside tributaries of Putah and Cache creeks are natural water bodies with diverse land uses and highly managed flows within their watersheds (see **Figure 4.1-1**). These creeks have lower levels of bacteria, TOC, DOC, total suspended sediment (TSS), pesticides, and salinities; but do contain higher levels of nitrate and metals (including mercury) than, for example, agricultural drains (City of Woodland 2005).

Historic mercury mines, naturally mercury-latent soils, and geothermal springs within the watersheds of both of these tributaries lead to both being sources of elemental mercury to the Yolo Bypass (CVRWQCB 2004). Cache and Putah creeks and all of their major reservoirs are currently listed as impaired by mercury on the USEPA § 303(d) list (see **Table 4.2-1**) (CVRWQCB 2006).

#### Agricultural Drains

Knights Landing Ridge Cut and Willow Slough Bypass, identified as agricultural drains, are mostly artificial channels constructed to convey irrigation and/or drainage water from agricultural operations (see **Figure 4.1-1**). These tributaries to the Yolo Bypass usually have water quality conditions similar to other agricultural drainage waters. The City of Davis also discharges its wastewater effluent to Willow Slough Bypass. The City of Woodland (2005) described the water quality characteristics of these agricultural drains throughout the course of a 12-month period (see **Table 4.2-2**), as typically having elevated levels of bacteria (measured as total coliform, fecal coliform, and *Escherichia coli*), TOC and DOC, TSS, pesticides, and salinities. The bacteria and salinity water quality objectives were exceeded within these sources on several occasions, with TSS and salinity levels higher during the dry season.

### Cache Slough Complex

#### Tributary Inflows

The Sacramento and San Joaquin rivers are the primary tributaries to the Delta. Other smaller rivers and creeks also contribute flow seasonally or year-round. In the Cache Slough Complex, the dominant tributary is the Sacramento River, which enters the system just south of Little Egbert Tract. The water quality of the Sacramento River is generally good (e.g., low salinity, nutrients, TSS, etc.); however, the river has elevated levels of mercury and general toxicity.

#### Agricultural and Discharges

The watershed of the Cache Slough Complex is dominated by agriculture. Small watershed streams flow into the system, as well as into direct agricultural drainage discharge points along the sloughs (see **Figure 4.1-2**). Discharges can cause water quality impairment during certain times of the year, particularly during the winter months when watershed runoff is highest (CALFED 2005). Agricultural discharges are generally high in bromide, DOC, and TSS.

#### Municipal Diversions

The Barker Slough Pumping Plant (BSPP) is located approximately 11.5 miles to the southwest of the proposed Project site on the upstream end of Barker Slough, which is connected to Lindsey and Cache sloughs, north of Rio Vista (see **Figure 2-2**). Situated in a dead-end slough with comparatively low exchange rates, BSPP supplies water from the Delta to the North Bay Aqueduct (NBA). The NBA, part of the State Water Project (SWP), supplies drinking water to Napa County, the cities of Vallejo and Benicia, and Travis Air Force Base (Solano County Water Agency [SCWA] 2010a).

During the winter months, local runoff flows into Barker, Lindsey, and Cache sloughs. Local runoff from the Barker Slough watershed flows past BSPP (ICFI 2011). Other streams (Calhoun Cut and Big Ditch) drain into Lindsey Slough and can be tidally mixed upstream of the NBA intake. Drainage from Ulatis , Putah and Cache creeks, along with the Yolo Bypass, flow into Cache Slough and past Lindsey Slough. Some of this Cache Slough water can be tidally-mixed upstream of the NBA intake. During the spring and summer months, the NBA diversion is predominantly Sacramento River water. Overall, the source of water diverted from Barker Slough through the BSPP/NBA intake depends on the tidal flows and volumes of the sloughs, the inflow of local runoff at the upstream end of the sloughs, and the source of inflow water at the downstream ends of the sloughs (ICFI 2011).

As noted in **Table 4.2-1**, the Ulatis creek is an impaired water body, defined under § 303(d) of the CWA, as are Putah and Cache creeks. The Ulatis Creek is a flood control conveyance that drains most of the central portion of Solano County. The monitoring site at Brown Road drains the Cache Slough area, as designated in the Yolo/Solano sub-watershed, and empties into Cache Slough. Ulatis Creek has been monitored by the Sacramento Valley Water Quality Coalition (2012) at the Brown Road drains site and has measureable contaminants such as chlorpyrifos and diazinon from a mix of agricultural and urban sources.

Source water quality pumped into the NBA during the winter and spring runoff is typically higher in turbidity and TOC, thereby requiring more treatment than water diverted at other times of the year (ICFI 2011). It is suspected that these elevated constituents originate from the local watershed, which is used mostly for grazing of livestock (Department of Water Resources [DWR] 2002). Subsequent studies have shown that it is not possible to control organic carbon effectively in the NBA watershed by using traditional best management practices (BMP) measures, such as vegetative buffers and settling ponds (ICFI 2011). Instead, the studies have recommended that eliminating livestock from stream channels and implementing erosion control measures are the best BMP measures. SCWA has installed fencing and alternate water supplies to prohibit livestock access to much of the waterways in the watershed. Monitoring efforts are ongoing to test the effectiveness of these source-control measures.

To eliminate these local water quality impacts at the BSPP, along with implementing other NBA improvements, DWR is the lead agency for the proposed relocation and expansion of the NBA intake to the Sacramento River. For further information on this proposal, see **Table 4.10-1** (Related Projects) in Section 4.10, Cumulative Impacts.

## *Beneficial Uses*

### Yolo Bypass

Beneficial uses for the Yolo Bypass in the Sacramento-San Joaquin River Basin Plan include: agricultural water supply (AGR); commercial and sport fishing (COMM); water contact recreation (REC-1); non-contact water recreation (REC-2); warm freshwater habitat (WARM); warm and cold water migration corridors (MIGR); warm water spawning, reproduction and/or early development (SPWN); and wildlife habitat (WILD) (CVRWQCB 2009 and 2011).

### Cache Slough Complex

The CVRWQCB (2009 and 2011) has designated the following beneficial uses for the Delta in the Cache Slough Complex: municipal and domestic water supply (MUN), AGR, COMM, REC-1, REC-2, WARM, MIGR, SPWN, and WILD.

## *Project Site Water Quality*

The relative influence of the Yolo Bypass and Cache Slough Complex on the water quality of the Project site vary seasonally. During the summer irrigation season and the winter, non-flood season, the Project site is more influenced by the water quality within the Cache Slough Complex. The irrigation water for the Project site is drawn directly from the tidally influenced portions of Shag Slough, the Stair Step, and the Toe Drain. During non-flood periods outside of the active irrigation season, the tide gates separating the Project site from the adjacent tidal waters are opened, allowing free exchange. During flood periods, however, the site is inundated by water moving down the Yolo Bypass, which is comprised of water from the many sources described earlier in this document (Sacramento River, agricultural drains, and westside tributaries), thus changing the usual water chemistry on the Project site.

The water quality on the Project site is also heavily influenced by the management of the site itself, particularly during the summer irrigation season. The act of pumping water onto pastures and holding it there during irrigation alters its water quality. Although no site-specific data on irrigated pasture water quality are available, it can be inferred by studying similar systems. Irrigated pastures are shallowly flooded, vegetated, low-velocity systems, similar to managed wetlands and rice fields, common to the Yolo Bypass. The nature of irrigated pasture land use results in increased water temperatures, lower dissolved oxygen (DO), higher DOC/TOC, and potentially higher MeHg concentrations (discussed in detail below) (Bachand *et al.* 2011). In addition, irrigated pasture areas used for cattle grazing would be expected to have elevated organic matter and bacteria levels in surface water, due to the presence of cattle manure. When water is drained from these irrigated pastures and discharged back to the adjacent tidal sloughs, it can alter the water quality conditions of the receiving body.

As indicated in Chapter 3, Project Description, a single domestic water supply well exists within the ranch compound in the northwest corner of the site (see **Figure 2-8**). This well draws groundwater for domestic use by persons involved in agricultural operations on the Yolo Ranch portion of the Project site. The well is 144 feet (ft) deep and is screened between 104 and 144 ft below ground surface (D. C. Crew 1952). This well would remain in place for the same use and purpose with Project implementation.

### Primary Water Quality Issues

Mercury, dissolved organic matter (DOM), DO, and other criteria pollutants[13] (e.g., sediment, oil and grease, and toxic chemicals) are discussed below, in terms of regionally and locally.

[13] Other criteria pollutants may be those chemicals or substances with numeric water quality criteria or those constituents listed on the CWA § 303d list.

## Mercury

Large amounts of elemental mercury exist in the water and soils of the Delta, due to historic mining activities in local watersheds, and from ongoing atmospheric deposition from mercury generated largely from burning coal for electrical power generation[14]. Historic mercury mines, mineral springs, and mercury-laden native soils in the watersheds of Cache and Putah creeks are substantial sources of mercury to the Yolo Bypass and ultimately to the Project site.

CVRWQCB adopted a Basin Plan amendment specifically to address mercury contamination in Cache Creek (CVRWQCB 2004), highlighting the magnitude of mercury loading from that creek. Total mercury in bulk sediments from sampling sites taken from the Yolo Bypass area vary from <0.10 (microgram of mercury per gram of soil) µg/g to 2.69 µg/g (Heim *et al.* 2010), which either corresponds to or is substantially greater than concentrations found throughout the Delta and Suisun Bay (**Table 4.2- 3**).

**Table 4.2-3. Average Mercury Sediment Concentrations in the Delta and Suisun Bay**

| Site | Year Collected | Mean Concentration (µg/g) | Minimum Concentration (µg/g) | Maximum Concentration (µg/g) | Source of Information |
|---|---|---|---|---|---|
| **Yolo County** | ~2005 | 0.242 | 0.011 | 3.246 | USGS |
| **Solano County** | ~2005 | 0.091 | 0.011 | 0.231 | USGS |
| **North Delta** | 1999 | 0.170 | 0.104 | 0.320 | BDCP |
| **East Delta** | 1999 | 0.110 | 0.011 | 0.340 | BDCP |
| **Central and West Delta** | 1999 | 0.077 | 0.011 | 0.370 | BDCP |
| **Central and West Delta** | 2000-2008 | 0.106 | 0.017 | 0.417 | BDCP |
| **Suisun Bay** | 1999 | 0.270 | 0.066 | 0.580 | BDCP |
| **Suisun Bay** | 2002-2007 | 0.114 | 0.00003 | 0.413 | BDCP |

Sources of information: USGS = United States Geological Survey 2005. BDCP = Bay Delta Conservation Plan Steering Committee Administrative Draft Environmental Impact Report/Environmental Impact Statement 2012.
µg/g = micrograms of mercury per gram of sediment (1 µg/g = 1 parts per million [ppm])

As part of their soils analysis of total-mercury distribution throughout the Yolo Bypass, Heim and others (2010) sampled four locations within the Project boundary. The samples were taken within the top six inches of the soil profile and thus represent surface soil conditions. The mercury concentrations in these four samples ranged between 0.15 and 0.436 parts per million (ppm), with an average concentration of 0.243 ppm. The soil mercury concentrations in the area of the study site are substantially higher than those at the reference site used in this study (below the Fremont Weir), suggesting the mercury loading contributions from Cache and Putah creeks and potentially the contributions from upstream agricultural drainage water.

The Phase 2 environmental assessment for the Yolo Ranch property of the Project site included limited sub-surface soil analysis for mercury in an area of the ranch compound (Wallace Kuhl and Associates 2007). Although this area is outside of the restoration footprint, the samples

[14] See http://www.epa.gov/mercury/about.htm.

provide an indication of potential mercury concentrations on the Project site. The four samples were taken between 1.5 – 2 ft below the ground surface (bgs). Mercury levels in these bgs samples ranged from <0.1 – 0.17 ppm with an average concentration of 0.15 ppm.

### Methylmercury

MeHg is an organic form of mercury that is produced by iron- and sulfate-reducing bacteria in anaerobic environments (environments lacking oxygen). MeHg is an extremely potent neurotoxin and bioaccumulates in aquatic food webs to levels 10 million times higher in predator fish than in their waters. Recent investigations on MeHg dynamics within the Yolo Bypass have found that the Yolo Bypass is a net source of MeHg to the Delta. Water exiting the southern end of the Bypass at Prospect Slough via the Toe Drain generally has the second highest MeHg concentration of any channel in the Delta (Stephenson *et al.* 2008).

Under low flow (non-flood) conditions, the Bypass usually contributes between 27 and 64 percent of the total MeHg load to the Delta at Prospect Slough. During moderately high flow events , when flows from Putah and Cache creeks lead to localized flooding within the Bypass but neither the Fremont nor Sacramento weirs are overflowing into the Yolo Bypass, *in-situ* MeHg production accounted for between 36 and 39 percent of the total MeHg load to the Delta. When the Bypass experiences a flood event (i.e., inflows are originating from the Fremont and/or Sacramento weirs), MeHg concentrations and loads increase substantially over low flow and mini-flood events, with the level of *in-situ* production increasing as a function of total Bypass flow — up to 40 percent of the total production within the entire Sacramento River watershed. This contribution is substantial given that the Yolo Bypass is less than 0.5 percent of the area of the Sacramento River watershed.

Land uses within the Yolo Bypass also impact MeHg dynamics. Stephenson *et al.* (2008) noted that MeHg levels within the Toe Drain typically increased between the Lisbon Weir and the next downstream sampling locations (12 miles south). With at least 29 constructed drains along this stretch of the Toe Drain, some of which are within the Project area, water released from irrigated agricultural lands as well as seasonal and managed wetlands has been sampled. MeHg concentrations in water discharged from these drains were higher than the concentration measured at the Lisbon Weir in 85 percent of all samples. This finding indicates that discharges from these drains contribute to the substantial increase in MeHg concentrations in this stretch of the Toe Drain.

Other research on agricultural lands, managed wetlands, and tidal wetlands in the San Francisco Estuary also provides relevant details as to the range of MeHg concentrations and the degree of variability in the data. All of the studied land use types were net MeHg producers, but to varying degrees. This information is directly applicable to the Yolo Bypass and the proposed Project.

1. **Agricultural lands.** Windham-Myers *et al.* (2010) conducted a study on MeHg dynamics in agricultural lands (including rice fields) on the Yolo Bypass that experience periodic wetting and drying cycles. During both the summer irrigation season[15] and the winter,

[15] The summer irrigation season varies in duration for different cropping practices ranging from about 60 days for fallow fields to over 120 days for rice and wild rice.

filtered[16] and unfiltered MeHg concentrations increased from inflows to outflows, while inflow unfiltered MeHg trended similarly but at much higher levels.

- **Summer Irrigation Season. Filtered MeHg Concentrations:**
    - Averaged at inflow: 0.5 nanograms per liter (ng/L)
    - Averaged at outflow: 0.65 ng/L
- **Summer Irrigation Season. Unfiltered MeHg Concentrations:**
    - Averaged at inflow: 0.9 ng/L
    - Averaged at outflow: 2.5 ng/L
- **Winter Irrigation Season. Filtered MeHg Concentrations:**
    - Averaged at inflow: 0.8 ng/L
    - Averaged at outflow: 1.8 ng/L
- **Winter Irrigation Season. Unfiltered MeHg Concentrations:**
    - Averaged at inflow: 1.2 ng/L
    - Averaged at outflow: 3.2 ng/L

These data indicate that the agricultural lands were generating and exporting MeHg in both summer and winter periods in waters already high in MeHg concentration. The higher ratio of inflow to outflow concentrations with unfiltered samples indicates that much of the MeHg load may be bound to sediments in the agricultural discharge water.

2. **Managed wetlands.** A study of MeHg concentrations in managed wetlands (i.e., waterfowl habitat) in Suisun marsh revealed MeHg concentrations that were 15 ng/L for unfiltered MeHg with a mean of 2 ng/L and 75 percent of samples with less than 3 ng/L (Siegel *et al.* 2011). Seventy-five percent of filtered MeHg samples were below 1 ng/L. Most water samples exceeded the Delta MeHg TMDL's goal of 0.06 ng/L. Drain water discharged from these wetlands had filtered MeHg concentrations from 0.05 – 0.2 ng/L higher than input water, while averaged unfiltered MeHg concentrations in drain water ranged from 0.4 ng/L less to 1 ng/L higher than input water. These wetlands have several discrete flood-up and draw-down events from early fall to mid-spring each year.

3. **Tidal wetlands.** A MeHg dynamics study was performed in tidal wetlands within San Pablo Bay (Yee *et al.* 2008). Filtered MeHg concentrations were in the range of concentrations observed in San Pablo Bay itself (0.1 – 0.3 ng/L). During a 24-hour sampling period, MeHg concentrations in waters ebbing from the wetlands were elevated compared to concentrations in the flood tide source water. During this tidal cycle, ebb tide filtered MeHg concentrations were generally in the range of 0.1 – 0.2 ng/L, while flood tide concentrations were generally <0.1 ng/L. A similar result was found in the tidal marshes on Browns Island at the extreme western end of the Delta (Bergamacschi *et al.* 2011). The tidal marsh MeHg concentration values are well below values for agricultural discharge waters on the Yolo Bypass and for managed wetlands in Suisun Marsh.

[16] MeHg concentrations in water are typically reported as unfiltered values representing water samples that may contain suspended matter and as filtered values representing concentrations after suspended matter has been filtered out. These two measures thus compare how much MeHg is dissolved in the water and how much is associated with suspended matter.

However, it is recognized that these concentrations nearly doubled in just six hours, every tidal cycle. The net load offsite was also quite high on a per acre basis.

Based on these scientific investigations, the rice fields were found to have the highest MeHg concentrations and had the highest loading of MeHg, due to the large discrete exports of water during field drainage and harvest activities.

At the other end of the spectrum for MeHg distribution, a study conducted by Heim *et al.* (2009) on farmed islands with mineral soils in the Delta found that such sites may act as a MeHg sink. MeHg concentrations collected from farmed islands where mineral soils predominate were lower than islands where organic soils predominate. For example, MeHg concentrations in a two-meter deep well in a cornfield (0.196 ng/L) were much lower than in a rice field (3.42 – 8.54 ng/L).

Managed permanent wetlands had the lowest concentrations of MeHg, as well as the lowest MeHg loads, because of minimal export of water out of them. Seasonal wetlands had exports similar to those of the rice fields. Still, other factors influence the fate, distribution, and loading of MeHg that further complicate understanding MeHg dynamics. The actual loading of MeHg from wetlands, be they natural or agricultural, depends heavily on the rate of hydrologic exchange with the surrounding environment (Windham-Myers *et al.* 2010). Limiting exchange allows the breakdown of MeHg by photodemethylation, biological uptake, and exchange between sediment and water pools prior to release, thus reducing the actual load of MeHg to receiving waters (Alpers *et al* 2008; Stephenson *et al.* 2008). However, restricted hydrologic exchange will increase resident time, which promotes the anoxic conditions that foster MeHg formation, and will expose organisms within the isolated wetland to high MeHg concentrations (Windham-Myers *et al.* 2010). **Table 4.2-4** indicates the variability of MeHg mass loadings in years 2000 and 2001 along Cache Creek and the Yolo Bypass.

**Table 4.2-4. Methylmercury Loads from Two Storm Events along Cache Creek and Yolo Bypass**

| Site Name | Methylmercury Load (grams/day) | |
|---|---|---|
| | Storm One[1] | Storm Two[2] |
| North Fork Cache Creek at Highway 20 | 0.45 | 0.11 |
| Davis Creek Reservoir at Dam, near Knoxville | 0.05 | NS |
| Cache Creek at Rumsey | 0.67 | 1.45 |
| Cache Creek into Settling Basin | 6.7 | 1.12 |
| Cache Creek out of Settling Basin | 5.1 | 0.75 |
| Yolo Bypass at Interstate 80 near West Sacramento | 21.8 | 1.22 |
| Lower Yolo Bypass[3] | 17.7 | 0.73 |

Source: Domagalski *et al.* 2004
[1] Storm One: sampling occurred from 27 February 2000 through 30 March 2000.
[2] Storm Two: sampling occurred from 20 February 2001 through 23 February 2001.
[3] The sample site was just upstream of where the Yolo Bypass discharges into the Delta region.
NS = not sampled

**Table 4.2-5** displays limited and seasonal sampling of MeHg in surface waters of Cache Creek and Yolo Bypass for 2005 and 2006. As discerned collectively from the various tables presented in this section, MeHg production and cycling is complex, dependent upon a number of interconnected biotic and abiotic processes (Alpers *et al.* 2008; Bachand *et al.* 2011a; Gill *et al* 1999; Holmes and Lean 2006; Windham-Myers *et al.* 2010).

**Table 4.2-5. Methylmercury Concentrations in Surface Waters of Cache Creek and Yolo Bypass**

| Site Location | Date | Time (hour) | u-MeHg[1] (ng/L) | f-MeHg[2] (ng/L) |
|---|---|---|---|---|
| **Phase I: Reconnaissance Sampling** | | | | |
| **Cache Creek Nature Preserve, southwest zone near outflow** | 2005-10-05 | 12:20 | 0.61 | ND |
| **Yolo Bypass Wildlife Area, Permanent Wetland** | 2005-10-05 | 17:00 | 0.71 | ND |
| **Yolo Bypass Wildlife Area, Seasonal Wetland** | 2005-10-05 | 18:00 | 1.48[3] | ND |
| **Phase II: Seasonal Sampling** | | | | |
| **Yolo Bypass Wildlife Area, Permanent Wetland** | 2005-10-31 | 13:20 | 0.41 | 0.30 |
| **Yolo Bypass Wildlife Area, Permanent Wetland** | 2006-05-22 | 13:15 | 1.10 | 0.26 |
| **Yolo Bypass Wildlife Area, Seasonal Wetland** | 2005-10-31 | 15:20 | 1.72 | 0.78 |
| **Yolo Bypass Wildlife Area, Seasonal Wetland** | 2006-05-22 | 15:30 | 1.05 | 0.15 |
| **Yolo Bypass, Inflow to Seasonal Wetland** | 2005-10-31 | 16:40 | 0.26 | 0.13 |
| **Yolo Bypass, Outflow drain from Seasonal Wetland** | 2006-05-22 | 17:00 | 0.23 | 0.15 |

Source: Marvin-DiPasquale *et al.* 2009
[1] u-MeHg = unfiltered methylmercury.
[2] f-MeHg = filter-passing methylmercury.
[3] Average of field replicate samples.
ng/L = nanograms per liter.
MeHg concentrations in water are typically reported as unfiltered values representing water samples that may contain suspended matter and as filtered values representing concentrations after suspended matter has been filtered out. These two measures thus compare how much MeHg is dissolved in the water and how much is attached to the suspended matter.
ND = not detected

At least four generalities from the scientific literature can be made regarding MeHg in aquatic environments that are directly applicable to the Project site:

1. MeHg production is generally higher in surface sediments than the overlying water, due to higher bacteria concentrations and more reduced conditions in sediments (Alpers *et al.* 2008).
2. Lower surface water DO concentrations, more episodic hydroperiods, and presence of more vegetation appear to increase MeHg flux from the sediments (Holmes and Lean 2006; Siegel *et al.* 2011; Ullrich *et al.* 2001).
3. The Delta is a net sink for MeHg, with losses from photodemethylation and particle settling exceeding gains from inflows and sediment flux (Wood *et al.* 2010).

4. Wetlands have long been known as net producers of MeHg, as they typically provide conditions ideal for methylation (e.g., shallow water, elevated water temperatures, ample sources of labile carbon, low DO levels, etc.) (Hurley *et al.* 1995; Rudd 1995; St. Louis *et al.* 1994). Floodplains and seasonal wetlands, which are typically flooded intermittently during later winter and spring, generally have the highest MeHg concentrations. High elevation tidal marshes that are flooded only during the highest springtide typically have relatively high sediment MeHg content. Lower elevation tidal marshes that experience regular wetting on a daily basis tend to have lower MeHg concentrations (Yee *et al.* 2008; Alpers *et al.* 2008). Permanently flooded habitats such as open-water zones with various types of aquatic vegetation (submerged, floating, and emergent) tend to be lower in MeHg in water and sediment than seasonally or regularly flooded habitats.

Despite these four qualitative generalities, sufficient data and information is not available to quantify accurately the MeHg concentrations and loads onto and off of the Project site under existing conditions. The multitude of site-specific factors that affect mercury methylation and demethylation rates (e.g., available organic carbon, inundation period and cycling, mercury concentrations in soils, vegetation characteristics), the resulting MeHg loading to adjacent waters (e.g., hydrologic connectivity with adjacent systems, hydrologic flow paths, and water recycling opportunities), and the currently available science do not support using non site-specific data to quantify accurately and reliably the MeHg production and loading at the Project site. Therefore, the remainder of this subsection on MeHg presents a qualitative assessment of MeHg production and loading under current site conditions.

During the summer irrigation season, MeHg production within the Project area is likely relatively high. Most of the site is managed as irrigated pasture, which has conditions that are conducive to MeHg production, such as shallow inundation, dense vegetation, and wetting/drying cycles on the order of days to weeks. As described earlier, agricultural wetlands studied within YBWA, including rice fields and fallow rice fields, all generally increased MeHg concentrations from inflow to outflow almost three-fold. Mean unfiltered MeHg concentrations in outflows were 2.85 ng/L, 47 times greater than the Delta MeHg TMDL's concentration goal (i.e., 0.06 ng/L).

MeHg samples were also taken at several agricultural drains along the Toe Drain, during non-flood periods in 2005 (Stephenson *et al.* 2008). These drains transport tailwater from irrigated agricultural operations as well as from some managed wetlands. The concentrations in the water flowing from these drains was highly variable (0.21 – 5.18 ng/L) with a mean concentration of 1.63 ng/L. This high variability is likely due to site-specific differences in the many aforementioned factors contributing to MeHg production in the various areas connected to these drains. Two of the drains sampled received water from agricultural operations on the Project site. The concentrations at these drains ranged from 0.23 – 1.18 ng/L (mean: 0.56 ng/L). The MeHg concentrations found within the irrigated pasture, irrigation ditch, and non-tidal wetland habitat on the Project site likely falls within the range of values presented in this discussion.

During the sampling period of that study, the unfiltered MeHg concentration in the Toe Drain, which comprised of water from numerous sources upstream and downstream including the sampled agricultural drains, ranged from 0.272 – 1.19 ng/L. The average concentration difference between drain water from the 2005 study and Toe Drain MeHg concentrations was 0.91 ng/L; indicating that these drains contain elevated MeHg levels. The data from the Windham-Myers *et al.* (2010) study also indicate that unfiltered MeHg concentrations on agricultural wetlands could be higher than source water by about 1 – 2 ng/L.

Data do not exist to accurately quantify the amount of drainage water volumes and the relative percent of recycled water and water discharged directly to the surrounding Delta tidal waterways. However, based on an understanding of irrigation operations and the appropriative water rights on the Project site, approximately 9,000 ac-ft of drainage water is estimated to be generated annually on the Project site (cbec Ecological Engineering 2011). Roughly 60 percent of that water, or 5,500 ac-ft, is re-circulated internally before discharge offsite while an estimated 40 percent of that water, or 3,500 ac-ft, is discharged directly offsite without re-circulation (cbec Ecological Engineering 2011).

MeHg is generated on the irrigated fields and rapidly equilibrates (i.e., net sediment flux in equates net losses). MeHg in the drainage canal also equilibrates quickly to a slightly lower concentration. Re-circulated water then varies between those two equilibrium states. The largest load of Project site irrigation water into the adjacent tidal system may occur at the end of the irrigation season, when the water control structures are opened to allow free hydrologic exchange in advance of the flood management season. This action may result in a substantial, discrete load of MeHg to the Delta.

During the irrigation season, organisms living within the Project site are subjected to potentially high MeHg levels in water and soils, due to the low level of hydrologic exchange with the adjacent tidal waters. Aquatic organism movements, between the site and adjacent areas, are essentially a one-way process where individuals enter the major irrigation ditches through the water control structures on rising tides and cannot exit on ebb tide, as the flap gates close to prevent drainage. MeHg bioaccumulation rates in aquatic organisms trapped onsite are anticipated to be greater than those in the adjacent Delta. This bioaccumulated MeHg in aquatic organisms transfers into the terrestrial foodweb via predation by birds, reptiles, and mammals.

During the winter flood management period, MeHg production across much of the site is likely limited to periods of flood inundation and rainfall-induced ponding (Heim *et al.* 2009). The initial flood produces a MeHg load pulse regardless of the flood's duration. Over time, the flooded land continues to generate MeHg, just at a slower rate, with the total flood load continuing to increase over time. When the Yolo Bypass is not flooded, MeHg production occurs within the existing seasonal and permanent wetlands and, to a lesser extent, within the major irrigation ditches onsite. However, total MeHg loads to the adjacent Delta may in fact be greater due to the more open hydrologic exchange between the systems during this time of year.

Outside of discrete flood events, MeHg exposure to aquatic organisms onsite is likely to be similar during the winter and summer but for different reasons. In winter, the open hydrological exchange between the site and the adjacent tidal waterways dilutes MeHg concentrations from whatever may be produced onsite. This open exchange not only allows regular mixing of tidal waters, but allows organisms to move freely in and out of the site, resulting in lower exposure periods and thus lower MeHg bioaccumulation rates in aquatic organisms. In summer, lower net MeHg production and reduced access for aquatic organisms reduces exposure.

As noted earlier in this section, MeHg concentrations are influenced by a number of factors, included DOC. Heim *et al.* (2009) conducted a study to quantify MeHg discharges from Delta farmed islands. Farmed islands compose roughly 70 percent of the total areas of the Delta and use water from Delta channels for irrigation. The study found that MeHg concentrations were significantly correlated (at the 95 percent confidence level) with DOC concentrations and that flushing of shallow zone groundwater (porewater) by the addition of new water is a possible mechanism that explains MeHg concentrations in subsurface drains on Delta Islands.

### Dissolved Organic Matter

One of the Project's objectives would be to enhance the regional food web in support of delta smelt recovery. To accomplish this objective, one approach would be to increase exports of organic matter to the Delta ecosystem. DOM, often quantified as DOC or TOC, is a water quality constituent of concern because during drinking water disinfection, DOC reacts with disinfecting agents (e.g., chlorine, chloramines, and ozone) to form toxic compounds known as disinfection byproducts (DBP) (Leenheer and Croue 2003). Common DBP produced by this process are trihalomethanes (THM) and haloacetic acids (HAA), which are regulated by USEPA (USEPA 2006). DOC is of concern to this Project because the BSPP, located about 11.5 miles to the southwest of the Project site, supplies water from the Delta to the NBA for use in domestic water supplies for several northern Bay Area communities. Source water quality pumped into the NBA during the winter and spring runoff is typically higher in turbidity and TOC, requiring more treatment than water diverted at other times of the year (ICFI 2011).

DOM is produced naturally from decomposing organic matter. Organic carbon can be produced within a given system by phytoplankton, benthic microalgae, microalgae, aquatic vegetation, photosynthetic bacteria, or imported from river flows, stormwater runoff, atmospheric deposition, oil spills, or other external sources (Jassby 1992, Jassby *et al.* 1993). USEPA modeled the TOC import and export from the Delta under different climatic conditions (USEPA 2006). During a typical wet year, TOC imports to the Delta from watershed sources were estimated at 155,000 tons. Within the Delta, dewatering from Delta islands and other agricultural sources contributed 24,000 tons, and tidal marsh export and primary production together contributed 12,000 tons. Most of the TOC was estimated to be exported to the Bay, with approximately 28,000 tons being taken in by the various water supply systems. During dry years, TOC contribution from the watershed was reduced to 54,200 tons, while contributions from within the Delta were estimated to remain the same.

The contribution of these various sources to the DOM pool can vary seasonally based on ecosystem productivity (Kraus *et al.* 2008). It is believed that during winter months, organic carbon in Barker Slough originates from land sources, while during the summer months it is generally produced directly by decaying material in aquatic habitats (CALFED 2005). The periods of highest organic carbon concentration occur primarily in winter months and coincide with periods of high runoff from the surrounding watershed (CALFED 2005).

A study on relative contributions of aquatic habitats within the Delta to the overall DOM pool indicated that wetlands are substantial producers of DOM during the spring and summer months and that the DOM produced in these systems has a greater propensity to form HAA and THM than incoming river water (Kraus *et al.* 2008). Consequently, perception and concern exist that widespread wetland restoration within the Delta could potentially increase the formation of DBP in drinking water extracted from this system (California Bay-Delta Authority 2003).

### Dissolved Oxygen

DO is a water quality constituent of concern because most aquatic organisms, including fish and benthic/pelagic macro-invertebrates, require DO concentrations of 5.0 mg/L or greater for optimal performance and health. Most fish cannot tolerate DO concentrations below 2.0 mg/L for long periods of time (Nobriga 2008) and may die if they cannot escape these low DO conditions (Siegel *et al.* 2011).

DO levels in the Project area are generally suitable for aquatic life (Kimmerer 2004). Water samples collected[17] between 2009 and 2011 in conjunction with the CVRWQCB's Irrigated Lands Regulatory Program found DO levels range between 7.0 and 13.3[18] mg/L mid-channel of Shag Slough near the Liberty Island Bridge. Additionally, sampling[19] in 2009 measured DO levels between 5.6 and 9.2 mg/L mid-channel of the Toe Drain near Dredger Cut. There are no known surface water impairments[20] relating to physical constituents (e.g., pH, DO, or electrical conductivity) in the Solano-Yolo sub-watershed as identified during routine sampling through the Irrigated Lands Regulatory program (CVRWQCB 2010).

There is also a high degree of variability of DO levels even within the same water source. For example, a 2007 study on mercury cycling in agricultural/non-agricultural wetlands in the YBWA found that conditions in the rice fields fluctuated greatly through the day, with DO levels dropping from 14 mg/L in the afternoon to 2 mg/L at dawn[21] (Fleck *et al.* 2007).

Though published data on DO levels in agricultural or managed wetland drainage water discharged from the Project site are lacking, a qualitative assessment can be made based on conditions found in systems with similar vegetation and hydrologic management characteristics. Recent research in irrigated alfalfa and orchard grass fields in the Willow Slough region of Yolo County indicate that, on average, DO concentrations in discharge water are reduced approximately 50 percent from inflow concentrations. The average DO concentration in discharge water from both field types was about 3.0 mg/L (Bachand *et al.* 2011a).

[17] Water samples can be found at the California Environmental Data Exchange Network (CEDEN) at www.ceden.org. This online clearinghouse provides information collected by its participants about California's water bodies, including streams, lakes, rivers, and the coastal ocean. The data is aggregated and is made available by CEDEN to environmental managers and the public. The Shag Slough station is identified by CEDEN as Code: 511XSSLIB.

[18] Two data topped over 13 mg/L out of 29 samples collected to date at the Shag Slough station. One sample was collected near the bank on April 20, 2009 and the other was taken mid channel on January 19, 2010. Five additional samples were between 10.4 and 12.4 mg/L, while the remainder of the 29 samples ranged between 7 and 9 mg/L.

[19] Water samples listed in CEDEN database at www.ceden.org. The Toe Drain at Dredger Cut is identified as Code: 510TDD011.

[20] See Central Valley Regional Water Quality Control Board 2010a. *Irrigated Lands Regulatory Program Draft Program Environmental Impact Report*. Section 5.9, Hydrology and Water Quality: see Table 5.9-4 on page 5.9-15.

[21] Information on this study can be found at http://adsabs.harvard.edu/abs/2007/AGUFM.B11B0394F.

Managed wetlands in Suisun Marsh can have extremely low DO concentrations in drainage water (from 0 – 2.0 mg/L) regardless of inflow DO concentrations, which often produce localized DO sags in the receiving sloughs (Siegel *et al.* 2011). Annual maintenance activities at these sites occur during the summer and early fall months, after vegetation has peaked earlier in the year. The resultant production of organic matter and its decomposition creates a high biological oxygen demand (BOD) from microbial respiration and a decrease in DO concentrations. When the fall floods arrive, this cycle of high BOD and low DO waters then flow into receiving waters (i.e., tidal sloughs).

Based on the above information, discrete discharge events from agricultural ditches and managed wetlands on or near the Project site may contribute low DO water, which could have short-term impacts to DO levels in the adjacent tidal sloughs.

#### Other Criteria Pollutants

Other pollutants can include:

1. Increased suspended sediments from construction activities in waterways, or in runoff from adjacent areas.
2. Fuel, oil, grease, and other toxic chemicals from construction equipment and vehicles during construction, maintenance, and routine operations.
3. Trash and debris from construction areas and illegal dumping activities, as well as from other adjacent areas.

High levels of suspended sediment can increase turbidity, thus shading aquatic vegetation and reducing visibility for sight-feeding fish and other aquatic organisms. They can also cause damage to gill filaments and reduce respiratory efficiency. Fuel, oil, and grease form visible slicks on the water surface and are toxic chemicals that can impact aquatic and terrestrial organisms. Trash is a nuisance and unsightly and can also cause harm to aquatic and terrestrial organisms that become tangled in it or attempt to consume it.

## *Regulatory Setting*

Actions that may affect water quality at the Project site are subject to applicable federal, state, and local laws, regulations, and policies as described below.

### Federal Law and Regulations

#### Clean Water Act

CWA regulates the discharge of pollutants into waters of the United States and sets federal standards for water quality. It accomplishes this mandate through § 401 by requiring a permit for an activity that may result in the discharge of pollutants to waters of the United States. This requirement is coordinated through the state to obtain a water quality certification that the activity complies with all applicable water quality standards. In the Delta, the CVRWQCB is the agency responsible for implementing § 401.

Additionally, CWA §402 created the National Pollutant Discharge Elimination System (NPDES) Permit Program. Entities and government agencies with point source discharges to surface waters are required to have NPDES permits. Regulated point source discharges include many types of facilities as well as storm-water dischargers from construction sites. The proposed Project would require permits under both sections (i.e., § 401, §4 02) of the CWA. Regulatory requirements of the Project under § 404 of the CWA are described in detail in Section 4.3, Terrestrial Biological Resources.

## State Law, Regulations, and Policies

### Porter-Cologne Water Quality Control Act

The CVRWQCB is responsible for protecting water quality in waters of the state within the Delta. The CVRWQCB (2009) *Water Quality Control Plan for the Sacramento River and San Joaquin River Basins* (Basin Plan) designates existing and potential beneficial uses for each water body within its geographic region, and sets numeric and narrative water quality objectives to protect the beneficial uses. For example, CVRWQCB has established a minimum DO criterion of 5.0 mg/L within the waters of the Delta (CVRWQCB 2009). The DO criteria within the mainstems of the Sacramento and San Joaquin rivers are 7.0 mg/L and 6.0 mg/L, respectively (CVRWQCB 2009).

For example, the CVRWQCB has established the following objectives for three pollutant types (i.e., turbidity, oil and grease, and trash) to maintain the beneficial uses of Delta waters (CVRWQB 2009):

1. **Turbidity.** Except during periods of storm runoff, the turbidity of Delta waters shall not exceed 50 nephelometric turbidity units (NTUs) in the waters of the Central Delta and 150 NTUs in other Delta waters. Exceptions are made for dredging projects.
2. **Oil and grease.** Waters shall not contain oils, greases, waxes, or other materials in concentrations that cause nuisance, result in a visible film or coating on the surface of the water or on objects in the water, or otherwise adversely affect beneficial uses.
3. **Trash (settleable, suspended, or floating material).** Water shall not contain material in amounts that cause nuisance or adversely affect beneficial uses.

Delta water quality is also regulated under the State Water Resources Control Board's (SWRCB's) *Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary* (Bay-Delta Plan). The Bay-Delta Plan includes water quality objectives for the purpose of the Estuary's beneficial uses (SWRCB 2006).

### CVRWQCB Mercury Total Maximum Daily Load

On April 22, 2010, the CVRWQCB adopted a TMDL — an official calculation of the maximum amount of a pollutant that a water body can receive and still meet water quality standards — for the control of MeHg and total mercury in the Delta [Resolution R5-2010-0043] (CVRWQCB 2010 & 2011; USEPA 2011). This TMDL was adopted by SWRCB on June 21, 2011, and approved by the USEPA on October 20, 2011.

This Delta MeHg TMDL sets limits for the amount of MeHg that may be discharged by both point and non-point sources to various sub-regions of the Delta over the period of a year. The Yolo Bypass, where the Project site is located, is allocated a total MeHg load of 235 grams (g)/year from all possible sources, including wetlands (**Table 4.2-6**). This represents a 78 percent reduction from current estimated loads.

**Table 4.2-6. Methylmercury Load and Waste Load Allocations for the Yolo Bypass**

| Sources | Current Load (grams/year) | Allocation (grams/year) |
|---|---|---|
| **Agricultural Drainage[3]** | 19 | 4.1 |
| **Atmospheric Wet Deposition** | 4.2 | 4.2 |
| **Open Water** | 100 | 22 |
| **Tributary Inputs[1]** | 462 | 100 |
| **Inputs from Upstream Subareas** | --- | --- |
| **Urban (nonpoint source)** | --- | --- |
| **Wetlands[3]** | 480 | 103 |
| **National Pollution Discharge Elimination System (NPDES) Facilities[1]** | 1.0 | 0.42 |
| **NPDES Facilities Future Growth[1]** | --- | 0.60 |
| **NPDES MS4[1]** | 1.5 | 0.38 |
| **Total Loads[2]** | **1,068** | **235** |

Source: Central Valley Regional Water Quality Control Board 2010
[1] Values shown for tributary inputs, NPDES Facilities, NPDES Facilities Future Growth, and NPDES MS4 represent the sum of several individual discharges.
[2] The allocations for agricultural drainage, atmospheric wet deposition, open water, urban (nonpoint source), and wetlands plus the individual allocations for tributary inputs, NPDES facilities and NPDES facilities future growth, and NPDES MS4 within the Yolo Bypass equal the Delta subarea's Total Maximum Daily Load (assimilative capacity).
[3] The load allocations apply to the net methylmercury (MeHg) loads, where the net loads equal the MeHg load in outflow minus the MeHg loads in source water (e.g., irrigation water and precipitation).

To accomplish this reduction, this state mandate has established the Delta Mercury Control Program. The first phase of this program (October 20, 2011 through October 20, 2020) emphasizes studies and pilot projects to develop and evaluate practices to control MeHg through an adaptive management approach. All dischargers, during Phase 1, are expected to implement reasonable, feasible controls for inorganic (total) mercury. In addition, control studies would be carried out, either by individual dischargers or through collaborative efforts, to evaluate control methods, innovative actions, watershed approaches, offset projects, and other relevant studies.

For Phase 2 (approximately October 20, 2022 to October 20, 2030), dischargers would implement MeHg controls to comply with final allocations and continue inorganic (total) mercury reduction efforts. Compliance monitoring and implementation of upstream control programs also would occur in Phase 2 (CVRWQCB 2011).

### State Water Resources Control Board Resolutions

The State Water Resources Control Board has approved several policies over the years on water quality issues in the Delta and the Yolo Bypass-Cache Slough Complex:

1. The *Statement of Policy with Respect to Maintaining High Quality of Water in California* (Resolution No. 68-16) (SWRCB 1968) and the *Antidegradation Implementation Policy* (SWRCB 1986) state that whenever the existing quality of water is better than the quality established in the policies, such existing high quality will be maintained until it has been demonstrated to the state that any change will be consistent with maximum benefit to the people of the state, will not unreasonably affect present and anticipated beneficial uses, and will not result in water quality less than that prescribed in the policies.
2. The *Sources of Drinking Water Policy* (Resolution No. 88-63) (SWRCB 1988a) specifies that, except under defined exceptions, all surface and ground water of the state is to be protected as existing or potential sources of municipal and domestic water supply. The exceptions include waters with existing high TDS concentrations greater than 3,000 mg/L, low sustainable yield, or contamination that cannot be reasonably treated.
3. The *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California* (Resolution No. 2005-019) (SWRCB 2005), establishes implementation provisions and certain monitoring requirements for the priority pollutant criteria promulgated by USEPA through the National Toxics Rule and California Toxics Rule (CTR), and for priority pollutant objectives established in the Basin Plan.
4. The *Nonpoint Source Management Plan* (Resolution No. 88-123) (SWRCB 1988b) has a three-tiered management approach for addressing nonpoint pollution source problems.
5. The *Nonpoint Source Implementation and Enforcement Policy* (Resolution No. 2004-0030) (SWRCB 2004) requires the SWRCB to regulate all nonpoint sources of pollution, using the administrative permitting authorities provided by the Porter-Cologne Water Quality Control Act.
6. The *Irrigated Lands Regulatory Program* (SWRCB 2011) provides conditional waivers of waste discharge requirements (WDR) for irrigated agricultural lands, which includes managed wetlands.

## Local Policies

### Yolo County General Plan

The Yolo County 2030 General Plan (County of Yolo 2009) contains the following policies to improve or maintain water quality in waters falling within the County boundaries:

- **Policy CO-5.6.** Improve and protect water quality for municipal, agricultural, and environmental uses.
- **Policy CO-5.7.** Support mercury regulations that are based on good science and reflect an appropriate balancing of sometimes competing public values including health, food

chain, reclamation and restoration of Cache Creek, sustainable and economically viable Delta agriculture, necessary mineral extraction, flood control, erosion control, water quality, and habitat restoration.

- **Policy CO-5.21.** Encourage the use of water management strategies, biological remediation, and technology to address naturally occurring water quality problems such as boron, mercury, and arsenic.

## 4.2.2 Significance Criteria

Potential impacts to water quality would be significant if the Project would exceed any of the following threshold criteria per Appendix G of the *State CEQA Guidelines*:

1. Violate any water quality standards, or waste discharge requirements.
2. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on- or off-site.
3. Create or contribute runoff water which would exceed the capacity of existing or planned storm-water drainage systems or provide substantial additional sources of polluted runoff.
4. Otherwise substantially degrade water quality.

## 4.2.3 Impacts

### Impact 4.2-1: Temporary Impacts to Water Quality from Pollutants or Soil Erosion

*Applicable Significance Criteria: 1, 2, 3, and 4*

Construction activities would involve site grading, channel excavation, and placement of the selected soils reuse option during the dry season, in and adjacent to water bodies. A variety of construction equipment, vehicles, materials, and maintenance supplies (e.g., fuels and lubricants) would also be present onsite. As described in Chapter 3.0, Project Description, habitat restoration, repairs and installation of water control systems, and the selected soils reuse option would include Project measures to minimize impacts to the water quality onsite:

1. Prepare and implement a stormwater pollution prevention plan (SWPPP) and a spill prevention and control plan (SPCP).
2. Repair or replace broken water control structures along adjacent tidal water bodies including installation of additional flap gates to allow effective site drainage and restrict water exchange with adjacent tidal waters during construction.
3. Install a turbidity curtain on the tidal side of all water control structure replacement/repair sites to prevent excessive turbidity.
4. Cease irrigation in all Project work areas to maintain dry conditions during construction and, if needed, pump water out of the site to hasten drawdown.
5. Construct temporary berms to prevent tidal overtopping in low-lying construction areas.

6. Stage construction equipment and other construction infrastructure in upland areas surrounded by appropriate erosion control structures, such as silt fences or other sediment barriers.
7. Conduct all refueling and maintenance of construction equipment within appropriate staging areas (e.g., place staging areas outside sensitive habitats; provide temporary storage of fuels, oils, lubricants, and solvents in proper containers in secured/fenced locations; develop and implement a SPCP; have stationary equipment equipped with drip pans; and do not allow storage of equipment or vehicle storage within natural drainage swales).
8. Connect restored tidal marsh areas to Delta waters only after all grading activities are completed.
9. Stabilize the newly constructed toe berm at the west Yolo Bypass levee and long-term soil stockpile with appropriate erosion control measures, including but not limited to coconut coir matting or tackified hydroseeding compounds. Due to the potential for giant garter snakes on the Project site, synthetic (e.g., plastic or monofilament) or jute matting, which may entangle snakes, would not be used for erosion control (see Section 4.3, Terrestrial Biological Resources).
10. Excavate tidal connections from the site interior.

Accordingly, construction-related pollutants such as increased suspended sediments from construction activities in waterways, or in runoff from adjacent areas; fuel, oil, grease, and other toxic chemicals from construction equipment maintenance, and trash and debris from construction areas would be minimal, since a SWPPP and a SPCP would be part of the Project scope, along with the other Project measures listed above. The overall intent would be to not adversely affect the water quality in the Lower Yolo Bypass and the Cache Slough Complex and be consistent with Yolo County's General Plan policies (CO-5.6, CO-5.7, and CO-5.21).

Hence, temporary construction impacts to overall water quality from pollutants and soil erosion would be **less than significant** and no mitigation would be required, since there would be compliance with applicable CVRWQCB water quality requirements, no substantial erosion on the Project site would occur, and no further contribution of polluted runoff from the Project site leading to a degradation of local water quality.

Long-term maintenance and the possible construction of another tidal and extended tidal channel, as necessary, would result in similar impacts to water quality with the preparation and implementation of a SWPPP and a SPCP, along with the implementation of the applicable Project measures above. Hence, temporary water quality impacts from routine, long-term maintenance activities and corrective actions as related to constructed-related pollutants and soil erosion would be **less than significant** and no mitigation would be required.

Ongoing monitoring activities and experiments involving sampling only would not have a temporary impact on water quality, but merely record what the existing water quality conditions were at the time of the sampling effort or experiment. Hence, **no impact** from ongoing monitoring activities and experiments would occur with Project implementation.

### Impact 4.2-2: Increase in Methylmercury Loading

*Applicable Significance Criteria: 1, 3, and 4*

Full understanding of the complexity, fate, and effects of MeHg in the physical environment still remains a challenge in the Delta (Wood *et al.* 2004). For example, from a regulatory standpoint, CVRWQCB has noted that "it is not possible at present to determine a scientifically defensible sediment mercury concentration that will protect the beneficial uses of Cache Creek" (CVRWQCB 2004). What is known is that the Project site currently provides a source and export of MeHg that is likely elevated compared to Cache Slough Complex source waters. Restoration of a portion of the Project site to tidal marsh would alter the production, transport, and biological uptake of MeHg in that immediate area. Recent studies have indicated that rice fields had the highest MeHg concentrations and had the highest exports of MeHg, due to the large discrete exports of water during field drainage (Windham-Myers *et al.* 2010). Managed permanent wetlands had the lowest concentrations of MeHg, as well as the lowest MeHg exports, due to their low export of water. Seasonal wetlands had exports similar to those of the rice fields.

The proposed Project would restore up to 1,226 ac of tidal marsh from areas currently managed as irrigated pasture including lands that are seasonal and farmed wetlands, seasonal marsh, and perennial marsh, thus reducing net MeHg production within this area. This reduction in MeHg concentration would be **beneficial** to fish and wildlife that inhabit tidal marshes, as they would be exposed to lower levels of the contaminant than they would be in an irrigated agricultural tailwater canal. Also, this area would provide new habitat. And because tidal marshes are open to adjacent waters, MeHg concentrations within the tidal marshes are constantly diluted by flood tide waters from the adjacent Delta, with aquatic organisms freely moving between these areas.

Additionally, Soils Reuse Option #1 (i.e., soils for a new toe berm at the west Yolo Bypass levee) would likely result in a slight reduction in long-term MeHg production and concentration on the Project site. The toe berm would remove a small area from irrigated agriculture and would fill in the existing west Yolo Bypass levee borrow ditch, which would be replaced with a smaller ditch. The toe berm would be inundated only during flood events, thereby contributing minimal loads of MeHg during the irrigation season. Soils Reuse Option #2 (i.e., stockpile soils on the fields within the restricted height levee) would not have an effect on MeHg production, as the area covered by the stockpile would be returned to irrigated agriculture, thus retaining the same MeHg production potential as under current conditions. Soils Reuse Option #3, a mix of the two, would have results ranging between the two other options.

Although concentrations of MeHg within the proposed tidal marshes would be less than currently generated by the agricultural, seasonal, and perennial wetlands and marshlands on the Project site, the net MeHg load to Delta waters from the Project site and the volume of water discharged from the tidal marshes on an annual basis would be much greater than the volume discharged from irrigated pasture and existing wetlands. The annual discharge volume from the tidal marshes in the proposed Project (based on a long-term average tidal height above typical invert elevations for the wetlands) would be approximately 40,000 ac-ft of water (cbec Ecological Engineering 2011). The appropriative water rights for Yolo Ranch and Yolo Flyway Farms (i.e., the two parcels that comprise the Project site) allow a total of 15,450 ac-ft for a given irrigation season (roughly April through October). Of this volume, it is estimated that recycling efforts and evapo-transpirative losses result in approximately 9,000 ac-ft discharged directly to the Delta (cbec Ecological Engineering 2011). Thus, the volume of water discharged from the site after Project implementation would be approximately four times greater than the existing condition in years when the Yolo Bypass would not be flooded. The net benefit in the decrease in MeHg concentrations coupled with an increase in hydrologic loading to the system could result in either a decrease or no net change in MeHg loading from existing conditions on an annual basis. The proposed restoration of tidal marsh would also lead to a reduction in the severity of high concentration MeHg discharges to the Delta, due to discrete agricultural drainage discharges. During years in which the Yolo Bypass is flood inundated and thus generating flood-induced mercury methylation in addition to the irrigation season methylation, the existing loadings may be similar to or greater than what would occur with the restored tidal marsh.

Soils Reuse Option #1 would likely lead to a slight reduction in MeHg loading from the Project site to the Delta, as it would result in the conversion of a small area of land from irrigated agriculture to uplands, thus reducing MeHg production and discharge water volume. The replacement ditch for the existing west Yolo Bypass levee borrow ditch, under this scenario, would be smaller than the existing ditch, resulting in a smaller volume of water that could be discharged to the Delta, thus potentially decreasing MeHg loading. Soils Reuse Option #2 would not result in any discernible change in MeHg loading, as the land covered by the stockpile would remain in agricultural production with the same potential contribution to MeHg loading to the Delta. The third option, a mix of the two, would have results between the two other options.

Based on the above analysis, the restoration of tidal marsh would result in a reduction in MeHg concentrations within the Project site and a reduction in the severity of discrete MeHg loading events to the Delta. Soils Reuse Option #1 would result in a slight decrease in MeHg production on and loading from the Project site, while Soils Reuse Option #2 would likely result in no change in MeHg dynamics. The third option's MeHg production would lie within the other two options. Therefore, the proposed Project would have **no impact** and no mitigation would be required. The Project would be consistent with Yolo County's General Plan policy (CO-5.7).

With respect to water quality standards, the mercury TMDL for the Delta has been in effect since October 20, 2011 (see **Table 4.2-3**). Although no established criteria for individual wetland restoration projects exist at this time, CVRWQCB's Delta Mercury Control Program, Phase 1 requires that discharges from identified sources be managed to reduce inorganic (total) mercury by relying on reasonable and feasible controls. Identified sources include managed wetlands and wetland restoration projects that discharge to the Yolo Bypass and Delta subareas requiring MeHg source reduction. The program also requires that either individually or collectively dischargers participate in control studies to find ways to limit and reduce sources of mercury contaminants. The proposed Project would include a number of measures incorporated in the Project scope (see Chapter 3, Project Description) and also listed in the discussion in Impact 4.2-1 that would preclude or minimize MeHg re-suspension during the implementation of the Project. For example, the Project site would be isolated from Delta waters during construction, so that the contributions of MeHg from the Project site would be lower (essentially zero) than under current conditions.

Additionally, as indicated in the post-construction phase, monitoring and pilot projects would be conducted regarding a variety of issues including pilot studies on MeHg. The State and Federal Contractors Water Agency (SFCWA), along with other stake-holders, would coordinate with the CVRWQCB to ensure that representative MeHg control studies are conducted in compliance with Phase 1 of the Delta Mercury Control Program. Accordingly, the proposed Project would not provide substantial additional sources of polluted runoff, substantially degrade the existing water quality, or violate any water quality standards or waste discharge requirements, resulting in a **less-than-significant impact** with no mitigation required.

Potential future site maintenance, an additional tidal connection (if needed) and extended tidal channel, or removal of invasive vegetation from channels would have a **net benefit** on MeHg production and transport as these actions are aimed at improving tidal circulation and reducing conditions that may foster MeHg production. Ongoing monitoring activities and experiments involving sampling only would not have a temporary impact on water quality, but merely record what the existing water quality conditions were at the time of the sampling effort or experiment. Accordingly, **no impact** from ongoing maintenance, corrective actions, monitoring activities, and experiments would occur with Project implementation. No mitigation would be required.

Overall, implementation of the proposed Project would result in a net benefit to the health of the adjacent Delta, i.e., trending towards less MeHg production and loading on an annualized basis.

### Impact 4.2-3: Project Dissolved Organic Carbon/Total Organic Levels at the Barker Slough Pumping Plant

*Applicable Significance Criteria: 1 and 4*

One of the proposed Project's objectives would be to enhance regional food web productivity in support of delta smelt recovery, by exporting primary and secondary productivity such as organic matter. By definition, this increase in organic matter exports would increase the levels of DOC in Delta waters in the Project vicinity. Organic carbon for food chain enhancement is one of the primary objectives of wetland restoration and it supports a key beneficial use of Delta waters. Conversely, DOC/TOC is a concern for municipal water supplies, due its contribution to DBP formation during the water treatment process. At the BSPP/NBA intake, additional treatment is necessary due to winter/spring sources of higher than normal TOC and turbidity. Results from DWR studies indicate that there is no single point source that contributes to the Barker Slough watershed's high levels of TOC and turbidity; however, soil geochemistry may be an important piece to the puzzle along with the presence of cattle in the watershed (DWR 2002).

To evaluate how tidal wetland restoration projects within the Cache Slough Complex could contribute excessive levels of DOC/TOC to the Barker Slough intake, potential DOC/TOC impacts from various restoration projects, including this Project, were modeled (SCWA 2010b). The results indicate that restoration at the Project site would not cause a substantial increase in DOC/TOC levels at the Barker Slough intake, due to the distance (11.5 miles) to the intake point as influenced by the Project vicinity's hydrologic conditions. These model results also indicate that the Project would not result in increases to any other water quality constituent at BSPP for the same reasons.

The three soils reuse options would result in either no change or a net decrease in DOC/TOC production and transport from the Project site, because the lands within the footprints of these structures would either be retained in irrigated agricultural use (soil stockpile), which would maintain existing DOC/TOC contributions, or would be removed from irrigated agriculture and converted to uplands (toe berm), which would also reduce DOC/TOC contributions.

As the Project levels of DOC/TOC would not substantially increase within the Delta, the Project would not directly or indirectly violate water quality standards at the intake of the BSPP. In particular, Project construction activities for the wetland restoration and soils reuse elements would not contribute excessive DOC to the adjacent Delta, because the Project site would be blocked from Delta waters during construction. Contributions of DOC from the Project site during construction would be lower (essentially zero) than under current conditions. This impact would be **less than significant** and no mitigation would be required.

Potential future site maintenance, corrective actions, possible future construction of another tidal connection and tidal channel segment, or removal of invasive vegetation from tidal channels would be aimed at improving tidal circulation and improving connections with the adjacent Delta. These actions would result in a slight increase in organic matter loading to the adjacent Delta to the **benefit** of target species and the aquatic food web, but the increase would not be substantial enough to impact DOC levels at BSPP, due to the factors described above. Ongoing monitoring activities and experiments involving sampling only would not have a temporary impact on water quality, but merely record what the existing water quality conditions were at the time of the sampling effort or experiment. Hence, **no impact** to DOC levels at BSPP from the Project's ongoing maintenance, corrective actions, monitoring activities, and experiments would occur. No mitigation would be required.

### Impact 4.2-4: Contribution of Low Dissolved Oxygen Plumes or Excessive Biological Oxygen Demand

*Applicable Significance Criteria: 1, 3, and 4*

Project construction activities for the wetland restoration and soils reuse options would not impact DO levels in the adjacent Delta (via Cache Slough Complex), because the Project site would be isolated from Delta waters during construction. Contributions of low DO water and DOC from the Project site during construction would be lower (essentially zero) than under current conditions. Hence, **no impact** to DO levels would occur with construction efforts as proposed and no mitigation would be required.

The DO concentration in drainage water from tidal wetlands depends on a number of factors including input water DO concentration, degree of tidal muting (i.e., restricted tidal exchange), depth of inundation, and temperature. A recent study undertaken in the historic tidal marsh on Browns Island (located at the extreme western end of the Delta) measured continuous DO concentrations in tidal channels in the winter, spring, and fall (Bergamaschi *et al.* 2011). This study found that DO concentrations in inflow water (on flood tide) were generally between 8 – 9.5 mg/L, while DO concentrations in discharge water (at ebb tide) were generally between 6.5 – 8 mg/L, thus indicating the tidal marsh had little impact upon DO concentrations.

The newly created tidal wetlands on the Project site would be designed to drain properly toward newly constructed tidal channels and would therefore not be prone to developing stagnant backwater areas, which can be low-DO hotspots. One of the Project's objectives would be to restore tidal marsh habitat for migratory salmonids and other estuarine-dependent aquatic organisms. Tidal marshes are known to be important habitats that help support a healthy estuarine ecosystem and thus a small reduction in DO levels in the adjacent sloughs, due to tidal marsh discharges, would not reduce aquatic habitat beneficial uses. Accordingly, the impact to DO levels, with the restoration of wetlands (i.e., post-construction and operation), would be **less than significant**. No mitigation would be required.

The three soils reuse options would not affect DO levels in water on the Project site, because the lands within the footprints of these structures would be retained in irrigated agricultural use (Soils Reuse Option #2), be removed from irrigated agriculture and converted to uplands (Soils Reuse Option #1), or be in some combination of the two options (Soils Reuse Option #3). The selected option would be carried out during the dry season only. Hence, **no impact** to DO levels by the soils reuse options would occur. No mitigation would be required.

Another concern is that DOM exported from tidal wetlands could contribute to the overall BOD of the receiving water body, leading to the production of low DO conditions in that water body. The DOM exported from tidal marshes on the Project site would be dispersed throughout the Project vicinity, where it would support the local aquatic food web. Hydraulic modeling of the Project vicinity has demonstrated adequate tidal circulation and connection between the Project site and the Cache Slough Complex, indicating it would be highly unlikely that stagnant areas would form that could become high BOD/low DO hotspots (cbec Ecological Engineering 2011). It is therefore unlikely that exports of DOM from the new tidal wetlands would lead to violation of the water quality standard for BOD and thus reduce habitat quality for aquatic organisms in adjacent waters of the Delta. As such, the impact of contributing excessive BOD to the Delta would be **less than significant** with Project implementation. No mitigation would be required.

The three soils reuse elements would not affect BOD production or transport from the Project site, because the lands within the footprints of these structures would either be retained in irrigated agricultural use (Soils Reuse Option #2) or removed from irrigated agriculture and converted to uplands (Soils Reuse Option #1), or some combination thereof for Soils Reuse Option #3. Hence, **no impact** to BOD levels by implementing the selected soils reuse option would occur. No mitigation would be required.

Potential future site maintenance, corrective actions, monitoring/experimental activities, and possible future construction of an additional tidal connection and tidal channel segment, or removal of invasive vegetation from tidal channels would be implemented for the purpose of improving tidal circulation and exchange with the Delta. Therefore, these efforts are expected to produce a **net benefit** to DO within the wetlands by reducing stagnant areas and improving flow-through. **No impact** would result with the various routine activities post-construction, as identified in detail in Chapter 3, Project Description, and no mitigation would be required.

In summary, the impacts would not exceed any of the significance criteria and would therefore be **less than significant** or be **none**. No mitigation would be required.

### Impact 4.2-5: Effect on Domestic Supply Well Onsite

*Applicable Significance Criteria: 1 and 4*

A single domestic water supply well is situated within the ranch compound (northwest portion of the Project site) (see **Figure 2-8**). At a depth of 144 ft below ground surface, the well is screened between 104 and 144 ft deep. This well supplies water to the ranch compound during the agricultural management season. As described in Impact 4.1-4 in the Section 4.1, Hydrology, the proposed Project would only have a very limited impact on groundwater levels in the local vicinity of the restoration footprint, due to the site soil conditions. The domestic supply well on the Project site draws from an aquifer much deeper (i.e., beyond 104 ft) than the shallow surface aquifer that would potentially be affected by the restored tidal marsh. Therefore, the proposed Project (i.e., grading activities within the top 10 ft of the soil profile) would not affect groundwater quality or violate a water quality standard or otherwise substantially degrade water quality. The selected soils reuse option would also not adversely affect water quality in the onsite well, because that option would be comprised of the same soil quality as currently above the well and would not result in any input of contaminants during the dry season into the groundwater or well. Therefore, the proposed Project would result in **no impact** to the supply well's groundwater quality. No mitigation would be required.

Construction activities, as well as long-term maintenance, experiments, monitoring, and possible construction of an additional tidal connection and tidal channel segment, would have **no impact** on the local aquifer from which the well draws, as all excavation and earthmoving activities would occur within the top 10 ft of the soil profile, approximately 95 ft above the well screen. Therefore, the proposed Project would result in **no impact** to the local aquifer supplying the onsite well to the ranch complex, and no mitigation would be required.

## 4.2.4 Mitigations

Because none of the water quality impacts listed in Section 4.2.3 would be significant or potentially significant, no mitigation measures would be required with Project implementation.

# 4.3 Terrestrial Biological Resources

## 4.3.1 Setting

Wetland and terrestrial environments observed onsite and in the Project vicinity are described in this section, along with special-status plant and animal species. Descriptions of aquatic biological resources are in Section 4.4, Aquatic Biological Resources. Vegetation associated with levees is briefly discussed in Section 4.1, Hydrology. **Table 4.3-1** lists a number of Project-specific field surveys that were relied on to summarize the existing setting for the terrestrial biological resources discussed in this section. The studies gathered information through a combination of literature review, database inquiries, mapping, site reconnaissance, laboratory analysis, and in some cases, protocol surveys.

**Table 4.3-1. Summary of Biological Field Surveys at the Project Site**

| Entity Performing Survey | Report Date | Survey Type[1] |
|---|---|---|
| **Vollmar Natural Lands Consulting 2010** | March 2010 | Reconnaissance level biological survey |
| **Vollmar Natural Lands Consulting and Wetlands and Water Resources 2010** | August 2010 | Rare plant survey at Yolo Ranch |
| **Biosearch Associates 2010** | August 2010 | Protocol level nesting survey of the burrowing owl |
| **Vollmar Natural Lands Consulting 2010a** | September 2010 | Survey of potential habitat for special-status invertebrate species (large brachiopods) |
| **Vollmar Natural Lands Consulting 2010b** | September 2010 | Vegetation community characterization and mapping of Yolo Ranch |
| **Vollmar Natural Lands Consulting 2010c** | October 2010 | Vegetation community characterization and mapping of Yolo Flyway Farms |
| **Vollmar Natural Lands Consulting and Wetlands and Water Resources 2010a** | November 2010 | Potential special-status species habitat assessment at Yolo Flyway Farms |
| **Helm Biological Consulting 2010** | December 2010 | Dry season sampling of potential habitat for large brachiopods |
| **Vollmar Natural Lands Consulting and Wetlands and Water Resources 2011a** | February 2011 | Delineation of waters/wetlands of the United States on Yolo Ranch |
| **Vollmar Natural Lands Consulting and Wetlands and Water Resources 2011b** | February 2011 | Delineation of waters/wetlands of the United States on Yolo Flyway Farms |
| **Vollmar Natural Lands Consulting** | June 2011 | Wet season sampling of potential habitat for large brachiopods |
| **ICFI** | October 2012 | Delineation update of waters/wetlands of the United States on Yolo Ranch |

[1] Only Phase 1 of the Project and not Phase 2 (which includes Yolo Flyway Farms and Network #4 on Yolo Ranch) is being pursued at this time; however, Phase 2 is included here as part of the reasonably foreseeable future build out.

## *Project Site Natural Communities*

Natural communities are assemblages of interacting populations that are dominated by species native to the area and that are diverse, regionally uncommon, or of special concern to local, state, and federal agencies. Much of the vegetation on the Project site consists of non-native or generalist species, indicative of ongoing disturbance and agricultural activities. Still, some natural communities are present, and include both wetland and upland communities, along with particular species composition.

### Wetland Communities

Under § 404 of the Clean Water Act (CWA), wetlands are defined as "areas that are inundated or saturated by surface or ground water at a frequency sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." Three parameters are used in the field to delineate wetlands: hydrophytic vegetation (more than 50 percent of dominant plants are adapted to anaerobic soil conditions), hydric soils (soils classified as hydric or that exhibit characteristics of a reducing environment), and wetland hydrology (inundation or soil saturation during at least five percent of the growing season).

Wetland communities on the Project site are associated with fields that are flooded seasonally (either naturally or artificially) or with perennially inundated areas and restrictive soil layers. Wetland habitats predominantly consist of seasonal wetlands and farmed wetlands, with lesser extents of seasonal marsh, perennial wetlands, and very limited tidal marsh (**Figure 4.3-1**). Based on soil conditions and periodically by hydrological conditions alone, the site is a current wetland, though dominantly degraded from a natural wetland and associated vegetation by consistent management as managed irrigated pasture land for cattle.

In spite of manipulations to support flood irrigation practices and artificial hydrologic inputs, the extent of historic wetlands on the Project site is still reflected in the underlying soils and residual natural topography. Soils across the Project site are characterized as hydric and are generally composed of poorly drained clayey or clay loam substrates in the upper soil horizons. Duripan soils (characterized by cementation by silica) were also documented across a majority of the Project site at variable depths (Vollmar Consulting and Wetlands and Water Resources 2011a, 2011b). Consequently, most of the Project site, excluding the restricted-height levee surrounding the ranch compound and adjacent agricultural lands, is considered to support wetlands and waters of the United States. This finding is based on Yolo Bypass hydrology, which has averaged a 1.5-year flood recurrence interval (two of every three years) (California Department of Fish and Game [CDFG] 2008).

Vernal pools receive hydrologic inputs only from natural sources (i.e., rainwater and runoff) and from periodic Yolo Bypass floods. In addition to wetland habitats, the Project site supports jurisdictional waters, which include the large, tidally surcharged irrigation ditches (navigable waters) and the network of smaller irrigation and drainage ditches (other waters). **Figure 4.3-2** depicts the vegetation communities identified on the Project site. **Table 4.3-2** summarizes total acreages for each of the above mentioned features.

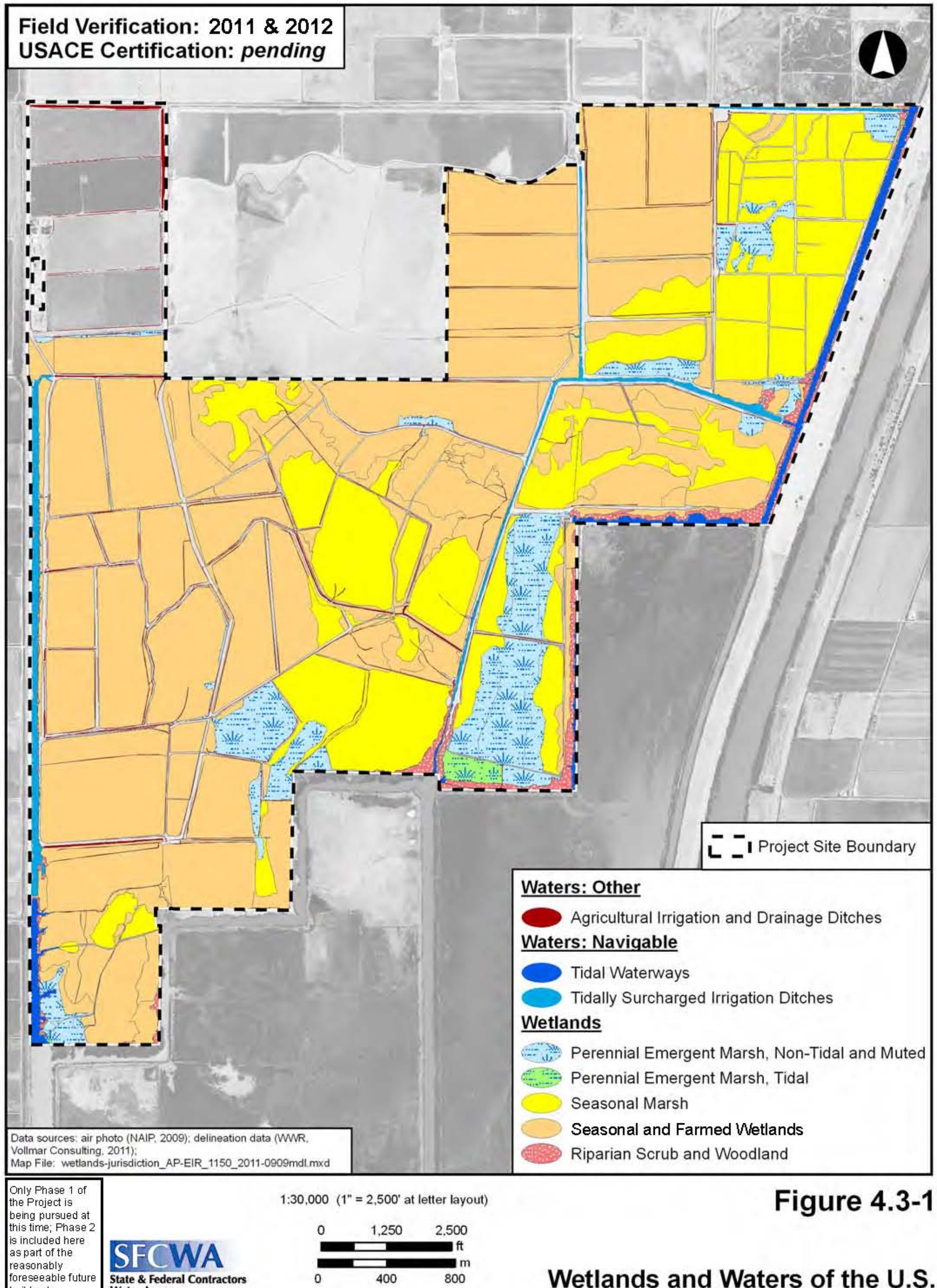



**Figure 4.3-1**

**Wetlands and Waters of the U.S.**

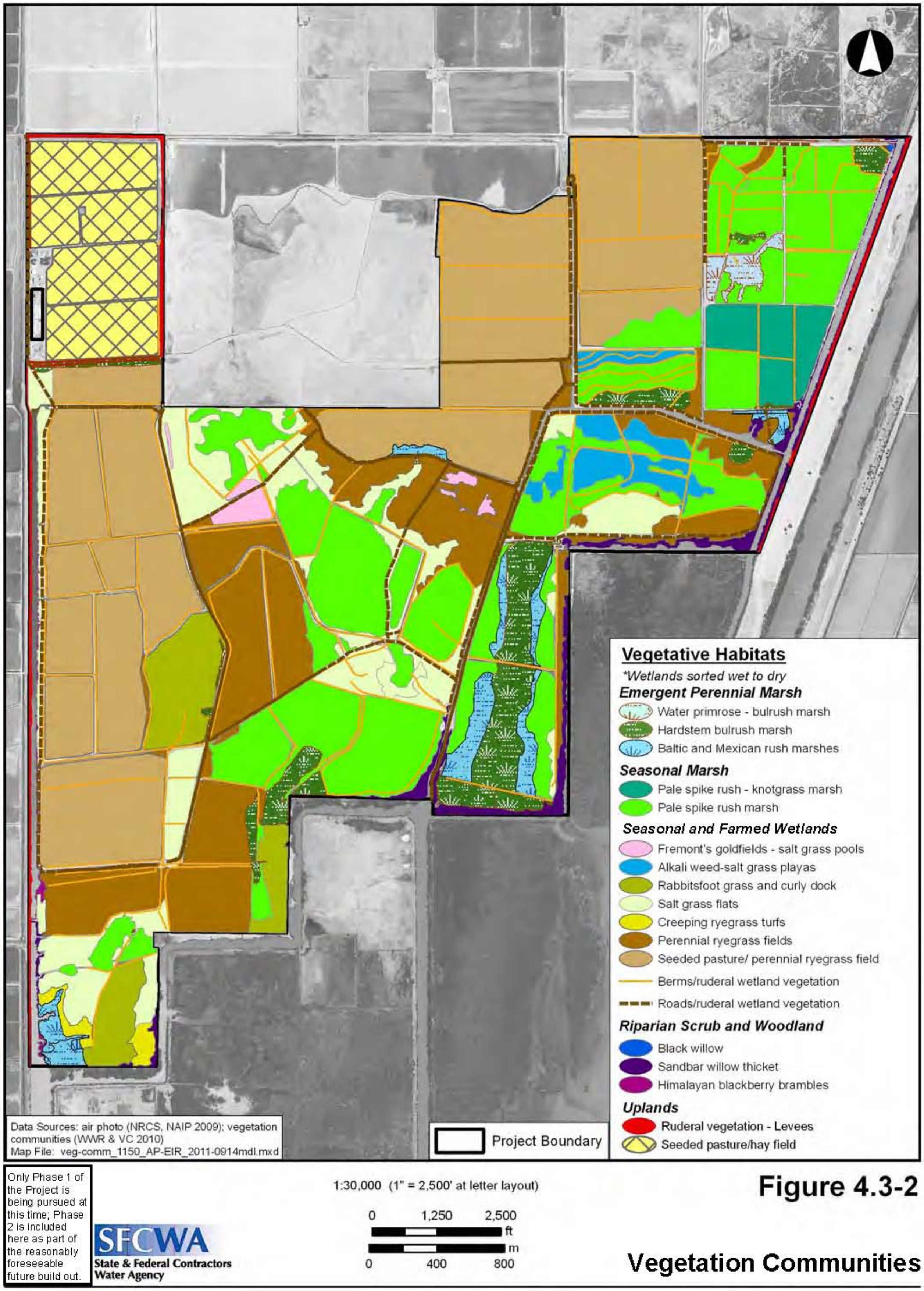



**Figure 4.3-2**

**Vegetation Communities**

### Table 4.3-2. Approximate Jurisdictional Wetlands and Waters of the U.S. on the Project Site

| Feature Type | Phase 1 | Phase 2[1] | Total Acres [1, 2] |
|---|---|---|---|
| **WETLANDS** | | | |
| **Perennial Emergent Marsh (Tidal)** | 12 | 0 | 12 |
| **Perennial Emergent Marsh (Non-tidal)** | 182 | 47 | 229 |
| **Seasonal Marsh** | 520 | 316 | 836 |
| **Seasonal Wetland (including vernal pools) and Farmed Wetlands** | 2,004 | 88 | 2,092 |
| **Riparian Woodland (scrub and forest)** | 50 | 11 | 61 |
| **WATERS** | | | |
| **Navigable Waters: Tidal Waterways** | 28 | 2 | 30 |
| **Navigable Waters: Tidally Surcharged Irrigation Ditches** | 35 | 15 | 50 |
| **Other waters (including agricultural irrigation and drainage ditches)** | 41 | 20 | 61 |
| **TOTAL** | **2,872** | **499** | **3,371** |

Sources: Wetland delineations carried out by Vollmar Consulting and Wetlands and Water Resources 2011 for both Phase 1 (most of Yolo Ranch) and Phase 2 (all of Yolo Flyway Farms plus Network 4 on Yolo Ranch), with an update by ICFI 2012 on Phase 1.

[1] Only Phase 1 of the Project and not Phase 2 is being pursued at this time; however, Phase 2 is included here as part of the reasonably foreseeable future build out.

[2] Jurisdictional boundaries include the Project area within the active Yolo Bypass floodplain, excluding man-made levees. A portion of the Project area (268 acres) within the internal restricted-height levee is not subject to the 1.5-year recurrence of seasonal flooding from the Yolo Bypass.

## Seasonal and Farmed Wetlands

Seasonal and farmed wetlands are the most widespread wetland types delineated on the Project site, covering roughly 2,092 acres (ac) or approximately 55 percent. Seasonal wetland habitats constitute the main transition zone from persistent emergent wetlands and seasonal marsh to higher elevation lands that are drier. Seasonal wetlands on the Project site are inundated during flood events of the Yolo Bypass, from rainfall, and from winter irrigation for waterfowl management. Flood events within the Yolo Bypass can result in surface ponding for periods longer than two weeks across the majority of the Project site (with the exception of the ranch compound within the northwest corner of the Project site, which is protected by an internal, restricted-height levee).

Farmed wetlands are seeded, irrigated pastures maintained during the summer to improve livestock foraging and are managed more intensively than seasonal wetlands. Many fields on the Project site are enclosed by man-made berms, and some fields are graded to facilitate flood irrigation. These circumstances, combined with widespread hydric soils (see **Figure 4.3-1**) create sufficient conditions to support wetland vegetation but of a lesser ecological value.

Seasonal pools are found onsite, two of which are delineated as vernal pool habitats based on the hydrologic and ecological characteristics of these features. These pools receive hydrologic inputs only from natural sources (i.e., rainwater and runoff) and from periodic Yolo Bypass floods. The other seasonal pools on the Project site receive both natural and artificial (irrigation) hydrologic inputs, and are considered seasonal wetlands.

Plant communities observed within these seasonal wetlands are typical of seasonally saturated grasslands. These habitats support facultative (equal likelihood of occurring in a wetland or non-wetland) and facultative upland (usually occur in non-wetlands, but occasionally found in wetlands) grassland species. The vernal pools and some of the seasonal pools support generalist vernal pool vegetation when dry. Seasonal wetlands on the Project site appear to have low to moderate ecological functions and values, due to ongoing agricultural activities.

The six seasonal wetland vegetation communities identified on the Project site, in order of driest to wettest, are:

1. Perennial ryegrass field, including seeded pasture,
2. Creeping ryegrass turf,
3. Salt grass flats,
4. Rabbitsfoot grass and curly dock,
5. Alkali weed – salt grass playas, and
6. Alkaline vernal pools.

These plant communities are mapped in **Figure 4.3-2**. Plant species observed in the seasonal wetlands consist primarily of non-native species, but a higher percentage of native species is observed in the salt grass flats, alkali weed – salt grass playas and alkaline vernal pools. Non-native grass species is observed in seasonal wetlands including perennial ryegrass (*Lolium perenne* ssp. *multiflorum*), Mediterranean barley (*Hordeum marinum* ssp. *gussoneanum*), rabbitsfoot grass (*Polypogon monspeliensis*), and Bermuda grass (*Cynodon dactylon*). Non-native forbs observed include strawberry clover (*Trifolium fragiferum*), white clover (*Trifolium repens*), and curly dock (*Rumex crispus*).

Native species observed in seasonal wetlands on the Project site include creeping ryegrass (*Leymus triticoides*), Mexican rush (*Juncus mexicanus*), salt grass (*Distichlis spicata*), alkali heath (*Frankenia salina*), graceful clover (*Trifolium gracilentum*), and alkali weed (*Cressa truxillensis*). Species observed in the vernal pools include valley downingia (*Downingia pulchella*), stalked popcorn flower (*Plagiobothrys stipitatus* var. *micranthus*), coyote thistle (*Eryngium vaseyi*), whitehead navarretia (*Navarretia leucocephala* ssp. *leucocephala*), short wooly heads (*Psilocarphus brevissimus* var. *brevissimus*), and multiple species of goldfields including Fremont's goldfields (*Lasthenia fremontii*), smooth goldfields (*Lasthenia glaberrima*), and yellow ray goldfields (*Lasthenia glabrata*).

### Seasonal Marsh

Many of the currently intertidal elevation areas on the Project site support a vegetation community with a mixed composition of perennial wetland plant species such as pale spike rush

(*Eleocharis macrostachya*) and seasonally saturated grassland species (about 836 ac or 22 percent of the Project site). These areas are typically saturated for a longer duration than seasonal wetland habitats, and in many instances support a more diverse plant community. Additionally, these habitats are likely to continue to support seasonal wetland features and vegetation during dry season years when the Yolo Bypass does not undergo flooding. Areas supporting seasonal marsh likely provide higher ecological functions and values as compared to seasonal wetland habitats on the Project site. Specific vegetation community composition of seasonal marsh habitats includes the pale spike rush marsh herbaceous alliance and the pale spikerush-knotgrass herbaceous alliance. The communities are mapped on **Figure 4.3-2** and representative photographs are found in **Figure 4.3-3**.

Plant species observed in seasonal marsh habitats on the Project site included pale spikerush, salt grass, knotgrass (*Paspalum distichum*), Mediterranean barley, perennial ryegrass, hardstem bulrush (*Schoenoplectus acutus*), Bermuda grass, swamp smartweed (*Polygonum hydropiperoides*), strawberry clover, and curly dock.

### Perennial Emergent Marsh (Non-tidal)

Non-tidal perennial emergent marsh occurs in portions of the Project site that typically experience perennial to near-perennial inundation or near-surface saturation (about 229 ac in total or six percent of the Project site). On the Yolo Ranch portion of the Project site, perennial emergent wetlands are restricted to lower elevation depressions near or adjacent to drainage ditches or bermed areas. Such areas receive hydrologic inputs from irrigation runoff, surface flow from precipitation and flood events, and in some locations, muted tidal influence through unmaintained tide gates.

The managed wetland (locally referred to as the Island) supports the bulk of the perennial emergent marsh habitat on the property; this wetland area receives hydrologic inputs from direct irrigation by a portable pump, as well as from drainage of a large, vegetated-ponded area at the northern end of the Island. This perennially ponded area of the Island receives some degree of muted tidal action year-round, through an unmaintained gate. Most perennial wetlands on Yolo Ranch are characterized by dense and continuous stands of bulrush, mixed with other predominantly obligate wetland plant species (plants found in wetlands 99 percent of the time). On Yolo Ranch, a few perennial wetlands exist that also support open water ponded areas, the two most important of which are the northern pond within the Island and a small pond within the Duck Pond area (refer to **Figure 2-5** for locations).

Perennial emergent marsh on the Yolo Flyway Farms property is limited to areas that are heavily managed for waterfowl (central western edge of the property) and an area in the northeast corner that is bound on three sides by man-made berms. Unlike the majority of perennial wetlands found on Yolo Ranch, the perennial emergent wetlands occurring on Yolo Flyway Farms are dominated by shallow, open water features, bordered by bulrush stands. An exception is the perennial emergent wetland in the northeastern corner of the Yolo Flyway Farms property, which is dominated by dense and continuous stands of bulrush with other obligate wetland species.

**Seasonal wetlands** occur in higher elevation areas and gentle slopes, forming the transition area from seasonal marsh and/or perennial emergent marsh. Above: a **perennial ryegrass** dominated field, typical of seasonally saturated grasslands following the winter rain/flood season. Below: **perennial ryegrass/seeded pasture** during summer months with active grazing.

**Figure 4.3-3**

**Representative Site Images of Seasonal Wetlands**

Perennial emergent marsh on the Project site appears to provide high to moderate ecological functions. The dominant plant species are primarily natives, and the prolonged periods of inundation provide good quality for nesting and/or foraging habitat for waterfowl and other native wildlife. No special-status plant species were found within the perennial emergent wetlands on the Project site. The vegetation communities associated within perennial emergent marsh include hardstem bulrush marsh, water primrose-bulrush marsh, and Juncus marsh. These communities are mapped on **Figure 4.3-2**. Plant species observed include hardstem bulrush (tule), narrowleaf cattail (*Typha angustifolia*), broadleaf cattail (*Typha latifolia*), tall flatsedge (*Cyperus eragrostis*), water primrose (*Ludwigia peploides*), swamp smartweed, Mexican rush, salt grass, and knotgrass.

### Perennial Emergent Marsh (Tidal)

Perennial tidal emergent marsh includes those wetlands on the Project site that are subject to direct tidal influence (roughly 12 ac or 0.3 percent of the total Project site). This wetland type was found solely on Yolo Ranch in two low-lying areas, one large patch at the junction of the Stair Step and Liberty Cut just south of the Island and one very small patch in the southwest corner at the junction of the Stair Step with Shag Slough (see **Figure 4.3-1**). Both of these areas are adjacent to major tidal waterways.

These tidal wetlands have high ecological functions and values. They primarily support native wetland plants and provide good quality, wildlife habitat. In addition, occurrences of three different special-status plant species - Mason's lilaeopsis (*Lilaeopsis masonii*), Suisun marsh aster (*Symphyotrichum lentum*), and Delta tule pea (*Lathyrus jepsonii* var. *jepsonii*) – occur in scattered locations along the banks of the tidal waterways on Yolo Ranch. These are discussed in detail in the special-status species section. Representative photographs are listed in **Figure 4.3-4**.

### Riparian Floodplain Wetland

Riparian floodplain wetland habitat was found only in the northeastern corner of the Project site, near the confluence of the central irrigation ditch with the Toe Drain (see **Figure 2-5**). This habitat type is dominated by perennial vegetation such as California bulrush (*Schoenoplectus californicus*) along the margins of the ponded area, floating aquatic vegetation mainly consisting of water primrose, and intermixed with emergent trees including black willow (*Salix goodingii*).

Riparian floodplain wetland habitat provides high to moderate ecological functions and supports native obligate wetlands wildlife species. Additionally, this habitat supports non-native species including bullfrogs (*Rana catesbiana*) and mosquito fish (*Gambusia affinis*).

Riparian woodland habitats are distributed along the major tidal waterways bordering Yolo Ranch (Stair Step and Toe Drain) and Yolo Flyway Farms (Toe Drain). These habitats consist of woodland species dominated by emergent trees, including cottonwood (*Populus*) and willows (*Salix*), and are best described by the vegetation community, "sandbar willow thicket" (Sawyer *et al.* 2009). Continuous stands of riparian woodland species provide potential habitat for a variety of special-status nesting birds and serve to shade adjacent tidal waterways and protect and stabilize channel banks.

**Seasonal and perennial marsh** occurs in topographic low areas, existing intertidal regions, and within poorly drained features. Above: dominant **pale spike rush** with mixed seasonal to perennial wetland graminoids and forbs are typical to seasonal marsh habitats. Below: perennial emergent marsh with dominant tules (**hardstem bulrush**) and mixed cattail, spikerush, and marsh forbs.

**Figure 4.3-4**

**Representive Site Images of Seasonal Marsh and Perennial Wetlands**

Riparian scrub habitats are dispersed between mature riparian forest stands and along the central irrigation ditch and west Yolo Bypass levee borrow ditch on Yolo Ranch (**Figure 4.3-5**). This habitat type is dominated by narrowleaf willow (*Salix exigua*) and low shrubs including California rose (*Rosa californica*) and Himalayan blackberry (*Rubus discolor [armeniacus]*). Other plant species observed in these communities include: coyote brush (*Baccharis pilularis*), box elder (*Acer negundo*), arroyo willow (*Salix lasiolepis*), and Fremont cottonwood (*Populus fremontii*). The section of riparian scrub bordering the central irrigation ditch on Yolo Ranch supports a large population of the special-status plant, Delta tule pea.

Riparian habitat with emergent trees on the Project site provides nesting habitat for Swainson's hawk and other raptors, and may also provide foraging opportunities for these species. Sporadic, isolated trees do occur on the floodplain on Yolo Flyway Farms; however, continuous woodland stands likely provide higher quality nest sites.

## Upland Habitats

The Project site is generally devoid of upland habitats (non-wetland) due to its position within the Yolo Bypass, which is subject to periods of inundation long enough to support seasonal wetlands. Upland habitats are restricted to the slopes of the east and west Yolo Bypass levees and to lands interior to the restricted-height levee in the northwest corner of the Project site (for locations, see **Figure 2-5**). The restricted-height levee encloses an area protected from the more regular Yolo Bypass flood events, and thus the area receives hydrologic inputs mainly from irrigation and seasonal rainfall events. The upland habitats on the Project site have limited ecological functions. When the adjacent areas of the Project site are inundated by Yolo Bypass floods, these lands may provide seasonal refuge for terrestrial wildlife. Hayfields provide marginal foraging habitat for raptors. Very few small mammal burrows were observed on the Project site during summer 2010 field surveys.

### Levees

Upland levee edges on the Project site are typically dominated by ruderal and non-native generalist species such as black mustard (*Brassica nigra*), milk thistle (*Silybum marianum*), bur clover (*Medicago polymorpha*), and yellow star thistle (*Centaurea solstitialis*).

### Seeded Pastures

These fields, located along the northwestern edge of the Project site within the restricted-height levee area, appear to be maintained for forage production and are regularly irrigated. The species assemblage within these pastures is composed predominantly of non-native grasses (including perennial ryegrass) and clover species, but also likely includes other weedy species when fallow. These areas are regularly cultivated for hay, although the frequency to re-seed is unknown.

**Riparian woodland** occurs along tidal slough edges and borders some major irrigation channels. Above: riparian forest consisting of cottonwood (*Populus*), bigleaf maple (*Acer*), and willows (*Salix*) as dominants (**sandbar willow thickets**), along a channel connection to the Toe Drain. Below: riparian scrub along a major irrigation channel, dominated by narrowleaf willow (*Salix*) and blackberry (*Rubus*).

**Figure 4.3-5**

**Representative Site Images of Riparian Woodland (Forest and Scrub)**

## Invasive Plant Species

Invasive plant species are common within the natural vegetation communities found in the Yolo Bypass and are common in the surrounding residential and agricultural areas. Seeds and vegetative fragments from these invasive species are carried into the Yolo Bypass by tributary flows, wind, animals, and by recreational use of the Yolo Bypass. Two terrestrial species of concern currently occur on the Project site, perennial pepperweed (*Lepidium latifolia*) and yellow star-thistle (*Centaurea solstitialis*). Both species hold a rating of "high" on the California Invasive Plant Council (Cal-IPC) Inventory, indicating that the impacts of such species may have "severe ecological impacts on physical processes, plant and animal communities and vegetation structure."

Perennial pepperweed occurs within marginally wet habitats, such as seasonal wetlands and irrigated pastures, and is common along roadways and ditches. Perennial pepperweed reproduces by seed and vegetatively from roots and root fragments, which are easily spread through flooding and soil movements (Cal-IPC 2006).

Yellow star-thistle is limited to roadsides, berms, levees, and disturbed upland areas on the Project site. Unlike perennial pepperweed, this species is a predominately upland invader, and does not inhabit moist or wet habitats.

## Special-status Plant and Animal Species

For the purposes of this Draft Environmental Impact Report (EIR), special-status species are defined as follows:

- Species that are listed or proposed for listing as threatened or endangered under the federal Endangered Species Act (ESA) (50 Code of Federal Regulations [CFR] § 17.12 for listed plants, 50 CFR § 17.11 for listed animals, and various notices in the *Federal Register* for proposed species).
- Species that are candidates for possible future listing as threatened or endangered under the federal ESA.
- Species that are listed or proposed for listing by the State of California as threatened or endangered under the California Endangered Species Act (CESA) (14 California Code of Regulations [CCR] § 670.5).
- Plants listed as rare under the California Native Plant Protection Act of 1977 (California Fish and Game [CFG] Code, § 1900 *et seq.*).
- Plants considered by the California Native Plant Society (CNPS) to be "rare, threatened, or endangered in California."
- Species that meet the definitions of rare or endangered under the California Environmental Quality Act (CEQA) (*State CEQA Guidelines*, CCR § 15380).
- Animals fully protected in California (CFG Code, § 3511 [birds], § 4700 [mammals], and § 5050 [reptiles and amphibians]).
- Nesting raptors protected in California (CFG Code, § 3503.5).

**Appendix C** of this Draft EIR contains a summary of each of the special-status species identified during initial review as potentially occurring on the Project site. The categories in this appendix include the status, habitat requirements, habitat suitability, local distribution, and potential for occurrence by these species. The data was derived from the U.S. Fish and Wildlife Service (USFWS) listings, California Natural Diversity Database (CNDDB), Consortium of California Herbaria (2011), and CNPS (CNPS 2001, 2010, 2011), as well as relevant literature, input from regional biologists, and observations made by biologists during the early field visits. A list of federally endangered and threatened species that may be affected by activities within nine U.S Geological Survey (USGS) 7.5-minute quadrangles (Birds Landing, Clarksburg, Courtland, Dixon, Dozier, Isleton, Liberty Island, Rio Vista, and Saxon) was obtained online from the USFWS website (USFWS 2011).

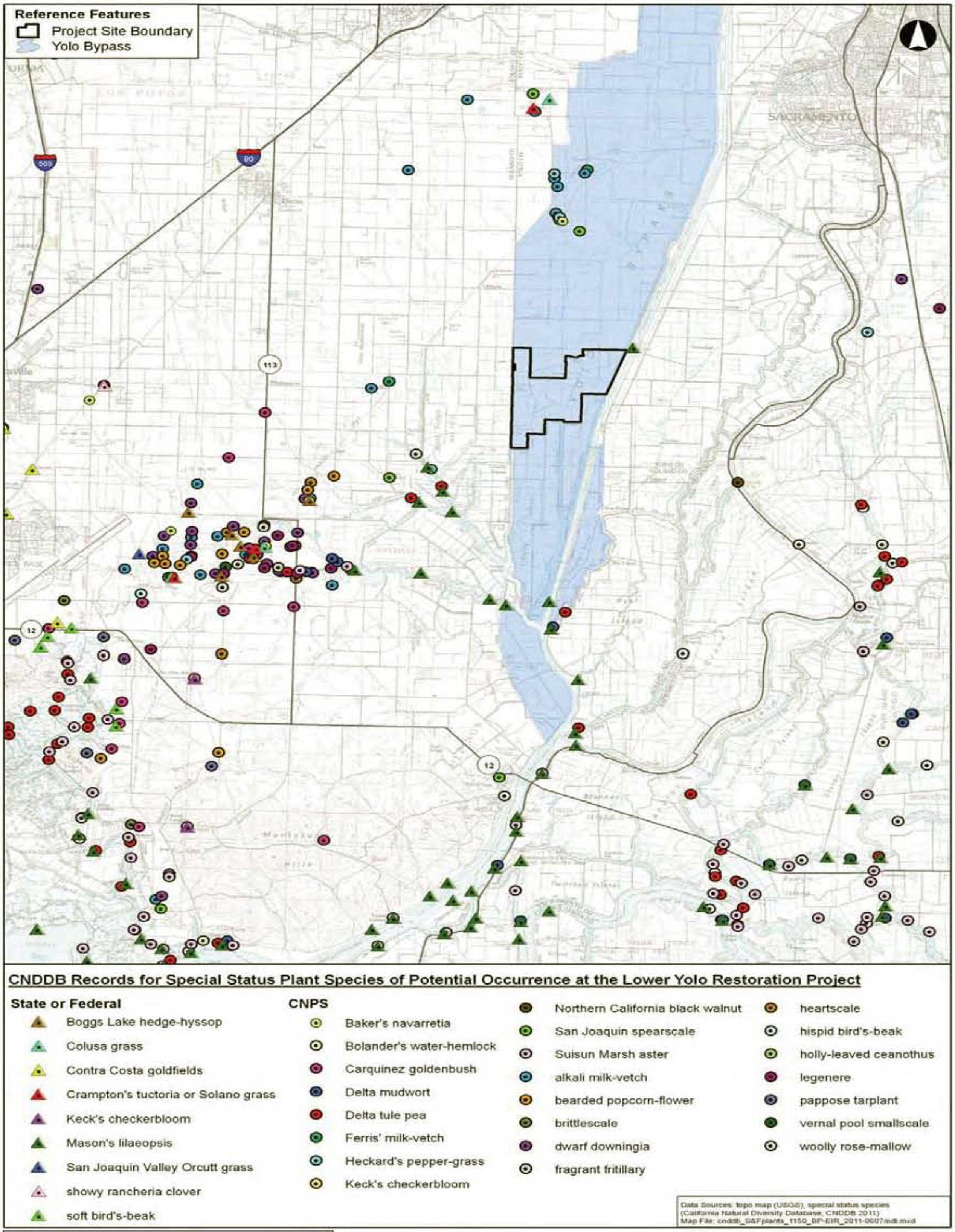
**Figures 4.3-6** through **4.3-7** depict special-status species occurrence data from the CNDDB (CDFG 2010) for the 14 quadrangles located in Yolo and Solano counties with a one-mile buffer around these quadrangles. CNPS electronic inventory was also queried for the 14 quadrangles and a one-mile buffer around these quadrangles.

## Special-status Plant Species

Following a preliminary review, 13 special-status plant species were identified to have some potential to occur on the Project site (**Appendix C [Table C-1]** and **Figure 4.3-6**). Intensive, protocol-level special-status plant surveys were conducted during the spring of 2010 throughout the Yolo Ranch property, and rare plant habitat surveys were conducted during late summer 2010 on Yolo Flyway Farms (Vollmar Natural Lands Consulting and Wetlands and Water Resources 2010a). During the surveys at Yolo Ranch, occurrences of three special-status plants were identified and mapped on Yolo Ranch:

- Mason's lilaeopsis (*Lilaeopsis masonii*) (CNPS List 1B.2, State listed as rare).
- Suisun marsh aster (*Symphyotrichum lentum*) (CNPS List 1B.1, no federal or state listing).
- Delta tule pea (*Lathyrus jepsonii* var. *jepsonii*) (CNPS List 1B.2, no federal or state listing).

All three species are associated with the edges of tidal waterways or large irrigation ditches. Mason's lilaeopsis and Suisun marsh aster were found in scattered locations along the tidally-influenced waterways situated along the southern and eastern region of the Project site, generally away from dense riparian areas. Delta tule pea was identified growing among riparian scrub along the central irrigation ditch on the property. Project biologists consider it unlikely that any other special-status plants occur on the Project site, with the possible exception of rose mallow (*Hibiscus lasiocarpus* var. *occidentalis*) (CNPS List 2.2, no federal or state listing status), which also occurs along tidal sloughs and riverbanks in the Delta. Some tidal slough edges with dense riparian vegetation were not accessible by land, therefore the potential for this species to occur onsite remains. The vernal pools and alkaline soil areas on the Project site were readily accessible and carefully surveyed, and no special-status plants were observed in these habitats.




Only Phase 1 of the Project and not Phase 2 is being pursued at this time; however, Phase 2 is included here as part of the reasonably foreseeable future buildout.

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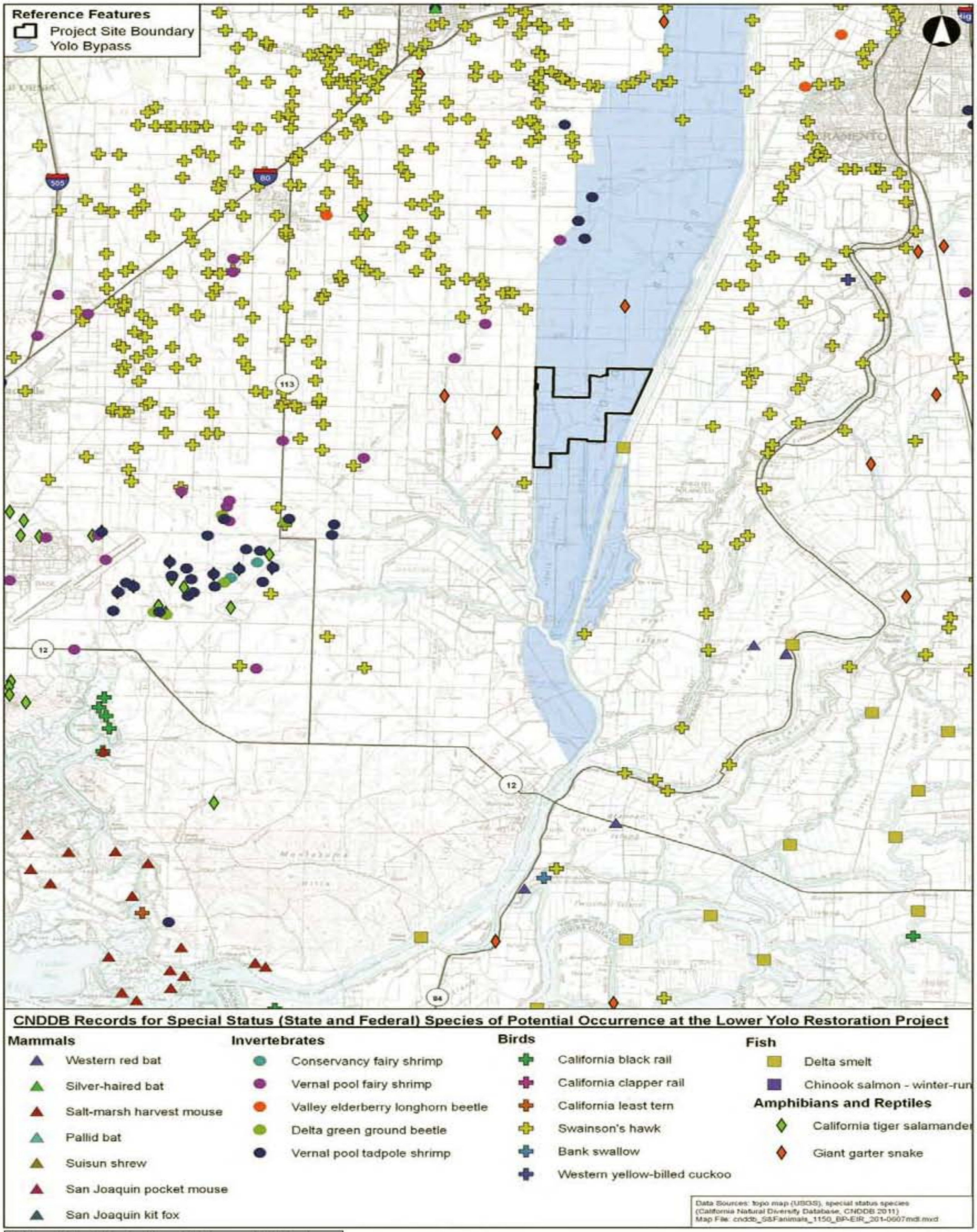
SFCWA
State & Federal Contractors Water Agency

**Figure 4.3-6**

**Special-status Plant Species Geographic Occurrences**




Only Phase 1 of the Project and not Phase 2 is being pursued at this time; however, Phase 2 is included here as part of the reasonably foreseeable future build out.

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SFCWA
State & Federal Contractors Water Agency

**Figure 4.3-7**
**Special-status Wildlife Species Geographic Occurrences**

Yolo Flyway Farms was surveyed for the presence of special-status plants and suitable habitat in August/September 2010, outside of the peak bloom period for many of the identified potential species (typically May - July). These surveys focused on identifying potential habitat for special-status species and for species that could be identified in their vegetative (non-blooming) state (**Table 4.3-3**). Minimal potential habitat was identified for special-status plant species, with only two species to have potential to occur onsite: Delta tule pea and Suisun marsh aster.

**Table 4.3-3. Special-status Species – Plants**

| Plant Species | Regulatory Status[1] | Habitat | Probability of Occurrence in Project Area |
|---|---|---|---|
| ***Hibiscus lasiocarpos* var. *occidentalis*** **Woolly rose mallow** | CNPS - 2 | Inhabits Central Valley wet banks and marshes below 40 meters (about 131 feet [ft]) in elevation; threatened by riverbank alteration; flowering occurs between June and September. | **Low to moderate**. Potential habitat onsite. Species was not observed in any of the accessible bank edges, but could potentially occur on inaccessible banks. |
| ***Juglans hindsii*** **Northern California black walnut (stands)** | CNPS - 1B.2 | Occurs along streams and disturbed slopes. | **Present.** Two individual trees were observed on the Project site but no continuous stands of this species were present. |
| ***Lathyrus jepsonii* var. *jepsonii*** **Delta tule pea** | CNPS - 1B.2 | Inhabits the Central Valley and San Francisco Bay area coastal and estuarine marshes below 30 meters (about 98 ft) in elevation; flowering is from May - July. | **Present.** Suitable habitat present in multiple locations; this species was observed on the Project site. |
| ***Lilaeopsis masonii*** **Mason's lilaeopsis** | SR, CNPS - 1B.1 | Inhabits sea level intertidal marshes and stream banks within the Sacramento Valley and San Francisco Bay area; flowering period persists from April through November. | **Present.** Suitable habitat occurs on the Project site along the Stair Step channel. Multiple occurrences were documented on the southern Stair Step. |
| ***Symphyotrichum lentus*** **Suisun marsh aster** | CNPS - 1B.2 | Endemic to brackish and freshwater marshes and along banks of sloughs and waterways in Suisun Marsh and Delta; found at elevations below 150 meters (about 492 ft); flowering extends from May - November. | **Present.** Suitable habitat is present onsite. This species was documented in similar habitats as Mason's lilaeopsis. |

[1] **Explanation of Listing Codes**

| State Listing Codes: | | California Native Plant Society (CNPS) | |
|---|---|---|---|
| SR | State-listed species as rare | 1B.1 | Rare, threatened, or endangered in California and elsewhere: Seriously endangered in California. |
| | | 1B.2 | Rare, threatened, or endangered in California and elsewhere: Fairly endangered in California. |
| | | 2 | Rare, threatened, or endangered in California and elsewhere: More common elsewhere. |

## Special-status Wildlife Species

Based on survey findings (see **Table 4.3-1**), available databases and literature, familiarity with local fauna, and surveys of onsite habitat suitability, 51 special-status fish and wildlife species were identified (see **Appendix C, Table C-2**). Of these species, 22 were ruled out based on lack of suitable habitat, local range restrictions, regional extirpations, lack of connectivity with areas of suitable or occupied habitat, incompatible land use, and/or habitat degradation/alteration of onsite or adjacent lands. The remaining 29 species with the potential to occur on the Project site are discussed further in **Table 4.3-4**.

## Table 4.3-4. Special-status Species – Wildlife

| Wildlife Species | Regulatory Status[1] | Habitat | Probability of Occurrence in Project Area |
|---|---|---|---|
| **Invertebrates** | | | |
| ***Branchinecta conservatio*** **Conservancy fairy shrimp** | FE | Endemic to the grasslands of the northern two-thirds of the Central Valley; found in large, turbid pools located in swales formed by old, braided alluvium, filled by winter/spring rains that last until June. | **Low.** Seasonal pools on the Project site provide potential habitat for this species. |
| ***Branchinecta lynchi*** **Vernal pool fairy shrimp** | FT | Central Valley, central and south Coast Ranges from Tehama to Santa Barbara counties. Isolated populations also in Riverside County. Common in vernal pools; found in sandstone rock outcrop pools. | **Present.** Seasonal pools on the Project site provide habitat for this species. This species found during wet season sampling in spring 2011. |
| ***Lepidurus packardi*** **Vernal pool tadpole shrimp** | FE | Inhabits vernal pools and swales in the Sacramento Valley with clear to highly turbid water; such pools are commonly found in grass bottomed swales of unplowed grasslands and are occasionally mud-bottomed and highly turbid. | **Low.** Seasonal pools on the Project site provide potential habitat for this species. |
| **Amphibians and Reptiles** | | | |
| ***Actinemys marmorata*** **Western pond turtle** | SSC | Inhabits permanent or nearly permanent bodies of water and low-gradient, slow-moving streams below 6,000 feet (ft) elevation. Range extends from Washington to the northern Bay Area counties along the Pacific slope drainages. Two recognized subspecies: the northwestern pond turtle (*A. m. marmorata*), which ranges north of the American River, and the southwestern pond turtle (*A. m. pallida*), which ranges from the coastal areas south of San Francisco. Subspecies interbreed within the gradation zone that defines the two subspecies. | **Present.** Suitable aquatic and upland habitat is present. Species has been documented from Yolo Bypass. Observed on the Project site. |
| ***Thamnophis gigas*** **Giant garter snake** | FT, ST | The most aquatic of California garter snakes, this species prefers freshwater marsh and low-gradient streams and has adapted to drainage canals and irrigation ditches predominantly in the Central Valley. | **High**. Suitable aquatic habitat present. The Project site may provide summer habitat, although winter inundation would reduce overall habitat suitability for this species. |
| **Birds[2]** | | | |
| ***Agelaius tricolor*** **Tricolored blackbird (nesting colony)** | SSC | Highly colonial species, most numerous in the Central Valley and vicinity. Largely endemic to California. Nest in emergent vegetation within aquatic and riparian habitats. Breeding begins in March; double-brooded (Baicich and Harrison 2005). | **Present.** Suitable nesting habitat present in freshwater marsh habitat. Species has been documented between one to five miles from the Project site. Observed on the Project site in recent surveys. |
| ***Ammodramus savannarum*** **Grasshopper sparrow** | SSC | Inhabits dense grasslands (preferably native) on rolling hills, lowland plains and valleys, and on lower mountain slopes. | **Present.** Breeding records confirmed from Yolo Bypass (Shuford and Gardali 2008). Observed on the Project site in recent surveys. |
| ***Asio flammeus*** **Short-eared owl (nesting)** | SSC | Inhabits open grasslands, prairies, marshes and agricultural fields with sufficient cover and abundant small mammal prey. Nests on the ground in shallow depressions. Breeding begins in April; single-brooded (Baicich and Harrison 2005). | **Present.** The Project site supports fields and sufficient cover to support nesting owls. Flushed from eucalyptus tree in SW corner of the Island during 2010 site visit. |

## Table 4.3-4. Special-status Species – Wildlife

| Wildlife Species | Regulatory Status[1] | Habitat | Probability of Occurrence in Project Area |
|---|---|---|---|
| **Birds[2] — continued** | | | |
| ***Athene cunicularia*** **Burrowing owl** | SSC | Nests in small mammal burrows that are in or adjacent to open dry annual or perennial grasslands, deserts and scrublands characterized by low-growing vegetation. Subterranean nester, dependent upon burrowing mammals, most notably, the California ground squirrel. | **Low.** Little to no suitable nesting habitat present due to periodic flooding, but possible on adjacent levees. No known records of the species from within the Project site. |
| ***Aythya Americana*** **Redhead** | SSC | Nest in freshwater emergent wetlands with dense stands of cattails and tules interspersed with areas of deep open water. Solitary nesters. In winter and migration redheads forage and rest on deep bodies of water. | **Moderate.** Suitable habitat present in the Duck Pond. A few documented nesting per season in Yolo Bypass Wildlife Area (Shuford and Gardali 2008). |
| ***Botaurus lentiginosus*** **American bittern** | Other | Inhabits freshwater marshes, and occasionally salt marshes. Breeds in California, west of the Sierra Nevada, and in the southern portion of its range. | **Low to moderate.** Suitable foraging and nesting habitat within the Project site. Recent observations of individuals noted in Davis wetlands and Fazio Yolo Bypass Wildlife area (CDFG 2008). |
| ***Buteo swainsoni*** **Swainson's hawk** | ST | Nests in oaks or cottonwoods in or near riparian habitats. Forages in grasslands, irrigated pastures, and grain fields in Lower Sacramento and San Joaquin valleys, Klamath Basin, and Butte Valley. Highest nesting densities occur near Davis, Woodland, and Yolo County. | **Present.** Suitable foraging habitat present. Nests in Yolo Bypass and surrounding area. Documented from within one mile of the Project site. Observed foraging in Project site during 2010 field survey. |
| ***Charadrius montanus*** **Mountain plover** | FPT, SSC | Occupies open plains or rolling hills with short grasses or very sparse vegetation; nearby bodies of water are not needed; may use newly plowed or sprouting grain fields. Does not breed in California; in winter, found in the Central Valley south of Yuba County, along the coast in parts of San Luis Obispo, Santa Barbara, Ventura, San Diego counties, and to a lesser extent in parts of Imperial, Riverside, Kern, and Los Angeles counties. | **Low**. Species is known from Yolo County, although no incidental observations were made (Shuford and Gardali 2008). Nesting is not likely due to lack of dry, barren areas. Species would potentially occur only during winter when the Project site is not flooded. |
| ***Chlidonias niger*** **Black tern** | SSC | Uses freshwater lakes, ponds, marshes, and flooded agricultural fields for nesting sites; temporarily occupies coastal lagoons and estuaries during migration. | **Low to moderate.** Several nesting pairs in Yolo County and small breeding populations in neighboring counties. Recorded use of wetlands and flooded rice fields in the Yolo Bypass during migration. |
| ***Circus cyaneus*** **Northern harrier (nesting)** | SSC | Inhabits both freshwater and saltwater marshes, as well as adjacent upland grasslands. Nests on the ground in tall grasses within grasslands and meadows. Breeds starting in March; single-brooded (Baicich and Harrison 2005). | **Present.** Suitable nesting and foraging habitat is present. Observed on the Project site. |
| ***Coccyzus americanus occidentalis*** **Western yellow-billed cuckoo** | FC, SE | Nest in wide, dense riparian forests with a thick understory of willows for nesting. Sites with a dominant cottonwood overstory are preferred for foraging. Nests along the upper Sacramento, lower Feather, south fork of the Kern, Amargosa, Santa Ana, and Colorado rivers. | **Low.** Limited suitable nesting habitat present. No known records of the species from the Project site. |

## Table 4.3-4. Special-status Species – Wildlife

| Wildlife Species | Regulatory Status[1] | Habitat | Probability of Occurrence in Project Area |
|---|---|---|---|
| **Birds[2] — continued** | | | |
| ***Elanus leucurus*** **White-tailed kite (nesting)** | FP | Inhabits grasslands, agriculture fields, oak woodlands, savannah and riparian habitats in rural and urban areas. Feeds primarily on California voles. Occurs year-round as a resident of central and coastal California. Breeds starting in February; sometimes double-brooded (Baicich and Harrison 2005). | **Low.** Trees and large shrubs provide suitable nesting habitat in the Project area, particularly in the mature trees in riparian areas. No observations during 2010 field surveys. Closest documented nest site in City of Davis. |
| ***Falco columbarius*** **Merlin (wintering)** | SSC | Winters throughout California; breeds in northern states, Canada, and Alaska. Wintering habitat includes open forests, grasslands, agricultural fields, mud flats, and urban areas. Feeds primarily on small birds. Breeding begins in May; single-brooded (Baicich and Harrison 2005). | **Low.** Species may occur onsite as a winter migrant only. |
| ***Lanius ludovicianus*** **Loggerhead shrike (nesting)** | SSC | Inhabits a variety of habitats from open grasslands and scrub, to woodlands and riparian areas. Is a year-round California resident. Breeding begins in February; double- to triple-brooded (Baicich and Harrison 2005). | **Present.** Suitable nesting and foraging habitats are present in the agricultural fields and riparian habitat within and adjacent to the Project site. Observed on the Project site. |
| ***Riparia riparia*** **Bank swallow (nesting)** | ST | Nests in colonies in vertical banks with friable soils. Breeds from April to August. Most of California's nesting colonies occur along the upper Sacramento River. Breeding begins in April; double-brooded (Baicich and Harrison 2005). | **Low to moderate.** Marginally suitable vertical bank nesting habitat is present on and adjacent to channels. |
| ***Xanthocephalus xanthocephalus*** **Yellow-headed blackbird** | SSC | Almost exclusively breeds in marshes with tall emergent vegetation over relatively deep water (0.6 - 1.2 meters or about two to four ft). Scarce breeder in the Sacramento Valley. | **Low to moderate.** Suitable nesting habitat present in freshwater marsh habitat. Species is a documented breeder from Yolo Bypass. Two small colonies present in Yolo County every year (Shuford and Gardali 2008). |
| **Mammals** | | | |
| ***Antrozous pallidus*** **Pallid bat** | SSC | Inhabits deserts, grasslands, shrub lands, woodlands, and forests. Found in open, dry habitats with rocky areas for roosting. Man-made roosts are also used. | **Low.** Riparian and channel habitat provides suitable foraging and roosting habitat. No documented occurrences onsite. |
| ***Corynorhinus* (syn. *Plecotus*) *townsendii*** **Townsend's big-eared bat** | SSC<br>WBWG-H | An obligate cave rooster and moth specialist, occurring throughout California. Inhabits caves and mines, but may also use bridges, buildings, rock crevices and tree hollows in coastal lowlands, cultivated valleys and nearby hills characterized by mixed vegetation below 3,300 meters. Exhibits high site fidelity and is highly sensitive to disturbance. Forages along edge habitats near water; may travel long distances during foraging bouts. | **Low.** Riparian and channel habitat provides suitable foraging and roosting habitat. No documented occurrences onsite. |

### Table 4.3-4. Special-status Species – Wildlife

| Wildlife Species | Regulatory Status[1] | Habitat | Probability of Occurrence in Project Area |
|---|---|---|---|
| **Mammals — continued** | | | |
| ***Myotis yumanensis*** **Yuma myotis** | WBWG-LM | A riparian obligate species. Ubiquitous throughout California. Inhabits riparian areas near permanent water sources. Roosts in a variety of habitats: bridges, buildings, caves, mines, cliff crevices, and trees. Forages above water and in riparian areas. | **Low.** Riparian and channel habitat provides suitable foraging and roosting habitat. No documented occurrences onsite. |

[1] **Explanation of Listing Codes**

Federal Listing Codes:

| | |
|---|---|
| FE | Federally-listed species as endangered |
| FT | Federally-listed species as threatened |
| FC | Federal candidate species (former category 1 candidate) |
| FPT | Federally proposed for listing as threatened |

State Listing Codes:

| | |
|---|---|
| SE | State-listed species as endangered |
| ST | State-listed species as threatened |
| SSC | California species of special concern |
| FP | Fully protected |

Designations of Bat Listings: The Western Bat Working Group (WBWG). H – High Priority indicates species that are imperiled or are at high risk of imperilment based on available information on distribution, status, ecology and known threats; LM – Low-Medium Intermediate designations.

[2] Birds listed in this table are identified as migratory birds covered under the federal Migratory Bird Treaty Act.

## Special-status Invertebrates

A visual assessment of all vernal pools and related seasonal wetlands onsite was conducted in late spring of 2010 (Vollmar Natural Lands Consulting 2010a). Three pools were identified as having the potential to support a high diversity and abundance of aquatic invertebrates. These pools were considered suitable habitat because they were not flooded, irrigated, or managed as agricultural areas, and lacked populations of mosquito fish and crayfish. Two of these pools were vernal pools, while the third pool was delineated as a seasonal wetland. This latter designation was based on a connection with a drainage ditch; however, since the connection was a minimal hydrologic alteration, the pool has the potential to provide habitat for large branchiopods (Vollmar Consulting and Wetlands and Water Resources 2010). One of these pools supported a widespread and non-special-status large branchiopod species, triops (*Triops longicaudatus*), as previously observed in October 2009 (Vollmar Natural Lands Consulting 2010).

Federally-listed branchiopod species with the potential to occur onsite include federally-threatened vernal pool fairy shrimp (*Branchinecta lynchi*), the federally-endangered conservancy shrimp (*B. conservatio*), and the federally-endangered vernal pool tadpole shrimp (*Lepidurus packardi*). Additional large branchiopod species with potential to occur include California fairy shrimp (*Linderiella occidentalis*), alkali fairy shrimp (*B. mackini*), midvalley fairy shrimp (*B. mesovallensis*), and triops.

Protocol-level dry season sampling was conducted prior to the winter rainy season (Helm Biological Consulting 2010). Soil samples were collected from all basins previously identified as having the potential to support federally-listed, large branchiopods. Following a close examination of the samples, none of the pools supported federally-listed, large branchiopod cysts. One sample did contain a single tadpole shrimp hatchling from the genus *Triops*.

### Vernal Pool Fairy Shrimp

Vernal pool fairy shrimp is a federally-listed species (i.e., threatened). It is a tiny crustacean found in vernal pools with clear to tea-colored water, most commonly in grass- or mud-bottomed pools in unplowed grasslands. This species is commonly found from early December through early May, and is rarely found with other vernal pool fairy shrimp species

Eight winter protocol surveys for these and other sensitive brachiopods at the Project site were completed in May, and the results were finalized in June 2011 (Vollmar Natural Lands Consulting 2011). Focused dip-net surveys of 22 seasonal pools, scattered across the Yolo Ranch property (**Figure 4.3-8**) documented the presence of vernal pool fairy shrimp within a single pool. A population of approximately 20 individuals, collected during two sampling periods, was estimated to inhabit this seasonal pool, delineated as a vernal pool based on the comparatively (to other pools on the Project site) natural hydrologic regime. All pools on the Project site are flooded following substantial winter rain events and are subject to deep and prolonged submergence during Yolo Bypass flood inundation.

During the 2011 sampling period, the final two sampling periods were postponed due to winter flooding conditions. These two sampling events did not detect any protected invertebrate species; additionally, the flooded conditions had rendered many of the pools previously mapped as potential habitat unsuitable for vernal pool invertebrates (due to depth, invertebrate community composition including absence of vernal pool indicator species, duration of ponding, and human introduction of predatory *Gambusia* for mosquito control). All three seasonal pools are subject to periodic inundation during extreme flood events in the Yolo Bypass. Such events would wash out these invertebrates should they exist on the Project site.

## Special-status Reptiles and Amphibians

The Project site contains suitable habitat for two special-status reptiles: the giant garter snake (*Thamnophis gigas*), which is both a federally-threatened and state-threatened listed species; and, the western pond turtle (*Actinemys marmorata*), which is a California species of special concern.

As noted in **Appendix C**, three amphibians were listed but not expected to occur onsite: California tiger salamander (*Ambystoma californiense*), California red-legged frog (*Rana draytonii*), and western spadefoot toad (*Spea hammondii*). Reasons for the lack of presence and potential non-occurrence on the Project site include: lack of suitable habitat, no known occurrences recorded, and/or presence of a multitude of predators. Hence, no amphibians are discussed further in this section.

### Giant Garter Snake

The giant garter snake (GGS) is listed as a federally-threatened species throughout its range (58 FR 54053), and is also listed as threatened under CESA. GGS is associated with aquatic habitats characterized by the following features:

1. **Water.** Sufficient water is needed during the GGS active season (typically early spring through mid-fall) to supply cover and food such as small fish and amphibians.

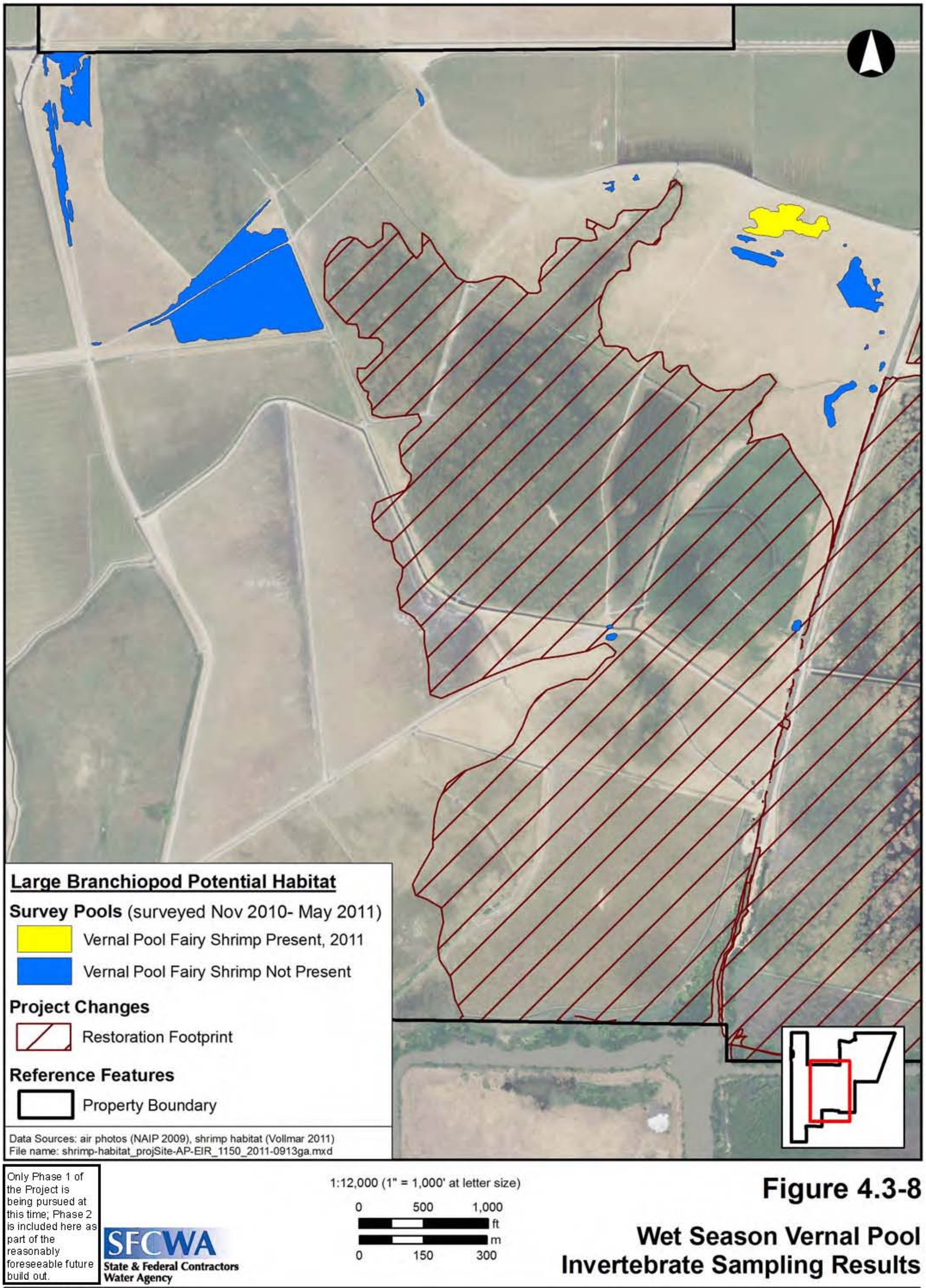


**Figure 4.3-8**

**Wet Season Vernal Pool Invertebrate Sampling Results**

2. **Vegetation.** Emergent herbaceous wetland vegetation is vital for GGS such as cattails and bulrushes, accompanied by vegetated banks, which together provide basking, foraging, and escape cover during the active season.
3. **Habitat during active season.** Adjacent upland habitat (e.g., bank-side burrows, holes, and crevices) provides short-term refuge areas during the active season.
4. **Habitat during dormant period.** High ground or upland habitat above the annual high water mark allows for cover and refuge for GGS from flood waters during the dormant winter period (Brode 1988; Hansen and Brode 1980).

The Project site is on the edge of the local range for GGS, with potential for the species to use the site during its active foraging and mating season (i.e., May through October) (Wetlands and Water Resources 2011). Irrigation ditches on the Project site offer suitable aquatic foraging habitats, with sufficient upland escape provided by adjacent banks (or levee berms). Although extensive wetland habitats do occur onsite, they are predominantly seasonal and provide limited foraging opportunities for GGS. Some of the perennial wetlands may offer suitable foraging and aquatic habitat for the species; however, the Project site is generally devoid of small mammal burrows and, due to winter flood patterns, does not likely offer suitable overwintering habitat for GGS. Hence, the Project site may provide suitable habitat for transient GGS during the active season, but probably not offer year-round, high value habitat for GGS.

#### Western Pond Turtle

Western pond turtles are listed by the state as species of special conern. This species uses the aquatic habitat for foraging, thermoregulation, and predator avoidance (Stebbins 2003). Although primarily an aquatic species, pond turtles can over-winter on land or in water, and may remain active during the winter, depending on environmental conditions. One turtle was observed on the Project site, basking along the edge of one of the larger irrigation channels on the Yolo Ranch property (Vollmar Natural Lands Consulting 2010). Suitable habitat includes all of the larger irrigation ditches on the Project site.

### Special-status Raptors

The Project site contains suitable nesting and foraging habitat for special-status raptors. Although all nesting raptors are protected under CFG Code § 3503.5, some are given further protection through the federal and state endangered species acts. Observed onsite include:

1. **Swainson's hawk**. State-listed species threatened per CESA – with removal of suitable nesting and/or foraging habitat subject to review by CDFW.
2. **Northern harrier.** State species of special concern.
3. **Short-eared owl.** State species of special concern.

Other raptor species with the potential to occur onsite include:

1. **Merlin.** State species of special concern, federal bird species of conservation concern).
2. **White-tailed kite.** California fully protected species.

3. **Western burrowing owl.** State species of special concern, federal bird species of conservation concern.

## Swainson's Hawk

Swainson's hawk (*Buteo swainsoni*) is a summer nesting migrant to the Central Valley and Bay-Delta regions. The preferred habitat for this state listed species (threatened) in the Project region includes open grasslands or low annual and perennial croplands for foraging, with nearby large trees or small groves for nesting (CDFG 2008). Swainson's hawks nest in mature riparian habitat, in scattered trees or small groves in sparsely vegetated flatlands and in individual trees, and then overwinter in Mexico (CDFG 2008). Occurrences of Swainson's hawks within the Bay-Delta region are less frequent than other regions within Yolo and Solano counties, mainly due to a lack of suitable agricultural foraging habitats (Jim Estep, personal communication, 2010).

**Figure 4.3-9** illustrates the documented nest sites and CNDDB occurrences within the Bay-Delta region, including the Yolo Bypass. Particularly illustrative is the general lack of occurrences within the Yolo Bypass relative to the surrounding area likely due to:

1. Generally low abundance of potential nest trees, and
2. Periodic winter/spring flooding of the Yolo Bypass that likely reduces or limits the abundance of rodent prey.

As noted, this species has been previously documented in multiple locations near the Project site, with the nearest occurrence approximately one-half mile from the southwest corner of Yolo Ranch (CDFG 2010). Swainson's hawks can forage up to ten or more miles from their nests. These raptors demonstrate a high degree of nest site fidelity, using the same nests, nest trees, or nesting stands for many years (England *et al.* 1997). Pairs are also monogamous, lasting for many years (England *et al.* 1997).

In 2007, a nest site was located within the riparian emergent woodlands on the southeastern edge of the Project site (along the eastern edge of the Island, bordering the Stair Step); however, it was not known if the hawks were actively using that site (Estep 2008). The larger trees within the riparian woodland could provide suitable nesting habitat for Swainson's hawk, along with foraging habitat of variable quality on the irrigated/non-irrigated pastures. Also, Swainson's hawks were observed flying overhead, possibly foraging onsite (Biosearch Associates 2010).

Using current, site-level vegetation mapping, an evaluation was conducted to determine the relative value of pasture lands on the Project site for Swainson's hawk foraging habitat. Relative suitability values were assigned based on the likelihood of the specific vegetation communities present to support rodent prey populations. In general, areas with low height vegetation combined with predominately dry soils were valued as providing high quality foraging opportunities. This habitat type is generally limited to the restricted-height levee agricultural fields (hay fields), because these areas are not inundated during minor and moderate flood events of the Yolo Bypass, and to the fields within Yolo Ranch that are periodically hayed (see **Figure 2-7**). The high value rating of these areas is relative to the remaining available habitat on the Project site.

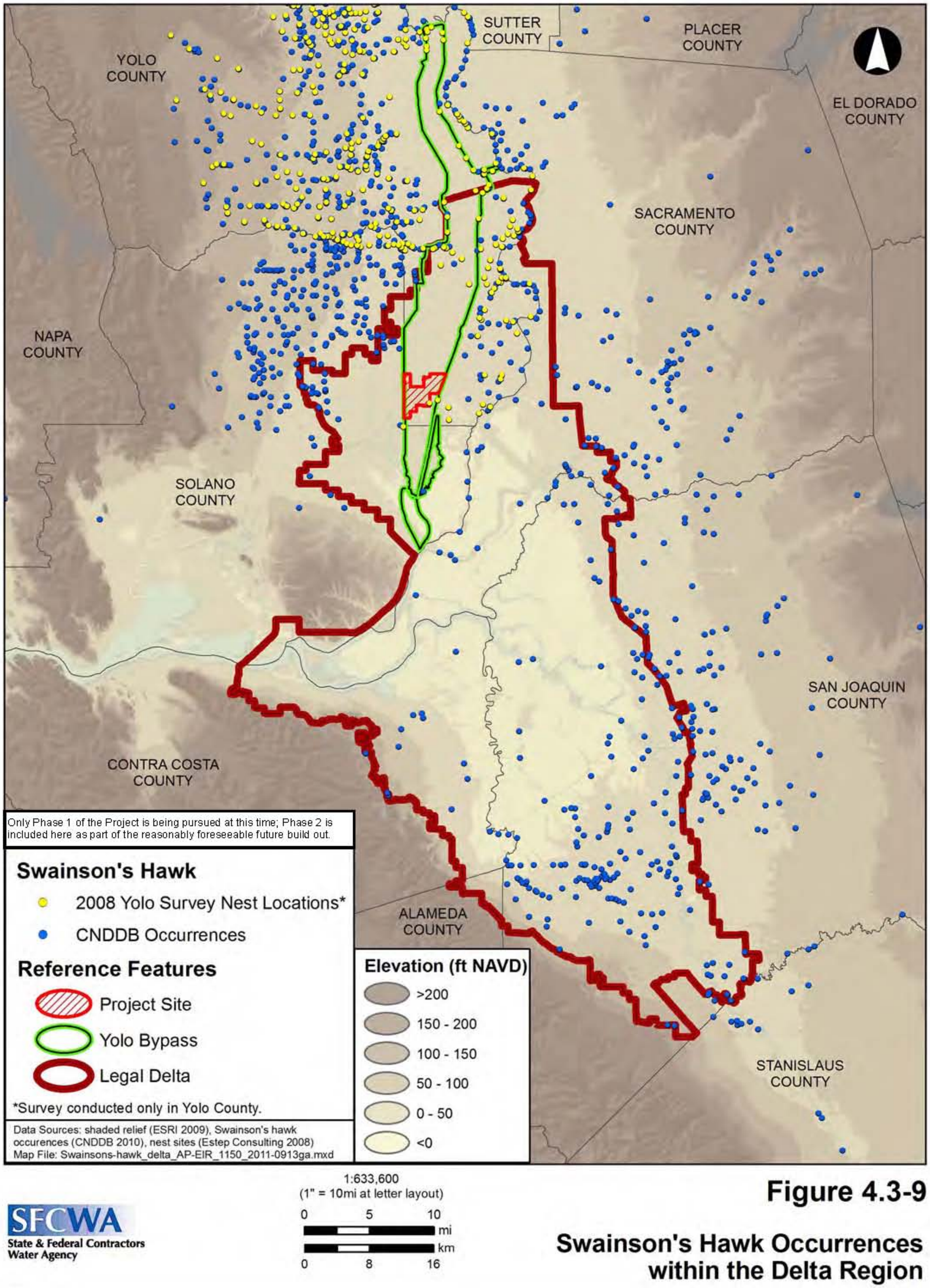


**Figure 4.3-9**

**Swainson's Hawk Occurrences within the Delta Region**

In general, habitat on the Project site is of lower value than areas outside of the Yolo Bypass (see **Figure 4.3-2**), because the flood events of the bypass reduce the abundance of suitable prey resources (mainly small mammals). Moderate foraging habitat for this species dominates the Project site, which includes the wetter seasonal wetland vegetation communities (irrigated wetlands) and areas supporting lush and tall vegetation (such as rabbitsfoot grass and/or perennial wildrye). The perennially wet habitats, which are likely excessively moist to support small mammals, are deemed as providing very low value foraging areas. Overall, a majority of the Project site is believed to offer a range of moderate to low foraging opportunities, both due to the position of the Project site within the Yolo Bypass and to the generally wet conditions of the Project site, which reduces the suitable prey abundance.

The Project site does offer limited, but high quality nesting habitat in riparian areas. Adjacent lands, outside of the Yolo Bypass, do provide suitable foraging grounds, as is evidenced by the numerous CNDDB records documenting Swainson's hawk occurrences in the general Project region and throughout Yolo and Solano counties (refer to **Figure 4.3-9**) (CDFG 2010).

#### Northern Harrier

Northern harriers (*Circus cyaneus*) roost and nest on the ground in areas with tall grasses and forbs; harriers will use habitats in open saltwater and fresh emergent wetlands, lightly-grazed pastures, wet meadows, croplands, desert sinks, and dry upland areas. This state-listed species of special concern prefers habitats that are located near water, such as seasonal wetlands or other wet grasslands or prairies, but often nests in drier upland areas such as cultivated and uncultivated fields. Such habitat for the northern harrier is present on the Project site; however, the nearest documented occurrence for this species is approximately 20 miles southwest of the Project site (CDFG 2010).

#### Short-Eared Owl

Short-eared owls (*Asio flammeus*) have been known to nest in Yolo County in freshwater marsh habitats, seasonal wetlands, fallow fields, and alfalfa fields with tall herbaceous vegetation to conceal nesting females (Yolo County Habitat Conservation Plan [HCP] 2009). A single owl was flushed from a eucalyptus tree on Yolo Ranch during a 2010 site visit. Potential nesting and foraging habitat is available for this state-listed species of special concern onsite. CNDDB records document the nearest occurrence of this species approximately 20 miles southwest of the Project site (CNDDB 2010).

#### Merlin

The merlin (*Falco columbarius*) is an uncommon winter migrant in California. They winter throughout California and breed in northern states, Canada, and Alaska. Wintering habitat includes open forests, grasslands, agricultural fields, mudflats, and urban areas. Suitable foraging habitat is present onsite, but this state-listed species of special concern was not observed during surveys conducted for the proposed Project.

### White-tailed Kite

Suitable nesting habitat is present on the Project site for white-tailed kite (*Elanus leucurus*) in mature riparian habitats located along major tidal waterways. This California fully protected species forages in valley grasslands, savannah-like habitats, agricultural fields, oak woodlands, and riparian areas. Nesting sites are typically selected in riparian areas with dense canopy or in a dense group of trees located near open foraging habitat, such as agricultural fields. Although the Project site provides adequate nesting habitat, its open areas may be too wet throughout the year to provide suitable foraging for this species. The closest documented white-tailed kite nest site is located in the City of Davis (CDFG 2010).

### Western Burrowing Owl

Western burrowing owls (*Athene cunicularia hypugaea*) are found in level, dry, open, heavily grazed or low stature grasslands, agricultural and range lands, and desert habitats, and are often associated with burrowing animals, as they are known to nest and roost in burrows such as those excavated by ground squirrels. They have also been found to occupy disturbed sites, including road and levee embankments, as long as burrows are available or there is suitable soil for burrowing. This California-listed species of special concern has been reported near the Project site; the nearest occurrence was documented less than a quarter-mile north of the Project site (CDFG 2010).

During protocol-level surveys for nesting western burrowing owls on Yolo Ranch, no individuals or evidence of their presence onsite (e.g., burrows) were observed. Hence, the Project site provides only very limited, potential habitat for this species. These results suggest that western burrowing owls are unlikely to nest on the Project site.

## Other Special-status Birds

### Bank Swallow

Bank swallows (*Riparia riparia*) are listed as California threatened. They breed through much of the Northern Hemisphere and migrate south during the winter to South America, Africa, and southern Asia. Within California, bank swallows arrive from their wintering grounds (typically the southern Amazon basin) from mid-March to May, and re-establish breeding colonies promptly after their arrival. Fall migrants typically leave in late July through mid-September. Bank swallows nest in colonies, and in California, nesting commonly occurs in steep earthen riverbanks subject to frequent winter erosion events. Most of California's nesting colonies occur along the upper Sacramento River. The nearest recorded occurrence of bank swallow is near the Brannan Island State Recreation Area (CDFG 2010). The Project site provides some suitable nesting habitat on earthen banks within and adjacent to irrigation and drainage ditches.

### Mountain Plover

Mountain plovers (*Charadrius montanus*) are listed as a California species of special concern. They are highly colonial and form loose flocks of over 1,000 individuals during nesting and wintering seasons. Breeding mountain plovers prefer low vegetation grass plains, plowed fields, alkali sink scrub and playas, annual grasslands, and open sagebrush areas that are barren or have sparse vegetation. They typically winter in dry alkali lakes, coastal prairies, fallow fields, and semi-desert habitats. Preferred wintering areas include those grazed by domestic livestock, within giant kangaroo rat or California ground squirrel habitats (Solano County Water Agency [SCWA] 2009). Currently, the Central Valley wintering population of mountain plover is concentrated in two main areas, including Colusa, Yolo, and Solano counties and from Stanislaus County south to Kern County, with two main populations in Yolo and King counties (Yolo County HCP 2009). Mountain plover are not likely to occur on the Project site, due to lack of dry, barren areas suitable as nesting areas. Most dry and sparsely vegetation areas on the Project site include roads, turnouts, and cattle feeding or watering areas. Additionally, wintering habitat is limited by the flood conditions of the Yolo Bypass and general lack of dry habitats.

### Western Yellow-Billed Cuckoo

The western yellow-billed cuckoo (*Coccyzus americanus occidentalis*) is listed as state endangered. In California, where much of its historical range has been reduced, this species occurs in isolated sites in the Sacramento Valley. At one time, this species was widespread in the Central Valley; since 1965 there have been only nine recordings of yellow-billed cuckoo in Yolo County. This species is a riparian-obligate species and is primary associated with willow-cottonwood riparian woodlands. Nest sites are typically in willow trees; however, occasionally they will use cottonwood and alders. Foraging also occurs within riparian woodland habitats (Yolo County HCP 2009). The one nearby recorded occurrence of this species is near the town of Clarksburg, roughly six miles east of the Project site (see **Figure 4.3-7**). This species was not observed during Project site surveys conducted for other purposes.

### Redhead

The redhead (*Aythya americana*) is listed as a state species of concern. Populations of this species occur year-round in California. Within the Central Valley, suitable nesting habitat has declined due to loss of vast wetland complexes. Small numbers of redheads continue to nest in the Central Valley, mainly on state- and federally-managed wildlife areas and private duck clubs that maintain summer water greater than one meter (about three ft) deep. This species typically nests in freshwater, emergent wetlands with dense stands of tule and cattails that are interspersed with areas of deep open water. Suitable habitat is present, but limited within the duck pond (winter) and the northern edge of the Island (summer and winter). A few nesting birds are observed annually within the Yolo Bypass Wildlife Area (YBWA) (Shuford and Gardali 2008).

### American Bittern

The American bittern (*Botaurus lentiginosus*) is a medium-sized, stocky heron found in freshwater emergent marshes and is cryptically colored to assist in its stand-and-wait hunting behavior. The bittern was listed by USFWS as a nongame species of management concern in 1987 and was included on the National Audubon Society’s Blue List in 1976 (USEPA 2003). In the Central Valley, this species is fairly common from October through April and is uncommon to rare the rest of year; although it breeds there (CDFG-California Interagency Wildlife Task

Group 2008). Populations have been declining since the 1960s due mostly from habitat loss and wetland degradation (via draining of marshes, overgrazing of emergent vegetation, and pesticides). Recent observations of individual bittern have been noted in areas within Davis containing wetlands and in the Fazio YBWA (CDFG 2008). Suitable foraging and nesting habitat does occur within the Project site for this bird species.

### Black Tern

Black terns (*Chlidonias niger*) are listed as state species of special concern. This species migrates to California from their South America wintering grounds in late April through mid-May, and typically begin fall migration as early as late July, peaking in mid-August into mid-September. Nesting occurs in freshwater lakes, ponds, marshes, and flooded agricultural fields (such as rice fields); during migration, terns utilize coastal lagoons and estuaries. Nests often consist of marsh vegetation on floating mats of dead vegetation, muskrat lodges, islands, and artificial platforms or floating cow manure. Black terns are semi-colonial nesters, particularly in productive foraging areas, and nest clusters typically range from 10 to 50 nests (Yolo County HCP 2009).

Foraging activities by black terns typically occur near their nesting sites. In Yolo County, nesting black terns have not been documented recently, perhaps due to a decline in suitable wetland/nesting habitat. Migrants are often observed foraging over flooded rice fields in the Yolo Bypass and over sewage treatment ponds (Yolo County HCP 2009). Suitable nesting and potentially suitable foraging habitat is present onsite; however, no reported occurrences have been recorded within the vicinity of the Project site and none were observed during field surveys conducted for other purposes.

### Loggerhead Shrike

This species is designated by the state as species of special concern. Loggerhead shrikes (*Lanius ludovicianus*) are common inhabitants and winter visitors in the lowlands and foothills of California. This species inhabits a variety of habitats from open grasslands and scrub, to woodlands and riparian areas, and feeds primarily on insects, but may also consume small vertebrates.

Loggerhead shrikes begin breeding in February, and nest from March into May and may continue with raising a second brood as late as July. This species builds well-concealed nests in dense shrubs or trees (Yolo County HCP 2009). Suitable nesting and foraging habitats are present in the agricultural fields and riparian scrub/woodlands within and adjacent to the Project site; however, none have been observed during field surveys conducted for other purposes, and there are no reported occurrences for this species within the vicinity of the Project site.

### Grasshopper Sparrow

This species is listed by the state as a species of special concern. Grasshopper sparrows (*Ammodramus savannarum*) nest in California from March to mid-May, depending on the location. Within Yolo County, most breeding records are documented from late-March until May. Nesting is semi-colonial, in clusters of territories. This species requires dry, well-drained grasslands with bare ground patches for nesting. Such grasslands often contain scattered scrubs or taller annuals that can be used for perching. Grasshopper sparrows breed in a variety of grasslands, including native bunchgrass, wild rye, wet meadows, annual grasslands, and rarely in pasturelands and annual grasslands dominated by star-thistle. This species was observed on the Project site during field surveys.

#### Tricolored Blackbird

Listed as a state species of special concern, the tricolored blackbird (*Agelaius tricolor*) is a California endemic species. A large portion of the population is believed to overwinter in the Delta region and breed in the Central Valley (April through July). This species is a colonial nester, typically nesting in inundated, dense cattail or tule marshes; however, nesting can also occur in upland habitats such as agricultural grain fields, thickets of blackberry, or patches of thistle or stinging nettle. Foraging generally occurs in upland habitats, particularly in dry pastures and grasslands, though heavily-grazed fields are usually not suitable foraging habitat. Winter roosting habitat consists of mainly dense, deepwater marshes and nearby trees (Yolo County HCP 2009).

Foraging typically occurs within relative proximity to the nesting colony; the extent of foraging area for this species also varies depending on colony size and insect abundance, and may range from a radius of two to three miles to as many as eight miles (Yolo County HCP 2009).

Suitable nesting habitat is available on the Project site in freshwater marsh habitats dominated by tule and/or cattails. Blackberry-dominated scrub may also provide some nesting value. Most pastures in the vicinity are heavily grazed, and may provide less valuable foraging habitat. This species has been documented within five miles of the Project site (CDFG 2010) and has been observed on the Project site.

#### Yellow-Headed Blackbird

This species is listed by the state as a species of special concern. Yellow-headed blackbirds (*Xanthocephalus xanthocephalus*) occur year-round in California, but winter and nest in different locations and habitats. They forage in pastures and agricultural fields, especially alfalfa fields with abundant insects. This species then nests in freshwater marshes in tall, emergent, wetland vegetation (such as cattails and tules); such nesting habitat is present on the Project site.

Nesting typically begins in April or May, and occurs in relatively small colonies. Successful reproduction is strongly correlated with distance of the nests from marsh wren territories; marsh wrens will puncture the eggs of yellow-headed blackbirds and other marsh nesting bird species. This species is an uncommon nester and rare winter visitor in Yolo County. In recent years, a few small colonies (i.e., a few pairs) nested at the Davis Wastewater Treatment Plant; additionally, potentially suitable breeding habitat is present at the YBWA and at Roosevelt Ranch (Yolo County HCP 2009).

### Special-status Mammals

Bats

Three special-status bat species have the potential to occur on the Project site. Two of these species, Townsend's western big-eared bat (*Corynorhinus* [*Plecotus*] *townsendii townsendii*) and Yuma myotis (*Myotis yumanensis*) are listed by the Western Bat Working Group (2010) as needing special consideration. Townsend's big-ear bat and a third species, the pallid bat (*Antrozous pallidus*) are listed as California species of special concern. Riparian and stream habitats onsite provide suitable foraging and roosting habitat for all three species; however, no occurrences of these species have been documented within the Project site. Furthermore, construction of the proposed Project would occur outside of the mating season for these bats (i.e., pallid bat and the Yuma myotis breed in late fall, while the Townsend's western big-ear bat breeds in winter). With the proposed enhancement of the riparian habitat with Project implementation, the overall effect would be beneficial to the bats, if present. Hence, no further environmental analysis is required for this species in Section 4.3.3 (Impacts).

## *Regulatory Setting*

### Federal Regulations

Federal Clean Water Act

The federal Clean Water Act (CWA: 33 United States Code [USC] § 1252) provides for the restoration and maintenance of the physical, chemical, and biological integrity of the nation's waters. An applicant for a federal license or permit under CWA § 401 is required to obtain a certification from the state that a project's discharge will comply with applicable effluent limitations and water quality standards during construction and operation. The Central Valley Regional Water Quality Control Board (CVRWQCB) is the authority for § 401 compliance at the Project site. CWA § 404 prohibits discharges of dredged or fill materials into waters of the United States except as permitted under separate regulations by the U.S. Army Corps of Engineers (USACE) and the U.S. Environmental Protection Agency (USEPA). This section also provides protection to special aquatic sites, such as sanctuaries and refuges, wetlands, and mudflats. The Project would require these permits to comply with this act.

Rivers and Harbors Act of 1899

Rivers and Harbors Act of 1899 (33 USC § 403) § 10 is principally concerned with regulation of any work or structures in navigable waters and impacts to navigation. The term navigable waters, is broadly defined by this law to include all tidal waters. Permits authorizing work or structures are issued by the USACE, whose permit process also includes CWA §404 authorization and a consolidated public interest review of factors affecting both laws. Rivers and Harbors Act jurisdiction may in some cases expand the overall federal jurisdiction of the USACE, and may trigger other federal environmental laws.

The proposed restoration design for the Project would involve modifying berms and levees to allow restoration of tidal flows, which would be subject to regulation under the Rivers and Harbors Act. The proposed Project would also modify a federal flood control levee if either Soils Reuse Option #1 (toe berm) or Soils Reuse Option #3 (combination of Options #1 and #2) were selected. These options would constitute an action subject to review under the Rivers and Harbors Act (§ 408); Section 4.1, Hydrology, discusses this activity.

### Federal Endangered Species Act

The federal ESA of 1973, as amended, establishes a national program for conservation (survival and recovery) of species listed as threatened or endangered, and the ecosystems on which they depend. USFWS and the National Marine Fisheries Service (NMFS) are responsible for implementing this act. Federally-listed plants, wildlife, and non-anadromous fish species are regulated by USFWS, and federally-listed, anadromous fish species and (most) marine mammals are regulated by NMFS.

The federal ESA § 7 requires that federal agencies consult with USFWS or NMFS if their actions may affect a federally-listed species or destroy or adversely modify critical habitat. This section also prohibits any federal agency from taking actions likely to jeopardize the survival and recovery of listed species. Issuance of a federal permit is one type of action that may trigger the § 7 consultation. USFWS or NMFS concludes formal § 7 consultation with the issuance of a Biological Opinion (BiOp), which may also include an incidental take statement. The statement provides authorization for incidental take (e.g., indirect killing, harm, harassment, injury) of listed fish or wildlife species that is otherwise prohibited by § 9 of the federal ESA. USFWS and NMFS may also conclude informal consultation with the issuance of a letter of concurrence.

The Project's major goal would be to partially fulfill the two BiOps for the Operations Criteria and Plan (OCAP) associated with the State Water Project (SWP) and the Central Valley Project (CVP). However, the Project itself must also be reviewed in consultation with USFWS and NMFS to ascertain its compliance under the federal ESA.

### Migratory Bird Treaty Act

The federal Migratory Bird Treaty Act (MBTA) of 1918, as amended (16 USC §§ 703 - 711) provides for the protection of migratory birds by making it illegal to possess, hunt, pursue, or kill any migratory bird, or any transaction pertaining to any wild migratory bird, part, nest, egg or product, manufactured or not, unless specifically authorized by the Secretary of the Interior. Currently, there are roughly 1,007 species on the list of migratory birds. The Project site provides foraging opportunities to migratory birds that are listed in **Table C-2** in **Appendix C**, so compliance with MBTA would be coordinated with the USFWS.

### Executive Orders

Two Executive Orders (No. 11988 (Floodplain Management) and No. 11990 (Protection of Wetlands) require federal agencies to provide leadership to protect the natural and beneficial values served by floodplains and wetlands. Federal agencies are directed to avoid development in floodplains where possible, and to minimize the destruction or degradation of wetlands.

Executive Order No. 13112 (Invasive Species) inaugurated the National Invasive Species Management Plan and National Invasive Species Council policy direction to promote coordination between federal, state, and local agencies in monitoring, detecting, preventing, evaluating, managing, and controlling the spread of invasive species, and increasing the effectiveness of scientific research and public outreach in controlling invasive species.

## State Regulations

### California Endangered Species Act

The state counterpart to the federal ESA, CESA (CFG Code § 2050 *et seq.*) has similar, but distinct requirements and goals. CESA requires state agencies to coordinate with the CDFW to ensure that state-authorized or state-funded actions do not jeopardize a state-listed species. The state list of species classified as rare, threatened, or endangered does not necessarily correspond with the federal list of threatened and endangered species.

The state code also includes a less familiar legal status for some species as fully protected. As originally written, prohibitions against take of older fully protected species were more stringent and inflexible than those of CESA, generally prohibiting nearly all take. However, recent California legislation authorizes CDFW to permit the incidental take of 36 fully protected species pursuant to an approved natural community conservation plan (Senate Bill 618 [Wolk].) The legislation, in effect, gives fully protected species the same level of protection as is provided under the Natural Community Conservation Planning Act (NCCPA) for endangered and threatened species (CFG Code § 2835). The legislation also removes a substantial regulatory barrier to the development of regional conservation plans under the NCCPA. The Project could potentially affect state-listed species and thus must be in compliance with CESA, as applicable.

### California Native Plant Protection Act

The Native Plant Protection Act (NPPA) (CFG Code § 1900 *et seq.*) designates 64 species, subspecies, and varieties of native California plants as rare. NPPA prohibits take of rare native plants, but includes some exceptions for agricultural and nursery operations; emergencies; and after properly notifying CDFW for vegetation removal from canals, roads, and other sites, changes in land use, and in certain other situations. Three sensitive plant species do occur or have the potential to occur onsite. The Project would comply with NPPA, as applicable.

### Streambed Alteration Agreements

Under §§ 1600 - 1616 of the CFG Code, CDFW regulates activities that would alter the flow, bed, channel, or bank of streams and lakes. The limits are as the "… bed, channel or bank of any river, stream, or lake designated by the department in which there is at any time an existing fish or wildlife resource or from which these resources derive benefit ..." (§ 1601). Undertaking stream-altering activities that may adversely affect fish or wildlife would require an applicant to enter into an agreement with CDFW for authorization for up to five years. The Project would require a streambed alteration agreement prior to construction.

### Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act (Porter-Cologne) (California Water Code Title 23) protects California waters. The act gives the State Water Resources Control Board, through the CVRWQCB, the authority to regulate discharges of waste, including dredged or fill material, to any state waters within its jurisdiction. Two basin plans have regulations that pertain to the Yolo Bypass: *Water Quality Control Plan for the Sacramento River and San Joaquin River Basins* (last amended in 2009), and *Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary* (adopted in 2006). Basin plans establish beneficial uses of state water resources, set forth water quality standards for surface water and groundwater to protect beneficial uses, as well as implement actions and regulations for the control of nonpoint and point sources of pollution to achieve and maintain water quality standards. Biological beneficial uses of state waters are subject to regulation through various means, including conditions attached to the certification of federal CWA (§ 401) authorizations.

More recently, the CVRWQCB has also generally taken jurisdiction over waters of the state that are not subject to USACE jurisdiction under the CWA. The Project would affect waters of the state and would have to comply with the Porter-Cologne Act, as applicable.

### Executive Order

Executive Order W-59-93 (California Wetlands Conservation Policy) establishes substantive environmental goals to ensure no overall net loss of wetlands; to achieve a long-term net gain in the quantity, quality, and permanence of wetlands in California; and to provide due consideration for private property and stewardship. It is the intent of State and Federal Contractors Water Agency (SFCWA) that the Project would be self-mitigating regarding temporary agricultural wetland loss with long-term expansion of high ecological value, tidal wetlands.

## Local Policies, Plans and Programs

### Yolo County 2030 Countywide General Plan

The Yolo County 2030 Countywide General Plan consists of numerous goals and policies and actions to protect biological resources (County of Yolo 2009). The policies that directly related to biological resources protection are summarized in **Table 4.3-5**.

### Draft Yolo County Natural Community Conservation Plan & Habitat Conservation Plan

The Draft Yolo County Natural Community Conservation and Habitat Conservation Plan (NCCP/HCP) is proposed to be a countywide, multi-species, natural community conservation program and is more generally referred to as the Yolo Natural Heritage Program (NHP). The goal of the Draft NHP is to protect regional diversity by conserving natural open space and agricultural landscapes that provide habitat for special-status and at risk species within the habitats and natural communities of Yolo County across a 653,820-acre planning area. For further information on the NHP, refer to www.yoloconservationplan.org.

## Table 4.3-5. Yolo County 2030 General Plan: Policies Relevant to Wetland Restoration and Biological Resources

| General Plan Policy Number | General Plan Policy Statements and Implementation Actions |
|---|---|
| **CO-1.29** | Balance the needs of agriculture with recreation, flood management, and habitat within the Yolo Bypass. |
| **CO-2** | Protect and enhance biological resources through the conservation, maintenance, and restoration of key habitat areas and corresponding connections that represent the diverse geography, topography, biological communities, and ecological integrity of the landscape. |
| **CO-2.1** | Consider and maintain the ecological function of landscapes, connecting features, watersheds, and wildlife movement corridors. |
| **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 that contribute to sustainable landscapes connected to each other and to regional resources. |
| **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 corridors, aquatic habitat, agricultural lands, heritage valley oak trees, remnant valley oak groves, and roadside tree rows. |
| **CO-2.4** | Coordinate with other regional efforts to sustain and recover special-status species populations by preserving and enhancing habitats for special-status species. |
| **CO-2.5** | Protect, restore, and enhance habitat for sensitive fish species so long as it does not result in the large-scale conversion of existing agricultural resources. |
| **CO-2.10** | Encourage the restoration of native habitat. |
| **CO-2.23** | Support efforts to coordinate the removal of non-native, invasive vegetation within watersheds and replacement with native plants. |
| **CO-2.25** | Support efforts to reduce water temperatures in streams for fish via habitat restoration (e.g. increase shading vegetation) and water management (e.g. control of flows) that are compatible with the Integrated Regional Water Management Plan. |
| **CO-2.26** | Coordinate with local watershed stewardship groups to identify opportunities for restoring or enhancing watershed, in-stream, and riparian biodiversity. |
| **CO-2.28** | Balance the needs of aquatic and riparian ecosystem enhancement efforts with flood management objectives. |
| **CO-2.32** | Protect wetland ecosystems by minimizing erosion and pollution from grading, especially during grading and construction projects. |
| **CO-2.36** | Consider potential effects of climate change on the locations and connections between wildlife migration routes. |
| **CO-A26** | Adopt and implement the Habitat Conservation Plan/Natural Communities Conservation Plan developed through the Yolo Natural Heritage Program. Integrate the HCP/NCCP (Natural Heritage Program) into the General Plan as appropriate. Direct habitat mitigation to strategic areas that implement the Yolo Natural Heritage Program and are consistent with the County's conservation strategy. Avoid the conversion of agricultural areas and focus on lands where wildlife values and farming practices are complementary. (Policy CO-2.1 through CO-2.4, Policy CO-2.14). |
| **CO-A27** | Protect the habitat value and biological function of oak woodlands, grasslands, riparian areas, and wetland habitats. Avoid activities that remove or degrade these habitats and establishment buffers to avoid encroachment into sensitive areas. (Policy CO-2.4, Policy CO-2.14, Policy CO-2.15, Policy CO-2.18, Policy CO-2.19, Policy CO-2.20 through CO-2.24). |
| **CO-9.21** | Work to ensure that state and federal habitat restoration efforts recognize and support the Yolo Natural Heritage Program. |

Source: County of Yolo 2009.

The draft NHP serves as a HCP, pursuant to the federal ESA, and a NCCP under the state's NCCPA. This draft plan is being developed by the Yolo County NCCP/HCP Joint Powers Authority (JPA), which consists of elected officials representing Yolo County and the cities of Davis, West Sacramento, Winters, and Woodland. SFCWA is not a participant of this draft plan.

The Yolo County NCCP/HCP JPA has also established the Swainson's hawk mitigation program in 1993 to protect this species' declining habitat within Yolo County. The interim program, which is dependent on completion of the Draft Yolo County NCCP/HCP, is limited to providing mitigation for impacts to foraging habitat and does not authorize incidental take of Swainson's hawk. The JPA administers the mitigation program for the County, and the cities of Davis, Woodland, Winters, and West Sacramento.

The draft NCCP/HCP is consistent with Yolo County's 2030 Countywide General Plan policies, including, but not limited to, Policies CO-2, CO-2.1, CO-2.2, CO-2.3, CO-2.4, CO-2.10, CO-2.23, CO-2.26, CO-A26, CO-A27, and CO-9.21 (refer to **Table 4.3-5**).

## 4.3.2 Significance Criteria

Potential impacts to terrestrial biological resources would be significant if the Project would exceed any of the following threshold criteria per Appendix G of the *State CEQA Guidelines*:

1. Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the CDFW or USFWS.
2. Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the CDFW or USFWS.
3. Have a substantial adverse effect on federally-protected wetlands as defined by § 404 of the CWA (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means.
4. Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.

Related terrestrial biological resources issues not covered in this section, but that are found elsewhere in the Draft EIR include: changes in water quality (Section 4.2) and crop depredation on nearby agricultural areas due to birds and wildlife at the restoration sites (Section 4.0).

Additionally, construction of the proposed Project is intended specifically to have long-term, beneficial effects on the recovery of certain federally-listed special-status species. It may also have some short-term, temporary impacts (refer to Section 4.3.3, Impacts).

## 4.3.3 Impacts

### Impact 4.3-1: Effects to Wetland Communities

*Applicable Significance Criteria: 2 and 3*

**Effects from Ground-disturbing Activities to Wetland Communities**

Construction activities could result in the temporary disturbance of up to 44 acres of seasonal wetlands and other waters (i.e., agricultural irrigation and drainage ditches). Other ground-disturbing activities associated with post construction (e.g., additional tidal connection and corrective actions) would also cause disruptions and temporary losses within wetland communities.

Temporary disturbances to ecological functions could include:

1. Temporary loss or degradation of the existing plant community.
2. Decrease in potential foraging or burrowing opportunities for wildlife.
3. Reduction in erosion protection.
4. Decline in soil microbial community.

Wetlands and waters that would sustain temporary disturbances could lose some or all of their ecological functions during this time, but would begin to function differently and more naturally following the cessation of such ground-disturbing activities. Because construction and other major earth-moving activities during post construction would take place only during the dry summer months, a period when pastures supporting seasonal marsh and wetlands currently are used for cattle grazing, earth-moving alteration of seasonal wetland functions would be minimal to moderate relative to existing grazing pressures.

Temporary impacts on wetland community functions could occur as a result of the following ground-disturbing activities:

1. Use of staging areas for trailers, equipment, and vehicles.
2. Use and movement of construction machinery within wetland communities.
3. Temporary disruptions to the availability of aquatic and wetland habitats associated with the proposed relocated of irrigation features for the soils reuse options.

Given that much of the Project site supports seasonal and farmed wetlands, some or all construction staging areas would likely be designated within such wetlands, which typically have lower ecological functions and values than the other wetland communities present onsite. To the extent possible, sensitive habitats would be avoided. Any temporary loss of waters associated with the soils reuse options would be temporally limited to the duration of Project construction (approximately six months); however, an extensive network of irrigation features would continue to be available (as aquatic habitat) during the Project construction period. Additionally, waters (irrigation ditches) temporarily affected as part of the soils reuse activities would be reconstructed and would regain their original ecological functions. Similar impacts would occur during the post-construction phase of the Project as it would relate to the additional tidal connection, if needed to be built.

Temporary impacts to wetland communities resulting from Project ground-disturbing activities would be **significant**, as a result of short-term degradation and/or disrupted use of federally protected wetland habitats, fragmentation or isolation of sensitive plant or animal communities and important wildlife habitat, or disruption of natural wildlife movement corridors.

Implementation of Mitigation Measure 4.3-1 would reduce temporary, but significant, impacts to wetland communities due to earth-moving activities, to **less than significant.** As detailed in Section 4.3.4, Mitigation Measure 4.3-1 would employ avoidance and/or minimization of the size of areas needed to carry out construction activities in sensitive wetland habitats. Various techniques would include educating the contractor and construction crew on environmental awareness, adhering to strictly demarcated areas to avoid sensitive sites noted in specifications and marked in the field, and utilizing qualified biologists for monitoring sensitive areas, as needed. This mitigation measure is consistent with Yolo County's General Plan policies CO-2, CO-2.1, CO-2.2, CO-2.5, CO-2.10, CO-2.28, CO-2.32, and CO-A27 (refer to **Table 4.3-5**).

#### Permanent Conversion of Wetland Communities

The Project would permanently convert up to 1,480 ac of seasonal and perennial non-tidal emergent marsh and some irrigation and drainage ditches (other waters and tidally surcharged waters) to tidal marsh, including marsh channels and a large intertidal pond, while enhancing seasonal marsh and riparian habitat (**Table 4.3-6**).

The conversion of waters and wetlands would result from the following restoration activities:

1. Excavation within the tidal marsh plain.
2. Dredging of tidal channels.
3. Removal of irrigation within existing marsh plain elevations.
4. Elimination of irrigation and/or grazing from seasonal marsh enhancement areas.
5. Removal of grazing from riparian areas.
6. Enhancement of hydrology of fallow areas, roads, and berms.
7. Fill and relocation of waters.

Overall, the permanent conversion of wetland habitats would result in a substantial improvement to the wetland functions and values on the Project site for the delta smelt and salmonids. The conversion would also increase the amount of habitat available to these sensitive fish species. Restored areas would result in the increased availability and quality of rearing habitat for Chinook salmon, steelhead, delta smelt, Sacramento splittail, and other delta native fish by providing more shelter, hiding, resting, and feeding areas for the fishes (refer to Section 4.4, Aquatic Biological Resources) that would then be tidally connected to the greater Bay-Delta system. Indeed, this conversion would be a **beneficial effect** that supports the Project goals and objectives (Section 1.3, Project Overview and Section 3.1.1, Project Goals and Objectives). The resultant mosaic of tidal marsh, seasonal marsh, other wetlands and open water would be of higher ecological function and value, with more frequent tidal inundation to adjacent natural communities.

## Table 4.3-6 Changes in Natural Communities with Proposed Project

| Description | Existing Conditions (acres) | | | Proposed Conditions (acres) | | | Changes (acres) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Phase 1 | Phase 2 | Total | Phase 1 | Phase 2 | Total | Phase 1 | Phase 2 | Total |
| **Restoration Component: Estimated Acreage Conversion** | | | | | | | | | |
| **Jurisdictional Wetlands and Water** | | | | | | | | | |
| **Wetlands** | | | | | | | | | |
| Perennial emergent marsh (tidal) | 12 | 0 | 12 | 861 | 365 | 1,226 | 849 | 365 | 1,214 |
| Perennial emergent marsh (non-tidal) | 182 | 47 | 229 | 26 | 8 | 34 | (156) | (39) | (195) |
| Seasonal marsh | 520 | 316 | 836 | 136 | 38 | 174 | (384) | (278) | (662) |
| Seasonal and farmed wetlands | 2,004 | 88 | 2,092 | 1,632 | 58 | 1,690 | (372) | (30) | (402) |
| Riparian | 50 | 11 | 61 | 48 | 11 | 59 | (2) | 0 | (2) |
| **Navigable waters** | | | | | | | | | |
| Tidal waterways | 28 | 2 | 30 | 28 | 2 | 30 | 0 | 0 | 0 |
| Tidally surcharged irrigation/drainage | 35 | 15 | 50 | 35 | 15 | 50 | 0 | 0 | 0 |
| **Other waters** | 41 | 20 | 61 | 31 | 19 | 50 | (10) | (1) | (11) |
| **Uplands** | | | | | | | | | |
| Levee side slopes | 261 | 42 | 303 | 336 | 25 | 361 | 75 | (17) | 58 |
| **TOTAL** | 3,133 | 541 | 3,674 | 3,133 | 541 | 3,674 | 0 | 0 | 0 |
| **Soils Reuse Component: Conversions** | | | | | | | | | |
| **Option #1: Toe Berm with Maintenance Access and West Yolo Bypass Levee Ditch Relocation** | | | | | | | | | |
| **Uplands** | | | | | | | | | |
| Levee side slopes | 15 | 0 | 15 | 101 | 0 | 101 | 86 | 0 | 86 |
| **Jurisdictional Wetlands and Waters** | | | | | | | | | |
| Seasonal wetlands | 76 | 0 | 76 | 10 | 0 | 10 | (66) | 0 | (66) |
| Tidally surcharged irrigation/drainage | 35 | 0 | 35 | 4 | 0 | 4 | (14) | 0 | (14) |
| Other waters | 5 | 0 | 5 | 1 | 0 | 1 | (4) | 0 | (4) |
| **TOTAL** | 131 | 0 | 131 | 116 | 0 | 116 | 2 | 0 | 2 |
| **Option #2: Restricted-Height Levee Agricultural Stockpile** | | | | | | | | | |
| **Uplands** | | | | | | | | | |
| Seeded pasture | 215 | 0 | 215 | 215 | 0 | 215 | 0 | 0 | 0 |
| Levee side slopes, roads, berms, and ranch complex | 39 | 0 | 39 | 39 | 0 | 39 | 0 | 0 | 0 |
| **Jurisdictional wetlands and waters** | | | | | | | | | |
| Other waters | 8 | 0 | 8 | 8 | 0 | 8 | 0 | 0 | 0 |
| **TOTAL** | 262 | 0 | 262 | 262 | 0 | 262 | 0 | 0 | 0 |
| **Option #3: Combination of Options #1 and #2** (specifics would be determined with the preparation of the final engineering designs; however, the acreages would fall between the two options listed above). | | | | | | | | | |

Hence, the gain of higher value wetlands and other waters of the United States would more than offset the loss of seasonal and perennial wetlands (see **Table 4.3-6**). Additionally, implementation of Soils Reuse Option #1 would provide substantial flood control benefits to many thousands of acres of agricultural lands immediately west of the lower Yolo Bypass. This beneficial effect would be consistent with Yolo County's General Plan policies CO-2.10 and CO-A27 (refer to **Table 4.3-5**). Accordingly, permanent conversion of wetland communities on the Project site would result in a **less-than-significant impact**. No mitigation would be required.

### Impact 4.3-2: Loss of or Disturbance to Riparian Woodland and Scrub

*Applicable Significance Criteria: 2*

Riparian habitats provide essential habitat for special-status plants, nesting birds, and fish, along with controlling bank erosion, sedimentation, and nutrient releases. Mature riparian forests are limited in the Yolo Bypass as a result of flood control maintenance and agricultural practices. Riparian emergent woodland habitats and riparian scrub on the Project site are restricted to the south along the Stair Step and to the east along the Toe Drain, along the western edge of the west Yolo Bypass levee borrow ditch, and along the central irrigation ditch on Yolo Ranch.

Construction could result in loss of some riparian woodland or scrub for tidal connections to the adjacent tidal waterways of the Stair Step and Toe Drain. Each tidal connection would be in the range of 70 to 120 feet (ft) in width (up to a total of 720 ft, including the additional connection if needed during the post-construction phase). The impacts to riparian woodlands or scrub would be minimized during final design to include the removal only of trees and scrub directly within the confines of the tidal channel transect, and an adjacent buffer large enough to permit passage of construction machinery. Additionally, the location of the tidal connections would be selected such that the minimum number of trees would be impacted or removed. This Project design is consistent with Yolo County's General Plan policies CO-2, CO-2.1, CO-2.3, CO-2.10, and CO-2.27 (refer to **Table 4.3-5**). Long-term operations and maintenance, along with other post-construction activities (i.e., inspections, monitoring, and limited scientific collections) would not further degrade these habitats. Thus, impacts to riparian woodlands would be minimal, and restricted to the narrow tidal connection modification, resulting in a **less-than-significant impact**. No mitigation would be required.

For Soils Reuse Option #1 (toe berm), a loss of up to one acre of riparian scrub habitat would result (Vollmer Natural Lands Consulting and Wetlands and Water Resources 2011a). However, this habitat area consists only of patchy stands of emergent scrub (i.e., non-native Himalayan blackberry and native California rose, with sporadic emergent trees). This area provides lower ecological functions because the stands are discontinuous and do not provide suitable habitat for native species, such as Delta tule pea. Hence, impacts to such low value riparian scrub at the Soils Reuse Option #1 would be **less than significant**. No mitigation would be required.

Long-term operations and maintenance activities, and other post-construction actions (e.g., monitoring, sampling, and inspecting) would not be likely to occur in the riparian corridors (except for occasional/rare minor repairs/emergency repairs to the tidal connections). Hence, such activities for the Project's post-construction phase would result in **no impact**. No mitigation would be required.

### Impact 4.3-3: Effects to Special-status Plants

*Applicable Significance Criteria: 1 and 2*

#### Loss or Disturbance of Habitat for Special-status Plants

Construction would consist of site preparation (including hydrologic management, clearing and grubbing, access road construction, and hazardous materials management), and construction of the proposed Project elements, (wetlands, soils reuse, and irrigation and drainage modifications). The hydrologic management elements include repairing or replacing broken water control structures along adjacent tidal water bodies, including along the Stair Step and Toe Drain. Construction of temporary low berms also could occur in topographic depressions, such as along the Stair Step. The Delta tule pea, Mason's lilaeopsis, and Suisun marsh aster are all associated with the edges of tidal waterways or large irrigation ditches on the Project site, including the Stair Step (see **Table 4.3-3**). Mason's lilaeopsis and Suisun marsh aster were found at scattered locations along the tidally influenced banks of the southern and eastern edge of the Project site (along the Stair Step channel). Delta tule pea was identified growing among riparian scrub associated with the tidally surcharged central irrigation ditch on the Project site. Should construction activities associated with hydrologic management, or other related activities during post construction, occur in the vicinity of these special-status plant species, they could disturb or extirpate individuals or populations, as well as their seed-banks. Additionally, invasive plant species could be introduced or spread through construction equipment, vehicles, and workers' clothing. Once these noxious plant species colonize an area, they can be very difficult to eradicate and can outcompete native plant species.

Overall, with Project implementation, direct loss of the special-status plant species from clearing or earth-moving activities, direct and indirect impacts to these plants' habitats, and/or increased competition with invasive plant species would be **significant**. Project elements regarding the control of invasive plants in Section 3.5.1 and the implementation of Mitigation Measure 4.3-2 would reduce this impact to **less than significant**. As noted in Section 4.3.4, Mitigation Measure 4.3-2 involves adjusting the engineering design to minimize impacts to special-status plants, flagging plants in the field either for avoidance by construction equipment and personnel (if possible), and/or providing the opportunity for eventual collection by the CDFW for plant translocation. The mitigation measure also proposes methods to limit the spread of invasive weeds that can out-compete native plants. This mitigation measure is consistent with Yolo County's General Plan policies CO-2, CO-2.4, CO-2.10, and CO-2.27 (refer to **Table 4.3-5**).

#### Potential Threat of Noxious Weed Populations to Special-status Plants

During both construction and certain post-construction activities, ground-disturbing elements of the Project have the potential to spread invasive terrestrial plant species. As discussed in Section 3.5.1, colonization and establishment of invasive wetland and upland plants may present a threat to establishment of native plant species, including special-status plants, into the restored tidal marsh and adjacent enhanced wetland habitats and wetland buffer, particularly around the upper margins.

Common nuisance species known today include yellow star thistle (*Centaurea solstitialis*) and broad-leaf pepperweed (*Lepidium latifolium*); other species may arise in the future that are not a factor at this time. Perennial pepperweed is of the greatest concern, because this species tolerates moist soils and could invade excavated marsh plain areas. Both species have the potential to invade the wetland buffer, which would be removed from summer irrigation. Invasive plant species have the potential to degrade habitat quality by outcompeting desirable native species.

The Project would include a number of measures to discourage such colonization, such as cattle grazing in these areas, physical removal, competitive exclusion plantings, salt application, and limited herbicide application if grazing is not effective. More Project specifics can be found in Section 3.5.1. With the implementation of these methods to control invasive plant species, this impact would be **less than significant**, and no mitigation would be required. These methods are consistent with Yolo County's General Plan policies CO-2 and CO-2.23 (refer to **Table 4.3-5**).

### Impact 4.3-4: Loss of Vernal Pools and Habitat for Invertebrates

*Applicable Significance Criteria: 1, 2, and 3*

The two vernal pools located on the Project site are located outside the restoration footprint (see **Figure 4.3-8**), and staging areas would be located outside of such sensitive areas. Infrastructure improvements, however, would be located in their vicinity, and construction-related activities could impact these sensitive habitats. Protocol-level wet season surveys, conducted during winter and spring 2011 prior to onset of spring floods, documented the presence of a small number of vernal pool fairy shrimp in one of the seasonal pools, although sampling conducted subsequently after spring flooding of the Bypass detected no protected invertebrate species in the pools onsite. The vernal pools receive hydrologic inputs only from natural sources (i.e., rainwater and runoff) and from periodic Yolo Bypass floods. Thus, the cessation of irrigation in nearby areas would not affect the vernal pools.

Potential direct construction-related impacts would include the possible trampling of vernal pool habitats by construction personnel and/or impacts associated with construction equipment or vehicle use (e.g., driving over vernal pool habitats). Potential indirect impacts would include the inadvertent release of hazardous materials into these sensitive areas or changes to topography or drainage that affected inflow or otherwise affected the timing or duration of vernal pool hydration/inundation (refer to Section 4.8, Hazards and Hazardous Materials and Section 4.1, Hydrology, respectively). Such impacts to vernal pools and vernal pool invertebrate species would be **significant** even during dry season conditions**.** This impact would be mitigated to **less than significant** through implementation of Mitigation Measure 4.3-3. As noted in Section 4.3.4, Mitigation Measure 4.3-3 involves onsite protection strategies and actions, such as establishing a clear buffer zone so that construction activities do not disrupt, destroy, or contaminate the vernal pools. This mitigation measure is consistent with Yolo County's General Plan policies CO-2, CO-2.1, CO-2.2, CO-2.3,CO-2.4, CO-2.32, and CO-A27 (refer to **Table 4.3-5**).

## Impact 4.3-5: Impacts on Giant Garter Snake or Giant Garter Snake Habitat

*Applicable Significance Criteria: 1*

### Loss of Habitat for Giant Garter Snake

The Project site may provide suitable aquatic habitat for transient GGS during the active season, but does not offer year-round, high value habitat for GGS due to winter inundation and flooding in the Yolo Bypass (Wetlands and Water Resources 2011). Construction activities (as well as post-construction activities such as the additional tidal connection) could temporarily disturb habitat for GGS, which includes seasonal wetlands, riparian scrub, and upland areas (levees and berms). Aquatic and ephemeral-aquatic habitats with potential to support GGS include tidal wetlands, irrigation ditches, perennial ponds, and perennial wetlands. Excavation of the marsh plains and channels, as well as the three soils reuse options, would result in temporary loss of GGS suitable habitat by temporarily rendering irrigation ditches inaccessible to GGS until relocated ditches were built. Construction (and future post-construction activities, such as the additional tidal connection) would take place only during the dry season (roughly April to November but variable each year) to avoid potential flood flows and associated soil erosion and mobilization of sediment. This schedule roughly coincides with the active season for GGS, when mortality is less likely to occur. The temporary loss of potential habitat would be **significant**, if not mitigated. Implementation of Mitigation 4.3-4 would reduce this potential impact to **less than significant.** As stated in Section 4.3.4, Mitigation Measure 4.3-4 is based on identifying GGS habitat and then monitoring during ground-disturbing activities, minimizing disturbances to the habitat, and wherever possible, returning disturbed areas (such as the removal of temporary berms) back to pre-Project condition. This mitigation measure is consistent with Yolo County's General Plan policies CO-2, CO-2.1, CO-2.2, and CO-A27 (refer to **Table 4.3-5**).

### Injury or Mortality of Individual Giant Garter Snakes

Construction activities, as well as post-construction events (such as the additional tidal connection) also have the potential to cause injury or mortality of individual GGS. Excavation activities, including marsh plain construction and fill and/or relocation of irrigation ditches could fill or crush burrows or crevices, obstruct GGS movement, decrease prey base, and may result in the direct disturbance, displacement, injury and/or mortality of GGS. Following construction of the soils reuse activities, the toe berm and/or stockpile would be stabilized as needed, using appropriate erosion control measures (such as hydroseeding, ground covering, and/or appropriate storm-water drainage consistent with supporting the movement of GGS, if present) to prevent damage from Yolo Bypass flood flows or wind erosion (refer to Section 4.1, Hydrology). Additionally, an accidental chemical and/or petroleum spill during construction could enter the aquatic habitat killing individual GGS as well as prey species. Project elements for avoiding accidental spills of chemicals and hazardous materials are discussed and evaluated in Section 4.8, Hazards and Hazardous Materials. Nonetheless, the impacts from the preceding activities would be **significant**, if not mitigated. Implementation of Mitigation 4.3-4, along with construction best management practices (BMP) measures (see Chapter 3, Project Description) would reduce this impact to **less than significant**. Per Section 4.3.4, Mitigation Measure 4.3-4 relies on monitoring, controlling the speed of construction vehicles and equipment, along with restricting the extent of construction activities in suitable GGS habitat and/or relocation of individual GGS if necessary. This mitigation measure is consistent with Yolo County's General Plan policies CO-2, CO-2.1, CO-2.2, and CO-A27 (refer to **Table 4.3-5**).

#### Stranding and Trapping of Individual Giant Garter Snakes in Restored Tidal Channels

The tidal channel geometries have been designed to promote peak ebb tide flow velocities of approximately three ft per second. In tidal marsh systems, peak velocities typically occur on ebb tide, with peaks occurring as the marsh plain drains (Bayliss-Smith *et al.* 1979). These peak velocities can last for one to two hours with the semi-diurnal tides experienced in the San Francisco Estuary and the Delta.

Although this peak velocity may be somewhat high for GGS, its short duration combined with the sinuosity of restored channels and vegetated channel banks, would not adversely affect GGS. This species can tolerate significant flow pulses in agricultural channel settings (of at least three ft per second) (Eric Hansen, personal communication, May 2011).

In addition, the high degree of tidal channel sinuosity would yield two beneficial aspects for GGS. First, channels would exhibit both low and high velocity areas, thus providing low velocity refugia for snakes during high flow events and preventing GGS from being entrained in high velocity currents and carried off of the Project site. Second, the banks of channels would be vegetated with tules and other tidal freshwater wetland plants, and flows on bends would direct GGS to the outside bends, which would serve as catchments for swimming GGS. The Project design would address the potential for stranding within channels at low tide with gently sloping banks on the insides of some channel meander bends, which would provide 'ramp'-type escapes from channels during extreme low tides. Because the Project would be designed in a manner that minimizes the potential risk of trapping GGS during high tidal flows and stranding of GGS during low tide, impacts would be **less than significant**, and no mitigation would be required.

#### Long-term Conversion of Giant Garter Snake Habitat

Under current conditions, the Project site provides suitable and marginal aquatic foraging habitat for GGS, mainly in the form of irrigation and drainage ditches, which support varying degrees of prey resources and predatory fish species. Conversion of irrigated agriculture to tidal marsh habitat, including sinuous tidal channels and a large intertidal pond, would alter the current distribution of available habitat for GGS within the Project site. The Project would, however, result in a net increase in available suitable aquatic habitat for this species. In the long term, the proposed Project would include a network of tidal channels with a suitable flow regime for GGS foraging and use. Tidal channels would support tidal marsh habitats but would terminate at marsh transition areas, which would provide basking and active season retreats for GGS. The Project would also include construction of a tidally-influenced, perennial pond that would function as a perennial aquatic feature supporting a consistent source of prey for GGS. The boundaries and depth of this pond would vary depending on the tidal stage. Overall, restoration would result in a net increase in perennial freshwater marsh – tidal marsh – through the conversion of about 1,480 acres of currently marginal habitat managed as irrigated agriculture. This long-term conversion of habitat would be a **beneficial** effect on GGS within the Lower

Yolo Bypass. This benefit is consistent with Yolo County's General Plan policies CO-2, CO-2.1, CO-2.2, and CO-A27 (refer to **Table 4.3-5**).

Therefore, the long-term conversion of potential GGS habitat on the Project site would result in a **less-than-significant impact**. No mitigation would be required.

### Impact 4.3-6: Impacts on Western Pond Turtle or Western Pond Turtle Habitat

*Applicable Significance Criteria: 1*

#### Injury or Mortality of Individual Western Pond Turtles

Although protocol surveys have not been conducted, western pond turtles could be present onsite. In fact, during habitat surveys of the Project site, a single western pond turtle was incidentally observed in the central irrigation ditch on Yolo Ranch. Abundant, suitable habitats for escape and refuge already exists onsite and would be available to this species during construction, especially within the retained irrigation and drainage ditches. Irrigation ditches outside of the Project footprint would maintain the current water levels and habitat functions.

The potential to injure or kill turtles could occur within the proposed restoration area or within those irrigation ditches relocated as part of the soils reuse options, during construction. Impacts to turtles occurring in aquatic features within the construction footprint would be **significant**, if not mitigated. Surveys and monitoring for this species within suitable habitat would be the strategy to avoid impacting the turtles. Therefore, implementation of Mitigation Measure 4.3-5 would reduce such impacts to this reptilian species to **less than significant**. As detailed in Section 4.3.4, Mitigation Measure 4.3-5 requires survey of areas that would be suitable habitat for this turtle species and then monitoring during ground-disturbing/dewatering activities by a qualified biologist. For individual western pond turtles found in active construction sites, they would be relocated out of the immediate area of construction by a qualified biologist following standard CDFW protocol. This mitigation measure is consistent with Yolo County's General Plan policies CO-2, CO-2.1, CO-2.2, and CO-A27 (refer to **Table 4.3-5**).

#### Long-term Conversion of Western Pond Turtle Habitat

The Project would, in the long term, provide a net gain of aquatic habitat for the western pond turtle from the restoration of tidal channels with adjacent basking habitat in high marsh areas. The proposed Project would also include construction of a tidally influenced perennial pond that would function as a perennial aquatic feature supporting a consistent source of prey for western pond turtles. Restoration (including long-term operation and maintenance) would result in a net increase in perennial freshwater marsh, including suitable aquatic habitat. Overall, long-term impacts to western pond turtle habitat would be **beneficial**. This benefit is consistent with Yolo County's General Plan policies CO-2, CO-2.1, CO-2.2, and CO-A27 (refer to **Table 4.3-5**). Therefore, the long-term conversion of potential western pond turtle habitat on the Project site would result in a **less-than-significant impact**. No mitigation would be required.

### Impact 4.3-7: Impacts to Nesting Habitat and to Nesting Special-status and Migratory Birds

*Applicable Significance Criteria: 1 and 4*

Trimming or removal of trees, shrubs, and other vegetation during the bird nesting season may result in direct impacts to potential nesting habitat for special-status birds, including raptors protected under CFG Code § 3503 and other nesting birds protected under the MBTA. Besides vegetation clearance, earth-disturbing activities (e.g., trenching, excavating, dredging, and grading) have the potential to impact ground nests and any associated eggs and/or nestlings either directly or indirectly. Additionally, activities that require mobilizing large equipment have the potential to disturb nesting birds due to excessive noise.

Several bird species use the Project site for nesting (see **Table 4.3-4**). Red-winged and tricolored blackbirds nest in colonies in emergent marsh and scrub vegetation such as blackberry (Beedy and Hamilton 1999). Within the riparian woodlands, suitable nesting habitat exists for the state fully protected white-tailed kite and the state threatened Swainson's hawk. Both short-eared owls and northern harriers nest on the ground in agricultural fields. Common shorebird/wading species, such as American avocet (*Recurvirostra americana*) and killdeer (*Charadrisu vociferous*) have been observed nesting on the Project site. Killdeer have been observed nesting on actively used access roads on the Project site. American bittern usually create a nest that is a platform of matted, emergent aquatics, other herbaceous stems, sticks and/or leaves, usually in shallow water, but sometimes floating, or on ground – but always concealed in tall, dense, fresh emergent vegetation (CDFG-California Interagency Wildlife Task Group 2008).

Under the current proposed Project schedule, excavation, creation of tidal connections, and vegetation removal would be conducted during the bird-nesting season (February 15$^{th}$ through August 15$^{th}$) and have the potential to temporarily impact nesting migratory birds and/or special-status birds and raptors. Such impacts may preclude or disrupt nesting in the Project area throughout the duration of the construction period and would be **significant**, if not mitigated. Implementation of Mitigation Measure 4.3-6 would result in a **less-than-significant impact** through the use of information obtained through preconstruction surveys, buffers, monitoring, and the implementation of habitat features associated with the Project (refer to Section 4.3.4, Mitigations). This mitigation measure is consistent with Yolo County's General Plan policies CO-2, CO-2.1, CO-2.2, and CO-2.4 (refer to **Table 4.3-5**).

Project excavation for tidal connections could also occur in areas that support nesting Swainson's hawks. However, tidal connections would occur late in the construction process, well after nesting season would have concluded. Should construction activities associated with tidal connections extend during active nesting, the proposed Project could result in direct impacts to this species through trimming and/or removal of a few trees, or because of noise generated by construction equipment. This impact would be **significant**, if not mitigated. Implementation of Mitigation Measure 4.3-6 that involves preconstruction surveys, buffers, and monitoring would result in a **less-than-significant impact** (refer to Section 4.3.4, Mitigations). Additionally, potential post-construction corrective measures including the placement of cattle exclusion fencing and invasive species management would further reduce this potential impact following completion of restoration activities. This mitigation measure is consistent with Yolo County's General Plan policies CO-2, CO-2.1, CO-2.2, and CO-2.4 (refer to **Table 4.3-5**).

The locations for the soils reuse options do not support vegetation necessary for Swainson's hawk nesting. Therefore, **no impact** to nests or nesting behavior to Swainson's hawk would occur in the soils reuse option locations. No mitigation would be required.

Outside of nesting season (i.e., August 16th to February 14th), tree removal, pruning, grubbing, grading, excavation or other construction activities to discourage pre-nesting activities would have **no impact** to nesting bird pairs or nesting habitat, and would not require mitigation. As noted in **Figures 4.3-7 and 4.3-9**, occurrences of sensitive bird species, including nesting by Swainson's hawk, have been observed almost exclusively outside of the Project site, with major occurrences several miles away, either northwest or southeast of the site. The minor vegetation removal that would happen outside of the nesting season would not substantially change the opportunities later on for migratory birds to nest, as they currently do, outside of the Project site.

For species that rely on the emergent tidal marsh, such as the American bittern, the restored wetlands would provide additional habitat for foraging and nesting; therefore, resulting in a **long-term, beneficial effect**.

### Impact 4.3-8: Loss of Foraging Habitat for Swainson's Hawk

*Applicable Significance Criteria: 1*

During the short-term construction phase, Swainson's hawk, a state-listed (threatened) species, would continue to depend on a range of natural and artificial habitats for foraging both on the Project site (but outside of the construction footprint) and offsite, including low or open agricultural lands such as alfalfa and certain row crops and grassland habitats. They would also rely on wetlands and other habitats to some extent. Their preferred habitats typically support abundant rodent populations such as voles, but this species also feeds on birds, reptiles, and insects. Much of the northwestern portion of the Project site would not be converted to tidal wetlands and would retain its importance for providing Swainson's hawk foraging habitat.

By the end of construction, i.e., early to mid-October, most Swainson's hawks would migrate out of California to overwinter in Mexico. In the following season, there would be a significant reduction in foraging habitat for these returning summer nesting migrants at the Project site. It is important to note that Swainson's hawks can forage up to ten or more miles from their nests. These raptors demonstrate a high degree of nest site fidelity, using the same nests, nest trees, or nesting stands for many years (England *et al.* 1995). Pairs are also monogamous, lasting for many years (England *et al.* 1997). **Figure 4.3-9** identifies at least 11 records for this species within five miles of the Project site. Multiple Swainson's hawks have also been observed flying overhead, possibly foraging on the Project site (Biosearch Associates 2010).

In California, especially in the Central Valley region, causes of the Swainson hawk's population decline are attributed to loss of nesting habitat (Schlorff and Bloom 1984) and loss of foraging habitat to urban development and to conversion to unsuitable agriculture, such as orchards and vineyards (England *et al.* 1995, England *et al.* 1997, and Anderson *et al.* 2005). Implementation of the Project would result in the loss of approximately 1,585 acres of low- to moderate-quality foraging habitat through the conversion of existing farmlands to tidal marshes and other wetlands (see **Table 4.5-8**). This impact would be **potentially significant**, if not mitigated. However, the Project would also create a wetland buffer consisting of 174 acres of enhanced seasonal marsh and 59 acres of riparian habitat. This 233-acre enhancement component would provide a buffer around the restored wetlands that would result in a mosaic of habitats of a higher ecological quality and value that would benefit Swainson's hawk. Accordingly, part of the Project would self-mitigate for the loss of foraging habitat by upgrading the existing farmland to a higher quality of wetlands/riparian habitats through the creation of the wetland buffer.

In general, with a mitigation ratio of 0.5 (mitigation credit) to 1 (affected environment) for impacts to low/moderate foraging areas of Swainson's hawk, the high functioning wetland buffer would provide roughly 1,480 acres of mitigation credit. This estimate would be further refined upon completion of the engineering designs and discussions with wildlife regulatory agencies. The remaining 105 acres of impacted foraging area (1,585 – 1,480 = 105 acres) would be mitigated by up to 52.5 acres of credit by implementing Mitigation Measure 4.3-7. As a result of a combination of self-mitigation and implementing Mitigation Measure 4.3-7, the impact to the foraging area of the Swainson's hawk would be **less than significant**. As detailed in Section 4.3.4, this mitigation measure permits a variety of options to substantially avoid this significant impact by enhancement of habitat onsite, payment of a mitigation fee for a Swainson's hawk mitigation bank, purchase of conservation easements, and/or participation in the Yolo County NCCP/HCP if adopted prior to the Project's start of construction. This mitigation measure is consistent with Yolo County's General Plan policies CO-2, CO-2.1, CO-2.2, and CO-2.4 (refer to **Table 4.3-5**).

### Impact 4.3-9: Loss of Habitat for Other Foraging Raptors and Other Special-status Birds

*Applicable Significance Criteria: 1 and 2*

Short-term disturbance from construction could deter northern harrier, short-eared owls, and other birds of prey observed onsite from foraging in otherwise suitable habitats. It is important to note that no white-tailed kites, a fully protected species, have been observed onsite, possibly due to the Project's open areas being too wet throughout the year to provide suitable foraging habitat for this species. Additionally, other foraging raptors that have not been observed, but for which suitable habitat may be present (e.g., merlin and western burrowing owl), could also be possibly deterred during the temporary, construction phase if nearby.

Although the Project restoration site would be in proximity to agricultural lands that typically offer high forage value, seasonal inundation of these lands already limits the size and extent of small mammal prey populations. Still, alfalfa is raised offsite, is highly productive, and supports large populations of small mammals such as voles and invertebrates that in turn can provide high-quality foraging value for a variety of birds and other wildlife. Alfalfa is of great importance to Swainson's hawk and some of the other raptor species, which take advantage of such high prey densities and population cycles when the fields are irrigated and mowed. However, such harvesting does not occur within the Project footprint. Additionally, minimal loss of riparian trees and shrubs in areas slated for tidal connections would likewise have a similar, minimal reduction in small mammal and ground-nesting bird prey populations.

Hence, similar to the foraging area impact on Swainson's hawk, the loss of foraging habitat for other special-status foraging raptors would be **significant**, if not mitigated. Implementation of Mitigation Measure 4.3-7 would reduce this impact to **less than significant**. As detailed in Section 4.3.4, this mitigation measure includes a variety of options to substantially avoid this significant impact by enhancement of habitat onsite, payment of a mitigation fee for a Swainson's hawk mitigation bank (that would be of benefit to other sensitive raptors), purchase of conservation easements, and/or participation in the Yolo County NCCP/HCP if adopted prior to the Project's start of construction. This mitigation measure is consistent with Yolo County's General Plan policies CO-2, CO-2.1, CO-2.2, and CO-2.4 (refer to **Table 4.3-5**).

For other special-status birds, such as mountain plover, black tern, western yellow-billed cuckoo, bank swallow, and yellow-headed blackbird, there is either a low or low-to-moderate probability of them occurring onsite because of limited, suitable habitat. Other special-status bird species have been observed onsite and include redhead, loggerhead shrike, grasshopper sparrow, and tricolored blackbird. These species of special concern, along with the bank swallow (California listed), do not occupy the site, or do so in a limited manner. Given the availability of nearby agricultural lands and that the restored areas would result in a mosaic of habitats that would be beneficial to these bird species, the temporary and permanent impacts on foraging for these species, if found onsite, would be **less than significant**. No mitigation would be required.

## 4.3.4 Mitigations

### Mitigation Measure 4.3-1: Effects from Ground-disturbing Activities to Wetland Communities

The following mitigation measure shall be implemented before and during the implementation of the Project where ground-disturbing activities may occur in sensitive wetland communities:

- Locate construction staging areas outside of sensitive wetland habitats, by having their perimeters be as small as possible, and/or within the excavation/trenching limits. All staging areas shall be clearly flagged to define the limits of the work area. No construction access, parking, or storage of equipment or materials shall be permitted outside of the established limits. This shall be achieved by limiting machinery and vehicle access to temporary tracks or pads, as necessary and direct removal of soils to temporary stockpiles, located away from sensitive areas, for transportation to the selected soils reuse site. These areas shall be identified on work plans, specifications, and other applicable engineering/contractor documents.
- Define clearly on maps the boundaries of sensitive habitats not within the restoration footprint (ground-disturbing areas of the Project site), and demarcated as avoidance areas.
- Limit construction and post-construction actions involving ground-disturbing activities to the dry weather season (generally between April and November, but varies each year), thereby reducing the potential for export of contaminants and/or sediments.

- Require contractors to sign documentation stating that they have read, agree to, and understand the required avoidance measures.
- Require construction crew members to participate in training sessions, which clearly identify and describe sensitive communities and other biological resources.
- Utilize the services of a qualified biologist onsite to observe ground-disturbing activities when such activities occur within or adjacent to sensitive habitats, and/or to monitor sensitive special-status species' locations.

Upon completion of ground-disturbing activities in areas containing sensitive habitats, the Project description identifies post-construction monitoring that will be carried out to ensure successful revegetation of native species, along with implementation of corrective measures, as needed, including control of invasive plant species (see Section 3.5: Long-term Operations and Maintenance Component, Project Outcome Verification Monitoring Component, and Regional Science Support Component).

Implementation of Mitigation Measure 4.3-1, above, would reduce the effects from ground-disturbing activities to wetland communities to **less than significant**.

### Mitigation Measure 4.3-2: Loss or Disturbance of Habitat for Special-status Plants

Prior to initiation of ground-disturbing activities, a qualified botanist shall conduct appropriately timed, focused botanical surveys of the Project site targeting known and potentially occurring special-status plant species, including Mason's lilaeopsis, Suisun Marsh aster, and Delta tule pea.

Dependent on the Project's final design and conditions onsite, the following mitigation measure shall be undertaken to avoid, minimize, or reduce loss or disturbance to identified special-status plants:

- Adjust design to avoid or minimize impacts to special-status plants to the extent feasible.
- Enumerate, photograph, and flag conspicuously or mark with temporary drift fencing or other physical barriers the areas supporting individual plants or populations of special-status plants that have the potential to be impacted, prior to construction.
- Limit work areas including access and staging areas to the minimum area practical.
- Notify the California Department of Fish and Wildlife (CDFW) at least ten days in advance of any ground-disturbing activity that could impact special-status plants to allow CDFW the opportunity to salvage affected individual plants for transplanting to a suitable location outside of the disturbed area.
- Require construction workers to inspect their clothing, including shoes, all vehicles, and equipment for invasive plant seeds or plant material, prior to entering and leaving the Project area. Appropriate cleaning measures shall be taken to prevent the spread of invasive species into restored areas.

Implementation of Mitigation Measure 4.3-2, above, would reduce the loss or disturbance of habitat for special-status plant species to **less than significant**.

### Mitigation Measure 4.3-3: Loss of Vernal Pools and Habitat for Invertebrates

The following mitigation measure shall be undertaken to avoid disturbance to vernal pools and special-status invertebrates:

- Establish and flag conspicuously a buffer area of at least a minimum of 250 feet horizontally from the edge of hydrophytic vegetation associated with the vernal pools. No construction vehicles, equipment, or personnel shall be permitted to enter this buffer zone for the duration of the Project.
- Identify the vernal pools as Environmentally Restricted Areas on all applicable engineering and construction drawings, designs, and specification/work plan documents.
- Control nearby grading or contouring in a manner that does not prevent hydrologic inputs to the vernal pools that are similar to what currently happens.

Implementation of Mitigation Measure 4.3-3, above, would reduce the loss of vernal pools and habitat for invertebrates for special-status plant species to **less than significant**.

### Mitigation Measure 4.3-4: Impacts on Giant Garter Snake or Giant Garter Snake Habitat

The mitigation measure for the giant garter snake (GGS) shall include the following:

- Require construction personnel to receive U.S. Fish and Wildlife Service (USFWS)-approved worker environmental awareness training to recognize the GGS and its habitat.
- Confine clearing of vegetation to only those areas necessary to facilitate construction activities and no greater. Areas designated as GGS and/or other sensitive-species habitat within or adjacent to the Project site shall be flagged as Environmentally Sensitive Areas and shall be avoided by all construction personnel.
- Survey the site at least 24 hours prior to the initiation of ground-disturbing activities in suitable GGS habitat. This survey shall be conducted by a USFWS-approved biologist in suitable GGS habitat. Surveys shall be repeated if a lapse in construction activity of two weeks or greater occurs. If a GGS is encountered during ground-disturbing activities, activities at that specific location shall cease until appropriate corrective measures, in concurrence with USFWS coordination, have been completed or it has been determined that the GGS will not be harmed. Sightings shall be reported to USFWS.
- Implement construction activity within GGS habitat between May 1 and October 1. This is the active period for GGS and direct mortality is lessened, because GGS are expected to actively move and avoid danger. Consultation with the USFWS is required for construction activities scheduled to occur in potential GGS habitat between October 2 and April 30.
- Ensure that any dewatered GGS habitat shall remain dry for at least 15 consecutive days after April 15, and prior to excavating or filling of the dewatered GGS habitat.

- Require when working near flooded canals during the summer months, vehicle speeds shall not exceed 15 miles per hour (MPH) in areas where the line-of-site is obstructed and 25 MPH in other areas to avoid hitting the GGS and other special-status wildlife.
- Remove temporary fill and construction debris after construction completion, and, wherever feasible, restore disturbed areas to pre-project conditions.

As required through the federal and state permitting processes, further minimization and avoidance measures shall be developed in coordination with USFWS through §7 of the federal ESA consultation and with CDFW through CESA for this Project.

Implementation of Mitigation Measure 4.3-4, above, would reduce the impact on GGS and its habitat to **less than significant**.

### Mitigation Measure 4.3-5: Impacts on Western Pond Turtle or Western Pond Turtle Habitat

The mitigation measure for the western pond turtle shall be as follows:

- Survey areas prior to implementing restoration activities and/or dewatering scheduled in or adjacent to suitable aquatic habitat for the western pond turtle by a qualified biologist.
- Remove western pond turtles found by a qualified biologist to a safe location outside of the work area in a manner consistent with applicable CDFW regulations.
- Conduct periodic monitoring by a qualified biologist of suitable aquatic habitat for the western pond turtle until ground-disturbing/dewatering activities have ceased in those areas.

Implementation of Mitigation Measure 4.3-5, above, would reduce the impact on the western pond turtle and its habitat to **less than significant**.

### Mitigation Measure 4.3-6: Impacts to Nesting Habitat/Nesting Special-status and Migratory Birds

To ensure compliance with MBTA (16 USC §§ 703-711) and CFG Code (§§ 3503, 3511, and 3513), the following mitigation measure shall be implemented, as applicable, to special-status birds and migratory birds:

- Remove or trim a minimal number of trees that would satisfy the Project design and allow for minimal access by construction equipment within the construction footprint in advance of nesting season, i.e., August 16 to February 14. Should nesting by sensitive bird species occur prior to February 15, proceed with the remaining steps in this mitigation measure.
- Conduct preconstruction nesting bird surveys during the bird breeding season (February 15 to August 15) within the construction footprint including a 300-foot buffer, by a qualified biologist, within two weeks prior to equipment or material staging, pruning/grubbing or surface-disturbing activities, including soils grading or excavation. If no active nests are found, no further mitigation shall be required.

- Establish a buffer area if active nests (i.e., nests in the egg laying, incubating, nestling or fledgling stages) are found within 300 feet of the Project footprint for raptors (birds of prey), within a 0.5-mile radius for Swainson's hawk, or 100 feet of the construction footprint for all other bird species. Non-disturbance buffers shall be established at a distance sufficient to minimize disturbance based on the nest location, topography, cover, the nesting pair's tolerance to disturbance and the type/duration of potential disturbance. The size of the buffers may be adjusted provided a qualified biologist, in consultation with CDFW and USFWS, monitors the behavior of the nesting birds and determines that impacts of Project-related activities are not affecting the birds' reproductive or rearing efforts.
- Ensure that if rescheduling of work is infeasible and non-disturbance buffers cannot be maintained, a qualified biologist shall be onsite to monitor active nests for signs of disturbance for the duration of the construction activity. If it is determined that Project-related activities are resulting in nest disturbance, then work in those sensitive areas shall cease immediately and CDFW and USFWS shall be contacted for further guidance.
- Repeat nest surveys by a qualified biologist, if post-construction activities continue beyond one year.

Implementation of Mitigation Measure 4.3-6, above, would reduce the impact to nesting habitats and nesting activities by special-status birds and migratory birds to **less than significant**.

### Mitigation Measure 4.3-7: Loss of Foraging Habitat for Swainson's Hawk

The mitigation measure for Swainson's hawk shall be as follows:

- Ensure that suitable Swainson's hawk foraging habitat is preserved or enhanced at a ratio of 0.5:1 for up to 52.5 acres, based on final engineering designs, presence of Swainson's hawk, and consultation with CDFW. Preservation/enhancement may occur through one or more actions:
    - Preservation and enhancement of habitat onsite with equal or greater quality than existing foraging habitat.
    - Payment of a mitigation fee to a CDFW-approved mitigation bank for the preservation of Swainson's hawk foraging habitat.
    - Purchase of conservation easements or fee title to suitable Swainson's hawk foraging habitat to protect the habitat from urban development.
    - Participation in the Yolo County NCCP/HCP should it be adopted prior to the Project's start of construction.
    - Other measures, as needed, through consultation with CDFW.

Implementation of Mitigation Measure 4.3-7, above, would reduce the impact to foraging by Swainson's hawk and other raptors to **less than significant**.

Depending on final design and construction efforts, credit for creating foraging habitat for the Swainson's hawk shall also be pursued as credit under the near term actions of the forthcoming Bay Delta Conservation Plan.

With adherence to all applicable laws and regulations governing biological resources (refer to Section 4.3.1, Regulatory Setting) and implementation of the above mitigation measures with applicable BMPs and post-construction activities (e.g., corrective actions, monitoring, etc.), no unavoidable, significant adverse impacts for biological resources assessed in Section 4.3.3, Impacts, would result with Project implementation.

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# 4.4 Aquatic Biological Resources

## 4.4.1 Setting

Aquatic biological resources include resident and anadromous fish occurring in water bodies within and adjacent to the Project site (in the Yolo Bypass and the Cache Slough Complex), the invertebrate communities in these water bodies, and aquatic and riparian habitat used by these aquatic organisms. The presence, timing, and distribution of these fish species are described, as well as certain aspects of their biology.

### *Fish Resources*

The Yolo Bypass and Cache Slough Complex provide aquatic habitat for at least 44 fish species (**Table 4.4-1**), all of which have the potential to occur in the Project vicinity (Sommer *et al*. 2003; California Department of Fish and Wildlife [CDFW] unpublished data). Of the 17 native fish species potentially occurring on the Yolo Bypass, eight have been designated as special-status species under the federal Endangered Species Act (ESA) or California ESA (CESA). These species include:

- Green sturgeon (*Acipenser medirostris*; federally threatened, state species of special concern).
- Delta smelt (*Hypomesus transpacificus*; federally threatened, state endangered), longfin smelt (*Spirinchus thaleichthys*; state threatened).
- Sacramento splittail (*Pogonichthys macrolepidotus,* state species of special concern).
- Pacific lamprey (*Lampetra tridentate*; federal species of concern).
- River lamprey (*Lampetra ayresii*; state species of special concern).
- Steelhead (*Oncorhynchus mykiss*; federally threatened).
- All four runs of Chinook salmon (*Oncorhynchus tshawytscha*) occurring in the Central Valley. These runs include spring-run (state and federally threatened), fall-run (state and federal species of concern), late fall-run (state and federal species of concern), and winter run (state and federally endangered).

The status and life history of each of the special-status fish species is discussed further.

#### Chinook Salmon

Migratory fish species, including Chinook salmon, steelhead and green sturgeon range from the middle-upper Sacramento River and its tributaries, through the Delta and out into the Pacific Ocean. The aquatic habitat provided by the Yolo Bypass under sufficiently inundated conditions serves as a migration corridor for Chinook salmon adults moving to upstream spawning tributaries, and for downstream-emigrating juveniles. In addition, the inundated floodplain provides rearing habitat for emigrating juvenile Chinook salmon.

## Table 4.4-1. Fishes Occurring on the Yolo Bypass Floodplain and Potentially Occurring on the Project Site

| Common Name | Scientific Name | Native/Introduced | Federal/State Status[1] |
|---|---|---|---|
| ***Acipenseridae – Sturgeons*** | | | |
| **Green sturgeon** | *Acipenser medirostris* | Native | T/SSC |
| **White sturgeon** | *Acipenser transmontanus* | Native | --/-- |
| ***Atherinopsidae – Silversides*** | | | |
| **Inland silverside** | *Menidia beryllina* | Introduced | --/-- |
| ***Catostomidae – Suckers*** | | | |
| **Sacramento sucker** | *Catostomus occidentalis* | Native | --/-- |
| ***Centrachidae – Sunfish and Basses*** | | | |
| **Black crappie** | *Pomoxis nigromaculatus* | Introduced | --/-- |
| **Bluegill** | *Lepomis macrochirus* | Introduced | --/-- |
| **Green sunfish** | *Lepomis cyanellus* | Introduced | --/-- |
| **Largemouth bass** | *Micropterus salmoides* | Introduced | --/-- |
| **Redear sunfish** | *Lepomis microlophus* | Introduced | --/-- |
| **Smallmouth bass** | *Micropterus dolomieu* | Introduced | --/-- |
| **Spotted bass** | *Micropterus punctatus* | Introduced | --/-- |
| **Warmouth** | *Lepomis gullosus* | Introduced | --/-- |
| **White crappie** | *Pomoxis annularis* | Introduced | --/-- |
| ***Clupeidae – Herrings*** | | | |
| **Threadfin shad** | *Dorosoma petenense* | Introduced | --/-- |
| **American shad** | *Alosa sapidissima* | Introduced | --/-- |
| ***Cottidae – Sculpins*** | | | |
| **Pacific staghorn sculpin** | *Leptocuttus armatus* | Native | --/-- |
| **Prickly sculpin** | *Cottus asper* | Native | --/-- |
| ***Cyprinidae – Minnows*** | | | |
| **Common carp** | *Cyrpinus carpio* | Introduced | --/-- |
| **Fathead minnow** | *Pimephales promelas* | Introduced | --/-- |
| **Golden shiner** | *Notemigonus crysoleucas* | Introduced | --/-- |
| **Goldfish** | *Carassius auratus* | Introduced | --/-- |
| **Hitch (Central Valley)** | *Lavinia exilicauda* | Native | --/-- |

# Table 4.4-1. Fishes Occurring on the Yolo Bypass Floodplain and Potentially Occurring on the Project Site

| Common Name | Scientific Name | Native/Introduced | Federal/State Status[1] |
|---|---|---|---|
| **Red shiner** | *Cyprinella lutrensis* | Introduced | --/-- |
| **Sacramento blackfish** | *Orthodon microlepidotus* | Native | --/-- |
| **Sacramento pikeminnow** | *Ptychocheilus grandis* | Native | --/-- |
| **Sacramento splittail** | *Pogonichthys macrolepidotus* | Native | --/SSC |
| ***Embiotocidae – Surfperches*** | | | |
| **Tule perch** | *Hysterocarpus traskii* | Native | --/-- |
| ***Gasterosteidae – Sticklebacks*** | | | |
| **Threespine stickleback** | *Gasterosteus aculeatus* | Native | --/-- |
| ***Gobiidae – Gobies*** | | | |
| **Yellowfin goby** | *Acanthogobius flavimanus* | Introduced | --/-- |
| **Shimofuri goby** | *Tridentiger bifasciatus* | Introduced | --/-- |
| ***Ictaluridae – Bullhead Catfish*** | | | |
| **Black bullhead** | *Ameiurus melas* | Introduced | --/-- |
| **Brown bullhead** | *Ameiurus nebulosus* | Introduced | --/-- |
| **Channel catfish** | *Ictalurus punctatus* | Introduced | --/-- |
| **White catfish** | *Ameiurus catus* | Introduced | --/-- |
| ***Moronidae – Striped Basses*** | | | |
| **Striped bass** | *Morone saxatilis* | Introduced | --/-- |
| ***Osmeridae – Smelts*** | | | |
| **Delta smelt** | *Hypomesus transpacificus* | Native | T/E |
| **Longfin smelt** | *Spirinchus thaleichthys* | Native | --/T |
| **Wakasagi** | *Hypomesus nipponensis* | Introduced | --/-- |
| ***Percidae – Perches*** | | | |
| **Bigscale logperch** | *Percina macrolepida* | Introduced | --/-- |
| ***Petromyzontidae – Lampreys*** | | | |
| **Pacific lamprey** | *Lampetra tridentate* | Native | SC/-- |
| **River lamprey** | *Lampetra ayresii* | Native | --/SSC |
| ***Poeciliidae – Livebearers*** | | | |
| **Western mosquitofish** | *Gambusia affinis* | Introduced | --/-- |

### Table 4.4-1. Fishes Occurring on the Yolo Bypass Floodplain and Potentially Occurring on the Project Site

| Common Name | Scientific Name | Native/Introduced | Federal/State Status[1] |
|---|---|---|---|
| ***Salmonidae – Salmon and Trout*** | | | |
| **Chinook salmon (spring-run)** | *Oncorhynchus tshawytscha* | Native | T/T |
| **Chinook salmon (fall-run)** | *O. tshawytscha* | Native | SC/SSC |
| **Chinook salmon (late fall–run)** | *O. tshawytscha* | Native | SC/SSC |
| **Chinook salmon (winter-run)** | *O. tshawytscha* | Native | E/E |
| **Steelhead (Central Valley)** | *O. mykiss* | Native | T/-- |

Source: Sommer *et al*. 2003; California Department of Fish and Game unpublished data
[1] Status abbreviations: E = Endangered; T = Threatened; SC = Species of Concern; SSC = Species of Special Concern.

Though adult Chinook salmon may be present in the lower Sacramento River year around, adults have only been documented on the Yolo Bypass floodplain when inundated from October through June (e.g., Sommer *et al.* 2001a; Sommer *et al.* 2001b). Juveniles could be at the Project site during the same period, since they have been captured on the Yolo Bypass floodplain during December through June (e.g., Sommer *et al.* 2001a; Sommer *et al.* 2001b), although they have been observed in the lower Sacramento River as early as October (Moyle *et al.* 1995). The life histories and status of these four Chinook salmon runs are described and referenced below.

## Sacramento River Environmentally Significant Unit Winter-run Chinook Salmon

The Sacramento River Environmentally Significant Unit (ESU)[22] winter-run Chinook salmon was originally listed as an endangered species under the ESA on January 4, 1994 (59 *Federal Register* [FR] 440), and the endangered status designation was reaffirmed on June 28, 2005 (70 FR 37160). The ESU includes all naturally spawned populations of winter-run Chinook salmon in the upper Sacramento River below Keswick Dam and its tributaries, as well as fish from two artificial propagation programs:

1. Winter-run Chinook salmon from the Livingston Stone National Fish Hatchery (NFH).
2. Winter-run Chinook salmon in a captive broodstock program maintained at Livingston Stone NFH and the University of California Bodega Marine Laboratory.

Adult winter-run ESU Chinook salmon upstream migrations through the lower Sacramento River occur from December through July, and peak during January through April, the same time as the peak period of juvenile emigration through the lower river into the Delta (National Marine Fisheries Service [NMFS] 1993).

[22] An evolutionarily significant unit, or ESU, of Pacific salmon is considered to be a distinct population segment and thus a species under the Endangered Species Act.

### Central Valley Environmentally Significant Unit Spring-run Chinook Salmon

Central Valley ESU spring-run Chinook salmon were listed as threatened under the CESA in February 1999, and under the ESA on September 16, 1999 (50 Code of Federal Regulations [CFR] 50394). The Central Valley ESU includes all spawning populations in the Sacramento River and its tributaries, including Butte Creek; Clear, Deer and Mill creeks and the Feather River; and one artificial propagation program, the Feather River Hatchery spring-run Chinook program.

Mature spring-run Chinook salmon begin migrating into the Sacramento River from March through September (Reynolds *et al.* 1990), peaking during April through June. Spawning occurs in mid-August through early October. A small portion of an annual year-class may emigrate as post-emergent fry and reside in the Delta undergoing smoltification, a physiological process preparing them for saltwater entry. The timing of juvenile emigration from the spawning and rearing reaches varies among the tributaries of origin, and occurs from November through June.

### Central Valley Fall/Late Fall-run Chinook Salmon

The fall-run of Chinook salmon is currently the largest run of Chinook salmon in the Sacramento River system. In general, adult fall-run Chinook salmon migrate into the Sacramento River and its tributaries from July through December, peaking from mid-October through November. Fall-run Chinook salmon spawn in the Sacramento River and its numerous tributaries. Fall-run emigrants may be present in the lower Sacramento River in any month except perhaps October, and the Delta in any month, but most abundant in the lower Sacramento River and the Delta during winter and spring (Williams 2006).

Late fall-run adult Chinook salmon immigration into the Sacramento River generally begins in October, peaks in December, and ends in April (Moyle *et al.* 1995). Primary spawning areas for late fall-run Chinook salmon are in tributaries to the Sacramento River. Juveniles emigrate through the lower Sacramento River in October through April, peaking in January and February.

## Central Valley Distinct Population Segment Steelhead

Central Valley Distinct Population Segment (DPS) steelhead was listed as threatened under the ESA on March 19, 1998 (63 FR 13347). As the anadromous form of rainbow trout, steelhead was once abundant in California coastal and Central Valley drainages from the Mexican to Oregon borders. Existing wild steelhead stocks in the Central Valley are now mostly confined to the upper Sacramento River and its tributaries (McEwan and Jackson 1996).

Adult steelhead, typically averaging 600 – 800 millimeters (mm) in length (Moyle *et al.* 1995), generally leave the ocean and begin upstream migration from August through April, but have been documented in the Yolo Bypass as late as June (Sommer 2001b). Spawning generally occurs from January through April (McEwan and Jackson 1996). Juvenile steelhead remains in the natal streams for one to three years prior to emigrating. Emigration of one- to three-year old, sub-adult fish from the American River primarily occurs from January through June (Snider and Titus 2000; Sommer 2001b). Unlike Chinook salmon, steelhead is iteroparous (able to spawn repeatedly). Thus, kelts (post-spawning adults) may be present in the Yolo Bypass shortly after spawning (i.e., January through mid-April).

### Green Sturgeon

On April 7, 2006, NMFS proposed the Southern DPS of green sturgeon, which includes all fish populations south of the Eel River, California, as threatened under the ESA (71 FR 17757). The Final Rule establishing take prohibitions for the Southern DPS was promulgated on June 2, 2010 (75 FR 30714).

The green sturgeon population is spread out. Adult green sturgeons inhabit marine waters along the eastern Pacific Coast from Mexico to Alaska (Moyle 2002). They move into estuaries and lower reaches of rivers in spring and early summer to feed and spawn. Green sturgeons tagged in San Pablo Bay ranged up at least to Vancouver Island, Canada (Lindley *et al.* 2008).

Based on angler and incidental catches of green sturgeon in the Sacramento River, and larval green sturgeon catches in the upper reaches of the lower Sacramento River (i.e., downstream of Shasta Dam), spawning times are believed to be from March through July, peaking from mid-April to mid-June (Poytress *et al.* 2011; U.S. Fish and Wildlife Service [USFWS] 1995). In the Sacramento River, spawning is believed to occur upstream of the Red Bluff Diversion Dam (RBDD); however, some spawning may occur immediately downstream of the RBDD when the flow-control gates at this structure are closed annually on May 15 (Hublein 2006; Poytress *et et al.* 2011). Juvenile green sturgeons are believed to reside in freshwater habitats from one to four years, before emigrating to the Delta under winter high-flow events; however, the timing and duration of juvenile emigration to the Delta is unknown (Environmental Protection Information Center *et al.* 2001; Poytress *et al.* 2011). Kynard *et al.* (2005) suggested that juvenile sturgeon move downstream to over-wintering and rearing habitats in the fall months, when temperatures decreased to less than 50°F and are, therefore, most likely to occur in the vicinity of the Project during the fall.

### Delta Smelt

The USFWS listed delta smelt as a threatened species under the federal ESA in March 1993 (58 FR 12854), and designated its critical habitat on December 19, 1994 (59 FR 65256). The delta smelt was listed as threatened under the CESA in 1993, and re-designated by the state as endangered in 2008.

The current range extends from Suisun Bay upstream through the Delta in Contra Costa, Sacramento, San Joaquin, and Yolo counties; however, delta smelt may be carried to San Pablo Bay under high outflows, but have not established permanent populations there (Moyle 2002). Spawning migrations begin in late winter and last through early summer. Delta smelt are weak swimmers, relying largely on transport flows and tides during migrations. The species life cycle is completed within the brackish low-salinity zone (LSZ) and freshwater portions of the Delta.

Although spawning has never been observed in the wild, evidence from laboratory studies and on related species suggest that delta smelt spawning occurs in freshwater, in sloughs and shallow edge waters of channels in the upper Delta and in the Sacramento River above Rio Vista (Moyle

2002). Delta smelt are broadcast spawners that discharge their milt and eggs near the channel bottom, over substrates of sand and small gravels (USFWS 2008; Brown and Kimmerer 2003; Wang 2007).

Following hatching, the planktonic (drifting in the water column) larvae are transported downstream near the surface of the water column. The larvae are carried by currents to zones of freshwater/saltwater mixing from late March through July (Wang 1986), where they rear for one year before reaching maturation and spawning. Occasionally, a very small percentage of the population spawns at two years of age.

Larval delta smelt occur seasonally in the Cache Slough Complex, as indicated by North Bay Aqueduct Larval Fish Survey (NBALFS) data, collected by CDFW from 1993 through 2004, from mid-February through mid-July. Delta smelt were captured in all years of the study.

The Department of Water Resources (DWR) data indicates that delta smelt occur in water bodies adjacent to the Project area from January through June (**Table 4.4-2**). DWR has conducted fish monitoring in the Yolo Bypass since 1998 (DWR unpublished data). This monitoring program operates an eight-foot (ft) diameter rotary screw trap (RST) and beach seine in the Toe Drain at a location directly adjacent to the eastern boundary of the Project site. The RST has operated annually from January through June since 1998, and beach seining was conducted a short distance upstream of the RST in May 2008 and June 2009.

**Table 4.4-2. Delta Smelt Captured in Toe Drain Adjacent to the Project Site – March 1998 to June 2010**

| Month | Minimum | Maximum | Average | Total (All Years) |
|---|---|---|---|---|
| **January** | 0 | 10 | 3.4 | 27 |
| **February** | 0 | 14 | 3.6 | 36 |
| **March** | 0 | 19 | 7.1 | 64 |
| **April** | 0 | 1 | 1.0 | 2 |
| **May** | 0 | 22 | 4.7 | 47 |
| **June** | 0 | 41 | 7.4 | 81 |

Source: Department of Water Resources unpublished data

In addition to the seasonal usage of the Project area, as shown in the NBALFS and Toe Drain data discussed above, unpublished data from DWR indicates that delta smelt occur year-round on Liberty Island, a flooded tract located south of the Project site that was breached under high flows in 1998. Monitoring of delta smelt on Liberty Island indicates that this species utilizes the near-shore habitats throughout the year.

## Longfin Smelt

The longfin smelt was first petitioned for listing under CESA in August 2007, and was listed as threatened under CESA on March 5, 2009, because of apparent long-term declines in abundance.

No federal ESA designation has been made for this species; however, the USFWS plans to complete a range-wide status review of the longfin smelt and consider whether the longfin smelt population, or any other longfin smelt population from California to Alaska, qualifies as a distinct population that warrants federal protection.

The Delta supports the largest population of longfin smelt in California, but their range also extends into San Pablo, San Francisco and South San Francisco bays, and the Gulf of the Farallones. Longfin smelt are found in areas ranging in salinity from almost pure seawater (35 parts per trillion [ppt]) upstream to areas of pure fresh water. Distribution of longfin smelt is centered in the west Delta and Suisun and San Pablo bays. In wet years, they may be distributed more toward San Pablo Bay, and in dry years more toward the west Delta. Spawning occurs in fresh water, over substrates composed of sand, gravel, rocks, and aquatic plants, and may occur from November into June, with peak spawning activity occurring from February through April (Emmett *et al.* 1991; Wang 1986). Spawning occurs mainly below Rio Vista in the Sacramento River, and below Medford Island in the San Joaquin River, with a downstream boundary near Pittsburg and Montezuma Slough (Moyle 2002). Longfin smelt are relatively short-lived, reaching maturity at age two. Most live two years, but some may live to age three.

Survey results indicate adult and juvenile longfin smelt would be in the vicinity of the Project site during January to July. Juvenile longfin smelt were captured at NBALFS monitoring locations in all but three years of the 1993-2004 monitoring period, the exceptions being 1993, 1996, and 1998. Adult longfin smelt were captured from February through early July, with peak abundance occurring in March. Far fewer fish were captured during May, June and July sampling periods during the study; over the course of the NBALFS study, a combined monthly total over the course of the 11-year monitoring period of 264, 27, and 10 fish were captured in these three months, respectively. As discussed above for delta smelt, unpublished fish monitoring data collected by DWR in the Yolo Bypass since 1998 indicate that longfin smelt occur in water bodies adjacent to the Project area, including the Toe Drain, from January through June (**Table 4.4-3**). Based on the sizes of longfin smelt captured during May (i.e., 30–199 mm), both adult and juvenile fish were collected under this fish monitoring program.

**Table 4.4-3. Numbers of Longfin Smelt Captured in Toe Drain Near the Project Site – March 1998 to June 2010**

| Month | Minimum Number | Maximum Number | Average Number | Total Numbers (All Years) |
|---|---|---|---|---|
| **January[1]** | 0 | 26 | 26 | 26 |
| **April[2]** | 0 | 28 | 15 | 30 |
| **May[3]** | 0 | 55 | 19.7 | 59 |
| **June[4]** | 0 | 21 | 12.5 | 25 |

Source: Department of Water Resources unpublished data
[1] Longfin smelt were captured in the month of January in Year 2002 only.
[2] Longfin smelt were captured in the month of April in years 2002 and 2003 only.
[3] Longfin smelt were captured in the month of May in years 2002, 2007, and 2009 only.
[4] Longfin smelt were captured in the month of June in years 2002 and 2004 only.

### Sacramento Splittail

Sacramento splittail are large, relatively long-lived cyprinids (minnows), native to California and are listed as a California species of special concern. Floodplains provide important spawning and rearing habitats for splittail (Crain *et al.* 2004), and they are found seasonally throughout much of the Yolo Bypass (Sommer *et al.* 2003; Harrell and Sommer 2003; Sommer *et al.* 2003). Splittail spawn in large numbers from January to April within flooded vegetation on the floodplains of the Yolo Bypass, with peak spawning occurring in February and March (Sommer *et al.* 2003). Juveniles remain in the shallow, near shore areas with abundant vegetation, moving to deeper water as they mature. Juvenile emigration seaward into the estuary begins in late winter (e.g., February) and continues into July (Sommer *et al.* 2003).

### Pacific Lamprey

The Pacific lamprey, an anadromous federal species of concern, range includes Pacific coast drainages extending from Japan to Alaska, California (Moyle 2002), and including rivers and creeks of the Central Valley in California. The adults begin their upstream spawning migrations to freshwater rivers as early as January, with peak immigration occurring from early March through late June (Moyle 2002) and may be present in the Project area during this time. Spawning occurs primarily during the spring and summer months. The majority of adults die after spawning, though a small percentage of adults are repeat spawners and may occur in the Project area in the summer months during post-spawning emigrations. Following hatching, the juveniles (ammocoetes) reside in upstream waters for a period of five to seven years, where they burrow into the sediments and filter organic matter, before undergoing metamorphosis to the predatory and saltwater-tolerant adult phase and subsequently emigrate from freshwater to the ocean. Emigration occurs under high flows during the winter and spring and, therefore, the emigrating post-ammocoete life stages coincide in the Project area with the spawning immigrations of adults (i.e., January through May).

### River Lamprey

The anadromous river lamprey, a California species of special concern, is distributed in streams and rivers along the eastern Pacific Ocean from Juneau, Alaska, to San Francisco Bay. It may have its greatest abundance in the Sacramento – San Joaquin River system, although it is not commonly observed in large numbers (Moyle *et al.* 1995).

Much of what is known about the life history of the river lamprey is from studies of populations in British Columbia, where adults migrate from the Pacific Ocean into rivers and streams in September, and spawn in the winter months. Adults die after spawning. Juvenile river lampreys remain in backwaters for several years, where they feed on algae and microorganisms (Moyle *et al.* 1995). The metamorphosis from juvenile to adult begins in July, and is complete by the following April. From May through July, following completion of metamorphosis, the river lamprey congregates in the Delta prior to entering the ocean. Therefore, river lamprey may occur in the Project area during the spring and summer months.

### Aquatic Invertebrates and Plankton

Aquatic invertebrates live in or on the sediments or other material lining channels or open waters and are referred to as benthic macroinvertebrates. Other aquatic invertebrates primarily inhabit the water column and drift with the currents, and are referred to as zooplankton. Algae also live on the bottom (epibenthic) or suspended in the water column, the latter referred to as phytoplankton. Linked together, these groups play vital ecological roles in aquatic environments and make the food web supporting fish production in the Delta. Phytoplankton and epibenthic algae are primary producers in the food web, capturing solar energy and nutrients to become food for benthic invertebrates and zooplankton, which in turn, are preyed upon by fish, which in turn, are the prey of larger fish or birds.

No known surveys have been conducted of the aquatic macroinvertebrate communities in water bodies on or immediately adjacent to the Project site. However, the benthic and pelagic invertebrate communities of the Project site are likely comparable to those occurring in similar floodplain and slough habitats throughout the Yolo Bypass and Cache Slough Complex. These communities frequently include benthic organisms that are typically associated with fine and unstable sediments, and those that occur in the pelagic zones. Benthic and pelagic macroinvertebrates found commonly in floodplain and estuary slough habitats include members of the taxonomic groups Annelidae (aquatic worms), Gastropoda (aquatic snails and limpets), Bivalvia (clams and mussels), crustaceans (e.g., crabs, mysid shrimp, crayfish, barnacles, and copepods) and numerous insect species, including Dipterans (true flies, mosquitoes, and midges).

Zooplankton serves as the primary food source for larger invertebrates and small fish. Mysid shrimp, one of the most abundant zooplankton in the Delta, are the primary food source for many young-of-the-year fish occurring in the Delta (Moyle 2002).

Phytoplankton are microscopic plants, often composed of a single cell or few cells. These plant species play an important role in primary production, as indicated by chlorophyll production, in aquatic systems, particularly in the Delta. Changes in phytoplankton community assemblage from one comprised largely of diatoms toward a greater proportion of green and blue-green (cyanobacteria) algae over the past few decades are believed to have altered primary production in some areas of the Delta. In addition, increases in turbidity and ammonium in the Delta are believed to be suppressing primary production. Both of these factors are believed to be contributing to decreases in Delta fish production, a concept referred to as the Pelagic Organism Decline (POD) (Baxter *et al.* 2008).

### Aquatic Habitat

Aquatic habitats in areas directly affected by the Project would consist primarily of the sloughs bordering the Project site as well as open-water habitats, which vary seasonally. During the wet season, aquatic habitats range from complete inundation (open water habitat) during major winter flood events to ponding in isolated areas (i.e., the Duck Pond, the Island, and seasonally flooded pools). In the dry season, ponding is limited to a section of the Island and small sporadic ponds, which may dry up by late summer. The large, tidally-surcharged irrigation ditches provide year-round habitat for aquatic invertebrates and fish. Because the Project site is primarily used for cattle grazing during the dry season, water and habitat quality in the isolated ponds and within irrigation ditches on the Project site are likely degraded.

Major sloughs within the Project vicinity include Shag Slough, a dead-end slough that terminates at a main irrigation borrow ditch tide-gate near the southwest corner of the Project site. The borrow ditch sits at the toe of the west Yolo Bypass levee, and borders the western edge of the Project site. The Toe Drain borders the Project site to the east, and is the sole tidal waterway linking the Yolo Bypass to Cache Slough. The Stair Step Slough forms the southern border of the Project site. This slough is connected to Cache Slough to the south and is, therefore, tidally influenced. This slough is a channelized water body bordered by levees. Substrates in this water body are dominated by fine sediments (e.g., sand, silt, and clay). Riparian habitat consisting of scrub and emergent woodland borders the Stair Step Slough along the southern and eastern edge of the Project site, as well as the Toe Drain along the eastern edge of the site.

## *Regulatory Setting*

This section addresses only regulations that directly affect fish and other aquatic resources. Regulations on other factors that indirectly affect these resources, such as hydrology and water quality, are described in Sections 4.1 and 4.2, respectively. Where regulations on aquatic resources are the same as those covering terrestrial resources, this section cross-references the discussion in Section 4.3, Terrestrial Biological Resources.

Management of anadromous fish is the responsibility of National Oceanic and Atmospheric Administration (NOAA)/NMFS, whereas management of non-anadromous fish and other aquatic biological resources in the Project area is the responsibility of USFWS at the federal level and CDFW at the state level. CDFW also acts as state trustee for aquatic species. These three agencies, either independently or in collaboration with other state and federal agencies, implement numerous fish management and restoration plans and initiatives.

### Federal Laws, Regulations, and Policies

#### Federal Endangered Species Act

The federal Endangered Species Act (ESA) (16 United States Code [USC] § 1531 *et seq*.) provides a program for the conservation of threatened and endangered plants and animals and the habitats in which they are found. The law requires federal agencies (and other public agencies seeking approval, funding, and/or permitting through federal agencies), in consultation with USFWS and/or the NOAA/NMFS, to ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitat[23] of such species.

[23] Designated critical habitat refers to specific geographic area(s) that contains features essential for the conservation of a federally-listed threatened or endangered species and that may require special management and protection. Critical habitat may include an area that is not currently occupied by the species but that will be needed for its recovery. An area is designated as "critical habitat" after the USFWS publishes a proposed federal regulation in the *Federal Register*, receives/considers public comments on the proposal, and then makes a determination. The final boundaries of the critical habitat area are also published in the *Federal Register*.

The Project site is in designated critical habitat for winter and spring Chinook salmon, steelhead and delta smelt, as detailed below.

1. **Sacramento River Winter-run ESU Chinook Salmon.** Critical habitat for winter-run ESU Chinook salmon was designated on June 16, 1993 (58 FR 33212), and is defined as the Sacramento River from Keswick Dam to Chipps Island, at the westward margin of the Delta; all waters from Chipps Island westward to Carquinez Bridge, including Honker, Grizzly and Suisun bays, and Carquinez Strait; all waters of San Pablo Bay westward of the Carquinez Bridge; and all waters of San Francisco Bay (north of the San Francisco/Oakland Bay Bridge) from San Pablo Bay to the Golden Gate Bridge. The critical habitat designation identifies those physical and biological features of the habitat that are essential to the conservation of the species and that may require special management consideration or protection. The proposed Project lies within the designated critical habitat for this ESU.
2. **Central Valley ESU Spring-run Chinook Salmon.** Critical habitat for Central Valley ESU spring-run Chinook salmon was designated September 2, 2005 (50 CFR 52488), and includes 12 hydrologic units (HUs). The critical habitat designation includes water bodies in Tehama, Butte, Glenn, Shasta, Yolo, Sacramento, Solano, Colusa, Yuba, Sutter, Trinity, Alameda, San Joaquin, and Contra Costa counties. The Yolo Bypass and Cache Slough lie within the Sacramento - Delta HU and Valley Putah - Cache HU and, therefore, the Project site lies within the critical habitat designated for Central Valley ESU spring-run Chinook salmon.
3. **Central Valley DPS Steelhead.** Critical habitat for Central Valley DPS steelhead was designated September 2, 2005 (50 CFR 52488), and includes 21 HUs. The critical habitat designation for Central Valley steelhead includes water bodies located in Tehama, Butte, Glenn, Shasta, Yolo, Sacramento, Solano, Yuba, Sutter, Placer, Calaveras, San Joaquin, Stanislaus, Tuolumne, Merced, Alameda, and Contra Costa counties. The Yolo Bypass and Cache Slough Complex lie within the Sacramento - Delta HU and Valley Putah - Cache HU and, therefore, the Project site lies within critical habitat designated for Central Valley DPS steelhead.
4. **Delta Smelt.** Critical habitat for delta smelt includes all water and all submerged lands below the ordinary high water and the entire water column bounded by and contained in Suisun Bay, including the contiguous Grizzly and Honker bays; the length of Goodyear, Suisun, Cutoff, First Mallard (Spring Branch), and Montezuma sloughs; and the existing contiguous water contained within the legal boundaries of the Delta, as defined in § 12220 of the California Water Code. Hence, the Project site is within the designated critical habitat for delta smelt. The USFWS has identified four primary constituent elements (PCE) essential to the conservation of delta smelt:
   1) **Physical habitat.** Structural components of habitat, including spawning substrate and, possibly, water depth for delta smelt.
   2) **Water.** Suitable water quality conditions to support the delta smelt life stages.

3) **River flow.** Transport flows to facilitate migrations to and from spawning habitats.

4) **Salinity.** LSZ (freshwater-brackish water interface) used as nursery habitat.

As described in Section 4.3, Terrestrial Biological Resources, § 9 of the federal ESA and its regulations prohibit the take of federally-listed species. An incidental take permit under ESA § 10(a) or federal consultation under § 7 of the ESA is required if the Project might affect a federally-listed species. ESA-listed fish species occurring or potentially occurring in the Project area are discussed previously in this setting (Section 4.4.1 and noted in **Table 4.4-1**).

In accordance with § 7 of the ESA, biological assessments (BA) have been prepared to address the potential impacts of the proposed Project on threatened and endangered aquatic and terrestrial species under the jurisdiction of NMFS or the USFWS. These BA reports evaluate the potential construction-related and long-term impacts of the proposed Project on federal ESA-listed delta smelt and anadromous fish. Each BA concludes that the proposed Project would not likely result in take, or have adverse effects on designated critical habitat for the species. While considering information in these BAs, USFWS and NMFS would prepare and process separate biological opinions (BiOps) prior to completing the ESA § 7 process.

### Magnuson-Stevens Fishery Conservation and Management Act

The federal Magnuson-Stevens Fishery Conservation and Management Act (16 USC § 1801 *et seq*.) is the primary law governing marine fisheries management in the United States. The purpose of this federal law is sevenfold: conserve fishery resources, support enforcement of international fishing agreements, promote fishing in line with conservation principles, provide for the implementation of fishery management plans to achieve optimal yield, establish regional fishery management councils to steward fishery resources, develop underutilized fisheries, and protect essential fish habitats (EFH).

EFH is defined as "…those waters and substrates necessary to fish for spawning, breeding, feeding or growth to maturity" (NMFS 1998). The act requires federal agencies to consult with NMFS when a project has the potential to adversely affect EFH. States are not required to consult with NMFS; however, NMFS is required to develop EFH conservation recommendations for any state agency activity that would affect an EFH. Similar in concept to critical habitat of the federal ESA, EFH protection measures recommended by NMFS or a regional fisheries management council are advisory and not prescriptive (NMFS 1998). The Project area is located in the region identified as EFH for Pacific salmon, which includes all runs of Chinook salmon.

### Clean Water Act

For a discussion on this act, refer to the regulatory settings in Sections 4.1 and 4.3, Water Quality and Terrestrial Biological Resources, respectively. Water Quality Certifications (Clean Water Act [CWA] § 401) are typically required in order to obtain a Streambed Alteration Agreement from CDFW and/or a CWA § 404 permit from the U.S. Army Corps of Engineers (USACE) (refer to Section 4.3, Terrestrial Biological Resources). The Project would need a § 401 certification from the Central Valley Regional Water Quality Control Board (CVRWQCB), along with other approvals (see Section 1.4, Agency Approvals and Permits), to demonstrate that the Project would comply with all applicable water quality standards, including meeting standards associated with levels of methylmercury (MeHg), suspended materials, dissolved oxygen (DO), and chemicals that could be affected by construction equipment during construction, maintenance, and/or operations (see Section 4.2 for water quality discussion).

## Federal/State Activities and Current Planning Efforts

### ESA Compliance for SWP and CVP Coordinated Operations Criteria and Plan

The operation of the CVP (Central Valley Project) and the State Water Project (SWP) is described in the existing Operations Criteria and Plan (OCAP). Updated in 2004, the OCAP provides details of the coordinated operations of the CVP and SWP based on historical data, and serves as a starting point for planning project operations in the future. Under the federal ESA, USFWS and NMFS must produce formal BiOps analyzing the impact of OCAP implementation on ESA-listed species, and thus pertains to the proposed Project. The BiOps have been subject to extensive litigation; portions of the BiOps have been overturned and will need to be revised and reissued.

Currently, five species (the winter-run and spring-run Chinook salmon, delta smelt, North American green sturgeon, and Central Valley steelhead) are listed under the ESA. USFWS released an OCAP BiOp for delta smelt on December 15, 2008. This BiOp includes the requirement within its Reasonable and Prudent Alternatives, among others, of developing 8,000 acres (ac) of tidal restoration. The primary purpose of the proposed Project would be to begin fulfilling this tidal restoration acreage identified in the current USFWS BiOp.

NMFS released its latest OCAP BiOp on June 4, 2009, concluding that CVP and SWP operations would jeopardize the continued existence of endangered Sacramento River winter-run Chinook salmon, threatened Central Valley spring-run Chinook salmon, threatened Central Valley steelhead, threatened Southern DPS of the North American green sturgeon, and southern resident killer whales. The NMFS BiOp includes by reference the 8,000-ac tidal restoration requirement contained in the USFWS BiOp, and thus pertains to the proposed Project as well.

### Bay Delta Conservation Plan

The development of the Bay Delta Conservation Plan (BDCP) is now undergoing a rigorous planning and environmental process. This effort is a collaboration and cooperation of affected local and regional water agencies, environmental and conservation organizations, state and federal agencies, and other interest groups to improve the habitat for Delta fish species in a way that improves water supply reliability to the 25 million Californians and 3 million ac of irrigated agriculture that receive water delivered from the Delta. BDCP is identifying conservation strategies to improve the overall ecological health of the Delta (refer to Section 2.4, Relationship to Regional Habitat Restoration Plans). The proposed Project fits within that strategy to improve ecological health and would qualify as a near-term action measure with the adoption of the BDCP. Also discussed in Section 2.4, are other federal/state planning efforts, such as CALFED and Delta Vision, and how the Project fits within their planning strategies.

## State Laws and Regulations

### California Endangered Species Act

CESA is described in Section 4.3, Terrestrial Biological Resources. Four fish species listed under CESA occur in the Project area (see **Table 4.4-1**): winter-run ESU Chinook salmon (endangered), spring-run ESU Chinook salmon (threatened), delta smelt (endangered), and longfin smelt (threatened).

### Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act, which provides the state with broad authority to regulate surface water quality, is summarized in the Regulatory Setting sections of Sections 4.2 (Water Quality) and 4.3 (Terrestrial Biological Resources). As noted in those discussions, the act requires basin plans that identify the Beneficial Uses for water bodies. Relevant Beneficial Uses for aquatic organism protection include warm- and cold-water habitat, fish migration and spawning, rare and endangered species, sport fishing, and shellfish harvesting. Designated Beneficial Uses for the Project are found in Section 4.2.1, Water Quality Setting.

### California Fish and Game Code

Fish and Game Code (FGC) (§ 1602) is detailed in Section 4.3, Terrestrial Biological Resources. Its primary purpose is the issuance of permits to ensure protection of the state's fish and wildlife resources from harmful impacts of proposed activities that occur near any rivers, streams, lakes or other water bodies in California, regardless of the amount or duration of flow. Fish are broadly defined in FGC § 45 as aquatic organisms, including mollusks, crustaceans, invertebrates, or amphibians, which do inhabit waters in and adjacent to the proposed Project.

## Local Policies

### Yolo County General Plan

The Conservation and Open Space Element of the Yolo County 2030 General Plan identifies goals, policies, and implementation actions for aquatic resources under the General Plan's Biological Resources goal (Goal CO-2). The intent of Goal CO-2 is to "Protect and enhance biological resources through the conservation, maintenance, and restoration of key habitat areas and corresponding connections that represent the diverse geography, topography, biological communities, and ecological integrity of the landscape (County of Yolo 2009)." This goal is supported by 43 policies and 11 implementation actions. Some of the key policies applicable to the Project on aquatic resources are listed in **Table 4.4-4**.

**Table 4.4-4. Yolo County 2030 General Plan: Policies Relevant to Aquatic Biological Resources**

| General Plan Policy/Action Number | General Plan Policy Statements and Implementation Actions |
|---|---|
| **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. |
| **CO-2.25** | Support efforts to reduce water temperatures in streams for fish via habitat restoration (e.g. increase shading vegetation) and water management (e.g. control of flows) that are compatible with the Integrated Regional Water Management Plan. |
| **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. |
| **CO-2.31** | Protect wetland ecosystems by minimizing erosion and pollution from grading, especially during grading and construction projects. |
| **CO-2.41** | Require that impacts to species listed under the state 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. |
| **CO-A30** | Encourage landowners to participate in programs that restore degraded creek resources by (Policy CO-2.12, Policy CO-2.20 through CO-2.24, Policy CO-2.25):<br>• Removing exotic species and establishing native riparian vegetation.<br>• Managing the upland areas of watersheds to control erosion and overgrazing.<br>• Adding exclusionary fencing to keep livestock out of streams and stream band areas |
| **CO-A33** | Coordinate with state and federal agencies to rehabilitate and/or improve watersheds for the benefit of salmon and steelhead by encouraging landowner cooperation and participation, and involving agencies and local groups. (Policy CO-2.5 through CO-2.11, Policy CO-2.26, Policy CO-2.28). |

Source: County of Yolo. 2009.

## 4.4.2 Significance Criteria

Criteria for determining significant impacts on aquatic biological resources are based upon the *State CEQA Guidelines* (Appendix G). In the evaluation that follows, a potential impact to aquatic biology would be significant if the implementation of the proposed Project would:

1. Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species[24] in local or regional plans, policies, or regulations, or by the CDFW or the USFWS.
2. Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the CDFW or the USFWS.

[24] These various categorizations are referred in the Draft EIR as special-status species.

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

## 4.4.3 Impacts

The Project would create up to 1,226 ac of perennial emergent tidal marsh habitats for several species of fish; would immediately expand critical habitats for winter- and spring-run Chinook salmon, steelhead, and delta smelt; provide more EFH for all four runs of Chinook salmon; and would thereby result in a **substantial beneficial effect** for these aquatic biological resources. This benefit would be the primary objective of the Project in meeting the federal obligations of the BiOps set forth by USFWS and NMFS. The creation of additional acres of habitat is also consistent with the CALFED and Delta Vision planning process (in particular the Delta Stewardship Council's draft Delta Plan), near term objectives described in the forthcoming BDCP, as well as with stated local policies identified in **Table 4.4-4** and detailed in the Yolo County General Plan (see Section 4.4.1 under Regulatory Setting).

### Impact 4.4-1: Effects to Aquatic and Riparian Habitats

*Applicable Significance Criteria: 1, 2, and 3*

Changes in aquatic and riparian habitats were evaluated in terms of the type and magnitude of the area affected, the nature and duration of effects, a comparison of the amount and type of habitat lost or altered to the amount and type of habitat created by the Project, and how such habitat alterations could affect resident and migratory fish species and other populations and communities of aquatic life.

**Alteration of Aquatic and Riparian Habitats**

Creation of tidal connections along the Toe Drain and the Stair Step would alter near-shore, instream and bank habitats for fish and other aquatic resources. The length of the levees that would be excavated at each of these five sites would be about 75 to 150 ft (ft), for a maximum, combined total length of 750 ft (including the Old Lake location as an additional tidal connection during the post-construction period). This potential disturbance would represent a very minor portion of the many miles of available near-shore aquatic and bank habitats along these channels. Additionally, a small amount of riparian trees and scrub would be removed for the construction at these tidal connection locations. The total area of tidal marsh habitat created through the construction of tidal channel networks under the proposed Project would substantially exceed the total amount lost at each of the excavation sites; thereby increasing the net amount of available habitat on the Project site and in the Yolo Bypass. Thus, the alteration of these habitats, which include designations as critical habitat and EFH, would result in a **less-than-significant impact** and no mitigation would be required.

For Soils Reuse Options #1 (toe berm soils placement) and Option #3 (combination of Options #1 and #2), the existing borrow ditch that currently connects to Shag Slough would be filled and replaced in order to construct the toe berm. This borrow ditch is a channelized waterway that served as a borrow ditch for the construction of the west Yolo Bypass levee. This ditch connects to Shag Slough via a tide gate, which allows tidal surcharge into the ditch to supply irrigation water. Minimal riparian scrub and isolated woodland species border the channel. Under current conditions, which includes the tide gate that impedes passage and controls tidal conditions and limited riparian habitat, the borrow ditch provides habitat of low quality for aquatic organisms. With implementation of Soils Reuse Option #1, the borrow ditch would be replaced with a new irrigation and drainage ditch, which would be constructed east of the toe berm (see **Figure 3-5**). This newly constructed channel would be approximately 10,000 ft long, 10 ft wide at its base, and 50 ft wide at its top, and would provide as much, if not more, aquatic and riparian habitat as the current borrow ditch does. Therefore, a **less-than-significant impact** would result in the alteration of aquatic and riparian habitats (including critical habitat and EFH) associated with the implementation of Soils Reuse Option #1. No mitigation would be required.

The aquatic habitat provided by the new irrigation/drainage ditch would provide habitat quality for fish and aquatic invertebrates, after colonization, similar to the existing ditch. The distributions of the fish species that may inhabit the toe berm fill area are extensive, as is the case for aquatic invertebrates. Therefore, construction of the toe berm would not substantially reduce habitat quality or quantity by an amount that would have adverse population-level effects on fish or other aquatic species occurring on the Project site.

For Soils Reuse Option #2, its location would be within the restricted-height levee area. All aquatic features in this area, irrigation and drainage ditches, obtain water through pumping irrigation water, direct rainfall, and inundation by major Yolo Bypass flood events. Because construction of the proposed Project would take place during the summer and fall months, these ditches would be supplied only through irrigation pumping and consequently would not support any fish habitat subject to impact analysis. Hence, selection of Soils Reuse Option #2 would result in **no impact** to aquatic and riparian habitats (including critical habitat and EFH). No mitigation would be required.

For Soils Reuse Option #3 (combination of Options#1 and #2), the potential impacts would lie between the two previously discussed options. Assuming the most reasonably foreseeable scenario, this option would be **less than significant** and no mitigation would be required.

For the post-construction phase, potential impacts on aquatic and riparian habitats could occur from activities such as adding an additional tidal connection (under corrective actions), digging minor ditches for mosquito control, removing invasive plants, or addressing channel slumping. The addition of another tidal connection, if necessary, would result in similar impacts as discussed in the construction phase for the tidal connections associated with the six networks. Similarly, mosquito control may necessitate installing drainage ditches at the higher elevation marsh-upland transitions, where tidal inundation occurs infrequently. As explained in the Chapter 3, Project Description, rotary ditchers would be used and care would be taken to dig a sinuous pattern to approximate natural tidal marsh channels and not further impact aquatic and riparian habitats. The likelihood of controlling invasive plants by measures using herbicides would be considered as a last measure, only when all other measures have been ineffective (see Section 3.5.1).

Additionally, the engineering design and construction of the channels would focus on minimizing channel slumping. Hence, potential impacts from activities associated with post construction would be **less than significant** to aquatic and riparian habitats (including critical habitat and EFH). No mitigation would be required. Project verification monitoring, itself, would only involve observations and minor sampling of the aquatic and riparian habitats, thereby resulting in **no impact** to such habitats. Accordingly, no mitigation would be required.

The overall net increase in shallow-water and tidal marsh habitats would provide **substantial benefits** to native fish, including juvenile anadromous Chinook salmon and Sacramento splittail, by having additional rearing habitat as well as incrementally increasing the available invertebrate food base.

#### Alterations in Habitat Leading to Increased Predation on Native Fish

The potential for the Project to result in increased predation on native and special-status fish species was evaluated by examining the foraging behavior and habitat preferences for piscivorous fish likely to occur on the Project site; design elements of the Project that were incorporated to minimize the potential for such habitat conditions to occur; and the nature, timing, and predator avoidance behaviors of fish that would likely to be preyed upon (e.g., juvenile salmonids).

Restoration of tidal marshlands and their associated tidal channel networks, along with the creation of tidal connections, as proposed in the Project would have the **beneficial effect** of increasing the amounts of habitats available to aquatic organisms. This could likely be used year-round by a wide variety of piscivorous fish, such as Sacramento pike minnow (*Ptychocheilus grandis*), striped bass (*Morone saxatilis*), largemouth bass (*Micropterus salmoides*) and other non-native Centrarchidae (i.e., basses and sunfish) and Ictaluridae (i.e., catfish and bullheads). This expanded habitat also may provide the potential for increases in the number of piscivorous wildlife, such as egrets, herons, raccoons, and otters, which may use the site for foraging.

The presence of piscivorous fish and wildlife throughout the restored marshlands and channels, but especially in the areas of the tidal connections and channel pools, would create the potential for the restored floodplain habitat to serve as a biological “sink.” Small fish not born on the Project site would enter this area on tidal inflows, including delta smelt and juvenile anadromous salmonids, and could be preyed upon by piscivorous fish or wildlife. However, the Project would have “built in” aquatic habitat features designed to favor native fish species, while discouraging the establishment and colonization by non-native, piscivorous fish. The tidal channel geometry would be excavated to depths approximately two to six ft below local mean lower low water (MLLW) to minimize the potential for colonization by aquatic vegetation, which can provide habitat for piscivorous fish. Channels also would be sized to promote peak tidal flow velocities of about three ft per second, which would minimize invasive Brazilian waterweed (*Egeria densa*) from becoming established onsite. Brazilian waterweed is known to invade natural waterways and substantially impede water flow, reduce turbidity, harbor invasive predator fish species, and decrease the quality of habitat for native resident and anadromous fish. It is also important to note that the fish subject to predation on the Project site would still be subject to predation, even if they did not enter the Project site but remained in nearby channels or elsewhere.

Another factor involved with potential predation losses would be stranding of fishes (refer to Impact 4.4-2). The Project would greatly reduce losses of fish due to predation by excavating the Project site to avoid ponding. The decrease in ponding would lead to a reduction in stranding in the ponds and consequently minimize the losses to predation there.

Further offsetting predation losses would be the rearing benefits of the seasonal floodplain habitat demonstrated to benefit juvenile Chinook salmon and Sacramento splittail (e.g., Junk *et al.* 1989; Moyle *et al.* 2007; Nobriga and Feyrer 2007; Sommer *et al.* 2001a; Sommer *et al.* 2001b). An increase in seasonal floodplain wetland habitat and high food productivity provided by the Project would result in robust growth rates and increased production of these fish, thereby further increasing their chances to survive predation.

Due to their life history, green sturgeon would not utilize the tidal marsh plain for any substantial length of time (e.g., these areas would likely be used for limited periods during juvenile rearing and migration). Thus, predation on these fish would not be measurably affected by the Project.

Overall, any predation losses are likely to be miniscule relative to the populations. Vast majorities of each of the native fish populations would be on or adjacent to the Project site, elsewhere in the Delta, or upstream of or seaward of the Delta. Furthermore, the Project would not substantially increase predation that would have population-level effects on special-status or other native fish, due to the offsets and relatively vast distributions of native fish populations represented onsite. Thus, predation impacts would be **less than significant** for Soils Reuse Options #1 and #3. No mitigation would be required.

For Soils Reuse Option #2 (stockpile) and post-construction activities such as monitoring and minor sampling, these actions would have minimal to no impact to fish predation. This soils reuse option would occur in the summer and fall months when irrigation ditches would be supplied only through irrigation pumping and consequently would not support any special-status fish or fish habitat. Additionally monitoring activities or minor sampling efforts would not appreciably affect the fish or their habitat to either directly or indirectly encourage further fish predation.

#### Alterations in Habitat Composition due to Increases in Colonizing Invasive Plant Species

During its construction (except for Soils Reuse Option #2) and post-construction phases (except for monitoring activities), the Project would create aquatic habitat that has the potential to be colonized by invasive non-native, submersed aquatic vegetation and emergent vegetation. However, as identified in Section 3.5.1, the Project would incorporate specific design features for discouraging establishment and colonization by invasive aquatic plants, including high flow water velocities in the channels, periodic monitoring, and specific management measures, including a livestock grazing program. Accordingly, this potential impact would be **less than significant**. No mitigation would be required.

All aquatic features associated with Soils Reuse Option #2 (stockpile) would be irrigation and drainage ditches. Such ditches would obtain water through pumping irrigation water, direct rainfall, and inundation by major Yolo Bypass flood events. Because construction of the proposed Project would take place during the summer and fall months, these ditches would be supplied only through irrigation pumping and consequently would not support any fish or fish habitat subject to impact analysis. Hence, **no impact** would result to any aquatic habitat in the area identified for Soils Reuse Option #2. No mitigation would be required.

For Soils Reuse Option #3 (combination of Options #1 and #2), the potential impacts would lie between the two previously discussed options. Assuming the most reasonably foreseeable scenario (i.e., greater than Option #2 and less than Option #1, pending final engineering design), this option would be **less than significant** and no mitigation would be required.

Project verification monitoring, itself, would only involve observations and minor sampling of the aquatic and riparian habitats for non-invasive plant species, thereby resulting in **no impact** to such habitats. Accordingly, no mitigation would be required.

**Effects from Ground-disturbing Activities to Aquatic and Riparian Habitats**

Construction activities would result in a temporary impact to aquatic and riparian habitats, especially those activities near seasonal ponds located within the boundary of the Project, and tidal connections along the Stair Step Slough and Toe Drain. Fish habitats within the boundaries of the Project site are limited to the irrigation and drainage ditches and ponded areas that receive water either from Yolo Bypass inundation events or the irrigation system. These ditches provide low-quality aquatic habitat for fish, and likely only support fish species that are tolerant of high temperatures, low DO levels, and sub-optimum habitat conditions that occur in summer (Nobriga 2008; Siegel *et al.* 2011). Intense solar radiation and ambient air conditions occur at the site during the warmest months, and may cause some, or all of the basins to reach temperatures exceeding the thermal tolerances of most fish species, and/or cause water to evaporate completely.

Excavation of the networks (e.g., intertidal channels) would occur during the summer months, prior to creating the tidal connections. The excavation work would occur on landside during low tides (refer to **Figure 3-3**) and, therefore, would not adversely affect aquatic habitats (including critical habitat and EFH). Due to the high groundwater conditions present at the site throughout the year, it is anticipated that water surface elevations between the channels within the work area and the surrounding natural tidal channels would equilibrate prior to construction of the tidal connections, resulting in minimal if any hydraulic differential. Because there would be no substantial hydraulic differential between the constructed area and the surrounding natural channels, excavation to create the tidal connections would not result in a surge of water into the work areas (see Chapter 3, Project Description).

Under very limited circumstances, some standing water may be present (e.g., irrigation channels and borrow ditchs) during construction. In those cases, the water present may provide aquatic and riparian habitat, albeit very poor condition, for fish and other aquatic organisms. Excavation of the tidal channel networks connecting to these basins could have short-term and localized effects at locations where the channels connect to basins still containing isolated pockets of water and fish. Given the small area and the absence or low quality of aquatic and riparian habitat that would be affected during excavation and grading, these effects would not reduce the overall aquatic habitat quality by an amount that would have substantial population-level effects on fish or other aquatic organisms occurring on the Project site, resulting in a **less than significant** impact. No mitigation would be required.

Creating the tidal connections would have small short-term effects between 70 to 120 ft of aquatic channel bank and riparian habitat within the immediate vicinity of each of the four or five tidal connection locations along the miles of the Stair Step or Toe Drain (see **Figure 3-1**), along with a potential sixth connection, if needed, during the post-construction stage. Riparian habitat at each of these locations consists of scrub and woodland trees, predominantly on the levee tops, and provides lower habitat value for aquatic species. These locations may provide shade and terrestrial insects that fall into the channel below. Further, the stream banks provide benthic invertebrates as food for fish. Excavation for the tidal connections would take place using an excavator, working from the levee crown or at the Project site (see **Figure 3-3**), and no heavy construction equipment would be operated from the water. Construction best management practices (BMP) measures would be implemented to minimize the extent of disturbance to riparian habitat, including removal of riparian vegetation and shaded riparian aquatic (SRA) habitat around each of the excavation sites. Construction may remove a relatively small amount of vegetation (scrub species and small amount of woodland trees) on the channel banks associated with the tidal connections; however, such activities would occur in the fall when few, if any, juvenile anadromous salmonids or green sturgeon would be likely to be present in waters adjacent to the Project site. Because the effects would be localized, effects on invertebrates reaching the channel would be small and localized.

Therefore, the tidal connections would have no substantial population-level effects on native or special-species depending on the terrestrial element of the forage base in the Project area, and impacts on fish, critical habitat or EFH, via habitat modification would be **less than significant**. No mitigation would be required. Further, only a small localized fraction of riparian habitat would be removed, the resultant impact would be **less than significant**, and no mitigation would be required.

With regards to Soils Reuse Option #1, creating the levee toe berm would fill the existing tidally surcharged irrigation ditch (the west Yolo Bypass levee borrow ditch) that connects to Shag Slough, thereby eliminating this stretch of aquatic and riparian habitat. The ditch would be replaced, at the same time as the borrow ditch would be filled in, with new aquatic habitat in the form of new irrigation and drainage ditches of similar length that would be constructed east of the toe berm (see **Figures 3-2 and 3-5)**. The new irrigation and drainage ditch habitat would provide water and be rapidly colonized by fish, aquatic invertebrates, algae and riparian vegetation. The existing gated borrow ditch contains warm, low-quality habitat for fish during summer, so any fish still there would be trapped behind the downstream gate and likely not be abundant there. These fish would be provided with replacement habitat during this same time in the new ditch with similar aquatic habitat features.

The loss and concurrent replacement of borrow ditch habitat would not modify the overall aquatic habitat quality or quantity by an amount that would adversely affect candidate, listed or special-status fish species. Thus, habitat modification impacts on fish would be **less than significant**. Potential riparian habitat loss would be replaced by vegetation colonizing a new stretch of ditch. In addition, the borrow ditch is behind a tidal gate away from migratory fish pathways. Further, the concurrent replacement of the borrow ditch with the irrigation ditch would maintain fish movement capability. Thus, temporary impacts to aquatic and riparian habitat from filling the borrow ditch, should Soils Reuse Option #1 be selected, would be **less than significant**. No mitigation would be required.

With respect to Soils Reuse Option #2 (stockpile), its location would be within the restricted-height levee area of the Project site. All aquatic features in this area, irrigation and drainage ditches, obtain water through pumping irrigation water, direct rainfall, and inundation by major Yolo Bypass flood events. Because construction of the proposed Project would take place during the summer and fall months, these ditches would be supplied only through irrigation pumping and consequently would not support any fish or fish habitat subject to impact analysis. Hence, Soils Reuse Option #2 would result in **no impact** to aquatic and riparian habitats, if selected. In turn, no mitigation would be required.

For Soils Reuse Option #3 (combination of Options#1 and #2), the potential impacts would lie between the two previously discussed options. Assuming the most reasonably foreseeable scenario, this option would be **less than significant** and no mitigation would be required.

During post construction, impacts on aquatic and riparian habitats could occur from activities such as adding an additional tidal connection (under corrective actions), digging minor ditches for mosquito control, removing invasive plants, or addressing channel slumping. The addition of another tidal connection, if necessary, would result in similar impacts as discussed in the construction phase for the tidal connections associated with the six networks. Similarly, mosquito control may necessitate installing drainage ditches at the higher elevation marsh-upland transitions, where tidal inundation occurs infrequently. As explained in the Chapter 3, Project Description, rotary ditchers would be used and care would be taken to dig a sinuous pattern to approximate natural tidal marsh channels and not further impact aquatic and riparian habitats. The likelihood of controlling invasive plants by measures using herbicides would be considered as a last measure, only when all other measures have been ineffective (see Section 3.5.1). Designing the channels utilizing the knowledge of their geology and topography, applying rigorous engineering standards, and carrying out BMP measures during construction in specific areas would be carried out to minimize channel slumping. Thus, impacts from activities associated with post construction would result in a **less-than-significant impact** to aquatic and riparian habitats (including critical habitat and EFH). No mitigation would be required.

Project verification monitoring, itself, would only involve observations and minor sampling of the aquatic and riparian habitats, thereby resulting in **no impact** to such habitats. Accordingly, no mitigation would be required.

### Impact 4.4-2: Direct Fish Lethality or Injury

*Applicable Significance Criteria: 1, 2, and 3*

The potential for aquatic organisms to be directly injured or killed because of construction-related activities was evaluated in terms of the timing and duration of construction, the spatial scale of in-channel disturbance, the equipment to be used and construction approach implemented, the nature of disturbance, and the organisms likely to occur at each construction location, and their expected responses to the construction activity.

With respect to post-construction activities, sampling of fishes for verification monitoring or scientific inquiry could result in injury and/or death. For such activities, the lead entity would coordinate with the environmental regulatory agencies, and if appropriate, secure the necessary permits and comply with the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA). This Draft Environmental Impact Report (EIR) cannot evaluate speculative research at this time.

#### Temporary Impacts from Tidal Connections Construction

Lethality or direct injury to special-status fish or other native fish, and other aquatic organisms by constructing tidal connections would be minimal for several reasons, and, therefore, would not have long-term population-level effects on fish or invertebrates in the waters adjacent to the excavation sites.

Construction machinery used to build each tidal connection would be operated from the levee crown or from the land side within the Project site, so that no heavy machinery would be operated from the water. BMP measures would also be implemented by the contractor to minimize the impact to aquatic plants and fishes (refer to Chapter 3, Project Description and Sections 4.2 [Water Quality] and 4.8 [Hazards and Hazardous Waste]). Construction equipment shovels would be used to remove the soils (about 70 to 120 ft width) of the levees and berms that comprise the five tidal connections (plus a sixth, if needed during post construction). With high groundwater conditions at the site, it is anticipated that water surface elevations between the channels within the work areas and the surrounding natural tidal channels would equilibrate prior to “removing the plug of soil.” This action would cause the water to gradually fill and not surge into the work areas, thereby allowing fish nearby to avoid any direct contact with the excavation of the soils.

Due to the construction-related noise, most fish would avoid the immediate construction area. Creating tidal connections would only occur for a few hours to a day at each of the five sites (plus one additional if necessary during post construction), thus the potential times and locations for effects are short, small, and localized. Further, such activities would occur during late summer or early fall months, missing the peak migration periods, so, few of these fish would be expected in waters adjacent to the Project site. Another reason for minimal effects is that the approximately 120-ft connections are miniscule portions of the distributions of each of the native or special species, which, depending on the species, extend through much of the Delta, several miles upstream of the Delta and out to the Bay or Pacific Ocean.

Accordingly, based on the analysis above, direct fish lethality and injury due to construction of tidal connections would be **less than significant** and no mitigation would be required.

#### Temporary Impacts from Filling of the West Yolo Bypass Levee Borrow Ditch

For Soils Reuse Option #1 (and to a lesser extent, Soils Reuse Option #3), construction equipment would be used to fill in the west Yolo Bypass levee borrow ditch with soil and to create another ditch to the east to accommodate the toe berm (refer to Section 3.4.3). Filling the borrow ditch could bury sensitive fish species, if present and result in a **significant impact** if not mitigated. However, the existing gated borrow ditch would contain warm, low-quality habitat during the summer, so any native fish still there would likely be rare. Those fish that possibly would be near the shoreline being filled could escape to the adjacent borrow ditch habitat or to the new replacement irrigation and drainage ditch habitat. Further, filling from one starting point across the ditch and then working either up- or downstream end of the toe berm, would minimize the length of channel perimeter being filled where fish might occur.

Additional minimization of potential direct lethality or injury would be through implementation of Mitigation Measure 4.4-1, which specifies that if larger, and therefore visible from shore, special-status fish, e.g., adult salmon, are observed in the immediate vicinity of the filling, construction shall be temporarily redirected until the fish exit the area being filled on their own accord (refer to Section 4.4.4, Mitigation). Direct lethality or injury would be avoided or minimized and impacts would be **less than significant.**

Soils Reuse Option #2 (stockpile) and post-construction actions do not involve the filling of the west Yolo Bypass levee borrow ditch. Hence, implementing these activities would have **no impact** to fishes, either through direct lethality or by injury.

#### Temporary Impacts from Irrigation/Drainage Improvements

In conjunction with any of the three soils reuse options, construction activity in the basins and irrigation/drainage ditches within the Project boundary would encounter few, if any, special or other native fish species, because the habitat would be nonexistent from being dried up, or warm, small and subject to predation by birds. Any fish present could be killed or injured during this activity through contact with equipment or burial and thereby result in a **significant impact** if not mitigated. From a population-level perspective, any areas with fish would hold a miniscule fraction of their overall populations in the Delta. Where practical, i.e., safe and immediately before construction activity so as to minimize reoccupation by fish before construction happens, these waters would be seined once prior to construction to remove fish present, per Mitigation Measure 4.4-2 (see Section 4.4.4, Mitigations). Thus, these temporary impacts would be avoided or minimized and be **less than significant** to special-status fishes and native fishes (refer to Section 4.4.4, Mitigation).

Post-construction actions would not involve improvements to the irrigation and/or drainage systems. Routine repairs of these systems would be the responsibility of the property owner, Westlands Water District, and/or their property manager/tenant, as the Project would not rely on these systems to operate. The intent would be for the Project to be self-sustaining and a natural system. Hence, during the post-construction phase, there would be **no impact** from irrigation and/or drainage system improvements by the Project.

**Potential Stranding Risk of Fish on the Project Site**

*Applicable Significance Criteria: 1 and 3*

Situated in the Yolo Bypass, the Project site is inundated by flood waters during parts of the wet (i.e., winter and spring) season on average two out of every three years. As a result, the Project site can pond flood waters, potentially stranding fish when flood flows recede. The Project site can also strand fish behind the tidal gate on the Stair Step. Under those circumstances, stranded fish may die from high water temperature, asphyxiate from low DO, be consumed by piscivorous birds, or dried up as water evaporates from the ponded waters in irrigation ditches or marsh areas onsite. The following factors were examined to determine the potential for fish stranding: the design elements of the Project that were incorporated to minimize the potential for stranding via proper drainage, the expected inundation regime of the restored floodplain channels, and the nature and timing of the use of floodplains and restored channels by fish species expected to occur on the Project site, as well as their behavioral adaptations for avoiding stranding.

Many fish, however, may leave the seasonal floodplain on the Project site before stranding becomes a possibility. Moyle *et al.* (2007) examined stranding phenomena on the restored Cosumnes River floodplain, and found that the majority of fish exited the floodplain approximately five to six weeks following the last seasonal inflow. In this study, the majority of fish that were stranded on the floodplain following disconnection from the river were non-native fish species, particularly inland silversides (*Menidia beryllina*), western mosquitofish (*Gambusia affinis*), golden shiner (*Notemigonus chrysoleucas*), and common carp. A relatively small numbers of native cyprinids, including Sacramento splittail and Sacramento blackfish, as well as Chinook salmon, were temporarily stranded in isolated pools between inundation events in most years. These native fish stranding occurrences were almost always associated with depressions or man-made structures; features that would be eliminated onsite by construction of the Project.

The study (Moyle *et al.* 2007) found that native fish were typically the first fish to leave the floodplain and return to the river prior to disconnection. This observation is not surprising, as the life histories of many native fish are adapted to the natural hydrologic regimes of floodplains and rivers and, as such, floodplain emigration by native fish is likely to be triggered by environmental cues (e.g., increases in floodplain water temperatures as the water recedes, decreases in water surface elevations, or increased photoperiod). Native fish generally occurred on floodplain habitats earlier (e.g., February through April) than non-native fish, and the emigration from floodplain habitats by the majority of native fish occurred rapidly (e.g., approximately over one week or less), when daily maximum air temperatures rose from 68$^{o}$F to 77$^{o}$F (Moyle *et al.* 2007). No juvenile salmonids were found to be permanently stranded (i.e., isolated on the floodplain following the final disconnection of the year) during the four-year study; however, a small number of native cyprinids were permanently stranded in some years (Moyle *et al.* 2007).

As proposed, the Project would create new open channels within its footprint. This modification to the land would result in the drainage of water off of the newly excavated areas graded to avoid ponding. The runoff would flow out through five new tidal connections into tidal waters of the Toe Drain or Stair Step.

This new drainage system would eliminate post-flooding, ponding potential over much of the Project site. The Project would be designed so that the daily tidal cycle of flooding and drainage minimizes ponding. Channel geometries would be sized to promote peak-tidal flow velocities of about three ft per second. Sinuous tidal channels that approximate historical floodplain conditions would be incorporated into the design, which would favor gradual drainage over rapid drainage and thereby permit fish sufficient time to swim off the floodplain, if necessary.

Proposed ground elevations within the Project site would range from approximately 4 to 6.5 ft (North American Vertical Datum of 1988 [NAVD88]). The tidal channels would be constructed with “grade to drain,” meaning channel bottoms would slope very gently down to their tidal connections. Channel invert depths would be in the range of two to four ft below local MLLW over much of the channel length, which would provide an uninterrupted, subtidal connection with the adjacent Delta waterways. The upper reaches of smaller channels may be constructed shallower, and would also be graded to drain. Should internal blockages develop within these channels (due to channel wall slumping or localized siltation, for example) creating isolated areas where fish could become trapped at low tide, these areas should have sufficient water depth to support any trapped fish until the next rising tide. Also, the channels would be designed with gently sloping banks on the insides of some meander bends, which would minimize the potential for isolated pools to form under low tide conditions. Based on monitoring efforts, channel wall slumping would be subsequently remedied through corrective actions (refer to Section 3.5.1).

Based on water surface elevations (WSE) at nearby Liberty Island, the frequency of inundation throughout the year on the restored Project site would range from about five percent of the time at the highest elevations (i.e., 6.5 ft) to 60 percent of the time at the lowest elevations (i.e., 4 ft) (**Figures 4.4-1 and 4.4-2**) The potential for stranding would be minimal in the lowest elevation portions of the restored site, and would minimally increase with higher elevation. In the unlikely event that any fish did become stranded (e.g., in scour holes) in the higher elevation portions of the Project site, those fish would be expected to survive until the next tidal inundation.

Regardless of which soils reuse option is selected, the Project would eliminate or reduce the potential for stranding fish onsite by reducing ponding incidents, as explained previously. Because the risk of native fish stranding would be greatly reduced by the Project, potential stranding impacts on special-status fish or the movement of native fish would be **less than significant**. No mitigation would be required. Similar impacts would be attributed in conjunction with the construction of an additional tidal connection and creation of small ditches to control mosquitoes, if needed, during the post-construction phase.

For other post-construction activities, such as monitoring and removal of invasive plants, stranding to fishes would not occur as grading activities would not be carried out. Hence, **no impacts** would result while implementing minor activities during the post-construction phase. No mitigation would be required.

### Impact 4.4-3: Temporary Noise Impacts Impeding or Delaying Fish Migration

*Applicable Significance Criteria: 1 and 3*

Construction activity at the tidal connection locations could generate sufficient noise within the channels to affect the movement or migration of special-status fish species. Adult fall-run Chinook salmon and steelhead may migrate past the Project site in the Stair Step or the Toe Drain on their way to upstream spawning reaches in Putah and Cache creeks during the late summer and fall months and, therefore, may coincide with the latter months of the construction period. However, these fish are expected to simply avoid the excavation areas by seeking a zone of passage further away from any noise sources (i.e., along the opposite bank of the slough, which is approximately 120 - 200 ft wide in most places). Excavation of the connections would occur over a maximum period of a few hours to one day at each location and, therefore, any delays in fish migration would be temporary and brief.

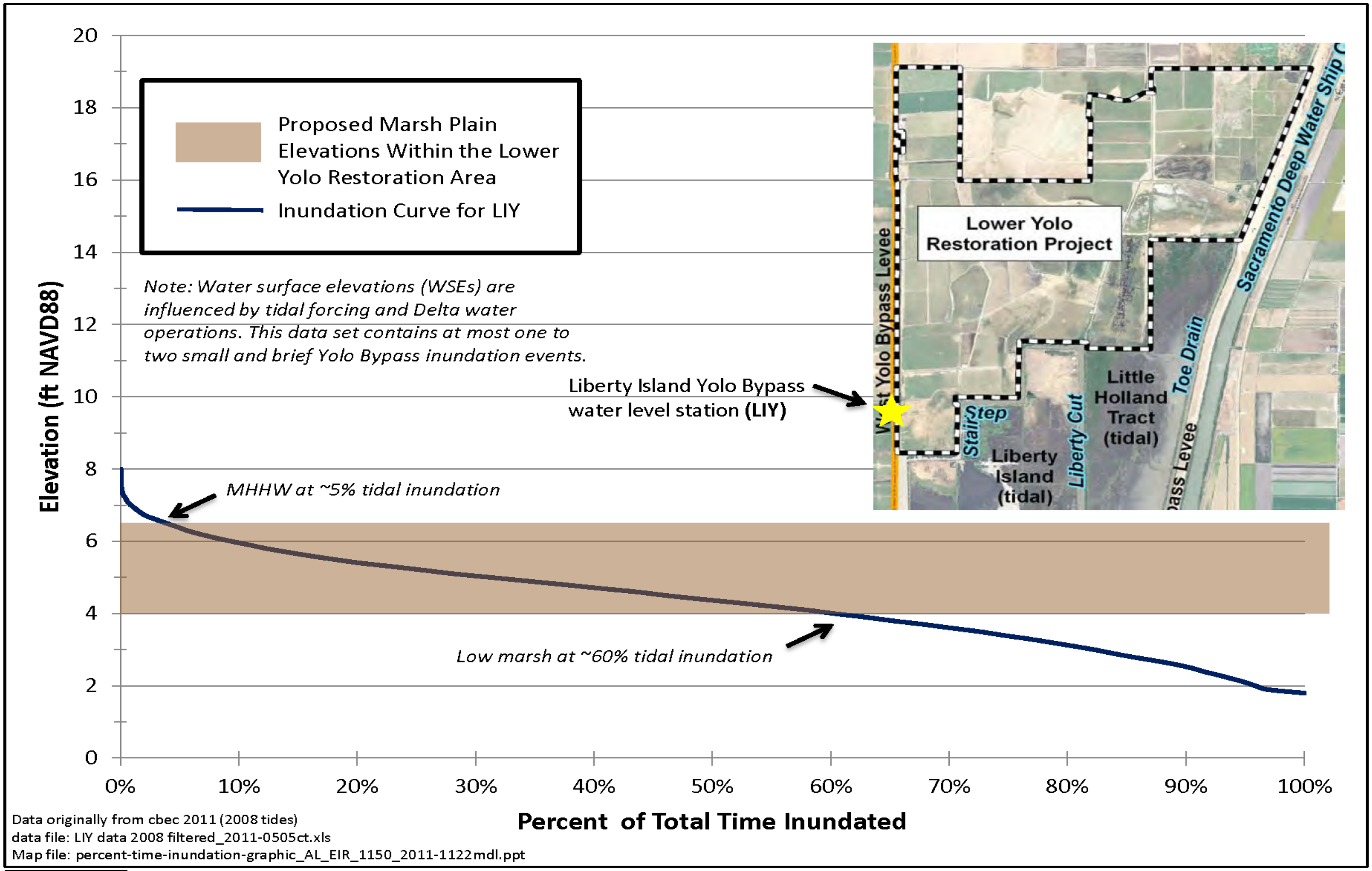
Scrapers typically generate 83 – 91 decibels A-weighted (dBA) at 50 ft, while haul trucks generate 83 – 94 dBA and loaders generate about 80 – 85 dBA at this distance (Bolt *et al.* 1987). Work atop the Yolo Bypass levee-crest road would not have noise shielding and such activities could include soils transport for toe berm construction (Soils Reuse Option #1). Grading of the upper toe berm would also be conducted from near the levee crest. However, this short-term construction noise associated with the grading activities would be similar to existing noise associated with ongoing agricultural activities in the adjacent areas (**Table 4.4-5**). Therefore, construction-related noise would not cause adverse individual or population-level effects on the movements or migrations of migratory fish, or their habitat, including critical habitat and EFH, to an extent that could cause a reduction in species abundance or long-term population levels. Therefore, this impact would be **less than significant** and no mitigation would be required. The additional tidal connection that may be needed during the post-construction phase of the Project would have similar impacts that would occur in constructing the other tidal connections.

For post construction, such as monitoring and sampling, no machinery or equipment used would generate substantial noise. Thus, **no impact** would result from temporary noise sources that could impede or delay fish migration. No mitigation would be required.

**Table 4.4-5. Farm Equipment Noise Exposure Levels and Maximum Time Duration set by the Occupational Safety and Health Administration**

| Maximum Duration Per Day (hours) | Sound Level (dB) | Examples of Noise Source at Sound Levels |
|---|---|---|
| **8** | 90 | Tractor, combine, or all-terrain vehicle |
| **6** | 92 | Tractor or combine |
| **4** | 95 | Tractor, grain grinding, combine, or air compressor |
| **3** | 97 | Tractor, combine, or shop vacuum |
| **2** | 100 | Tractor, pigs squealing, or table saw |
| **1 1/2** | 102 | Tractor, combine, or riding lawnmower |
| **1** | 105 | Tractor, combine, chickens, or irrigation pump |
| **1/2** | 110 | Tractor or leaf blower |
| **1/4** | 115 | Chainsaw |

Source: http://www.extension.org/pages/62258/hearing-loss-and-protection-for-agricultural-producers




Only Phase 1 of the Project is being pursued at this time; Phase 2 is included here as part of the reasonably foreseeable future build out.

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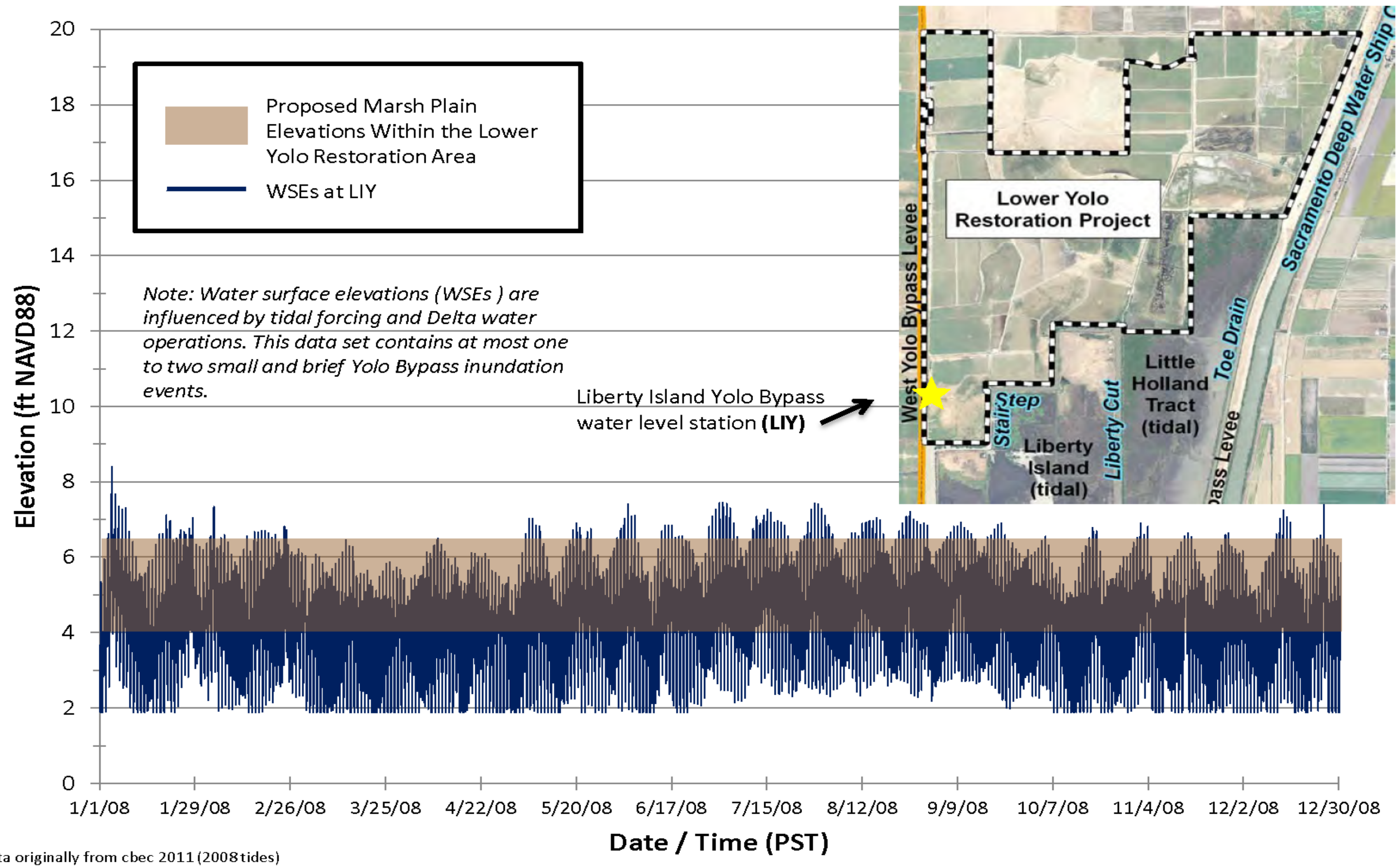
**Figure 4.4-1**

**Proposed Future Inundation Conditions: Percent Time Inundation**




Data originally from cbec 2011 (2008 tides)
data file: LIY data 2008 filtered_2011-0505ct.xls
Map file: daily-tides-graphic-EIR_2011-1122mdl.ppt

Only Phase 1 of the Project is being pursued at this time; Phase 2 is included here as part of the reasonably foreseeable future build out.

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**Figure 4.4-2**

**Proposed Future Inundation Conditions: Daily Tides**

### Impact 4.4-4: Water Quality Impacts on Fish and Aquatic Resources

*Applicable Significance Criteria: 1, 2, and/or 3*

Assessing the potential effects of water quality conditions within the Project site and in adjacent channels of the lower Yolo Bypass and Cache Slough Complex have been fully analyzed in Chapter 4.2, Water Quality.

#### Suspended Solids/Turbidity

Impacts were assessed on fish and aquatic habitat resources due to increases in sedimentation and turbidity from construction-related activities, based on the magnitude and areal extent of expected changes in these water quality parameters. Toxicity impacts on aquatic life that could result from chemical spills during construction were assessed based on the potential for accidental spill events, the volumes of various contaminants likely to be spilled in any such event, and their dilution.

Creating tidal connections would occur in very, localized areas of up to 120 ft in width of levees/berms at five locations (with a possible sixth location during the post-construction phase) along miles of channels found in the lower Yolo Bypass and Cache Slough Complex. Each location would also involve excavation lasting between a few hours to one day.

These activities would occur in late summer or fall (e.g., September or October), during the period in which adult immigrating fall-run and late fall-run Chinook salmon, adult immigrating steelhead, and juvenile green sturgeon could be present in adjacent water bodies. Uncontrolled re-suspension of sediments through excavation could result in adverse effects on fish such as impairing the ability of sight-feeding fish finding prey, clogging and abrading gill filaments, burying benthic macroinvertebrate prey once sediment has settled out of the water column, and preventing fish avoidance from temporarily turbid areas. However, the potential for such short-term, sediment re-suspension and scouring impacts would be minimized by excavating the connections from the landward side, toward tidal waters to create and remove a “plug of soil” in which water (both tidal and groundwater) would then slowly equilibrate on both sides of the berm, avoiding a surge into the work areas. In addition, the heavy machinery required to excavate each connection would be operated from the levee crown or from within the Project site (refer to **Figure 3-3** in Chapter 3, Project Description). The excavated soils would be moved by dozers or placed into dump trucks and transported away from the excavation area. This approach, along with other construction BMPs listed in Chapter 3, would minimize the amount of soil available for re-suspension. Overall, the potential impact of sediment introduction into localized waters adjacent to the Project site, in which special-status fish and critical habitat and EFH, could occur, would be **less than significant**. No mitigation would be required.

Development and maturation of wetland vegetation on the restoration site would attenuate and reduce erosion and scour processes. Over the long term, stabilization of site vegetation would result in suspended solids and turbidity levels that are substantially equivalent to those of other inter-tidal areas of the Yolo Bypass. Hence, impact to aquatic resources from suspended solids/turbidity within the restored and enhanced wetlands would be **less than significant**. No mitigation would be required. Other post-construction activities, such as project verification monitoring and sampling would be small in scale, not involve in grading, and therefore would result in **no impact**. No mitigation would be required.

#### Methylmercury Uptake

As presented in Section 4.2, Water Quality, a qualitative analysis based on MeHg data from similarly managed systems and data collected elsewhere in the Yolo Bypass, including drainage discharges from the Project site to the Toe Drain, indicates that concentrations on the Project site are likely elevated above those found in Delta (i.e., Cache Slough Complex) source waters. Also, the Project site likely serves as a net source of MeHg to the Delta.

As described in Impact 4.2-2, it is projected that Project implementation (including both construction and post-construction phases) would result in reduced MeHg loading within the site and reduced severity of discrete MeHg loads to the Delta. The restored tidal marshes are expected to slightly increase the MeHg concentrations in tidal flows out of the marsh relative to inflow concentrations, as observed in San Pablo Bay and Brown's Island marsh studies (Yee *et al.* 2008; Bergamacschi *et al.* 2011), and there may be some build-up of mercury concentrations at the marsh rim from vegetation die-offs after exposure and then re-submergence. However, these potential increases would be countered by decreases in MeHg discharges from the Project site to the Toe Drain.

With respect to impacts to aquatic resources through exposure/uptake of MeHg, evidence indicates that bioaccumulation by invertebrates, fishes, and wildlife consuming aquatic resources would not differ from current exposures in the Delta:

> "Speculation of the possible effects of tidal wetlands on MeHg in the Delta and fish tissue mercury concentrations has been widespread, as it is generally thought that tidal wetlands contribute to MeHg production (Davis *et al.* 2003). However, empirical studies have shown that there is no localized increase in biotic MeHg concentration (in fish) in wetlands compared with adjacent aquatic habitats like open water channels (Yee *et al.* 2005; Slotton *et al.* 2002). While the project may attract fish to spend a portion of their life cycle within the project's tidal wetlands, their exposure to MeHg would be similar to that of the baseline environment of the Delta's existing tidal wetlands and open channels.
>
> Beyond production and release of MeHg from tidal wetlands, one prevalent general concern is the possibility of bio-accumulation of MeHg in the food chain. However, based on the rationale and studies cited above, MeHg levels found in larger game fish that feed on smaller fish associated with tidal wetland habitat should be comparable to baseline levels and would not be substantially changed by the project. No evidence is known that indicates restoring tidal wetlands would increase concentrations of MeHg in invertebrates, zooplankton, fish, or wildlife to be any greater than what is currently measured in these organisms within the various Delta habitats." (Source: Reclamation District 2093, *Liberty Island Conservation Bank Mitigated Negative Declaration*, 2009).

Overall, the reduced severity of discrete loads and reduced MeHg onsite and in discharges would be **beneficial** changes in MeHg dynamics on the Project site and in the general vicinity of the Delta, thereby decreasing the bioaccumulation of MeHg in fish. Hence, MeHg impacts to aquatic biological resources would be **less than significant** and no mitigation would be required.

#### Pesticides

Based on the review of available information, the potential for the proposed Project to expose fish and other aquatic resources to increased toxicity from current-use and legacy pesticides would be unlikely. The Phase 1 environmental site assessments conducted onsite reveal that land uses have been primarily used for pasture and grazing, with pesticide use minimized in recent years. Also, the land is routinely exposed to high flood waters during seasonal inundation in the Yolo Bypass. The stabilization period during construction, when farming activity would cease, would also be expected to allow time for breakdown of any current-use pesticides and lessen the potential for adverse runoff effects. Additional discussion on pesticides is presented in Section 4.8.1, Setting: Agricultural Practices and in Section 4.2, Water Quality.

Overall, the potential Project-related exposure of fish, including special-status fish, to pesticides would be no different than at other areas in the Delta receiving runoff from active urban and agricultural land uses. Additionally, chemical use for mosquito control during the post-construction phase would be employed as a last resort if nothing else worked and would comply with applicable laws and regulations for its use (refer to Impact 4.8-3 in Section 4.8) Therefore, impacts from pesticide exposure to aquatic biological resources would be **less than significant** and no mitigation would be required.

#### Long-term Water Temperature Impacts to Fish and Other Aquatic Resources

Assessing this impact focuses at times on Chinook salmon and steelhead, as both species are of resource management concern, and because they have the lowest and narrowest thermal tolerances of all fish species currently occurring in the Project area.

Under existing conditions, the non-tidal irrigation/drainage ditches and basins on the Project site are subject to intense solar radiation and ambient air conditions during the warmest months (e.g., July and August), which can create water temperatures that exceed upper thermal maximum thresholds, even for many warm-water fish species, or cause the basins to evaporate until dry.

Shallow water habitats are subject to increased water temperatures as a result of direct solar radiation and influence from ambient air temperatures. Of the fish and invertebrate communities potentially occurring on the restored floodplain, anadromous salmonids have the lowest temperature tolerances, and have the potential to occur within the restored wetlands for extended time periods. Therefore, if temperatures on the Project site and adjacent water bodies are suitable for Chinook salmon and steelhead, they would likewise be suitable for warm water resident fish species, as well as other anadromous or migratory fish (e.g., green sturgeon, delta smelt, longfin smelt) and invertebrate communities. Increased temperatures can sub-lethally affect aquatic organisms through reduced growth and/or maturation rates, increased vulnerability to predation, and increased risk of disease, and in the case of extreme temperatures, cause mortality.

The closest water temperature monitoring station in the vicinity of the Project is the DWR Yolo Bypass at Lisbon Weir gauge (CDEC Station ID: LIS), located a short distance northeast of the Project site. Temperature data were obtained from this monitoring station for the entire available period of record, July 16, 2008 through March 28, 2011. The summary statistics of monthly temperatures for this station (**Table 4.4-6**) indicate that temperatures in the Yolo Bypass are well within suitable ranges for growth and survival of anadromous salmonids during the fall to spring months, during which anadromous salmonids would be present in the vicinity of the Project site. It should be noted that this data set encompasses some of the warmest summer months on record (i.e., summer 2009).

**Table 4.4-6. Monthly Water Temperature Summary Statistics for the Yolo Bypass at Lisbon Weir Monitoring Station – July 16, 2008 through March 28, 2011**

| Month | Temperature (°F) | | | |
|---|---|---|---|---|
| | Average | Minimum | Maximum | Count |
| **January** | 49.4 | 44.9 | 53.3 | 1485 |
| **February** | 53.5 | 48.9 | 60.8 | 1051 |
| **March** | 59.3 | 53.9 | 65.5 | 744 |
| **April** | 65.1 | 60.2 | 75.8 | 720 |
| **May** | 71.9 | 63.0 | 84.4 | 744 |
| **June** | 74.1 | 67.8 | 84.9 | 720 |
| **July** | 76.2 | 70.0 | 85.9 | 1178 |
| **August** | 75.5 | 70.7 | 83.0 | 1486 |
| **September** | 73.2 | 67.3 | 81.4 | 1377 |
| **October** | 63.9 | 56.0 | 73.9 | 1488 |
| **November** | 57.3 | 49.3 | 62.8 | 1439 |
| **December** | 47.7 | 42.3 | 55.3 | 1487 |

Source: California Data Exchange Center. No Date.

These recorded temperatures indicate that juvenile Chinook salmon would encounter a temperature regime that is conducive to growth during the peak winter-spring emigration and rearing period. Juvenile Chinook salmon show positive growth at temperatures ranging from 46.4 degrees Fahrenheit (°F) (Clarke and Shelbourn 1985) to 77°F (Brett *et al.* 1982), with maximum growth under maximal rations occurring at temperatures in the mid- to upper 60s°F (Cech and Myrick 1999). These temperatures are similar to temperatures recorded in the Yolo Bypass from December through April (**Table 4.4-6**). However, juvenile Chinook salmon rearing in the Yolo Bypass and on the Project site may begin to encounter daily maximum temperatures that exceed their thermal tolerances beginning in May. Hanson (1991) reported that juvenile Chinook salmon from the Feather River acclimated at 55.4°F had an upper incipient lethal temperature (UILT) of 78.8°F. Cech and Myrick (1999) found that juvenile Chinook salmon exposed to acute temperature changes can tolerate temperatures as high as 83.8°F for short exposures, when acclimated to 66.2°F. Their ability to tolerate temperatures higher than the UILT is a function of exposure time, with an inverse relationship between exposure time and tolerated temperature. Marine and Cech (2004) reared juvenile Chinook salmon at temperatures ranging from 69.8 – 75.2°F without experiencing significant mortality.

It has also been shown in the wild that pre-spawning adult spring Chinook salmon holding in the Yakima River can maintain an average internal temperature of 2.5°C below ambient river temperature, while being most commonly associated with islands, pools, and rock out-croppings along stream banks (Berman and Quinn 1991). Further, adult fall Chinook salmon migration rates up the lower Columbia River slow when river water temperatures exceed about 20 (degrees Celsius) °C, and are strongly associated with temporary use of cooler tributaries (Goniea *et al*. 2006). Younger, subyearling Chinook salmon in a Snake River reservoir select depth and temperature combinations that increased exposure to 16 – 20°C when temperatures <16 and >20°C were lower or higher in the water column (Tiffan *et al*. 2009). Other salmonids such as steelhead and brook trout will actively try to avoid unsuitably warm temperatures by reducing foraging activity and by seeking cooler pockets of water, perhaps in cooler flows near the bottom or in cooler depths of thermally stratified pools or lakes (Nielsen, *et al.* 1994; Biro1998).

The Project would incrementally increase the net amount of shallow water habitat in the Yolo Bypass and also would inundate the existing basins onsite, (currently isolated in the dry season), with cooler tidal waters throughout the summer. Because the tidal waters of the Toe Drain and Stair Step provide suitable temperatures for warm water fish year-round and cold water fish seasonally, re-establishing the tidal connections to water bodies on the Project site would likewise provide suitable habitat and would likely improve the summer thermal regime of the Project basins.

Although the Project would create shallow water habitat on the floodplain where water temperatures may be incrementally increased above that of the ambient water in the adjacent tidal waters, any such temperature increases would be minimal, and are unlikely to adversely affect anadromous salmonids or other anadromous and resident fish with higher thermal tolerances for several reasons. First, juvenile salmonids (i.e., the most thermally intolerant life stage expected to utilize the Project site) would be present during the winter and spring months, when, as discussed above, average and maximum daily temperatures are well within suitable ranges for growth and survival of these species. Second, ambient air temperatures during this time period are also generally within values for survival of anadromous salmonids, and would, therefore, not increase temperatures of waters on the floodplain to levels that would adversely affect growth or survival of salmonids or other fish with higher thermal tolerances. Third, the daily cycles of tidal exchange and cool nighttime temperatures would ameliorate any increases in temperature that may occur on the floodplain during the day. Fourth, any temperature increases would likely be limited to shallow and/or near-shore margins of the floodplain, and would likely occur only on relatively warm days with little cloud cover (i.e., exposure to direct sunlight).

Finally, if temperatures on the floodplain did reach critical levels, fish would exit the floodplain in search of cooler water as temperatures began to exceed their thermal preferences. The floodplain habitat created by the proposed Project would not be expected to increase water temperatures on the floodplain or in the adjacent and connected water bodies (i.e., Toe Drain and the Stair Step Slough) to levels that would have adverse effects on anadromous salmonids or other resident or migratory fish. Conversely, any short-term incremental increases in floodplain water temperatures may be beneficial to rearing juvenile salmonids, by increasing growth rates and by providing a temporary thermal refuge, should temperatures in the adjacent water bodies become very low.

As described above, temperatures on the Project site and in adjacent water bodies would not reach temperatures of sufficient magnitude or frequency as to have any individual or population-level effects on any anadromous or resident fish occurring in the Project area, or their invertebrate food base. Under situations in which temperatures in the adjacent water bodies become unfavorably low, the shallow waters on the restored floodplain may provide benefits to anadromous salmonids, by providing thermal refugia and increased growth rates. Therefore, temperature impacts with Project implementation (both construction and post construction) would be **less than significant** and **potentially beneficial**. No mitigation would be required.

#### Long-term Dissolved Oxygen Impacts to Fish

The assessment under this impact focuses at times on Chinook salmon and steelhead, as both are species of resource management concern, and because they have the lowest and narrowest DO tolerances of all fish species currently occurring in the Project area. Section 4.2, Water Quality, concluded that discrete discharge events from agricultural ditches and managed wetlands on or near the Project site presently, could potentially contribute to low DO water, which could have short-term impacts to DO levels in the adjacent tidal sloughs. However, these discrete events do not appear to have a negative impact upon the long-term water quality of the receiving sloughs, as DO levels in the Project area generally exceed five mg/L and thereby are suitable for aquatic life (Kimmerer 2004). Many fish cannot tolerate water when DO concentration is lower than about two to five mg/L (Nobriga 2008).

Compared to the existing site conditions, the proposed Project would result in a net additional area of dendritic intertidal channels, exposed to aeration from mixing by the wind, and daily tidal exchange and flushing. The restoration channels would be constructed to drain freely, and thus reduce potential for DO-sag conditions from long water residence times, providing generally stable and suitable DO levels for resident and anadromous fish species. Consequently, the proposed Project would not result in DO levels low enough or extensive enough to cause adverse population-level effects on resident or anadromous fish occurring in waters within or adjacent to the Project site or their invertebrate food base. Therefore, DO impacts to fish with Project implementation (during both construction and post construction) would be **less than significant**. No mitigation would be required.

## 4.4.4 Mitigations

### Mitigation Measure 4.4-1: Temporary Impacts from Filling of the West Yolo Bypass Levee Borrow Ditch

The following mitigation measure shall be implemented during construction:

- Conduct biological monitoring during the filling of the west Yolo Bypass levee borrow ditch if either Soils Reuse Option #1 or #3 is selected.
- Develop and implement a protocol between the biological monitor and the project engineer to redirect the filling activity if special-status fishes (e.g., adult salmonids) are observed in the immediate vicinity of the fill area, until the fishes leave the site.

Implementation of Mitigation Measure 4.4-1, above, would reduce the effects from filling the ditch to **less than significant**.

### Mitigation Measure 4.4-2: Temporary Impacts from Irrigation and Drainage Improvements

The following mitigation measure shall be implemented prior to the onset of excavation on the marsh plain and irrigation ditches:

- Conduct biological surveys to determine if there are any fishes present.
- Recover fishes, if present, using appropriate techniques such as beach seining; retain the captured fishes in cooled, aerated containers; and release fishes the same day as captured into the waters of Stair Step or Toe Drain.

Implementation of Mitigation Measure 4.4-2, above, would reduce the effects from excavating marsh plains and irrigation ditches to **less than significant**.

No unavoidable, significant adverse impacts would result from the Project with respect to aquatic biological resources, because SFCWA will adhere to all applicable laws and regulations (refer to Section 4.4.1, Regulatory Setting) and will implement the above mitigation measures with applicable BMPs and post-construction activities (e.g., corrective actions and monitoring).

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# 4.5 Agricultural Resources

## 4.5.1 Setting

Situated in the southern portion of the 66,000-acre (ac) Yolo Bypass Agricultural Region in Yolo County, the Project site consists of about 3,795 ac of land and water. Pertinent aspects of the Project's agricultural setting include:

1. State farmland designations, soils, and productivity; and
2. State and local laws, plans, zoning, and ordinances.

### *California Farmland Mapping Program Productivity Designations*

The California Department of Conservation (CDC) has developed a Farmland Mapping and Monitoring Program (FMMP) that classifies farmland productivity (CDC 2007). The classification system combines technical soil ratings and current land use as the basis for identifying farmlands as Prime Farmland, Farmland of Statewide Importance, Unique Farmland, Farmland of Local Importance, Grazing Land, Urban and Built-up Land, Other Land, and Water. These classifications are described in **Table 4.5-1**.

**Table 4.5-1. State Farmland Productivity Classifications and Descriptions**

| State Farmland Productivity Classification | Description of State Farmland Productivity Classification |
|---|---|
| **Prime Farmland** | Farmland with the best combination of physical and chemical features able to sustain long-term agricultural production. This land has the soil quality, growing season, and moisture supply needed to produce sustained high yields. Land must have been used for irrigated agricultural production at some time during the four years prior to the mapping date. |
| **Farmland of Statewide Importance** | Farmland similar to Prime Farmland but with minor shortcomings, such as greater slopes or less ability to store soil moisture. Land must have been used for irrigated agricultural production at some time during the four years prior to the mapping date. |
| **Unique Farmland** | Farmland of lesser quality soils used for the production of the state's leading agricultural crops. This land is usually irrigated, but may include nonirrigated orchards or vineyards as found in some climatic zones in California. Land must have been cropped at some time during the four years prior to the mapping date. |
| **Farmland of Local Importance** | Land of importance to the local agricultural economy as determined by each county's board of supervisors and a local advisory committee. |
| **Grazing Land** | Land on which the existing vegetation is suited for grazing by livestock. |
| **Urban and Built-up Land** | Land occupied by structures with a building density of at least 1 unit to 1.5 acres (ac), or approximately 6 structures to a 10-ac parcel. This land is used for residential, industrial, commercial, construction, institutional, public administration, railroad and other transportation yards, cemeteries, airports, golf courses, sanitary landfills, sewage treatment, water control structures, and other developed purposes. |
| **Other Land** | Land not included in any other mapping category. Common examples include low density rural developments; brush, timber, wetland, and riparian areas not suitable for livestock grazing; confined livestock, poultry or aquaculture facilities; strip mines, borrow pits; and water bodies smaller than 40 ac. Vacant and nonagricultural land surrounded on all sides by urban development and greater than 40 ac. |
| **Water** | Perennial water bodies with an extent of at least 40 ac. |

Source*:* California Department of Conservation 2007.

As shown in **Table 4.5-2**, the Yolo Bypass region is dominated by Unique Farmland.

**Table 4.5-2. Farmland Classifications for Yolo Bypass Region, Yolo County – 2008**

| Farmland Type | Yolo Bypass Region[1] (Acres) | Percentage of Yolo Bypass Region Agricultural Lands | Yolo Bypass Region as Percentage[2] of Same Agricultural Land Type in Yolo County |
|---|---|---|---|
| **Prime Farmland** | 8,193 | 12.4 | 3.2 |
| **Farmland of Statewide Importance** | 247 | 0.4 | 1.5 |
| **Unique Farmland** | 25,227 | 38 | 50.2 |
| **Farmland of Local Importance** | 290 | 0.4 | 0.7 |
| **Farmland of Local Potential** | 1,230 | 1.9 | 5.6 |
| **Grazing Land** | 13,865 | 21.0 | 9.2 |
| **Urban and Built-Up Land** | 712 | 1.1 | 2.4 |
| **Other Land** | 15,420 | 23.3 | 20.4 |
| **Water** | 973 | 1.5 | 12.4 |
| **Total Acreage** | **66,158** | | |

[1] Yolo Bypass Region defined as the Yolo Bypass plus nearby surrounding lands in similar agricultural uses.
[2] Rounding up may result in overstating overall percentages.
Source: California Department of Conservation 2007

According to farmland mapping data available from CDC, the 3,795-ac Project site does not contain Prime Farmland or Farmland of Statewide Importance; it does contain about 1,760 ac of Unique Farmland, 1,160 ac of Grazing Land, 780 ac of Other Land, and 95 ac of Water.

It should be noted that CDC has erroneously mapped the west Yolo Bypass levee as Unique Farmland (**Figure 4.5-1**). The levee's sole purpose is for flood protection. Consequently, as noted in the figure, the levee is considered as Other Land and the major irrigation ditches are identified as Water rather than as Unique Farmland, Grazing Land, or Other Land.

### *Agricultural Soils*

Onsite soils vary in their ability to contribute to agricultural productivity. The Natural Resources Conservation Service (NRCS) soils survey (NRCS 1972) identifies eight soil types on the Project site (**Figure 4.5-2** and **Table 4.5-3**). The Storie index is a soil/irrigation rating system that expresses numerically the relative degree of suitability or value of a soil for intensive agricultural uses (University of California, Division of Agricultural Sciences 1978). Four factors that part of the Storie index rating: soil profile indicating the suitability for the growth of roots; texture of the surface layer; the slope of the soil and ease of irrigation; and other conditions limiting the use of the soil such as drainage, high water table, salt, alkali and acidity. This rating is obtained by multiplying each percentage score of the four factors together. Each factor has a highest possible percentage of 100, indicating the most favorable or ideal conditions. These factors are then weighted relative to one another and summed to yield a final score on a 100 point scale. For simplification, six soils grades have been designated in California based on the index ratings.

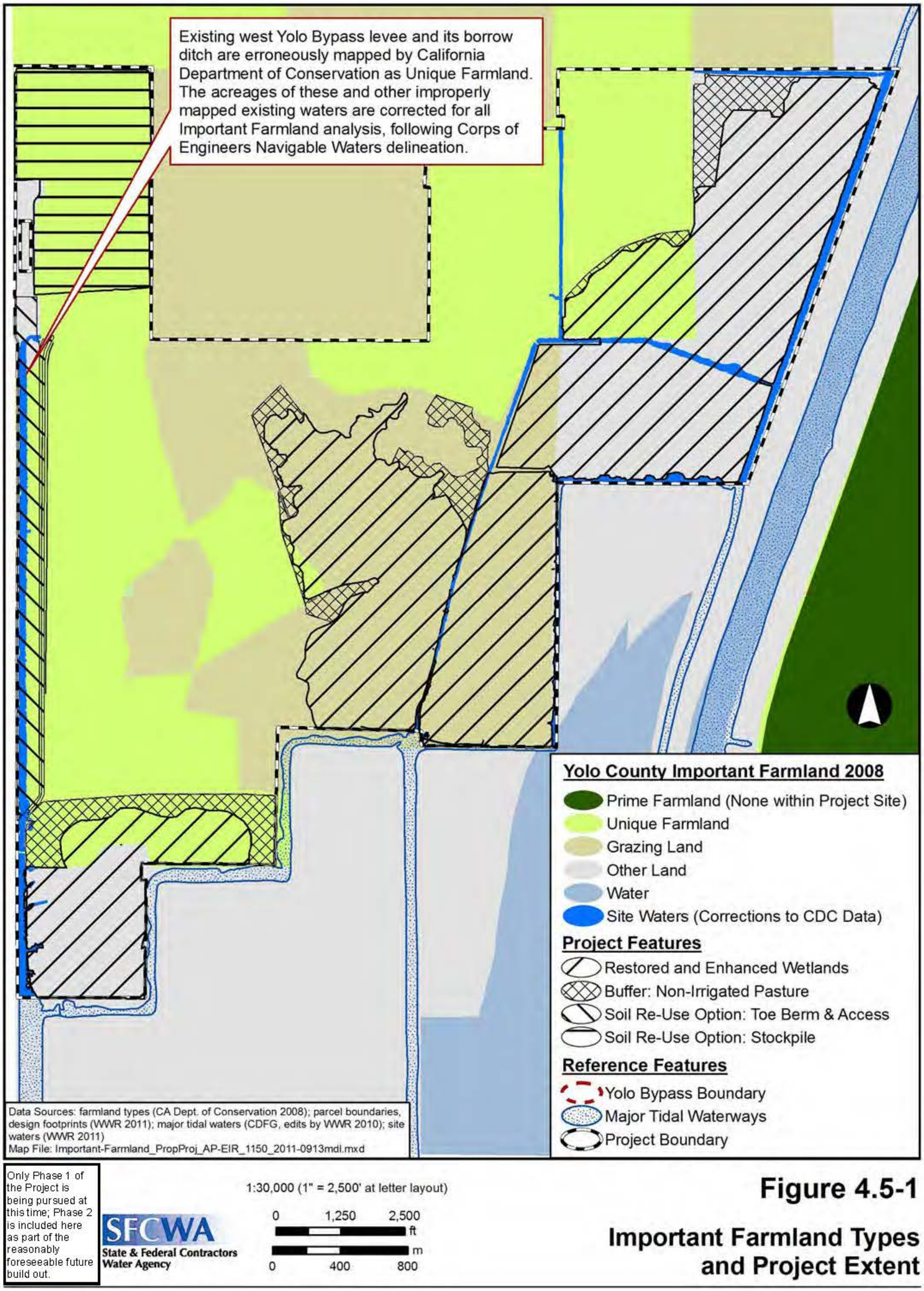
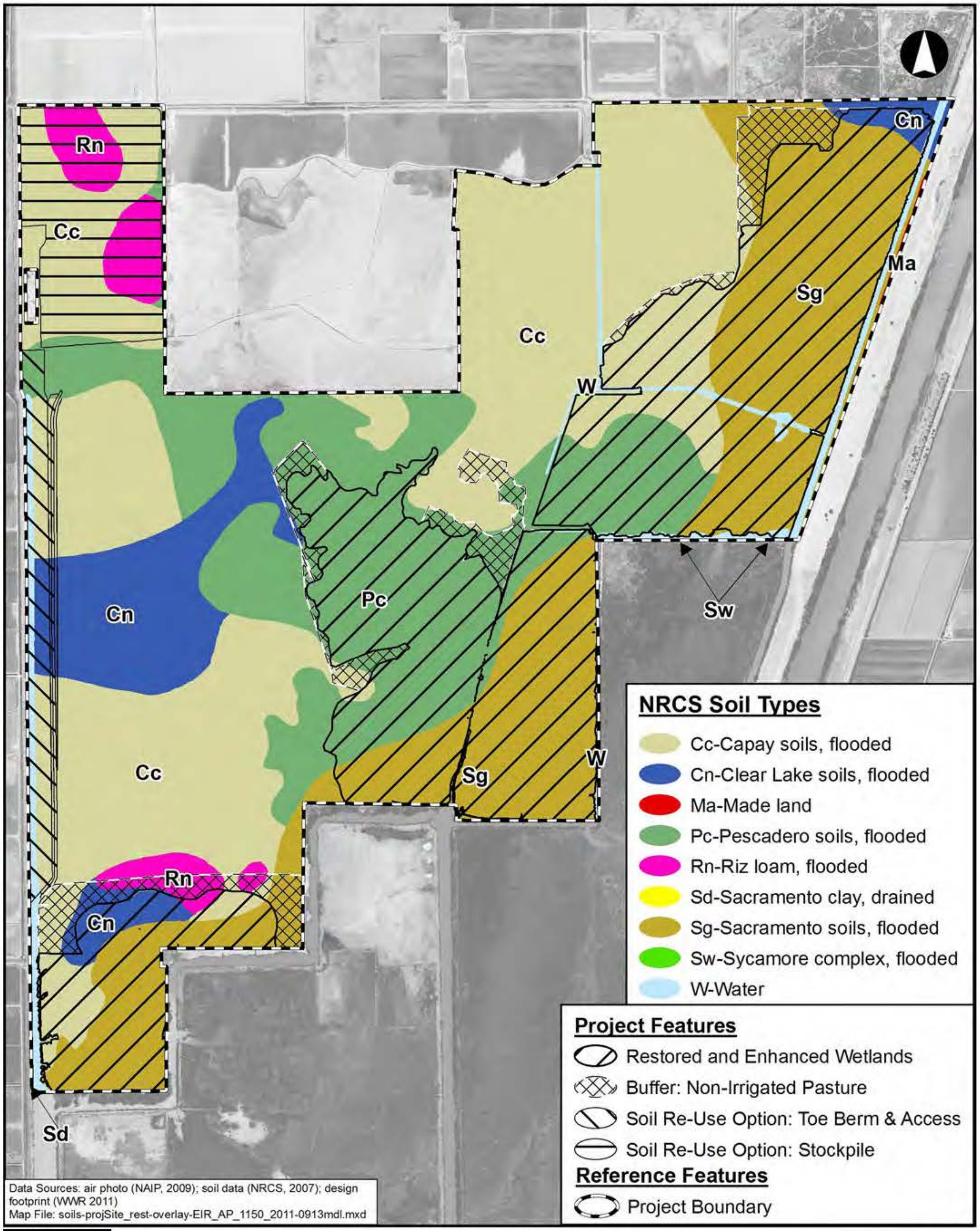



**Figure 4.5-1**

**Important Farmland Types and Project Extent**




Only Phase 1 of the Project is being pursued at this time; Phase 2 is included here as part of the reasonably foreseeable future build out.

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1:30,000 (1" = 2,500' at letter size)

0 1,250 2,500 ft

0 400 800 m

**Figure 4.5-2**

**NRCS Soils and Project Extent**

## Table 4.5-3. Combined Soil Types of Yolo Ranch and Yolo Flyway Farms[1]

| Soil Types | Acres | Percentage of Site | Storie Index | Storie Grade[2] |
|---|---|---|---|---|
| **Capay soils, flooded** | 1,506 | 40 | 34 | 4 |
| **Sacramento soils, flooded** | 914 | 24 | 30 | 4 |
| **Pescadero soils, flooded** | 844 | 22 | 15 | 5 |
| **Clear Lake soils, flooded** | 312 | 8 | 61 | 2 |
| **Riz loam, flooded** | 119 | 3 | 24 | 4 |
| **Made land[3]** | 4 | <1 | NA | NA |
| **Sycamore complex, flooded** | 0.02 | <1 | 26 | 4 |
| **Sacramento clay, drained** | 0.1 | <1 | 34 | 2 |
| **Water** | 94 | 2 | NA | NA |
| **Total Acreage** | **3,793** | | | |

[1] Only Phase 1 of the Project is being pursued at this time; Phase 2 (which includes Yolo Flyway Farms) is included here as part of the reasonably foreseeable future build out.
[2] Storie Grade 1 represents the most productive soils and Grade 6 the least productive. Numerically, the range can be categorized as follows: Grade 1: 80 to 100, Grade 2: 60 to 79, Grade 3: 40 to 59, Grade 4; 20 to 39, Grade 5: 10 to 19, and Grade 6: 0 to 9.
[3] Made land represents disturbed soils, urban land, or altered land. Specifically, such soils have been mixed, graded, compacted, or altered. When soil is disturbed, its traits and characteristics are changed substantially from that of the natural soil from which it was created. Made lands include lands derived from dredged sediments.
NA = Not Applicable
Source: Natural Resources Conservation Service 1972: *Soils Types Map and Storie Index Soil Classifications*

**Table 4.5-3** indicates that more than 90 percent of the soils in the Project site are rated as below-average productivity (Grades 4 and 5). Grade 4 soils rank between 20 and 39 percent suitability and thus have a narrow range of agricultural possibilities, requiring special management. Grade 5 represents soils rated between 10 and 19 percent suitability with very limited agricultural use (i.e., pasture and range). Most of the lands proposed for conversion to wetlands are Sacramento soils (flooded), or Pescadero soils (flooded), which have Storie grades of 4 and 5, respectively. Small areas of Clear Lake and Capay soils also occur within the Project construction footprint (see **Figure 4.5-2**).

A majority of the Project site is irrigated during the summer months to support forage production for cattle grazing. Field irrigation is facilitated by an extensive system of irrigation and drainage ditches, which connect to the major interior irrigation and drainage ditches within the Project site boundary and to the tidal waterways bordering the site (see **Figure 3-4** in Chapter 3, Project Description). Many fields have been graded to promote efficient flood irrigation within and between fields. The current hydrologic regime is discussed in further detailed in Section 4.1.

### *Productivity*

Yolo County's primary industry is agriculture. Within the Yolo Bypass, rice production and pasture are two major uses of agricultural fields, depending on the annual flood season. In 2008, the County had over 650,000 ac of farmland, not all of which was in active production. These agricultural lands include about 255,000 ac of Prime Farmland, about 17,000 ac of Farmland of Statewide Importance, and about 45,000 ac of Unique Farmland.

In 2009, over 618,000 ac of land were utilized for agricultural production. Yolo County's major commodities, as shown in **Table 4.5-4,** were vegetables, field crops, wine grapes, fruits and nuts, seed crops, organic produce, and livestock and poultry.

**Table 4.5-4. Agricultural Production in Yolo County – 2009**

| Commodities | Harvested Acreage (acres) |
|---|---|
| **Vegetables** | 40,891 |
| **Field crops** | 358,913 |
| **Wine grapes** | 13,187 |
| **Fruits and nuts** | 25,084 |
| **Seed crops** | 25,574 |
| **Organic production** | 5,774 |
| **Livestock pasture** | 148,775 |
| **Total** | **618,198** |

Sources: County of Yolo 2008a, 2009a.

Agricultural production in the Yolo Bypass, however, is secondary to its use as an area for flood control and, in places, wildlife habitat (Richter 2009). The southern end of the Yolo Bypass contains a large amount of pastureland. Between I-5 and I-80, a combination of rice and land use for wildlife habitat are the major land uses, while at the northern end of the bypass, a combination of pastureland, rice fields, and other field crops are found. The actual number of acres of rice produced in the Yolo Bypass varies from year to year depending on the level of water passed through the Yolo Bypass and the timing of its spring drawdown.

In Yolo County, on irrigated pasture lands within and outside the Yolo Bypass, livestock grazing begins in April or May and ends in October or November. Grazing within the Yolo Bypass cannot begin until past the annual flood conveyance period, which varies from April to June, depending on climate conditions. As a result, the agricultural productivity of lands within the Yolo Bypass is reduced if the Bypass is flooded into late spring, as occurred in 2011. Yolo Ranch and Yolo Flyway Farms occupy the Project site and are currently leased for irrigated and non-irrigated pasture to support cattle grazing (**Figure 4.5-3**). Additionally, because of the floodway priority of lands within the Yolo Bypass, lands outside of the Bypass typically have more cropland use options. Any land uses proposed or already managed in the Yolo Bypass must, by Central Valley Flood Protection Board regulation, not inhibit the movement of flood waters through the Yolo Bypass (California Code of Regulations [CCR], Title 23, § 15).

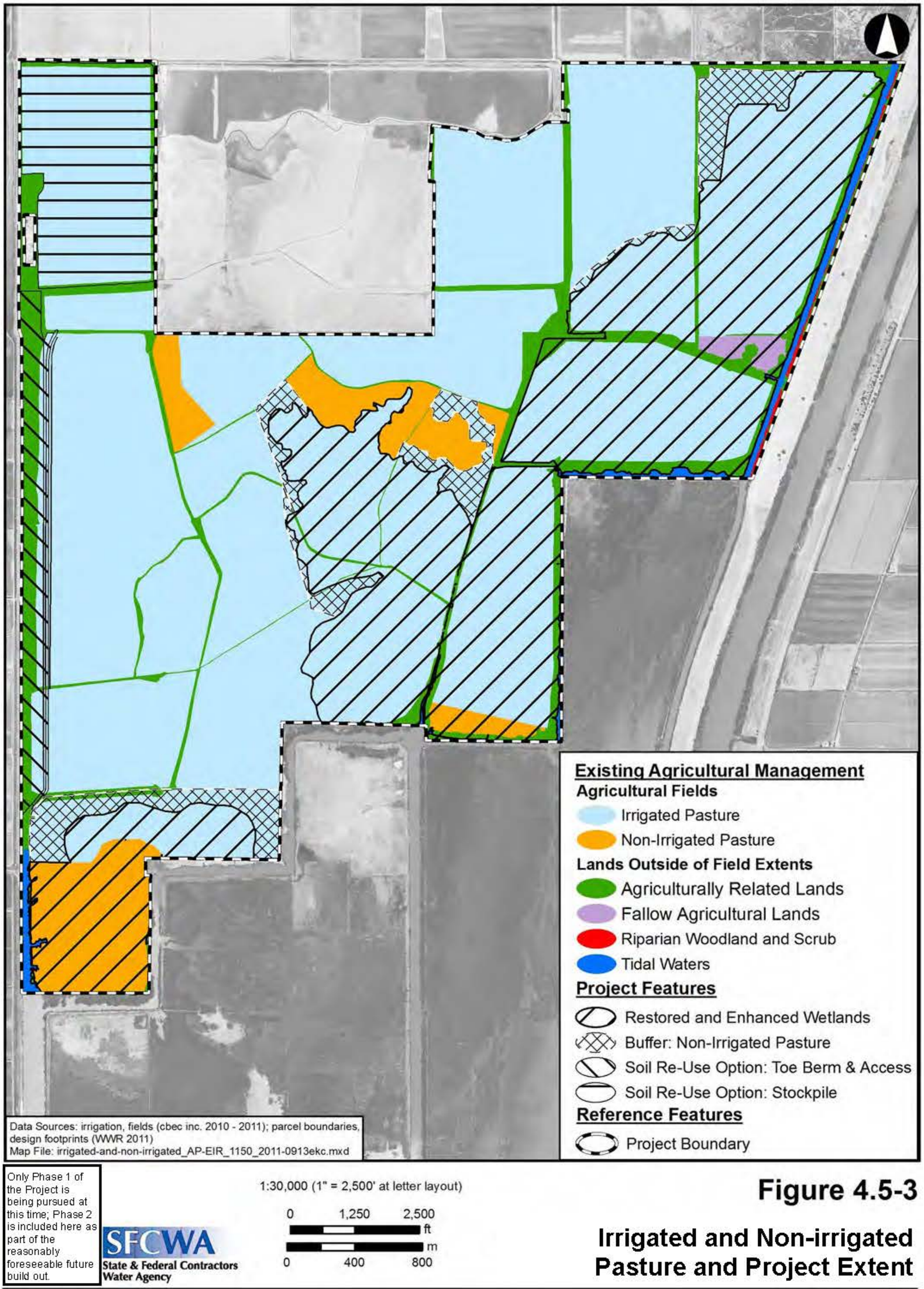


**Figure 4.5-3**

**Irrigated and Non-irrigated Pasture and Project Extent**

During high rain and flood years, grazing by cattle is delayed and portions of Yolo Ranch are used for hay production (Duncan McCormack, personal communications, 2011). Production records for Yolo Ranch from 2000 through 2010 are presented in **Table 4.5-5**. Production records for Yolo Flyway Farms were not available. Duck hunting has taken place on Yolo Flyway Farms in the past and currently takes place on a portion of Yolo Ranch.

**Table 4.5-5. Cropping History at Yolo Ranch between 2000 and 2010**

| Year | Grazing (acres) | Rice (acres) | Fallow (acres) | Wheat (acres) | Sunflower Seed (acres) | Total (acres) |
|---|---|---|---|---|---|---|
| **2000** | 1,697 | 511 | | 994 | 148 | 3,350 |
| **2001** | 2,345 | 564 | | | 441 | 3,350 |
| **2002** | 2,654 | 611 | | | 129 | 3,350 |
| **2003** | 1,687 | 1,167 | | 495 | | 3,350 |
| **2004** | 2,739 | 611 | | | | 3,350 |
| **2005** | 2,546 | 611 | 192 | | | 3,350 |
| **2006** | 2,937 | 413 | | | | 3,350 |
| **2007** | 3,350 | | | | | 3,350 |
| **2008** | 3,350 | | | | | 3,350 |
| **2009** | 3,350 | | | | | 3,350 |
| **2010** | 3,350 | | | | | 3,350 |

Sources: U.S. Department of Agriculture (USDA), Solano County Farm Services Agency 2000 – 2007; Duncan McCormack, personal communications, 2011

## *Regulatory Setting*

Actions that may affect agricultural resources at the Project site are subject to applicable laws, regulations, plans, and policies as described below.

### State Law, Plan, and Policies

#### Williamson Act

The California Land Conservation Act of 1965 (Williamson Act) (Government Code §§ 51200 - 51297.4) enables local governments, such as Yolo County, to enter into Williamson Act contracts with private landowners. The purpose of such contracts is to discourage premature and unnecessary conversion of agricultural lands and open space to urban uses by contractually restricting specific parcels of land to agriculture or open space purposes. The legislation benefits landowners by allowing them to enter into long-term contracts (10 or 20 years) with the state of California to keep agricultural land in production. In return, the state reduces property taxes based on a complex calculation tied to agricultural income.

In addition to the conservation of agricultural land as an economic resource, the Williamson Act also recognizes the importance of preserving land for open space purposes and includes open space uses as compatible uses. Open space lands form portions of upland watersheds whose protection from unnecessary subdivision and development is important to water and stream quality, wildlife habitat, downstream flood management, and provision of buffers between agricultural and other uses. In 2008, Assembly Bill 2921 was enacted, providing for a mechanism to rescind Williamson Act agricultural contracts in order to enter into either an open space contract under the Williamson Act, or an open space easement. Under the new provisions, the resulting agreement must be at least as restrictive as the contract it replaced, and the affected parcel large enough to provide open space benefits.

About 400,000 of the over 600,000 acres of agricultural land in Yolo County are enrolled in the Williamson Act (Rees 2010). The Project site includes about 3,795 acres of farmlands and falls under two contracts: Yolo Flyway Farms contract, No. 71-67, signed on January 4, 1971, and the Yolo Ranch contract, No. 71-244, signed on February 1, 1971.

### Delta Protection Commission's Land Use and Resource Management Plan

The mission of the Delta Protection Commission (DPC) is to adaptively protect, maintain, and where possible, enhance and restore the overall quality of the Delta environment consistent with the State of California's Delta Protection Act. This mission includes, but is not limited to, lands and other resources devoted to agriculture, wildlife habitat, and recreational activities. The goal of the Commission is to ensure orderly, balanced conservation and development of Delta land resources and improved flood protection.

As called for in the Delta Protection Act, a Land Use and Resource Management Plan (LURMP) for the Primary Zone[25] of the Delta was prepared and adopted by the DPC in 1995 and revised in 2002. The Project site is located in the Primary Zone of the Delta (see **Figure 2-1**). The LURMP sets out findings, policies, and recommendations resulting from background studies in the areas of environment, utilities and infrastructure, land use, agriculture, water, recreation and access, levees, and marine patrol/boater education/safety programs. The LURMP also provides guidance to state agencies undertaking activities in the Primary Zone. However, the DPC is not authorized to exercise any jurisdiction over matters within the jurisdiction of, or to carry out its powers and duties in conflict with, the powers and duties of any other state agency. This plan, therefore, applies to development subject to approval by the Delta counties (Contra Costa, Sacramento, San Joaquin, Yolo and Solano). Should cities propose to expand into the Delta Primary Zone, or acquire land in the Primary Zone for utility or infrastructure facility development, those actions are to be carried out in conformity with the Delta Protection Act. Relevant policies of the LURMP are summarized in **Table 4.5-6**.

[25] Pursuant to the Act, the Primary Zone is the Delta land and water area of primary state concern and statewide significance situated within the boundaries of the Delta, as described in § 12220 of the Water Code, but is not within either the urban limit line or sphere of influence line of any local government's general plan or studies existing as of January 1, 1992. The precise boundary lines of the Primary Zone includes the land and water areas as shown on the map titled "Delta Protection Zones" on file with the California State Lands Commission. Where the boundary between the Primary Zone and Secondary Zone is a river, stream, channel, or waterway, the boundary line shall be the middle of that river, stream, channel, or waterway. The Primary Zone consists of approximately 500,000 ac. (Source: http://www.delta.ca.gov/commission.htm)

## Table 4.5-6. Delta Protection Commission Land Use and Resource Management Plan: Policies of Interest

| Plan Policy Number | Plan Policy Statement of Interest |
|---|---|
| **Land Use Policies** | |
| **P-3** | 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. Buffers shall adequately protect integrity of land for existing and future agricultural uses and shall not include uses that conflict with agricultural operations on adjacent agricultural lands. Appropriate buffer setbacks shall be determined in consultation with local Agricultural Commissioners, and shall be based on applicable general plan policies and criteria included in right-to-farm ordinances adopted by local jurisdictions. |
| **P-8** | Local government policies regarding mitigation of adverse environmental impacts under the California Environmental Quality Act may allow mitigation beyond county boundaries, if acceptable to reviewing fish and wildlife agencies and with approval of the recipient jurisdiction, for example in approved mitigation banks or in the case of agricultural loss to mitigation. California Government Code § 51256.3 specifically allows an agricultural conservation easement located within the Primary or Secondary Zone of the Delta to be related to Williamson Act contract rescissions in any other portion of the secondary zone without respect to county boundary limitations. |
| **Agriculture Policies[1]** | |
| **P-1** | Support and encourage agriculture in the Delta as a key element in the state's economy and in providing the food supply needed to sustain the increasing population of the state, the nation, and the world |
| **P-2** | Conversion of land to non-agriculturally-oriented uses should occur first where productivity and agricultural values are lowest. |
| **P-6** | Encourage acquisition of agricultural conservation easements from willing sellers as mitigation for projects within each county. Promote use of environmental mitigation in agricultural areas only when it is consistent and compatible with ongoing agricultural operations and when developed in appropriate locations designated on a countywide or Delta-wide habitat management plan. |
| **P-7** | Encourage management of agricultural lands, which maximize wildlife habitat seasonally and year-round, through techniques such as fall and winter flooding, leaving crop residue, creation of mosaic of small grains and flooded areas, wildlife friendly farming, controlling predators, controlling poaching, controlling public access, and others. |
| **P-8** | Encourage the protection of agricultural areas, recreational resources and sensitive biological habitats, and the reclamation of those areas from the destruction caused by inundation. |
| **Natural Resources Policies** | |
| **P-5** | Preserve and protect the viability of agricultural areas by including an adequate financial mechanism in any planned conversion of agricultural lands to wildlife habitat for conservation purposes. The financial mechanism shall specifically offset the loss of local government and special district revenues necessary to support public services and infrastructure. |
| **P-6** | Support the implementation of appropriate buffers, management plans and/or good neighbor policies (e.g., safe harbor agreements) that among other things, limit liability for incidental take associated with adjacent agricultural and recreational activities within lands converted to wildlife habitat to ensure the ongoing agricultural and recreational operations adjacent to the converted lands are not negatively affected. |

[1]The goal of the agricultural element of the LURMP is to support long-term viability of agriculture and to discourage inappropriate development of agricultural lands. The priority land use of areas in the Primary Zone shall be oriented toward agriculture and open space. If agriculture is no longer appropriate, land uses that protect other beneficial uses of Delta resources and that would not adversely affect agriculture on surrounding lands or the viability or cost of levee maintenance, may be permitted.

## Local Policies, Zoning, Programs, and Ordinances

### Yolo County General Plan

On November 10, 2009, the Yolo County Board of Supervisors adopted the 2030 Countywide General Plan (Plan) (County of Yolo 2009b). The Plan designates the entire Project site as Agriculture (AG) with a Delta Protection Overlay (DPO). Agriculture (AG) includes the full range of cultivated agriculture, such as row crops, orchards, vineyards, dryland farming, livestock grazing, forest products, horticulture, floriculture, apiaries, confined animal facilities, and equestrian facilities. It also includes agricultural industrial uses as well as agricultural commercial uses. Agriculture also includes farmworker housing, surface mining, and incidental habitat. (Yolo County General Plan, p. LU-13.) In general, the County considers wetland habitat restoration projects to be consistent with the 2030 General Plan, including agricultural policies (Nos. 2.9, 2.10, and 2.12) (County of Yolo 2008b, p. 6).

The DPO is applied to County lands within the Delta Primary Zone, to ensure the compatibility of land uses and decision-making with applicable policies of the LURMP of the DPC, which are described above under the Delta Protection Commission subsection. The County General Plan GOAL LU-4 Delta Land Use and Resource Management, Policy LU-4.1 promotes recognizing the unique land use constraints and interests of the Delta area.

The Yolo County General Plan includes a number of policies that are designed to protect and encourage agricultural production (Yolo County 2009b). Those policies are in **Table 4.5-7**.

### Zoning Designations

Title 8 (Land Development and Zoning) of the Yolo County Code contains the primary land development regulations of the County, including the Zoning Code (County of Yolo 2009d). These regulations implement the General Plan and must be consistent with the plan. Inconsistencies between the two documents must be resolved in favor of the General Plan (Yolo County General Plan, Community Character Element, p. LU-10).

The Yolo County Development Code, Title 10 (Zoning) designates nearly all of the site as Agricultural Preserve (A-P), which is intended to facilitate establishment of agricultural preserves in accordance with the California Land Conservation Act of 1965 (Williamson Act). A small portion of the site adjacent to the sloughs is zoned Agriculture (A-1). Permitted land uses under the A-P and A-1 zoning include a wide range of agricultural uses. Water retention basins with a potential to provide wildlife habitat improvement benefits also are permitted under this designation (Zoning Ordinance, § 8-2.403[j]).

## Table 4.5-7. Yolo County 2030 General Plan: Agricultural Policies of Interest

| General Plan Policy Number | General Plan Policy Statements |
|---|---|
| **AG-1.3** | Prohibit the division of agricultural land for non-agricultural uses. |
| **AG-1.4** | Prohibit land use activities that are not compatible within agriculturally designated areas. |
| **AG-1.5** | Strongly discourage the conversion of agricultural land for other uses. No lands shall be considered for re-designation from Agricultural or Open Space to another land use designation unless all of the following findings can be made:<br>A. There is a public need or net community benefit derived from the conversion of the land that outweighs the need to protect the land from long-term agricultural use.<br>B. 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.<br>C. The use would not have a significant adverse effect on existing or potential agricultural activities on surrounding lands designated Agriculture. |
| **AG-1.6** | Continue to mitigate at a ratio of no less that 1:1 the conversion of farm land and/or the conversion of land designated or zoned for agriculture, to other uses. |
| **AG-1.14** | Preserve agricultural lands using a variety of programs, including the Williamson Act, Farmland Preservation Zones (implemented through the Williamson Act) conservation easements, an Agricultural Conversion Ordinance, and the Right-to-Farm Ordinance. |
| **AG-1.18** | When undertaking improvement of public roadways and drainage facilities, consult with adjoining farmland owners and incorporate designs that minimize impacts on agriculture. |
| **AG-1.22** | Protect the integrity of irrigation conveyance systems and related infrastructure from the impacts of adjoining non-agricultural development. |
| **AG-2.2** | Preserve water resources for agriculture, both in quality and quantity, from competition with development, mitigation banks, and/or interests from outside of the County. |
| **AG-2.8** | Facilitate partnerships between agricultural operations and habitat conservation efforts to create mutually beneficial outcomes. |
| **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. |
| **AG-2.10** | Encourage habitat protection and management that does not preclude or unreasonably restrict on-site agricultural production. |
| **AG-2.12** | Encourage farmers to employ agricultural practices that supplement rather than deplete topsoil and conserve or minimize water use. |
| **AG-2.13** | Promote wildlife-friendly farm practices, such as tailwater ponds, native species/ grasslands restoration in field margins, hedgerows, ditch management for riparian habitat, restoration of riparian areas in a manner consistent with ongoing water delivery systems, reduction of pesticides, incorporating winter stubble and summer fallow, etc. |
| **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. |
| **AG-6.3** | Within the Delta Primary Zone, ensure compatibility of permitted land use activities with applicable agricultural policies of the Land Use and Resource Management Plan of the Delta Protection Commission. |

While the County's primary interest is in retaining agricultural lands for farming purposes, it has considered wetland habitat restoration goals and policies within areas zoned for agricultural uses. For example, in 1996 the Board of Supervisors adopted the Cache Creek Resources Management Plan for Lower Cache Creek in Yolo County (later revised in 2002) to set forth goals and policies for that area's resources, including adjacent agricultural resources (Yolo County 2002). Goal 7.2-2 states: "Develop opportunities where restoration efforts and agriculture can provide mutual benefits." Several subsequent objectives and actions note the careful planning of both resources to maximize benefits and reduce costs, including:

- Objective 7.3-1: Ensure the compatibility of planned habitat and the channel floodplain with adjoining agricultural land, so that productivity is not adversely affected.
- Objective 7.3-2: Coordinate with local farmers to employ existing agricultural practices in improving the quality of riparian habitat.
- Objective 7.3-3: Manage Cache Creek to reduce the loss of farmland from erosion and increase the recharge potential of the channel.
- Action 7.4-1: Work with the Department of Fish and Game to investigate the feasibility of developing a "Safe Harbor" program for agricultural operations potentially impacted by the development of riparian habitat along Cache Creek.
- Action 7.4-2: Design and develop habitat restoration projects so that they do not adversely impact the agricultural productivity of nearby farmland.
- Action 7.7-3: Incorporate agriculturally related features, such as agricultural forage areas and drainage systems, into the design of habitat planning.

In addition, the County, among other stakeholders, partners with the Yolo County Resource Conservation District (Yolo County RCD). One of Yolo County RCD's completed projects, entitled the Yolo-Solano Conservation Partnership[26], was to refine innovative programs dealing with wildlife habitat development. The project had several purposes including to: provide programs to reduce conservation barriers for farmers, demonstrate new ecological findings regarding the benefits of farm ponds for native aquatic and terrestrial species, add to the documentation of on-farm habitat improvement benefits for wildlife, and develop a social and economic analysis of farm "ecosystem services."

Other examples of habitat restoration projects that have been approved under existing Yolo County land use designations include the Putah Creek Mitigation Bank and the Fremont Landing Conservation Bank.[27]

### Yolo County Agricultural Conservation Easement Program

The Yolo County Board of Supervisors established § 82.2416 (County of Yolo 2009e) in order to implement the agricultural land conservation policies contained in the Yolo County General Plan. The program is designed to permanently protect agricultural land located within the unincorporated planning area of Yolo County. Per § 3(a) of the ordinance establishing in-lieu

[26] Refer to: http://www.yolorcd.org/nodes/programs/projects/yolo_solano_conservation_partnership.htm
[27] See: http://yolo.granicus.com/MetaViewer.php?view_id=&clip_id=401&meta_id=97445

agricultural mitigation fee, this program applies only to "conversion or change from agricultural use to an urban use…" and therefore is not applicable to the proposed Project.

Yolo County Habitat Conversion Moratorium/Habitat Mitigation Project Ordinance

On October 12, 2010, the Yolo County Board of Supervisors approved an ordinance to establish a 45-day temporary moratorium on habitat projects undertaken to mitigate or otherwise respond to biological resource impacts resulting from activities outside of Yolo County. Subsequent to that action, on November 9, 2010, the Board of Supervisors extended the temporary moratorium for 22 months and 15 days (to October 2012) to allow time for coordination between the Office of County Counsel and other County departments to complete a use permit ordinance. As of the published date of this Draft EIR, the Moratorium has expired and is no longer in effect.

After the issuance of the Notice of Preparation for the proposed Project, the Yolo County Board of Supervisors passed an ordinance on January 29, 2013, requiring a major use permit for habitat mitigation projects in excess of 40 acres. The ordinance applies to the conversion of agricultural land to projects designed to mitigate environmental impacts outside of Yolo County.

## 4.5.2 Significance Criteria

This analysis is based partly in light of questions posed in the Appendix G checklist of the *State CEQA Guidelines*, as well as by employing an alternative method known as the Land Evaluation and Site Assessment (LESA) model and professional standards and practices. Neither CEQA nor the *State CEQA Guidelines* requires lead agencies to employ significance thresholds taking the form of affirmative answers to the questions posed in Appendix G. Sometimes thresholds make verbatim use of the language from the questions; other times, lead agencies can modify that language in order to avoid thresholds that are either set too low or are too inflexible. For this Project, SFCWA employed the California LESA model as discussed below. This is an approach recognized by Appendix G as an optional model.

Additionally, inconsistency with a specific land use law, regulation, plan or policy is not by itself an adverse impact on the physical environment. However, this Draft EIR, in assessing whether particular categories of environmental impacts are significant, considers relevant land use laws, regulations, plans and policies that are adopted for the purpose of avoiding or mitigating a significant environmental impact.

Accordingly, the impact to agricultural resources is considered potentially significant if it would:

1. Convert a substantial amount of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Important Farmland), as shown on the maps for the FMMP by the California Resources Agency, to non-agricultural use.
2. Convert a substantial amount of land in a manner that is inconsistent with existing zoning for agricultural use on designated Important Farmland, or with a Williamson Act contract.

3. Involve other changes in the existing environment, which due to their location or nature, could result in conversion of a substantial amount of Important Farmland to non-agricultural use.

For purposes of the first of three significance threshold criteria, “Important Farmland” means Agricultural Lands located in areas that could be farmed economically and on a sustainable basis for an indefinite period of time absent a conversion to wetlands with Project implementation. The CEQA statute (Public Resources Code [PRC] § 21060.1[a]) defines Agricultural Land as “prime farmland, farmland of statewide importance, or unique farmland, as defined by the USDA land inventory and monitoring criteria as modified for California.” The California LESA model is a point-based approach for rating the relative importance of agricultural land resources based upon specific measureable features. For a given project, the factors are rated, weighted, and combined, resulting in a single numeric score. The project score then becomes the basis for making a determination of a project’s potential significance.

To aid in determining the proposed Project’s impact to agricultural resources onsite, a California LESA Model was run (refer to Section 4.5.3 and **Appendix D**). It relies on two standard Land Evaluation factors that are separately rated:

1. The Land Capability Classification Rating.
2. The Storie Index Rating.

Additionally, the model also has four site assessment factors separately rated:

1. Project Size Rating.
2. Water Resources Availability Rating.
3. Surrounding Agricultural Land Rating.
4. Surrounding Protected Resource Land Rating.

Final project scoring is based on a scale of 100 points, with a given project being capable of deriving a maximum of 50 points from the Land Evaluation factors and 50 points from the Site Assessment factors. Under the California LESA model, scores of 0 to 39 points are not considered significant, whereas scores of 40 to 59 points are considered significant only if Land Evaluation and Site Assessment sub-scores are each greater than or equal to 20 points. Projects scoring 60 to 79 points are considered significant, unless either the Land Evaluation or Site Assessment sub-score is less than 20 points. Lastly, projects with scores of 80 to 100 points are considered to contribute significant impacts to agricultural lands regardless of the sub-scoring associated with the Land Evaluation or Site Assessment (CDC 1997).

## 4.5.3 Impacts

### Impact 4.5-1: Loss of Important Farmland and Productivity

*Applicable Significance Criteria: 1 and 3*

The proposed Project would not convert any Prime Farmlands or Farmlands of Statewide Importance. Additionally, approximately 2,210 ac of the 3,795-ac Project site would remain in agricultural use (**Table 4.5-8** and **Figure 4.5-4**) upon completion of the enhancement and restoration efforts.

The majority of the Project site proposed for permanent wetland restoration (about 1,310 ac out of 1,480 ac) is defined as Grazing Land, Other Land, or Water following the California FMMP classification system (**Table 4.5-8**). The Project would also include the permanent conversion to wetlands of up to about 230 ac of Important Farmland (i.e., Unique Farmland) including the creation of the toe berm at the west Yolo Bypass levee by implementing Soils Reuse Option #1.

**Table 4.5-8. Project Changes to State Agricultural Designations**

| State Agricultural Designations in Project Site | Pre-Project Acreage | Post-Project Acreage[1] | Conversion to Wetlands, by FMMP Designation[2] (Acres) | Conversion to Levee Toe Berm, by FMMP Designation[2] (Acres) | Conversion to Other Farmland Types[3], by FMPP Designation (Acres) |
|---|---|---|---|---|---|
| **Important Farmland** | 1,760 | 1,520 | 170 | 60 | 10 |
| **Grazing Land** | 1,160 | 530 | 630 | 0 | 0 |
| **Other Land** | 780 | 90 | 670 | 10 | 0 |
| **Water** | 95 | 70 | 10 | 25 | (10) |
| **Total** | **3,795** | **2,210** | **1,480** | **105** | **0** |

FMMP = Farmland Mapping and Monitoring Program

[1]These values represent the estimated acreage for continued use in agricultural activities post construction of the Project.

[2]This value includes Unique Farmlands converted to wetlands, toe berm, and toe berm maintenance access, if Soils Reuse Options #1 or #3 is selected. It does not include drainage and irrigation modifications to facilitate ongoing agricultural use of the remaining property and of adjacent properties.

[3]This value represents farmland converted to other farmland type, i.e., it represents the lands converted from Unique Farmland (active grazing fields) to the proposed toe berm access road and new irrigation ditch if Soils Reuse Options #1 or #3 is selected.

This agricultural land conversion to wetlands would represent approximately 0.04 percent of the total agricultural land in Yolo County and a decrease of about 0.4 percent of the County’s Unique Farmlands (whether or not those agricultural lands are of high quality and high productivity). This conversion to wetlands restoration and enhancement is minimal in the greater context of the County’s agricultural lands.

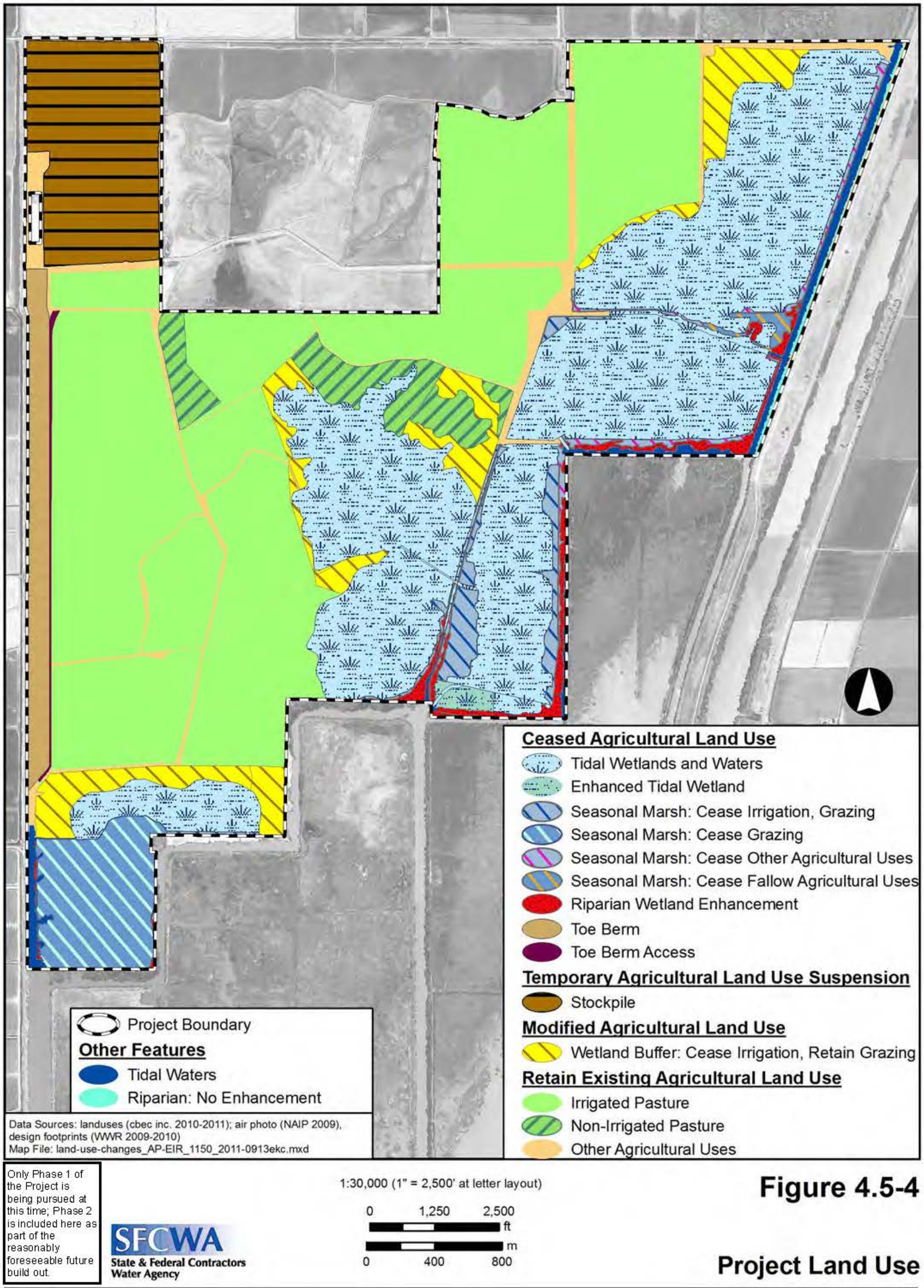


**Figure 4.5-4**

**Project Land Use**

Existing flood easements on the Project site limit the crops that can be grown and the time of year that agricultural operations can take place. In particular, the portion of the Project site that would be restored to tidal marsh would be most likely subject to inundation with sea level rise and mostly encumbered by high groundwater and tidal action. This means agricultural production on the land proposed for wetlands restoration is less productive than pasture lands outside of the Yolo Bypass. Winter and spring flood events, combined with widespread hydric soils onsite have rendered most of the Project site as suitable for supporting wetland conditions. This observation is evident from results of the site wetland delineation that identified as jurisdictional wetlands and waters most of the site and all the lands proposed for restoration (see Section 4.3, Terrestrial Biological Resources). Indeed, the Project site was originally wetlands that was diked and reclaimed as recently as the early to mid-1900s.

For Soils Reuse Option #2, 170 ac of Unique Farmland would be permanently restored, but the additional soil would be stockpiled onsite and would be placed back into production after one year's time. **Figure 4.5-4** illustrates these changes, while specifics on the Project acreage are noted in **Table 4.5-9.** In addition to the permanent conversion of agricultural lands to wetland uses, the onsite stockpile soils reuse option would place up to 262 ac of excavated soils from the construction of tidal marshland and irrigation and drainage modifications onto Unique Farmland on the northwest corner of the Project site within the restricted-height levee (see **Figure 3-6** in Chapter 3). The excavated soil would form a broad plateau up to the edge of the existing restricted-height levee, raised between three to nine feet (ft) in elevation above the existing land surface. The agricultural land would then be leveled and new irrigation and drainage channels would be constructed. Soils Reuse Option #3 would be a combination of the other two options, dependent on final design.

To determine the agricultural values and productivity of these farmlands, a number of factors were considered including the loss of state-designated agricultural lands, total countywide supply of agricultural lands and productivity, long-term agricultural viability of the lands, and associated secondary benefits of the land (i.e., open space values).

As stated in Section 4.5.2, a single LESA score is generated for all farmland to be converted by a given project, after all of the factors have been scored and weighted. The Project's California LESA score was calculated to be in the 40 - 59 point range (depending on the water supply scenario, it would be either 52 (no limitations on water supply) or 46 (limitations on water supply). While the Project's Site Assessment scores with either approach is over 20, its Land Evaluation sub-score is 16 (i.e., less than 20), therefore the loss of the site's Unique Farmlands (up to 240 ac) and other agricultural lands of up to 1,345[28] ac (which consist of poor soil quality and marginal application to agricultural uses given the overriding needs of flood management and protection) would be a **less-than-significant** impact and no mitigation would be required (see **Appendix D** for the California LESA Model Worksheets).

[28] When the LESA modeling was conducted, the number of other farmlands categories was 1,345 ac. Due to ongoing design refinement that number has decreased to 1,310 ac.

## Table 4.5-9. Project Changes to Land Acreages and Uses

| Description | Existing Acreages | Proposed Acreages | Total Change (acres) |
|---|---|---|---|
| **Existing Agricultural and Other Uses** | | | |
| Irrigated pasture, total | 3,100 | 1,680 | |
| a) removed | | | -1,230 |
| b) converted to non-irrigated pasture | | | -190 |
| Non-irrigated pasture, removed | 250 | 110 | -140 |
| Non-irrigated pasture, added | 0 | 190 | 190 |
| Other agricultural areas | | | |
| Miscellaneous uses[1] | 275 | 145 | -130 |
| Fallow agriculture | 15 | 0 | -15 |
| Riparian areas (grazed) | 60 | 15 | -45 |
| Tidal, muted tidal wetlands | 15 | 0 | -15 |
| Other uses[2] | 80 | 1,655 | 1,575 |
| **TOTAL** | 3,795 | 3,795 | 0 |
| **Proposed Project Elements that Convert Agricultural Lands[3]** | | | |
| Wetlands | 0 | 1,480 | 1,480 |
| Toe berm and adjacent maintenance access[4] | 0 | 105 | 105 |
| **TOTAL** | 0 | 1,585 | 1,585 |

[1] Miscellaneous agricultural uses include irrigation and drainage ditches, ranch compound, roads, major berms, pump station areas, etc. Features to be changed are dependent on the selection of the soils reuse option.
[2] Other uses include tidal waterways, existing and restored wetlands, west Yolo Bypass levee, new toe berm and its maintenance access area, dependent on the selection of the soils reuse option.
[3] These elements potentially would include lands that would no longer be used for agricultural purposes. This would exclude the wetland buffer area that would continue as non-irrigated pasture.
[4] These elements would Include the existing west Yolo Bypass levee borrow ditch and fields to its east; excludes west Yolo Bypass levee, if Soils Reuse Options #2 or #3 were selected.

It should also be noted that between the circulation of the Notice of Preparation/Initial Study (NOP/IS) and the Draft Environmental Impact Report (EIR), buffer lands in the proposed Project (to separate sensitive wetland restoration areas from possible contaminants/nutrients loads from irrigation runoff) have been redesigned to reduce the agricultural lands and other agricultural areas affected within the buffer areas. The original buffer areas described in the NOP/IS totaled approximately 650 ac. As part of this impact assessment, this buffer was reduced to approximately 270 ac, a reduction of roughly 58 percent when compared with the original design. The buffer, itself, would still be sufficient to provide the transition between tidal wetlands and agricultural lands from an ecological perspective.

As post-construction activities (i.e., maintenance and operations activities, potential corrective measures, and long-term monitoring) would involve minor actions such as invasive vegetation control and non-intrusive monitoring located primarily at the wetland, channel, or levee areas, **no impact** to Important Farmland would occur. Hence, no mitigation would be required. For example, if needed, the additional tidal connection that would be added post construction would occur in Grazing Lands with a non-significant LESA score (see **Figure 3-1**).

### Impact 4.5-2: Inconsistent with Existing Williamson Act Contracts

*Applicable Significance Criterion: 2*

The Project site (i.e., Yolo Ranch and Yolo Flyway Farms) is covered by two Williamson Act contracts. Nearly all the Project site is zoned A-P with some small areas adjacent to the sloughs zoned A-1. The Williamson Act does allow for open space/habitat contracts. Government Code § 51205 notes (with bold highlight added):

> "Notwithstanding any provisions of this chapter to the contrary, land devoted to recreational use or land within a scenic highway corridor, **a wildlife habitat area**, a salt pond, **a managed wetland area**, or **a submerged area may be included within an agricultural preserve** pursuant to this chapter. When such land is included within an agricultural preserve, **the city or county within which it is situated may contract with the owner for the purpose of restricting the land to recreational or open space use and uses compatible therewith in the same manner** as provided in this chapter for land devoted to agricultural use. For purposes of this section, where the term "agricultural land" is used in this chapter, it shall be deemed to include land devoted to recreational use and land within a scenic highway corridor, **a wildlife habitat area**, **a salt pond, a managed wetland area, or a submerged area**, and where the term 'agricultural use' is used in this chapter, it shall be deemed **to include recreational and open space use**."

The Williamson Act contracts for the Project parcels explain, among other things, that the properties "shall not be used for any purpose other than agricultural use and those uses determined to be compatible with the agricultural use of the land within this preserve and subject to contract." The Williamson Act (California Government Code, § 51254) provides for changing of existing contracts from agricultural to open space lands. Parties may, upon their mutual agreement, rescind a contract in order to simultaneously enter into a new contract. With respect to the specific Williamson Act contracts at issue, differences between what is explicitly written versus what is implied by the contracts *per se*, would be a contractual matter that would be discussed further between SFCWA and Yolo County, and is not a CEQA matter.

In applying Significance Criterion 2, the impact analysis considers whether inconsistencies with agricultural land use zoning or a Williamson Act contract would translate into a physical effect. An inconsistency with local zoning or a Williamson Act contract that does not lead to a physical, on the ground impact would not by itself constitute a significant environmental impact. However, inconsistencies that would lead to long-term changes in agricultural and open space uses that conflict with overall land use patterns and policies and the Williamson Act itself may represent significant impacts.

The Project's conversion of about 1,585 ac of the Project site from agricultural to non-agricultural land uses would be consistent with the Williamson Act. In this case, the conversion would not be to urbanized use, which the Williamson Act is intended to discourage, but to open space, which is consistent with the Williamson Act. Further, the Project site is within the floodplain and subject to seasonal inundation, agricultural use on the Project site is limited to irrigated grazing and only in the dry season, and soils on the site are of marginal quality. Thus, given the limited agricultural value and use of the site, and the fact that agricultural use would continue on the remainder of the Project site, which would not be restored to habitat, there would be no substantial change, i.e., no physical impact, in the long-term land use patterns that are protected by the Williamson Act.

Therefore, with Project implementation, **no impact** would occur with any proposed changes in the contracts. The physical impact of contract compliance/non-compliance is the removal of agricultural lands from production, which is discussed in Impact 4.5-1, above. As such, no mitigation would be required.

### Impact 4.5-3: Inconsistent with Planning Requirements

*Applicable Significance Criteria: 2 and 3*

As noted in Section 4.5.2, an inconsistency with local zoning, general plan land use policies, and DPC LURMP policies is not a physical impact under the purview of CEQA. Should a project not conform to local plans and policies, the lead agency weighs such information as part of its overall determination of whether any physical effects involved are significant. The lead agency also determines whether relevant land use laws, regulations, plans and policies have been adopted for the purpose of avoiding or mitigating an environmental impact created by a project.

Hence, the impact analysis below considers whether conflicts with zoning, land use designations, county agricultural policies, and other changes would translate into a physical effect. The General Plan designation is AG with a Delta Protection Overlay (DPO.) Nearly all the Project site is zoned A-P with some small areas adjacent to the sloughs zoned A-1. Those standard zoning designations are not completely reflective of current uses and practices by Yolo Ranch and Yolo Flyway Farms. That is, agricultural uses onsite are deeply constrained by seasonal flooding events with the priority given to flood control management. Most of the site is used seasonally from spring to fall for irrigated cattle pasture, at an average density of about one head per acre. Because of several factors, including marginal soils, only a portion of the Yolo Ranch parcel may be used for hay production. Winter waterfowl management takes place on much of Yolo Flyway Farms and a moderate portion of Yolo Ranch.

With the Project, approximately 2,210 ac of the 3,795-ac site would remain in agricultural use. But given the long-term agricultural use patterns and constraints on the Project site, the acreage proposed for habitat enhancement and restoration efforts are nonetheless generally consistent with many of the Yolo County's general plan policy statements identified in **Table 4.5-7**, including: AG-1.5, AG-1.18, AG-1.22, AG-2.8, AG-2.9, AG-2.10, AG-2.13, and AG-6.3. For example, AG-2.10 states: "Encourage habitat protection and management that does not preclude or unreasonably restrict on-site agricultural production." The Project would not preclude or restrict onsite agricultural production for the remainder of lands not restored to wetlands. It should also be noted that between the circulation of the NOP/IS and this Draft EIR, elements of the proposed Project have been redesigned. The original acreage for converting Unique Farmlands was described in the NOP/IS as approximately 270 ac in total. As part of this impact assessment, the affected area of Unique Farmlands onsite has been re-engineered to approximately 230 ac (should Soils Reuse Option #1 be selected), a reduction of roughly 15 percent compared with the original design.

With other Yolo County general plan policies (AG-1.3 and AG-1.4), the Project would not result in any substantial change to the long-term land use patterns on the Project site (refer to the discussion in Impact 4.5-2). For policies AG-1.6, AG-1.14, AG-2.2, and AG-6.1, refer to the discussion in Section 4.10, Cumulative Impacts, on Agricultural Resources. Hence, the Project would generally be consistent with County policies regarding compatibility with agriculturally designated areas, continuing open space uses, preserving the integrity of irrigation for remaining onsite and offsite agriculture, preserving water resources, providing flood attenuation, and continuing agricultural uses on the remainder of the Project site not converted to wetlands.

The Project would also be generally consistent with DPC LURMP policies (see **Table 4.5-6**) with respect to Land Use Policies (P-3), Agriculture Policies (P-2, P-7, and P-8), and Natural Resources Policies (P-6)), by providing agricultural buffer zones, locating restoration projects on lands with relatively low agricultural productivity and value, maximizing wildlife habitat, and potentially enhancing flood attenuation and protection (assuming Soils Reuse Option #1 is selected). With other policies (e.g., Agriculture Policy, P-1), the Project would not result in any substantial change to the long-term land use patterns on the Project site (refer to the discussion in Impact 4.5-2). For policies (Land Use Policy P-8, Agriculture Policy P-6, and Natural Resource Policy P-5), see the discussion in Section 4.10, Cumulative Impacts, on Agricultural Resources.

No significant agricultural land use effects would occur as a result of the Project because (1) the majority of the Project site would remain in its existing agricultural use and (2) the proposed acreage designated for habitat enhancement and restoration efforts would be generally consistent with both the existing Yolo County land use designations and with long-term use patterns and constraints on the site. This conclusion is consistent with other habitat projects approved by Yolo County. For example, Putah Creek Mitigation Bank, which includes riparian and seasonal wetlands on a site designated A-P (Agricultural Preserve), was found to "be compatible with the longstanding agricultural use of the land (grazing)."[29]

Should Soils Reuse Option #2 (onsite stockpile near the restricted-height levee) be implemented, agricultural production for the 262 acres would be halted for just one year and then resume. Since 2007, Yolo Ranch has been utilized for cattle grazing as the primary, if not sole, use of its lands (**Table 4.5-5**). By its very nature, this short-term and temporary impact would have no bearing on the overall zoning, general plan designations, Delta planning efforts, or other changes related to the Project site.

For post-construction efforts, the activities related to operations and maintenance activities, an additional tidal connection if deemed necessary, monitoring, and scientific studies, would not be inconsistent with the existing zoning, general plan designations, or Delta planning efforts related to the Project site. All would be temporary in nature and would not even lead to a physical impact that could be tied to consistency issues.

[29]Source: http://yolo.granicus.com/MetaViewer.php?view_id=&clip_id=401&meta_id=97445

Therefore, the Project would generally be consistent with Yolo County's existing zoning, general policies, and land use designations, along with the existing DPC LURMP policies. **No impact** by the Project, during both construction and post-construction phases, would result in conjunction with these land use planning requirements. Accordingly, no mitigation would be required.

## 4.5.4 Mitigations

Because none of the three agricultural resources impacts listed in Section 4.5.3 would be significant or potentially significant, no mitigation measures would be required with Project implementation.

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# 4.6 Air Quality and Greenhouse Gases

## 4.6.1 Setting

Air quality is a function of both the rate and location of pollutant emissions, under the influence of meteorological conditions and topographic features that influence pollutant movement and dispersal. Atmospheric conditions such as wind speed and direction, atmospheric stability, and air temperature gradients interact with the physical features of the landscape to determine the movement and dispersal of air pollutants, which affects air quality.

### *Regional Topography, Meteorology, and Climate*

California is divided geographically into air basins for the purpose of managing air resources on a regional basis. Similar meteorology and geographic conditions can be found throughout an air basin. The Project site is located within the Sacramento Valley Air Basin (SVAB), which encompasses 11 counties including all of Shasta, Tehama, Glenn, Colusa, Butte, Sutter, Yuba, Sacramento, and Yolo counties, the westernmost portion of Placer County and the northeastern half of Solano County. The site is within Yolo County, approximately 14 miles south of Davis and 13 miles north of Rio Vista.

The distinctive climate of the SVAB is determined by its terrain and geographic location. The SVAB is bounded by the Northern Sierra Nevada Mountains in the east and the North Coast Ranges to the west. The SVAB's Mediterranean climate is characterized by hot, dry summers and mild, rainy winters with temperatures ranging from 20 to 115 degrees Fahrenheit annually. Average annual rainfall is 20 inches and occurs primarily from November through March. The prevailing winds are moderate in strength, and consist of dry inland flow from the north and moist marine flow from the south.

The surrounding mountains can trap air pollutants by restricting airflow into and out of the SVAB. During the fall and early winter, large high-pressure cells collect over the Sacramento Valley and reduce surface winds and vertical air flow. These conditions restrict the influx of air into the basin and allow air pollutants to become more concentrated. Concentrations of surface air pollutants can also increase under the influence of boundary-layer temperature inversions, where warm air aloft prevents mixing with lower levels of the atmosphere.

Ozone concentrations in the SVAB are highest from May through October, when morning winds are light and the sea-breeze from the south arrives in the afternoon, allowing photo-chemical reactions and transporting pollutants inland within the valley. During half the days from July to September, a phenomenon called the "Schultz Eddy" causes the wind to circle back south and blow air pollutants back into the SVAB. This can result in higher air pollution concentrations until the eddy dissipates around noon and the southwesterly Delta sea-breeze arrives.

Additionally, the "greenhouse effect" is the phenomenon that allows the atmosphere near the Earth's surface to be warm enough for the successful habitation of humans and other life forms. Present in the Earth's lower atmosphere, greenhouse gases (GHG) play a critical role in maintaining the Earth's temperature; i.e., GHG capture some of the long-wave infrared radiation emitted from the Earth's surface due to sunlight warming surfaces that would otherwise escape to space. GHGs include the following gases: carbon dioxide ($CO_2$), methane ($CH_4$), nitrous oxide ($N_2O$), perfluorocarbons (PFC), sulfur hexafluoride ($SF_6$), and hydrofluorocarbons (HFC). Increasing atmospheric concentrations of GHG beyond ambient levels enhance the greenhouse effect, which in turn contributes to global warming. Warming of the Earth's lower atmosphere promotes large-scale changes in ocean circulation patterns, rainfall patterns, global ice cover, biological distributions, and other natural fluctuations collectively referred to as climate change.

## *Regulatory Setting*

Regulation of air pollution is achieved through both federal and state ambient air quality standards defining goals for air quality and emission limits for individual sources of air pollutants.

### Federal Laws, Regulations, and Policies

#### Federal Clean Air Act (National Ambient Air Quality Standards)

As required by the federal Clean Air Act (CAA) (42 United States Code § 7401), the U.S. Environmental Protection Agency (USEPA) is responsible for implementing air quality programs including the National Ambient Air Quality Standards (NAAQS) to protect public health and welfare. The NAAQS has identified several criteria air pollutants:

- Ozone ($O_3$).
- Nitrogen dioxide ($NO_2$).
- Carbon monoxide (CO).
- Coarse and fine particulate matter ($PM_{10}$ and $PM_{2.5}$).
- Sulfur dioxide ($SO_2$).
- Lead (Pb).

These pollutants are called "criteria" air pollutants because standards have been established for each of them to meet specific public health and welfare criteria. The physical characteristics and health effects of the criteria pollutants are summarized in **Table 4.6-1**.

The USEPA has set "primary" and "secondary" maximum ambient thresholds for each of the criteria pollutants (**Table 4.6.2**). Primary thresholds were set to protect human health, particularly sensitive receptors.

Sensitive receptors represent people who are considered to be more sensitive than others to air pollutant impacts. The reasons for greater than average sensitivity include preexisting health problems, proximity to emissions sources, or duration of exposure to air pollutants. Schools, hospitals, and convalescent homes are considered to be relatively sensitive to poor air quality because children, elderly people, and the infirm are more susceptible to respiratory distress and other air quality related health problems than the general public. Residential areas are considered sensitive to poor air quality because people usually stay home for extended periods of time, with associated greater exposure to ambient air quality. Recreational land uses are also considered sensitive due to the greater exposure to ambient air quality conditions, because vigorous exercise associated with some forms of recreation places a high demand on the human respiratory system.

**Table 4.6-1. Physical Characteristics and Health Effects of Criteria Air Pollutants**

| Criteria Air Pollutant | Physical Characteristics/Health Effects |
|---|---|
| **Ozone ($O_3$)**<br>**Reactive Organic Gases (ROG)**<br>**and**<br>**Nitrogen Oxides ($NO_x$)** | $O_3$ is a respiratory irritant and an oxidant that increases susceptibility to respiratory infections. It can also cause substantial damage to vegetation and other materials. It is not emitted directly into the atmosphere, but is a secondary air pollutant produced through a complex series of photochemical reactions involving ROG and $NO_x$. ROG and $NO_x$ are precursor compounds for $O_3$ production. Concentrations tend to be higher in the late spring, summer, and fall, when the long sunny days combine with regional air subsidence inversions to create conditions conducive to the formation and accumulation of secondary photochemical compounds such as $O_3$. |
| **Carbon Monoxide (CO)** | CO is a non-reactive pollutant that is a product of incomplete combustion and is mostly associated with motor vehicle traffic. High CO concentrations develop primarily during winter, when periods of light winds combine with the formation of ground level temperature inversions (typically from the evening through early morning). These conditions result in reduced dispersion of vehicle emissions. In high concentrations, it can cause physiological and pathological changes sometimes resulting in death by interfering with oxygen transport in the blood. |
| **Particulate Matter**<br>**($PM_{10}$ and $PM_{2.5}$)** | PM represents fractions of small particles that can be inhaled, causing adverse health effects. PM in the atmosphere results from many kinds of dust and fumes producing industrial and agricultural operations, fuel combustion, and atmospheric photochemical reactions. Some sources of PM, such as demolition and construction activities, are more local in nature, while others, such as vehicular traffic, have a more regional effect. Very small particles of certain substances (e.g., sulfates and nitrates) can cause lung damage directly or can contain adsorbed gases (e.g., chlorides or ammonium) that may be injurious to health. PM can also damage materials and reduce visibility. |
| **Sulfur Dioxide ($SO_2$)** | $SO_2$ is a combustion product of sulfur or sulfur-containing fuels such as coal. $SO_2$ also is a precursor to the formation of atmospheric sulfate and PM (both $PM_{10}$ and $PM_{2.5}$) and contributes to potential atmospheric sulfuric acid formation that could precipitate downwind as acid rain. |
| **Lead (Pb)** | Pb has a range of adverse neurotoxic health effects, and was historically released into the atmosphere primarily via leaded gasoline. The phasing out of leaded gasoline in California has resulted in decreasing levels of atmospheric lead. |

Source: Yolo-Solano Air Quality Management District. 2007: *Handbook for Assessing and Mitigating Air Quality Impacts: Appendix A*.

Secondary standards for each of the criteria air pollutants were set to protect the natural environment and prevent deterioration of crops, vegetation, and buildings. The NAAQS are defined as the maximum acceptable concentration that may be reached, but it may not be exceeded more than once per year.

Toxic air contaminants (TAC) are also of concern. TAC are also termed hazardous air pollutants (HAP) under federal regulations, and are air pollutants that may cause or contribute to an increase in mortality or serious illness, or may otherwise pose a hazard to human health. Various sources produce TAC, including industrial processes, commercial operations such as gasoline stations and dry cleaners, as well as motor vehicle exhaust. Nearly 200 substances have been designated TAC under California law, including benzene and diesel particulate matter (DPM).

### Table 4.6-2. National and State Ambient Air Quality Standards

| Criteria Air Pollutant | Averaging Time | Federal Standards Primary[3] | Federal Standards Secondary | California Standards Concentration[1,2] |
|---|---|---|---|---|
| **Ozone ($O_3$)** | 1 Hour | No federal standard | No federal standard | 0.09 ppm |
| | 8 Hour | 0.075 ppm | 0.075 ppm | 0.070 ppm |
| **Particulate Matter$_{10}$ ($PM_{10}$)** | 24 Hour | 150 µg/m$^3$ | 150 µg/m$^3$ | 50 µg/m$^3$ |
| | Annual Arithmetic Mean | No federal standard | No federal standard | 20 µg/m$^3$ |
| **Particulate Matter$_{2.5}$ ($PM_{2.5}$)** | 24 Hour | 35 µg/m$^3$ | 35 µg/m$^3$ | No separate standard |
| | Annual Arithmetic Mean | 15 µg/m$^3$ | 15 µg/m$^3$ | 12 µg/m$^3$ |
| **Carbon Monoxide (CO)** | 8 Hour | 9 ppm | No federal standard | 9.0 ppm |
| | 1 Hour | 35 ppm | No federal standard | 20 ppm |
| **Nitrogen Dioxide ($NO_2$)** | Annual Arithmetic Mean | 53 ppb | 53 ppb | 0.030 ppm |
| | 1 Hour | 100 ppb | No federal standard | 0.18 ppm |
| **Sulfur Dioxide ($SO_2$)** | 24 Hour | No federal standard | No federal standard | 0.04 ppm |
| | 3 Hour | No federal standard | No federal standard | No separate standard |
| | 1 Hour | 75 ppb | No federal standard | 0.25 ppm |
| **Lead[4] (Pb)** | 30 Day Average | No federal standard | No federal standard | 1.5 µg/m$^3$ |
| | Calendar Quarter | 1.5 µg/m$^3$ | 1.5 µg/m$^3$ | No separate standard |
| | Rolling 3-Month Average[5] | 0.15 µg/m$^3$ | 0.15 µg/m$^3$ | No separate standard |

Notes:
[1] µg/m$^3$ = micrograms per cubic meter; ppm=parts per million; ppb=parts per billion.
[2] CAAQS for ozone, CO, $SO_2$, $NO_2$, $PM_{10}$, $PM_{2.5}$, and visibility reducing particles are values not to be exceeded. All other are not to be equaled or exceeded.
[3] NAAQS, other than ozone, PM, and those based on annual averages or annual arithmetic means, are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest eight-hour concentration in a year, averaged over three years, is equal to or less than the standard. For $PM_{10}$, the 24-hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 µg/m$^3$ is equal to or less than one. For $PM_{2.5}$, the 24-hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard.
[4] The California Air Resources Board has identified lead and vinyl chloride as “toxic air contaminants” with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.
[5] NAAQS for lead, rolling 3-month average: final rule signed October 15, 2008.
Source: California Air Resources Board 2011a

The USEPA has classified air basins (or portions thereof) as being in “attainment,” “nonattainment,” or “unclassified” for each criteria air pollutant, based on whether or not the NAAQS have been achieved. If an area is designated unclassified, it is because inadequate air quality data were available as a basis for a nonattainment or attainment designation. The USEPA classifies SVAB as “nonattainment” for national and state $O_3$ standards, the $PM_{10}$ standard, and $PM_{2.5}$ standard. The SVAB is designated “maintenance,” “attainment,” or “unclassified” with respect to the other ambient air quality standards (**Table 4.6-3**).

**Table 4.6-3. Federal and State Air Quality Attainment Status of the Sacramento Valley Air Basin**

| Pollutant | Federal Standards | California Standards |
|---|---|---|
| Ozone (1 hr) | No federal standard | Nonattainment (serious) |
| Ozone (8 hr) | Nonattainment (severe) | Nonattainment |
| Particulate $Matter_{10}$ | Nonattainment (moderate) | Nonattainment |
| Particulate $Matter_{2.5}$ | Nonattainment | Nonattainment |
| Carbon Monoxide | Maintenance (moderate) | Attainment/Unclassified |
| Nitrogen Dioxide | Attainment | Attainment |
| Sulfur Dioxide | Attainment | Attainment |
| Lead | --- | --- |

hr = hour

Sources: U.S. Environmental Protection Agency 2011b; California Air Resources Board 2011b.

The Yolo-Solano Air Quality Management District (YSAQMD) has jurisdiction over air quality in the Project area, including all of Yolo County and the northeastern portion of Solano County. YSAQMD, along with California Air Resources Board (CARB), maintains a regional network of monitoring stations for ambient air quality at several locations in the SVAB. These stations are used to measure and monitor criteria and toxic air pollutant levels. Currently, the criteria pollutants of most concern in the SVAB are $O_3$ and PM.

The YSAQMD-operated monitoring stations closest to the Project site that represent the rural nature of the Project area are the Davis station at the University of California at Davis, about 14 miles to the north of the site, and the Woodland station on Gibson Road, approximately 25 miles to the north of the site. **Table 4.6-4** summarizes the most recent four years of available air monitoring data (i.e., 2007 through 2010) published by CARB for the Davis and Woodland stations. The data show a moderate number of violations related to state and federal ozone standards, state and federal $PM_{10}$ standards, and the federal $PM_{2.5}$ standard. No other state or federal air quality standards were exceeded during the four-year period.

## Federal Clean Air Act (Greenhouse Gases)

In the past, the USEPA has not regulated GHG under the CAA. However, the U.S. Supreme Court ruled on April 2, 2007, in *Massachusetts v. U.S. Environmental Protection Agency*, that $CO_2$ is an air pollutant as defined under the Act, and that USEPA has the authority to regulate emissions of GHG. On December 7, 2009, USEPA announced that GHG threaten the public health and welfare of the American people. USEPA also stated that GHG emissions from on-road vehicles contribute to that threat.

On January 1, 2010, USEPA began requiring large emitters of GHG to begin collecting GHG data under a new reporting system. This new program covers approximately 85 percent of the nation’s GHG emissions and applies to roughly 10,000 facilities. Fossil fuel and industrial GHG suppliers, motor vehicle and engine manufacturers, and facilities that emit 25,000 metric tons or more of carbon dioxide equivalents ($CO_2e$) per year are required to report GHG emissions data to USEPA annually. This threshold is equivalent to about the annual GHG emissions from 4,600 passenger vehicles. Vehicle and engine manufacturers outside of the light-duty sector began phasing in GHG reporting with model year 2011.

**Table 4.6-4. Annual Air Quality Monitoring Data for Davis and Woodland, CA, 2007 – 2010**

| Pollutant | Standard | Number of Days Standards Exceeded | | | |
|---|---|---|---|---|---|
| | | 2007 | 2008 | 2009 | 2010[1] |
| **Davis – University of California at Davis Campus** | | | | | |
| **Ozone** | State 1–Hour | 2 | 4 | 0 | NA |
| | Federal 8–Hour | 3 | 5 | 1 | 0 |
| | State 8–Hour | 4 | 10 | 7 | 3 |
| **Woodland – Gibson Road** | | | | | |
| **Ozone** | State 1–Hour | 1 | 4 | 0 | |
| | Federal 8–Hour | 5 | 12 | 11 | 0 |
| | State 8–Hour | 2 | 4 | 3 | 0 |
| **Particulate Matter$_{10}$** | Federal 24–Hour | 0 | 6 | 0 | 0 |
| | State 24–Hour | 19 | 49 | 12 | 7 |
| **Particulate Matter$_{2.5}$** | Federal 24–Hour | 15 | NA | 0 | 0 |

Source: California Air Resources Board 2010. *Aerometric Data Analysis and Management:* http://www.arb.ca.gov/adam/.
[1] Data from this column originates from the Sacramento Area Council of Governments 2011: *Draft Environmental Impact Report for MTP/SCS 2035 at* http://www.sacog.org/2035/files/Draft-eir/5-Air%20Quality.pdf. NA: No data available.

## State Laws, Regulations, and Policies

### California Clean Air Act (California Ambient Air Quality Standards)

In 1988, the California Clean Air Act (CCAA) was enacted to establish a statewide air pollution control program and the California Ambient Air Quality Standards (CAAQS) (see **Table 4.6-2**). CCAA requires all air districts in California to meet the CAAQS by the earliest practical date.

Unlike the federal CAA, the CCAA does not set precise attainment deadlines. Instead, the CCAA establishes increasingly stringent requirements for areas that will require more time to achieve the standards. CAAQS are generally more stringent than the NAAQS and incorporate additional standards for sulfates ($SO_4$), hydrogen sulfide ($H_2S$), and vinyl chloride ($C_2H_3Cl$), and visibility-reducing particles. $SO_4$ is formed by the combustion of petroleum-derived fuels containing sulfur (mainly diesel fuels) and their subsequent conversion to sulfate compounds in the atmosphere. $H_2S$ is mostly generated by the decomposition of sulfur-containing organic substances and $C_2H_3Cl$, a chlorinated hydrocarbon, is typically detected near landfills, sewage plants, and hazardous waste sites due to microbial breakdown of chlorinated solvents. Emissions of these pollutants would not be generated by the Project, hence, no further environmental analysis of these pollutants in the Draft Environmental Impact Report (EIR) is required.

CARB is responsible for establishing and reviewing the CAAQS, compiling the California State Implementation Plan (SIP), securing approval of the SIP from the USEPA, conducting research and planning, and identifying TAC. CARB also regulates mobile sources of emissions in California, such as construction equipment, trucks, and automobiles, and oversees the activities of California's air quality management districts. These districts are primarily responsible for regulating stationary sources at industrial and commercial facilities within their geographic areas. They are also responsible for preparing the air quality plans required under the federal CAA and the CCAA. Other pertinent state regulations related to CAAQS include:

1. **General Requirements for In-Use Off-Road Diesel Fueled Fleets.** This 2007 regulation is intended to reduce emissions of DPM and $NO_x$ from in-use off-road diesel vehicles. The regulation also supports the *Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles*, which was adopted by CARB in 2000. It should be noted that on April 22, 2010, CARB met to consider relaxing certain deadline requirements of the California Code of Regulations (CCR), Title 13, § 2449 for diesel trucks and construction equipment to account for the slumping economy and inaccurate emissions projections.
2. **On-Road Heavy-Duty Diesel Vehicles (In-Use).** In addition, on December 12, 2008, CARB approved a new regulation, the *On-Road Heavy-Duty Diesel Vehicles (In-Use) Regulation***,** to substantially reduce emissions from existing on-road diesel vehicles. The regulation requires affected trucks to meet performance requirements between 2011 and 2023. By that time, all 2023 vehicles must have a 2010 model year engine or equivalent; this includes on-road heavy-duty diesel fueled vehicles with a gross vehicle weight rating greater than 14,000 pounds.

### Greenhouse Gas Regulations

Gases that trap heat in the atmosphere are collectively identified as GHG. The major concern with GHG is how they cause global climate change, seen as a change in the average weather on Earth that can be measured by wind patterns, storms, precipitation, and temperature. GHG allow sunlight to enter the atmosphere, thereby trapping a portion of the outward-bound infrared radiation, resulting in a net warming of the atmosphere (i.e., global climate change).

Besides GHG production via natural processes, GHG can also be emitted through human activities. For example, emissions from fossil fuel-based electricity production and the use of motor vehicles have substantially elevated the concentration of GHG. California recognizes seven types of GHG: $CO_2$, $CH_4$, $N_2O$, HFC, PFC, and $SF_6$ (California Health and Safety Code § 38505[g]), and nitrogen trifluoride ($NF_3$) (Senate Bill No. 104, Chapter 331). $CO_2$ is the most common reference gas when assessing climate change. To account for the warming potential of

GHG, such emissions are often quantified and reported as $CO_2e$. GHG emissions are reported in metric tons of $CO_2e$ ($MTCO_2e$).[30]

Some of the already observed effects of global warming in California include loss in snow pack, changes in precipitation and runoff patterns, sea level rise, more extreme heat days per year, more high $O_3$ days, more large forest fires, and more drought years. Globally, climate change is expected to impact numerous environmental resources through potential, though uncertain, impacts related to future air temperatures and precipitation patterns. The projected effects of global warming on weather and climate are likely to vary regionally, but are expected to include the following direct effects:

- Higher maximum temperatures and more hot days over nearly all land areas.
- Higher minimum night-time temperatures, fewer cold days and frost days over nearly all land areas.
- Increase of heat index over land areas.
- More intense precipitation events.

CARB estimates that in 2006, California produced 484 million gross metric tons of $CO_2e$ emissions ($MMTCO_2e$). CARB found that transportation was the source of 38 percent of the State's GHG emissions; followed by electricity generation at 22 percent, and industrial sources at 21 percent. Other pertinent state laws, regulations, and policies related to GHG include:

1. **Executive Order S-3-05.** In 2005, in recognition of California's vulnerability to the effects of climate change, then Governor Schwarzenegger established Executive Order S-3-05, which set forth a series of target dates by which statewide emissions of GHGs would be progressively reduced, as follows:

    - By 2010, reduce GHG emissions to 2000 levels.
    - By 2020, reduce GHG emissions to 1990 levels.
    - By 2050, reduce GHG emissions to 80 percent below 1990 levels.

2. **Assembly Bill 32 – California Global Warming Solutions Act.** California Assembly Bill 32 (AB 32), also known as the Global Warming Solutions Act of 2006, was enacted as legislation in 2006 and requires CARB to establish a statewide GHG emissions cap for 2020 based on 1990 emission levels. AB 32 required CARB to adopt regulations by January 1, 2008, that identify and require selected sectors or categories of GHG emitters to report and verify their statewide GHG emissions (CARB 2009, 2011). CARB is also authorized to enforce compliance with the program. Under AB 32, CARB was also required to adopt a statewide GHG emissions limit by January 1, 2008, equivalent to the statewide GHG emissions levels in 1990, which must be achieved by 2020. CARB established this limit, in December 2007, at 427 MMTCO2e. This is approximately 30 percent below forecasted "business-as-usual" emissions of 596 MMTCO2e, and about 10 percent below average annual GHG emissions during the period of 2002 through 2004.

[30] A metric ton is 1,000 kilograms; it is equal to approximately 1.1 U.S. tons.

As required by AB 32, CARB prepared a Scoping Plan that contains eight main strategies California will use to reduce the GHG that cause climate change (**Table 4.6-5**). The 2008 scoping plan has a range of GHG reduction actions that include direct regulations, alternative compliance mechanisms, monetary and non-monetary incentives, voluntary actions, market based mechanisms such as a cap-and-trade system, and an AB 32 program implementation regulation to fund the program. The environmental analysis of the Scoping Plan was the subject of successful litigation and in August 2011 the Scoping Plan and its revised environmental analysis were re-approved by the Board[31].

**Table 4.6-5. Key Strategies in the AB 32 Scoping Plan**

| Title of Strategy | Brief Description of Strategy |
|---|---|
| **Agriculture** | More efficient agricultural equipment, fuel use and water use through transportation and energy measures; reductions from manure digesters; address impacts on productivity of crops and livestock. |
| **Cap-and-Trade Program** | Broad-based to provide a firm limit on emissions; covers 85 percent of California's emissions: electricity generation, large industrial sources, transportation fuels, residential and commercial use of natural gas, and provides linkage with the Western Climate Initiative, which allows greater environmental and economic benefits. |
| **Electricity and Energy (imported included)** | Improved appliance efficiency standards and other aggressive energy efficiency measures; 33 percent renewable by 2020; increased use of efficient "combined heat and power"; Million Solar Roofs, Solar Hot Water heating; Green Buildings; and water efficiency. |
| **Forestry** | Preserve forest sequestration and voluntary reductions possible from forestry projects. |
| **High Global Warming Potential Gases** | Capture refrigerants and other high global warming potential gases already in use; reduce future impact through leak-resistant equipment, restrictions on use, and fees. High global warming chemicals trap heat in the atmosphere at levels many times that of carbon dioxide, the primary cause of global warming. |
| **Industry** | The 800 largest emission sources in California including cement; audit of the largest industrial sources to identify greenhouse gas reduction opportunities; regulations on refinery flaring, and fugitive emissions; considerations for cement to address "leakage." |
| **Transportation** | Reduction of 30 percent in vehicle greenhouse gas emissions by 2016 (known as the 'Pavley standards') followed by further reductions from 2017. Decrease ten percent by 2020 carbon intensive vehicle fuels through the low-carbon fuel standard. Lastly, changes in the way we build, plan and develop our cities through better land-use planning (Senate Bill (SB) 375). Other transportation measures include more efficient delivery trucks, heavy duty trucks and goods movement. |
| **Waste and Recycling** | Reduce methane emissions from landfills and move toward high recycling and zero waste. |

Source: California Air Resources Board. Undated. *California's Climate Plan Fact Sheet*. http://www.arb.ca.gov/cc/cleanenergy/clean_fs2.htm

The Scoping Plan includes recommended measures that were developed to reduce GHG emissions from key sources and activities while improving public health, promoting a

[31] California Air Resources Board, *Notice of Decision, AB 32 Scoping Plan*, August 24, 2011, http://www.arb.ca.gov/cc/scopingplan/notice-of-decision-scoping-plan-08-26-11.pdf.

cleaner environment, preserving natural resources, and ensuring that the impacts of the reductions are equitable and do not disproportionately impact low-income and minority communities. These measures also aid in meeting the long-term 2050 goal of reducing California's GHG emissions to 80 percent below 1990 levels[32]. The total reduction for the adopted measures is 146.7 million metric tons/year of $CO_2$e. For further information on the recently implemented 2012 cap-and-trade program by CARB, refer to its website: http://www.arb.ca.gov/cc/capandtrade/capandtrade.htm.

3. **California Environmental Quality Act (CEQA) and the *State CEQA Guidelines*.** In 2007, the California Legislature passed SB 97, which required amendment of the *State CEQA Guidelines* to incorporate analysis of, and mitigation for, GHG emissions from projects subject to CEQA compliance (Public Resources Code § 21083.05). The California Natural Resources Agency adopted these amendments on December 30, 2009, and they took effect March 18, 2010.

   The *State CEQA Guidelines'* revisions include a new section (CCR § 15064.4) that specifically addresses the significance of GHG emissions. This section calls for a good-faith effort to describe, calculate, or estimate GHG emissions. The section further states that the significance of GHG impacts should include consideration of the extent to which a project would increase or reduce GHG emissions; exceed a locally applicable threshold of significance; and comply with regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of GHG emissions.

   The revisions to the *State CEQA Guidelines* also state that a project may be found to have a less-than-significant impact if it complies with an adopted plan that includes specific measures to sufficiently reduce GHG emissions (CCR § 15064[h][3]). The revised guidelines retain the lead agency's discretion to determine significance thresholds for GHG emissions.

## Local Policies and Regulations

### Yolo Solano Air Quality Management District Air Quality Management Plan

The YSAQMD is one of five air districts located in the SVAB. The YSAQMD regulates most air pollutant sources (stationary sources), with the exception of motor vehicles, aircraft, and agricultural equipment, which are regulated by the CARB or USEPA. Public agency projects, as well as private projects requiring government permits or funding, are subject to requirements of the local air district and the state CCAA if the sources are regulated by the YSAQMD.

The YSAQMD has prepared and adopted the fifth update of the YSAQMD's 1992 Air Quality Management Plan (AQMP). As the most recent update to the AQMP, the *Triennial Assessment and Plan Update* (YSAQMD May 2010) presents emission reductions information (2003 – 2008), emission inventory and forecasts, air quality trends up to 2008, and commitments for the 2009-2011 period. The Plan identifies new $O_3$ control measures to be adopted and notes that attainment of the state standards is dependent on state regulations to implement control strategies

[32] *Ibid.*

on mobile sources. While the YSAQMD is not required to prepare an attainment plan for $PM_{10}$, the YSAQMD rules reduce PM emissions through regulation of the construction industry.

Relevant YSAQMD rules include the following:

- **Rule 2.3, Ringelmann Chart.** Visible emissions from stationary diesel-powered equipment are not allowed to exceed 40 percent opacity for more than three minutes in any one hour.
- **Rule 2.5: Nuisance.** Dust emissions must be prevented from creating a nuisance to surrounding properties.
- **Rule 2.11: Particulate Matter.** To limit release or discharge into the atmosphere, from any source, particulate matter in excess of 0.3 grains per cubic foot of exhaust volume as calculated at standard atmospheric conditions.

### Yolo County General Plan (Pertaining to Air Quality)

The County of Yolo 2030 Countywide General Plan (2010) contains various policies and actions that deal with air quality. **Table 4.6-6** identifies the policies and actions that Yolo County intends to carry out in conjunction with air quality and relevant to the proposed Project.

**Table 4.6-6. Yolo County 2030 General Plan: Policies Relevant to Air Quality**

| General Plan Policy Number | General Plan Policy Statements Relevant to the Proposed Project |
|---|---|
| **CO-6** | Improve air quality to reduce the health impacts caused by harmful emissions. |
| **CO-6.6** | Encourage implementation of YSAQMD Best Management Practices, such as those listed below, to reduce emissions and control dust during construction activities:<br>• Water all active construction areas at least twice daily.<br>• Haul trucks shall maintain at least two feet of freeboard.<br>• Cover all trucks hauling soil, sand, and other loose materials.<br>• Apply non-toxic binders (e.g., latex acrylic copolymer) to exposed areas after cut-and-fill operations and hydroseed area.<br>• Apply chemical soil stabilizers on inactive construction areas (disturbed lands within construction projects that are unused for at least four consecutive days).<br>• Plant tree windbreaks on the windward perimeter of construction projects if adjacent to open land.<br>• Plant vegetative ground cover in disturbed areas as soon as possible.<br>• Cover inactive storage piles. |
| **CO-A104** | For discretionary permits, require agricultural Best Management Practices regarding odor control, stormwater drainage, and fugitive dust control where appropriate. |

Source: County of Yolo 2009. Pages CO 91 - 94.

## Yolo County General Plan (Pertaining to Reduction in Greenhouse Gases)

The County of Yolo 2030 Countywide General Plan (2010) contains various policies and actions that encourage the reduction of GHG. **Tables 4.6-7 and 4.6-8** identify the programs, policies, and actions that Yolo County intends to carry out in conjunction with GHG reduction that are relevant to the proposed Project.

### Table 4.6-7. Yolo County Programs To Reduce Greenhouse Gases

| Name of Program | Brief Description of Program that is Relevant to the Proposed Project |
|---|---|
| **Climate Change Working Group** | Yolo County has created a climate change team through the County Administrator's Office and has organized a climate change working group that includes the cities and various districts to coordinate countywide climate change efforts. |
| **California Climate Action Registry** | The County has prepared a baseline audit energy usage associated with County operations. This baseline will be used to measure energy usage over time. Through the registry, the County will use a common GHG emission reporting system and receive credit for reductions in emissions. |
| **Research** | The County is involved in a variety of research projects related to energy conservation and control of greenhouse gas emissions. |
| **Development Review** | The County requires energy efficient project design and landscaping design as a part of the development review process. |

Source: County of Yolo 2009. Pages CO 90 - 91.

### Table 4.6-8. Yolo County 2030 General Plan: Policies to Reduce Greenhouse Gases

| General Plan Policy Number | General Plan Policy Statements Relevant to the Proposed Project |
|---|---|
| **CO-8** | Reduce greenhouse gas emissions and plan for adaptation to the future consequences of global climate change. |
| **CO-8.2** | Use the development review process to achieve measurable reductions in greenhouse gas emissions. |
| **CO-8.5** | Promote GHG emission reductions by supporting carbon efficient farming methods (e.g. methane capture systems, no-till farming, crop rotation, cover cropping); installation of renewable energy technologies; protection of grasslands, open space, oak woodlands, riparian forest and farmlands from conversion to other uses; and development of energy-efficient structures. |
| **CO-8.6** | Undertake an integrated and comprehensive approach to planning for climate change by collaborating with international, national, State, regional and local organizations, and entities. |

Source: County of Yolo 2009. Pages CO 91 - 94.

## Yolo County Climate Action Plan

In March 2011, the Yolo County Board of Supervisors adopted the *Yolo County Climate Action Plan*[33]. This plan implements the Yolo County General Plan by identifying efforts by the County to address GHG and global change. Implementation is based on five strategies: agriculture, transportation and land use, building energy, solid waste and wastewater, and adaptation. Measures and actions are grouped within these five strategies. **Table 4.6-9** presents the applicable measures that would be relevant to the proposed Project.

**Table 4.6-9. Summary of Applicable Yolo County Climate Action Plan Measures in Conjunction with the Proposed Project**

| Measure Number | Measure Title | Timeframe | Mandatory (M) or Voluntary (V) | New (N) and/or Existing (E) Development |
|---|---|---|---|---|
| **A-1** | Reduce nitrogen fertilizer application rates | 2020 & 2030 | V | E |
| **A-2** | Reduce fossil fuel consumption in field equipment | 2020 & 2030 | V | E |
| **A-3** | Reduce energy use in agricultural irrigation pumping | 2020 & 2030 | V | E |
| **A-6** | Sequester carbon in agricultural landscapes | 2020 & 2030 | M & V | N |

Source: County of Yolo 2011

The plan assumes that the unincorporated area (excluding University of California at Davis, the Yocha Dehe Wintun Nation, and special districts) produced 651,470 $MTCO_2e$ in 2008. Approximately 48 percent of those GHG emissions were attributed to agriculture. Transportation and energy accounted for an additional 47 percent, with the remainder comprised of landfill, wastewater treatment, construction, mining and stationary sources (County of Yolo 2011).

A target is established in the *Climate Action Plan* to reduce the 2008 emissions back to the levels estimated for 1990, or 613,651 $MTCO_2e$. To achieve this target, 15 programs are proposed, including such measures as increasing renewable energy production, enhancing energy and water conservation, expanding alternative transportation, planting trees and reducing fertilizer application. The *Climate Action Plan* also has voluntary goals to reduce GHG emissions to 447,965 $MTCO_2e$ by 2030, and 122,730 $MTCO_2e$ by 2050.

[33] County of Yolo. *The Yolo County Climate Action Plan: A Strategy for Smart Growth Implementation, Greenhouse Gas Reduction, and Adaptation to Global Climate Change* can be found at http://www.yolocounty.org/Index.aspx?page=2004.

## 4.6.2 Significance Criteria

### *Criteria Air Pollutants*

Criteria for determining significant impacts for emissions of air pollutants are based upon the *State CEQA Guidelines* (Appendix G). In the evaluation that follows, the proposed Project would have a significant impact on air quality if it would:

1. Conflict with or obstruct implementation of the applicable air quality plan.
2. Violate any air quality standard or contribute substantially to an existing or projected air quality violation.

The YSAQMD has developed CEQA significance thresholds for project construction and operation for guidance to lead agencies responsible for determining significant air quality impacts for their projects. YSAQMD's significance thresholds are 80 pounds per day of $PM_{10}$ and 10 tons per year of ROG or $NO_x$.(YSAQMD 2007). Project emissions above these threshold levels are deemed significant by YSAQMD.

### *Greenhouse Gases*

*State CEQA Guidelines* (Appendix G) indicate that the proposed Project would have a significant impact on GHG emissions if it would:

3. Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment.
4. Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of GHG.

Currently, for GHG evaluations, the methodologies and significance thresholds vary throughout the state. YSAQMD has not identified a threshold for GHG emissions for new projects. It is recognized that for most development reviews, no simple metric is available to determine if a single project would help or hinder meeting the AB 32 emission goals. The air quality analysis for this EIR quantifies the GHG emissions to provide a perspective on the amount of GHG emissions, primarily $CO_2$ and $CH_4$, which would be generated with Project implementation.

Although it is possible to generally estimate a project's incremental contribution of $CO_2$ into the atmosphere, it is not possible to determine whether or how a specific project's relatively small incremental contribution might translate into physical effects on the environment (e.g., sea level rise, loss of snowpack, severe weather events, etc.). Given the complex interactions between various global and regional physical, chemical, atmospheric, terrestrial, and aquatic systems that result in the physical expressions of global climate change, it is impossible to discern whether the presence or absence of $CO_2$ emitted by a specific project would result in any altered conditions.

Four types of analyses are used to determine whether the proposed Project would conflict with the State goals for reducing GHG emissions. The analyses are as follows:

A. Potential conflicts with CARB's recommended actions contained in its Climate Change Scoping Plan that would be applicable to the proposed Project.

B. The relative size of the Project's GHG emissions compared to the size of major facilities that are required to report GHG emissions (annual 25,000 $MTCO_2e$)[34] to the state.

C. The basic energy efficiency parameters of the proposed Project to determine whether its design is inherently energy efficient.

D. Potential conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions.

## 4.6.3 Impacts

Effects on air quality can be divided into short-term, construction-related effects and those associated with long-term operation of the Project. The Project would involve short-term, construction activities that would create emissions during an approximately six-month period spanning May to October (i.e., less than a single year during the dry season). The construction schedule would generally be six days per week and about 10 hours per day within that short, approximately six-month, period. Dewatering activities may involve 24-hour intervals.

Fugitive dust would be generated by loading/unloading of materials, grading, and excavating on the site, as well as possible wind erosion from stockpiles and re-entrainment of settled dust by vehicle and equipment movement. Exhaust emissions would also be generated by a variety of diesel-powered equipment and construction worker vehicles. **Appendix E**, Air Quality Impact Calculations, presents the information pertaining to the construction emissions inventory.

Based on final design, contractor requirements, and other factors, transporting of the soils for reuse may be accomplished with haul trucks, scrapers, or a combination thereof. These scenarios would involve the movement of approximately up to 2.5 million cubic yards (mcy) of material (Phase 1: 1.85 mcy; Phase 2: 0.65 mcy) within the Project site with the selection of Soils Reuse Option #1 (toe berm). For Soils Reuse Option #2 (stockpile), about 2.4 mcy of soil would be excavated. For this analysis, the reasonably foreseeable future approach was analyzed, i.e., with haul trucks. Utilizing 20-cubic-yard (cy) haul trucks, a total of 110,000 haul truck trips would be required. It is assumed that each haul truck would travel 2.5 (one-way trip) miles during material movement. The use of scrapers would provide only minor decreases of the criteria air pollutant emissions. Additional equipment such as dozers, loaders, backhoes, water trucks, and excavators would be used (refer to Section 3.4.1, Construction Personnel and Equipment).

The Project would primarily involve emissions from one season of construction; however, potential excavation and grading of a minor portion of the site (approximately up to 129 feet [ft] width) would occur if an additional tidal connection was created during the post-construction

[34] The State of California has not provided detailed guidance as to quantitative significance thresholds to assess the impact of GHG on climate change and global warming concerns. It does, however, provide guidance via its technical advisory (State of California 2008).

phase. For an additional connection, air quality impacts, to a much lesser extent, would be similar to those analyzed for each of the five tidal connections proposed during construction.

Minor long-term operations and maintenance activities (i.e., such as monitoring and sampling) and corrective actions (including the possibility of creating small ditches to control mosquitoes and monitoring) would occur. In a preliminary economic study commissioned for the Project, between 250 and 304 full-time equivalent (FTE) numbers of labor[35] for 50 years would be generated by the Project; such positions would involve performing biological and water quality monitoring activities onsite, with this activity focused in the first few years of operation, lessening thereafter as monitoring results were evaluated (M.Cubed 2012; see **Appendix G**). Such activities would generate a small number of trips in personal cars and trucks; however, such vehicular traffic would result in air pollutant criteria emissions far below the significance thresholds, rendering the impacts **less than significant**. Also, no long-term loss of existing employment onsite would be expected, as i current ranch labor lost to habitat restoration would be supplanted by habitat land management responsibilities utilizing the same personnel. Hence, no further environmental analysis of these post-construction emissions is required.

### Impact 4.6-1: Short-term Construction Emissions of Criteria Pollutants that May Contribute to Existing Air Quality Violations

*Applicable Significance Criteria: 1 and 2*

The Project would involve excavation of channels, grading down of wetland areas, and reuse of graded/excavated soils for the west Yolo Bypass levee toe berm (Soils Reuse Option #1), an onsite storage stockpile (Soils Reuse Option #2), or a combination of the two options (Soils Reuse Option #3). Emissions from site grading and soils reuse options are presented below. The air calculations for the construction-vehicle scenarios (haul only versus scraper only approach) can be found in **Appendix E**. Combustion emissions (ROG and $NO_x$) with the scrapers would be slightly lower than the emissions with the haul trucks. Fugitive dust emissions would be essentially the same with the scrapers or the haul trucks.

#### Temporary Air Quality Effects from Site Grading and Material Transport

**Table 4.6-10** lists the results from the air quality model used to estimate the air pollutant emissions by the Project. Details of that model run can be found in **Appendix E**. During construction, emissions of $NO_x$ and $PM_{10}$ emitted at the Project site would exceed the recommended YSAQMD thresholds for annual $NO_x$ and daily $PM_{10}$. Exceeding these thresholds would result in a **potentially significant impact**, unless mitigated.

To reduce these potentially significant air emissions to a level of less than significant, a variety of best management practices and mitigation strategies at the work sites and during the transport of the soils could be employed. **Table 4.6-11** lists mitigation strategies for controlling $NO_x$.

[35] The phrase “full-time equivalent (FTE) numbers of labor” refers to the ratio of the total number of paid hours during a set period (part-time, full-time, contracted) by the number of working hours in that period Mondays through Fridays. Therefore, the ratio units (FTE) units or equivalent employees are assumed to be working full-time. For example, one FTE is equivalent to one employee working full-time or two employees each working half-time.

## Table 4.6-10. Estimated Daily and Average Annual Project Construction Emissions[1]

| Construction Emissions (Estimated and Thresholds) | ROG | CO | $NO_x$ | $PM_{10}$ | $PM_{2.5}$ |
|---|---|---|---|---|---|
| | Emissions (pounds per day) | | | | |
| **Daily** | 82 | 844 | 426 | 166 | 45.5 |
| ***YSAQMD Threshold*** | - | - | - | *80* | - |
| ***Significant?*** | | | | ***Yes*** | |
| | Emissions (tons per year) | | | | |
| **Annual** | 3 | 24 | 19 | 10 | 3 |
| ***YSAQMD Threshold*** | *10* | *See note[2]* | *10* | - | - |
| ***Significant?*** | *No* | *NO* | ***Yes*** | | |

ROG = reactive organic gases CO = carbon monoxide $NO_x$ = nitrogen oxide $PM_{10}$ = particulate matter, 10 microns or less $PM_{2.5}$ = particulate matter, 2.5 microns or less

[1]$PM_{10}$ and $PM_{2.5}$ estimates assume 50 percent control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified. For a detailed analysis of the air calculations, refer to Appendix E of the Draft EIR.

[2] Note: The Yolo-Solano Air Quality Management District's threshold of significance for CO is "violation of a state ambient air quality standard for CO." (Yolo-Solano Air Quality Management 2007)

## Table 4.6-11. Mitigation Strategies to Reduce Nitrogen Oxides ($NO_x$)

| Mitigation Strategy | Source Category | Effectiveness in $NO_x$ Reduction (percent) |
|---|---|---|
| **Use of newer model engines or retrofit engines on construction equipment and trucks.** | Off-road mobile construction equipment and haul trucks | Depends on models and years of age; from 20 to 80 |
| **Limit use of construction equipment and trucks on days when Yolo County exceeds its Air Quality Index for ozone greater than 127; halt construction work when index exceeds 151.** | All construction sources | 25 to 100 |
| **Selective Catalytic Reduction (SCR): Install a catalytic device that converts the exhaust to nitrogen and oxygen.** | Tail pipe exhausts from trucks and stationary sources | 70 |
| **Retrofit of Diesel Oxidation Catalyst and SCR** | Construction equipment and engines | 80 |
| **Construction Driver Education: Develop idle reduction policies to reduce idling practices that are strictly a matter of habit (e.g., the driver does not feel like turning off the engine since it will have to be started up again).** | Trucks and off-road mobile construction equipment | No data |

Sources: USEPA 1999 and University of California at Davis and California Department of Transportation 2008.

$NO_x$, emission control technology relies on newer engine models, retrofitting or replacing older engine models, modifying engine processes (such as exhaust gas recirculation), and installing catalytic converters, such as selective catalytic reduction (SCR). A modeling study conducted jointly by the University of California at Davis and the California Department of Transportation (Caltrans) found that the oldest mobile construction equipment used to complete transportation projects was two to three times more polluting than average equipment forecasted to operate in 2010 to 2015 (University of California at Davis and Caltrans 2008). By replacing older equipment in 2010 with brand new equipment, NOx reductions would diminish by 77 percent. However, the emission reduction benefits decreased in value when moving from replacement-only scenarios to retrofitting older models or replacing with newer but used equipment (i.e., 40 percent relative to a 2010 base case). General factors that can affect the benefits of retrofitting include: type, age, and emissions profile of existing equipment and trucks; retrofit technology used, and the remaining useful life of that equipment and trucks. CARB implements a voluntary incentive program, the Carl Moyer Memorial Air Quality Standards Attainment Program, to encourage retrofits and replacement. This program provides grants for cleaner-than-required engines and equipment. These grants are administered by local air districts: http://www.arb.ca.gov/msprog/moyer/air%20district%20contacts.htm.

Strategies in controlling dust (i.e., $PM_{10}$) focus on minimizing dispersal of earth materials during excavation, transport, and disposal activities (**Table 4.6-12**). Watering and covering (e.g., tarps, surfactants, and vegetation) are frequently relied on to minimize dust at construction sites.

**Table 4.6-12. Mitigation Strategies to Reduce Dust (i.e., Particulate Matter [$PM_{10}$])**

| Mitigation Strategy | Source Category | Effectiveness in Controlling Dust ($PM_{10}$) (percent) |
|---|---|---|
| **Water all active construction sites at least twice daily. Frequency should be based on the type of operation, soil, and wind exposure.** | Fugitive emissions from active, unpaved construction areas | 50 |
| **Haul trucks shall maintain at least two feet of freeboard.** | Spills from haul trucks | 90 |
| **Cover all trucks hauling dirt, sand, or loose materials.** | Spills from haul trucks | 90 |
| **Apply hydroseed to exposed bare areas after cut and fill operations.** | Wind erosion from inactive areas | 5 to 99 (based on planting plan) |
| **Cover inactive storage piles.** | Wind erosion from storage piles | Up to 90 |

Source: Yolo-Solano Air Quality Management District. 2007. See Table 5, Page 27 of the YSAQMD document.

Based on the above general information regarding mitigation strategies and with the specifics of the proposed Project, along with the short-term nature of the Project's construction phase, the air quality impacts from elevated $NO_x$ and $PM_{10}$ emissions would be reduced to **less than significant** with the implementation of Mitigation Measure 4.6-1. This proposed mitigation measure would employ well-established construction BMPs such as reducing idling time of construction equipment, covering haul trucks, and applying water to temporary soil stockpiles, as well as innovative strategies such as requiring the contractor to develop an emission reduction plan that would incorporate one or more of the mitigation strategies listed above and limiting construction activities when the Sacramento Metropolitan Air Quality Management District's (SMAQMD) Air Quality Index level for "Spare the Air" is predicted to exceed 127 for $O_3$ (see Section 4.6.4, Mitigations).

**Short-term Construction Emissions containing Toxic Air Contaminants**

The Project would be situated in a rural, agricultural environment within the Yolo Bypass, a vast flood control zone, where there are no sensitive receptors (residence, schools, day care centers, etc.) in the immediate vicinity. Substantial TAC levels would not be a concern during Project implementation because of the lack of sensitive receptors, the short-term, temporary nature of the construction itself (approximately six months), and existing pollution-control devices with state-mandated formulated fuels used by the construction equipment. Also, the construction of the wetlands would not involve the use of hazardous materials that could result in the release of carcinogenic substances or TAC (refer to Section 4.8, Hazards and Hazardous Materials).

Because no future substantial grading or development of the site is proposed (except for a possible tidal connection post construction) and because the Project area is agricultural and rural in nature, TAC impacts would be **less than significant**. No mitigation would be required.

### Impact 4.6-2: Conflict with or Obstruction of Applicable Air Quality Plans

*Applicable Significance Criteria: 1*

A project is deemed inconsistent with air quality plans if it would result in substantial population and/or employment opportunities that exceed growth estimates included in the applicable air quality plan. The Project would not result in substantial population growth, as it would only restore, enhance, and preserve native fish habitat in the Sacramento-San Joaquin River Delta.

With respect to employment, up to 50 temporary, full-time workers would be employed for the approximate six-month construction phase. During the post-construction phase, several fulltime and part-time employees would be hired to conduct survey work and other monitoring efforts onsite (M.Cubed 2012). It is assumed that much of these activities would focus in the first five years and gradually taper off in the remaining 45 years or so. These positions would not involve a substantial number of new employees and hence would not conflict with or obstruct applicable air quality plans in Yolo County. It is also assumed that monitors, for the most part, would be local residents trained to carry out the various activities needed for project verification monitoring.

Additionally, the proposed Project is consistent with the intent of controlling or minimizing GHG (refer to Impact 4.6-3, GHG and Global Climate Change Contributions). All applicable plans, i.e., the YSAQMD's AQMD, the County's general plan policies, and the County's *Climate Action Plan* policies, have measures or conditions with which the proposed Project would be in compliance with or would be slated to achieve (e.g., County *Climate Action Plan*, Measure A-6: Sequester carbon in agricultural landscapes).

Consequently, with Project implementation, there would be **no conflict or impact** to the YSAQMD's AQMD; the County's general plan policies, such as CO-6, CO-6.6, and CO-A104 (refer to **Table 4.4-6**); and/or Yolo County's *Climate Action Plan* measures, such as A-1, A-2, A-3, and A-6 (refer to **Table 4.6-9**). No mitigation would be required.

### Impact 4.6-3: Greenhouse Gases and Global Climate Change Contributions

*Applicable Significance Criteria: 3 and 4*

For an assessment of net long-term GHG emissions associated with the Project, it is important to define the baseline conditions at the Project site. Existing conditions include up to approximately 6,000 cattle seven months per year with the majority of the site irrigated for cattle grazing. The land is currently irrigated with water pumped onto pastures that result in some energy-related GHG emissions associated with irrigation. Cattle generate direct GHG emissions primarily in the form of methane gas associated with enteric fermentation and passive manure management. Based on emission factors obtained from the Intergovernmental Panel on Climate Change (IPCC), grazing cattle can generate up to 0.055 metric tons methane per head per year, which equals approximately 1.38 metric tons $CO_2e$ per head per year (IPCC 2006). Assuming that the site accommodates approximately 6,000 cows seven months each year, about 4,800 $MTCO_2e$ of GHG emissions are annually generated onsite. It is also reasonable to assume that the cattle would continue to use the portion of the Project site that would remain in agricultural use, or be shifted to other grazing lands after construction of the Project would be completed. Further, inasmuch as grazing of non-dairy cattle is primarily a function of demand for beef, the amount of GHG production from beef cattle is independent of grazing land availability. Therefore, for the purposes of a conservative analysis, it is assumed that the cattle would continue to generate GHG emissions onsite and in California. Hence, no reduction in the GHG emissions would occur as associated with the cattle on the Project site (i.e., baseline conditions).

The Project would create a tidal freshwater marsh of approximately 1,226 acres (ac). Freshwater emergent wetlands, like those that would be created in the Project, absorb more carbon per year than any other biome on earth, exceeding even redwood forests in annual net primary production by five times (Schlesinger 1997; Busing and Fujimori 2005). Since 1995, USGS and DWR have studied carbon sequestration and associated subsidence reversal in a similar 15-ac restored freshwater tule wetland on Twitchell Island in the western Delta, referred to as the Twitchell Island Pilot Project (Miller *et al.* 2000, Miller *et al.* 2008, Miller and Fujii in preparation). Experiments and monitoring at this site have demonstrated that wetland restoration, with the rapid re-establishment of dense tule and cattail vegetation, increases net carbon capture in the form of new soil organic matter (Miller *et al.* 2000).

With inundation and the associated low-oxygen conditions needed for new peat formation, come other microbially mediated gas emissions of $N_2O$ (in variably reduced and oxidized conditions) and $CH_4$ (in more highly reduced conditions). The global warming potentials for $CH_4$ and $N_2O$ are 25 and 310 times greater than for $CO_2$, respectively, making even small changes in emissions of these gases potentially important for the net GHG balance of a wetland (IPCC 2007).

The Twitchell Island study found that shallow vegetated wetlands, the type most similar to those that would be created under the Project, sequester approximately 25.3 $MTCO_2e$ ac-1y-1 of carbon while emitting 13.8 $MTCO_2e$ ac-1y-1 of methane for a net GHG sequestration rate of 11.5 $MTCO_2e$ ac-1y-1 (Merrill *et al.* 2011). $N_2O$ emissions were not measured in this study, but are likely to be negligible in the low redox environment of the wetlands. Low redox conditions will drive denitrification all the way to the most reduced end product, diatomic nitrogen and suppress nitrification (Merrill *et al.* 2011). Therefore, using the net sequestration rate of 11.5 $MTCO_2e$ ac-1y-1 across the 1,226 ac of restored wetlands under the Project, the Project would potentially sequester approximately 13,800 $MTCO_2e$/yr.

As noted in Section 4.6.2, Significance Criteria for GHG, there are four GHG analyses that have been undertaken with respect to the Project. First analysis was with compliance with AB 32 measures (Item A). Since the passage of AB 32, CARB published Proposed Early Actions to Mitigate Climate Change in California (CARB 2007b) (see **Table 4.6-5** for the key strategies of AB 32). No early action measures specific to the proposed Project are included in the list of measures identified for CARB to pursue at this time. Still, the Project would not conflict with any of the recommended actions contained in the Climate Change Scoping Plan. The AB 32 Scoping Plan will generally be implemented through regulations enacted by CARB.

For the second analysis on reducing GHG emissions, the net total GHG emissions from the Project would be between 1,702 to 2,065 $MTCO_2e$ during the less than single-year construction phase, depending on the use of haul trucks and/or scrapers (Item B). The estimated GHG emissions would be less than the state threshold of 25,000 $MTCO_2e$ per year. The state's annual limit identifies the large stationary point sources in California that make up approximately 94 percent of the stationary emissions. If a project's total emissions are below this limit, its total emissions are equivalent in size to the smaller projects in California that as a group only make up six percent of all stationary emissions. It is assumed that the activities of these smaller projects generally would not conflict with state's ability to reach AB 32 overall goals. In reaching its goals, CARB will focus upon the largest emitters of GHG emissions. The estimated Project emissions of 1,702 to 2,065 $MTCO_2e$ in about a six-month period would be less than ten percent of the state's limit. Therefore, the Project would not be considered a major project by the state from the standpoint of GHG emissions.

For the third GHG analysis, the Project would be energy efficient (Item C) by designing it to minimize the removal and reuse of soil to the least amount necessary to fulfill restoration strategies within the Project site. Energy consumption and efficiencies are also discussed in Section 4.9, Energy Consumption. Replacement of aging agricultural pumps and inefficient water control structures within the Project site would also make the movement of water more energy efficient. Energy efficiencies and reduced consumption can make substantial differences in controlling GHG. Most recently, the U.S. Energy Information Administration (2012) published data that reveals the U.S. $CO_2$ emissions from energy use during the first quarter of 2012 is the lowest in two decades for any January-March period. This federal agency notes: "normally, $CO_2$ emissions during the year are highest in the first quarter because of strong demand for heat produced by fossil fuels. However, $CO_2$ emissions during January-March 2012 were low due to a combination of three factors: a mild winter that reduced household heating demand and therefore energy use; a decline in coal-fired electricity generation; and, reduced gasoline demand.” The Project’s construction would follow with this recent trend of lower GHG emissions by being inherently energy efficient (see Section 4.9). Hence, the proposed Project would comply with Item C analysis.

For the last GHG analysis (Item D), the Project would not be in conflict with any of the identified local or regional air quality plans for reducing GHG emissions (refer to **Tables 4.6-6** through **4.6-9**). Indeed, the Project would result in a long-term net **benefit** by potentially sequestering approximately 13, 800 $MTCO_2e$ annually.

Due to the temporary nature and relatively minor amount of GHG emissions from construction activities and the long-term net benefit of the Project, the Project would improve net GHG emissions and therefore impacts associated with global warming would be **less than significant**. Also, the proposed Project would not be conflict with the AB 32 Scoping Plan nor adopted local or regional plans for reducing GHG emissions. No mitigation would be required.

## 4.6.4 Mitigations

### Mitigation 4.6-1: Release of Short-term, Temporary Construction Emissions

This mitigation measure shall be implemented to minimize emissions of $NO_x$ and $PM_{10}$:

- Limit construction on those days where Yolo County is predicted to exceed the “Spare the Air” Air Quality Index (AQI) for ozone >127 by the Sacramento Metropolitan Air Quality Management District (summer downwind area). Examples of limiting construction could range from stopping work that day to reducing construction to a half day or relying on electrical equipment solely. Once the AQI level of unhealthy is reached, i.e., 151 to 200 or beyond, all construction work shall cease for that day.
- Require haul trucks and off-road diesel equipment operators to shut down their engines instead of idling for more than five minutes, unless such idling is necessary for proper operation of the equipment. Provide clear signage that posts this requirement for workers at the entrances to the site.
- Require contractors’ construction equipment to be maintained and properly tuned in accordance with manufacturer’s specifications. All equipment shall be checked and determined to be running in proper condition prior to operations.
- Limit vehicle speeds on unpaved roads to 15 miles per hour.
- Cover or maintain at least two feet of freeboard space on haul trucks transporting soil, sand, or loose materials onsite. Any haul trucks that would be traveling along freeways or major roadways shall be covered.
- All active construction sites shall be watered at least twice daily. Frequency shall be based on the type of operation, soil, wind exposure, and the ability to eliminate visible fugitive dust.

- Between the time of completing construction and prior to the onset of winter rains, encourage the property owner and/or property manager to reinstate typical agricultural irrigation practices as a means to wet soils so they do not generate dust, as feasible.
- Cover or water inactive storage piles.
- If Soils Reuse Option #1 or #3 is selected, then re-establish vegetation on the toe berm and buffer areas, i.e., use native grassland species seed mix on the toe berm and apply native wetland-upland transition mix in the buffer areas.
- Develop an emissions reduction plan that demonstrates that off-road equipment of more than 50 horsepower to be used during construction of all project- and program-level elements shall achieve a project-wide fleet-average 20 percent $NO_x$ reduction and 45 percent PM reduction compared to the most recent California Air Resources Board fleet average. Acceptable options for reducing emissions shall include using late model engines, low-emissions diesel products, alternative fuels, engine retrofit technology, after-treatment products, and/or add-on devices such as particulate filters, with specifics dependent on contractor's ability to secure such equipment in a timely fashion.

During the preparation of the Draft EIR, the option of extending the construction phase to two years was considered but rejected as an air quality mitigation/option to minimize $NO_x$ (refer to Section 5.7.4, Construction Schedule Extension Option, for a more detailed discussion).

With implementation of Mitigation Measure 4.6-1, construction $NO_x$ and $PM_{10}$ emissions would be **less than significant**. Hence, no unavoidable, significant adverse impacts associated with air quality and GHG would occur with Project implementation.

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# 4.7 Cultural Resources

## 4.7.1 Setting

A number of cultural resource assessments have been conducted at the Project site, including a literature review, Native American consultation, a general reconnaissance (Holman & Associates 2010), and a historic resources evaluation (Bradley and Hill 2011). These relevant studies, findings, and methodologies are summarized below.

As described in the Notice of Preparation/Initial Study (see **Appendix A**), paleontological resources are not expected to be encountered during Project-related activities due to the types of site soils onsite, periodic flooding and water inundation, and the shallow depths of proposed excavation. No impacts would occur and so therefore, this resource category is not discussed in the Draft Environmental Impact Report (EIR).

### *Archaeological Resources Survey and Findings*

#### Literature Review

A records search was conducted at the Northwest Information Center (NWIC) of the California Historical Resources Information System. The geographic scope of this literature review encompassed the Project site, along with an approximate one-mile radius beyond the site identified as the study area. Additionally, other resources were reviewed:

- Historic Properties Directory (California Office of Historic Preservation (OHP) 2011).
- California Register of Historical Resources (CRHR) (California Department of Parks and Recreation (DPR) 1998 and updates).
- California Points of Historical Interest (DPR 1998 and updates).
- California Historical Landmarks (DPR 1998 and updates).
- Directory of Properties in the Historical Resources Inventory (OHP 2011).
- NWIC Historic Resources Map (U.S. Geological Survey [USGS] 1979, *Liberty Island* Quad).
- 1859-1885 General Land Office Plat Maps.

Based on this review, no prehistoric or historic archaeological resources are known to occur inside the study area. Two historic features, a collection of abandoned farm equipment (P-57-000587) and portions of a levee surrounding Liberty Island (P-57-000588) were previously recorded adjacent to the study area. One previous linear survey included a small portion of the northwestern most corner of the Project area, and five other cultural resources studies (most also linear surveys) reconnoitered property immediately adjacent to the study area, most in support of improvements to flood control systems (Werner 1985; Weaver 1986; Hale, Kelly, and Nilsson 1995; Shapiro and Syda 1997; Jones & Stokes 1999; Kovak 2007). Although the 1995 Hale *et al.*

study cited a letter indicating that a prehistoric site may have been located at the Yolo Ranch compound complex site, none of these studies identified any important prehistoric or historic archaeological sites within the study area.

### Native American Consultation

Consultation efforts were conducted with the Native American Heritage Commission (NAHC) and Most Likely Descendants (MLD) of the Patwin Group of Native Americans (Yocha Dehe Wintun Nation) during 2010 (Holman & Associates 2010). NAHC and the MLD did not provide any data indicating the existence of cultural resources (e.g., burial sites, sacred lands, or other resources) in the study area.

#### Archaeological Resources Pedestrian Survey

A pedestrian reconnaissance of the Project area was conducted August 16 – 20, 2010 (Holman & Associates 2010). Due to challenging conditions onsite, a general reconnaissance (cf. King, Moratto, and Leonard 1973) was performed. On portions of the Project area, reconnaissance was difficult due to past repeated grading and leveling to drain water into a particular ditch, along with construction of ranch roads, irrigation ditches, canals, and flood control levees.

Where possible, the Project site was walked in transects 40 – 75 meters apart (e.g., about 131 to 246 feet [ft]), with locations periodically cleared by trowel of duff and other surface-obscuring materials. Particular attention was given to the location of vernal pools and the irregular border of the large backwater lake that was once present in Section 20 and the eastern portion of Section 19 (see **Figure 2-5** for generalized location of historic backwater lake).

No prehistoric archaeological resources were identified during the pedestrian survey, consistent with the results of previous studies completed near the study area and pre-field research that indicated much of the Project site and study area was historically and currently susceptible to flooding and therefore uninhabitable during part of the year. A survey report (Hale, Kelly, and Nilsson 1995) did indicate that a prehistoric site might be present on the existing ranch complex near the northwest portion of the Project site. However, intensive inspection of the mound and surrounding ranch complex did not reveal any evidence of a prehistoric archaeological resource (Holman & Associates 2010). The mound, covered by a cluster of trees at the northeast end of the complex, has been highly disturbed by construction and demolition of structures and other improvements on top and along its eastern side.

## *Historic Resources Surveys*

Two historic resources studies (i.e., historical map/archival review and historical resources pedestrian survey) were undertaken (Holman & Associates 2010; Bradley and Hill 2011). A brief overview of the methodology and results are presented below.

### Historic Map and Archival Review

Historic resources studies were conducted to identify and date structures and other cultural resources, both existing and formerly present, within the Project study area. Data were also obtained on land tenure, including property ownership and specific structures, and economic activities associated with the properties. This type of research complements field data and establishes historical associations and context needed to formulate evaluation criteria. A records and documents search was conducted at the NWIC at Sonoma State University. In addition, reference maps, aerial photographs, census data, and other archival sources available at the Earth Sciences Library at the University of California at Berkeley, or available online, were reviewed. Those sources indicated the presence of a number of potential historic structures that were subsequently evaluated in a pedestrian survey.

## Historic Resources Pedestrian Survey

The pedestrian survey initially identified four wood-frame structures (a house, a hunting club house, a decoy storage shed, and another shed) within the ranch compound; two abandoned natural gas drilling platforms; segments of flood control levees; and numerous internal hydrologic and water control structures. Some of these structures appeared to be at least 50 years old, requiring evaluation per the federal and state landmark criteria, i.e., National Register of Historic Places (NRHP) and CRHR (see Section 4.7.3, Impacts).

### Yolo Ranch Compound Complex

A ranch compound is located along the northwestern border of the Project site (see **Figure 2-5**). This complex is currently known as Yolo Ranch; previously named McCormack Ranch and historically called Mound Ranch. The ranch compound is comprised of ten modern structures (seven houses, a kennel, a large garage/shop, and a pump/tank house) and four wood-frame structures that appear to be at least 50 years old (a house, a hunting club house, a decoy storage shed, and another shed). South of this ranch compound are several metal corrals.

While the entire complex occurs within the study area, it is not within the Project's construction footprint and would not be altered either directly or indirectly with Project implementation. Hence, no detailed historic structure assessment was conducted nor would be required for the ranch compound complex and adjacent corrals. Accordingly, no further cultural resources analysis on the Yolo Ranch compound complex is presented in this Draft EIR.

### Natural Gas Drilling Platforms

Two abandoned steel platforms that supported natural gas wells are present in the study area and on the Project site, one in the northwest quadrant of Section 19 and the other in the southwest quadrant of Section 16. Both structures are located within the Millar Gas Field, which extends into the northern portion of the study area (Department of Conservation 2009). Out of the approximately 21 exploratory wells that were built, between 1944 and 2005, within the Project area, only four were ever in production (Bradley and Hill 2011). The two steel platform remnants surviving to this day and stripped of all of the drilling equipment are what remains of those natural gas wells.

## Yolo Flyway Farms Property Structural Remains

Steel-reinforced cement/cinder block structural remains were identified in the northeastern portion of the Project site (on the property identified as Yolo Flyway Farms[36]). Two structures are shown at the location on the 1978 USGS quad map, but no other data identifies the period of construction and function of the debris. At the first structure location, the only standing remains are a bathroom filled with duck decoys, and a canal/pump station with a power pole.

The second structure shown on the USGS map was about 40 meters (about 131 ft) east of the bathroom, and next to the canal, a pump station, and two power/telephone poles. The site has been disturbed by construction of a catchment basin (irrigation facility) associated with the water pump on the south bank of the canal. Cement debris surrounds the basin and a large debris pile is located due south of the basin. Also, about 200 meters (656 ft) of the south bank of the canal has been stabilized with discarded appliances and vehicle/farm equipment. Potential hazardous waste related to debris onsite is discussed further in Section 4.8, Hazards and Hazardous Materials.

## Flood Control Levees

The western and easternmost perimeter of the Project site is bordered by Yolo Bypass flood control levees. The eastern levee is situated on the east bank of the Toe Drain. The levee was constructed in 1963 from dredged material excavated from the Sacramento River Deep Water Ship Channel (SRDWSC) (Yolo Bypass Working Group *et al.* 2001). This levee is classified as a navigational levee and was not constructed to flood control levee standards. It is, however, higher than the original federal flood control levee east of the SRDWSC and thus serves as the east Yolo Bypass levee. The west Yolo Bypass levee parallels the borrow ditch that extends north from Shag Slough to the south end of Section 18. Additionally, a series of interior earthen, restricted-height levees (within the Yolo Bypass) demarcate most of the western half of Section 18, providing flood control to the Yolo Ranch compound (Yolo Bypass Working Group *et al.* 2001). Various degraded levee segments border the Stair Step to the south side of the study area and elsewhere, as do small earthen berms.

## Water Control Structures

The study area contains numerous water control structures. These features include irrigation ditches, irrigation pumping stations, a variety of control gates, and other structures associated with water conveyance. Internal roads are found in the study area to provide access for routine operation and maintenance activities to the existing water control and flood infrastructures.

## Other Features

Miscellaneous features were noted but not considered important enough to record, including makeshift boat launches, piles of ranching and duck hunting-related debris, and concrete debris used to stabilize levees. The debris was isolated and artifactual material was not temporally distinct, most dating back to the mid-to-late twentieth century.

[36] Only Phase 1 of the Project and not Phase 2 (which includes Yolo Flyway Farms) is being pursued at this time; however, Phase 2 is included in this analysis as part of the reasonably foreseeable future build out (see Section 1.1.4, Project Phasing, Components, and Activities).

## *Regulatory Setting*

### Federal Laws and Regulations

#### Archaeological Resources Protection Act

This statute (16 United States Code [USC] §§ 470aa-470mm; Public Law 96-95 and related amendments) ensures the protection of archaeological resources and sites that are on public lands and Indian lands, and fosters increased cooperation and exchange of information between governmental authorities, the professional archaeological community, and private individuals.

#### National Historic Preservation Act

NHPA § 106 (16 USC § 470f), defines the nation's policy for the protection and preservation of the country's most important cultural resources, which are those resources identified as eligible for listing in the National Register of Historic Places (NRHP). Cultural resources eligible for the NRHP are referred to as historic properties.

#### Code of Federal Regulations, Title 36, Part 60.4

To be eligible for listing in the NRHP, a resource must be significant in American history, architecture, archaeology, engineering, or culture. Districts, sites, buildings, structures and objects of potential significance must meet one or more of the following four established criteria, as defined under Title 36 Code of Federal Regulations (CFR) Part 60.4:

a) **Criterion A.** Are associated with events that have made a significant contribution to the broad patterns of our history;

b) **Criterion B.** Are associated with the lives of persons significant in our past;

c) **Criterion C.** Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction;

d) **Criterion D.** Have yielded, or may be likely to yield, information important in prehistory or history.

In addition to meeting these four criteria, a historic property must also possess integrity. The various aspects of integrity include: location, design, setting, materials, workmanship, feeling, and association. Furthermore, unless the resource possesses exceptional significance, it must be at least 50 years old to be considered for NRHP listing (**Criterion G**).

#### Code of Federal Regulations, Title 36, Part 800

The implementing regulations for NHPA are defined under Title 36 CFR Part 800, which defines effect and adverse effect on historic properties as follows:

- **Section 800.9(a) Criterion of Effect.** An undertaking has an effect on a historic property when the undertaking may alter characteristics of the property that may qualify it for inclusion in the NRHP. For the purpose of determining effect, alteration to features of a property's location, setting, or use may be relevant depending on a property's significant characteristics and should be considered.

- **Section 800.9(b) Criteria of Adverse Effect.** An undertaking is considered to have an adverse effect when the effect on a historic property may diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Adverse effects on historic properties include, but are not limited to:
  - Physical destruction, damage, or alteration of all or part of the property;
  - Isolation of the property from or alteration of the character of the property's setting when that character contributes to the property's qualification for the NRHP;
  - Introduction of visual, audible, or atmospheric elements that are out of character with the property or alter its setting;
  - Neglect of a property resulting in its deterioration or destruction; and/or
  - Transfer, lease, or sale of the property without adequate provisions to protect historic integrity.

## State Laws and Regulations

### California Environmental Quality Act and *State CEQA Guidelines*

Policies for the State's important historic resources are found in specific sections of the CEQA statute (Public Resources Code [PCR] § 21083.2 and §2 1084.1) and the *State CEQA Guidelines* (California Code of Regulations § 15064.5 and Appendix G). For purposes of this section, an historical resource is a resource listed in, or determined eligible for listing in, the California Register of Historical Resources (California Register).

### California Public Resources Code § 5024.1

Under these nominating regulations, a number of historic resources are automatically eligible for the California Register if they have been listed under various state, national or local historic resource criteria. California historic resources listed in, or formally determined eligible for the NRHP are automatically listed on the California Register.

In order for a resource to be eligible for the California Register, it must satisfy all of the following three criteria:

- **Criterion 1.** A property must be significant at the local, state or national level, under one or more of the following four criteria of significance (these are essentially the same as NRHP criteria with more emphasis on California history):
  - The resource is associated with events or patterns of events that have made a significant contribution to the broad patterns of local or regional history and cultural heritage of California or the United States.

- The resource is associated with the lives of persons important to the nation or to California's past.
- The resource embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of a master, or possesses high artistic values.
- The resource has the potential to yield information important to the prehistory or history of the state or the nation (applicable primarily to archaeological sites).

- **Criterion 2.** The resource retains historic integrity.
- **Criterion 3.** It is 50 years old or older (except for certain cases described in the California Register regulations).

California Public Resources Code §§ 5097.91 to 5097.95; § 5097.98

The NAHC advises public agencies and the public on what to do when there is a discovery and disposition of human remains of Native American origin. This commission also identifies and catalogues places of special religious or social significance to Native Americans, and known graves and cemeteries of Native Americans on private lands, as well as performs other duties regarding the preservation and accessibility of sacred sites and burials and the disposition of Native American human remains and burial items.

When contacted by the county coroner's office, the NAHC identifies the designated MLD in that area. The MLD, archaeologist, project proponent, and land owner then coordinate on the treatment and disposition of any human remains and associated grave goods (PRC § 5097.98.)

California Health and Safety Code § 7050.5

The California Health and Safety Code (§ 7050.5) requires that construction or excavation be stopped in the vicinity of discovered human remains, until the county coroner – in this case the Yolo County Coroner's office – can determine whether the remains are those of a Native American. If the remains are determined to be Native American, the coroner must contact the NAHC within 24 hours.

## Local Policies

Yolo County 2030 Countywide General Plan

The Yolo County 2030 Countywide General Plan consists of numerous goals and policies and actions to protect cultural resources (County of Yolo 2009). The policies that directly relate to cultural resources management are summarized in **Table 4.7-1**.

### *Historic Resources Evaluation for National Register/California Register Eligibility*

Cultural features over 50 years of age and on the Project site were further evaluated for their historic importance and eligibility to be designated as state and/or federal landmarks. An additional field survey was conducted specifically on these cultural features on May 1, 2011

(Bradley and Hill 2011). Included in this historic resources evaluation was that of cultural landscape features, which are defined as geographic areas that have been shaped by human activity. They can result from a conscious design or plan, or they can evolve as a byproduct or result of people's activities.

Below are the findings on the historic importance of the cultural landscape features, two natural gas drilling platforms, flood control levees, and agricultural water conveyance and irrigation control infrastructure.

**Table 4.7-1. Yolo County 2030 General Plan: Policies on Cultural Resources Management**

| General Plan Policy Number | Relevant General Plan Policy Statements and Implementation Actions |
|---|---|
| **CO-4.1** | Identify and safeguard important cultural resources. |
| **CO-4.11** | Honor and respect local tribal heritage. |
| **CO-4.13** | Avoid or mitigate to the maximum extent feasible the impacts of development on Native American archaeological and cultural resources. |
| **CO-A61** | Require cultural resources inventories of all new development projects in areas where a preliminary site survey indicates a medium or high potential for archaeological, historical, or paleontological resources. In addition, require a mitigation plan to protect the resource before the issuance of permits (see page CO 52 of chapter 7 in the General Plan). |
| **CO-A62** | Require that discretionary projects which involve earth disturbing activities on previously undisturbed soils in an area determined to be archaeologically sensitive perform the following:<br>• Enter into a cultural resources treatment agreement with the culturally affiliated tribe.<br>• Retain a qualified archaeologist to evaluate the site if cultural resources are discovered during the project construction. The archaeologist will have the authority to stop and redirect grading activities, in consultation with the culturally affiliated tribe and their designated monitors, to evaluate the significance of any archaeological resources discovered on the property.<br>• Consult with the culturally affiliated tribe to determine the extent of impacts to archaeological resources and to create appropriate mitigation to address any impacts.<br>• Arrange for the monitoring of earth disturbing activities by members of the culturally affiliated tribe, including all archaeological surveys, testing, and studies, to be compensated by the developer. |
| **CO-A63** | Require that when cultural resources (including nontribal archeological and paleontological artifacts, as well as human remains) are encountered during site preparation or construction, all work within the vicinity of the discovery is immediately halted and the area protected from further disturbance. The project applicant shall immediately notify the County Coroner and the Planning and Public Works Department. Where human remains are determined to be Native American, the project applicant shall consult with the Native American Heritage Commission (NAHC) to determine the person most likely descended from the deceased. The applicant shall confer with the descendant to determine appropriate treatment for the human remains, consistent with State law. |

Source: County of Yolo 2009

## Cultural Landscape

Within the regulatory framework of cultural resources, the Project area can best be described as a cultural landscape. The construction of the Yolo Bypass, which began in 1916, and the land uses (including grazing, hay production, and duck hunting) that have developed since its construction have been the critical factors in shaping the cultural landscape within the Project area. Important features within this cultural landscape are the spatial organization that results from the arrangement of the field patterns, roads, and internal ditch and berm systems.

Although ranching and the various agricultural land uses have occurred on at least a portion of the Project area since the early 20th century (as evidenced by the construction of a local levee in the vicinity of the historic backwater lake on the 1908 *Courtland* and the 1916 *Cache Slough* USGS maps), a review of the USGS maps and aerial photographs (including a comparison of the location of the field patterns, roads, and berm and ditch systems on the 1952, 1968, 1978, and 1993 *Liberty Island* USGS maps, and 1993 and 2011 aerial photographs available on Google Earth) indicates that the current configuration of the key cultural landscape features developed during the 1960s and 1970s and is less than 50 years old. The cultural landscape features within the Project's construction footprint are all common examples of these types of cultural landscape features within the Yolo Bypass.

In summary, the cultural landscape within the Project area does not appear to possess significance for the NRHP or CRHR under Criteria A/1, B/2, or C/3. Additionally, the cultural landscape features do not appear to possess exceptional significance under NRHP Criteria Consideration G: Properties That Have Achieved Significance within the Past Fifty Years; they are common examples of the types of cultural landscape features that continue to be found throughout the Yolo Bypass. Accordingly, the cultural landscape in the Project area is not an important historic resource as defined in the federal and state laws and regulations. No further environmental analysis is required in conjunction with the proposed Project.

### Natural Gas Well Platforms

Two natural gas well platforms are located on the Yolo Ranch property portion of the Project site. The platform for the "Sorenson A-1" gas well (American Petroleum Institute [API] Number 11320079) located in the northwest quadrant of Section 19 on Assessor's parcel number (APN) 033-390-001 was constructed in 1969. The platform for the "Yolo Ranch 1-16" gas well (API Number 11320959) located in the southwest quadrant of Section 16 on APN 033-390-001 was constructed in 1990.

These structures do not appear to be eligible for the NRHP or CRHR Criteria A/1, B/2, or C/3. The platforms are less than 50 years old and appear to be a common example of this type of structure. In particular, they don't possess exceptional significance under NRHP Criteria Consideration G: Properties that Have Achieved Significance within the Past Fifty Years. Accordingly, the natural gas well platforms in the Project area are not an important historic resource as defined in the federal and state laws and regulations. No further environmental analysis is required in conjunction with the proposed Project.

## Yolo Bypass Flood Control Levees

### West Yolo Bypass Levee, Shag Slough, and Stair Step

The Yolo Bypass is part of the pre-1944 Sacramento River Flood Control Project (Bradley and Hill, 2011). In 1986, the Yolo Bypass was evaluated on a California (State) Historic Resources Inventory Record as eligible for listing on the NRHP; no boundaries were given in this evaluation. The west Yolo Bypass levee is part of the Yolo Bypass that was authorized as part of the pre-1944 Sacramento Flood Control Project, and it is shown as completed on a 1943 map of the Sacramento River Flood Control Project. Neither the west Yolo Bypass borrow ditch, the north end of Shag Slough, nor the Stair Step are listed as part of the pre-1944 Sacramento Flood Control Project. However, the west Yolo Bypass borrow ditch, the portion of Shag Slough that borders the Project site are shown on the 1952 Liberty Island USGS map, and the Stair Step is visible in 1937 aerial photographs of the area and on the 1952 *Liberty Island* USGS map.

Additional research would be necessary in order to make a definite evaluation of the eligibility of the west Yolo Bypass levee, Shag Slough, and the Stair Step as potential contributing features of the Yolo Bypass. However all are more than 50 years old and in the absence of a definitive evaluation, the portions within or bordering the Project should be considered to be cultural resources for the purposes of the environmental analysis – that is as potential contributors to the significance of a potential Yolo Bypass historic district under NRHP Criterion A (in association with the history of the Yolo Bypass as part of the pre-1944 Sacramento Flood Control Project).

### East Yolo Bypass Levee and Toe Drain

The east Yolo Bypass levee and Toe Drain were constructed in 1963, as part of the construction SRDWSC. Any significance for the east Yolo Bypass levee and Toe Drain would be in association with the significance of the adaptations of the southern portion of the Yolo Basin that resulted from the construction of the SRDWSC.

Similar to west Yolo Bypass levee, additional research on the east Yolo Bypass and Toe Drain would be necessary in order to determine their eligibility to either the California or National registers. However, the east Yolo Bypass levee and Toe Drain are approaching 50 years old, and in the absence of a definitive evaluation, the portions of each that are within or bordering the Project should be considered to be cultural resources for the purposes of the environmental analysis – that is as potential contributors to any significance of a potential Yolo Bypass historic district under NRHP Criterion A (in association with the post-1944 history of the Yolo Bypass).

## Water Control Structures

### Small Berms and Irrigation Ditches

The internal system of small berms and irrigation ditches that provide water to irrigate the various field areas, within the Project site, are generally less than 50 years old. They are also common examples of features typically found throughout the Yolo Bypass. They do not appear to possess significance under the NRHP or CRHR Criteria A/1, B/2, or C/3. Accordingly, these internal structures in the Project area are not an important historic resource as defined in the federal and state laws and regulations. No further environmental analysis is required in conjunction with the proposed Project.

<u>Irrigation and Drainage Structures and Equipment</u>

The variety of tide gates, flap gates, pumps, and other structures that control the extent to which water can enter (irrigate) and leave (drain) the site are of varying ages (many are less than 50 years old) and are common examples of these types of features. They do not appear to possess significance under the NRHP or CRHR Criteria A/1, B/2, or C/3. Accordingly, these water control structures in the Project area are not an important historic resource as defined in the federal and state laws and regulations. No further environmental analysis is required in conjunction with the Project.

## 4.7.2 Significance Criteria

Under Appendix G of the *State CEQA Guidelines,* the Project would have a significant impact on cultural or historic resources if it would result in any of the following threshold criteria:

1. A substantial adverse change in the significance of a historical resource as defined in CCR § 15064.5.
2. A substantial adverse change in the significance of an archaeological resource pursuant to CCR § 15064.5.
3. Disturb any human remains, including those interred outside of formal cemeteries.

## 4.7.3 Impacts

### Impact 4.7-1: Loss of, or Damage to, Unknown Archaeological Resources

*Applicable Significance Criteria: 2 and 3*

No known prehistoric or historic archaeological resources meeting CRHR or NRHP eligibility criteria as significant or as unique archaeological resources were previously recorded inside the Project area. Archaeological resources were also not identified during the pedestrian survey. However, there is some potential for buried archaeological resources to be unearthed during Project construction. The northern parts of the site near the former Mound Ranch would have the highest likelihood of containing cultural resources. No excavation is proposed for that area. The southern portions of the site have low potential for containing cultural resources. Earthwork, such as excavating, trenching, dredging, potholing, and digging, may infrequently occur during operations and maintenance activities, corrective actions, and long-term monitoring during the life of the proposed Project. Such earthwork may occur in areas that have not been previously disturbed by agricultural operations and flood control maintenance practices; thereby increasing the risk of disturbing soils that may contain unknown archaeological resources.

Should cultural resources be encountered during ground-disturbing activities during the construction and post-construction phases, then a **potentially significant impact** could result if not mitigated. Implementation of Mitigation 4.7-1 (refer to Section 4.7.4, Mitigations) would reduce this impact to **less than significant**. This measure is consistent with the Yolo County's General Plan policies and actions (see **Table 4.7-1**), by training contractors and their employees on cultural resources management recognition, monitoring, surveying, avoidance, and/or excavation and curation, as applicable.

### Impact 4.7-2: Impacts to Historic Resources

*Applicable Significance Criteria: 1*

No listed historic structures have been identified on the Project site.

However, in Section 4.7.1, Setting, the historic evaluation noted that features of the Yolo Bypass – the portions of the east and west Yolo Bypass levees, the Stair Step, Shag Slough, and the Toe Drain that are within or bordering the Project Area should be considered to be cultural resources for the purposes of the Project – that is, as potential contributors to any significance of a possible Yolo Bypass historic district under NRHP Criterion A (in association with the post-1944 and post-1944 history of the Yolo Bypass).

The Project would modify the eastern slope and base of the west Yolo Bypass levee with construction of the toe berm and reconstruction of an existing drainage ditch from Shag Slough (if either Soils Reuse Options #1 or #3 was selected). However, it would not degrade the historic integrity of the levee. There would be no material impairment, as defined in the California Environmental Quality Act (CEQA), and no adverse effects to the integrity as defined in § 106 of the NHPA from the Project to the larger potential historic district of the Yolo Bypass. Accordingly, the Project's impact to this structure would be **less than significant**. No mitigation would be required. Since Soils Reuse Option #2 (stockpile) would not require the modification of the west Yolo Bypass levee, this version of the Project would result in **no impact** to historic resources. No mitigation would be required.

The Project would modify up to six distinct sites at the Stair Step and Toe Drain with construction of connections to restore tidal action to the site. These features are a fraction (i.e., 70 to 120 ft in width for up to six connections with an overall total of 720 ft: three on Yolo Ranch, two on Yolo Flyway Farms; and a potential additional one during the post-construction phase) of the much larger potential historic district for the Yolo Bypass. By way of comparison, the main flood management facilities in the Delta-Suisun consist of about 1,100 miles of levees in the Delta and about 230 miles in the Suisun Marsh and the Yolo Bypass (Department of Water Resources and California Department of Fish and Game 2008). No material impairment as defined in CEQA would result, and no adverse effects to the integrity as defined in § 106 of the NHPA from the Project to the larger potential historic district of the Yolo Bypass. Hence, the Project's impact to the structures would be **less than significant** with no mitigation required.

Earthwork may infrequently occur during operations and maintenance activities, corrective actions, and long-term monitoring during the life of the proposed Project. Although such earthwork may occur in areas that have not been previously disturbed by agricultural operations and flood control maintenance practices they are unlikely to occur in the areas where historical resources have been documented and therefore are unlikely to affect any historical resources.

Therefore, during the post-construction phase, the Project's impact to historic resources would be **less than significant.** No mitigation would be required.

### Impact 4.7-3: Impacts to Unknown Human Burial Resources

*Applicable Significance Criteria: 3*

No cemeteries, ancient burial grounds, or other sites containing human remains, are known onsite. However, the potential exists for unknown human burial resources to be unearthed during Project construction. The northern parts of the site near the former Mound Ranch would have the highest likelihood of containing such resources. No excavation is proposed for that area. The southern portions of the site have low potential for containing such resources.

Earthwork, such as excavating, trenching, dredging, potholing, and digging, may infrequently occur during operations and maintenance activities, corrective actions, and long-term monitoring during the life of the proposed Project. Such earthwork may occur in areas that have not been previously disturbed by agricultural operations and flood control maintenance practices; thereby increasing the risk of disturbing soils that may contain human burial resources.

Overall, lack of surface evidence does not preclude the existence of possible buried human remains. Since ground-disturbing activities may result in the discovery and inadvertent damage to these important resources and the possibility cannot be completely eliminated, a **potentially significant impact**, if not mitigated, could result during the construction and post-construction phases. Implementation of Mitigation 4.7-1 (refer to Section 4.7.4, Mitigations) would reduce this potential impact to **less than significant**. This measure is consistent with the Yolo County's General Plan policies and actions (see **Table 4.7-1**), and involves working with the coroner's office and MLD, as applicable.

## 4.7.4 Mitigations

### Mitigation Measure 4.7-1: Loss of, or Damage to, Unknown Archaeological Resources

The following mitigation measure shall be implemented before and during the implementation of the Project where ground-disturbing activities may occur:

- Conduct an environmental awareness training concerning cultural resources management, utilizing the services of a qualified archaeologist for contractors and their staff prior to the start of construction.
- Cease ground-disturbing work in the vicinity of the area should buried archaeological resources be uncovered during construction, operation, and/or routine maintenance, until a qualified archaeologist can visit the site of discovery and assess the significance of the resource. After the assessment is completed, the archaeologist shall submit a report describing the significance of the discovery and its origin with cultural resources management recommendations if the archaeological resources are significant.

- Comply with Public Resources Code § 21083.2, as applicable, should buried archaeological resources be found. Avoidance or preservation in an undisturbed state is the preferable course of action. Preservation methods may include:
  - Planning construction to avoid archaeological sites.
  - Deeding sites into permanent conservation easements.
  - Capping or covering sites with a layer of soil before building on the sites.
  - Planning parks, greenspace, or other open space to incorporate archaeological sites.

Actual preservation measures may vary, depending upon the specific situation and may include excavation, preservation, and curation at a designated repository. This mitigation would reduce the impact to unknown buried archaeological resources to **less than significant**.

### Mitigation Measure 4.7-2: Impacts to Unknown Human Burial Resources

The following mitigation measure shall be implemented before and during the implementation of the Project where ground-disturbing activities may occur:

- Notify the Yolo County coroner, Yolo County Department of Public Works, and designated Most Likely Descendant (as identified by the Native American Heritage Commission) in the event of discovering human remains during construction, operation, and/or routine maintenance of the Project. The notification protocol and process shall proceed in accordance with the *State CEQA Guidelines*, California Code of Regulations (CCR) § 15064.5(e); Public Resources Code § 5097.98; and Health and Safety Code § 7050.5, as applicable.

This mitigation would reduce the impact to unknown human burial resources to **less than significant**.

With the implementation of Mitigation Measures 4.7-1 and 4.7-2, there would be no unavoidable, significant adverse impacts associated with cultural resources.

# 4.8 Hazards and Hazardous Materials

## 4.8.1 Setting

### *Agricultural Practices*

A wide variety of chemicals associated with agricultural practices, including insecticides, herbicides, and fungicides, have been used onsite and in the Project vicinity for many years. However, since 2007, the use of the Yolo Ranch portion of the Project site for raising crops has ceased (see **Table 4.5-5**). Information on Yolo Flyways Farm concerning crops is unavailable. Additionally, with annual flooding occurring on the entire Project site, much of the agricultural chemicals from past practices onsite have been removed. Remaining residues from these compounds may still occur (from wind and runoff from adjacent properties) in the soil, including the more common compounds such as organochlorines, arsenates, and mercury. It is also important to note that residues of agricultural chemical products in farmed soils as a result of routine agricultural operations are not typically managed as hazardous waste sites, when the chemicals have been applied in accordance with applicable laws and regulations. For further discussion concerning water contamination, refer to Section 4.2, Water Quality.

With respect to the existing onsite irrigation system, some of the wood pilings in irrigation ditches are either pressure treated or contain wood preservatives. It is also possible that heavy wood posts (e.g., recycled railroad timbers) at some fence corners and at gate supports might be moved if they would lie within the restoration footprint. Overall, the risk is great that this wood has been treated with a wood preservative such as creosote, pentachlorophenol, and/or arsenic, along with lead, if painted. These kinds of constituents are defined as hazardous waste under current laws and regulations. If these preservative constituents are present in the wood in sufficiently high leachable concentrations, then the treated wood products themselves would be hazardous waste. The designation as hazardous waste would apply, regardless of whether the ties and other wood would be disposed of or recycled.

### *Known Contamination Sites and Existing Utility Infrastructure Hazards*

Along with agricultural pesticides and treated wood, farming practices may also involve the use and storage of petrochemicals for farming equipment and vehicles. A summary of previous site investigations and geotechnical reports conducted on and near the Project site is presented in **Table 4.8-1**. It is intended to provide a background regarding the types of potentially hazardous wastes contamination that have been documented in the subsurface soil and groundwater beneath the site and surrounding properties to date. Potential contamination may also exist from electrical power pole transformers. Hazards could also be related to existing natural gas wells within the Project area (ten of the approximate 21 wells are onsite). These closed/abandoned gas wells and power pole locations are shown in **Figures 4.8-1** and **2-8**, respectively.

## Table 4.8-1. Previous Hazardous Materials Studies Conducted on or near Project Site

| Title of Report | Author and Date | Report Findings, Recommendations, and Follow Up Actions |
|---|---|---|
| **Yolo Ranch Property** | | |
| Phase I Environmental Site Assessment, Yolo Ranch Property, Yolo County, CA | Wallace Kuhl and Associates (WKA)<br>September 17, 2007 | Surveys found evidence of contamination outside of the Project site:<br>1. Former refuse dump adjacent to an irrigation ditch on the western side of the property outside the Project footprint, and<br>2. Soil staining found in a farm equipment storage area near an onsite shop building in the ranch complex area.<br>Identification of 20 abandoned natural gas wells on or adjacent to the site was made, based on California Division of Oil, Gas, and Geothermal Resources reports and maps (California Department of Conservation 2007; 2010). Two additional wells were "cancelled." All of the drilled wells have been plugged. The locations of these wells are depicted on Figure 4.8-1.<br>Report has a number of recommendations for demolition of structures and abandoning the water wells and septic systems on site, if applicable. A Limited Phase II subsurface assessment was recommended to further evaluate conditions at the two contaminated sites. Follow up actions are noted below in this table. |
| Report of Findings - Limited Phase II Assessment, Yolo Ranch Property, Yolo County, CA | Wallace Kuhl and Associates<br>October 2, 2007 | Study further characterized site contamination identified in original study (WKA 2007a). Twenty-four shallow exploratory test pits were excavated with 18 soil samples collected from 11 of the 24 locations, based on the presence of buried debris. Another soil sample was taken in the stained-soil area. This sample had elevated amounts of arsenic, cadmium, chromium, and lead. Although WKA detected metals concentrations in site groundwater, the data suggests metals in the soil are not rapidly migrating into the groundwater.<br>Report recommended that approximately 730 cubic yards (cy) of chemically impacted soil be excavated from the retired refuse dump and properly disposed, followed by confirmation soil sampling. Subsequently, the remediation was conducted and the area is clean. |
| Report of Additional Soil Investigation | Geocon Consultants, Inc.<br>November 19, 2007 | Evaluated five shallow pits in the area of WKA's previous exploratory pits. Assessment confirmed elevated concentrations of antimony, arsenic, cadmium, lead, and zinc in site soils. Report recommended that about 11 cy of soil surrounding one of the WKA test pits be excavated and removed. Refer to next entry in this table. |
| Soil Removal Report | Geocon Consultants, Inc.<br>December 6, 2007 | On November 21, 2007, the 11 cy of contaminated soil was excavated and removed. Soil analyses showed a substantial reduction in heavy metals concentrations in the south, east, and western sidewalls and bottom confirmation samples. Elevated levels of arsenic and cadmium concentrations were collected from the north sidewall. |

**Table 4.8-1. Previous Hazardous Materials Studies Conducted on or near Project Site**

| Title of Report | Author and Date | Report Findings, Recommendations, and Follow Up Actions |
|---|---|---|
| **Yolo Ranch Property -- continued** | | |
| Report of Findings – Supplemental Phase II Assessment, Yolo Ranch Property, Yolo County, CA | Wallace Kuhl and Associates<br>December 20, 2007 | Another test pit excavation and sampling occurred onsite, on December 5, 2007, to further delineate the extent of previously identified heavy-metal affected soil s. WKA enlarged Geocon's northern pit excavation by another two feet, resulting in one cy of contaminated soils removed and appropriately disposed. Samples were also taken from stockpiled soils. The combined results of WKA's assessments of the former refuse dump indicated that the site soils contain elevated levels of cadmium and lead, requiring excavation and offsite disposal or re-designating that part of the site to restrict land uses. Arsenic at background levels were present in native soils. |
| Former Dump Area, Yolo Ranch, Yolo County, CA, Removal and Offsite Disposal of Excavated Soil | Geocon Consultants, Inc.<br>April 18, 2008 | Report documented soil removal from the area and offsite disposal. It concluded that the source of the highest concentrations of metals in the former dump area and 13.4 tons of surrounding soil have been excavated and removed from the site. No further action required for the former dump area. |
| **Yolo Flyway Farms Property** | | |
| Phase I Environmental Site Assessment, Yolo Flyway Farms Ranch Property, Yolo County, CA | Wallace Kuhl and Associates<br>February 1, 2008 | Analysis included a historic literature review, site owner interviews, and site reconnaissance. Review found that the site was developed with a cabin by at least 1961, and had been used as pastureland and by a duck-hunting club circa 1958 to 2008. An agricultural well, an idle natural gas well, and a plugged natural gas well were identified onsite, as were pole-mounted electrical transformers. |
| Debris Removal Observations, Yolo Flyway Farms Ranch Property, Yolo County, CA | Wallace Kuhl and Associates<br>March 19, 2008 | Observations noted site conditions after excavation, separation, and partial removal of the debris piles from the property. No obvious hazardous materials contamination or items removed from the debris pile were noted. Cleanup was sufficient and no further action was recommended. |

With remediation complete, no known contamination sites are present onsite. Still, the possibility of encountering undetected contamination, such as polychlorinated biphenyls (PCBs) from utility poles, cannot be precluded. For an analysis of impacts to water quality associated with soil contamination, including methylmercury, refer to Section 4.2, Water Quality; for an analysis of greenhouse gases see Section 4.6, Air Quality and Greenhouse Gases.

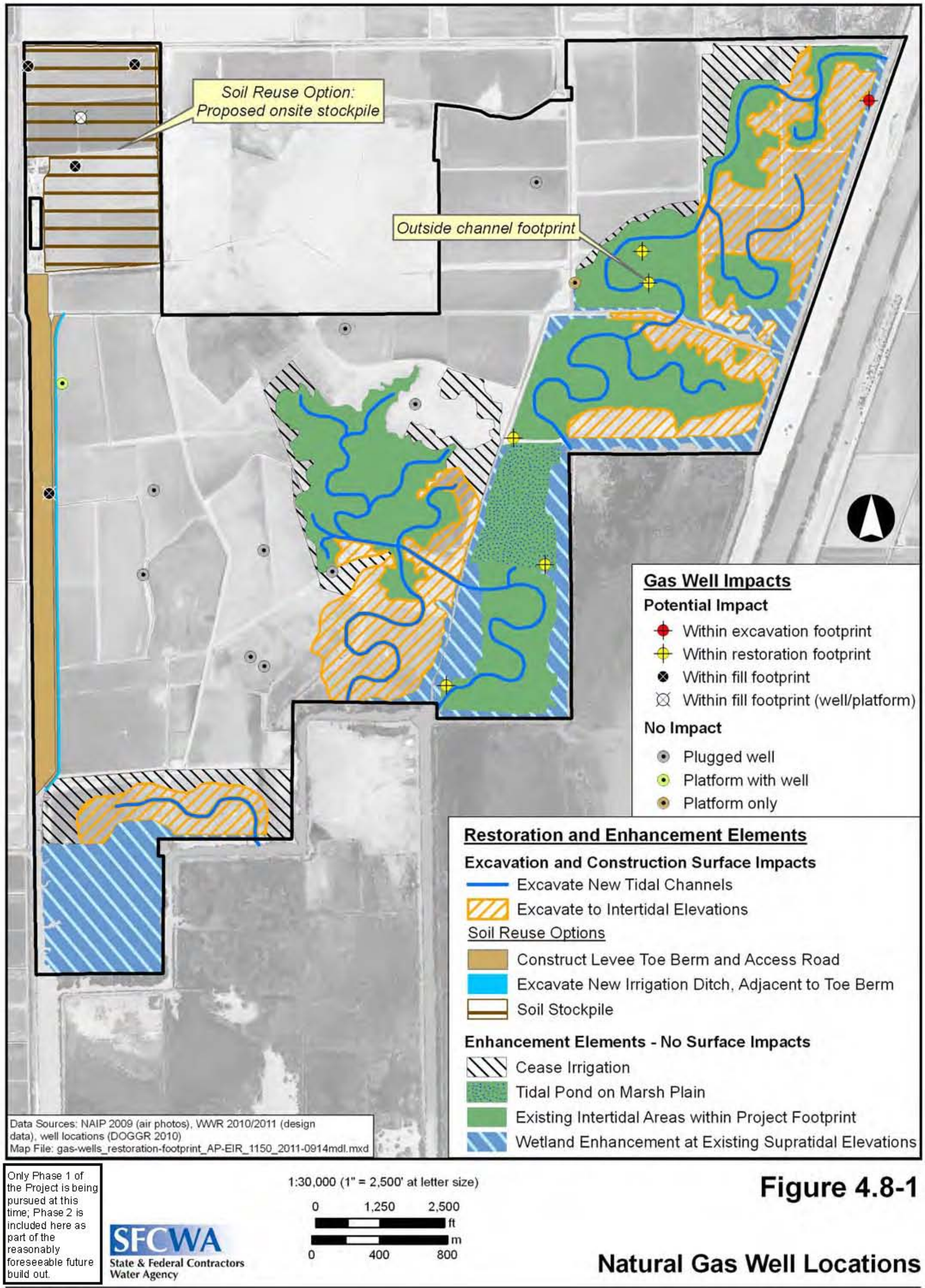


**Figure 4.8-1**

**Natural Gas Well Locations**

### *Biological Vectors*

Biological vectors are mosquitoes, ticks, and those wildlife species (e.g., rats and other rodents) that serve as hosts to transmitted viruses, parasites, and diseases affecting humans. In Yolo County, major public health concerns include mosquito transmission of West Nile viruses (WNV), encephalitis viruses, and malaria parasites. Between 2007 and 2009, four individuals from Yolo County were infected with WNV. Since 2009, no further WNV cases have been identified in residents of Yolo County (Sacramento-Yolo Mosquito Vector Control District [SYMVCD] 2012).

The spreading of Lyme disease by ticks and of diseases transmitted by animal-hosts, such as bubonic plague and rabies, is not considered a substantial risk to public health in the Delta (Semitrophic Water Storage District 2010). Hence, the analysis on vectors focuses on the risks of increased mosquito production and the need for additional or expanded SYMVCD facilities to control the vectors with Project implementation.

Water that becomes stagnant in excess of five days can serve as a breeding ground for mosquitoes. In Yolo County, immature mosquitoes develop and mature in agricultural, industrial, domestic, and natural habitats (SYMVCD 2006). Of the estimated 25 species of mosquitoes in the Sacramento and Yolo counties, 4 species are of primary concern to public health: floodwater mosquitoes (*Aedes melanimon*) and standing water mosquitoes (*Culex tarsalis*, *Culex erythrothorax*, and *Anopheles freeborni*). **Table 4.8-2** gives additional details on each species.

Depending on seasonal and environmental conditions and the particular mosquito species involved, it generally takes from 3 to 12 days for a mosquito to complete its life from developed egg to early adult stage. In general, as temperature increases, the number of days required from hatching to emergence as an adult decreases. The potentially rapid life cycle of mosquitoes can result in rapid, eruptive mosquito populations related to relatively short-term variations in flooding and emergence, or seasonal tidal cycles.

Although no residential or urban areas occur in the vicinity of the Project area, scattered, nearby ranch residences are present. In addition, the Project site supports extensive areas of freshwater seasonal and perennial wetlands, as well as flood irrigated pasture areas that receive regular summer inundation. This overall situation has the potential to serve as mosquito breeding habitat onsite and is monitored by the SYMVCD. In 2010, mosquito control efforts by SYMVCD on the Project site resulted in the application of over 5,000 gallons of (S)-methoprene-based larvicide and nearly 1,200 gallons of Vactobac (a biological larvicide) for treatment of mosquito larvae. (Marty Scholl, personal communication, 2011).

**Table 4.8-2. Information on Four Mosquito Species Found in Yolo County and on Project Site[1]**

| Common Name | Scientific Name | Public Health Concern | Habitat | Potential Occurrence on Project Site | Peak Periods |
|---|---|---|---|---|---|
| **Floodwater Mosquitoes** | | | | | |
| **Wetlands mosquito** | *Aedes melanimon* | Involved in the encephalitis transmission cycle | Common in Yolo County, especially in managed seasonal wetlands, duck clubs, and irrigated pastures | Likely to be found near seasonal wetlands that undergo seasonal or periodic (a few days) wetting/flooding/drying, such as irrigated pasture, freshwater marshes in drought years, or ruderal areas. | Most abundant during the fall flooding and summer irrigations |
| **Standing Water Mosquitoes** | | | | | |
| **Western malaria mosquito** | *Anopheles freeborni* | Can transmit the malaria parasite | Common in rice growing regions, especially in rice fields, wetlands, duck clubs, and rain pools | Most likely to be associated with seasonal ponds (freshwater marshes) | Most abundant in summer |
| **Tule mosquito** | *Culex erythrothorax* | Involved in transmission of West Nile virus, western equine encephalomyelitis virus, and St. Louis encephalitis virus | Primarily found along the margins of tule swamps, lakes, and ponds, often over relatively deep water | Likely to be found associated with seasonal ponds (freshwater marshes). | Most active during fall, winter and spring |
| **Encephalitis mosquito** | *Culex tarsalis* | Able to transmit the encephalitis virus to humans; it has been known to transmit West Nile virus, western equine encephalomyelitis virus, and St. Louis encephalitis virus | Distributed throughout Yolo County, especially in wetlands (e.g., vernal pools and upland fresh water marshes), duck clubs, rice fields, and irrigated crops | Most likely to be associated with marshes that have been flooded for more than two or three weeks. In particular, this species may be associated with seasonal ponds (freshwater marshes). | Most active during the summer and fall months |

[1] Information taken from: Sacramento-Yolo Mosquito and Vector Control District 2006; California Department of Fish and Game and U.S. Fish and Wildlife Service 2004.

## *Regulatory Setting*

A myriad of laws and regulations at the federal, state, and local levels stringently regulate how hazardous materials and wastes are identified, handled, treated, transported, and disposed. For example, under the Toxic Substances Control Act (TSCA), the U.S. Environmental Protection Agency (USEPA) was able to ban PCBs beginning in 1978 through implementing a set of regulations. Electrical facilities, such as power poles, constructed after 1979 are unlikely to be associated with PCB-containing transformers. The actual levels of PCBs in specific equipment can only be confirmed by sampling and analysis of the mineral oil coolant within the actual pieces of equipment under consideration.

In California, USEPA has delegated to the California Department of Toxic Substances Control the authority to carry out another important federal law, i.e., the Resource Conservation and Recovery Act (RCRA) program with respect to permitting, inspection, compliance and corrective actions. This program ensures that projects are managed properly by following state and federal requirements.

USEPA has also granted enforcement authority over other federal hazardous materials regulations to the California Environmental Protection Agency (Cal-EPA), which in turn has delegated some of its responsibilities to the counties. Actions taken to implement the proposed Project that may affect hazards and hazardous materials are subject to applicable laws, regulations, and policies as described below.

## State Regulations

### California Occupational Safety and Health Act

The California Occupational Safety and Health Administration (Cal OSHA) regulates worker safety similar to federal OSHA, but also requires preparation of an Injury and Illness Prevention Program, an employee safety program of inspections, procedures to correct unsafe conditions, employee training, and occupational safety communication. In addition, Cal OSHA regulations indirectly protect the general public by requiring construction managers to post warnings signs, limit public access to construction areas, and obtain permits for work considered to present a significant risk of injury, such as excavations greater than five feet. The Project's excavations would involve removing soils between 2 and 6 ft deep below mean lower low water.

Cal OSHA Title 8 § 1541 requires that subsurface installations be identified prior to opening an excavation and ensure that they are marked. The excavator must receive a response from all known owners/operators of subsurface installations and must meet with owners/operators of high priority (such as high pressure pipelines, natural gas/petroleum pipelines, electrical lines greater than 60,000 volts, etc.). Subsurface installations are located within 10 ft of the proposed excavation prior to its opening. Only qualified persons (persons that meet training and competency requirements) can perform subsurface installation locating activities. All proposed employees must be trained in excavator notification/excavation activities. Excavators must immediately notify the subsurface installation owner/operator of any damage discovered during or caused by excavation activities. Compliance with applicable requirements of this law would be implemented once engineering designs are finalized.

Typically, applicable requirements found in titles 19 and 22 are included in construction contacts requiring contractors, among other things, to comply with the proper storage and disposal of substances such as fuel and lubricants. Compliance with applicable requirements for this portion of the law would be implemented once engineering designs are finalized.

### Unified Hazardous Waste and Hazardous Materials Management Regulatory Program

Cal-EPA oversees the Unified Hazardous Waste and Hazardous Materials Management Regulatory Program and has designated certain local agencies as Certified Unified Program

Agencies (CUPA) Program to implement the program. The local agencies regulate hazardous substances management with respect to the following areas: hazardous waste generators and hazardous waste onsite treatment; underground and aboveground storage tanks; hazardous materials release response plans and inventories (business plans), including Unified Fire Code hazardous materials management plans and inventories; and risk management and accidental release prevention programs. The CUPA in the Project area is the Yolo County Environmental Health Division of the County Health Department. Coordination with the Yolo County Environmental Health Division would be initiated once engineering designs are finalized.

#### Public Resources Code

Public Resources Code § 3208.1 authorizes the State Oil and Gas Supervisor of the Department of Oil, Gas, and Geothermal Resources (DOGGR) to order the re-abandonment of a previously abandoned well if construction of any structure over or in the proximity to a well could result in a hazard. Coordination with DOGGR would be initiated once engineering designs are finalized.

### Local Policies and Regulations

#### Yolo County General Plan

The County of Yolo Countywide General Plan (2009) contains various policies that encourage protection of the community from hazardous wastes and materials, as well as implementation of federal, state and county hazardous materials laws and regulations. Health and Safety Element Goal HS4 includes policies and implementation programs towards this end.

#### Yolo County Health Department

The Yolo County Environmental Health Division is the CUPA that enforces the regulatory-based Unified Hazardous Waste and Hazardous Materials Management Regulatory Program, and portions of the Uniform Fire Code that address hazardous materials in Yolo County.

## 4.8.2 Significance Criteria

Potential impacts from hazards and hazardous waste would be significant if the Project would exceed any of the following threshold criteria per Appendix G of the *State CEQA Guidelines*:

1. Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials.
2. Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment.
3. Result in substantial adverse physical impact associated with the provision of new or physically altered government facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable performance objectives [i.e., vector control].
4. Have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly.

## 4.8.3 Impacts

During Project implementation (both construction and post-construction for the additional tidal connection if needed), a set of activities under site preparation (see Section 3.4.2) would be undertaken that would involve the management of hazardous waste materials:

1. Identify and remediate suspected soils and materials contamination.
2. Prevent potential site contamination runoff (refer to Section 4.2, Water Quality).
3. Prevent or remediate existing/abandoned utilities' potential contamination and hazards.

One of the corrective measures, within the long-term operations and maintenance component of the Project would involve controlling and minimizing biological vectors (refer to Section 3.5.1).

Based on this information in conjunction with the environmental setting and the above significance criteria, the analysis for hazards/hazardous materials impacts is presented below.

### Impact 4.8-1: Effects of Soils and Materials Contamination

*Applicable Significance Criteria: 1, 2, and 4*

#### Effects from Hazardous Waste Contamination Sites

As noted in the setting, residuals of agricultural chemicals in agricultural soils that have been managed properly are not typically classified as hazardous wastes sites. However, through routine environmental assessments, a few, isolated areas on the Project site were identified as contaminated. These known sites have been cleaned up (see **Table 4.8-1**). Additionally, no work would occur in the vicinity of leach fields or water wells. Hence, with Project implementation (during both construction and post construction), none of the thresholds for the Significance Criteria listed above in Section 4.8.2 would be reached. Consequently, **no impact** would occur in areas where soils had been previously excavated from identified contaminated sites.

The removal of irrigation water system facilities (e.g., gates and flaps) during construction or post construction (i.e., addition of tidal connection) would involve metal objects that would not release hazardous waste. However, for those facilities that may also contain treated/painted wood, which could release hazardous waste, this would result in a **potentially significant impact**, if not mitigated. Mitigation Measure 4.8-1 would reduce this impact to **less than significant**. This measure would involve monitoring, testing, removal of hazardous wastes, and disposal in accordance with applicable federal and state laws, if such materials were to be found.

Should previously unknown hazardous materials or wastes be encountered during construction at the site or during installation of the additional tidal connection during the post-construction phase, the site contamination would be examined, tested, and discussed with the Yolo County Environmental Health Division (USEPA's designated CUPA). Fulfillment of regulatory requirements is generally imposed on a case-by-case basis and specific to conditions at each affected site. Based on this analysis, this situation would result in a **potentially significant impact**, if not mitigated. Mitigation Measure 4.8-1 would reduce this impact to **less than**

**significant**. Federal and state regulations do require that any contaminated soil or groundwater be remediated or removed prior to or during the construction of the Project.

Impacts related to site runoff potentially containing oils and fuels from construction vehicles and equipment are addressed in Section 4.2, Water Quality.

#### Effects from Contamination Due to Leaking PCB Transformers

The ages of the various power poles at the Project site are not known and whether or not their transformers have been replaced over time. It is suspected that some of the poles were erected in the 1960s, or possibly earlier. USEPA banned the use of PCB in transformers in 1978, so any transformer installed after 1979 should not contain PCB. Due to the uncertainty of the ages of the transformers, this analysis relies on a conservative approach. That is, should electrical power lines that are proposed for relocation include leaking transformers that contain PCB, such relocations would result in a **potentially significant impact**, if not mitigated. Mitigation Measure 4.8-1 would reduce this impact to **less than significant**. Regulations stipulate that the remediation of PCB for these particular transformers and any resultant soil or groundwater contamination would be the responsibility of Pacific Gas and Electric Company (PG&E) (refer to Section 3.4.2, Site Preparation).

### Impact 4.8-2: Hazards with Natural Gas Wells and Related Pipelines

*Applicable Significance Criteria: 1, 2, and 4*

Workers on the Project site could be exposed to hazardous conditions (e.g., potential explosion and fire) associated with the presence of natural gas wells onsite. As shown in **Figure 4.8-1**, six of approximately 21 mapped (known) plugged gas wells occur in the area that would be converted to tidal wetlands or toe berm (Soils Reuse Options #1 and #3). All six wells have been abandoned and plugged with cement plugs within the borehole at several locations; additionally, mud was placed within the borehole between plugs. This process prevents the migration of gas fluids within the piping system to the surface. Cement plugs vary in length of approximately 20 to 40 ft and are typically located at depth (above the mineral source), a second plug may be placed at mid-depth, and finally a surface plug is added 5 to 10 ft below ground where the final well casing is cut off and a steel plate is welded on top.

If Project grading would encounter the plugged wells, it could potentially strike the surface plug and plate, which could damage the upper portion of the surface plug. Such damage may not likely result in the release of natural gas resources or fluids, because gas reserves are located several 1,000 ft below ground. Furthermore, the placement of cement plugs at depth in addition to the placement of mud within the borehole, prevent the release of gas resources in the event that a surface plug is altered or damaged. None of the six wells within the impact footprint (restoration footprint) were in active production; these exploratory wells were drilled and then abandoned shortly after due to, lack of, or low production. Yet, even with this minimal risk and the uncertainty of encountering other non-mapped natural gas wells during construction and post construction (i.e., additional tidal connection), this conservative analysis concludes that this activity would result in a **potentially significant impact,** if not mitigated. Mitigation Measure 4.8-2 would reduce this impact to **less than significant** through coordination with Yolo

County and the State of California (DOGGR) to implement plans and actions to remove, relocate, or cap any hazards found onsite.

It is unlikely that related, distribution natural gas pipelines were connected to the production wells within the Project footprint, since the wells were not in active production. However, such pipelines connecting other active or formerly active wells within the Project vicinity would need to be identified. Distribution pipes within the vicinity of the Project site are owned and operated by PG&E. Preliminary mapping provided by PG&E indicates that a portion of a distribution pipeline is located within the area proposed for the Soils Reuse Options #1 and #3 (i.e., relocation of the borrow ditch associated with the west Yolo Bypass levee) (Brian McCoy, PG&E, pers. comm. October 2010). Damage to distribution gas pipelines could be a **significant impact** (i.e., explosion and fire) during Project implementation (i.e., construction and post construction – additional tidal connection), if not mitigated. Mitigation Measure 4.8-2 would reduce this impact to **less than significant**.

For Soils Reuse Options #2 and #3 during the construction phase, placement of excavated soils as a permanent onsite soil stockpile would occur within four agricultural fields located in the northwest corner of Yolo Ranch. These fields are currently used for forage hay production. Four known abandoned natural gas wells occur within the fields proposed for the permanent onsite stockpile. Under this scenario, soil would be placed on the fields, raising the surface elevation to approximately 15.5 to 20.5 ft (North American Vertical Datum of 1988); an increase of 3 to 9 ft from their current average surface elevation, possibly damaging these abandoned gas wells and any related piping that would lead to a **potentially significant impact**, if not mitigated. Consultation, coordination, and approvals from agencies responsible for overseeing applicable hazardous materials regulations as proposed in Mitigation Measure 4.8-2 would reduce this impact to **less than significant**.

## *Biological Vectors*

### Impact 4.8-3: Impacts related to Mosquito Control

*Applicable Significance Criteria: 3 and 4*

#### Physical Impacts from New or Altered SYMVCD Facilities

SYMVCD has been monitoring and controlling mosquitoes at the Project site for a number of years for public health purposes. This function would not change with Project implementation, during the construction phase and throughout the post-construction phase.

The proposed Project would have a long-term operations and maintenance component (see Section 3.5.1) that would include controlling and minimizing biological vectors, including mosquitoes. The hallmark of this control would be primarily in habitat management, i.e., wetland design and vegetation management. Generally, restored tidal marsh areas would not be major sources of breeding grounds for mosquitoes, because of increased tidal flushing, greater depth of water, and more favorable habitat to fishes that would act as biological controls.

Overall, Project elements for controlling or minimizing mosquitoes would include:

1. **Habitat management.** Designing the restoration efforts to minimize suitable habitat for the mosquitoes; constructing shallow mosquito control ditches to tidal channels, if needed, with the use of rotary ditchers; and employing vegetation management.
2. **Biological control.** Providing suitable habitat for fishes, birds, and bats to prey on the various stages of mosquitoes' life cycles.
3. **Chemical treatment.** Applying, as a last resort and based on threats to public health, appropriate chemical treatments in consultation with SYMVCD.

Consequently, at a minimum, the proposed Project would be beneficial in the control of mosquitoes and would lessen the resources that SYMVCD now employs in mosquito control. No new or modified SYMVCD facilities would be required to further combat mosquito production at the Project site. SYMVCD regards the proposed Project, specifically the restoration of tidal flow, as beneficial for mosquito vector control and expects the Project to greatly reduce mosquito control efforts onsite (Marty Scholl, personal communication, 2011). Based on this analysis, **no physical impact** would occur in conjunction with the need for additional or altered government facilities (i.e., vector control) with Project implementation.

#### Environmental Health Effects from Mosquito Production

The design or habitat features of wetland restoration most relevant to human health relate to:

1. Mosquito production (frequency, type, abundance and location of mosquitoes produced); and
2. Human exposure to mosquitoes by either dispersal of mosquitoes from source areas, or entry of source areas (e.g., marshes, sloughs) by humans.

Specific marsh habitat features that are most likely to be risks for excessive production of mosquitoes include:

1. Poorly drained, flat to gently sloping sheltered marsh areas with gradually fluctuating water levels, low turbulence, and rich organic matter from decomposition. Marsh plains edged by artificial berms that obstruct sheet-flow drainage across marshes are likely to be associated with this mosquito sub-habitat.
2. Areas of dense marsh vegetation with minimal access to fish predators, strong surface currents, or exposure to wind-generated waves.
3. Areas of gradual seasonal fluctuation in water levels, alternating between wetted and desiccated ground.

Conversely, marsh habitat features that are inherently likely to constrain mosquito production are associated with strong daily tidal fluctuation and currents, exposure to surface turbulence (wind-waves, currents) of open water surfaces, and exposure to fish predators that are widespread in tidal sloughs.

Areas of the proposed Project differ in the extent to which they could contribute to potential increases or decreases of mosquito production relative to existing conditions. Generally, deep (over 2 ft) open water areas are likely to be unproductive of floodwater mosquitoes. Low intertidal marshes (i.e., tule marshes with bed elevations near mean low water) with full tidal range are also unlikely to produce mosquitoes.

Marsh types that have variably higher risk of standing water mosquito production would include: interior areas of mid-intertidal or high intertidal marsh, remote from tidal channels; zones of wrack (tidal debris) accumulation within the marsh plain or marsh edge, particularly at downwind ends (corners) marshes or near topographic high areas; channel reaches that develop obstructed circulation (e.g., blockage by debris jams); and marsh areas that are exposed to flood deposits of sediment leaving variable topography, drainage, and debris. Hence, *C. tarsalis* could be associated with isolated, marginal ponded habitats that could form within restored freshwater tidal marsh. *C. erythrothorax* and *A. freeborni* could be associated with isolated, marginal ponded habitats (those flooded for more than two to three weeks), or poorly drained areas that could form within restored freshwater tidal marsh.

In general, though, the proposed Project would reduce levels of mosquito production on the Project site below those of existing conditions, because it would substantially reduce the area of seasonal and perennial wetlands and irrigated pastures – habitat with vegetation and hydrologic characteristics that can promote mosquito production – on the site in favor of tidal wetlands which, as described above, are far less suitable for mosquito production.

Restored tidal marsh areas would not be sources of floodwater mosquitoes (*A. melanimon*), due to increased tidal flushing. This type of physical alteration would reduce available habitat for this mosquito species and improve access for fishes, which would serve as a form of biological control (Resh and Balling 1983). Monitoring data collected from the Tubbs Island and Lower Tolay Creek Tidal Marsh Enhancement Project (Sonoma County) documented a substantial reduction of mosquito larvae within enhancement areas. Enhancement activities involved increasing the number of tidal channels within the existing marsh plain and expanding the mash interior mudflats. Mosquito larvae were detected in standing water areas prior to this activity being implemented. Following enhancement, it was noted that with the substantial reduction in standing water area, no mosquito larvae were detected (Wetlands and Water Resources 2010).

For control of the standing water mosquitoes, the proposed Project would, in general, create tidal areas that were greater than 2 ft. However, should conditions arise after post construction that lead to standing water, Section 3.5.1 identifies a method in which to reduce such isolated, marginal ponded habitats, including the use of rotary ditchers to construct mosquito control ditches and connecting them to tidal channels. These ditches would be dug in a sinuous pattern to approximate natural tidal channels to maintain the wetlands but also control mosquito production. Other measures identified for post construction would include: a possible additional tidal connection, which in turn could provide additional connections for mosquito control ditches, as needed; biological controls, and if appropriate, chemical treatments. SYMVCD would be consulted further in such matters.

No urban or residential areas occur in the vicinity of the Project; however, scattered, nearby ranch residences would be subject to mosquitoes produced both on and off of the Project site. This impact would not likely to change noticeably compared with existing conditions at those ranches. Based on this analysis, this environmental health effect would be **less than significant**.

Because none of the vector control impacts listed in Section 4.8.3, Impact 4.8-3, would be significant or potentially significant, no mitigation measures would be required. Additionally, the overall effect of mosquito control would be **beneficial** with Project implementation.

## 4.8.4 Mitigations

### Mitigation Measure 4.8-1: Effects of Soils and Materials Contamination

Based on final design and environmental/physical conditions onsite, one or more of the following elements of this mitigation measure shall be undertaken if evidence indicates that soil sites and/or materials are contaminated per applicable hazardous waste laws and regulations:

- Develop and implement a monitoring and treatment/disposal plan in accordance with all applicable hazardous waste laws and regulations.
- Examine soil below any pole-mounted transformers on the portion of the Project site to be graded. If there is evidence (such as discoloration of the soil) that PCBs have leaked from the transformers, then Pacific Gas & Electric (PG&E) shall be contacted. It is the responsibility of PG&E to perform a soils investigation and cleanup if any of the pole-mounted transformers are determined to have leaked PCBs.
- Test or assume that the wood demolished and removed from the existing irrigation system contains potentially hazardous waste (e.g., lead paint, creosote, arsenic, etc.) and then have it treated, recycled, or disposed of in accordance with applicable regulations concerning hazardous waste.

Implementation of Mitigation Measure 4.8-1, above, would reduce these potential effects of soils and materials contamination to **less than significant**.

### Mitigation Measure 4.8-2: Hazards with Natural Gas Wells and Related Pipelines

- Develop and implement actions in coordination and concurrence with the Yolo County Fire and Emergency Services Department and California Division of Oil, Gas, and Geothermal Resources to comply with applicable requirements of the Well Review Program (DOGGR 2007) and other applicable public safety requirements. Such measures include contacting the California Underground Service Alert in a timely manner prior to excavation, inspecting site to look for physical evidence of underground facilities, marking off excavated areas, having an emergency plan in place, etc.

Implementation of Mitigation Measure 4.8-2, above, would reduce this potential impact to **less than significant**.

As identified under site preparation (see Section 3.4.2), Project implementation would involve the management of hazardous materials by: identifying and remediating suspected soils and materials contamination, preventing potential site contamination runoff (refer to Section 4.2, Water Quality), and preventing or remediating existing/abandoned utilities' potential contamination and hazards. Additionally, with adherence to all applicable laws and regulations governing hazardous materials (refer to Section 4.8.1, Regulatory Setting) and implementation of the above mitigation measures, no unavoidable, significant adverse impacts associated with hazards and hazardous materials would result with Project implementation.

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# 4.9 Energy Consumption

## 4.9.1 Setting

### *Natural Gas and Electricity*

In Yolo County, natural gas and electricity are mostly provided by the investor-owned utility, Pacific Gas and Electric (PG&E). PG&E relies on a variety of energy sources to serve its customers' needs, including fossil fuels, natural gas fields, hydroelectric facilities, solar energy, hydrogen fuels, and biofuels. Concerning natural gas, approximately 25 active gas fields exist within Yolo County and are important to the County's economy (County of Yolo 2009). In 2010, over 62 million therms of natural gas and 1,658 giga-watts per hour (gWh) of electricity were consumed by residential and non-residential sectors within Yolo County[37].

On the Project site, abandoned gas wells with appurtenant structures (e.g., well pads, casings, and defunct gas transmission lines) exist within a portion of the Millar natural gas field (see **Figure 4.8-1**). Exploratory drilling for natural gas occurred on the site between 1944 and 2005. However, out of roughly 21 wells present, only four were ever in production. Two natural gas drilling platforms remain within the Project footprint.

The platform for the Sorenson A-1 gas well (American Petroleum Institute [API] Well Number 11320079) located in the northwest quadrant of Section 19 on Assessor's Parcel Number (APN) 033-390-001 was constructed in 1969 and abandoned in 1989. The platform for the Yolo Ranch 1-16 gas well (API Well Number 11320959) located in the southwest quadrant of Section 16 on APN 033-390-001 was constructed in 1990 and abandoned in 1995.

High-voltage power lines cross the Project footprint's northwestern corner. Low-voltage power poles are present along the western side of the Project footprint, within the Yolo Ranch complex (outside of the Project site), in the eastern east portion of the property near the area known as the "Duck Pond," and on the Yolo Flyway Farms property (see **Figure 2-8**).

### *Transportation Fuels*

Reported sales in Yolo County for 2010 were 100 million gallons for gasoline and 34 million gallons for diesel fuel[38].

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[37] Data was obtained through the Energy Consumption Data Management System as maintained by the California Energy Commission at http://www.ecdms.energy.ca.gov/ on April 17, 2012.
[38] Data source: Energy Almanac as maintained by the California Energy Commission at http://energyalmanc.gov on April 17, 2012.

## 4.9.2 Significance Criteria

Potential impacts to energy would be significant if the Project would exceed any of the following threshold criteria per Appendices F and G of the *State CEQA Guidelines*:

1. Substantial effects on local and regional energy supplies and on requirements for additional capacity.
2. Result in substantial adverse physical impacts associated with the provision of new or physically altered facilities, need for new or physically altered facilities, or the construction of which could cause significant environmental impacts, in order to maintain acceptable public services.
3. Create wasteful, inefficient, and unnecessary consumption of energy during construction, operation, maintenance, and/or removal.

## 4.9.3 Impacts

### *Natural Gas*

#### Impact 4.9-1: Impacts related to Natural Gas Usage

*Applicable Significance Criteria: 1 and 2*

It is reasonable to assume that it would be highly unlikely that construction equipment selected by the contractor would be powered by natural gas, because while this type of fuel can be used in trucks, it must be either compressed or liquefied, and vehicles must be equipped to carry and burn it. Natural gas equipment can also be more costly. More than likely, major equipment would be fueled by either diesel or gasoline (refer to discussion below). Additionally, small amounts of propane might be used, but again its use would be dependent on the choices made by the contractor. No expansion or new facilities would be built to store and distribute natural gas because of the Project. Based on this information, the Project would have **no impact** on natural gas demand in Yolo County during construction.

Existing natural gas wells onsite have not been in use, if ever, for a long time and do not play a role in the extraction of natural gas in Yolo County. The last well was abandoned in 1995. The Project would remove, relocate, or abandon these existing structures as part of the site preparation, based on the final engineering design. Any plans by PG&E and/or the owners to resurrect and restart these structures are not known at this time, are not part of this Project, and would require additional environmental compliance review by the applicable lead agency. Therefore, the Project would have **no impact** on active natural gas wells/fields nor would it foster the creation of new wells/fields during the construction phase. Issues concerning potential contamination can be found in Section 4.8, Hazards and Hazardous Materials.

With the post-construction phase, a variety of activities would be implemented, i.e., long-term operations and maintenance, project outcome verification monitoring, and regional science support. None of these activities would place a new demand for natural gas nor substantially consume it during implementation. Most actions would involve minor impacts to the physical environment such as sampling, taking core samples in the ground, and other monitoring and scientific activities. The possible new tidal connection would have no additional impacts to natural gas (demand or facility construction) other than what might occur during the original construction of the Project. Based on this information, **no impacts** to active natural gas wells and fields or to substantial increases in demand for natural gas would occur during post construction.

## *Electricity*

### Impact 4.9-2: Impacts related to Electricity Usage

*Applicable Significance Criteria: 1, 2, and 3*

A temporary connection to an existing power line would supply electricity to the contractor's trailer during construction. The trailer would be centrally located within the Project site, as selected by the contractor. Electricity use by the trailer would be less than the use of one residential connection (about 4,500 kilo-watts per hour [kWh] total[39]) during construction. Power hook ups would also be used, to the feasible extent, at equipment staging areas. However, if electricity was not available, then diesel and gasoline generators would be utilized (see discussion below). This electrical usage for the Project would not result in any new electrical facilities nor require substantial upgrades to the existing power lines onsite or offsite. Additionally, due to high costs of energy and the short duration of the construction phase, the contractor would most likely be incentivized to not be wasteful of electricity. The overall consumption would be miniscule, especially when compared with the existing annual electricity consumption for Yolo County (i.e., 1,658 gWh). N**o impact** related to electricity would occur.

For post-construction activities, the possible new tidal connection would have no additional impacts to electricity (demand, facility construction, or wastefulness) than what might occur during the original construction of the Project. Other activities, such as monitoring or sampling, would have minimal, if any, electricity requirements. On this basis, **no impact** would result to electricity usage from post-construction activities.

## *Transportation Fuels*

### Impact 4.9-3: Impacts from Transportation Fuel Consumption

*Applicable Significance Criteria: 1, 2, and 3*

Construction of the Project would involve excavation of channels, grading down of farmlands, and disposal of graded/excavated soils. Two construction equipment scenarios have been considered during this activity, i.e., the use of haul trucks or scrapers to move materials within the Project site. Both options would involve the movement of between 2.4 million cubic yards (mcy) and 2.5 mcy of soil, depending on which soil reuse option would be selected. In addition to haul trucks and scrapers, use of other equipment such as dozers, loaders, backhoes, water

[39] Construction trailer specifications are not known at this time. For the EIR analysis, it was assumed that the size of one large trailer would be 800 square feet (sq ft) or two smaller trailers each at 400 sq ft. A typical residential electrical connection of a similar square footage for one year would be about 9,000 kWh total. Within the approximate six months of working onsite, it was therefore estimated that the electricity consumed by one or two trailers would be about 4,500 kWh total.

trucks, and excavators would also be employed. Such equipment would consume refined petroleum fuel products in the form of diesel fuel. Other equipment, such as generators, pumps (for dewatering, if necessary), and power tools may also rely on energy from diesel fuel and related fuel products such as propane.

The volume of diesel fuel that that the Project would consume over the approximately six-month construction period has been estimated by comparing the Project-related generation of metric tons of carbon dioxide equivalents ($MTCO_2e$) emissions to U.S. Energy Information Administration diesel fuel coefficient data (USEIA, 2011). As described in Section 4.6.3, under Impact 4.6-5: Greenhouse Gases and Global Climate Change Contributions, temporary construction activities would result in the generation of up to 2,065 or 1,702 $MTCO_2e$ emissions, depending whether scrapers or trucks, respectively are used to haul soil. Assuming that the vast majority of $CO_2$ emissions would be generated by the combustion of diesel fuel, and the understanding that 10.15 kilograms of $CO_2$ emissions are generated for every gallon of consumed diesel fuel, it is estimated the proposed Project would consume up to approximately 200,000 gallons of diesel fuel with haul trucks or approximately 170,000 gallons of diesel fuel with scrapers. This would result in about 1 percent of the overall Yolo County annual consumption for diesel fuel if scrapers would be used, and 1.2 percent of the county's consumption for haul trucks.

Gasoline would also be consumed during the Project, mostly by commuting worker vehicles. In this instance, up to 50 construction workers would be traveling to/from the work site. Even if 50 vehicles were utilized, based on a 40-mile roundtrip and an average fuel consumption rate of 15 miles/gallon, the gasoline consumption would be about 24,300 gallons for the entire construction phase – a small amount of fuel when compared with the overall Yolo County annual consumption (i.e., 0.05 percent).

No new facilities or modifications to existing facilities that store, process, or distribute transportation fuels would be required.

Project construction-related energy demand would represent irreversible consumption of finite fossil fuel energy resources. However, due to high costs of these fuels and the short duration of the construction phase, the contractor would most likely be incentivized to not be wasteful or inefficient with the equipments' energy consumption. The contractor, working with the design team, would develop a number of ways to save fuel and cut down on tail pipe emissions (refer to Section 4.6, Air Quality and Greenhouse Gases; Mitigation Measure 4.6-1):

1. **Proper specifications.** Using the appropriate heavy-duty construction vehicle for the task to ensure proper fuel efficiency.
2. **Regular tune-ups.** Maintaining the vehicle's engine and related parts to greatly improve fuel efficiency.
3. **Minimize engine idling.** Exercising care in not allowing the engine to idle for long periods of time thereby preventing: burning expensive fuel needlessly, releasing contaminant air emissions and greenhouse gases, and accelerating the wearing out of the engine's components.

4. **Control speed.** Controlling speed and avoiding sudden acceleration to promote fuel efficiency and to reduce the wear and tear on a variety of components including the engine, clutch, valves, and tires.

Based on the above analysis, consumption and potential inefficiencies of using diesel and gasoline during the Project's construction would be **less than significant**. With respect to new or modified fuel facilities, **no impact** would result with Project implementation.

Long-term operations of the Project would include minor maintenance activities, potential corrective actions, and monitoring. A limited degree of operations and maintenance activities (e.g., levee improvement) would involve some labor as well as energy usage by equipment and vehicles, but this would represent a minor long-term use of energy. Transportation vehicles would also be used to bring monitors and scientists to and from the site periodically. Overall, these long-term operational activities would not involve inefficient, wasteful, or unnecessary consumption of energy. The amount of long-term energy requirements associated with the Project for these post-construction activities would result in **no impact** on existing energy resources available to the local area or to Yolo County.

### 4.9.4 Mitigations

Because none of the energy impacts listed in Section 4.9.3 would be significant or potentially significant, no mitigation measures would be required with Project implementation.

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# 4.10 Cumulative Impacts

During the preparation of an environmental impact report (EIR), the California Environmental Quality Act (CEQA) and the *State CEQA Guidelines* require the evaluation of a project's cumulative impacts on the physical environment (*State CEQA Guidelines*, California Code of Regulations [CCR] § 15130). Cumulative impacts are two or more individual effects that when occurring simultaneously can amplify these effects further or exacerbate other environmental impacts (*State CEQA Guidelines*, CCR § 15355).

Cumulative impacts may arise when individual effects originate from a single project over its multiple phases, or from a number of separate projects that are occurring within similar timeframes and geographical areas as that of the proposed project. Moreover, potential adverse changes to the physical environment due to cumulative impacts may arise with the incremental impact of the project when combined with other closely related past, present, and reasonably foreseeable future projects (Public Resources Code [PRC] § 21083(b) and *State CEQA Guidelines*, CCR § 15355[b]).

To determine if an impact is cumulative, two determinations must be made:

1. Is the combined impact of the project and other projects significant (*State CEQA Guidelines*, CCR § 15130[a][2])?
2. Is the project's incremental effect cumulatively considerable (*State CEQA Guidelines*, CCR § 15130[b])?

A cumulative impact must be analyzed if the combined impact is significant and the project's incremental effect is found to be cumulatively considerable. This discussion must reflect the severity of the impacts and the likelihood of occurrence, but not necessarily in as great as detail as those discussions on effects attributed to the project alone. Additionally, CEQA states that when a project's contribution is not cumulatively considerable, then the EIR need only note the reason why and then no further discussion is required.

To perform an adequate analysis, CEQA recommends relying on one of two strategies:

- **List Approach.** A list of past, present, and probable future projects producing related or cumulative impacts; or
- **Projection Approach.** A summary of projections contained in an adopted general plan or planning document, or in a prior environmental planning document, which has been adopted or certified, that describes or evaluates regional or area-wide conditions contributing to the cumulative impacts.

For the purposes of this section of the Draft EIR, the list approach is utilized. In addition, the geographic scope of the area affected by the cumulative effect should be defined in the EIR (*State CEQA Guidelines*, CCR § 15130[b][3]). Accordingly, the geographic scope of the area affected by the proposed Project for each of the environmental resource topics addressed in this Draft EIR is identified in **Table 4.10-1**.

**Table 4.10-1. Geographic Areas that Would be Potentially Affected by the Proposed Project**

| Environmental Resource Topic | Geographic Area Potentially Affected |
|---|---|
| Hydrology | Area-wide drainage system with implications for the Yolo Bypass |
| Water Quality | Local ditches and canals with implications for the Yolo Bypass |
| Terrestrial Biological Resources | Lower Yolo Bypass habitat generally (scope of area may vary with the listed species analyzed) |
| Aquatic Biological Resources | Local drainage system (aquatic habitat at individual waterside improvement sites), with implications for the Lower Yolo Bypass and northwest portion of the Sacramento-San Joaquin River Delta (Delta) |
| Agricultural Resources | Yolo County with regional implications (i.e., Delta and Suisun Marsh) |
| Air Quality and Greenhouse Gases | Region-wide (i.e., Yolo-Solano Air Quality Management District's jurisdictional service area, a subset of the Sacramento Valley Air Basin); global for greenhouse gas emissions |
| Cultural Resources | Local ground disturbance sites and area-wide, landscape level |
| Hazards and Hazardous Materials | Local ground disturbance sites |
| Energy Consumption | Region-wide service areas with emphasis to Yolo County |

A literature review and consultations with knowledgeable agency representatives revealed that the Project would be one of many activities, projects, and programs proposed for in Yolo County, adjacent counties, and in the Sacramento-San Joaquin River Delta (Delta) region. These various projects can be placed into one or more categories:

- Habitat protection and ecosystem restoration.
- Water conveyance and water quality.
- Flood control and levee maintenance.
- Local and regional land use planning activities.

These planned or ongoing projects, activities, and programs are listed in **Table 4.10-2**. The table also includes information on the projects' locations, brief descriptions, and status as of the time of publication of the Draft EIR. With respect to the latter category, website links are provided, whenever possible, so that more detailed information is available to the public and decision-makers. **Figure 4.10-1** illustrates potential habitat restoration sites throughout the Delta and Suisun Marsh.

Following **Table 4.10.2**, the cumulative impacts are evaluated in the same order as found in Chapter 4.0, i.e., hydrology, water quality, terrestrial biological resources, aquatic biological resources, agricultural resources, air quality and greenhouse gases, cultural resources, hazards and hazardous materials, and energy consumption.

**Table 4.10-2. List[1] of Related Projects Utilized in Conducting the Cumulative Impacts Analyses for the Proposed Lower Yolo Restoration Project**

| Names of Related Projects and Lead Agencies (CEQA and/or NEPA) | Location | Brief Descriptions | Status as of April 2013 |
|---|---|---|---|
| **Anadromous Fish Screen Program (AFSP)**<br>(Bureau of Reclamation, U.S. Fish and Wildlife Service [USFWS], and California Department of Fish and Wildlife [CDFW]) | Multiple Delta counties, including Yolo County | Protect juvenile Chinook salmon (all runs), steelhead, green and white sturgeon, striped bass and American shad from entrainment at priority diversions throughout the Central Valley, including Sacramento and San Joaquin rivers, their tributaries, the Delta, and the Suisun Marsh. The types of projects eligible for cost-share funds under the AFSP include: construction fish screens on unscreened diversions; rehabilitating existing fish screens; replacing existing non-functioning fish screens; and relocating water diversions to less fishery-sensitive areas. Since 1994, the AFSP has screened 35 high priority diversions ranging from 11 cubic feet per second (cfs) up to 960 cfs. Cumulatively, the AFSP has screened over 5,412 cfs in the Central Valley and the Delta. | Ongoing program. For further information, go to http://www.fws.gov/cno/fisheries/cvpia/AnadromFishScreen.cfm and http://www.usbr.gov/mp/cvpia/docs_reports/meetings/2013/AFSP_Presentation-Public_Meeting1-17-13.pdf?bcsi-ac-a8c0312cffb9ad05=2032707400000002VxA/1szVEffrvD5ei75Ccqw0fDhLBwAAAgAAAPDDGwCEAwAAAwAAAF+wAAA= |
| **Aquatic Weed Control Program**<br>(California Department of Boating and Waterways) | Delta and its tributaries (multiple Delta counties, including Yolo County) | To implement both short- and long-term measures to control Brazillian waterweed (*Egeria densa*) and water hyacinth (*Eichhornia crassipes*). Beginning in 2001, this weed control program includes treatment with herbicides, environmental monitoring, regulatory compliance, and surveillance. Permits restrict program treatment in the Delta from April 1 through October 15.<br>Since 1982, the water hyacinth program includes treatment with herbicides, mechanical methods, and biological controls. Permits restrict program treatment of chemicals in the Delta from July 1 through October 15. Every season surveys are done in the Delta region to determine where the hyacinth is located and which areas are in most need of treatment.<br>During the 2012 Legislative session, Assembly Bill 1540 (Buchanan) was approved giving the California Department of Boating and Waterways authority to control a new aquatic weed that has been recently found in the Delta, the South American spongeplant (*Limnobium laevigatum*). | Ongoing program with the agency pursuing new regulatory permits in 2013. Most recent environmental documentation for the waterweed: 2006 Second Addendum to the Certified 2001 Final Environmental Impact Report (EIR) with Five-Year Program Review and Future Operations Plan; 2007 National Marine Fisheries Service Biological Opinion on the program. Go to:<br>http://www.dbw.ca.gov/PDF/Egeria/EIR/eirAdd2.pdf?bcsi-ac-a8c0312cffb9ad05=2032707300000002RzoJ+KZIMVCXPSwBnd/nyDf8LEyFBwAAAgAAANGhHACEAwAAAAAAABW2AAA=<br>A Programmatic EIR for the water hyacinth was certified on December 8, 2009. National Marine Fisheries Service (NMFS) provided its biological opinion on this program on April 4, 2006. Go to:<br>http://www.dbw.ca.gov/BoaterInfo/WaterHyacinth.aspx |
| **Bay Delta Conservation Plan (BDCP)**<br>(California Department of Water Resources [DWR]; Bureau of Reclamation [Reclamation]) | Multiple Delta counties, including Yolo County | Provide comprehensively for the conservation and management of 54 covered species in the Delta, along with modifying certain existing structures/operations and proposing new water supply diversion facilities in the Delta by state and federal water contractors. If approved, BDCP would restore at least 55,000 acres of tidal wetlands. Specific projects are not defined at this time, but extensive tidal wetland restoration is expected in Cache Slough. | Notice of Preparation was released for review on February 13, 2009. Revised Administrative Draft BDCP released February 2013. Public draft BDCP and EIR/EIS expected summer of 2013. The construction target is 2014. Go to http://baydeltaconservationplan.com/Home.aspx |

**Table 4.10-2. List[1] of Related Projects Utilized in Conducting the Cumulative Impacts Analyses for the Proposed Lower Yolo Restoration Project**

| Names of Related Projects and Lead Agencies (CEQA and/or NEPA) | Location | Brief Descriptions | Status as of April 2013 |
|---|---|---|---|
| **Biological Opinions and Conference Opinions on the Long-term Operations of the Central Valley Project and State Water Project for Delta Smelt and Salmonids** (USFWS 2008 and NMFS 2009) | Multiple counties including Yolo County | Issuance of final biological opinions by each regulatory agency with findings that continued operations of the Central Valley Project (CVP) and the State Water Project (SWP) would likely jeopardize several listed species, including the delta smelt and salmonids. These agencies identified reasonable and prudent alternatives that, if implemented, would avoid the likelihood of jeopardizing the continued existence of those listed species. Included in these opinions are actions such as the restoration of 8,000 ac of land to intertidal habitat for the delta smelt and 17,000 to 20,000 ac of seasonal floodplain habitat for the salmonids. | Ongoing. Biological opinions (BiOps) are undergoing revisions due to the outcomes of recent litigation; however, implementation of habitat tidal restoration still remains. The proposed Lower Yolo Restoration Project would partially fulfill that state and federal requirement. Go to the USFWS and NMFS websites: http://www.fws.gov/sfbaydelta/cvp-swp/cvp-swp.cfm and http://swr.nmfs.noaa.gov/ocap.htm |
| **Cache Creek, Bear Creek, Sulfur Creek, Harley Gulch Mercury Total Maximum Daily Load (TMDL) Plan** (Central Valley Regional Water Quality Control Board [CVRWQCB]) | Cache Creek watershed, including Yolo County | Develop and implement a plan to reduce mercury loads through a combination of actions to clean up mines, sediments, and wetlands; identify engineering options; undertake control erosion reduction actions; and perform studies and related monitoring efforts. | Ongoing program. In 2005, CVRWQCB proposed to amend its Water Quality Plan to control mercury in the Cache Creek watershed. Go to: http://www.waterboards.ca.gov/water_issues/programs/tmdl/#rb5 |
| **Cache Creek Resources Management Plan Program (CCRMP), Off-Channel Mining Plan (OCMP), Cache Creek Area Plan (CCAP), and Cache Creek Improvement Program (CCIP)** (County of Yolo) | Yolo County | Implement a framework of goals and objectives viewing the creek as a total system (CCRMP). The CCRMP covers agriculture, aggregate resources (OCMP), riparian and wildlife resources, water resources, floodway and channel stability, open space and recreation, and the cultural landscape. The CCAP comprises both the OCMP and the CCRMP. The CCIP implements the goals, objectives, actions, and performance standards of the CCRMP as it relates to the stabilization and maintenance of the Cache Creek channel. | Plan first adopted in 1996 and revised in 2002. Program ongoing. Refer to: http://www.yolocounty.org/Index.aspx?page=1601 and http://www.yolocounty.org/Index.aspx?page=1598 |
| **CALFED Ecosystem Restoration Program Conservation Strategy/Delta Regional Ecosystem Restoration Implementation Plan** (CDFW) | Delta and Suisun Marsh/Bay | Address the critical environmental conditions in the Delta and Suisun Marsh/Bay during the first phase of CALFED Stage 2 implementation (2009-2020). The strategy includes an ecosystem restoration program (ERP) plan, multi-species conservation strategy, strategic plan for implementation that includes adaptive management, performance measures and monitoring, and proposed performance targets (i.e., Delta outflow and other in-Delta flows, restored tidal marsh and other habitats, stressors, and species abundance). | Ongoing program. For specifics on current CDFW ERP activities and reports, go to: http://www.dfg.ca.gov/erp/reports_docs.asp |
| **Calhoun Cut/Lindsey Slough Tidal Habitat Restoration Project** (CDFW and DWR) | Lindsey Slough, Solano County | Enhance about 165 ac of tidal marshes on an approximate 927-ac parcel by removal of features that restrict flow through the slough, excavate starter channels to initiate channel evolution and promote tidal flow, and potentially block Calhoun Cut. This activity is part of the Cache Slough Area Restoration effort and DWR's Interim Delta Actions. | Program in development. Potential implementation date is estimated as 2013 or later. Go to: http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/1_7_10_Presentation_Phase_1_Restoration_Projects.sflb.ashx |

**Table 4.10-2. List[1] of Related Projects Utilized in Conducting the Cumulative Impacts Analyses for the Proposed Lower Yolo Restoration Project**

| Names of Related Projects and Lead Agencies (CEQA and/or NEPA) | Location | Brief Descriptions | Status as of April 2013 |
|---|---|---|---|
| **California Aquatic Invasive Species Management Plan** (CDFW) | State of California, including the Delta counties (e.g., Yolo County) | Establish a management plan for controlling aquatic invasive species, and provide a framework for developing and implementing a rapid response plan. CDFW has identified at least 312 species of aquatic invaders, which can cause major impacts: disrupting agriculture, shipping, water delivery, recreational and commercial fishing; undermining levees, docks and environmental restoration activities; impeding navigation and enjoyment of the state's waterways; and damaging native habitats and the species that depend on them. | Ongoing program. The Rapid Response Plan for Aquatic Invasive Species in California is an appendix to this adopted 2008 management plan. For general discussion on this program, go to: http://www.dfg.ca.gov/invasives/plan/ |
| **CALFED Delta Risk Management Strategy (DRMS)** (DWR) | Delta counties, including Yolo County | Assess the sustainability of the Delta and major risks to the Delta resources from floods, seepage, subsidence, and earthquakes. Phase 1 of DRMS was completed in March 2009. This phase evaluated the risk and consequences to the State (e.g., water export disruption and economic impact) and the Delta (e.g., levees, infrastructure, property, and ecosystem) associated with the failure of Delta levees and other assets considering their exposure to all hazards (seismic, flood, subsidence, seepage and sea-level rise, etc.) under present as well as foreseeable future conditions. The evaluation assessed the total risk as well as a disaggregation of the risk for individual islands. DRMS did not include the Project site in its analyses because the site is not located within a subsided Delta island. However, DRMS does consider the risks to nearby islands such as the Hastings Tract and Prospect Island. | Ongoing program. The Phase 2 Report was completed in June 2011 with an errata document released in August 2011. These reports build on the knowledge gained from the DRMS Phase 1 assessment to evaluate scenarios which could reduce the risks to the state economy. The information in the reports provides insight to methods that may be used by DWR and others to manage risk. For more details on DRMS, go to: http://www.water.ca.gov/floodmgmt/dsmo/sab/drmsp/ |
| **California Invasive Species Program** (CDFW) | Throughout California within the jurisdiction of CDFW | Prevent the introduction of non-native invasive species in California, detect and respond to introduction when they occur, and prevent the spread of non-native invasive species that have become established. Program activities include development of the California Aquatic Invasive Species Management Plan, the Marine Invasive Species Program, and information and education activities for quagga/zebra mussels, New Zealand mudsnails, and dwarf eelgrass. | Ongoing program. Various CDFW websites on this program and related activities. Go to: http://www.dfg.ca.gov/invasives/ http://www.dfg.ca.gov/invasives/quaggamussel/ http://www.dfg.ca.gov/invasives/mudsnail/ http://www.dfg.ca.gov/invasives/dwarfeelgrass |
| **Campbell Ranch Conservation Bank** (USFWS) | 12 miles south of Dixon in Solano County | Protect about 19 ac of vernal pools and swales, with several sensitive plants and wildlife onsite, within a 160-ac parcel through a conservation easement. Credits available for vernal pool fairy shrimp and vernal pool tadpole shrimp. | Ongoing program. Currently an active conservation bank since 2005. Go to the following websites for further information: http://www.cnlm.org/cms/index.php?Itemid=229&id=100&option=com_content&task=view and http://www.dfg.ca.gov/habcon/conplan/mitbank/catalogue/ |

**Table 4.10-2. List[1] of Related Projects Utilized in Conducting the Cumulative Impacts Analyses for the Proposed Lower Yolo Restoration Project**

| Names of Related Projects and Lead Agencies (CEQA and/or NEPA) | Location | Brief Descriptions | Status as of April 2013 |
|---|---|---|---|
| **Capital Conservation Bank** | North end of County Road (CR) 107, east of CR 152 in the Southern Yolo Bypass, Yolo County | Establish and manage a giant garter snake conservation bank on 320 ac of land. The project would involve about 480,000 cubic yards (cy) of earthmoving with the excavation and disposal of the soils balanced onsite. | Project currently development (Eric Parfrey, October 14, 2011, pers. comm.). |
| **Central Valley Flood Protection Plan – 2012** (DWR and CVFPB) | Central Valley, multiple Delta counties (including Yolo County) | Guide California's participation (and influence federal and local participation) in managing flood risk along the Sacramento and San Joaquin rivers' systems. The Plan is a system-wide investment approach for sustainable, integrated flood management in areas currently protected by facilities of the State Plan of Flood Control (SPFC). One proposal under consideration is to widen and improve Fremont Weir in Yolo County. | The Final Program EIR was certified and the plan was adopted in June 2012. The environmental documentation and technical studies are at: http://www.water.ca.gov/cvfmp/documents.cfm<br><br>Orientation briefings are scheduled in the latter part of March 2013 to discuss the Basin-Wide Feasibility Studies and the Conservation Strategy. Go to the following website for updated information: http://www.water.ca.gov/cvfmp/ |
| **Conaway Ranch Floodway Corridor and Habitat Enhancement Project** | North-central Yolo Bypass, Yolo County | Establish an approximately 17,300-ac seasonal floodplain habitat for both flood protection (i.e., transitory storage of over 66,000 ac-ft of flood water during large storm events) and habitat restoration. Re-create historical floodplain habitat for salmon, splittail, and other native fish spawning and/or juvenile rearing. Construct improvements to New Sacramento River Bypass/Weir to provide for fish passage (e.g., new vertical slot weir and/or fish ladders or improvements). Other opportunities include integrated water management and recreation/open space. | Program under development. Go to the following websites for more information:<br>http://www.conawayranch.com/files/u1/1__Conaway_Flood_Habitat_Proj_Aug_2007.pdf and<br>http://westsideirwm.com/projects/Sort%20by%20Project%20Type.pdf<br>In 2012, the Wildlife Conservation Board issued an exemption to grant to the California Waterfowl Association to acquire a conservation easement on the ranch for protection of agricultural-friendly habitat areas, supporting migratory waterfowl and other bird, amphibian and reptile species. Refer to: http://www.ceqanet.ca.gov/NOEdescription.asp?DocPK=666975 |

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| Names of Related Projects and Lead Agencies (CEQA and/or NEPA) | Location | Brief Descriptions | Status as of April 2013 |
|---|---|---|---|
| **Davis-Woodland Water Supply Project** (City of Davis, City of Woodland, and University of California at Davis) | East-central portion of Yolo County | Divert up to about 45,000 ac-ft annually of surface water from the Sacramento River and convey it for treatment and subsequent use in the cities of Davis and Woodland and the University of California at Davis campus. Project activities include construction and operation of a water intake/diversion, conveyance, and water treatment facilities. Water rights were granted in March 2011, subject to conditions imposed by the state. Water diversions would be limited during summer and other dry periods. A more senior water right for 10,000 ac-ft was purchased from the Conaway Preservation Group to provide summer water supply. Groundwater would continue to be used by Woodland and Davis during when demand for water cannot be met with surface water supplies alone. | The Final EIR was certified in 2009. The project is scheduled for design in 2013, for construction between 2013 and 2015, and for operation in 2016. Go to http://www.wdcwa.com/the_project |
| **Delta Plan** (Delta Stewardship Council) | Sacramento-San Joaquin Delta region | To carry out the intent of water-related measures passed by the State Legislature in 2009, including the Delta Reform Act. The Delta Plan would rely on a mix of policies and recommendations to prioritize actions and strategies for improved water management, ecosystem restoration, and levee maintenance for significant plans, projects, and programs in the Delta. | Environmental analysis is now ongoing with a re-circulated PEIR. It is anticipated that the Final PEIR will be certified in Spring 2013 with implementation to occur in Summer 2013. For further information, go to: http://deltacouncil.ca.gov/ceqa-process |
| **Delta Smelt Permanent Refuge** (University of California at Davis, California DWR, CDFG, USFWS, and Bureau of Reclamation) | Possibly in Rio Vista, Solano County | Create a permanent facility, possibly at the proposed USFWS Science Center in Rio Vista. | Program under development. Go to (page 3D-17): http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/EIR-EIS_Appendix_3D_-_Defining_Existing_Conditions_No_Action_Alt_No_Project_Alt_and_Cumulative_Impact_Conditions_2-29-12.sflb.ashx |
| **Delta Wetlands Project** (US Army Corps of Engineers [USACE]) | Contra Costa and San Joaquin counties | This proposal is the same as the project below, Delta Wetlands Project Place of Use, but is being assessed via the National Environmental Policy Act (NEPA) process. The original USACE regulatory permit for the Delta Wetlands Project Place of Use was issued on June 26, 2002. That permit required that construction be completed no later than on December 31, 2007. That permit has since expired; hence, the applicant (Delta Wetland Properties) is applying for a new permit under Section 404 of the federal Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899. | A Federal Register notice was released on February 28, 2013 announcing that USACE intends to prepare a draft environmental impact statement and is conducting a public scoping meeting in March. Refer to: http://www.gpo.gov/fdsys/pkg/FR-2013-02-28/pdf/2013-04722.pdf?bcsi-ac-a8c0312cffb9ad05=2032707200000002lik1rDP6W6ZylY+zMrGIBWAqVVb2BwAAAgAAADlIHgCEAwAAAgAAADrDAAAA= |

**Table 4.10-2. List[1] of Related Projects Utilized in Conducting the Cumulative Impacts Analyses for the Proposed Lower Yolo Restoration Project**

| Names of Related Projects and Lead Agencies (CEQA and/or NEPA) | Location | Brief Descriptions | Status as of April 2013 |
|---|---|---|---|
| **Delta Wetlands Project Place of Use** (Semitropic Water Storage District) | Contra Costa and San Joaquin counties | Provide water to various places of use by exporting Delta water through diversion, water storage on Bacon Island and Webb Tract, and supplemental water storage south of the Delta, along with implementing a habitat conservation plan on Bouldin Island and Holland Tract. | A Final EIR and an Addendum were certified in September 2011. Project construction schedule is unknown at this time, go to http://deltawetlandsproject.com |
| **Development Activities Proposed** (Sacramento County) | Sacramento County vicinity to the east of the proposed Project | Implement a number of private projects: agricultural rezoning, subdivisions, and lot-line adjustments. One project (C&L Wilson TPM/LRP application) would involve a parcel map division of 50.7 ac into two lots in the AG-40 zone and allow one lot to be about 3.21 ac. Another private project, the Lambert Road Williamson Act application, involves the formation of a Williamson Act preserve on 329 ac in the AG-40 and AG-80 zones. Still another project, the Heringer Ranch BRB, requests extinguishment of development rights of about 155 ac from the Miracle Land Company on 862.51 ac in the AG-80 zone, to allow a Swainson's hawk and agricultural conservation easement of about 765 ac on the same property. | None of these private projects would result in an overlapping contribution with any of the Project's impacts. All three applications are pending at this time. Go to: http://www.planningdocuments.saccounty.net/SACIndividualCommunityMap.aspx?communityid=12 |
| **Development Activities Proposed** (Solano County) | Vicinity of proposed Project, Solano County | Implement a number of privately, proposed projects: application for a development permit to develop a 198-ft high meteorological tower near the intersection of Etzel and Delhi roads, about a mile west of the proposed Project site; and, an incomplete application for a four-lot minor agricultural subdivision near the intersection of Delhi and Liberty Island roads. | None of these private projects would be of sufficient size and type to result in an overlapping/cumulative contribution with any of the Project's impacts. For general planning information, go to: http://www.co.solano.ca.us/depts/rm/planning/default.asp |
| **Development Activities Proposed** (Yolo County) | Vicinity of proposed Project, Yolo County | Implement the Capital Conservation Bank and the Putah Creek Wetland Mitigation Bank (projects referred elsewhere in this table). | For a listing of activities throughout Yolo County, go to: http://www.yolocounty.org/Index.aspx?page=728 |
| **Dutch Slough Tidal Marsh Restoration Project** (DWR and California State Coastal Conservancy) | Oakley, Contra Costa County | Create and manage about 1,200 ac of tidal marsh and lowland grasslands. The Project has three goals: to provide ecosystem benefits including habitats for sensitive aquatic species, to assess the development of those habitats and measure ecosystem responses so that future Delta restoration projects will be more successful, and to provide opportunities for public access, education, and recreation. | Final EIR was certified in March 2010. Applicants have applied for a USACE regulatory permit and anticipate receiving it in June/July 2013. With all permits obtained, applicants anticipate beginning clearing/grubbing the site in summer 2013. Construction would be anticipated to begin in 2014. For more information go to: http://www.water.ca.gov/deltainit/action.cfm and http://www.water.ca.gov/floodsafe/fessro/environmental/dee/dutch.cfm |

**Table 4.10-2. List[1] of Related Projects Utilized in Conducting the Cumulative Impacts Analyses for the Proposed Lower Yolo Restoration Project**

| Names of Related Projects and Lead Agencies (CEQA and/or NEPA) | Location | Brief Descriptions | Status as of April 2013 |
|---|---|---|---|
| **Fish Screen Project at Sherman and Twitchell Islands** (CDFG and DWR) | Sacramento County | Install fish screens on up to 10 currently unscreened DWR-owned agricultural intakes used to irrigate state-owned lands on Sherman and Twitchell islands. Contribute to the protection of the delta smelt and other sensitive aquatic species and the restoration of habitat in the Delta. | Mitigated negative declaration was completed in 2008. Applicants are going through the environmental regulatory processes. For further status, go to: http://www.water.ca.gov/deltainit/action.cfm |
| **FloodSAFE Strategic Plan** (DWR and multiple stakeholders) | Multiple Delta counties, including Yolo County | Fund flood system repairs and improvements, repair critical erosion sites, address the backlog of statewide subventions claims, and conduct inspection and maintenance of levees and channels in the Central Valley. | The Draft Strategic Plan was circulated for public review during June and July 2009. DWR is assessing the FloodSAFE Implementation Plan to help organize and manage FloodSAFE work. Upon completion of the draft implementation plan, the strategic plan will be refined and finalized. Go to: http://www.water.ca.gov/floodsafe/plan/ |
| **Franks Tract Project** (DWR, Reclamation) | Sacramento and Contra Costa counties | Install and operate a flow control gate on up to two Delta waterways (Three-mile Slough and West False River) to protect fish resources and reduce seawater salinity intrusion into the Delta. The project gates would be operated seasonally and during certain hours of the day, depending on fisheries and tidal conditions. Boat passage facilities would allow for passing of watercraft when the gates are in operation. | Notice of Preparation and Notice of Intent were circulated in September/October 2008. The Initial Alternatives Information Report was completed February 2010. The Draft Feasibility Report is due April 2013. Preparation of a joint EIR/EIS has been delayed, go to for additional information: http://www.water.ca.gov/frankstract/ and http://www.usbr.gov/mp/nepa/nepa_projdetails.cfm?Project_ID=3460. No schedule on when project would be constructed. |
| **Fremont Landing Conservation Bank (aka Central Valley Anadromous Salmonid Umbrella Conservation Bank)** (CDFW) | Yolo County | Restore, enhance, and preserve of 100 ac of habitat for the federally- and state-listed Chinook salmon and Central Valley steelhead. In particular, to preserve and enhance 40 ac of existing riparian and wetland habitat, and restore/create 60 ac of riparian woodland and wetland sloughs within the floodplain of the Sacramento River. This project involves the excavation of 60,000 cy at Oxbow Slough channels to prevent fish stranding. | Ongoing program. Mitigated Negative Declaration adopted on December 21, 2009. Active habitat bank. Go to: http://www.cvfpb.ca.gov/meetings/2010/072310Item12B_18603_%20FremontLanding_StaffReportAttachmentsandPermit.pdf |
| **Fremont Weir Modifications Project** (CDFW) | Northern end of Yolo Bypass, Yolo County | Create and manage approximately 21,500 ac of seasonal floodplain habitat. Increase the duration of Yolo Bypass flooding in winter and spring by modifying the Fremont Weir to allow lower-stage flows of the Sacramento River to pass through the Yolo Bypass. Install an inflatable barrier to induce overbank flooding out of the Tule Canal/Toe Drain or modify the Tule Canal/Toe Drain to create an excavated, shallow flooded region. | This project is an early action measure identified in the CalFed's *Ecosystem Restoration Program Plan: Strategic Plan for Ecosystem Restoration* (see Page D-4 of the 2000 Final Programmatic EIS/EIR Technical Appendix). Potential implementation date is not known at this time. Go to: http://www.dfg.ca.gov/ERP/reports_docs.asp |

**Table 4.10-2. List[1] of Related Projects Utilized in Conducting the Cumulative Impacts Analyses for the Proposed Lower Yolo Restoration Project**

| Names of Related Projects and Lead Agencies (CEQA and/or NEPA) | Location | Brief Descriptions | Status as of April 2013 |
|---|---|---|---|
| **Knaggs Ranch Project**<br>**(Formerly known as the Elkhorn Basin Ranch)**<br>(Sacramento Area Flood Control Agency) | Northern Yolo Bypass, Yolo County | Develop and manage approximately 1,750 ac of seasonal floodplain habitat while allowing for continued agricultural production on the remaining portion of the ranch, including grazing or row crop production compatible with Swainson's hawk foraging needs. | Potential implementation date is estimated to be 2015 or later.<br>http://www.water.ca.gov/floodmgmt/fpo/sgb/fpcp/prop84/comp_sol/2008_selections/alist_projects/knaggs/ |
| **Knaggs Ranch Project: Experimental Agricultural Floodplain Pilot Study**<br>(DWR) | Northern Yolo Bypass, Yolo County | Evaluate growth of juvenile Chinook salmon in flooded agricultural fields as initiated in the winter of 2011-2012 and scheduled to expand over time (i.e., a multi-phased, multi-year research project). This pilot study is investigating the biological and physical parameters of fish habitat, as well as the relationships between habitat, growth, and survival. Such information is essential to the development of Yolo Bypass rearing habitat for salmonids at appropriate temporal and spatial scales. | Ongoing program. For Year One Overview (2011-2012), refer to:<br>http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/YBFE_Planning_Team_%E2%80%93_Knaggs_Ranch_Pilot_Project_Year_One_Overview_6-13-12.sflb.ashx |
| **Levee Failure (Natural Event):**<br>**Liberty Island** | Solano County | Natural levee failure occurred in 1998 resulting in approximately 4,300 ac of subsided land restored by tidal inundation. | Natural restoration occurring over time |
| **Levee Failures (Natural Events):**<br>**Little Holland Tract** | Yolo County | Natural levee failures occurred in 1983 and 1992 breaches resulting in approximately 1,500 ac of subsided land restored by tidal inundation. | Natural restoration occurring over time |
| **Liberty Island Conservation Bank**<br>**(Formerly known as the Kerry Parcel Project)**<br>(Reclamation District 2093) | Northern portion of Liberty Island, Yolo County | Preserve, enhance, and restore approximately 186 ac of habitat for native fish species (including Chinook salmon, Central Valley steelhead, and delta smelt) while designated as a wetlands mitigation bank. | Ongoing program. Mitigated Negative Declaration completed in 2009. For further information, go to: http://www.mitigationbanking.org/pdfs/libertyislandcb.pdf<br>Constructed and breached in late 2010. Background information can be found in:<br>http://www.delta.ca.gov/res/docs/meetings/2007/092707_item_15.pdf |
| **Lisbon Weir Fish Passage Enhancement** | Yolo County | Improve agriculture and habitat water control structure for fish and wildlife benefits. | Concept only at this time. Go to:<br>http://www.yolobypass.net/docs/BDCPSubcommittee/5-Point%20Plan.pdf |
| **Little Holland Tract Restoration**<br>(DWR and USACE) | Yolo County | Continue restoration efforts that would complement what has occurred naturally. This activity is part of the Cache Slough Area Restoration effort and DWR's Interim Delta Actions. | Ongoing program. Go to link for more details:<br>http://www.water.ca.gov/deltainit/docs/6-16-08CacheSlough.pdf |

**Table 4.10-2. List[1] of Related Projects Utilized in Conducting the Cumulative Impacts Analyses for the Proposed Lower Yolo Restoration Project**

| Names of Related Projects and Lead Agencies (CEQA and/or NEPA) | Location | Brief Descriptions | Status as of April 2013 |
|---|---|---|---|
| **Lower Cache Creek, Yolo County Woodland Area Feasibility Study** (Cities of Woodland and Davis) | Yolo County | Evaluate modifications to the Cache Creek Settling Basin and other facilities to determine their feasibility and contribution toward achieving urban and rural agricultural flood improvement in the area. Also evaluate the Cache Creek Settling Basin to identify a long-term program for managing sediment and mercury to maintain the flood conveyance capacity of the Yolo Bypass. | Ongoing program. For further information, go to: http://www.cvfpb.ca.gov/meetings/2011/022511item9A_LowerCacheCreekFeasibilityStudy.pdf |
| **Lower Putah Creek Realignment Project** (possibly CDFW – not yet established) | Lower Putah Creek from the Toe Drain to Monticello Dam in central Yolo Bypass, Yolo County | Remove fish barriers on 25 miles of Lower Putah Creek, restore and enhance anadromous fish spawning and emigration access, and reroute Lower Putah Creek east of Davis through five miles of new stream channel and seasonal wetland complex. The project would establish between 300 to 700 ac (five miles of stream) of creek and associated floodplain and tidal marsh habitat. | Developing. For more information, go to: http://www.google.com/url?sa=t&rct=j&q=lower%20putah%20creek%20realignment%20project&source=web&cd=1&cad=rja&ved=0CC8QFjAA&url=http%3A%2F%2Fnrm.dfg.ca.gov%2FFileHandler.ashx%3FDocumentID%3D27856&ei=73I_UY3sBYGFyQG4zYH4Dg&usg=AFQjCNGqSQi6Bhya3iB_jiEify2dhBfuPQ&bvm=bv.43287494,d.aWM;bcsi-ac-cbeb2b96b46cba65=204F41B500000002FWTLAvto1TcQEPWrxtPZ9N6HtMBZAgAAAgAAAH0mCQCEAwAAAQAAAFRZAAA= Potential implementation date is unknown at this time. |
| **Mayberry Farms Subsidence Reversal and Carbon Sequestration** (Reclamation District No. 341) | Sherman Island, Sacramento County | Create 274 ac of palustrine emergent (permanently flooded) wetlands on a nearly 308-ac parcel owned by the state. About 191,700 cy of peat soil would be excavated to create ponds and channels, and then compacted to make the berms, levees and islands onsite. | Ongoing program. Mitigated negative declaration was adopted on August 20, 2009. Constructed in 2010. Go to http://www.water.ca.gov/floodsafe/fessro/environmental/dee/mayberry.cfm |
| **North Bay Aqueduct Alternative Intake Project** (DWR) | Solano and Yolo counties | Construct and operate an alternative intake on the Sacramento River, generally upstream of the Sacramento Regional Wastewater Treatment Plant in Fairfield, and connect it to the existing North Bay Aqueduct (NBA) system by a new segment of pipe. The proposed alternative intake would be operated in conjunction with the existing NBA intake at Barker Slough. The project would be designed to improve water quality and to provide reliable deliveries of SWP supplies to its contractors, the Solano County Water Agency and the Napa County Flood Control and Water Conservation District. | The Notice of Preparation for the EIR was published on November 24, 2009. Release of the Draft EIR is still pending. Start of construction is unknown at this time. Go to the following website for more information: http://www.water.ca.gov/engineering/Projects/Current/NBA/ |

**Table 4.10-2. List[1] of Related Projects Utilized in Conducting the Cumulative Impacts Analyses for the Proposed Lower Yolo Restoration Project**

| Names of Related Projects and Lead Agencies (CEQA and/or NEPA) | Location | Brief Descriptions | Status as of April 2013 |
|---|---|---|---|
| **Northern Liberty Island Fish Conservation Bank (aka North Delta Fish Conservation Bank)** (Reclamation District 2093) | Northern Liberty Island, Yolo County | Establish an approximate 808-ac of tidal marsh enhancement. Degrade approximately 4,200 linear ft of the east-west private levee along Shag Slough within the Yolo Bypass, excavate minor breaches and small channels, widen and deepen the existing breach on the east-west levee, excavate a bench and plant tule plugs along a portion of the northern project boundary, and seed existing levee upland areas with native and naturalized species. | The Mitigated Negative Declaration was adopted on February 10, 2011. Securing permits and approvals at this time. Go to: http://www.cvfpb.ca.gov/meetings/2012/052512Item7D_18723_ISMND_LTMP_NOD.pdf?bcsi-ac-cbeb2b96b46cba65=204F41B500000002uFWgMVgZTEPNW+Ec92AO8SeH6ExaAgAAAgAAADsqCQCEAwAAAQAAAFRZAAA= |
| **Pope Ranch Conservation Bank Project** (Reclamation Board) | Near City of Davis, Yolo County | Replicate natural conditions by creating a mosaic pattern of shallow, permanent ponds interspersed with seasonally inundated swales and uplands to create aquatic (open water), emergent marsh, and grassland habitats throughout the 391 ac, thereby providing suitable habitat for a diversity of wetlands-dependent wildlife species including GGS. | A notice of exemption was issued in April 2001. Currently, this bank is noted in a USFWS list as either inactive or sold out. Go to: http://webcache.googleusercontent.com/search?hl=en&q=cache:evabLLFmNvsJ:http://www.fws.gov/sacramento/ES/Conservation-Banking/Banks/Inactive-Sold-Out/es_conse-bank-inactive-sold-out.htm%2Bpope+ranch+conservation+bank&gbv=2&gs_l=heirloom-hp.1.8.0l3j0i30l7.5397.8865.0.13441.10.10.0.0.0.0.144.951.2j7.9.0...0.0...1c.1.TSOJbkrKf-o&ct=clnk |
| **Prospect Island Restoration Project** (DWR and USACE) | East of Sacramento Deep Water Ship Channel (SRDWSC), Solano County | Restore 1,620 ac of tidal marsh and shallow tidal aquatic habitat for fish species, including delta smelt. Project construction would involve the creation of long sinuous interior islands, channels, dead-end sloughs, and interior levee benches. Native wildlife would also benefit. | A Mitigated Negative Declaration and A Finding of No Significant Impact were adopted in September 2001. Plans are still conceptual. Go to: http://deltacouncil.ca.gov/node/8145 Construction date is estimated to be 2016 or later. |
| **Putah Creek Wetland Mitigation Bank** (County of Yolo) | North of Yolo Bypass Wildlife Area, Yolo County; at the intersection of County Road (CR) 36 and CR 106, near the city of Davis, Yolo County | Construct seasonal wetlands and playa pools, restore riparian habitat, and preserve upland habitat at the Putah Creek Mitigation Bank. The project site resides within a larger 433.7-ac property at Muzzy Ranch. A majority of the property, excluding the project site, includes upland areas, which was originally purchased by ASB Southport II to preserve Swainson's hawk foraging habitat as mitigation for a development project in West Sacramento. In addition to hawk habitat, the project would restore and construct 72.2 ac of seasonal wetland habitat, and restore 1.97 ac of riparian habitat. Eight constructed wetlands, and six upland mounds, are proposed. The project would involve about 180,000 cy of earth moving in two phases. | A Mitigated Negative Declaration was processed by Yolo County in 2011. Securing regulatory approvals at this time. |

**Table 4.10-2. List[1] of Related Projects Utilized in Conducting the Cumulative Impacts Analyses for the Proposed Lower Yolo Restoration Project**

| Names of Related Projects and Lead Agencies (CEQA and/or NEPA) | Location | Brief Descriptions | Status as of April 2013 |
|---|---|---|---|
| **Remanded Biological Opinions on the Coordinated Long-term Operation of the Central Valley Project and State Water Project** (Reclamation) | Counties containing CVP and SWP service areas and facilities | Continue the operations of the CVP, in coordination with the SWP, as described in the 2008 Biological Assessment (as modified) to meet its authorized purposes, in a manner that: is consistent with federal reclamation law, applicable statutes, previous agreements and permits, and contractual obligations; listed species; and does not result in destruction or adverse modification of designated critical habitat. Planning efforts would involve the restoration of up to 8,000 ac. Specific restoration efforts are not yet defined under this program. | Notice of Intent to Prepare an EIS was released on March 28, 2012, with a series of public scoping meetings conducted in April and May 2012. Public comments were extended to June 28, 2012. NEPA alternatives are currently being developed for operation components of the 2008 USFWS and 2009 NMFS Reasonable and Prudent Alternatives for delta smelt and salmonids, respectively. For further information, go to: http://www.usbr.gov/mp/BayDeltaOffice/Documents/remand.html |
| **Restoring Ecosystem Integrity in the Northwest Delta** (CDFW) | Yolo and Solano counties | Acquire conservation easements within the Cache Slough complex, along the Barker, Lindsey and Calhoun sloughs, north Delta tidal channels located west of the Yolo Bypass. Acquisition of conservation easements would be on 1,100 ac of existing riparian, wetland and/or agricultural lands. Also, manage and restore up to 1,300 ac of perennial grassland/vernal pool complex in Solano County. | Ongoing program. For background information, go to: http://cdm16658.contentdm.oclc.org/cdm/singleitem/collection/p267501ccp2/id/2008/rec/20 |
| **Ridge Cut Giant Garter Snake Conservation Bank** (Yolo County) | Yolo County (near Dunnigan) | Restore and preserve about 186 ac of habitat for the GGS by creating 48.4 ac of perennial marsh, 57.4 ac of open water, and 80.1 ac of uplands. | Ongoing program. A Mitigated Negative Declaration was adopted on December 17, 2009. Active habitat conservation bank. Go to: http://www.cvfpb.ca.gov/meetings/2009/Item8C-18406ManagementPlan.pdf |
| **Sacramento River Deep Water Ship Channel (SRDWSC) Project** (USACE and Port of West Sacramento) | Within the Sacramento River Deep Water Ship Channel ,Yolo, Solano, Sacramento, Contra Costa counties | Improve the navigation of the 46.5-mile shipping channel via dredging and establishing wetland/riparian habitat on Prospect and lower Sherman islands. Would involve both deepening portions of the SRDWSC to a depth of -35 ft MLLW and selective widening from River Miles (RMs) 0.0 to 35.0, completing the construction that was suspended in 1990, and conducting maintenance dredging from RMs 35.0 to 43.4. This project would involve the excavation and disposal of between 8.1 and 10 mcy of material. The dredging is proposed for six month windows (June 1 – December 31) over four years. | The Draft Supplemental EIS/EIR was released on February 25, 2011 for a public review period that ended on April 18, 2011. A revised Draft EIS/-Subsequent EIR is anticipated to be re-circulated in response to comments in 2013. Construction target is on or before 2015. Go to: http://www.sacramentoshipchannel.org/ |
| **Sacramento River Ranch Conservation Bank** (CDFW) | Yolo County | Involves the development and minor alteration of 108.5 ac to create wetlands habitat while maintaining agricultural activities on the property outside of the created wetlands. Four types of conservation and mitigation activities on the bank property: species banks for the Valley Elderberry Longhorn Beetle and salmonids, a conservation easement for Swainson's hawk habitat, and a federal wetlands bank at the low-lying, southern end of the property. | Ongoing program; an active mitigation bank. A Notice of Exemption was issued on July 2007. For additional information, go to: http://www.ecoagriculture.org/documents/files/doc_348.pdf |

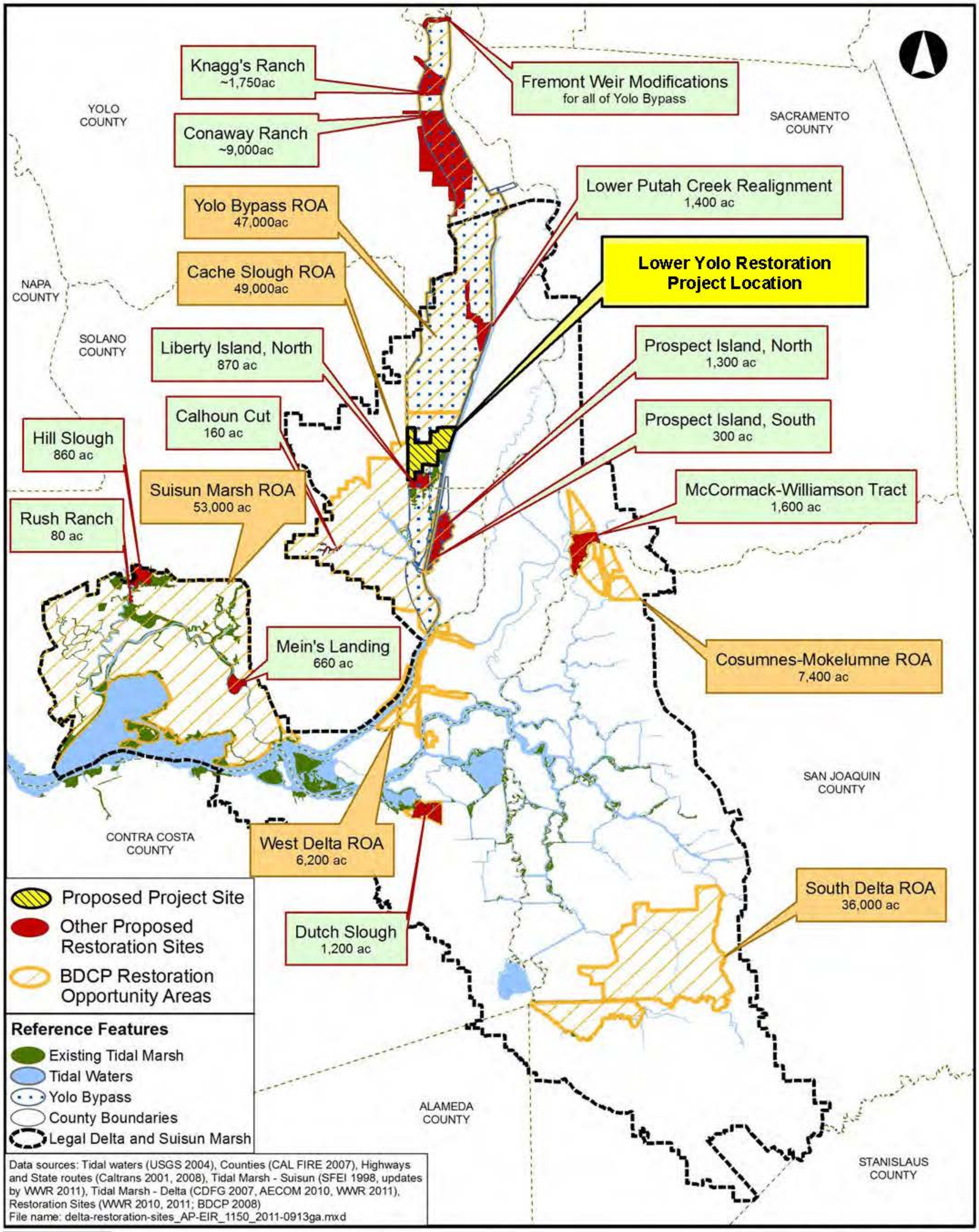
**Table 4.10-2. List[1] of Related Projects Utilized in Conducting the Cumulative Impacts Analyses for the Proposed Lower Yolo Restoration Project**

| Names of Related Projects and Lead Agencies (CEQA and/or NEPA) | Location | Brief Descriptions | Status as of April 2013 |
|---|---|---|---|
| **Sacramento-San Joaquin Delta Islands and Levee Feasibility Study** (USACE) | Delta, Suisun Marsh, and adjacent areas | To evaluate alternatives to meet the study goals of restoring sustainable ecosystem functions and improving flood risk management in the Delta, Suisun Marsh, and adjacent areas. The array of measures and alternatives will depend on the information received during the scoping process. | A Notice of Intent for the preparation of an EIS was published on January 31, 2013. The Draft EIS is expected to be released in early 2014. Go to: http://www.spk.usace.army.mil/Media/NewsReleases/tabid/1034/Article/9959/corps-to-discuss-delta-islands-and-levees-feasibility-study-at-public-meetings.aspx |
| **Southport Sacramento River Early Implementation Project** (USACE and West Sacramento Area Flood Control Agency) | Yolo County | Implement flood risk-reduction measures along the Sacramento River South Levee in the city of West Sacramento. The project reach extends along the right (west) bank of the Sacramento River south of the Barge Canal downstream approximately 6.4 miles to the South Cross Levee, protecting the Southport community of West Sacramento. The 3.3-square mile study area encompasses the area of levee improvement along the river corridor and the potential soil borrow sites east and west of southern Jefferson Blvd. | A Notice of Preparation for an EIS/EIR was originally released on August 26, 2011. A revised Notice of Preparation/Notice of Intent due to changes in the preferred alternative was posted on March 8, 2013 and March 15, 2013, respectively, with comments due on April 8, 2013. Certification of the Final EIS/EIR is anticipated for late 2013. Construction is scheduled for sometime between 2014 and 2015. For further information, refer to: http://www.cityofwestsacramento.org/city/flood/southport_eip/milestone_schedule.asp?bcsi-ac-cbeb2b96b46cba65=204F41B400000002YOQ0ZwMumfUE9txLm4N+Vjd1fnRnAgAAAgAAAIdaCQCEAwAAAwAAAFRZAAA= |
| **Tule Canal Fish Passage Enhancement** | Yolo County | Identify passage impediments and evaluate the feasibility of improving fish passage or removing fish passage impediments. | Concept only at this time. Go to: http://www.yolobypass.net/docs/BDCPSubcommittee/5-Point%20Plan.pdf |
| **Update to the 2006 Water Quality Control Plan for the Bay-Delta Estuary (Bay-Delta Plan)** (State Water Resources Control Board) | Bay-Delta Estuary | Update the existing 2006 Bay-Delta Plan: (1) focus on San Joaquin River flow requirements and southern Delta water quality objectives; (2) examine fish and wildlife beneficial uses; (3) study possible modifications to water rights; and (4) develop and implement flow requirements for priority Delta tributaries. | Update process underway. Go to: http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/ |
| **West Sacramento Levee Improvements Program** (West Sacramento Area Flood Control Agency and USACE) | West Sacramento levees, Yolo County | Improve the levee system within the entire West Sacramento Area Flood Control Agency boundaries, including the Sacramento River, the Yolo Bypass, the Sacramento Bypass, and the SRDWSC. | Ongoing program. Final Program EIR/EIS certified in March 2011. For further information, go to: http://www.cityofwestsacramento.org/city/flood/levee_improvements.asp?bcsi-ac-cbeb2b96b46cba65=204F41B400000002GqyjJqepuG3l28WQidwXfIPtuwtoAgAAAgAAAGZeCQCEAwAAAwAAAFRZAAA= |

**Table 4.10-2. List[1] of Related Projects Utilized in Conducting the Cumulative Impacts Analyses for the Proposed Lower Yolo Restoration Project**

| Names of Related Projects and Lead Agencies (CEQA and/or NEPA) | Location | Brief Descriptions | Status as of April 2013 |
|---|---|---|---|
| **Yolo Bypass Salmonid Habitat Restoration and Fish Passage** (Reclamation and DWR) | Yolo Bypass, Yolo County (within the Sacramento Valley region) | To create more suitable conditions for fish in the Yolo Bypass and/or lower Sacramento River basin by implementing the Reasonable and Prudent Alternative actions (i.e., I.6.1 and I.7) as described in the 2009 NMFS BiOp and the 2012 Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan. | Notice of Intent and Notice of Preparation for the Draft EIS/EIR was released on March 4, 2013. Written comments are due on April 3, 2013; two public scoping meetings were held in mid March. For further information, go to: http://www.usbr.gov/mp/BayDeltaOffice/Documents/yolo.html |
| **Yolo Bypass Wildlife Area Land Management Plan** (CDFW) | About 16,770 ac managed in the Yolo Bypass, Yolo County | Guide the management of habitats, species, public use and programs to achieve CDFW's mission; direct an ecosystem approach in coordination with the objectives of the CALFED ERP; promote cooperative relationships with adjoining private property owners; establish a species inventory; create an O&M program with personnel requirements; and meet all applicable environmental regulations and processes. | Ongoing program. Negative Declaration was adopted in 2007. Go to: http://www.dfg.ca.gov/lands/mgmtplans/ybwa/ |
| **Yolo County Natural Heritage Program Habitat Conservation Plan/Natural Community Conservation Plan** (Yolo County HCP/NCCP Joint Powers Agency and USFWS) | Yolo County | Develop a comprehensive, county-wide plan for 653,820 ac designed to provide long-term conservation and management of natural communities, sensitive species, and the habitats upon which those species depend, while accommodating other important uses of the land. The Plan would set out a conservation strategy that includes measures to ensure that impacts on the 35 covered species and habitats related to covered activities are avoided, minimized, or mitigated, as appropriate. The Plan also proposes to provide conservation for 31 additional species of local concern. | Notice of Intent and Notice of Preparation for the Draft EIS/EIR was released on October 21, 2011. Completion target for plan is 2013. For further information, go to: http://www.yoloconservationplan.org/index.html and http://www.yoloconservationplan.org/enviro-portal.html |

[1] Various agencies in the region and documents produced were consulted to establish this table: Yolo County, Solano County, and Sacramento County Planning Departments, USACE, DWR, member agencies of SFCWA, Bay Delta Conservation Plan, Delta Plan, Suisun Marsh Plan, CDFW, and USFWS. This review includes both the public agencies' projects as well as private projects that may require approvals through these public agencies. In particular, several sources were reviewed including the counties' currently proposed projects list, the list of projects being planned as part of the CALFED Ecosystem Restoration Program and its member resource agencies, potential projects identified as part of fulfilling the 8,000-ac restoration requirement contained with the Reasonable and Prudent Alternatives of the USFWS Delta Smelt Biological Opinion of December 2008 and the NMFS Salmonid Biological Opinion of June 2009, potential projects identified as part of fulfilling the 55,000-ac restoration requirement currently being considered for incorporation into the BDCP.




Only Phase 1 of the Project is being pursued at this time; Phase 2 is included here as part of the reasonably foreseeable build out.

SFCWA
State & Federal Contractors Water Agency

1:570,420 (1" = 9mi at letter size)

0 4.5 9 mi

0 7 14 km

**Figure 4.10-1**

**Delta and Suisun Potential Restoration Sites**

## 4.10.1 Cumulative Impacts Analysis on Hydrology

### *Flood Conveyance Cumulative Impacts*

Up to 55,000 acres (ac) of tidal wetland restoration projects identified in the Bay Delta Conservation Plan (BDCP) are now under consideration within the Project vicinity as well as throughout the Delta (see **Table 4.10.2**). The primary hydrologic concern of these actions is their potential cumulative impact on tidal heights in the Project vicinity and how this could affect flood conveyance within the Yolo Bypass and ultimately the Delta. The California Department of Water Resources (DWR) conducted preliminary modeling of the effects of restoring approximately 7,500 ac of tidal marsh in the Cache Slough region (Enright, personal communication, 2010). This modeling effort indicated that tidal marsh restoration would reduce the Mean Higher High Water (MHHW) elevation by up to 0.3 feet (ft), thus resulting in a net benefit to flood conveyance within the Delta. Other actions resulting from studies generated by the CALFED Delta Risk Management Strategy (DRMS) and from funding through the FloodSAFE Strategic Plan would strengthen the levees and channels in Yolo County and elsewhere in the Delta, thereby also providing a beneficial effect to flood protection and flood conveyance in the Yolo Bypass.

BDCP modeling of its various isolated facilities alternatives with respect to the Yolo Bypass/Fremont Weir indicated that flow would be equal to or less than what is currently occurring.[40] Additionally, it is not anticipated that the isolated facilities themselves, be they surface canals or pipelines contained in tunnels, would affect the hydrology or flood conveyance of the Yolo Bypass, because construction would be outside of the Bypass and hydrologic flow at the Cache Slough Complex is strongly controlled by the local tidal regime (see Section 4.1.1, Setting). The only exception to location in or adjacent to the Bypass would be the West Option that has a limited stretch of its canal traversing to the east of the Sacramento Deep Water Ship Channel within Prospect Island. Should that alternative be selected, construction would not be permitted until modeling showed that there would be no significant flood conveyance impacts to the Bypass, along with other conditions set by the Central Valley Flood Protection Board (CVFPB) prior to its issuing its encroachment permit. Compliance with an encroachment permit with the U.S. Army Corps of Engineers (USACE) would also be required.

The various Yolo County mitigation bank and habitat conservation projects also would not affect flood flows or capacity, because they would balance grading onsite and/or be required to comply with CVFPB requirements for work within the Yolo Bypass. Projects located in Solano and Sacramento counties that are identified in **Table 4.10.2** would be outside of the Yolo Bypass and would have no effect on flooding or flood flow capacity.

The Sacramento River Deep Water Ship Channel (SRDWSC) Project by USACE project would increase flood flow capacity in the ship channel, and thereby aid in flood protection. Impacts of soil disposal on flood capacity are unknown and would depend largely on location and hydrology of the receiving site; if sediments are disposed of within the Yolo Bypass, that disposal would be

[40]Source: Administrative Draft: *Bay Delta Conservation Plan Draft EIR/EIS*, Chapter 6, Surface Waters, dated February 2012 at: http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/EIR-EIS_Chapter_6_-_Surface_Water_2-29-12.sflb.ashx

required to comply with CVFPB requirements for work within the Yolo Bypass. Additionally, the Southport Sacramento River Early Implementation Project and the West Sacramento Lee Improvements Program would be designed to improve the levee system, thereby reducing flood risk along the Sacramento River.

While the CVFPB Plan has been adopted, specific projects are not yet fully planned or realized as of this time. However, the intent of the plan is to manage flood risk along the Sacramento and San Joaquin rivers system, by developing and implementing a system-wide approach for sustainable, integrated flood management. One proposal under consideration is to widen and improve Fremont Weir in Yolo County. However, this activity is not expected to occur during the construction phase of the Project nor any time soon after completion.

Other recently proposed projects, such as the Conaway Ranch Floodway Corridor and Habitat Enhancement Project, Delta Wetlands Project, Franks Tract Project, Remanded Biological Opinions on the OCAP for the CVP and SWP, and the Sacramento-San Joaquin Delta Islands and Levees Feasibility Study, are still in the conceptual/early planning phase and consequently specific information to evaluate flood conveyance impacts cumulatively is lacking and/or speculative. However, it can be reasonably expected that such activities would also be required to meet the flood control requirements of the CVFPB and USACE in the Yolo Bypass.

The proposed Project (relying on Soils Reuse Option #1 [toe berm]) would result in limited increases in surface water elevation (see **Figure 4.1-9**) between 0.05 to .1 ft within small areas of the restoration interior. Construction of the toe berm would be to protect the west Yolo Bypass levee slope, which would be expected to have a considerably reduced effect on water surface elevation through engineering design, as well as provide additional protection to the levee. Hence, this version of the Project would not be cumulatively considerable and therefore would not contribute in a cumulatively significant manner with the related projects to flood conveyance impacts described in Section 4.1. N**o cumulative impacts** from flood conveyance would occur. No mitigation measures would be required.

For Soils Reuse Option #2 (stockpile at the restricted-height levee) and #3 (combination of #1 and #2), significant project-specific impacts would be mitigated to less than significant through the implementation of Mitigation Measure 4.1-1 (i.e., and finalizing the design to ensure that the elevation would not exceed CVFPB and USACE guidelines). As a result, the combination of these options with the related projects would still not be cumulatively considerable. Hence, with mitigation, the Project (with Soils Reuse Option #2 or Option #3) would result in a **less-than-significant cumulative impact** with respect to flood conveyance.

### *Other Hydrological Cumulative Impacts*

The proposed Project would not be cumulatively considerable and therefore would not contribute in a cumulatively significant manner to any of the potential hydrology impacts described in Section 4.1. No other planned projects in the vicinity, in conjunction with the proposed Project, would impact agricultural irrigation and drainage on the Project site or adjacent properties within the Bypass that depend upon the Project site irrigation and drainage infrastructure. There are no other planned projects within the lower Yolo Bypass that could contribute significantly to the impediment of winter flood conveyance and stormwater drainage. Additionally, no other planned projects are proposed collectively with the Project that would contribute significantly to impacts to local groundwater levels.

An additional concern is the cumulative impact of the Project on sea level rise. The site can accommodate sea level rise because of its location at the Delta margin. The Project's final design would also accommodate sea level rise, by examining and considering several relevant factors: existing elevation at the site, sedimentation rates and accretion, and projected sea level rise onsite. As discussed in Chapter 1 (Introduction), site selection is paramount, based on the best available science and the unique physical, chemical, and biological factors at the site. Several features would be included into the restoration efforts to achieve and maintain long-term ecological functions of tidal and seasonal wetlands. For example, encouraging tidal and seasonal wetlands to extend upslope could be done through the creation of a gradually sloping wetland/upland transition zone at interior areas onsite and then selecting restoration areas at the wetland-upland edge that would provide an elevation gradient over which the tidal wetland would shift upslope as sea level rises. Studies have found that local wetlands in the Bay-Delta region have been able to keep pace with recent rates of sea level rise through accretion rates between 2 and 5 mm per year (Orr *et al.* 2003; Callaway *et al.* 2012; PRBO Conservation Science 2012). Another action in dealing with sea level rise would be promoting early emergent vegetation to aid in the capture of sediment for marsh accretion. Such vegetation can also enhance the accumulation of organic matter in the developing wetland sediments (U.S. Bureau of Reclamation *et al.* 2010).

Accordingly, it would be advantageous for tidal marsh restoration efforts, such as the proposed Project, to be implemented during the first half of the 21$^{st}$ century, enabling onsite marsh elevations to be high enough to continue sustainable accretion rates in response to projected increased sea level rise in the latter part of the 21$^{st}$ century (PRBO Conservation Science 2012).

As detailed in Section 4.1, the overall increase in the tidal height/surface water elevation from the Project would be minor to less than significant with mitigation (see discussion in Impact 4.1-4). Therefore, the proposed Project would not be cumulatively considerable, and when combined with the related projects (who presumably would also look in design to accommodate exposure to sea level rise), would result in **no cumulative impacts** relating to other hydrological issues. No mitigation would be required.

## 4.10.2 Cumulative Impacts Analysis on Water Quality

In general, the related projects listed in **Table 4.10-2** would have similar water quality concerns as identified for the proposed Project; however, the magnitude of impacts from the related projects in connection with dredging activities in open channels would be greater than that of the Project alone.

### *Methylmercury Loading Cumulative Impacts*

Mining in the Coast Ranges for gold in the late 1800s required large amounts of mercury for extraction purposes. Furthermore, hydraulic mining generated large amounts of sediment that contained high levels of heavy metals (including mercury). This contaminated sediment was washed from the hillsides, carried downstream, and deposited in river beds, Delta tidal marshes, and mudflats. Under certain conditions identified in Section 4.2.1, Setting for Water Quality, these sediments have then lead to the formation of methylmercury (MeHg), the most bioavailable form of mercury. Mercury is of major concern today because of its continuing potential to adversely affect beneficial uses and human health in the Delta. Additionally, dredging these contaminated soils can release, re-suspend and re-distribute mercury and MeHg into the water column and in the food chain, leading to consumption of tainted fish and shellfish.

Most of the planned tidal marsh restoration projects, deepening open channel projects, and other related projects in **Table 4.10-2** could collectively contribute substantially to the release of mercury and/or the production and distribution of MeHg. These projects may involve one or more of the following activities: construction in the water, discharge into the water, or placement of fill on lands that are currently in agricultural production, in open channel waters, or part of levee improvements. **Table 4.2-6** presents the MeHg load and waste allocations for the Yolo Bypass as approved by the Central Valley Regional Water Quality Control Board (CVRWQCB). The majority of these related projects, including the proposed Project, would be participants in the CVRWQCB's Delta Mercury Control Program. For Phase 1, the program requires that discharges from identified sources be managed to reduce inorganic (total) mercury by relying on reasonable and feasible controls. The related projects would also be required to mitigate on a project-related basis to the maximum extent feasible. One related project is geared specifically to reduce mercury loads through a combination of actions to clean up mines, sediments, and wetlands. That project is the Cache Creek, Bear Creek, Sulfur Creek, Harley Gulch Mercury Total Maximum Daily Load Plan.

Tidal wetlands are generally known to produce less MeHg than irrigated agriculture and managed wetlands. As described in Section 4.2, the Project would not contribute in a substantial way to MeHg production and loading to the Delta, because the restoration of tidal marsh is expected to either reduce loadings from current conditions (by relying on Soils Reuse Option #1 or #3 (toe berm or combination), or result in no net change in MeHg loading (by relying on Soils Reuse Option #2 [stockpile within the restricted-height levee]). From a construction standpoint, the Project site would be isolated from Delta waters by excavating landside under low tide conditions.

Hence, for the reasons stated above, the Project would not be cumulatively considerable in conjunction with the related projects (refer to **Table 4.10-2**) when combined regarding MeHg loading. Overall, the Project would have a **less-than-significant cumulative impact** on MeHg loading. No mitigation measures would be required.

### *Dissolved Organic Carbon Levels Cumulative Impacts*

Dissolved organic matter (DOC) loads to Delta waters from restored tidal marshes could be a concern to municipal water suppliers, due to the increased potential for disinfection byproduct (DBP) formation. Greatly increased concentrations of DOC could prove to be problematic. The proposed Project lies within the Cache Slough Restoration Opportunity Area (ROA), where two other wetland restoration projects are planned and the draft BDCP has identified the area for 5,000 ac of tidal restoration.

The municipal water diversion of the most concern in this area would be the Barker Slough pumping plant. Hydrologic modeling (SCWA 2010b) was conducted to determine the potential for several proposed wetland restoration projects in the Cache Slough region to impact DOC levels at the Barker Slough intakes. The results indicate that those restoration projects that were closest to the intake, or had direct hydrologic connections to the Lindsey Slough system have the potential to exhibit measurable effects on the DOC concentrations at the intake, resulting in a potentially significant cumulative impact. Conversely, the North Bay Aqueduct Alternative Intake Project proposes to construct an alternative intake structure and pump station to move existing water supplies more efficiently during periods of high demand or to optimize use of water supplies. The new intake would be located above the Sacramento Regional Wastewater Treatment Plant to be upstream of the wastewater discharge point. This related project would be designed to improve water quality, including DOC levels that would benefit downstream the Project area.

Modeling results also indicated that the proposed Project would be too distant from the intake for DOC produced within its wetlands to have any measurable impact on DOC concentrations at the Barker Slough intake. The toe berm and stockpile soils reuse options would have no effect on DOC concentrations, because they would be upland uses and not substantively change organic matter production compared to existing land uses.

Long-term operation and management of the proposed Project also would not affect DOC levels at the intake. Therefore, the proposed Project would not be cumulatively considerable to DOC impacts at any existing municipal water intakes in combination with related projects identified in **Table 4.10-2**. Accordingly, the Project would result in a **less-than-significant cumulative impact**. No mitigation measures would be required.

### *Dissolved Oxygen and Biological Oxygen Demand Levels Cumulative Impacts*

Seasonal declines in dissolved oxygen (DO) can occur within the Project vicinity, and DO concentrations are negatively affected by increases in water temperature (refer to Section 4.2, Water Quality). Nutrient loading from point and nonpoint sources may also cause excessive algal growth, with a resultant lowering of DO concentrations in water bodies. Activities from related projects (see **Table 4.10-2**) that disturb sediments and aquatic plants such as dredging and clearing of aquatic plants from ship channels can cause increased decomposition of organic material, resulting in decreases in DO concentrations. Such projects would include the SRDWSC Project, the Southport Sacramento River Early Implementation Project, and the West Sacramento Levee Improvements. However, the removal of aquatic plants, especially invasive plant species, may allow light to better penetrate the water column, increasing photosynthesis and thereby increasing DO concentrations. Such activities would include the Aquatic Weed Control Program and the California Invasive Species Program (including the California Aquatic Invasive Species Management Plan).

Organic matter loads to the Delta from restored tidal marsh also could be a concern, due to the potential for increased biological oxygen demand (BOD) of these waters. Hydraulic modeling results of the tidal sloughs in the vicinity of the Project site indicate that there is adequate tidal circulation and exchange to prevent the formation of stagnant areas, which could become high BOD/low DO hotspots. Overall, it is unlikely that the organic matter exported from restored tidal marsh would cause a decrease in DO levels that could impact beneficial uses within the Delta (cbec 2010). Accordingly, the Project would not be cumulatively considerable in combination with related projects listed in **Table 4.10-2**. Therefore, the Project would result in a **less-than-significant cumulative impact** on DO and BOD levels in Delta waters. No mitigation measures would be required.

### *Other Water Quality Issues Cumulative Impacts*

Sediment, trash, and spills from construction activities at the Project site would have a less-than-significant impact on water quality in the Delta, due to implementing best management practices (BMP) identified as part of the scope of the Project, along with the preparation and implementation of a storm-water pollution prevention plan (SWPPP) and a spill prevention and control plan (SPCP) (see Chapter 3, Project Description). Potential construction impacts would be isolated to on or near the site, and other related projects (refer to **Table 4.10-2**) in the immediate area of the Project would be subject to the same stringent requirements to avoid affecting the water quality from sediment, trash, and spills. Therefore, construction impacts of the Project would not be cumulatively considerable to these particular water quality concerns.

Tidal restoration to meet the federal biological opinions (BiOps) requirements of 8,000 ac and the BDCP targets of 55,000 ac, along with sea level rise projections, have the potential to change the hydrodynamics of the San Francisco Estuary and Delta such that oceanic salinity may extend further inland (see Section 4.1, Hydrology). However, the Project would have a small increase in tidal prism (cbec 2010) given its relatively high site elevations. Therefore, the proposed Project would not be cumulatively considerable with the combined impacts of the related projects on salinity levels in the Delta.

Lastly, one domestic water supply well located within the Project site would not be impacted by the construction or post-construction phase. The related projects dealing with habitat restoration and conservation banks may affect local water supply wells, most substantially would be BDCP. The Davis-Woodland Water Supply Project would provide up to 46,100 acre-feet (ac-ft) annually of surface water from the Sacramento River to the cities of Davis and Woodland, as well as to the University of California at Davis. No local water supply wells would be affected. Overall, the Project would not be cumulatively considerable in conjunction with the related projects (see **Table 4.10-2**).

Given the above discussion, the Project, when combined with the related projects, would have a **less-than-significant cumulative impact** on other water quality issues. No mitigation measures would be required.

## 4.10.3 Cumulative Impacts Analysis on Terrestrial Biological Resources

For most of the terrestrial biological resource impacts occurring during the Project's construction, they would be temporary, localized, and minor and thus would not be cumulatively considerable with related projects. In other instances during construction, the proposed Project would have the potential to contribute to a potentially significant cumulative impact in combination with other projects in the region, particularly with other restoration projects or projects in similar habitats. Post construction, the Project would be beneficial to some special-status species by providing additional habitat.

### *Wetlands Cumulative Impacts*

The proposed Project would result in the temporary disturbance of seasonal wetlands, vernal pools, and other waters in combination with related projects in **Table 4.10-2** (e.g., restorations, dredging programs, aquatic weed control projects, and flood infrastructure improvements) during construction. The cumulative impact would be **significant** in the short term, and the proposed Project's contribution would be considerable. Mitigation measures proposed in this EIR would reduce the proposed Project's contribution to a **less-than-significant cumulative impact** by avoiding or minimizing impacts through locating activities outside of sensitive habitats where feasible, marking areas to be avoided on maps, limiting construction to the dry season, using an onsite biologist to monitor construction, minimizing the amount of disturbance, and monitoring revegetation of native plants for invasive species (refer to Mitigation Measures 4.3-1 and 4.3-3). Other projects would be required to include similar mitigation measures that would further reduce the cumulative impact.

The proposed Project would result in the permanent conservation of currently, degraded wetland communities and would have a beneficial effect from the improvement of wetland functions and values. The other restoration projects or projects with a restoration component also would have beneficial impacts. Projects such as the Putah Creek Wetland Mitigation Bank and Restoring Ecosystem Integrity in the Northwest Delta would include the restoration of vernal pools. As a result, the Project would not be cumulatively considerable in combination with related projects and would result in **no cumulative impact** on wetland communities, including vernal pools. No mitigation measures are required post construction. The Project would be permanently **beneficial** to wetland communities.

### *Riparian Woodland and Scrub Cumulative Impacts*

As noted in Section 4.3.3 (Impact 4.3-2), riparian habitats such as mature riparian forests, are limited in the Yolo Bypass as a result of flood control maintenance and agricultural practices. Some of the related projects identified in **Table 4.10-2** may impact riparian habitat during construction but would either mitigate and/or create new riparian habitat. Those projects would include Calhoun Cut/Lindsey Slough Tidal Habitat Restoration Project, Conaway Ranch Floodway Corridor and Habitat Enhancement Project, BDCP, Bay Delta Conservation Restoration Opportunity Areas, Dutch Slough Tidal Marsh Restoration Project, Fremont Landing

Conservation Bank, Yolo Bypass Wildlife Area Land Management Plan, and Yolo County Natural Heritage Program Habitat Conservation Plan/Natural Community Conservation Plan (HCP/NCCP).

The Project would involve the removal of some riparian woodland and scrub for up to five tidal connections during construction and possibly one more connection post construction that would involve up to about 720 ft in width of excavation. This impact would be limited to removal of those riparian vegetation within the confines of the tidal channel transect. Hence, the combined effects of the related projects and the Project would be negligible or too small to make the Project's contribution cumulatively considerable. Hence, the Project would have **no cumulative impact** to riparian woodland and scrubs. No mitigation would be required.

### *Special-status Plants Cumulative Impacts*

Because of the limited range and populations of certain special-status plants and the potential for impacts by the related projects (see **Table 4.10-2**) within the Yolo Bypass and Cache Slough Complex, projects with even minor effects may be cumulatively considerable and contribute to **significant cumulative impacts** on special-status plants.

The proposed Project would have significant impacts on Delta tule pea, Mason's lilaeopsis, and Suisun marsh aster, if present during construction, which could disturb or extirpate individuals and seedbanks and introduce or spread invasive species. Several of the related projects, including the BDCP; Dutch Slough Tidal Marsh Restoration Project; and Delta Wetlands Project, also would have similar impacts to special-status plants during construction. The cumulative impact would be significant, and the proposed Project's contribution would be considerable. A proposed mitigation measure included in this EIR (i.e., Mitigation Measure 4.3-2) would reduce the proposed Project's contribution to the cumulative impact by including a variety of methods to control invasive plant species. Corrective actions would also be part of the Project and are identified in Section 3.5.1, including periodic monitoring and reliance on limited cattle grazing to control invasive plant species. Hence, the potential for proposed Project restoration activities to impact special-status plants would be minimal.

Therefore, the proposed Project (incorporating avoidance, minimization, and mitigation) would not contribute in a cumulatively considerable manner to significant cumulative impacts to the Delta tule pea, Mason's lilaeopsis, and Suisun marsh aster. Other related projects with a habitat restoration component also would be required to provide suitable mitigation or avoidance on a project-by-project basis. Therefore, with mitigation, the contribution of the proposed Project to **cumulative impacts** on special-status plant species would be **less than significant**.

### *Giant Garter Snake Cumulative Impacts*

The proposed Project would have a significant impact, unless mitigated, on giant garter snake (GGS) during construction from the temporary loss of habitat and injury or mortality of individuals. Other related projects (see **Table 4.10-2**) that would have similar impacts during construction include the Dutch Slough Tidal Marsh Restoration Project, eradication programs for invasive plants, Delta Wetlands Project (Place of Use), and the BDCP. The **cumulative impact** from construction by the various projects listed that provide suitable GGS habitat would be **significant**, unless mitigated, and the proposed Project's contribution would be considerable. A proposed mitigation measure (see Section 4.3.4, Mitigation Measure 4.3-4) included in this EIR would reduce the proposed Project's contribution to a **less-than-significant cumulative impact** by scheduling construction when GGS would be active and would avoid danger; surveying the area prior to construction, minimizing vegetation clearing and avoiding adjacent areas designated as Environmentally Sensitive Areas; implementing a worker awareness program, and other measures intended to minimize disturbance. Other related projects would also include mitigation measures that would further reduce the cumulative impact.

The proposed Project also would have a **long-term beneficial effect** on GGS through the creation of additional habitat. Projects such as the Dutch Slough Tidal Marsh Restoration Project, Delta Wetlands Project (Place of Use), and BDCP would include measures that would either offset the habitat loss from construction or result in increased habitat for GGS. The Northern Liberty Island Fish Conservation Bank also is intended to preserve, create, restore, protect, and manage 400+ ac of habitat features suitable for GGS, and the Capital Conservation Bank also would establish a GGS conservation bank on 320 ac. The Pope Ranch Conservation Bank Project and the Ridge Cut Giant Garter Snake Conservation Bank already provide 391 ac and 186 ac of suitable habitat for GGS, respectively. Therefore, the long-term, cumulative impact on GGS habitat would be beneficial.

### *Western Pond Turtle Cumulative Impacts*

The proposed Project would have a significant impact, unless mitigated, on western pond turtle during construction from injury or mortality of individuals. Related projects in **Table 4.10-2** such the BDCP and other restoration projects that support the turtle's habitat would result in similar impacts. The **cumulative impact** on the turtles from construction activities would be **significant**, if not mitigated, and the proposed Project's contribution would be cumulatively considerable. A proposed mitigation measure (see Section 4.3.4, Mitigation Measure 4.3-5) included in this EIR would reduce the Project's contribution to a **less-than-significant cumulative impact**, because preconstruction surveys, along with appropriate actions to relocate the turtles if found, would be implemented to ensure that no turtles would be injured or killed by construction activities. Other related projects would also include mitigation measures that would further reduce this cumulative impact.

Conversely, the Project would have a **long-term beneficial effect** western pond turtle through habitat creation, and other projects such as the Delta Wetlands (Project Place of Use) and BDCP would also be beneficial. These projects would include measures that would either offset the habitat loss from construction or result in increased habitat for western pond turtles. Therefore, the long-term cumulative impact for the western pond turtle habitat would be beneficial.

### *Nesting by Special-status and Migratory Birds Cumulative Impacts*

Impacts on nesting special-status birds, including Swainson's hawk, and migratory birds would occur during construction of the proposed Project, and are likely to occur during construction of most of the related projects in Table **4.10-2**. The **cumulative impact** from construction would be **significant**, if not mitigated, and the proposed Project's contribution would be cumulatively considerable. A proposed mitigation measure included in this EIR (see Section 4.3.4, Mitigation Measure 4.3-6) would reduce the proposed Project's contribution to a **less-than-significant cumulative impact** by requiring preconstruction surveys, appropriate buffers, and specific measures to be implemented if active nests are present. Other related projects would also include mitigation measures that would further reduce the cumulative impact.

### *Foraging Habitat for Special-status Raptors Cumulative Impacts*

The proposed Project would result in a long-term loss of foraging habitat for Swainson's hawk, white-tailed kite, and loggerhead shrike as would several other related projects. In the event that all future restoration efforts and conservation banks listed in **Table 4.10-2** are realized and the full BDCP restoration targets are met, approximately 55,000 ac of agricultural and wetland habitat would be restored to historic conditions in the Delta, Yolo Bypass, and Suisun Marsh. Dredging activities where stockpiles of soil are placed on agricultural lands would also impact foraging habitat. With respect to Swainson's hawk, whose occurrences and nest locations are depicted in **Figure 4.3-9**, most of the related sites targeted for restoration would be located in areas that do not support large populations of Swainson's hawks. Projects in the Yolo Bypass (refer to **Figure 2-3**) would have some impact on this species, but such effects would be lesser than for the larger region in the Delta, due to regular inundation of flood waters during the rainy season and the overall low prey populations.

The loss of foraging habitat for the affected raptors would be a **significant cumulative impact** if not mitigated, and the proposed Project's contribution would be considerable. The mitigation measure proposed in this EIR would reduce the Project's contribution to less than significant by requiring the preservation or enhancement of the lost habitat (refer to Mitigation Measure 4.3-7). The related projects where raptor foraging habitat would be lost would also have similar mitigation measures that would further reduce the cumulative impact.

Restoration projects including the proposed Project would result in protection of a variety of habitat types, including tidal marsh, seasonal wetlands, levees, berms and associated uplands. Restoration and protection – in perpetuity – of a mosaic of habitat types that represent historic conditions would benefit Swainson's hawk and other raptors, by increasing biodiversity in an area that has been dominated by agriculture for over a century. Related projects that would provide additional foraging habitat for the Swainson's hawk and other sensitive raptors include the Conaway Ranch Floodway Corridor and Habitat Enhancement Project, Knaggs Ranch Project, Putah Creek Wetland Mitigation Bank, Sacramento River Ranch Conservation Bank, and Yolo County Natural Heritage Program HCP/NCCP. Therefore, with mitigation, the contribution of the proposed Project to **cumulative impacts** on foraging habitats for sensitive raptors, including Swainson's hawk, would be **less than significant**.

## 4.10.4 Cumulative Impacts Analysis on Aquatic Biological Resources

The Project site lies at the unique hydrologic intersection within the Delta where wetland restoration efforts have taken place and more are contemplated or planned for the future: Putah Creek fan, historic Yolo Basin floodway, and North Delta tidal marshes. The most substantial restorations that have happened in the region (see **Figure 3-3**) are the natural levee failures of Little Holland Tract (nearly 1,500 ac, 1983 and 1992 breaches) and Liberty Island (more than 4,300 ac, 1998 levee failure), both located immediately south of the Project site. East across the SRDWSC is the 1,600-ac Prospect Island tidal restoration, currently in the planning stages by DWR. Immediately south of the site is the 185-ac Kerry Parcel (now known as the Liberty Island Conservation Bank), constructed in 2010 as a wetland mitigation bank. Just southwest of the Project site is the 1,700-ac Liberty Farms diked wetlands enhancement project constructed through the Natural Resources Conservation Service (NRCS) Wetland Reserve Program.

At the western end of Lindsey Slough, the Calhoun Cut tidal wetland enhancement project is currently being planned by the California Department of Fish and Wildlife (CDFW). The forthcoming BDCP has identified a 5,000-ac tidal restoration target for the Cache Slough Complex; the Project as well as Prospect Island would likely count toward that target. In addition to specific projects, BDCP has identified six ROAs totaling approximately 200,000 ac within which it has identified minimum restoration targets totaling 22,000 ac. Within some or all of these regions, restoration activities would take place to bring the total restoration area up to the currently identified target of 55,000 ac.

For the Project alone, the potential adverse effects on aquatic biological resources would be less than significant, as discussed in Section 4.4.3, Impacts pertaining to Aquatic Biological Resources. The proposed construction and post-construction activities could potentially result in effects to aquatic and riparian habitats, direct fish lethality or injury, temporary noise impacts impeding or delaying fish migration, and water quality impacts on fish and aquatic resources. The construction-related effects of the proposed Project would be limited to the local area of the Yolo Bypass and Cache Slough Complex and have been effectively limited by conservation measures (e.g., construction BMP measures) and by the construction timing and sequencing.

The evaluation for cumulative effects considered whether any of these Project-specific impacts would be cumulatively considerable in conjunction with effects by the related projects listed in **Table 4.10-2.** The Project and the related projects would involve changes in habitat conditions within the Lower Yolo Bypass and northwest portion of the Delta resulting in cumulative effects on water quality, ecosystem function, food supply, habitat availability, and hydrology in the Yolo Bypass and Cache Slough Complex. The cumulative impacts analyses of the Project on aquatic biological resources were judged not significant for a number of reasons, as detailed in **Table 4.10-3**. Overall, the reasons leading to this conclusion included the following attributes of the related projects:

- Though the 8,000-ac restoration obligation under the two BiOps is in place and BDCP, with the presumed 55,000-ac restoration obligation, may be agreed upon in the next year or two, most of the actual projects to meet those obligations are currently not identified or not well defined. CEQA does not require speculation or consideration of projects that are not “probable.”

- Not scheduled for construction within the timeframe of the Project’s construction.
- Effects too temporary, localized and mitigated. Thus, the combined effects of the related projects and the Project were negligible or too small to make the Project’s contribution cumulatively considerable.
- Not related to aquatic biological resources. Although such project was related due to location, its effects pertained to other environmental resources rather than on aquatic biological resources.
- Provides more habitat for sensitive fish species as well as more riparian and wetland habitat. There is a benefit in such cases, preempting cumulative adverse effects of the Project.
- Refuge would not have adverse effects on delta smelt. Here, the refuge is in a facility, out of the Delta waters, and would be beneficial.
- Would reduce or not affect invasive species at the Project site.
- Intended to reduce or not affect mercury at the Project site.

Over the long term, operations of the proposed Project would reduce the amount of water from the Delta used for field irrigation. The increased tidal prism and daily tidal exchange of water in the restored site would incrementally alter tidal exchange in the lower Yolo Bypass and Cache Slough Complex channels (refer to Section 4.1, Hydrology). However, the potential hydrologic effects of the Project would be small and localized, and thus, would not contribute considerably to any future cumulative adverse conditions associated with Delta flow or hydrodynamic conditions important to fisheries habitat.

As noted above, the water quality conditions in the Yolo Bypass and downstream water bodies following implementation of the Project would not be measurably different, and may improve, relative to existing conditions, therefore impacts to fisheries would be minimal or beneficial. Because the Project would enhance regional food web productivity in support of delta smelt recovery, incrementally increase the amount of available habitat for fish that utilize tidal wetlands and seasonal floodplains for spawning and/or rearing, and would restore natural tidal exchange with the floodplain, the Project would increase habitat and lessen other current adverse effects to the delta smelt population.

## Table 4.10-3. Explanations of Why Project Cumulative Effects are not Considerable

| Related Projects | Effects of Related Projects that make the Project Effects not Cumulatively Considerable |
|---|---|
| **Anadromous Fish Screen Program** | Effects of projects temporary, localized and mitigated |
| **Aquatic Weed Control Program** | Would reduce or not affect invasive species at the Project site. |
| **Bay Delta Conservation Plan and Alternative Delta Conveyance Facilities** | Effects on fish and wetlands/riparian habitats beneficial or mitigated. Construction phase not firmly established. |
| **Biological Opinions and Conference Opinions on the Long-term Operations of the Central Valley Project and State Water Project for Delta Smelt and Salmonids** | Similar temporary and localized and mitigated effects of projects intended to yield more fish and wetland and riparian habitat, and operations to protect or increase sensitive species of fish. |
| **Cache Creek, Bear Creek, Sulfur Creek, Harley Gulch Mercury Total Maximum Daily Load Plan** | Would reduce or not affect mercury at the Project site. |
| **Cache Creek Resources Management Plan and Improvement Program** | Provides more riparian habitat. |
| **CALFED Ecosystem Restoration Program Conservation Strategy/Delta Regional Ecosystem Restoration Implementation Plan** | Similar temporary and localized and mitigated effects of a project intended to improve wetland habitat. |
| **Calhoun Cut/Lindsey Slough Tidal Habitat Restoration Project** | Similar temporary and localized and mitigated effects of projects intended to yield more fish and wetland and riparian habitat. Construction phase not firmly established. |
| **California Aquatic Invasive Species Management Plan** | Would reduce or not affect invasive species at the Project site. |
| **CALFED Delta Risk Management Strategy** | Future repairs and improvements, based on funding, would result in potential effects on sensitive fish species that would be mitigated. |
| **California Invasive Species Program** | Would reduce or not affect invasive species at the Project site. |
| **Campbell Ranch Conservation Bank** | Provides more vernal pool habitat for vernal pool fairy shrimp and vernal pool tadpole shrimp. |
| **Capital Conservation Bank** | Potential impacts of construction on sensitive fish and wetlands would be mitigated. Construction phase not firmly established. |
| **Central Valley Flood Protection Plan — 2012** | Though no projects are yet detailed, repairs and improvements potential effects on sensitive fish species would be mitigated. Construction phase not firmly established. |
| **Conaway Ranch Floodway Corridor and Habitat Enhancement Project** | Similar temporary and localized and mitigated effects of projects intended to yield more fish and wetland and riparian habitat. Construction phase not firmly established. |
| **Davis-Woodland Water Supply Project** | Intake construction effects temporary, localized and mitigated. Construction phase not firmly established. |
| **Delta Plan** | Reviews and comments on major projects, activities, programs, and plans in the Delta. Does not directly carry out construction or development of projects in the Delta. |

### Table 4.10-3. Explanations of Why Project Cumulative Effects are not Considerable

| Related Projects | Effects of Related Projects that make the Project Effects not Cumulatively Considerable |
|---|---|
| **Delta Smelt Permanent Refuge** | Refuge would not have adverse effects on delta smelt. Construction phase not firmly established. |
| **Delta Wetlands Project** | Delta Wetlands would create more wetland habitat, and effects would be mitigated, including take of delta smelt and other listed fish species. Construction phase not firmly established. |
| **Delta Wetlands Project Place of Use** | Delta Wetlands would create more wetland habitat, and effects would be mitigated, including take of delta smelt and other listed fish species. Construction phase not firmly established. |
| **Development Activities Proposed in Sacramento County** | Not related to aquatic biological resources. Construction phase not firmly established. |
| **Development Activities Proposed in Solano County** | Not related to aquatic biological resources. Construction phase not firmly established. |
| **Development Activities Proposed in Yolo County** | Per Capital Conservation Bank and Putah Creek Wetland Mitigation Bank. Construction phase not firmly established. |
| **Dutch Slough Tidal Marsh Restoration Project** | Similar temporary and localized and mitigated effects of projects intended to yield more fish and wetland and riparian habitat. Construction phase outside of construction timeframe for the Lower Yolo Restoration Project.. |
| **Fish Screen Project at Sherman and Twitchell Islands** | Intake construction too temporary, localized and mitigated, and intended to save fish. Construction phase not firmly established. |
| **FloodSAFE Strategic Plan** | Repairs and improvements potential effects on sensitive fish species would be mitigated. Construction phase not firmly established. |
| **Franks Tract Project** | Temporary, localized and mitigated construction effects of a project intended to yield more delta smelt. Construction phase not firmly established. |
| **Fremont Landing Conservation Bank (aka Central Valley Anadromous Salmonid Umbrella Conservation Bank)** | Provides more habitat for sensitive fish species as well as more riparian and wetland habitat. |
| **Fremont Weir Modifications Project** | Temporary, localized and mitigated construction effects of a project intended to yield more salmonids and sturgeon. Construction phase not firmly established. |
| **Knaggs Ranch Project**<br>**(Formerly known as the Elkhorn Basin Ranch)** | Temporary, localized and mitigated construction effects of a project intended to yield more fish and wetland habitat. Construction phase not firmly established. |
| **Knaggs Ranch Project: Experimental Agricultural Floodplain Pilot Study** | Limited study on growth of salmonids when exposed to different habitat regimes onsite. |
| **Levee Failure (Natural Event): Liberty Island** | Provides wetland and sensitive fish species habitat. |
| **Levee Failures (Natural Events): Little Holland Tract** | Provides wetland and sensitive fish species habitat. |
| **Liberty Island Conservation Bank**<br>**(Formerly known as the Kerry Parcel Project)** | Provides wetlands and sensitive fish species habitat. |

## Table 4.10-3. Explanations of Why Project Cumulative Effects are not Considerable

| Related Projects | Effects of Related Projects that make the Project Effects not Cumulatively Considerable |
|---|---|
| **Lisbon Weir Fish Passage Enhancement** | Conceptual at this time; CEQA process has not begun; potential implementation time frame is outside the construction timetable for the Lower Yolo Restoration Project. |
| **Little Holland Tract Restoration** | Would provide more wetlands and sensitive fish species habitat. |
| **Lower Cache Creek, Yolo County Woodland Area Feasibility Study** | Would reduce or not affect mercury at the Project site. |
| **Lower Putah Creek Realignment Project** | Temporary, localized and mitigated construction effects of a project intended to yield more fish and wetland habitat. Construction phase not firmly established. |
| **Mayberry Farms Subsidence Reversal and Carbon Sequestration** | Provides more wetland habitat. |
| **North Bay Aqueduct Alternative Intake Project** | Would benefit sensitive fish species. Construction phase not firmly established. |
| **Northern Liberty Island Fish Conservation Bank (aka North Delta Fish Conservation Bank)** | Would provide more wetlands and sensitive fish species habitat. Construction phase not firmly established. |
| **Pope Ranch Conservation Bank Project** | Provides more wetland habitat. |
| **Prospect Island Restoration Project** | Could increase predation; however, the Project (Lower Yolo) should make more habitat for sensitive species of fish, and more fish as well. The Prospect Island potential effects would be mitigated. Construction phase not firmly established. |
| **Putah Creek Wetland Mitigation Bank** | Temporary, localized and mitigated effects of a project intended to yield more wetland habitat. Construction phase not firmly established. |
| **Remanded Biological Opinions on the Coordinated Long-term Operation of the Central Valley Project and State Water Project** | Although there are no specific improvements proposed at this time (only operational changes), for purposes of analysis it is assumed that there would be construction and that temporary, localized effects would occur, be mitigated with the intention that this project would yield more wetland habitat. Construction phase not firmly established. |
| **Restoring Ecosystem Integrity in the Northwest Delta** | Temporary, localized and mitigated effects of a project intended to yield more wetland habitat. |
| **Ridge Cut Giant Garter Snake Conservation Bank** | Provides some additional wetland habitat. |
| **Sacramento River Deep Water Ship Channel Project** | Temporary potential adverse effects on sensitive fish species would be mitigated. Construction phase not firmly established. |
| **Sacramento River Ranch Conservation Bank** | Provides additional habitats for the valley elderberry longhorn beetle, Swainson's hawk, and salmonids. |

**Table 4.10-3. Explanations of Why Project Cumulative Effects are not Considerable**

| Related Projects | Effects of Related Projects that make the Project Effects not Cumulatively Considerable |
|---|---|
| **Sacramento-San Joaquin Delta Islands and Levee Feasibility Study** | Repairs and improvements to levees in the Delta and Suisun Marsh region with potential effects on sensitive fish species would be mitigated. Construction phase not established. |
| **Southport Sacramento River Early Implementation Project River Early Implementation Project** | Temporary potential adverse effects on sensitive fish species would be mitigated. Construction phase not firmly established. |
| **Tule Canal Fish Passage Enhancement** | Conceptual at this time; CEQA process has not begun; potential implementation time frame is outside the construction timetable for the Lower Yolo Restoration Project. |
| **Update to the 2006 Water Quality Control Plan for the Bay-Delta Estuary (Bay-Delta Plan)** | Developing flow requirements and water quality objectives for the Bay-Delta Estuary. |
| **West Sacramento Levee Improvements Program** | Temporary potential adverse effects on sensitive fish species would be mitigated. Construction phase not firmly established. |
| **Yolo Bypass Salmonid Habitat Restoration and Fish Passage** | Temporary potential adverse effects on sensitive fish species would be mitigated. Construction phase not firmly established. |
| **Yolo Bypass Wildlife Area Land Management Plan** | Provides sensitive fish species habitat and wetland habitat. |
| **Yolo County Natural Heritage Program Habitat Conservation Plan/Natural Community Conservation Plan** | Temporary, localized and mitigated effects of potential projects intended to protect or increase sensitive fish species populations and wetland habitat. Construction phase not firmly established. |

With mitigation proposed in Section 4.3.4, the Project, in conjunction with the related projects, would not be cumulatively considerable and would not contribute to a significant cumulative adverse conditions for delta smelt, salmonids, longfin smelt, green sturgeon, or other fish species within the affected environment. Moreover, the Project and those related projects that would contribute to improvements to the quality of the ecosystem and/or provide additional aquatic habitats would, in the long term, be **beneficial** to the aquatic biological resources. Hence, the Project would result in **less-than-significant cumulative impacts** to aquatic biological resources during the construction phase only.

There would be **no cumulative impacts** to aquatic biological resources with post construction activities involving monitoring, scientific sampling, and other minor, non-invasive activities. For those scientific activities requiring incidental take of sensitive species, the individuals or entities involved would apply for the appropriate permits and comply with conditions set forth by CDFW and/or USFWS. Those entities involved with the related projects that support scientific and other research activities would also have to comply with applicable environmental regulatory permits prior to the commencement of such activities. No mitigation measures would be required.

## 4.10.5 Cumulative Impacts Analysis on Agricultural Resources

### *Important Farmland and Productivity Loss Cumulative Impacts*

Much of the Delta lands are in agricultural use. Related projects in **Table 4.10.2** have at least one or more of the following attributes: habitat protection and ecosystem restoration, water conveyance and water quality, flood control and levee maintenance, and local and regional land use planning activities. The vast majority of these projects, activities, and programs would have the potential to significantly impact Important Farmland and productivity. Up to 55,000 ac of land in the Delta and Suisun Marsh may be converted to tidal wetlands in order to partially fulfill the two federal BiOps (requiring 8,000 ac of tidal restoration for the delta smelt) and the BDCP, currently under development (potentially requiring 55,000 ac of wetland restoration, including the 8,000 ac required under the BiOps).

Other major activities such as the recently approved 2012 Central Valley Flood Protection Plan, with modifications to existing levees and weirs, could lead to affecting the use of Important Farmlands. The creation and management of Dutch Slough tidal marsh restoration would affect land formerly used for ranchlands and a dairy. Other habitat restoration efforts, including Prospect Island Restoration Project, Restoring Ecosystem Integrity in the Northwest Delta, Yolo Bypass Wildlife Area Land Management Plan, and the proposed Yolo County Natural Heritage Program HCP/NCCP would further contribute to the removal of Important Farmlands. Dredging activities, such as the SRDWSC Project, Southport Sacramento River Early Implementation Project, and West Sacramento Levee Improvements Program may temporarily impact Important Farmland and productivity loss through the use of such sites for stockpiles of dredged soils.

It is expected that each of the proposed or potential projects, programs, or activities in the region would assess impacts of any conversion of agricultural lands to wetlands resulting from that action as it proceeds through CEQA review and to mitigate for significant impacts. However, as discussed below, there would still be a significant cumulative net loss of agricultural lands in the Delta even after mitigation with the combined actions of the related projects.

The proposed Project is one of the first habitat restoration projects designed to meet the two federal BiOps and BDCP tidal restoration targets and, as described above, would contribute about 1,480 ac to the total acreage converted from agricultural to habitat (wetland) uses. As described in Impact 4.5-1, up to 240 ac of this is defined as Important Farmlands (Unique Farmland) under the *State CEQA Guidelines*. Conversion of Unique Farmlands with Project implementation would be a less-than-significant impact to agricultural resources (refer to Section 4.5, Agricultural Resources). In particular, the restoration of 240 ac of Unique Farmlands represents the conversion of approximately 0.04 percent of the total agricultural land in the County and a decrease of about 0.4 percent of the County's Unique Farmlands. More importantly, as identified in Section 4.5, these Unique Farmlands are marginal in their productivity due to limited availability of usage (outside of the flood inundation period), poor soil quality, and an overall poor California Land Evaluation and Site Assessment Model (LESA) rating. Hence, this Project would not be cumulatively considerable with the related projects (refer to **Table 4.10-2**) when combined. Overall, the Project would have a **less-than-significant**

**cumulative impact** to the loss of Important Farmlands and productivity in Yolo County. No mitigation measures would be required.

### *Other Cumulative Impacts to Agricultural Resources*

Two other issues, inconsistencies with existing Williamson Act contracts and county, regional, and state planning requirements, were found to yield no impacts with the implementation of the Project (see Section 4.5). While some of the related projects in **Table 4.10-2** may be inconsistent with Williamson Act contracts in place, these projects would be required to undergo the appropriate process to either renew or terminate those contracts. With the exception of some of the development activities planned in the counties (such as in Yolo County and Solano County), most if not all of the major projects, programs, and activities would be consistent with the various planning requirements (including the LUMRP policies noted in **Table 4.5-6**). For those activities not consistent with planning efforts, they would undergo variances or not be approved. Therefore, the proposed Project, combined with the related projects, would result in **no cumulative impacts** relating to inconsistencies with existing Williamson Act contracts and county, regional, and state planning requirements. No mitigation measures would be required.

## 4.10.6 Cumulative Impacts Analysis on Air Quality and Greenhouse Gases

### *Construction Activities and Consistency with State and Federal Air Quality Plans Cumulative Impacts*

Situated in the Sacramento Valley Air Basin (SVAB), those related projects in **Table 4.10-2** whose construction schedules overlap with the Project's schedule would collectively release air criteria pollutants, mostly notably nitrogen oxides ($NO_x$) and particulate matter (PM). These projects would include, but not be limited to, the Capital Conservation Bank, the CALFED Ecosystem Restoration Program, the Calhoun Cut/Lindsey Slough Tidal Habitat Restoration Project, the Campbell Ranch Conservation Bank, the Davis-Woodland Water Supply Project, Little Holland Tract Restoration, Putah Creek Wetland Mitigation Bank, Restoring Ecosystem Integrity in the Northwest Delta, SRDWSC Project, and Southport Sacramento River Early Implementation Project.

Currently, the criteria pollutants of most concern in the SVAB are ozone ($O_3$) ($NO_x$ is a precursor to $O_3$) and PM (refer to **Table 4.6-3**). For $O_3$, the Yolo-Solano Air Quality Management District (YSAQMD) prepares and implements the state implementation plan (SIP) that addresses attainment of the state and federal $O_3$ Ambient Air Quality Standards (AAQS). Growth accommodation is recognized in these plans by forecasting growth in $O_3$ precursor emissions, while offsetting such emissions by regional controls on stationary, area, and transportation sources. For $O_3$ emissions above significance thresholds, those projects have not been accommodated in the air quality plans; hence, they are not consistent with air quality plans. Accordingly, construction emissions from such projects occurring during the same timeframe as the SIP would have a **significant cumulative impact** on regional air quality, unless $O_3$ precursor emissions (i.e., $NO_x$) would be below the YSAQMD significance thresholds.

With respect to PM, the YSAQMD implements regulations from the California Health & Safety Code § 39614 and has developed a subset of control measures to further reduce $PM_{10}$ emissions from new and existing stationary, mobile, and area sources. The objective is to make progress toward attainment of the California $PM_{10}$ standard. When $PM_{10}$ emissions are above those significance thresholds, such projects when combined during the same timeframe have not been accommodated in the plan and therefore the construction emissions would have a significant cumulative impact, if not mitigated, within the SVAB for the Yolo-Solano region.

Construction of the related projects (see **Table 4.10-2**) would emit air criteria pollutants including $NO_x$ and $PM_{10}$, generated from construction equipment and vehicles. In addition, projects involving earth-moving activities would generate fugitive dust emissions. Overall, those related projects could collectively exceed YSAQMD's significance criteria and result in a **significant cumulative impact** for both construction activities and air quality planning consistency if their construction schedules overlapped and if not mitigated.

Other identified related projects (see **Table 4.10-2)** are conceptual in nature, in the planning phase with construction beyond the Project's construction schedule, have no funding to implement the project at this time, or have been completed. Other activities listed include studies, local programs to eradicate invasive species, and small pilot experiments when combined in the same time period would not contribute to or exacerbate ambient air quality problems and result in **no cumulative impact**.

As noted in Section 4.6.3, Impacts on Air Quality, the proposed Project would potentially result in a significant, temporary impact for $NO_x$ and $PM_{10}$ during the construction phase, unless mitigated. The Project's proposed mitigation measure (see Section 4.6.4, Mitigation Measure 4.6-1) would reduce this impact to less than significant. With a number of features built in to the mitigation measure to control onsite air pollutant emissions, two aspects would be particularly critical: only Phase 1 of the Project would be implemented, and a reduction in construction activity during "Spare the Air" (Air Quality Index >127) days within the Sacramento Metropolitan Air Quality Management District (summer downwind area) would be instituted. Standard dust control measures, e.g., watering dry lands, would also reduce PM emissions. Additionally, the Project would undergo construction for a short duration, approximately six months. The contractor would also prepare and implement an emissions reduction plan to further control emissions. Finally, the Project would be consistent with YSAQMD's plans, as the Project would not be growth inducing.

Based on the discussion above, the Project with mitigation would not be cumulatively considerable and therefore, with the related projects, would result in a **less-than-significant cumulative impact** for temporary air emissions released during the construction phase.

For the post-construction phase of the Project, minor activities such as monitoring and scientific studies would involve few vehicles and possibly a small boat for infrequent inspections. Such activities would result in **no cumulative impact** in conjunction with other related projects. No mitigation measures would be required.

In addition, the Project, combined with the related projects, would have **no cumulative impact** in connection with YSAQMD's air plans, since the Project's contribution would not be cumulatively considerable. No mitigation would be required.

### *Greenhouse Gases and Global Climate Change Cumulative Impacts*

The Project's greenhouse gas (GHG) emissions due to construction activities would be temporary and would be less than significant when compared to applicable thresholds (refer to the discussion in Section 4.6.3, Impact 4.6-3, Greenhouse Gases and Global Climate Change Contributions). Construction of the other related projects would contribute to temporary cumulative emissions of GHG in the region. The impacts of these other projects could be cumulatively significant if their construction schedules overlapped. However, because the proposed Project would be constructed prior to construction of most of the related projects that have not already been built, and the Project's contribution to GHG would be below applicable standards, the Project's contribution would not be cumulatively considerable and, therefore, the Project would have a **less than significant cumulative impact** for GHG and global climate change. No mitigation measures would be required.

## 4.10.7 Cumulative Impacts Analysis on Cultural Resources

### *Buried Archaeological Resources and Human Burial Resources Cumulative Impacts*

The proposed Project would not affect any known archaeological sites. However, prehistoric habitation sites are common in riverbank and floodplain areas, and burial sites are often accidentally discovered during excavations. Project-related impacts on archaeological resources and human burial resources would therefore be limited to possible inadvertent disturbance of unknown buried resources during ground-disturbing activities (refer to Section 4.7).

Other development and government projects in the Project vicinity that require grading and excavation would also have the potential to inadvertently disturb archaeological resources. Local related (active) projects would include but not be limited to: Cache Creek Resources Management Plan and Improvement Program, Calhoun Cut/Lindsey Slough Tidal Habitat Restoration Project, Capital Conservation Bank, Davis-Woodland Water Supply Project, Fremont Landing Conservation Bank, Liberty Island Conservation Bank, Little Holland Tract Restoration, Mayberry Farms Subsidence Reversal and Carbon Sequestration, Northern Liberty Island Fish Conservation Bank, Putah Creek Wetland Mitigation Bank, Restoring Ecosystem Integrity in the Northwest Delta, Ridge Cut GGS Conservation Bank, SRDWSC Project, Southport Sacramento River Early Implementation Project, and Yolo Bypass Wildlife Area Land Management Plan.

The cumulative effect of these related projects would contribute to the continued loss of subsurface cultural resources and result in a **significant cumulative impact**, if these resources were not properly managed upon discovery. For the Project, implementation of mitigation measures proposed (Mitigation Measures 4.7-1 and 4.7-2) would minimize the potential for inadvertent destruction of such important buried resources. These measures would involve conducting environmental awareness training regarding cultural resources by a qualified archaeologist to contractors and vendors prior to the initiation of construction, redirect work when buried archaeological/human burial resources were uncovered, and complying with state law on identifying, removing, and managing historic resources and Native American remains and grave goods. Furthermore, as required by CEQA and the *State CEQA Guidelines*, other development projects in the area would also implement similar measures to fully document those resources and minimize destruction.

Accordingly, the Project, with mitigation, would not be cumulatively considerable, and in conjunction with the related projects, would result in a **less-than-significant cumulative impact** with respect to buried archaeological and human burial resources.

### *Historic Resources Cumulative Impacts*

No listed historic landmarks have been identified on the Project site. The Project would result in minor changes to certain levees that contribute to a potential Yolo Bypass historic district (refer to Impact 4.7). As noted in Section 4.7, the Project modifications would not materially impact the Stair Step and Toe Drain and there would be a less-than-significant impact to these structures' integrity. Such Project changes would not be cumulatively considerable in conjunction with potential cultural resources impacted by other related projects. Other habitat restoration projects, flood control and conveyance projects, and dredging/channel deepening projects each may encounter and affect historic resources, including the levees. Each of those projects would be required to mitigate for any such resources discovered. Therefore, the Project would not be cumulatively considerable; in particular, its **cumulative impact** on historic resources, in combination with the related projects listed in **Table 4.10-2** would be **less than significant**. No mitigation measures would be required.

## 4.10.8 Cumulative Impacts Analysis on Hazards and Hazardous Materials

### *Soils and Materials Contamination Cumulative Impacts*

Isolated, contaminated areas have been found onsite and have the potential to exist on sites proposed for development as described in **Table 4.10-2,** due to a variety of land use activities. Agricultural production, conducted on sites of applicable related projects, utilizes storage facilities and agricultural ponds or pits contaminated with fertilizers, pesticides, herbicides, or insecticides. Petroleum products and other substances may be present in the soil and groundwater near leaking underground tanks used to store such materials. Leaking polychlorinated biphenyls (PCB) from aging electrical transformers may also be present. Contamination from metals and polycyclic aromatic hydrocarbons (PAH) could result from existing and defunct railroad operations. Metals such as cadmium, zinc, and mercury are present in inactive and abandoned mines, and in streams in the Delta. Hence, implementing the related projects collectively could result in a **potentially significant cumulative impact**.

The proposed Project identified potential sources of contamination, such as unknown hazardous materials or wastes in the sediments encountered during ground-disturbing activities, salvaged wood from repairs of the irrigation system that may have been treated or painted and contain creosote or other hazardous chemicals, and possible leaking of PCBs from Pacific Gas & Electric (PG&E)'s electrical transformers. Mitigation Measure 4.8-1 would ensure that such discoveries would be mitigated to less than significant by developing plans to treat or remove such contaminants in accordance with federal and state hazardous waste laws and regulations.

Hazards and hazardous materials associated with any of the related projects (see **Table 4.10-2)** would need to be evaluated for potential risks to public safety on a project-by-project basis. Furthermore, as required by CEQA and the *State CEQA Guidelines*, the related projects would also implement similar measures to ensure that humans, biological resources, and the environment would not be subjected to dangerous materials. Section 4.8.1 describes in detail the array of federal, state, and local laws, regulations, and ordinances that all projects must comply with to reduce the likelihood of accidental release of hazardous materials or how to handle an unknown source of existing contamination.

Therefore, based on the above discussion, the Project, with mitigation, would not be cumulatively considerable, and in conjunction with the related projects listed in **Table 4.10-2**, would result in a **less-than-significant cumulative impact** with respect to soils and materials contamination.

### *Hazards with Natural Gas Wells/Pipelines Cumulative Impacts*

Natural gas was discovered in the Delta in 1935 and has since been developed into a substantial source supply and depot for underground storage[41]. Gas fields, pipelines, underground storage areas, and its infrastructure are located throughout the region. Infrastructure consists of pipelines and storage facilities owned by oil and gas companies, public and private utilities, and a multitude of independent leaseholders.

It is likely that gas wells exist on several of the sites proposed for conversion to wetland habitats and conservation banks listed in **Table 4.10-2** that could lead to a **significant cumulative impact** concerning the risk of upset. Each related project would be responsible for mitigating impacts from gas well hazards (e.g., potential explosion and fire) on the specific site. As described in Section 4.8, the Project's mitigation (Mitigation Measure 4.8-2) would reduce its contribution to less than significant. The related projects would be required to fully mitigate their impacts to any onsite wells too.

Therefore, the Project, with mitigation, would not be cumulatively considerable and the **cumulative impact** on gas well/pipeline hazards by related projects with the contribution of the proposed Project would be **less than significant**.

[41] *CALFED Bay-Delta Program Final Programmatic EIS/EIR*. 2000. Chapter 7, page 7.6-3.

### *Mosquito Control Cumulative Impacts*

Mosquitoes are the primary biological vectors for disease in the region. Certain agricultural infrastructure and practices (for example, irrigation ditches and post-harvest flooding in fields to provide habitat for wintering waterfowl and other wildlife) may create suitable breeding conditions for mosquitoes. Open-water habitats include permanently inundated wetlands, ditches, sloughs, and ponds that may in part sustain stagnant or standing waters, which are also ideal for mosquito breeding.

Mosquito control by Sacramento-Yolo Mosquito Vector Control District (SYMVCD) includes:

- Biological agents, such as mosquito fish, which consume mosquito larvae.
- Source reductions, such as draining the water bodies that produce mosquitoes.
- Pesticides.
- Ecological manipulations of mosquito breeding habitat.

The restoration of 55,000 ac of tidal wetlands in the Delta and Suisun Bay (the preliminarily identified BDCP target) could reduce impacts associated with mosquito production in existing ponds and ditches on those sites, but increase mosquito production on new tidal wetland areas. Similarly the mitigation bank and habitat restoration related projects listed in **Table 4.10-2** could result in increased mosquito production. A potential indirect benefit of improved water quality by projects such as the North Bay Aqueduct Alternative Intake Project could include controlling the mosquito population. Decreased amounts of organic material in the water could discourage mosquitoes from breeding, thereby decreasing the mosquito population. The SRDWSC Project, the Southport Sacramento River Early Implementation Project, and the West Sacramento Levee Improvements Program may re-suspend organic matter in the water temporarily during dredging activities and thereby contribute to an increased risk in mosquito production. However, conversely, by widening the channels, there would be less likelihood of adjacent flooding resulting in less standing water in the fields, thereby reducing mosquito production. Overall, each related project would be responsible for mitigating its contribution to mosquito production.

As described in Section 4.8, the proposed Project would reduce levels of mosquito generation, because it would substantially reduce the area of seasonal and perennial wetlands and irrigated pastures - habitat with vegetation and hydrologic characteristics that can promote mosquito production - in favor of tidal wetlands, which are far less suitable for mosquito production. Additionally, in the Project Description (Chapter 3), there are corrective actions included as part of the Project that detail a plan to follow if mosquito production fails to decrease after the completion of the construction phase. Such measures would include habitat management, biological controls, physical controls, and appropriate chemical treatment (but only as a last resort and in consultation with SYMVCD). Overall, after Project implementation, mosquito production would be expected to decrease substantially, resulting in a **beneficial effect**.

Consequently, the proposed Project would not be cumulatively considerable and in conjunction with the related projects would result in a **less-than-significant cumulative impact** on mosquito production. No mitigation measures would be required.

## 4.10.9 Cumulative Impacts Analysis on Energy Consumption

The Project would result in a one-time energy demand (i.e., natural gas, electricity, and transportation fuels) associated with construction and a very small ongoing demand for energy associated with post construction (e.g., maintenance and monitoring). As described in Section 4.9, that demand would not represent a wasteful or inefficient use of energy. Calculations reveal that less than 0.6 percent of the entire Yolo County consumption of diesel fuel would be required to construct the Project. Demand for electricity, natural gas and other transportation fuels would also be minor during both construction and post construction.

Of the related projects listed in **Table 4.10-2** that might conceivably be constructed during the Project's construction phase, all would represent short-term, but moderate energy consumption. These projects would include, but not be limited to, the Capital Conservation Bank, the Davis-Woodland Water Supply Project, Little Holland Tract Restoration, Putah Creek Wetland Mitigation Bank, Restoring Ecosystem Integrity in the Northwest Delta, SRDWSC Project, and Southport Sacramento River Early Implementation Project. Additionally, some project elements may actually result in energy efficiency during their operational phases such as the repairs and replacements of older pumps and motors with newer equipment for irrigation systems and flood control infrastructure.

Other programs, plans, and projects have a longer planning phase and their construction activities would not overlap with the Project's construction schedule including the BDCP, Central Valley Flood Protection Plan, the Dutch Slough Tidal Marsh Restoration Project, and Remanded Biological Opinions on the Coordinated Long-term Operation of the Central Valley Project and State Water Project. Still other activities have no known construction date as of this writing, such as the Prospect Island Restoration Project and the Yolo Bypass Salmonid Habitat Restoration and Fish Passage. Ongoing programs, such as CALFED's Ecosystem Restoration Program Conservation Strategy/Delta Regional Ecosystem Restoration Implementation Plan and the BiOps for delta smelt and salmonids provide the justification for several of the identified projects in **Table 4.10-2** and no other applicable projects related to these programs are identified at this time. For small ongoing programs, such as AFSP and invasive plant control, energy consumption would be extremely minor, as would be the small development projects near the Project vicinity in Sacramento, Solano, and Yolo counties.

While the specific construction details of the combined related projects are not known at this time, it is not likely that the overlapping construction activities for these projects would result in the substantial and inefficient waste of energy (i.e., natural gas, electricity, or transportation fuels) region wide. Based on the Project's short construction period (i.e., about six months) and the small usage of energy required, the incremental effect of the Project with the related projects would not be cumulatively considerable. Therefore, the **cumulative impact** on energy consumption by the Project in conjunction with the related projects during construction would be **less than significant**. For post construction, all of the related projects would require minimal energy levels. Hence, the Project with its minimal contribution during post construction (see Section 4.9) for energy usage would not be cumulatively considerable and with the related projects would result in **no cumulative impact**. No mitigation measures would be required.

# Chapter 5 Alternatives

## 5.1 Introduction

The California Environmental Quality Act (CEQA) requires that alternatives to the proposed Project be included in the Draft EIR (Public Resources Code [PRC] § 21100[b][4]). The *State CEQA Guidelines* (California Code of Regulations [CCR] § 15126.6) identifies the following topics that must be included in an alternatives analysis for an environmental impact report (EIR):

1. A discussion of a range of reasonable alternatives to a proposed project (including alternative locations if feasible).
2. An analysis of the No Project alternative.
3. An evaluation of the comparative merits of the feasible alternatives.
4. A determination of the environmentally superior alternative.

The discussion in this EIR includes the basis for selection of alternatives to be analyzed and the reasons for excluding infeasible alternatives and options. This discussion will enable decision makers to compare the alternatives to the proposed Project, thereby analyzing the environmental effects of each alternative to reach an informed and objective decision on the Project.

## 5.2 Basis for Establishing a Range of Reasonable Alternatives

CEQA has no set number of alternatives that must be examined in the Draft EIR. Except for the mandatory inclusion of the No Project alternative, the basis for establishing a range of reasonable project alternatives is governed by the "rule of reason" (CCR § 15126.6[f] of the *State CEQA Guidelines*). Specific criteria are relied on in ascertaining a range of reasonable alternatives. Such alternatives must:

- Avoid or substantially lessen one or more of the significant impacts of the proposed Project (CCR § 15126.6[b] of the *State CEQA Guidelines*).
- Meet most of the basic proposed Project's objectives (CCR § 15126.6[a] of the *State CEQA Guidelines*).
- Be feasible (CCR § 15126.6[a], § 15126.6[f][1], and § 15364 of the *State CEQA Guidelines*).
- Be reasonable, selected to foster informed decision-making and public participation (CCR § 15126.6[a] of the *State CEQA Guidelines*).

It is the responsibility of the lead agency to determine those alternatives that meet the above criteria and then carry out an EIR alternatives evaluation. As noted in CCR § 15126(a) of the *State CEQA Guidelines*, "[a]n EIR need not consider every conceivable alternative to a project.

Rather it must consider a reasonable range of potentially feasible alternatives that will foster informed decision making and public participation. An EIR is not required to consider alternatives which are infeasible. The lead agency is responsible for selecting a range of project alternatives for examination and must publicly disclose its reasoning for selecting those alternatives. There is no ironclad rule governing the nature or scope of the alternatives to be described other than the rule of reason."

Further discussion of these criteria is presented below, explaining the screening process used to choose the feasible alternatives addressed in this Draft EIR.

### 5.2.1 Criterion #1: Alternatives Avoid or Substantially Lessen One or More of the Significant Impacts of the Project

Based on the impact analysis in Chapter 4, Environmental Setting, Impacts, and Mitigation Measures, seven environmental resource categories were found to be impacted significantly by the proposed Project: hydrology, terrestrial biological resources, aquatic biological resources, air quality, cultural resources, hazards and hazardous materials, and cumulative impacts. Each impact is briefly listed below:

- **Hydrology.** Flood conveyance impacts would be significant if either Soils Reuse Options #2 (stockpile) or #3 (combination) would be implemented. This impact would be reduced to less than significant by carrying out proposed Mitigation Measure 4.1-1 (refer to Section 4.1, Hydrology).
- **Terrestrial Biological Resources.** Short-term, but significant, construction impacts would affect wetland communities, special-status plants species, vernal pools and their invertebrates, giant garter snakes (GGS) and their habitats, western pond turtles, migratory and special-status birds with respect to their nesting habitats, and foraging habitats for Swainson's hawk and other special-status raptors. The seven proposed mitigation measures (Mitigation Measures 4.3-1 through 4.3-7) listed in Section 4.3, Terrestrial Biological Resources, would reduce those impacts to less than significant.
- **Aquatic Biological Resources.** Temporary impacts from the filling of the west Yolo Bypass levee borrow ditch (Soils Reuse Options #1 or #3) and temporary impacts from improvements to the existing irrigation/drainage systems would be significant to trapped, individual sensitive fish species. Two proposed mitigations (Mitigation Measures 4.4-1 and 4.4-2) stated in Section 4.4 (Aquatic Biological Resources) would reduce such impacts to less than significant.
- **Air Quality.** Nitrogen oxide ($NO_x$) emissions released through the tailpipes of diesel-fueled construction equipment, worker vehicles, and delivery vehicles during construction would exceed significance thresholds established by the Yolo-Solano Air Quality Management District (YSAQMD). Dust, i.e., particulate matter ($PM_{10}$) would exceed YSAQMD significance criteria during construction too. Proposed Mitigation Measure 4.6-1 would reduce both impacts to less than significant (refer to Section 4.6, Air Quality and Greenhouse Gases).

- **Cultural Resources.** Earth-moving activities in areas not previously disturbed during construction, operation, and routine maintenance could result in the discovery of important archaeological resources and unknown human burial resources. Such occurrences would be potentially significant. With implementation of the proposed mitigations (Mitigation Measures 4.7-1 and 4.7-2) identified in Section 4.7, Cultural Resources, the impacts to cultural resources would be less than significant.
- **Hazards and Hazardous Materials.** Ground-disturbing activities during construction, operation, and routine maintenance could result in the discovery of unknown contamination (such as PCBs from leaking transformers on power poles, isolated soil contamination from previous agricultural practices, etc.) or the accidental damaging of abandoned natural gas wells and/or related piping. Such occurrences would be potentially significant. With implementation of the proposed mitigation (Mitigation Measures 4.8-1 and 4.8-2) identified in Section 4.8, Hazards and Hazardous Materials, hazardous impacts would be less than significant.
- **Cumulative Impacts.** The environmental resource categories listed below would be subject to temporary but significant cumulative impacts if not mitigated. Section 4.10, Cumulative Impacts, details how each cumulative impact would be reduced to less than significant through implementation of mitigation measures noted above:
    - **Cumulative Terrestrial Biological Resources Impacts.** Wetlands, special-status plant species, GGS and their habitats, western pond turtles, nesting by special-status and migratory bird species, and foraging habitats for special-status raptors (including Swainson's hawk).
    - **Cumulative Air Quality Impacts.** Air pollutant criteria emissions, i.e., $NO_x$ and $PM_{10}$, during construction activities.
    - **Cumulative Cultural Resources Impacts.** Unknown, buried archaeological resources and human burial resources.
    - **Cumulative Hazards and Hazardous Materials Impacts.** Unknown soils and materials contamination, and accidentally encountering natural gas wells and/or related appurtenant facilities.

With incorporation of the proposed mitigation measures (refer to Table ES-1 in the Executive Summary, for specific details), the significant and potentially significant environmental impacts of the proposed Project would be reduced to less than significant for all environmental resources categories. The CEQA alternative analysis does not differentiate between those significant impacts that can be fully mitigated to levels less than significant and those that are unavoidable and remain significant with mitigation. Therefore, the alternatives discussed in Section 5.3 were selected based on the potential to avoid or substantially lessen one or more of the significant Project-related impacts.

## 5.2.2 Criterion #2: Alternatives Meeting Most of the Basic Project Objectives

The second criterion that is critical in establishing the range of reasonable alternatives to the proposed Project would be that such alternatives meet most of the basic Project goals and objectives.

As noted in Section 3, Project Description, the two goals of the proposed Project would be:

- To partially fulfill the federal permit obligations of the California Department of Water Resources (DWR) and the U.S. Bureau of Reclamation (Reclamation) to create or restore at least 8,000 acres (ac) of intertidal and associated subtidal habitat in the Delta and Suisun Marsh, as set forth in the Reasonable and Prudent Alternative (RPA) of the 2008 U.S. Fish and Wildlife Service (USFWS) Delta Smelt Biological Opinion (BiOp) and as referenced in the 2009 National Marine Fisheries Service (NMFS) Salmonid BiOp for the ongoing coordinated operations of the State Water Project (SWP) and Central Valley Project (CVP).
- To serve as a near-term restoration measure for the forthcoming Bay Delta Conservation Plan (BDCP) in accordance with applicable provisions of Conservation Measure No. 22 for Avoidance and Minimization Measures.

To achieve these two goals, four objectives have been identified for the proposed Project:

1. To enhance regional food web productivity in support of delta smelt recovery.
2. To enhance rearing habitats for out-migrating salmonids.
3. To support a broad range of other aquatic and wetland-dependent species, including Sacramento splittail.
4. To provide ecosystem functions associated with the combination of Delta freshwater aquatic/tidal marsh/floodplain/seasonal wetland/lowland grassland interfaces that once existed historically.

## 5.2.3 Criterion #3: Alternatives Must Be Potentially Feasible

### *Feasibility: As Defined by the State CEQA Guidelines*

Reliance on two sections of the *State CEQA Guidelines* was employed to assess the feasibility of the alternatives (i.e., CCR § 15126.6[f][1] and §15364), the third criterion for establishing a range of reasonable alternatives to the proposed Project. Feasible is defined in CCR § 15364 as “capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social and technological factors.”

Feasibility is also characterized in CCR § 15126.6[f][1] as follows: “Among the factors that may be taken into account when addressing the feasibility or alternatives are site suitability, economic viability, availability of infrastructure, general plan consistency, other plans or regulatory limitations, jurisdictional boundaries (projects with a regionally significant impact should consider the regional context), and whether the proponent can reasonably acquire, control or otherwise have access to the alternative site (or the site is already owned by the proponent). No one of these factors establishes a fixed limit on the scope of reasonable alternatives."

Two other aspects of developing feasible alternatives with respect to the proposed Project pertain to complying with certain regulatory requirements and meeting specific physical requirements pertaining to habitat restoration.

### *Feasibility: Regulatory Requirements Mandating Habitat Restoration*

The 2008 USFWS Delta Smelt BiOp and references in the 2009 NMFS Salmonid BiOp require the tidal restoration of 8,000 ac in the Delta and/or Suisun Marsh prior to the year 2018. The proposed Project would contribute to fulfilling this requirement by over 24 percent (Phase 1 = 18.3 percent; Phase 2 = 6 percent). The BDCP, currently in preparation, most recently identified a 55,000-ac restoration goal for the Delta, Yolo Bypass, and Suisun Marsh. The proposed Project would partially fulfill that goal as a near-term measure as well.

### *Feasibility: Physical Requirements for Successful Habitat Restoration*

Properties considered suitable for tidal marsh restoration would need to meet at least five critical feasibility criteria:

- Must be at suitable intertidal or very shallow, subtidal elevations so that tidal marsh habitat could be restored on the lands.
- Need to be located in regions of the Delta and Suisun Marsh where the target ecological resources (both species and ecosystem processes) would be either present or believed to be of particular importance to supporting ecosystem recovery.
- Be relatively unencumbered by major infrastructure constraints that would require costly solutions to address if present.
- Need to be located away from areas that either limit their effectiveness (e.g., not near the major Delta export pumps) or could become an attractive nuisance (e.g., preferentially support predatory fish species or water quality conditions that would be harmful to target native fish species).
- Be able to accommodate projected sea level rise.

**Figure 5-1** identifies the regions of the Delta, Yolo Bypass, and Suisun Marsh that are at suitable restoration elevations and ranks them broadly into priority regions based on these site criteria. The Delta Vision Strategic Plan (Delta Vision Blue Ribbon Task Force 2008) provides greater detail on these criteria. Throughout the entire Delta-Suisun region, there is approximately 110,000 ac of lands at modern intertidal elevations and another 55,000 ac of shallow subtidal (within three feet [ft] of low tide) (Delta Vision Blue Ribbon Task Force 2008, Table 2-1, p.77). As shown in **Figure 5-1**, 64,000 ac of high priority, intertidal elevation lands could be restored. The 55,000-ac BDCP target would occur over several decades, with some of the feasibility constraints resolved, making the medium-priority lands (24,000 ac) more suitable for restoration.

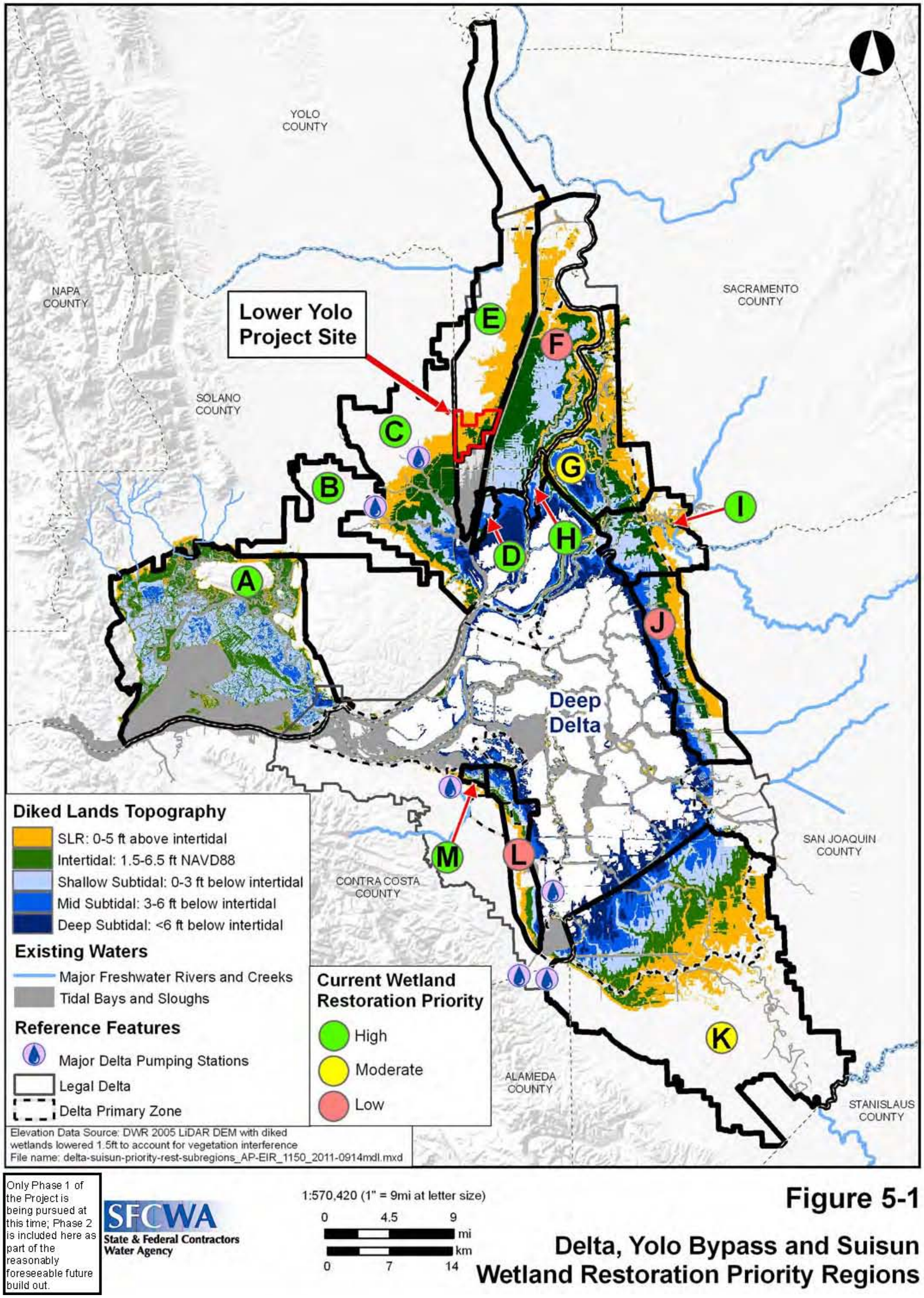



**Figure 5-1**

**Delta, Yolo Bypass and Suisun Wetland Restoration Priority Regions**

Lastly, those options or alternatives that were deemed infeasible, inadequate, or unachievable were excluded from the alternatives analysis and are described in Section 5.7, Options Eliminated from Further Consideration.

### 5.2.4 Criterion #4: Alternatives Must Be Reasonable

The final criterion for considering alternatives is that an alternative must be reasonable and selected to foster informed decision-making and public participation. An EIR need not consider alternatives whose effect cannot be reasonably ascertained or whose implementation is remote and speculative. Such alternatives do not contribute to a useful environmental analysis (CCR § 15126.6[a]). A lead agency may conclude that an alternative is remote or speculative if significant changes in governmental policy or legislation would be necessary to carry it out. An alternative is also remote or speculative if it is unlikely as a practical matter to be carried out within the reasonable future or is contingent on the occurrence of uncertain future events.

All reasonable alternatives ultimately chosen for further analysis are feasible as defined under Section 5.2.3, Criterion #3: The Alternatives Must Be Feasible. The reasonableness of the alternatives, and of those eliminated from the alternatives analysis, is discussed in detail below in Sections 5.4 through 5.7.

### 5.2.5 Formulation of Alternatives

For almost four years now, State and Federal Contractors Water Agency (SFCWA) has met and discussed the Project, including various alternatives and options, with numerous public agencies, local stakeholders, and interested parties (refer to Chapter 7, Consultation and Coordination). These meaningful exchanges have included written communication, phone calls, individual meetings, and committee/forum meetings.

Additionally, through the Notice of Preparation/Initial Study (NOP/IS) process and a public scoping meeting (see Sections 7.2 and 7.3, respectively), alternatives were recommended including a smaller-sized restoration effort and offsite alternatives. All alternatives and options were carefully vetted by SFCWA. The remainder of this chapter discusses and analyzes a range of feasible alternatives to the proposed Project, as well as why other alternatives and options were deemed infeasible and rejected.

## 5.3 Feasible Alternatives to the Proposed Project

Given due consideration to the criteria for establishing a range of reasonable alternatives, as described in the previous subsections, the following four feasible alternatives chosen for this Draft EIR analysis are:

- Alternative No. 1: No Project alternative.
- Alternative No. 2: Reduced Restoration Footprint alternative.
- Alternative No. 3: Offsite Soil Disposal/Reduced-size alternative.
- Alternative No. 4: Tidal Marsh Complex (TMC) alternative.

# 5.4 Evaluation of Feasible Alternatives

## 5.4.1 Alternative No. 1: No Project Alternative

The *State CEQA Guidelines* (CCR § 15126.6[e]) require the evaluation of the No Project alternative in the Draft EIR whether or not it is feasible. The No Project alternative can be defined as either no physical changes at the Project site (i.e., no new construction activities) or as no policy change from existing conditions, as described in CCR §§ 15126.6(e)(3)(A) and (B). This alternative analysis assumes both no new construction activities and no changes to land use policy, i.e., the Project site would continue to be utilized for agricultural purposes and flood control management.

### *Description of Alternative No. 1*

The No Project alternative represents a fact-based forecast of the environmental effects of maintaining the status quo. Accordingly, under the No Project alternative, the proposed Project components and elements described in Chapter 3, Project Description, would not be constructed. Agricultural operations would continue onsite at Yolo Ranch and Yolo Flyway Farms. Changes made to levees, tide gates, or other irrigation/drainage infrastructure would occur because of emergencies or routine maintenance associated with agricultural operations and flood control management. The *State CEQA Guidelines* (CCR § 15125[e]) require that EIRs include a description of the baseline conditions that exist at the time of the NOP/IS, i.e., March 1, 2011. Thus, the environmental baseline for the No Project alternative is represented by the environmental, operational, and physical conditions associated with the Project site in 2011.

*State CEQA Guidelines* (CCR § 15126.6[e][2]) indicate that the No Project alternative may include some reasonably foreseeable changes in existing conditions and changes that would be reasonably expected to occur in the foreseeable future if the project were not approved, based on current plans and consistent with available infrastructure and public services. This statement is intended to limit the assumptions a lead agency can make about potential future actions.

For this analysis, the No Action alternative assumptions are limited to existing conditions, programs and policies adopted by governmental and nonprofit entities during the early stages of development of the EIR, public and private facilities that would be permitted or under construction during the early stages of development of the EIR, and projections related to climate change that would occur with or without the proposed Project or alternatives (see the list of related programs, projects, and other planned activities identified in **Table 4.10-2**). Hence, these assumptions represent the continuation of the existing plans, policies, and operations and conditions that represent continuation of trends in nature. For example, over a longer period of time, lower portions of the Project site may become tidally flooded and thus unusable for agricultural production due to sea level rise or levee failure from a major seismic or storm event. It is probable, based on observations subsequent to levee failures at Liberty Island and Little Holland Tract, that such flooded areas would revert naturally to wetland habitat, unless levees would be raised and/or repaired (pending regulatory approvals and permits) to prevent further tidal inundation and strengthened to withstand a major seismic or storm event.

## *Impacts associated with Alternative No. 1*

### Hydrology Impacts: No Project Alternative

No changes in agricultural irrigation and drainage, flood flows, groundwater levels, or geomorphology (either onsite or offsite) would occur under the No Project alternative. None of the small levees or berms onsite would be affected, since no tidal connections would be constructed.

The west Yolo Bypass levee toe berm and/or the stockpile behind the restricted-height levee would not be constructed, because Soils Reuse Options #1, 2, or #3 would not be implemented. No long-term operations and management impacts from the Project would occur either. Therefore, this levee would continue to require costly maintenance and repairs, inherently faced with some degree of failure risk and subsequent flooding of adjacent agricultural lands. Consequently, the impacts to flood water elevations under the No Project alternative would be substantially less than those impacts attributed to the implementation of the Project's soils reuse options and not require mitigation.

Gradual sea level rise may result in Delta waters slowly encroaching onto lower areas of the Project site (i.e., providing sea level rise accommodation) (refer to **Figure 5.1**). For example, with half a foot of local sea level rise (i.e., a mean high higher water (MHHW) of +7 ft North American Vertical Datum of 1988 [NAVD88]), additional tidal inundation could occur on approximately up to 550 ac of the Project site. Depending on the rates of sea level rise, additional wetlands may be achieved. If sedimentation rates/carbon sequestration fail to keep up with increased rates of sea level rise over time, then the marsh plain would probably continue to fall and vegetation, unable to tolerate prolonged inundation, would transition from a marsh plain to a mudflat. In particular, when suitable uplands are lacking or located behind levees, marshes are not able to migrate landward, resulting in marsh loss (Stralberg *et al*. 2011).

Due to local hydrology and topography of the Project site, an average one inch rise in sea level would not necessarily equate to a one inch rise throughout the property, i.e., with a buffering effect occurring to some degree that the rise would be slower. Despite the inability to predict with certainty the precise impact to the Project site by sea level rising, it is fairly certain that without modifications to the existing water control structures such as levees and berms, sea level rise would likely further constrain summertime agricultural operations onsite in the future, under the No Project alternative.

Likewise, another scenario of the Project site becoming inundated by Delta waters could be from levee failure. Two such examples in recent times are the Liberty Island and Little Holland levee failures. Both have demonstrated a return to natural aquatic and wetlands habitats. For more information on these two events, refer to **Table 4.10-2** in Section 4.10, Cumulative Impacts.

Depending on which one of these future scenarios played out, hydrological impacts would range from no impact to potentially significant impact if not mitigated. Thus, as compared to baseline conditions (see Chapter 2), the No Project alternative may result in potentially significant hydrology impacts due to sea level rise and/or levee failure.

## Water Quality: No Project Alternative

Under the No Project alternative, the Project site would remain in its current condition with no restoration of tidal marsh; hence, the impacts to water quality under this alternative would be similar to current conditions. The potential benefits of the proposed Project in terms of methylmercury (MeHg) loading reductions and increased organic matter exports to the Delta, which would enhance local food webs and aid in returning the water quality characteristics of the Delta to a more natural state, would not be realized. Discrete discharges of agricultural drain water from the site, which can have short-term temporary impacts on local water quality (e.g., dissolved organic carbon/total organic carbon [DOC/TOC], low dissolved oxygen [DO]/excessive biological oxygen demand [BOD]) in receiving waters, would continue at their present level, thereby resulting in a less-than-significant impact. Since no Project operations and maintenance would be implemented under the No Project alternative, no long-term impact to water quality would occur.

Sea level rise would likely extend salinity intrusion from the San Francisco Bay further inland, but tidal marsh restoration in the Delta (including the proposed Project) and the Suisun Marsh areas would likely reduce intrusion, because most of the restoration would be done away from the main axis of the estuary.

## Terrestrial Biological Resources: No Project Alternative

With this alternative, the Project site would remain in agricultural use and no conversion of irrigated agricultural lands or upland habitat to tidal wetland habitat would occur. Hence, the No Project alternative would result in no impact to terrestrial biological resources, both individually or cumulatively, in the short term. However, it would not result in any of the benefits of the Project to such resources, including an increase in high value tidal wetland habitat. Lower value seasonal wetlands and limited perennial wetlands would likely persist on the site but would continue to support lower ecological functions under the current land-use regime. The site would continue to provide marginal foraging habitat for raptors including Swainson's hawk and aquatic areas for GGS and western pond turtle. Suitable habitat for special-status plants would be primarily limited to the tidal slough and channel edges.

Over a longer period of time, lower portions of the Project site may become tidally flooded (either due to sea level rise or levee failure) and thus unusable for these sensitive biological species, resulting in a potentially significant impact. The proposed Project's minimal long-term operations and management would not occur and would therefore lead to no impact on terrestrial biological resources under the No Project alternative.

## Aquatic Biological Resources: No Project Alternative

The No Project alternative would not result in any physical changes to the aquatic environment, as there would be no new construction (e.g., excavation). Hence, no impacts would occur to aquatic biological resources with the No Project alternative.

However, the benefits of the Project to aquatic resources in the Lower Yolo Bypass and Cache Slough Complex, including improving food web dynamics for the delta smelt and incrementally increasing the available aquatic habitat for fishes that utilize floodplains for spawning and rearing, such as Chinook salmon and Sacramento splittail, would not be realized. Potential water quality benefits of the Project such as MeHg loading reductions that would aid in returning the water quality characteristics of the Delta to a more natural state, would also not be achieved.

### Agricultural Resources: No Project Alternative

Existing agriculture and related uses, i.e., primarily cattle grazing and winter waterfowl hunting, would continue onsite, since no conversion of farmlands to wetlands would occur. The No Project alternative would also not result in physical impacts related to consistency with the Williamson Act, or with the plans or policies adopted by the Delta Protection Commission (DPC) or Yolo County.

It is possible that a portion of the agricultural lands (potentially up to 550 ac) would diminish, over time, due to sea level rise or levee failures. Depending on how these future scenarios would play out, physical impacts to agricultural resources would range from no impact to potentially significant impact if not mitigated under the No Project alternative.

### Air Quality and Greenhouse Gas Emissions: No Project Alternative

Under this alternative, no Project emissions, individually or cumulatively, would be emitted, i.e., dust, criteria air pollutants, or greenhouse gases (GHG) emissions. Air emissions would continue to emanate from the site as associated with agricultural use of the land and maintenance of the levees. However, the opportunity to increase sequestration of carbon and GHG from the atmosphere at the site would be lost with the No Project alternative.

### Cultural Resources: No Project Alternative

This alternative would have no impact to cultural resources, including historic and archaeological resources, either individually or cumulatively, because there would be no major construction or operation of the proposed Project.

### Hazards and Hazardous Materials: No Project Alternative

No impacts would occur to existing hazards or hazardous materials either individually or cumulatively with the No Project alternative. This scenario would not introduce construction-related contaminants, although unknown contaminants associated with past agricultural practices would still be present onsite. Known, isolated contaminated sites have been cleaned up. Potential hazards associated with removing/capping abandoned gas wells and relocating transmission lines that may contain leaking PCB transformers would not occur. This alternative would not affect hazards or contamination associated with active gas or water wells onsite. The proposed Project’s minimal long-term operations and management impacts would also not occur under the No Project alternative.

### Energy Consumption: No Project Alternative

Energy consumption would continue in support of agricultural operations and flood control maintenance practices with the use of combustible-engine machinery and personal vehicles. No additional, temporary consumption from large-scale construction activities or Project operations and maintenance-related consumption would transpire under the No Project alternative.

## 5.4.2 Alternative No. 2: Reduced Restoration Footprint Alternative

### *Description of Alternative No. 2*

Alternative No. 2 would be a somewhat smaller habitat restoration version of the proposed Project. While maximizing the amount of restored tidal marsh and enhanced seasonal wetland/riparian areas, this alternative would minimize the amount of earth-moving and soil disturbance to construct the wetlands. This alternative would restore about 41 percent less tidal wetland habitat than the proposed Project and would result in the excavation of about 64 percent less soil. However, it would include almost twice the area of seasonal wetland and riparian enhancements as the Project. The Reduced Restoration Footprint alternative's conceptual plan is shown in **Figure 5-2** with the acreage and volume estimates presented in **Table 5-1.**

Similar to the proposed Project, this alternative would involve pursuing only the implementation of Phase 1 (Yolo Ranch, excluding the Network 4 in the Northeast Field) at this time. However, Phase 2 (Yolo Flyway Farms including Yolo Ranch's Network 4) is also included in this alternative for analysis purposes as part of the reasonably foreseeable future build out.

Alternative No. 2 would restore tidal flows to the portions of the site that are already within the intertidal range, but which are currently managed as cattle pasture and winter waterfowl hunting through the use of water control structures. It would maintain existing topography, except that areas excavated to form channel networks would be graded to subtidal elevations.

This alternative would include changes in the location and operational regimes of existing water control structures, as appropriate, as well as the realignment of certain irrigation and drainage ditches. These modifications would restore tidal action and would allow for ongoing agricultural operations on the remainder of the property. It also would entail lowering or removing some internal berms and roads that would otherwise block effective tidal circulation. As with the proposed Project, certain seasonal wetland and riparian areas surrounding the restored tidal marshes would benefit from a combination of enhanced natural hydrology and restricted agricultural activities (i.e., irrigation and grazing).

Soils excavated to create tidal channels would be reused onsite to create a toe berm along the west Yolo Bypass levee, a stockpile within the restricted-height levee, or a combination of the two. The soils reuse options would be similar to those described for the proposed Project, but would be smaller in size due to the reduced excavated soil volumes (**Table 5-1**).

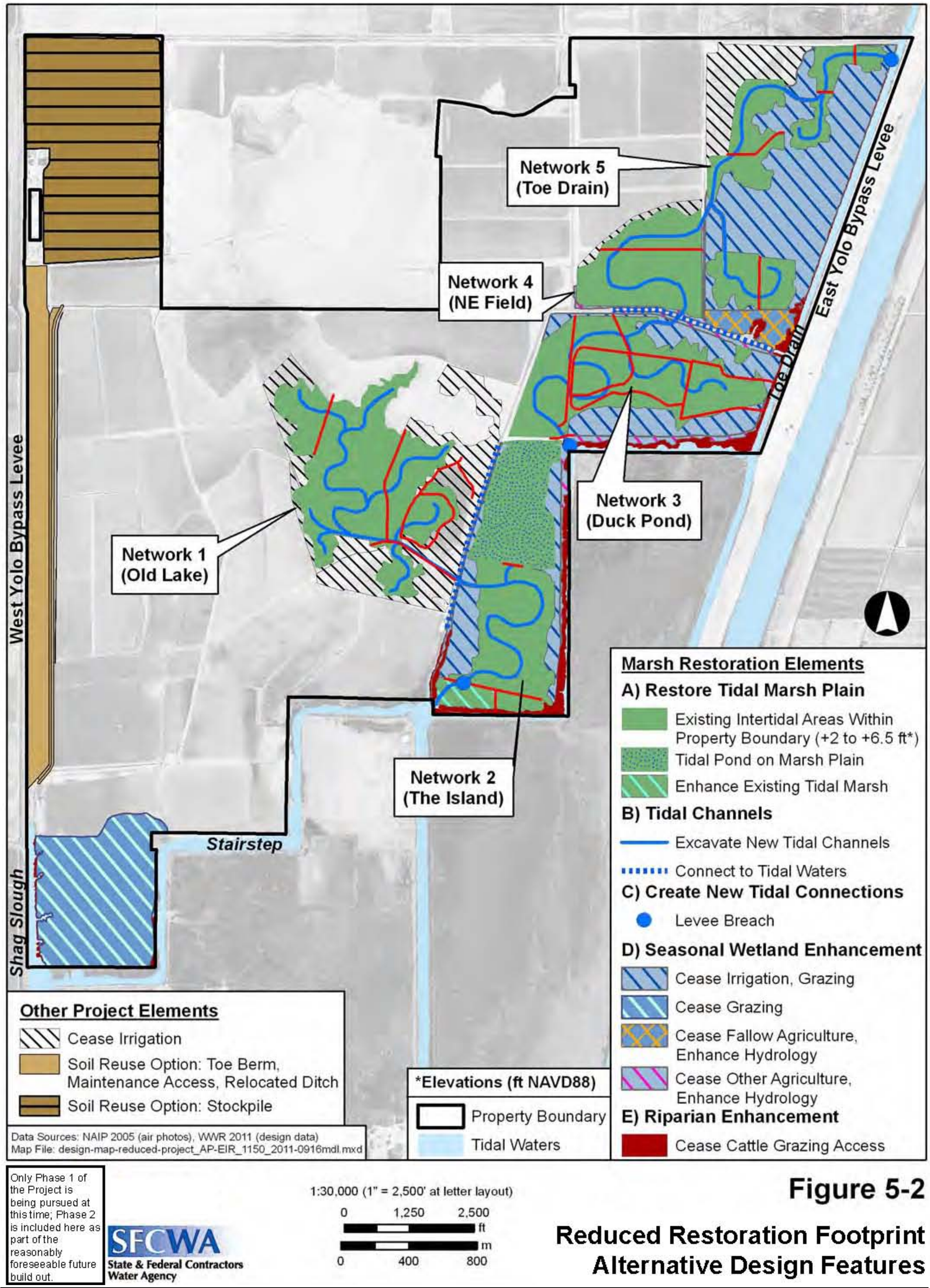



**Figure 5-2**

**Reduced Restoration Footprint Alternative Design Features**

**Table 5-1. Reduced Restoration Footprint Alternative[1]: Estimated Acres and Volumes of Soils Excavated during the Construction Phase**

| Reduced Restoration Footprint Alternative – Components and Elements: | Estimated Land Size (acres) |
|---|---|
| Tidal Marsh Restoration | 710 |
| Tidal Marsh Enhancement | 10 |
| Seasonal Marsh Enhancement | 480 |
| Riparian Enhancement | 40 |
| Wetland Buffer | 180 |
| Improvements and Modification of Water Control Infrastructure | 15 |
| Options #1, #2, or #3 for Soils Reuse (Value dependent on final option selected) | 115 – 240 |
| **TOTAL ACRES** | **1,550-1,675** |
| **Reduced Restoration Footprint Alternative – Components and Elements:** | **Volumes of Excavated Soils (cubic yards)** |
| Intertidal Wetlands Restoration and New Tidal Channels | 595,000 |
| Widen Existing Ditches and Establish New Smaller Ditches | 197,000 |
| Options #1 and #3 for Soils Reuse (Value dependent on final option selected) | 0 – 110,000 |
| **TOTAL FOR ESTIMATED VOLUME OF EXCAVATED SOILS** | **792,000 – 902,000** |

[1]This alternative would include Phases 1 and 2 (combined). While only Phase 1 of the Project and not Phase 2 is being pursued for implementation at this time, Phase 2 is included here as part of the reasonably, foreseeable future build out.

This alternative would include modifications of up to about 1,675 ac of the 3,795-ac site (see **Figure 5-2**). Actions taken within this alternative's footprint would include:

1) **Restoration footprint.** Restoring and enhancing approximately 1,240 ac of wetlands and tidal channels: 710 ac of tidal marsh restoration, 10 ac of tidal marsh enhancement, 480 ac of seasonal marsh enhancement, and 40 ac of riparian enhancement.
2) **Wetland buffer.** Ceasing agricultural irrigation from about 180 ac surrounding the restored wetlands.
3) **Irrigation and drainage improvements.** Relocating and/or modifying several water control structures and irrigation and drainage ditches on 15 ac.
4) **Soils reuse.** Reusing excavated soils in one of three ways. These options would be smaller in scale from that of the Project due to the reduced volume of excavated soil:
    a. To construct a toe berm, maintenance access corridor (toe berm), and relocated irrigation and drainage ditch along the west Yolo Bypass levee of up to 115 ac in size, or

b. To construct a stockpile of up to 240 ac in size behind the restricted-height levee, or

c. To construct a combination of these two features, each smaller in soil volumes than if constructed alone.

The methods used to construct this alternative would be similar to those previously described in the Project Description (Chapter 3) for the Project, except that no grading of tidal marsh networks would take place. Given the approximately 64 percent reduction in soil volumes relative to the proposed Project, the construction duration would be shorter (i.e., about five months) with fewer pieces of construction equipment and less construction personnel (ranging 15 - 40).

Construction of the components, associated with the Alternative No. 2, would require many different types of equipment. Conditions in the field at the time of construction would influence the type of equipment that would be best suited for the work and ultimately would be chosen by the construction contractor.

The list of equipment presented below includes the entire suite of machinery that could be used:

- Tracked long-reach and standard-reach excavators (3).
- Low-ground-pressure tracked or wheeled 10-15 ton dump trucks (5).
- Wheeled 20-cubic yard (cy) or 40-cy scrapers (6); scrapers could be an alternative to excavator/articulated dump truck combination for excavation and transport.
- Tracked standard and low ground pressure bulldozers (3).
- Front end loaders (3).
- Wheeled articulated 30- or 35-ton dump trucks (6).
- Double and/or single drum pad-foot compactors (3).
- Water trucks (3).

Equipment would be delivered onsite by flatbed truck and transported to the work areas via existing access roads.

## *Impacts associated with Alternative No. 2*

### Hydrology: Reduced Restoration Footprint Alternative

The potential impacts to hydrology onsite and offsite under the Reduced Restoration Footprint alternative would be similar to the impacts associated with the Project, but on a smaller scale. Similarly, Alternative No. 2 would be designed to maintain agricultural irrigation and drainage capabilities as well as stormwater conveyance capacity on the Project site and adjacent parcels to the north.

The wetland restoration elements of this alternative would be expected to have similar reductions in Yolo Bypass flood elevations as the Project. The toe berm soils reuse element in this alternative would be substantially smaller (i.e., less volume and potentially a smaller footprint) than under the Project, and would thus would have a smaller impact on flood water elevations than under the Project, remaining below the established threshold of significance. The Reduced Restoration Footprint alternative soil stockpile would also have a smaller impact upon Yolo Bypass flood elevations than under the Project. However, this impact would still be considered potentially significant unless mitigated (i.e., Mitigation Measure 4.1-1). As with the Project, the Reduced Restoration Footprint alternative would have no impact on local groundwater levels.

Gradual sea level rise may result in Delta waters slowly encroaching onto lower areas of the Project site with or without implementing the Reduced Restoration Footprint alternative. This additional tidal inundation could occur on approximately up to 550 ac of the Project site. Depending on the rates of sea level rise, additional wetlands may be achieved. With the Reduced Restoration Footprint alternative, it is expected that the wetland habitats restored onsite would be established enough to accommodate this rise, especially in the latter part of the 21$^{st}$ century. Sedimentation rates/carbon sequestration would aid in keeping up with the sea level rise, along with the final, gradually sloped topographic/geologic design of the networks and channels onsite. In addition, due to local hydrology and topography of the Project site, an average one inch rise in sea level would not necessarily equate to a one inch rise throughout the property, i.e., with a buffering effect occurring to some degree that the rise would be slower.

It is important to note that the Second Appellate District held that CEQA does not require identification of significant effects of the environment, such as sea level rise, on a proposed project (*Ballona Wetlands Land Trust v. City of Los Angeles* and *Ballona Ecosystem Education Project v. City of Los Angeles*, No. B231965 [Cal. Ct. App. 2d Dist., November 9, 2011]). However, indirect effects by the alternative to accelerate or enhance impacts by sea level rise are relevant to CEQA analysis. As stated in Chapter 2 (Baseline Conditions), the site lies within the Yolo Bypass where it is already inundated by substantial seasonal flooding events during the winter-spring rainy season. Also, most of the site is flat with one quarter of the site within intertidal ranges of +2 to +6.5 ft NAVD88. Whether or not the alternative is implemented onsite, sea level rise will still happen in the near future. The habitat restoration effort would be beneficial in dealing with this phenomenon. Consequently, the Reduced Restoration Footprint alternative would accommodate the sea level rise within the networks and channels and would not indirectly accelerate sea level rise exposure to the remaining agricultural lands either onsite or offsite. Hence, no indirect impact by the Reduced Restoration Footprint alternative would result on other agricultural lands onsite or on adjacent farmlands with predicted sea level rise.

### Water Quality: Reduced Restoration Footprint Alternative

The potential water quality impacts would be the same for this alternative as under the Project, but on a smaller scale. With less conversion of irrigated pasture to tidal marsh, a similar decrease in the benefit would be anticipated to the aquatic ecosystem of the Delta through organic matter exports and a return to a more natural state. Less tidal marsh restoration could also reduce the water quality benefits of the Project with respect to MeHg concentration and loading reduction as more of the Project site would remain as irrigated pasture and managed wetland. Construction-related impacts to water quality would also be less of a concern than under the Project, but continue to remain less than significant.

## Terrestrial Biological Resources: Reduced Restoration Footprint Alternative

Under Alternative No. 2, the smaller restoration area would still yield a substantial amount of tidal marsh and intertidal channel habitat, providing important ecological functions. However, the wetland habitat created in this alternative would consist of less acreage of lower-elevation tidal marsh and thus on average the frequency and duration of inundation would be somewhat lower. Because this alternative would restore a smaller area and excavate a smaller volume of soil compared with the Project, it would also require a shorter duration and smaller extent of construction-related activities. This alternative would thereby reduce the period of temporary disturbance to multiple sensitive species that may use the site under its existing condition. Hence, temporary but potentially significant construction impacts would remain under the TMC alternative and would affect wetland communities, special-status plants, vernal pools and their invertebrates, GGS and their habitat, western pond turtles, migratory and special-status birds with respect to their nesting habitats, and foraging habitats for Swainson's hawk and other special-status raptors. The overall impacts, both individually and cumulatively, would be reduced in magnitude from those of the Project's impacts; however, this alternative would still cause potentially significant impacts. As such, the same mitigation measures would be required (refer to Section 4.3, Terrestrial Biological Resources regarding Mitigation Measures 4.3-1 through 4.3-7) for Alternative No. 2.

With implementation of the proposed mitigation measures, construction-related and long-term operation and maintenance impacts by this alternative on terrestrial biological resources would all be less than significant after mitigation. Benefits of restoration under this alternative would also be incrementally reduced in scale, but would still provide substantial ecosystem functions to the Delta freshwater tidal-marsh-floodplain-seasonal wetland-lowland grassland interfaces.

## Aquatic Biological Resources: Reduced Restoration Footprint Alternative

Under this alternative, approximately 1,240 ac of tidal marsh would be restored and up to 902,000 cy of soil would be excavated. Though smaller in size than the proposed Project, Alternative No. 2 would still restore a substantial amount of tidal marsh and intertidal channel habitat, providing important ecological functions. However, the wetland habitat created in this alternative would have a greater percentage of higher elevation tidal marsh that is inundated less frequently. (In comparison, the Project would restore tidal marsh at lower elevations, which would be inundated more frequently.) The more frequently the marsh would be inundated, the more productivity from the marsh would be exported to open-water habitats; hence, this alternative would be less supportive for target species than the proposed Project.

Since this alternative would restore a smaller area and excavate a smaller volume of soil, it would also require a shorter duration and smaller extent of construction-related activities, as well as a smaller area inundated on a long-term basis. As a result, the benefits to aquatic organisms would also be incrementally reduced in scale, but would still provide a net benefit in regional food web production and aquatic habitat for fishes that utilize floodplains for spawning and rearing. The Reduced Restoration Footprint alternative would be potentially significant, unless mitigated, for potential construction activities (i.e., filling and relocation of the west Yolo Bypass levee borrow ditch and repairs to the irrigation/drainage infrastructure) – refer to Section 4.4.3 on Impacts to Aquatic Biological Resources and Mitigation Measures 4.4-1 and 4.4-2.

### Agricultural Resources: Reduced Restoration Footprint Alternative

If the Reduced Restoration Footprint alternative were to be implemented, the amount of agricultural lands restored to wetlands and converted to the toe berm (for Soils Reuse Options #1 and #3) would be reduced, from 1,585 ac affected under the proposed Project to 1,240 ac affected under this alternative. The amount of marginal Unique Farmland (as detailed in Section 4.5 and **Appendix D** for the overall Project) that would be restored to wetlands and converted to the toe berm and a relocated irrigation ditch would be reduced from 240 ac to 170 ac. Loss of agricultural land under this alternative would be less than that of the Project (over 11 percent reduction) and, as with the Project, would remain less than significant. The Reduced Restoration Footprint alternative would conform to the Williamson Act and generally comply with the DPC and County of Yolo policies for open space and agriculture. As noted for the proposed Project, plan consistency by the Reduced Restoration Footprint alternative is not deemed a physical impact under CEQA.

### Air Quality and Greenhouse Gases: Reduced Restoration Footprint Alternative

Alternative No. 2 would involve a reduced amount of soils to be excavated (up to 902,000 cy) rather than 2.5 mcy removed under the proposed Project. However, the air quality and GHG emissions for this alternative would be only somewhat lower than those emissions calculated for the proposed Project, still resulting in potentially significant impacts from $NO_x$ and $PM_{10}$ air pollutants during the construction phase. With implementation of Mitigation Measure 4.6-1, Alternative No. 2 would result in $NO_x$ and $PM_{10}$ construction emissions that would not exceed the significance criteria established by the YSAQMD, and therefore the impact (both individually and cumulatively) would be less than significant.

For the post-construction phase, Alternative No. 2 would be similar in nature to that of the proposed Project, i.e., less than significant. Vehicles and boats used for monitoring, inspections, and scientific sampling would not generate substantial amounts of air criteria pollutant emissions.

Construction activities would result in up to 1,083 metric tons of carbon dioxide equivalent ($MTCO_2e$) emissions – the major GHG pollutant – during the approximate five-month period. The estimated GHG emissions are less than the 25,000 $MTCO_2e$ per year threshold (refer to threshold discussion in Section 4.6.2 for GHG) and thus construction of this alternative would result in a less-than-significant impact of GHG emissions.

In addition, converting from conventionally managed agricultural lands to emergent wetlands could reduce long-term net GHG emissions. As described in Section 4.6, Air Quality, emergent tule marshes have the ability to sequester 11.5 $MTCO_2e$ per acre per year. This reduction would be less than with the Project, because fewer wetland acres would be created under this reduced alternative.

### Cultural Resources: Reduced Restoration Footprint Alternative

Cultural resources impacts, both individually and cumulatively, under this alternative would be similar to those associated with the Project, i.e., potentially significant impacts for buried archaeological resources and unknown human burial resources. The same mitigations for the Project would apply to this alternative (refer to Mitigation Measures 4.7-1 and 4.7-2). The residual impact with mitigation for the Reduced Restoration Footprint alternative would then be less than significant.

### Hazards and Hazardous Materials: Reduced Restoration Footprint Alternative

This alternative would have similar potentially significant impacts (both individually and cumulatively) as that of the Project with respect to unknown contaminated soil/materials and potential hazards with natural gas wells and related pipelines. The same mitigations would apply, i.e., proposed Mitigation Measures 4.8-1 and 4.8-2 and would result in such impacts being less than significant.

### Energy Consumption: Reduced Restoration Footprint Alternative

This alternative would require about 23 percent of the energy used by the Project in construction, due to reduced earth-moving activities. Minor ongoing operation and maintenance energy use would be similar to that of the Project. As with the Project, this alternative's energy consumption would not be wasteful and would be less than significant.

## 5.4.3 Alternative No. 3: Offsite Soil Disposal/Reduced-size Alternative

### *Alternative No. 3: Opportunities for Offsite Soil Disposal Sites*

Numerous opportunities exist for offsite soil disposal options in the region. In 2010, USACE identified 124 possible existing and potential disposal sites in conjunction with its Sacramento River Deep Water Ship Channel Project (U.S. Army Corps of Engineers [USACE] and Port of West Sacramento 2011). This background information and relevant analyses are incorporated by reference in conjunction with this alternative analysis per CCR § 15150 of the *State CEQA Guidelines*. Beneficial reuse opportunities found in the study[42] included the following:

- Levees – raise elevation, construct landside slopes and toe berms on many Delta Islands.
- Filling or shallowing of channels – reduces stress on levees adjacent to unnecessarily deep channels.

[42] Applied Water Resources Corporation. 2010. *Draft Final Sediment Stockpile and Beneficial Reuse Sites for the Sacramento River Deep Water Ship Channel*. Submitted to USACE San Francisco District, May 2010. This study is identified as Appendix H to the *Draft SEIS/SEIR for the Sacramento River Deep Water Ship Channel Project*, February 2011.

- Habitat development of uplands – for example, the Antioch Dunes National Wildlife Refuge needs material, but has concerns regarding sediment quality.
- Habitat development of wetlands – creation and enhancement at Dutch Slough and as part of the BDCP to create or enhance 55,000 ac of habitat.
- Landfill cover – Yolo County Landfill expressed a need for landfill cover material.
- Levees along railroad lines – construct or enhance levees along railroad lines to provide additional protection.
- Residential development – support residential development by Shea Homes on Hotckiss Tract.
- Road construction – California Department of Transportation expressed a need for fill material, but has concerns regarding sediment quality.
- Subsidence reversal – filling in low areas and adding top soil on many Delta Islands.

The material needed for all of the above beneficial reuse opportunities by the USACE could be satisfied by delivering dry sediment from a stockpile site. Other examples of beneficial reuse opportunities that could be satisfied through direct discharge from a hydraulic dredge include:

- Levee enhancement projects that employ the method of pumping in the levee, which would involve creating a rather narrow (e.g. 250 ft wide) placement site that parallels the inland side of the levee. Discharge from the hydraulic dredge would be directed into the narrow placement site and once dried the sediment would be reworked to form the landside slope and toe berm.
- Subsidence reversal projects would directly receive the discharge from the hydraulic dredge and would then keep the dry sediment in place to raise elevation.
- Wetland habitat creation projects could directly receive the discharge from the hydraulic dredge, and then the sediment could be reworked to form habitat when the water level recedes.

## *Description of Alternative No. 3*

### Alternative No. 3: Restoration Component

The restoration component for the Offsite Soil Disposal/Reduced-size alternative would be somewhat similar to what was described in Chapter 3, Project Description, with the highlights of the alternative summarized below.

Overall, the restoration and enhancement of wetland and terrestrial habitats onsite would total approximately 1,465 ac occurring solely on Yolo Ranch. This alternative does not include Yolo Flyway Farms.

- Categories and acreage of improvements:
    - Tidal marsh restoration – 830 ac.
    - Tidal marsh enhancement – 10 ac.
    - Seasonal marsh enhancement/wetland buffer – 580 ac.
    - Riparian enhancement – 45 ac.

- Depths[43] of restored wetlands and tidal channels:
  - Wetland excavation up to six ft deep.
  - Tidal channel excavation up to 15 ft deep below existing grade.
- Drainage and runoff volumes:
  - Drainage modifications would redirect summer drainage from irrigated pastures away from the tidal wetlands and channels. Precipitation excess during the wet season would also be redirected from specific fields in a similar manner. The redirected drainage water would still enter the Stair Step and Toe Drain, only at slightly different locations. Drainage water from the tidal wetlands would enter the Stair Step and Toe Drain via the tidal connections. Runoff volumes and timing would be similar to existing conditions.

## Construction Component for Alternative No. 3

Construction details for the Offsite Soil Disposal/Reduced-sized alternative are somewhat similar to those activities identified in Chapter 3, Project Description. However, differences between the Project and the alternative do occur in possible methods of excavation, handling of soils, transport of soils, placement sites, and use of soils.

### General Construction Details for Alternative No. 3

- One phase, generally between May and October of 2013.
- Work days normally 12 hours per day or six days a week, except instances of dewatering that might require 24 continuous hours or more.
- Active construction areas on the Yolo Ranch property would be de-watered with portable pumps on an as-needed basis. Water would be discharged into filter bags or into vegetated uplands to allow for settling of suspended sediment. Water would not be discharged directly into any adjacent waterways or channels. Water quality monitoring would be conducted as per the stormwater pollution prevention plan (SWPPP) at locations downstream of the dewatering discharge points.
- Number of construction workers would be about 60 during peak construction activities.
- Potential construction equipment and their estimated numbers[44]:
  - Scrapers (25 to 30).
  - Excavators/ Backhoes (4 to 5).
  - Loaders (1 to 2).

[43] Proposed wetland areas with existing elevations ranging from 7 to 10 ft North American Vertical Datum of 1988 (NAVD88) would be graded down to intertidal benches ranging in elevation from 4 to 6 ft NAVD88. Some areas may require over excavation to accommodate top dressing (e.g., Network 6). Proposed tidal channel features with existing elevations ranging from 2 to 9 ft NAVD88 would be graded down to -6 ft NAVD88. Proposed drainage features with existing elevations up to 7 ft NAVD88 would be graded down to 2 ft NAVD88.

[44] The contractor for the Project would be selected through a competitive public works bidding process. The successful bidder would then develop his/her own construction approach and methodology to implement the Project including equipment used, staffing, and scheduling. The plans and specifications would present the grading necessary but generally would not specify how the contractor would construct the alternative (means and methods). The selected contractor's actual approach might be different; however, the assumptions built into this analysis presume what would be a reasonably foreseeable scenario.

- Dump Trucks (35 to 40, if material hauled longer distances).
- All Wheeled Trucks (4 to 5).
- Dozers (5 to 6).
- Water Trucks (3 to 4).
- Road Graders (2 to 3).
- Dredger (1).
- Fueling and serving equipment (1 to 2).
- Miscellaneous support equipment.
- For materials slurried or conveyed to offsite locations:
  - Conveyors and Ancillary Equipment (approximately 7 miles: 1 for loading, potentially 1 for unloading, and 1 for spreading).
  - Generators (if power is not available onsite).
  - Slurry pipelines (approximately 5 miles).
  - Slurry booster pumps.
  - Barges (3 to 4) and/or tug boats (2 to 3).
  - Other offloading equipment including possibly augers or backhoes

- Alterations to existing onsite irrigation and drainage systems at Yolo Ranch:
  - Such modifications would be similar to those described in Chapter 3, Project Description, and would include removing existing infrastructure (i.e., culverts and various gates) from tidally surcharged irrigation ditches and their connections to tidal waterways (i.e., Stair Step and Toe Drain).
  - Modifications would also include the addition of new ditch blocks to disconnect existing ditches from draining into the restored tidal wetlands, ditch blocks to replace tide gates at existing points of diversion at their tidal connections, new tide gates to upgrade existing points of diversion at their tidal connections, and new flap gates at their tidal connections to allow proposed drainage features to drain on low tide.

- Construction staging and storage areas would be similar in nature to those areas identified for the Project (refer to Chapter 3, Project Description).

- Details of access roads:
  - Access for equipment and excavated material transport would occur primarily along existing roads on the Project site and on the adjacent Mound Farms (access pending).
  - If needed, additional access roads would shorten haul routes, provide access across ditches, and/or provide improved access to the temporary soils reuse/ stockpile storage areas.
  - Any roads constructed within the footprints of restoration (i.e., grading) areas would be temporary and would be removed prior to Project completion.
  - Such roads would be improved or built to a minimum of 20 ft and have sufficient base materials, such as dry excavated soils from restoration areas, to support heavy equipment use.

  - Roads would be equipped with ingress/egress ramps with gravel pack or equivalent to prevent sediment tracking.
  - Access turnouts (minimum width of 24 ft) would be constructed every 300 to 500 ft along the roads to permit two-way vehicular traffic.
  - All actively used access roads would be watered twice daily for dust control.
  - If desired by the landowner where these access roads would be constructed, the roads would be returned to the land's approximate original configuration following completion of construction activities.

- Details of temporary, excavated soils stockpiles:
  - Onsite locations could include Yolo Ranch area, at the Toe Drain, adjacent to the Sacramento River Deep Water Ship Channel (SRDWSC), and at other nearby areas where access can be obtained.
  - Height of these stockpiles could range between 10 and 100 ft.
  - All temporary stockpiles within the Yolo Bypass would be removed no later than October (i.e., prior to the rainy season).

- Methods to control erosion at the construction sites:
  - Preparation and implementation of a SWPPP.
  - Potential control methods:
    - Good housekeeping: cover inactive, loose stockpiles; and carry out access/entrance best management practices (BMP) controls such as gravel traps or equivalent to reduce offsite tracking of sediment and plant/landscape materials.
    - Waste management: secure stockpiles from wind and rain when inactive.
    - Site containment: use silt fences, rice wattles or equivalent to prevent or reduce offsite discharge.
    - Landscape management: stack erodible landscape material on pallets when not in use; discontinue use of erodible landscape material within two days of forecasted rain event (i.e., 50 percent chance of rain).
    - Run-on diversion: diversion of stormwater flowing onsite from upstream sources, if needed.

#### Excavation and Transport of Soils: Mechanical Excavation for Alternative No. 3

Excavation of the site could be accomplished by two construction methods: mechanical excavation or hydraulic dredging. The first method, mechanical excavation, would entail the use of conventional heavy construction equipment to physically remove the material and haul it to a reuse site, such as the West Side Property (adjacent and west of Yolo Ranch) or Sierra Sod Farm (about 7.5 miles from Yolo Ranch) both properties being in Solano County. While many options exist for mechanical excavation, two such approaches can be discussed, i.e., scrapers or excavators/dump trucks (**Figure 5-3**).

If the reuse sites are close enough, and no public roads are available, scrapers may be used to haul the excavated soils. If 36-cy scrapers are used, then approximately 42,000 scraper loads would be necessary, based on 1.5 million cubic yards (mcy) of dry material. For longer hauls, trucks would be used with a capacity that could range from 13 cy to 33 cy per truck. For transporting 1.5 mcy of soil, using 24-cy trucks, the number of truckloads would be approximately 63,000, based on dry material. Damage by the trucks to public roads would be repaired on a regular basis.

Some potential benefits would exist by using conventional earth-moving equipment. First, conventional earth-moving equipment would be readily available and typically would require a modest cost for mobilization and demobilization. Second, the excavated material would be kept in a dry or nearly dry state. This would facilitate transport of the smallest volume of material and the material remains in a state suitable for subsequent placement as construction fill.

| | |
|---|---|
| **Scrapers**<br>Assuming the excavation site would be capable of supporting scrapers and excavation could be performed in a dry state (i.e., no excessive groundwater present), self-propelled, large-capacity scrapers would excavate (with push-cat assist), transport and dump material. Each scraper would make the round-trip from excavation site to the reuse site and no other equipment would be needed for excavation or hauling other than haul road construction and maintenance, stockpile management, and dust control. Nearby properties, such as the West Side Property in Solano County, would be appropriate repositories for the soil excavated and transported in this manner. |  |
| **Excavators and Dump Trucks**<br>Assuming the haul roads would support the wheeled loads, track-mounted excavators (i.e., hydraulic excavators, hydraulic long-reach excavators, or crawler mounted draglines) could excavate the material and place it into dump trucks for hauling to offsite locations, such as the Sierra Sod Farm in Solano County. Additional equipment would be required for haul road construction and maintenance, stockpile management, and dust control. |  |

**Figure 5-3**

**Two Construction Approaches for Mechanical Excavation**

## Excavation and Transport of Soils: Hydraulic Dredging for Alternative No. 3

The second method to excavate would be to hydraulically dredge the site and pump the material via pipeline (**Figure 5-4**). The dredge would enter the site by excavating through the perimeter levee. It would operate by simultaneously utilizing suction and mechanical cutting heads to rapidly mobilize the earthen material and conveying the slurry (roughly 10 – 20 percent solids) through a pipeline, typically high-density polyethylene (HDPE) or steel pipe. The slurry would result in a large volume of water at the placement site in addition to the excavated material.

There would be several benefits to using hydraulic dredging. First, dredging would be performed in soft, wet soils that would not be able to support conventional construction equipment. Second, once the material would be in the pipeline, the material would be conveyed long distances with no additional handling beyond the possible addition of booster pumps; the material would be conveyed the entire distance to the offsite soils reuse site, eliminating other operations to cross the channel or haul the material southward via trucks.

Example of Hydraulic Dredge

Example of Dredge Discharge

**Figure 5-4**

**Typical Hydraulic Dredge and Typical Hydraulic Dredge Discharge**

The most critical drawback to hydraulic placement would be the large volume of slurry generated, requiring containment at the soils reuse site. The slurry would be introduced at the north end of such sites and would pass through the sites toward the south end where the “free” water would be decanted via a weir structure. A large area would be needed to promote sluggish conditions to facilitate settlement of solids. Internal baffles might be constructed to lengthen the overall distance between the discharge point and the decant weir; it would also prevent wind-driven waves that cause re-suspension of solids. Although the reuse site would be bounded by a perimeter levee, improvements to the levee might be necessary to ensure stability, depending on the rate of discharge and the resulting depth of slurry.

Decanted water would either be transferred to a secondary containment area for final clarifying, or discharged directly back into the channel if it meets regulatory requirements. The remaining material would need to be processed to further reduce the water content to a level near optimum for subsequent use as construction fill. Such action might include physically re-exposing the material (via dozer or ripper) to enhance air drying.

Another drawback would entail the typically large mobilization and demobilization costs associated with the setup and removal of hydraulic dredging plant and equipment. This would become less of an issue with costs amortized over a greater quantity of material dredged, but for smaller projects these costs could be substantial.

Preliminary soils information indicates that the excavated materials would be primarily clay. Top soil would be harvested and stored for later reuse to top dress problematic areas (e.g., the soil underlying Network 6 is hardpan and not conducive for colonizing wetland plants). Tule rhizome[45] would be harvested and stored for later revegetation. The plugs may be stored on pallets to allow stormwater to flow underneath them. For potential locations to store top soil on a temporary basis, refer to storage/staging areas identified in Chapter 3, Project Description. For example, the eastern salt grass field of Block 3 could serve as a topsoil stockpile area for Network 6.

### Cross-channel Transport Methods for Excavated Soils for Alternative No. 3

Once soils are excavated, either through mechanical excavation or hydraulic dredging, additional options would be available for transporting the materials to designated offsite locations across the SRDWSC, depending on the excavation method used and whether the material would be conveyed dry or slurried. The estimated number of vessels calling at the Port of West Sacramento via the SRDWSC in 2011 was 58[46], or an average number of four or five vessels per month.

Those cross-channel transport methods could include:

1. Hydraulic pumping slurry.
2. Dump box pumping slurry.
3. High-solids pumping.
4. Conveyor systems.
5. Truck hauling on floating bridges.

Each of these methods is briefly described below.

**Hydraulic pumping slurry.** For hydraulically dredged material, the slurry would be conveyed through the pipeline permitting solids of up to several inches in size. The distance the slurry could be transported would be a function of the size and number of pumps used and the ratio of solids to water in the slurry. With properly-sized booster pumps along the pipeline and consistent slurry characteristics, the material could be transported over long distances. There would be several benefits to using this method. First, the pipeline would be capable of conveying slurry very efficiently, because there would be no moving parts other than the pumps. During conveyance, the pipeline would not need maintenance or monitoring other than to ensure the pipeline would be secured in position. The pumps also would have relatively low maintenance requirements, as both the primary pump (on the dredge) and booster pumps would be designed to accommodate solids (i.e., small rocks) without incident. Another benefit would be the pipeline's small footprint; the pipeline would be located to minimize impacts to existing physical and environmental conditions and would be laid on the channel bottom to minimize disruption to vessel traffic.

[45] A plant stem that grows horizontally under or along the ground and often sends out roots and shoots. New plants develop from the shoots.
[46] Source of vessels calling at Port of West Sacramento found in USACE and Port of West Sacramento 2011, page 100.

Dump Box with Pit

Dump Box with Toyo Pump

Toyo Pump and Crane

**Figure 5-5**

**Typical Dump Box Pumping Slurry Process**

**Dump box pumping slurry.** If mechanical excavation would be employed, the excavated material would be relatively dry. To achieve the benefits of conveying the material as slurry, the dry excavated material would be placed into a "dump box" where water would be introduced and then pumped out as slurry with a Toyo pump, as illustrated in the photos above (**Figure 5-5 above**). A Toyo pump is a submersible trash pump capable of passing large (less than three-inch) solids and achieving relatively high flow rates; however the slurry being conveyed through the trash pump would be primarily water, containing only ten to 15 percent solids. As a result, the rate of transport of solids would be only moderate.

The pump would be typically suspended from an excavator or crane and powered by a generator or hydraulic power pack. The discharge pipe would be small (eight to ten inches in diameter) and would be connected directly to the Toyo pump; for longer pumping distances (i.e., greater than 1,500 ft), booster pumps would be added to extend the pumping range.

**High-solids pumping.** Another option would be to convey the excavated material in its natural state (without adding water), otherwise known as high-solids pumping (**Figure 5-6**). These types of pumps have been used to deliver "wet" concrete for many years, and high-pressure models would be capable of conveying dredged material up to 70 percent solids by weight. High-solids pumps would be specialized piston-type pumps that operate under high pressure to convey material over long distances, and typically would operate quieter than centrifugal trash pumps. Small diameter pipelines (eight to ten inches in diameter) would be weighted down while traversing the SRDWSC.

High-solids pumping would have a substantial advantage by conveying the excavated material without the addition of slurry water. As a result, the disposal site would be much smaller, would not need containment berms or weirs to decant water, and the material would be handled and managed without waiting for the slurry to dry. Permit-related issues related to fish and noise would also be eliminated or lessened.

Hopper Feeding High-solids Pump

Typical Dredge Material Discharge

Hopper Feeding High-solids Pump

**Figure 5-6**

**Typical High-solids Pumping Process**

Potential disadvantages would include clogging (due to small diameter discharge pipelines) and damage due to objects lodging in the system. Because the pump would operate at high pressure, the equipment would be protected from damage due to large objects (greater than three inches) passing through the system. Specialized screening hoppers and/or screw-feeders would be used to protect the pump from such dangers.

Other possible disadvantages would include a moderate production rate, which would be typically about 125 cy per hour (maximum 250 cy per hour for certain models). The pump would also be kept in operation continuously to prevent clogging by the dry material, and the discharge line would be cleared of material at the end of each shift.

**Conveyor systems.** Dry material could also be transported on a conveyor system (**Figure 5-7**). These systems could either be fixed or mobile, and would consist of a single conveyor belt or a series of shorter belts. Conveyor lengths would vary, with a maximum single-belt system of about one mile. These conveyor systems have been used in mining operations and would be an efficient means of moving material from a fixed location to another fixed location.

Land-based Conveyor

Floating Conveyor

Telescoping Conveyors

**Figure 5-7**

**Examples of Conveyor Systems**

Standard land-based or telescoping conveyors would be set up on floating platforms to cross the channel, or systems dedicated for floating applications would be available. The conveyor system would include a series of short (100-ft or less) conveyors, each elevating the material to a height sufficient to drop into the next conveyor's hopper. For telescoping systems, small vessels would be allowed to pass under the conveyor system during operation; otherwise the conveyor system would need to be disconnected to allow passage of larger vessels in the SRDWSC. For bulk cargo ships, the entire system would need to be moved along the shoreline to provide space for the vessel to pass.

Conveyors would have the advantages of low initial costs, low operational costs, and moderate to high production rates. Disadvantages would include maintenance of large numbers of moving parts, potential susceptibility to wind and wave action, operational difficulties inherent in coordinating multiple systems acting in series, and stopping operations to allow vessel passage.

**Truck hauling on floating bridges.** Excavated material could be transported across the SRDWSC using dump trucks and sectional barges (**Figure 5-8**). The sectional barges would be sized to provide the required buoyancy for the large loads carried by the dump trucks, and timber matting would be placed along the barge deck to provide a uniform driving surface and additional stability. The sectional barges would be connected to form a continuous floating bridge across the channel; spud piles would be used at intervals to provide lateral support to the floating bridge and ensure proper positioning. Floating bridges are shown in **Figure 5-9**. Similar to the floating conveyor system, short sections of the floating bridge could be decoupled and removed to provide small vessel passage, but to accommodate cargo ships the spud piles would be retracted and the entire bridge would be rotated along the shoreline.


Typical End Dump Truck

Articulating Off-road Dump Truck

**Figure 5-8**

**Examples of Dump Trucks**

The type and size of dump trucks would vary from standard end dump trucks (ten- to 20-cy capacity) to higher-capacity (35-cy) off-road articulating end dump trucks, although higher capacity dump trucks may exceed the available buoyancy of the sectional barge floating bridge.

Trucking of material would be relatively predictable, as the material would be physically handled only once during loading at the west transfer site, and hauling would not be subject to technical difficulties inherent with pumping or conveying methods. Loading rates would be determined fairly accurately, and round-trip haul times would be subject primarily to distance travelled.

Typical Floating Bridge

High Load-capacity Floating Bridge

**Figure 5-9**

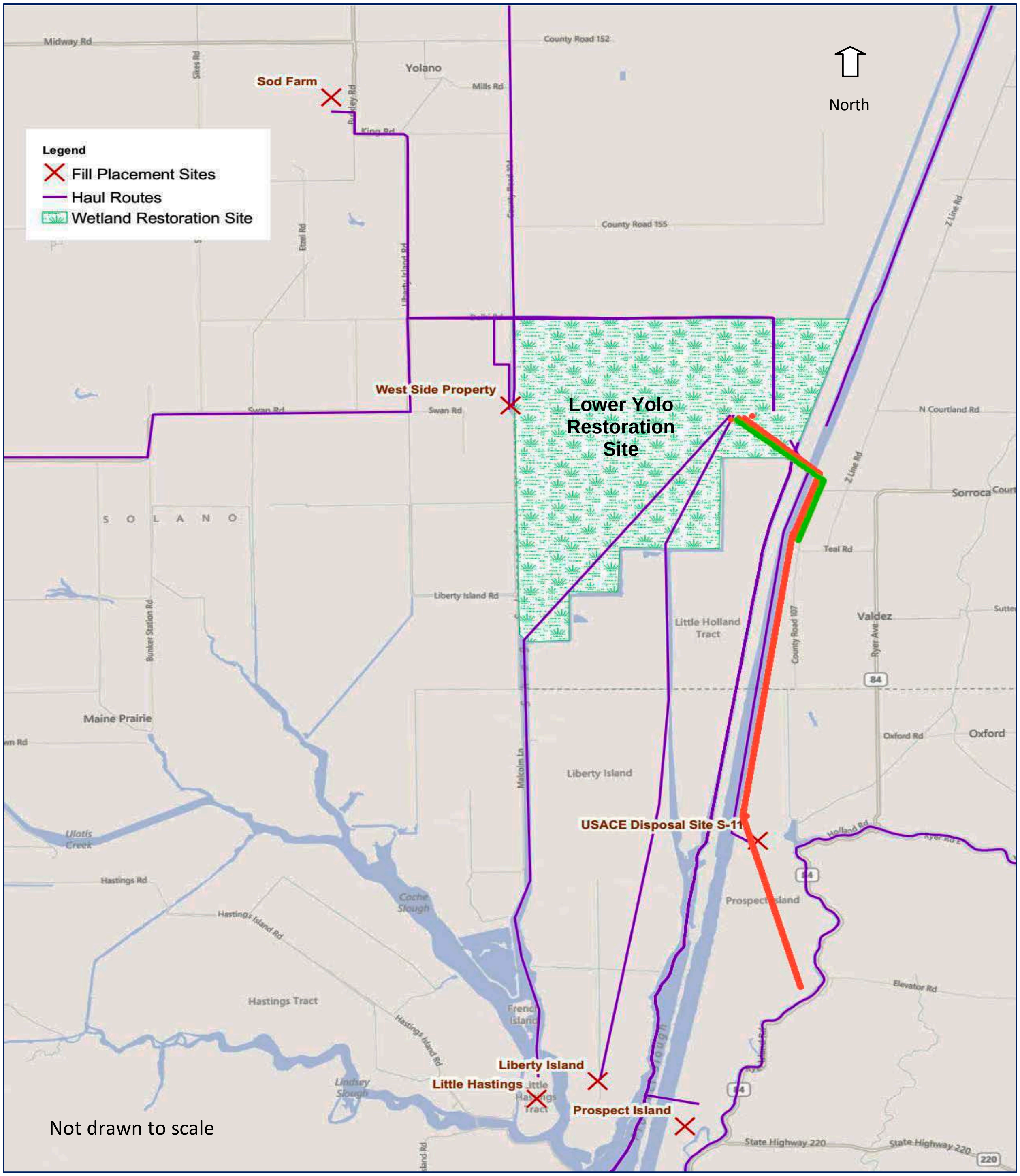
**Examples of Floating Bridges**

## Overland Transport by Truck Hauling for Alternative No. 3

Similar to truck hauling used for cross-channel transport, trucks could transport dry excavated material from the east side of the SRDWSC southward to the offsite disposal location(s). This option would use conventional dump trucks on a dedicated haul route, which would be on surface streets or unpaved roads. There would be no technical difficulties associated with such standard trucking methods.

## Long-term Stockpiles Offsite for Alternative No. 3

About 1.5 mcy of soil would be removed for offsite stockpiling outside of the Yolo Bypass to one or more sites. Besides those sites identified in the 2010 USACE study (e.g., USACE Disposal Site S-11), other properties could provide suitable accommodations for the Project's excavated soils such as the West Side Property, Sierra Sod Farm, Port of West Sacramento/Fahn/Garcia properties, and habitat restoration sites (e.g., Liberty Island, Little Hastings, and Prospect Island) (**Figure 5-10**).




SFCWA State & Federal Contractors Water Agency

**Figure 5-10**

## Potential Offsite Soil Disposal Sites and Haul Routes for the Offsite Soil Disposal/Reduced-size Alternative

It would be most desirable to secure a site that would be as close to the Yolo Ranch property as possible, to minimize the hauling distances and related costs. The actual volume of soil excavated may change somewhat depending on final design and eventual placement. For example, the West Side Property would have a minimum capacity of 160 ac to support the stockpiling of excavated soils. Other sites, like USACE Disposal Site S-11 (**Figure 5-11**), would have a stockpile area of 185 ac (assuming a height of about five ft). Such sites could require berms to be constructed to retain the stockpiles. The berms would be created with clay soils excavated from restoration areas at Yolo Ranch.

**Figure 5-11**

**USACE's S-11 Disposal Site**

If timing was compatible, a different approach would be to convey the thick slurry from dump box pumping directly to DWR's levee maintenance areas at Prospect Island. As described previously, these slurry pipelines would be weighted down while traversing the SRDWSC, thereby not affecting vessel movement. As the lead agency, DWR would be responsible for securing permits related to its levee maintenance activities and the use of this slurry at the levee locations on Prospect Island.

Aside from DWR's levee maintenance areas at Prospect Island, the other offsite stockpile locations would be in use until a beneficial soils reuse option would be developed, possibly involving two to five years or more to permit, design, and construct. For example, the USACE Disposal Site S-11 could store the excavated soils and in time such soils could be used at Prospect Island, immediately adjacent to S-11 to the south, to build up intertidal wetlands within the interior along the Miner Slough side. Adding the excavated material to available offsite locations would likely enhance the ecosystem benefits of the planned projects. The restored habitat could be credited to the SWP/CVP Operations Criteria and Plan (OCAP) requirement for 8,000 ac of new tidal marsh and the BDCP targets. However, at this time, the subsequent, beneficial reuse option is unknown and its environmental analysis is not part of this EIR.

The ultimate configuration of the long-term stockpiles would be subject to the review and approval of the landowners. It is anticipated that the fills and stockpiles would be uniform and would drain in similar patterns as the existing land. These offsite stockpiles, outside of the Yolo Bypass, would be maintained through the implementation of BMP controls that would be adequate for the material and size of the stockpiles and duration of stockpiling. Wind-erosion control BMP measures could include fencing or equivalent. Rain-erosion control BMP measures could include tracking and/or compaction on clay-type soils, plastic sheeting, erosion control blankets (if feasible), hydroseeding (with a minimum of at least 70 percent cover prior to the rainy season), or equivalent measures, as well as secondary site containment.

Activities associated with post construction at Yolo Ranch for the offsite soil disposal alternative would be similar in nature to that already identified in Chapter 3, Project Description.

## *Impacts associated with Alternative No. 3*

### Hydrology: Offsite Soil Disposal/Reduced-size Alternative

For Alternative No. 3, hydrologic impacts onsite would be similar when compared with the less-than-significant impacts by the Project, but on a much smaller scale. Similar to the Project, this alternative would be designed to maintain agricultural irrigation and drainage capabilities as well as stormwater conveyance capacity on the Project site and adjacent parcels to the north. However, the onsite wetland restoration elements of this alternative would have greater reductions in Yolo Bypass flood elevations than the Project, because there would be no west Yolo Bypass toe berm construction or stockpiling of materials at the restricted-height levee. As the excavated soils would be relocated outside the floodplains of the Yolo Bypass, this alternative would be beneficial for flood control management and would result in no impact to flood conveyance.

Stockpiles placed offsite – such as in Yolo (but outside the Bypass), Solano or Sacramento counties – or added to berms (such as the DWR levee areas on Prospect Island), would be designed to flow with the existing drainage pattern at those locations. BMP measures would also be in place to ensure that the stockpiles would be stable and not prone to erosion or subjected to scouring that may indirectly affect the hydrology of the sites. Sea level rise would not be a determining factor because the stockpiles would be kept at these offsite locations for a relatively short period of time (five years or so) prior to beneficial reuse, the channel depth and its related hydrodynamic properties would be the primary control parameters for those disposal sites adjacent to or near the SRDWSC, and the soils themselves, once permitted, could be utilized to counteract the incremental rise of sea level through the raising of elevation on existing lands.

Similar to the Project, the Offsite Soil Disposal/Reduced-size alternative would have no impact on local groundwater levels either onsite or at offsite locations.

### Water Quality: Offsite Soil Disposal/Reduced-size Alternative

The potential water quality impacts, including MeHg, would be similar for this alternative as under the Project, but to a lesser degree because Phase 2 of the Project would not be restored to wetlands under this alternative. Though less acreage would be restored (1,465 ac restored versus the Project's 1,955 ac), tidal marsh restoration would still be substantial under this alternative. Hence, the benefit to the aquatic ecosystem of the Delta through organic matter exports and return to a more natural state would be similar to the Project under Alternative No. 3. Water quality benefits of this alternative with respect to MeHg concentration and loading reduction would be similar to that of the Project because of the conversion of low lying pasture lands adjacent to tidal influences. Construction-related impacts to water quality would also be less of a concern with this alternative than under the proposed Project, and would continue to remain less than significant.

Stockpiles placed offsite – such as in Yolo (but outside the Bypass), Solano or Sacramento counties – or added to berms (such as the DWR levee areas on Prospect Island) would be designed and constructed using BMP measures (such as hydroseeding) to not exacerbate existing water quality issues at those locations. Recent sampling of dredged materials from the SRDWSC has found concentrations of zinc, chromium, copper, and nickel exceeding the sediment quality criteria (USACE and Port of Sacramento 2011, page 115). However, despite these exceedances, when factoring in natural attenuation at the existing placement sites as utilized by USACE, the Central Valley Regional Water Quality Control Board (CVRWQCB) has continued to issue regulatory permits to USACE to conduct maintenance dredging every year from 2000 to 2009. In essence, these exceedances have been found to be relatively minor by USACE and CVRWQCB. Additionally, the excavated soils from this alternative would be similar in nature to those soils that primarily occur in the area, i.e., soils supporting agriculture, duck hunting, and conservation lands. Hence, sediment quality of the excavated soils, as with the currently dredged soils from the USACE project, would be acceptable for placement and no unacceptable soil contamination/leakage to water quality would be expected. Thus, water quality impacts associated with the offsite disposal sites would be less than significant.

### Terrestrial Biological Resources: Offsite Soil Disposal/Reduced-size Alternative

Under Alternative No. 3, the conversion of agricultural lands to wetlands would result in the restoration of a substantial amount of tidal marsh and intertidal channel habitat, providing important ecological functions. The wetland habitat created in this alternative would also consist of lower-elevation tidal marsh and thus on average the frequency and duration of inundation would be somewhat similar to the Project, although the size of restoration would be slightly smaller. Due to the various types of construction methods of excavation and soils transport offsite, the construction phase would remain the same as for the proposed Project. Hence, temporary but potentially significant construction impacts would remain under the TMC alternative and would affect wetland communities, special-status plants, vernal pools and their invertebrates, GGS and their habitat, western pond turtles, migratory and special-status birds with respect to their nesting habitats, and foraging habitats for Swainson's hawk and other special-status raptors.

The overall impacts, both individually and cumulatively, would be slightly reduced compared with the proposed Project, but still potentially significant and the same mitigation measures (i.e., Mitigation Measures 4.3-1 through 4.3-7) would be required (refer to Section 4.3, Terrestrial Biological Resources). Consequently, construction-related and long-term operation and maintenance impacts of this alternative on biological resources would all be less than significant after mitigation. Benefits of restoration under this alternative would still provide improved ecosystem functions, like that of the Project, to the Delta freshwater tidal-marsh-floodplain-seasonal wetland-lowland grassland interfaces.

### Aquatic Biological Resources: Offsite Soil Disposal/Reduced-size Alternative

Under this alternative, approximately 1,465 ac of tidal marsh would be restored and up to 1.5 mcy of soil would be excavated. Though the alternative would have a smaller footprint, it would still restore a substantial amount of tidal marsh and intertidal channel habitat, providing important ecological functions. There would be no impact regarding the improvements associated with the west Yolo Bypass levee borrow ditch, since all soils reuse would be disposed of offsite. However, improvements to the irrigation/drainage systems onsite would still result in a potentially significant impact to those special-status aquatic species who would be trapped in those systems during construction. Implementation of Mitigation Measure 4.4-2 would reduce this impact to less than significant.

The wetland habitat created in this alternative would have similar tidal marsh coverage, though somewhat smaller, than the Project. As a result, the benefits to aquatic organisms would also be similar in scale to the Project, and would still provide a net benefit in regional food web production and aquatic habitat for fishes that utilize floodplains for spawning and rearing. Similar to the Project, the Offsite Soil Disposal/Reduced-size alternative would be less than significant for long-term operation and maintenance impacts relating to monitoring, inspecting, and conducting scientific experiments.

### Agricultural Resources: Offsite Soil Disposal/Reduced-size Alternative

If Alternative No. 3 was to be implemented, the amount of agricultural lands restored to wetlands would be reduced from 1,585 ac (under the proposed Project) to 1,465 ac. The amount of marginal Unique Farmland (as detailed in Section 4.5 and **Appendix D** for the overall Project) that would be restored to wetlands would be reduced from 240 ac to 170 ac. Loss of agricultural land under this alternative would be less than that of the proposed Project (over 11 percent reduction) and, as with the Project, would remain less than significant. This alternative would conform to the Williamson Act and generally comply with the DPC and County of Yolo policies for open space and agriculture. As noted for the Project, plan consistency by the Offsite Soil Disposal/Reduced-size alternative is not deemed a physical impact under CEQA.

### Air Quality and Greenhouse Gases: Offsite Soil Disposal/Reduced-size Alternative

Alternative No. 3 would involve a reduced amount of soils to be excavated (up to 1.5 mcy) than the Project (up to 2.5 mcy), but greater than the amount of soil removed under Alternative No. 2, the Reduced Restoration Footprint alternative (about 902,000 cy) and the Tidal Marsh Complex alternative (44,300 cy). Hence, the air quality and GHG impacts for this alternative would be lower than those impacts calculated for the Project in Section 4.6 and greater than those impacts for the Reduced Restoration Footprint alternative in Section 5.4.2. Accordingly, the Offsite Soil Disposal and Reduced-size alternative would potentially result in construction $PM_{10}$ emissions (and possibly $NO_x$ emissions depending on the construction approach taken) that exceed the significance criteria established by the YSAQMD, thus mitigation would be required (refer to Section 4.6, Air Quality and Greenhouse Gases). With implementation of Mitigation Measure 4.6-1, the Offsite Soil Disposal alternative would result in $PM_{10}$ (and possibly $NO_x$) construction emissions that would not exceed the significance criteria established by the YSAQMD, and therefore the impact (both individually and cumulatively) would be less than significant.

Within a five-month or so timeframe, construction activities would range between 1,083 to 2,065 $MTCO_2e$, the major GHG pollutant depending on which option or options would be selected to excavate and transport the soils offsite. The estimated GHG emissions would still be less than the state's 25,000 $MTCO_2e$ per year threshold and thus construction of the Offsite Soil Disposal/Reduced-size alternative would result in a less-than-significant impact as related to GHG emissions.

In addition, converting from conventionally managed agricultural lands to emergent wetlands could reduce long-term net GHG emissions. As described in Section 4.6, Air Quality, emergent tule marshes have the ability to sequester 11.5 $MTCO_2e$ per acre per year. This reduction would be less than that of the Project, because fewer wetland acres would be created under this alternative. However, a net value in carbon sequestration would be achieved and quantified based on subsequent monitoring, sampling, and modeling of field data.

### Cultural Resources: Offsite Soil Disposal/Reduced-size Alternative

Cultural resources impacts, both individually and cumulatively, under this alternative would be similar to those associated with the Project, i.e., potentially significant impacts for buried archaeological resources and unknown human burial resources onsite and for offsite locations for soil disposal. The same mitigations for the Project would apply to this alternative (refer to Mitigation Measures 4.7-1 and 4.7-2 in Section 4.7, Cultural Resources). The residual impact with mitigation for the Alternative No. 3 would then be less than significant.

### Hazards and Hazardous Materials: Offsite Soil Disposal/Reduced-size Alternative

This alternative would have similar potentially significant impacts (both individually and cumulatively) as that of the Project with respect to unknown contaminated soil/materials and potential hazards with natural gas wells and related pipelines onsite and for offsite locations for soil disposal. The same mitigations would apply, i.e., proposed Mitigation Measures 4.8-1 and 4.8-2 (see Section 4.8, Hazards and Hazardous Materials) and would result in cumulative impacts being less than significant.

### Energy Consumption: Offsite Soil Disposal/Reduced-size Alternative

This alternative would vary in its consumption of energy used by the Project in construction, due to the various scenarios that could be employed during the excavation and transport of materials offsite. For those options based on conveyor systems, a larger expenditure of electricity would result than what would be needed by the Project. For those options relying on movement by trucks and scrapers to transport excavated soils at greater distances, more diesel fuel and gasoline would be consumed than that of the Project. However, even with a doubling or tripling of such energy requirements, the overall energy consumption for this short-term construction alternative would still have a negligible effect on the region's energy resources. Minor ongoing operation and maintenance energy use would be similar to that of the Project. As with the Project, this alternative's energy consumption would not be wasteful and would be less than significant.

### Vessel Transportation: Offsite Soil Disposal/Reduced-size Alternative

Unlike the other alternatives, including the No Project alternative, only the Offsite Soil Disposal and Reduced-size alternative would have an impact to vessels calling at the Port of West Sacramento via the SRDWSC. In 2011, 58 vessels traveled to/from the Port, or roughly four to five vessels per month. As part of the Offsite Soil Disposal/Reduced-size alternative, should conveyor systems, bridges, and/or pipelines be installed to transport soil across the SRDWSC, such equipment would either be redirected, weighted down (i.e., pipelines), or disassembled to permit vessel passage. Applicable regulatory and local agencies, such as the U.S. Coast Guard, USACE, and the Port of West Sacramento, would be coordinated with to ensure no impacts to vessel traffic. Hence, for this alternative, vessel transportation would be less than significant. For the Project and the other alternatives (Alternative Nos. 1, 2, and 4), no impact to vessel transportation would occur.

## 5.4.4 Alternative No. 4: Tidal Marsh Complex Alternative

### *Overview of Alternative No. 4*

Historically, the Project site holds a uniquely rich location at the hydrological intersection of the Putah Creek fan, historic Yolo Basin floodway and North Delta tidal marshes (**Figure 5-12**) shows aerial views of the Project site adjacent to various water bodies). The Tidal Marsh Complex (TMC) alternative would partially restore some of these ecological functions in the current, highly altered agricultural landscape by restoring as much of the historic, hydro-period diversity as feasible and practical. Considerations in wetland restoration and historical ecology revitalization would include reconnecting areas of existing topography that are at an intertidal elevation to adjacent tidal water bodies, by removing obstructions to tidal inundation and allowing seasonal and tidal waters to drain slowly through the marsh plains. Depending on the seasonal and regional hydrology, water would come from daily tidal exchange or from seasonal inundation during flood events in the Yolo Bypass.

View from northwest (Shag Slough Stair Step Channel in foreground)

View from northwest (Liberty Island in background)

View from northeast (Sacramento River Deep Water Ship Channel in foreground)

**Figure 5-12.**

**Aerial Views of Yolo Ranch**

The low lying areas onsite are currently managed as cattle pasture and winter waterfowl hunting through the use of perimeter berms and water control structures. This alternative would maintain existing topography and irrigated pasture infrastructure at the Project site to increase hydraulic residency time through increased surface flow complexity and discharge distance to receiving waters. These features would provide the maximum resiliency in the face of sea level rise and regional stressors such as changes in tides, floods, salinity mixing, and invasive species.

Hence, implementation of the TMC alternative would substantially maximize the amount of restored tidal marsh and enhanced seasonal wetland/riparian areas, while minimizing both the disturbance to existing resources and the amount of earth-moving needed to construct the wetland complex. About 44,300 cy of soil would be excavated to achieve a 1,672-ac restored tidal marsh for the delta smelt and salmonids. This alternative would restore over 36 percent more tidal wetland habitat than the proposed Project and would result in the excavation of over 98 percent less soil. Of special note, there would be no offsite disposal of the excavated soil. All of the materials would be placed behind the restricted-height levee in the northwest portion of the Project site.

In addition, approximately 1,248 acres of the Yolo Ranch outside of the construction footprint but on the Project site would continue to support existing agricultural operations. Alternative No. 4 would result in a decrease of about 44 percent with respect to the remaining agricultural lands under the proposed Project (which would include both Yolo Ranch and Yolo Flyway Farms for a total of 2,210 acres).

The TMC alternative's conceptual plan is shown in **Figure 5-13** with the acreage and volume estimates presented in **Table 5-2**. Additionally, this alternative would involve pursuing the implementation of Phase 1 (Yolo Ranch) and the Northeast Field in Network 4 (part of Phase 2). Phase 2 (that portion covering Yolo Flyway Farms) would not be part of this alternative.

## *Description of Alternative No. 4*

### Components and Elements of Alternative No. 4

The TMC alternative would maximize ecological productivity by enhancing resiliency, diversity and regional integration. The construction phase would be a subset of previously described features for the proposed Project (refer to Chapter 3, Project Description), as follows:

1. **Restoration Component.** The TMC alternative would include modifications to about 1,790 ac within the 3,423-ac site (only on Yolo Ranch). Restoration would include:

    a. Restoring approximately 572 ac of tidal marsh, enhancing approximately 28 ac of tidal marsh, enhancing about 1,100 ac of seasonal floodplain wetlands, and enhancing about 49 ac of riparian habitat. Restoration and enhancement measures would involve eliminating or relocating existing water control infrastructure elements, grading some lands to facilitate establishment of intertidal wetlands, excavating new starter tidal channels and swales to connect restored wetland areas to adjacent tidal water bodies, removing irrigation from seasonal wetland features, and removing or restricting grazing within the restored and enhanced areas.

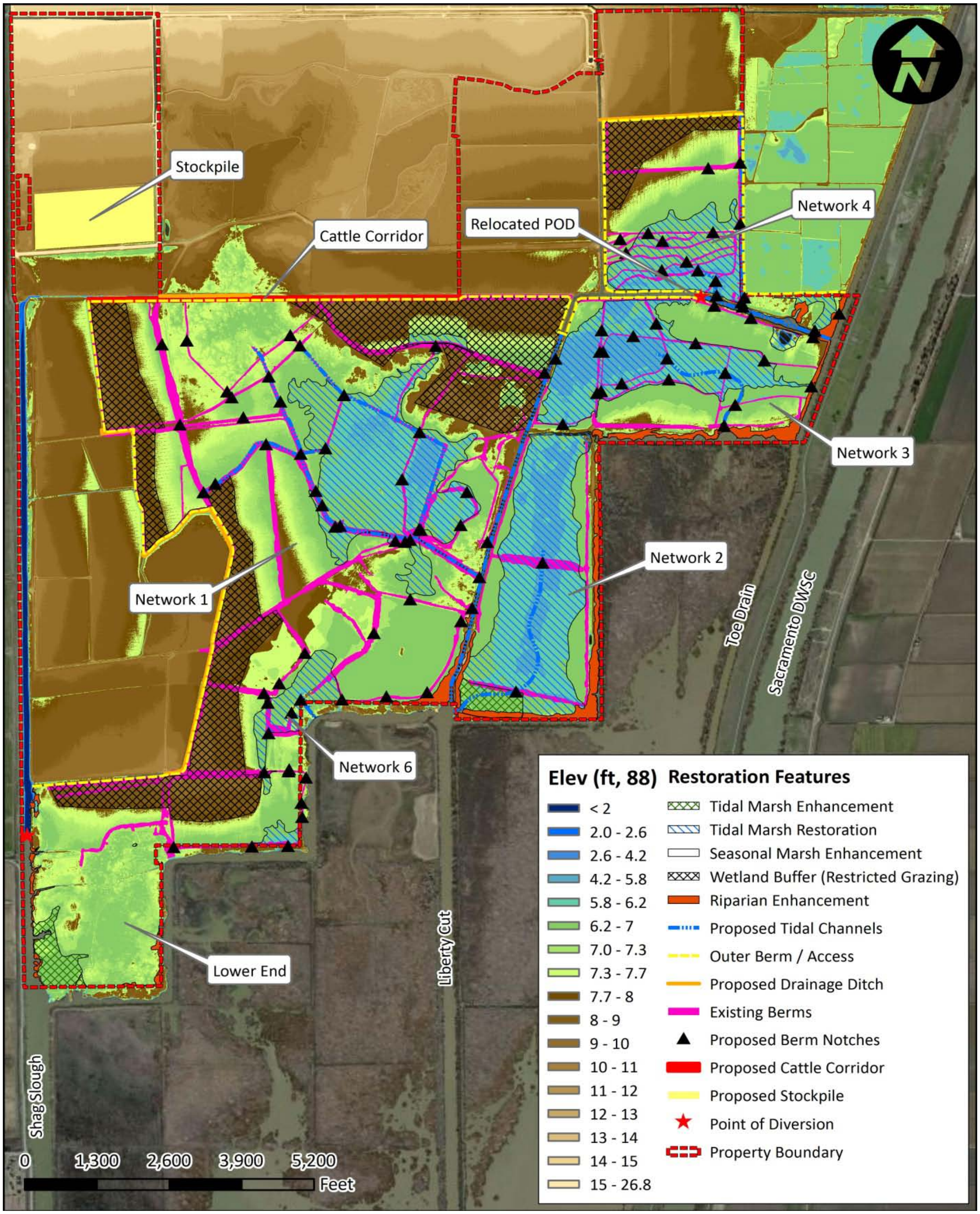



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**Figure 5-13**

**Conceptual Overview of the Tidal Marsh Complex Alternative**

## Table 5-2. Tidal Marsh Complex Alternative[1]: Estimated Acres and Volumes of Soils Excavated during the Construction Phase

| Tidal Marsh Complex Alternative – Components and Elements: | Estimated Land Size (acres) |
|---|---|
| Tidal Marsh Restoration | 1,672 |
| Tidal Marsh Enhancement | 28 |
| Riparian Enhancement | 49 |
| Wetland Buffer | 385 |
| Improvements and Modification of Water Infrastructure | 38 |
| Soils Stockpile at the Restricted-height Levee | 50 |
| **Tidal Marsh Complex Alternative – Components and Elements:** | **Volumes of Soils Balanced Excavation and Disposal (cubic yards)** |
| Excavation: Intertidal Wetlands Restoration via Notches to Create Starter Tidal Channels | 31,200 |
| Excavation: Widen Existing Ditches and Establish New Smaller Ditches | 13,100 |
| Disposal: Soils Stockpile at the Restricted-height Levee | 44,300 |

[1] The Tidal Marsh alternative would involve pursuing the implementation of Phase 1 (Yolo Ranch) and the Northeast Field in Network 4 (part of Phase 2). Phase 2 (that portion covering Yolo Flyway Farms) would not be part of this alternative.

b. Removing agricultural irrigation and restricting grazing from about 385 ac of fringe tidal wetlands surrounding the project footprint. Limited grazing would be allowed within this buffer area for invasive plant management, as needed.

c. Stockpiling excavated soil (approximately 44,300 cy) behind the restricted-height levee in the northwest corner of the Project site (about 50 ac);Relocating one existing tide gate, removing one existing tide gate, and installing one new ditch block to ensure irrigation and drainage needs would be met in the remainder of the site; and

d. Removing approximately 214 ditch culverts and 344 irrigation spiles[47].

About 572 ac of the 1,790-ac footprint are currently at intertidal elevations and would be able to support tidal marsh habitat. The varying elevations within this area would be studied to allow for scientific evaluation of the relationship between restored marsh plain elevation and the magnitude of ecosystem function provided.

[47] Spiles are short pieces of pipe buried in the ditch bank.

Tidal channels and swales would be excavated to facilitate the movement of tidal water between existing tidal sources (Stair Step, Toe Drain) and restored intertidal and seasonal wetlands. As noted in **Figure 5-13**, five tidal networks would be created:

- <u>Network 1:</u> This tidal network would be located in a natural topographic drainage swale that is currently managed as cattle pasture. The tidal source for this network would be an excavated swale that would connect the lower interior portion of the network with an existing north-south tidally-surcharged irrigation ditch. To promote tidal channel circulation within and out of the network, low internal and perimeter berms and roads would have 50-ft wide notches excavated at strategic locations. The notches would be created by using an excavator to remove soil to an elevation that would match the surrounding field grades. Afterwards, the notches would be seeded with an appropriate seed mix to stabilize them and prevent erosion.
- <u>Network 2:</u> This tidal network would be located in an area of historic tidal marsh that is currently managed as irrigated cattle pasture in the summer and open water and emergent marsh in the winter. The tidal source for this network would be a channel excavated to the junction of Liberty Cut and Shag Slough/Stair Step. The northern portion of this network already experiences limited muted tidal connectivity with a portion of the Stair Step northeast of Liberty Cut through an unmaintained tide gate at its northeast corner. The northern half of the network would be restored to an intertidal pond by retaining most of the existing east-west berm and allowing higher tides to connect with it.
- <u>Network 3:</u> This tidal network would be located in an area of historic tidal marsh that is currently managed as irrigated cattle pasture in the summer and irrigated open water emergent marsh in the winter. The primary tidal sources for this network would be two new channels, one connecting to the Stair Step west of its connection with the Toe Drain and the other to the existing north-south tidally-surcharged irrigation ditch referenced above. This flow-through channel arrangement would have two purposes: (1) maximize the efficiency of tidal transport processes from the marsh plain to open water habitats; and (2) provide a fish movement corridor with more complex habitats relative to the Stair Step and Toe Drain. As in Network 1, 50-ft wide notches would be excavated at strategic location on existing internal and perimeter berms, and then seeded with an appropriate mix to stabilize them and prevent erosion.
- <u>Network 4:</u> This tidal network would be located in an area of historic tidal marsh that is currently managed as upland pasture. The tidal sources for this network would be a new tidal channel connected to the existing east-west tidally-surcharged irrigation supply ditch. Several 50-ft wide notches would be excavated at strategic locations on existing internal and perimeter berms (see **Figure 5-13**). Appropriate seed mix would then be added to stabilize the notches and prevent erosion.

- Network 6: This tidal network would be located in an area of historic tidal marsh that is currently managed as irrigated pasture. No new channels would be excavated to connect this network with Shag Slough/Stair Step, but notches would be excavated at strategic locations on existing internal and perimeter berms to allow for periodic tidal inundation (see **Figure 5-13**). Appropriate seed mix would then be added to stabilize the notches and prevent erosion.

The dimensions of the constructed tidal channels would vary according to flow capacity needs, depth of intertidal area the channel would service, and experimental hypotheses associated with each separate network. Deeper channels within Networks 2 and 3 would be excavated to a minimum depth of at least two ft below MLLW to minimize colonization by tules. Deeper channel geometries would also be sized to promote peak ebb tidal flow velocities between 1.6 to 3 ft per second through the networks to actively discourage colonization and establishment of Brazilian waterweed. Deeper channels would be constructed with 1.5:1 (width: height) side slopes, resulting in trapezoidal cross-sections. In some locations, one channel bank may be sloped more gently to provide some littoral habitat on the inside of channel bends well suited to native fish species.

At the terminus of the deeper channels in Networks 2 and 3 and the entrance to Network 4, swales 20 to 30 ft wide with 10:1 side slopes and up to one foot below existing grade would be constructed to facilitate connectivity and exchange of productivity between marsh plain and open water habitats. In Networks 1 and 4, existing irrigation and drainage ditches with intertidal elevations, coupled with selective field berm notching, would be used to maximize tidal inundation and flood water retention.

The Project site has numerous raised ranch roads and internal berms, which would largely be left in place in order to help simulate historic hydroperiod conditions. To accomplish this, about 100-ft wide tidal connections would be excavated in the roads and berms at strategic locations throughout the different networks, to facilitate water exchange in and out of the site. Depending on the season, the predominant water source would be tidal incursion from the surrounding channels or flood events in the Yolo Bypass. The excavated notches, coupled with the site's existing topography and irrigated pasture infrastructure, would increase hydraulic residency time, surface flow complexity and discharge distance to receiving waters.

2. **Irrigation and Drainage Improvements Component.** Currently, a variety of berms, external tide gates, interior flap gates, permanent and portable pumps, and other conveyance structures moderate how water can enter (irrigate) and leave (drain) the Project site during summer and winter. All changes to the water control infrastructure would be designed to maintain irrigation and drainage functions for adjacent properties that rely on the current infrastructure on the Project site for their agricultural operations.

Modifications to the irrigation and drainage infrastructure would include:

- The truncation of a tidally-charged supply ditch via the relocation of one tide gate and the replacement of a second tide gate with a ditch block.
- The reuse of existing permanent pumps for continued irrigation and grazing outside of the project footprint.
- The removal of several water control structures, apply selective notching of field berms, and reuse of existing irrigation and drainage ditches within the alternative's construction footprint to maximize tidal inundation and flood water retention.
- The rerouting of some drainage ditches outside the alternative's footprint to minimize the sourcing of drain water into the alternative's footprint.
- The construction of a restricted-height perimeter berm to minimize inundation of the remaining grazing lands outside the alternative's footprint by high tides.

Irrigation of 385 ac of fringe tidal wetlands located adjacent to the alternative's footprint would be eliminated. Instead, seasonal cattle grazing would be utilized in this area as a vegetation management tool.

3. **Soils Disposal Component.** Implementation of the restoration activities described above would result in the generation of excess of soils. This excavated soil would be placed as a permanent stockpile on the fields within the restricted-height levee in the northwest portion of the Project site. Stockpiled materials would be located and arranged to avoid adverse effects on Yolo Bypass flood flow conveyance. The fields within this location are currently used for summer cattle grazing and hay production. Approximately 44,300 cy of material would be placed over 50 ac at a depth no greater than six inches and contoured for border irrigation to match existing conditions. The slope of the existing field is 0.2 percent with borders spaced 50 ft apart. The irrigation spiles on the field ditch m need to be reset six inches higher.

The post-construction phase would be similar in nature as previously described for the proposed Project (refer to Section 3.5, Post-construction Activities). Of special note would be:

1. **Long-term Operations and Maintenance Component.** A long-term operations and maintenance plan would be developed to include, but not be limited to:
   - General management of agricultural activities outside of the restoration footprint;
   - Maintenance and management of cattle exclusionary devices (i.e., fencing) around restored areas;
   - Maintenance and management of water control structures;
   - Control of invasive or undesirable vegetation within both restored and remaining upland areas with reduced cattle grazing uses; and

- Physical, biological, and water quality monitoring plan to determine this alternative's outcomes relative to the Project goals and objectives, and to conduct associated adaptive management science activities, as applicable.

2. **Project Outcome Verification Monitoring Component.** To monitor the TMC alternative's outcome with implementation, e.g., demonstrating the site's benefits of providing new sources of food and shelter for several fish species, including delta smelt and salmonids.
3. **Regional Science Support Component.** Through collaborative and cooperative arrangements with trustee agencies and scientific organizations, the TMC alternative would provide educational and scientific opportunities to study wetland ecosystem functions such as habitat for fish and wildlife, water quality improvements, erosion control, flood attenuation, landscape enhancements, and other ancillary benefits.

## Construction Activities for Alternative No. 4

The construction activities for the TMC alternative are a subset of the activities described in Chapter 3 for the proposed Project and are briefly noted below.

### Construction Equipment for the TMC Alternative

The construction of the restoration elements would require several types of earth-moving equipment. Conditions in the field at the time of construction would influence the type of equipment that would be best suited for the work. The list of equipment presented below includes the entire suite of machinery that may be used:

- Standard-reach excavator (1).
- Agricultural tractor and towed scraper (3).
- Low ground pressure bulldozer (1).
- Water truck (1).

All equipment would be delivered to the site by flatbed truck and access the work areas via existing roads. Staging/storage areas would be located in upland areas outside of sensitive habitats. The location of all staging areas would be determined by the contractor and design team at the time of construction based on field conditions. These areas would be clearly delineated in the field and appropriate erosion control BMPs (e.g., weed-free, rice straw wattles, and/or silt fences) would be installed around them in accordance with the SWPPP and SPCP to prevent the transport of sediments and/or construction contaminants into surrounding areas. All refueling, maintenance, and storage of equipment when not in use would occur within these staging/storage areas. Construction water would be supplied from pumping water from existing irrigation ditches on the Project site.

## Construction Schedule for the TMC Alternative

Construction of the TMC alternative would occur during an approximate four-week period in the late summer of 2013. Construction in the Yolo Bypass would conclude before the late fall so construction activities do not interfere with sensitive habitats/special-status biological resources and the Yolo Bypass flood conveyance.

At the completion of construction, all temporary soil stockpiles and structures (e.g., temporary ditch blocks, office trailers, storage containers, etc.) would be removed from the Yolo Bypass prior to the onset of the winter flood season.

## Site Preparation for the TMC Alternative

The site preparation information below for the TMC alternative in a subset of the activities associated with the proposed Project. For more specifics, go to Section 3.4.2.

1. **Hydrologic Management.** Prior to the start of construction, changes to the water infrastructure onsite would be done so the soils would be dry enough to work in:
   - Repairing or replacing unmaintained water control structures along adjacent tidal water bodies, including installing additional flap gates to allow effective site drainage;
   - Installing earthen ditch blocks or water filled bladders on the inside of water control structures to prevent flooding in the event water control structures leak after they are repaired or replaced;
   - Cessation of irrigation in all proposed work areas; and
   - Construction of temporary low berms in areas where high tides may inundate work areas.
2. **Clearing and Grubbing.** Prior to earth-moving activities, after site soils have dried out from prior rain events, all vegetation within the work areas would be removed.
3. **Infrastructure Removal.** As needed, abandoned gas wells, transmission lines, and other utilities and energy infrastructure would be removed and disposed of in accordance with federal, state, and local environmental regulatory requirements.
4. **Access Road Preparation.** Equipment access and excavated material transport would occur primarily along existing roads within the site. Roads would be improved/created to construction standards by clearing a smooth, vegetation-free path a maximum of 12 ft wide, to which dry, excavated soil would be added, if necessary, to support earth-moving equipment. Filter fabric may also be used in problematic (soft or damp) soil areas to provide a base for the roads. Turnouts (minimum width of 24 ft) would be cleared in several locations to permit two-way vehicle traffic. If desired by the landowner, roads would be returned to their approximate original configuration following completion of construction.

It may also be necessary to construct temporary roads within the restoration footprint. These roads would be built to similar specifications as described above and would be removed after completion of all earth-moving operations by scarifying the surface and applying an appropriate seed mix. All actively used access roads would be watered twice daily for dust control. Roads that would not remain would be scarified and an appropriate seed mix would be applied upon completion of construction.

#### Earth-moving Activities for the TMC Alternative

Grading and excavation within the restoration footprint would begin upon completion of the site preparation activities described above. Soils would be excavated by scraper or excavator and transported to the stockpile location via scraper along the major site access roads and temporary haul roads. Under suitable soil conditions (i.e., firm and dry enough), marsh plain grading would be accomplished using scrapers. This method would eliminate the need to transfer material into dump trucks as the scrapers themselves would cut and transport material to disposal sites. Restored areas would not be connected to adjacent tidal channels until all grading and excavation within the restoration footprint would be completed. This strategy would ensure work areas remain as dry as possible. This construction methodology would reduce the potential for direct take of special-status aquatic species and would substantially minimize, if not avoid, the transport of silt and construction debris/contaminants into adjacent waterways.

#### Permanent Onsite Soil Stockpile for the TMC Alternative

Stockpiling would consist of elevated pads on the fields inside the restricted-height levee (**Figure 5-14**). The material would be transported to the interior of the levee, dumped, graded into place, and compacted (if necessary). Following construction, the stockpiles would be stabilized with erosion control measures to prevent damage from Yolo Bypass flood flows. Agricultural use would continue after the stockpiles stabilized. Water control infrastructure would be modified/replaced as needed within and adjacent to the stockpile footprint, as needed.

#### Construction Personnel for the TMC Alternative

Personnel onsite would include a construction manager, construction foreman, equipment operators, and resource monitors. Multiple management duties may be filled by one position (i.e., construction foreman and equipment operator). Field staffing for the construction duration would consist of approximately six to seven personnel. Depending upon permit requirements and allowable hours of operation, shift work and/or weekend work may take place.

### Post-construction Activities for Alternative No. 4

Activities associated with post construction at Yolo Ranch for the TMC alternative would be similar in nature to that already identified in Chapter 3, Project Description under Section 3.5, Post-construction Activities.

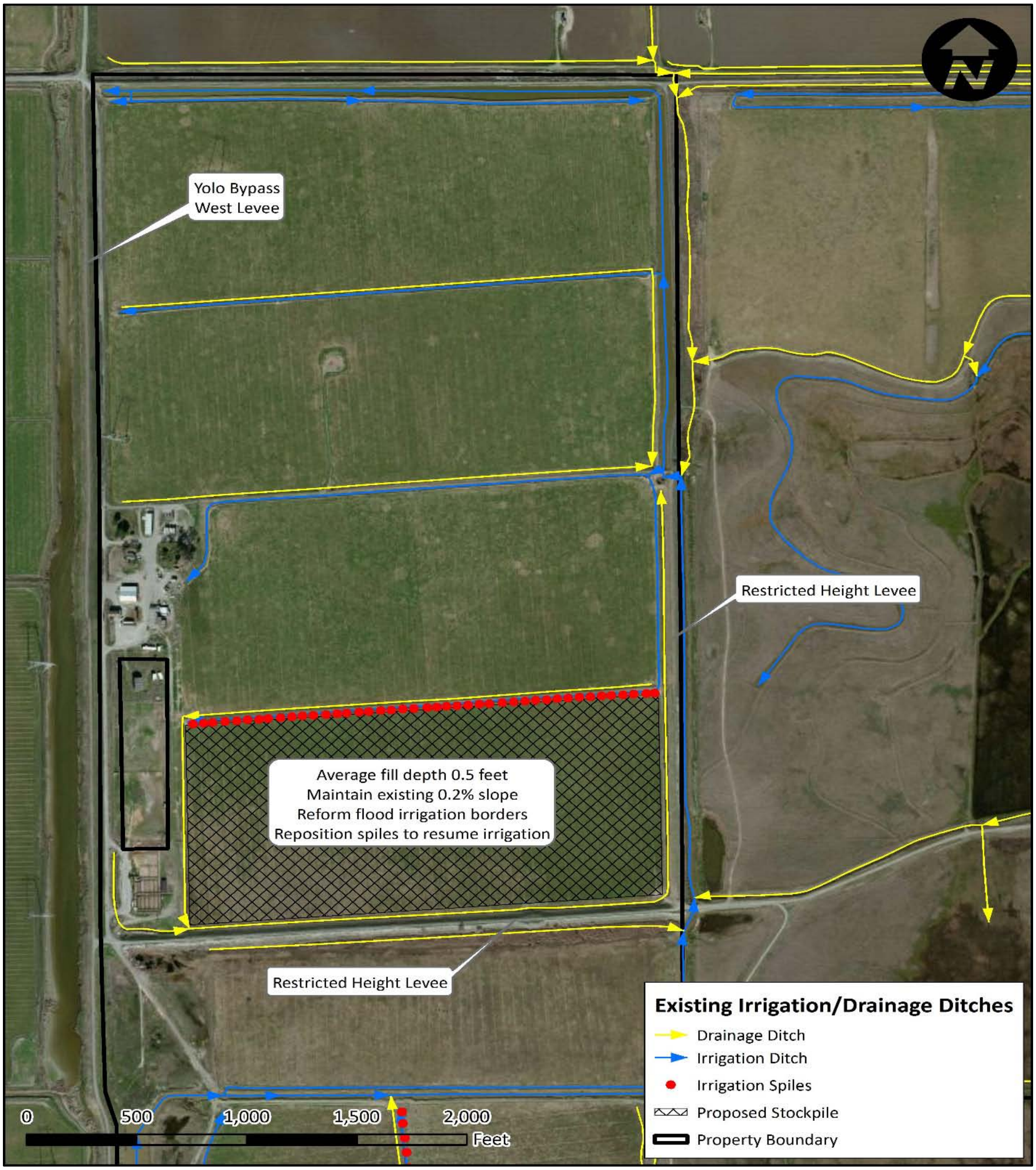


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**Figure 5-14**

**Onsite Soils Disposal for the Tidal Marsh Complex Alternative**

### *Impacts associated with Alternative No. 4*

#### Hydrology: TMC Alternative

Similar to the proposed Project, this alternative would be designed to maintain agricultural irrigation and drainage capabilities as well as storm-water conveyance capacity on the Project site and for adjacent parcels to the north that have always relied on the existing water control infrastructure.

The TMC alternative soil stockpile (i.e., 50 acres within the restricted-height levee) would have a much smaller impact upon Yolo Bypass flood/water surface elevations (WSE) (i.e., about 0.04 ft WSE) resulting in a less-than-significant impact when compared with the significant impact by the proposed Project relying on Soils Reuse Options #2 (stockpile) and #3 (combination) (**Figure 5-15** versus **Figure 4.1-10**).

The hydrology modeling for **Figure 5-15** was based on the construction of the TMC alternative assuming existing baseline condition, i.e., with the completed construction of the Liberty Island Conservation Bank (formerly known as the Kerry Parcel Project) in late 2010. The reason for the very minor increase in WSE would be due in part to the increased vegetative roughness in the absence of mass grading that would be proposed for the Project and the stockpile (cbec eco engineering 2013). Recent informal consultations with the CVFPB indicate that this slight increase would not be deemed substantial from a flood protection regulatory standpoint (cbec eco engineering 2013).

**Figure 5-16** illustrates the modeling results for construction of the TMC alternative, construction of the Kerry Parcel (i.e., removal of northern east-west levee segment, marsh-plain excavation, and stockpile), and Phase 2 of the Liberty Island Conservation Bank (i.e., removal of southern and middle east-west levee Stair Step levee segments). The figure shows that these combined activities would actually further reduce the TMC alternative’s minor flood conveyance impact and would in turn create a slightly positive flood benefit, cumulatively speaking. It is not precisely known when the Kerry/Liberty Island project would begin; however, the applicant is moving forward with permits.

As with the proposed Project, the TMC alternative would have minimal to no impact on local groundwater levels. Excavations would be shallow to allow for the creation of “starter channels” with mostly notches in existing berms at various selected locations. There would be no deep excavation or dredging of the adjacent water bodies with this alternative.

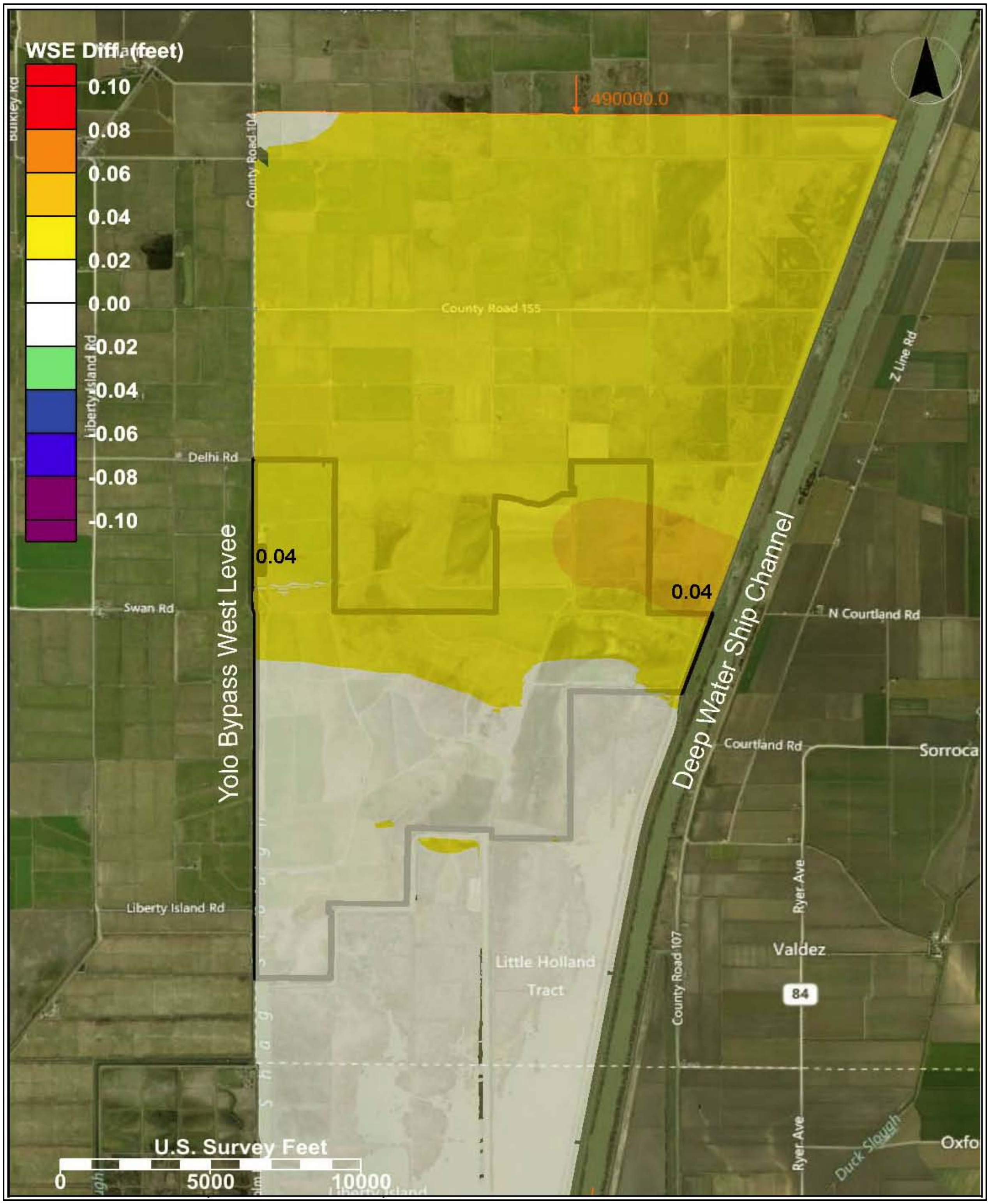


**Figure 5-15**

**Preliminary Flood Conveyance Model Results**
**Tidal Marsh Complex Alternative**

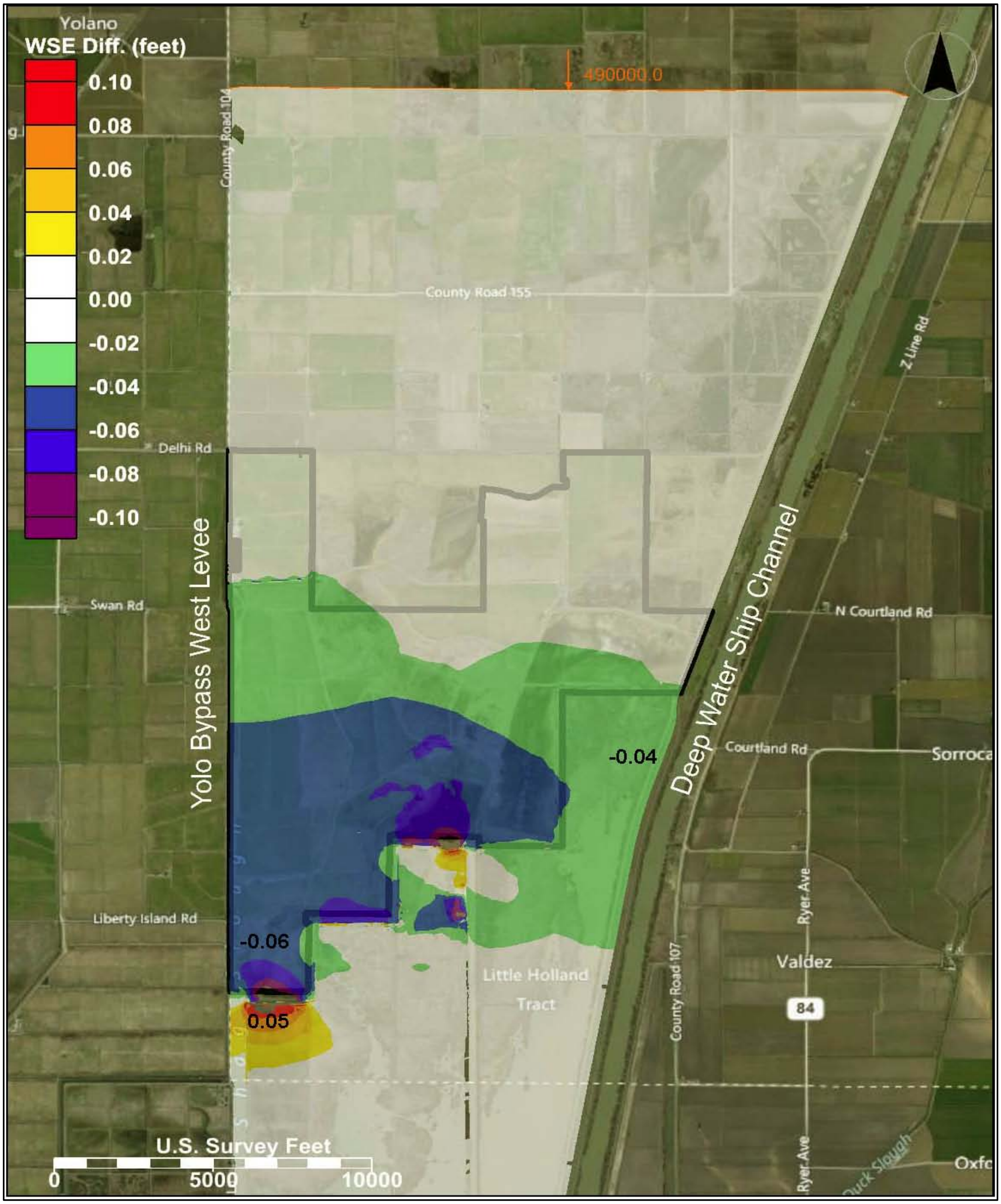


**Figure 5-16**

**Preliminary Flood Conveyance Model Results Tidal Marsh Complex Alternative with Other Wetland Restoration Projects**

## Water Quality: TMC Alternative

### MeHg Loading and Concentrations: TMC Alternative

As discussed in Section 4.2, Water Quality, MeHg concentrations and mass loadings at the Project site and within the Delta region involve a certain degree of complexity and uncertainty. The actual loading of MeHg from wetlands depends heavily on the rate of hydrologic exchange with the surrounding environment (Windham-Myers *et al.* 2010). Limiting exchange allows the breakdown of MeHg by photodemethylation, biological uptake, and exchange between sediment and water pools prior to release, thus reducing the actual load of MeHg to receiving waters (Alpers *et al* 2008; Stephenson *et al.* 2008). However, this restricted hydrologic exchange would increase resident time, which could promote the anoxic conditions that foster MeHg formation, and could expose organisms within the isolated wetland to high MeHg concentrations (Windham-Myers *et al.* 2010). Because the mass loading to the site would vary considerably with water year type and whether the Yolo Bypass floods, even more uncertainty would exist as to the site's contributions of MeHg to the receiving waters.

The Project site's MeHg production and cycling is influence by a number of interconnected biotic and abiotic processes (Alpers *et al.* 2008; Bachand *et al.* 2011a; Gill *et al* 1999; Holmes and Lean 2006; Windham-Myers *et al.* 2010). Despite this complexity and degree of uncertainty, at least four generalities from the scientific literature can be made for MeHg in aquatic environments that are directly applicable to the TMC alternative:

1. MeHg production is generally higher in surface sediments than the overlying water, due to higher bacteria concentrations and more reduced conditions in sediments (Alpers *et al.* 2008).
2. Lower surface water DO concentrations, more episodic hydroperiods, and presence of more vegetation appear to increase MeHg flux from the sediments (Holmes and Lean 2006; Siegel *et al.* 2011; Ullrich *et al.* 2001). Tules are generally associated with high rates of MeHg flux (Stephenson *et al.* 2008).
3. The Delta is a net sink for MeHg, with losses from photodemethylation and particle settling exceeding gains from inflows and sediment flux (Wood *et al.* 2010).
4. Wetlands have long been known as net producers of MeHg, as they typically provide conditions ideal for methylation (e.g., shallow water, elevated water temperatures, ample sources of labile carbon, low DO levels, etc.) (Hurley *et al.*, 1995; Rudd, 1995; St. Louis *et al.*, 1994). Floodplains and seasonal wetlands, which are typically flooded intermittently during later winter and spring, generally have the highest MeHg concentrations. High elevation tidal marshes that are flooded only during the highest springtide typically have relatively high sediment MeHg content. Lower elevation tidal marshes that experience regular wetting on a daily basis tend to have lower MeHg concentrations (Yee *et al.* 2008; Alpers *et al.* 2008). Permanently flooded habitats such as open-water zones with various types of aquatic vegetation (submerged, floating, and emergent) tend to be lower in MeHg in water and sediment than seasonally or regularly flooded habitats.

Still, despite these four qualitative generalities, sufficient data and information is not available to quantify accurately the MeHg concentrations and loads onto and off of the Project site under existing conditions. The multitude of site-specific factors that affect mercury methylation and demethylation rates (e.g., available organic carbon, inundation period and cycling, mercury concentrations in soils, vegetation characteristics), the resulting MeHg loading to adjacent waters (e.g., hydrologic connectivity with adjacent systems, hydrologic flow paths, water recycling opportunities), and the currently available science do not support using non site-specific data to quantify accurately and reliably the MeHg production and loading at the Project site. Therefore, the remainder of this subsection on MeHg presents a qualitative assessment of MeHg production and loading under current site conditions and its applicability to the TMC alternative.

During the summer irrigation season, MeHg production within the Project area is likely relatively high. Most of the site is managed as irrigated pasture, which has conditions that are conducive to MeHg production, such as shallow inundation, dense vegetation, and wetting/drying cycles on the order of days to weeks. As described earlier, agricultural wetlands studied within the Yolo Bypass Wildlife Area, including rice fields and fallow rice fields, all generally increased MeHg concentrations from inflow to outflow almost three-fold. Mean unfiltered MeHg concentrations in outflows were 2.85 ng/L, 47 times greater than the Delta MeHg TMDL's concentration goal (i.e., 0.06 ng/L).

MeHg samples were also taken at several agricultural drains along the Toe Drain, during non-flood periods in 2005 (Stephenson *et al.* 2008). These drains transport tailwater from irrigated agricultural operations as well as from some managed wetlands. The concentrations in the water flowing from these drains was highly variable (0.21 - 5.18 ng/L) with a mean concentration of 1.63 ng/L. This high variability is likely due to site-specific differences in the many aforementioned factors contributing to MeHg production in the various areas connected to these drains. Two of the drains sampled received water from agricultural operations on the Project site. The concentrations at these drains ranged from 0.23 ng/L - 1.18 ng/L (mean: 0.56 ng/L). The MeHg concentrations found within the irrigated pasture, irrigation ditch, and non-tidal wetland habitat on the Project site likely falls within the range of values presented in this discussion.

During the sampling period of that study, the unfiltered MeHg concentration in the Toe Drain, which included water from numerous sources upstream and downstream including the sampled agricultural drains, ranged from 0.272 - 1.19 ng/L. The average concentration difference between drain water from the 2005 study and Toe Drain MeHg concentrations was 0.91 ng/L; indicating that these drains contain elevated MeHg levels. The data from the Windham-Myers *et al.* (2010) study also indicate that unfiltered MeHg concentrations on agricultural wetlands could be higher than source water by about 1 - 2 ng/L.

Data do not exist to accurately quantify the amount of drainage water volumes and the relative percent of recycled water and water discharged directly to the surrounding Delta tidal waterways. However, based on an understanding of irrigation operations and the appropriative water rights on the Project site, approximately 9,000 ac-ft of drainage water is estimated to be generated annually on the Project site (cbec Ecological Engineering 2011). Roughly 60 percent of that water, or 5,500 ac-ft, is re-circulated internally before discharge offsite while an estimated

40 percent of that water, or 3,500 ac-ft, is discharged directly offsite without re-circulation (cbec Ecological Engineering 2011).

MeHg is generated on the irrigated fields and rapidly equilibrates (i.e., net sediment flux in equates net losses). MeHg in the drainage canal also equilibrates quickly to a slightly lower concentration. Re-circulated water then varies between those two equilibrium states. The largest load of Project site irrigation water into the adjacent tidal system may occur at the end of the irrigation season, when the water control structures are opened to allow free hydrologic exchange in advance of the flood management season. This action may result in a substantial, discrete load of MeHg to the Delta.

During the irrigation season, organisms living within the Project site are subjected to potentially high MeHg levels in water and soils, due to the low level of hydrologic exchange with the adjacent tidal waters. Aquatic organism movements, between the site and adjacent areas, are essentially a one-way process where individuals enter the major irrigation ditches through the water control structures on rising tides and cannot exit on ebb tide, as the flap gates close to prevent drainage. MeHg bioaccumulation rates in aquatic organisms trapped onsite are anticipated to be greater than those in the adjacent Delta. This bioaccumulated MeHg in aquatic organisms transfers into the terrestrial foodweb via predation by birds, reptiles, and mammals.

During the winter flood management period, MeHg production across much of the site is likely limited to periods of flood inundation and rainfall-induced ponding (Heim *et al.* 2009). The initial flood produces a MeHg load pulse regardless of the flood's duration. Over time, the flooded land continues to generate MeHg, just at a slower rate, with the total flood load continuing to increase over time. When the Yolo Bypass is not flooded, MeHg production occurs within the existing seasonal and permanent wetlands and, to a lesser extent, within the major irrigation ditches onsite. However, total MeHg loads to the adjacent Delta may in fact be greater due to the more open hydrologic exchange between the systems during this time of year.

Outside of discrete flood events, MeHg exposure to aquatic organisms onsite is likely to be similar during the winter and summer but for different reasons. In winter, the open hydrological exchange between the site and the adjacent tidal waterways dilutes MeHg concentrations from whatever may be produced onsite. This open exchange not only allows regular mixing of tidal waters, but allows organisms to move freely in and out of the site, resulting in lower exposure periods and thus lower MeHg bioaccumulation rates in aquatic organisms. In summer, lower net MeHg production and reduced access for aquatic organisms reduces exposure.

Additionally, Heim *et al.* (2009) conducted a study to quantify MeHg discharges from Delta farmed islands. Farmed islands compose roughly 70 percent of the total areas of the Delta and use water from Delta channels for irrigation. The study found that MeHg concentrations were significantly correlated (at the 95 percent confidence level) with DOC concentrations and that flushing of shallow zone groundwater (porewater) by the addition of new water is a possible mechanism that explains MeHg concentrations in subsurface drains on Delta Islands.

Hence, from a qualitative perspective, the following observations and considerations are provided in the context of the TMC alternative:

1. It is likely that a sizeable MeHg production and export is associated with the current land use and irrigation practices of the site.
2. The TMC alternative, by the very nature of its complexity, would result in a variety of conditions that would potentially increase and decrease MeHg relative to the existing site, however overall wetted area would decrease by nearly 43 percent. On the high tidal marsh areas (1,100 acres), wetting would occur much less frequently than under current irrigation and 385 acres of wetland buffer would be above tidal influence and removed from irrigation.
3. The rate of tidal exchange would be critical, but specifying in advance a "sweet spot" for minimizing MeHg export is not possible and is deemed as speculative.
4. The TMC alternative would encourage the growth of tules in certain areas; hence, it would be important to evaluate MeHg production in this portion of the TMC footprint.
5. Once inundation regimes are specified, more definitive predictions would be possible. However, the high degree of uncertainty would require monitoring of MeHg production and export. This monitoring activity shall be coordinated and collaborated with the ongoing regional studies being proposed by the CDFW to comply with the CVRWQCB's Delta TMDL for mercury.

Based on the overall reduction in wetted area with the TMC alternative and the amount of area subject to less frequent inundation, it is expected that a less-than-significant impact to MeHg production would occur relative to existing conditions. Given the relative uncertainty, monitoring requirements would be initiated to evaluate MeHg production. Subsequent analysis of such results would be addressed in the adaptive management aspects in the post-construction phase to further reduce MeHg production as may be necessary.

### Other Water Quality Issues: TMC Alternative

Other potential water quality impacts would be similar or slightly greater in nature for this alternative as under the proposed Project, but remain less than significant. With more conversion of irrigated pasture to tidal marsh under the TMC alternative, an increase in the benefit would be anticipated to the aquatic ecosystem of the Delta through organic matter exports and return to a more natural state. Due to the distance of water supply facilities, e.g., Barker Slough Pumping Plant at over 11 miles away from the Project site, any elevated DOC/TOC levels from the TMC alternative would still be less than significant. Related to that issue would be low DO and or excessive BOD; however, with a tidal influence as part of the TMC alternative, just as with the proposed Project, such water quality issues would not occur as "hot spots" on the site. The overall impact would be less than significant.

## Terrestrial Biological Resources: TMC Alternative

Under Alternative No. 4, the habitat restoration footprint would be greater than what would be created under the proposed Project, by relying on the site's unique topographic and hydrologic elements. Conversely, this alternative would excavate a dramatically smaller volume of soil compared with the proposed Project (i.e., 44,300 cy versus 2.5 mcy of excavated materials). Thus, a broader area of agricultural land that supports a lower ecological value within a terrestrial/aquatic interface would be impacted for a shorter construction duration and intensity for the TMC alternative when compared to the Project. This alternative would therefore reduce the period of temporary disturbance to multiple sensitive species that may use the site under its existing condition but would cover a somewhat broader area than the Project's construction footprint. Hence, temporary but potentially significant construction impacts would remain under the TMC alternative and would affect wetland communities, special-status plants, vernal pools and their invertebrates, GGS and their habitat, western pond turtles, migratory and special-status birds with respect to their nesting habitats, and foraging habitats for Swainson's hawk and other special-status raptors.

The overall impacts, both individually and cumulatively, would require the same mitigation measures proposed for the Project (refer to Section 4.3, Terrestrial Biological Resources, i.e., Mitigation Measures 4.3-1 through 4.3-7). Consequently, construction-related and long-term operational and maintenance impacts by this alternative on terrestrial biological resources would be less than significant after mitigation. In the long term, benefits of restoration under this alternative would provide improved ecosystem functions to the site and to the Delta freshwater tidal-marsh-floodplain-seasonal wetland-lowland grassland interfaces.

## Aquatic Biological Resources: TMC Alternative

Under Alternative No. 4, approximately 1,672 acres of tidal marsh would be restored and up to 44,300 cy of soil would be excavated. This alternative would maximize ecological productivity by enhancing resiliency, diversity and regional integration. The Project site has numerous raised ranch roads and internal berms, which would largely be left in place in order to help simulate historic hydroperiod conditions. To accomplish this, about 100-ft wide tidal connections would be excavated in the roads and berms at strategic locations throughout the different networks, to facilitate water exchange in and out of the site. Depending on the season, the predominant water source would be tidal incursion from the surrounding channels or flood events in the Yolo Bypass. The excavated notches, coupled with the site's existing topography and irrigated pasture infrastructure, would increase hydraulic residency time, surface flow complexity and discharge distance to receiving waters. Given its unique hydrological location, Alternative No. 4 would provide a net benefit in regional food web production and aquatic habitat for fishes that utilize floodplains for spawning and rearing resulting in a beneficial effect to aquatic resources in the long term.

Since this alternative would excavate a smaller volume of soil than the Project, Alternative No. 4 would also require a shorter construction duration and smaller extent of construction-related activities; hence temporary construction impacts would be further reduced when compared to the proposed Project, but would still yield potentially significant impacts. As with the Project, the TMC alternative would be less than significant with mitigation for potential construction-related (i.e., improvements to the irrigation/drainage infrastructure where drainages may contain individual special-status fishes) and long-term operation and maintenance impacts (refer to Mitigation Measures 4.4-1 and 4.4-2 in Section 4.4, Aquatic Biological Resources). There would be no impact to aquatic biological resources regarding the filing of the west Yolo Bypass levee borrow ditch, since Alternative No. 4 would not involve construction of a new toe berm at that location.

### Agricultural Resources: TMC Alternative

If Alternative No. 4 was implemented, the amount of agricultural lands restored to wetlands would be increased from 1,585 acres affected under the proposed Project to 1,672 acres. Hence, the amount of marginal Unique Farmland (as detailed in Section 4.5 and **Appendix D** for the overall Project) that would be permanently restored to wetlands would increase from 240 acres to 356 acres. Loss of agricultural land under this alternative would be greater than that of the proposed Project. This conversion would represent a decrease of less than 0.8 percent of the County's Unique Farmlands (whether or not those agricultural lands were of high quality and high productivity). This percentage change would be a minimal amount in the greater context of the County's agricultural lands. Additionally, as the case for the Project and other alternatives, the agricultural lands on the Project site are limited in use due to the primary role of the Yolo Bypass, which is to protect cities, such as Sacramento and West Sacramento, from flooding during the rainy season. The Project site's agricultural uses are currently limited to cattle grazing and growing alfalfa. Accordingly, Alternative No. 4 would result in less-than-significant impacts on agricultural resources.

The TMC alternative would also conform to the Williamson Act and generally comply with the DPC and County of Yolo policies for open space and agriculture. As noted for the proposed Project, plan consistency by the TMC alternative is not deemed a physical impact under CEQA.

### Air Quality and Greenhouse Gases: TMC Alternative

Alternative No. 4 would involve a substantially reduced amount of soils to be excavated (up to 44,300 cy rather than 2.5 mcy slated for excavation with the proposed Project). Hence, the air quality and GHG emissions for this alternative would be substantially lower than those emissions associated with the proposed Project. Calculated $NO_x$ emissions for the construction phase (total = 0.7 tons per construction project) would not exceed the YSAQMD threshold of 10 tons per year. However, the 80 pounds per day YSAQMD significance threshold for $PM_{10}$ would be exceeded (calculated emissions would be about 225 pounds per day at the height of construction) (ICFI 2013). Hence, the TMC alternative would result in a significant impact for $PM_{10}$ emissions and a less-than-significant impact for $NO_x$ emissions.

With implementation of the Mitigation Measure 4.6-1, Alternative No. 4 would result in $PM_{10}$ construction emissions that would not exceed the significance criteria established by the YSAQMD, and therefore the air quality impact from $PM_{10}$ (both individually and cumulatively) would be less than significant.

Construction activities associated with the TMC alternative would result in slightly more than 100 metric tons of $CO_2$, the major GHG pollutant. The estimated GHG emissions are less than the 25,000 metric tons per year threshold (refer to threshold discussion in Section 4.6.2 for GHG) and thus construction of Alternative No. 4 would result in a less-than-significant impact with the release of GHG emissions.

In addition, converting from conventionally managed agricultural lands to emergent wetlands could reduce long-term net GHG emissions. As described in Section 4.6, Air Quality, emergent tule marshes have the ability to sequester 11.5 metric tons $CO_2e$ per acre per year. This alternative would therefore sequester more carbon than the proposed Project, because a larger-sized wetland acres would be created. Hence, this carbon sequestration would be a beneficial effect associated with the TMC alternative

### Cultural Resources: TMC Alternative

Cultural resources impacts, both individually and cumulatively, under Alternative No. 4 would be substantially reduced as the excavation of materials would involve 44,300 cy versus the up to 2.5 mcy as proposed by the Project. While the area of potential effects would be very small under the TMC alternative, similar impacts to those associated with the proposed Project could still be potentially significant, i.e., for buried archaeological resources and unknown human burial resources encountered during earth-moving activities. The same mitigations for the proposed Project would apply to this alternative (refer to Mitigation Measures 4.7-1 and 4.7-2). The residual impact with mitigation for the TMC alternative would then be less than significant.

### Hazards and Hazardous Materials: TMC Alternative

This alternative would have similar potentially significant impacts (both individually and cumulatively) as that of the proposed Project with respect to unknown contaminated soil/materials and potential hazards with natural gas wells, energy infrastructure, and related pipelines. The same Project mitigations would apply to this alternative, i.e., Mitigation Measures 4.8-1 and 4.8-2 and would result in such impacts being less than significant with the implementation of those measures.

### Energy Consumption: TMC Alternative

Alternative No. 4 would require a minor amount of energy resources compared to the Project during construction, i.e., reduced earth-moving activities (one month construction phase for the TMC alternative versus a six-month construction phase for the proposed Project). Minor ongoing operation and maintenance energy use would be similar to that of the Project. As with the Project, this alternative’s energy consumption would not be wasteful and would be less than significant.

# 5.5 Comparison of Project and Feasible Alternatives

Implementation of either the proposed Project or one of its alternatives would result in environmental impacts as discussed herein and in Chapter 4, Environmental Setting, Impacts, and Mitigation Measures. These environmental impacts would range from beneficial effects to potentially significant adverse impacts that can all be mitigated to a level of less than significant. A matrix on some of the restoration features/construction elements for each alternative and proposed Project is presented in **Table 5-3.**

**Table 5-3. Differences between the Alternatives and the Proposed Project**

| Categories | Proposed Project | Alternatives | | | |
|---|---|---|---|---|---|
| | | No. 1<br>No Project | No. 2<br>Reduced Restoration Footprint | No. 3<br>Offsite Soil Disposal/ Reduced-size | No. 4<br>Tidal Marsh Complex |
| **Tidal Marsh Restoration** | 1,226 acres | 0 | 710 acres | 830 acres | 1,672 acres |
| **Tidal Marsh Enhancement** | 34 acres | 0 | 10 acres | 10 acres | 28 acres |
| **Seasonal Marsh Enhancement** | 174 acres | 0 | 480 acres | 580 acres | Combined with tidal marsh restoration |
| **Riparian Enhancement** | 59 acres | 0 | 40 acres | 45 acres | 49 acres |
| **Amount of Soil Excavated** | 2,500,000 cubic yards | 0 | 902,000 cubic yards | 1,500,000 cubic yards | 44,300 cubic yards |
| **Conversion of Unique Farmland to Wetlands** | 240 acres | 0 | 170 acres | 170 acres | 356 acres |
| **Remaining Agricultural Lands after Construction** | 2,210 acres | 3,795 acres[1]; | 2,555 acres | 2,330 acres | 1,235 acres |
| **Construction Period** | 6 months | 0 | 5 months | 3 months | 1 month |

[1]Even the No Project alternative is anticipated to lose some acreage in the future due to sea level rise or levee failure. It is estimated that a portion of the property would be inundated (about 550 acres), perhaps leaving 3,245 acres left to farm.

**Table 5-4** summarizes the comparison of impacts between the proposed Project and its alternatives. Where the significant and potentially significant environmental impacts are noted, these comparisons are done prior to implementing the proposed mitigation measures.

## Table 5-4. Impacts Comparison between the Project and Alternatives

| Environmental Categories | Alternatives and Impact Significance Determination Prior to Mitigation | | | | |
|---|---|---|---|---|---|
| | Proposed Project | No. 1<br>No Project | No. 2<br>Reduced Restoration Footprint | No. 3<br>Offsite Soil Disposal/ Reduced-size | No. 4<br>Tidal Marsh Complex |
| **Hydrology** | Significant for flood conveyance impacts with Soils Reuse Options #2 and #3 | None to potentially significant, depending on the future scenario such as sea level rise or levee failure | Significant for flood conveyance impacts with Soils Reuse Options #2 and #3 | None for flood conveyance impacts in the Yolo Bypass | Less than significant |
| **Water Quality** | Less than significant | Less than significant | Less than significant | Less than significant | Less than significant |
| **Terrestrial Biological Resources** | Significant from temporary construction impacts to sensitive habitats and species | None to potentially significant, depending on the future scenario such as sea level rise or levee failure | Potentially significant from temporary construction impacts to sensitive habitats and species | Potentially significant from temporary construction impacts to sensitive habitats and species t | Potentially significant from temporary construction impacts to sensitive habitats and species |
| **Aquatic Biological Resources** | Significant impacts on aquatic species isolated in the borrow ditch near the west Yolo Bypass levee and the irrigation and drainage improvements | None | Potentially significant impacts on aquatic species isolated in the borrow ditch near the west Yolo Bypass levee and the irrigation and drainage improvements | No impact to west Yolo Bypass levee borrow ditch; potentially significant but temporary impacts from irrigation and drainage improvements | No impact to west Yolo Bypass levee borrow ditch; potentially significant but temporary impacts from irrigation and drainage improvements |
| **Agricultural Resources** | Less than significant | Less than significant to significant, depending on future scenarios | Less than significant | Less than significant | Less than significant |
| **Air Quality and Greenhouse Gases (GHG)** | Potentially significant for nitrogen oxides ($NO_x$) and particulate matter ($PM_{10}$ fugitive dust); less than significant for greenhouse gases (GHG) | No impacts | Potentially significant for $NO_X$ and $PM_{10}$; less than significant for GHG | Less than significant to potentially significant for air quality ($NO_x$ and $PM_{10}$), depending on which excavation/soil transport approach would be chosen; less than significant for GHG | Potentially significant for $PM_{10}$ only; no impact for $NO_x$; less than significant for GHG |

## Table 5-4. Impacts Comparison between the Project and Alternatives

| Environmental Categories | Alternatives and Impact Significance Determination Prior to Mitigation | | | | |
|---|---|---|---|---|---|
| | Proposed Project | No. 1<br>No Project | No. 2<br>Reduced Restoration Footprint | No. 3<br>Offsite Soil Disposal/ Reduced-size | No. 4<br>Tidal Marsh Complex |
| **Cultural Resources** | Potentially significant for encountering unknown buried cultural resources | None | Potentially significant<br>(probability of encountering unknown buried cultural resources would be less than with Project due to reduction in excavation acreage) | Potentially significant<br>(probability of encountering unknown buried cultural resources would be less than with Project due to reduction in excavation acreage) | Potentially significant<br>(probability of encountering unknown buried cultural resources would be substantially less than with Project due to less excavation) |
| **Hazards and Hazardous Materials** | Potentially significant for encountering unknown buried hazards and hazardous materials | None | Potentially significant<br>(probability of encountering unknown buried hazards and hazardous materials would be less than with Project due to reduction in excavation acreage) | Potentially significant<br>(probability of encountering unknown buried hazards and hazardous materials would be less than with Project due to reduction in excavation acreage) | Potentially significant (probability of encountering unknown buried hazards and hazardous materials would be substantially less than the Project due to the least excavation of all alternatives) |
| **Energy Consumption** | Less than significant | None | Less than significant | Less than significant | Less than significant |
| **Vessel Transportation** | None | None | None | Less than significant | None |
| **Cumulative Impacts** | Temporary, potentially significant for:<br>• Terrestrial biological resources<br>• Air quality ($NO_x$ and $PM_{10}$)<br>• Cultural Resources<br>• Hazards and Hazardous Materials | None | Short-term, potentially significant for:<br>• Terrestrial biological resources<br>• Air quality (NOx and $PM_{10}$)<br>• Cultural Resources<br>Hazards and Hazardous Materials | Temporary, significant for:<br>• Terrestrial biological resources<br>• Air quality ($NO_x$ and $PM_{10}$) with truck transport, not significant with pumping thick slurry or conveyor systems<br>• Cultural Resources<br>• Hazards and Hazardous Materials | Short-term, potentially significant for:<br>• Terrestrial biological resources<br>• Air quality ($PM_{10}$)<br>• Cultural Resources<br>Hazards and Hazardous Materials |

In comparing Alternative No. 1 (No Project alternative) with the Project, this alternative would not incur the several short-term, significant Project construction impacts. There would be no loss of Unique Farmlands, but over time, sea level rise and/or possible levee failure may directly affect low lying Important Farmlands at the Project site. Several of the environmental issues examined in Chapter 4 (such as water quality, enhanced food web productivity, rearing habitats for out-migrating salmonids, etc.) would also not be improved over time and theoretically could contribute to a worsening of conditions affecting the overall ecological health of the Cache Slough Complex. Hence, Alternative No. 1 (No Project alternative) would not meet the Project goals (as related to OCAP requirements and providing coverage as a near-term measure for BDCP) nor would it advance the Project's four objectives.

The other three alternatives would avoid or substantially lessen one of the Project's significant and potentially significant impacts. Alternative No. 2 (Reduced Restoration Footprint) alternative would cause: less severe impacts to biological resources and less-than-significant impacts to air quality relating to $NO_x$ emissions (both individually and cumulatively). Alternative No. 3 (Offsite Soil Disposal/Reduced-size alternative) would have no impact to hydrology, as well as a reduction in severity to air quality impacts, depending on the mode of excavation and soil transport. Alternative No. 4 (TMC alternative) would substantially reduce almost all of the Project significant impacts because of its greatly reduced construction footprint and timeframe. Alternative Nos. 2 through 4, like the Project, would also provide less-than-significant impacts and beneficial effects to water quality. Additionally, Alternative Nos. 2 and 3 would reduce the acreage of Unique Farmlands converted to restored wetlands. Beneficial effects would also occur with the implementation of the Project or any of the three alternatives (Alternative Nos. 2 through 4) to the ecosystem associated with the aquatic and terrestrial habitats and those biological species found at the Project site.

## 5.6 Environmentally Superior Alternative

The *State CEQA Guidelines* (CCR § 15126.6 [e][2]) require that the analysis of alternatives identify the "environmentally superior alternative" among all of those considered. The Project would be a wetlands restoration project with its construction-related impacts mitigated to less-than-significant levels with well-established mitigation strategies. The No Project alternative would eliminate these potential short-term impacts. However, this alternative would not meet the Project goals and objectives and it would lack the longer-term environmental benefits of the Project on water quality, fisheries, marsh and wetland habitat, and vector control. Hence, the No Project alternative would not be the environmentally superior alternative. The Reduced Restoration Footprint alternative would reduce the loss of Unique Farmlands, construction air pollutant emissions, the loss of upland habitat for birds, DOC in receiving waters, and the potential for construction sediment release. However, this alternative would not substantially reduce the significance level of any the proposed Project's significant impacts except for $NO_x$ emissions, and would reduce the benefits to aquatic productivity and fish habitat as compared with the Project.

The Offsite Soil Disposal and Reduced-size alternative would avoid the Project's hydrological impact, and similar to the Reduced Restoration Footprint alternative, would reduce the severity of the Project's significant or potentially significant impacts depending on the construction approach to excavation and soils transport. Additionally, the increase in restoration acreage over the Reduced Restoration Footprint would make the Offsite Soil Disposal and Reduced-size alternative more aligned with the Project in meeting the Project's goals and objectives.

The TMC alternative would avoid the Project's significant hydrological impact and would substantially reduce or eliminate the severity of the Project's other significant or potentially significant impacts tied to construction (e.g., one month rather than six months duration; 44,300 cy of excavated soils versus 2.5 mcy of excavated materials, etc.). At the same time, the TMC alternative would increase the amount of wetlands created beyond what was proposed by the Project (1,672 ac versus 1,226 ac).

Accordingly, based on the analysis in this chapter, the Alternative No. 4 (TMC alternative) would be the environmentally superior alternative.

## 5.7 Options Eliminated from Consideration

This subsection details why other alternatives and options to the proposed Project were deemed infeasible, inadequate, or unachievable. Feasibility of alternatives is defined and characterized in Section 5.2.3, Criterion #3: The Alternatives Must Be Feasible. The four criteria discussed in section 5.2 were utilized to determine whether an alternative should be eliminated from the reasonable range of alternatives.

### 5.7.1 Re-sized Restoration Alternatives

Two re-sized restoration configurations were considered but eliminated from further analysis in the EIR, i.e., a larger-sized restoration footprint alternative and a small, pilot project alternative.

#### *Larger-sized Restoration Footprint Alternative*

A larger-sized restoration effort to further meet the requirements of the federal BiOps was considered. It would be similar in design to the proposed Project; however, it would expand the total extent of tidal restoration acreage by grading down the adjacent upland areas. About three mcy of soil would be excavated. Though it would have provided additional acreage of restored tidal marsh and the associated ecological benefits, an expanded size could be accomplished only through greater soil excavation. Such excavation was rejected because of limitations on the ability to place soils at the proposed soil disposal sites (Soils Reuse Options #1 through #3), greater regulatory requirements and constraints, and substantially higher costs. Furthermore, this configuration would not have avoided nor substantially lessened one or more of the proposed Project's significant impacts.

## *Small Pilot Project Alternative*

In response to the Notice of Preparation, the County of Yolo recommended that a small, pilot project alternative be considered in the EIR. The County concluded that the Project was really an experiment. In particular, the County stated: “What the NOP fails to explain, however, is that the biological effectiveness of the Project is speculative.” (Refer to the County’s letter in **Appendix B**.) The letter goes on to cite the National Research Council (NRC) study entitled: “A Scientific Assessment of Alternatives for Reducing Water Management Effects on Threatened and Endangered Fishes in California’s Bay Delta.” That excerpted citation is in reference to a scientific assessment done by the NRC on the RPA for the entire Bay Delta, requiring the creation of 8,000 ac of intertidal and related subtidal habitat for the delta smelt in the Delta and Suisun Marsh. The focus of that analysis is on the whole of the RPA and not specifically on individual restoration efforts. In fact, the NRC acknowledges that “the concept of increasing and improving habitat to help offset other risks to smelt is conceptually sound….”

The engineering and scientific knowledge base necessary to restore the Project site to tidal marsh is well established (Teal *et al.* 2009). Furthermore, while the NRC states that the California Department of Fish and Game (CDFG) has raised questions about the details of the RPA, it should be noted that the CDFG is in a partnership with DWR regarding the implementation of satisfying the RPA requirements through the Fish Restoration Program Agreement (FRPA).

As noted on the CDFW website:

> “The Fish Restoration Program Agreement (FRPA)[48], between the Department of Fish and Game (DFG) and the Department of Water Resources (DWR), addresses specific habitat restoration requirements of the US Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) biological opinions (Biological Opinions) for State Water Project (SWP) and Central Valley Project (CVP) operations. FRPA is also intended to address the habitat requirements of the DFG Longfin Smelt Incidental Take Permit (ITP) for SWP Delta operations. FRPA was signed by the Directors of DWR and DFG on October 18, 2010 and has been amended once (November 15, 2010) since that time.
>
> The primary objective of FRPA is to implement the fish habitat restoration requirements and related actions of the Biological Opinions and the ITP in the Delta, Suisun Marsh, and Yolo Bypass. FRPA is focused on restoring 8,000 acres of intertidal and associated subtidal habitat to benefit delta smelt, 800 acres of mesohaline habitat to benefit longfin smelt, and a number of related actions for salmonids. Habitat restoration actions implemented in compliance with the USFWS biological opinion that also meet the habitat restoration requirements of the ITP will satisfy the acreage requirements of the ITP.
>
> FRPA establishes the framework for how DFG will work cooperatively with and assist DWR to implement the habitat restoration actions of the Biological Opinions and the ITP. DWR, with assistance from DFG, will plan and implement the restoration actions to mitigate impacts to delta smelt, longfin smelt, and winter-run and spring-run Chinook salmon caused by the SWP Delta operations. DWR’s obligations focus on the above species, but may also benefit steelhead, sturgeon, and other native fish. Specifically, these actions are:
>
> - Delta Smelt Biological Opinion Reasonable and Prudent Alternative (RPA) Component 4;
> - NMFS Biological Opinion RPA Actions 1.2.6 and 1.6.2 in partnership with the US Bureau of Reclamation;
> - NMFS Biological Opinion RPA Action Suite 1.6 and 1.7. FRPA will not be lead, but will provide funding and technical support only;
> - ITP Condition 7.”

[48] http://www.water.ca.gov/environmentalservices/frpa.cfm

Overall, the Project is not an experiment because sound scientific and engineering practices are available to implement the Project and the regulatory agencies are supportive of large scale restoration efforts (refer to **Table 4.10-2**); therefore, conducting small pilot projects on the property beforehand is not necessary, would not meet the goals and objectives of the Project, and would delay the ability of the Project to partially fulfill the BiOps requirements.

### 5.7.2 Alternative Restoration Locations

During the preliminary planning for the proposed Project and in accordance with CCR § 15126.6(f)(2) of the *State CEQA Guidelines,* alternative locations were considered for the Project components and their respective elements. As described below, these alternative locations were eliminated from further consideration in the EIR for one or more of the following reasons: they would fail to meet most of the basic Project objectives, would be infeasible as defined by CCR § 15126.6(f)(1) and CCR § 15364 of the *State CEQA Guidelines*, or would not avoid or substantially lessen one or more significant environmental impacts created by the proposed Project.

#### *Onsite Restoration Locations*

Other possible onsite locations, besides the Project site, were studied. The topography of the Project site is primarily flat, with an almost imperceptible slope descending from the northwest to the southeast. Much of the site is at elevations above modern high tide (+6.5 ft NAVD88), with elevations ranging between +6.5 to +15 ft NAVD88 (see **Figure 2-6**). Maximum elevations of +15 ft NAVD88 and above are located in the extreme northwestern corner of the property near the intersection of Levee and Delhi roads. About one quarter of the site is within intertidal ranges of +2 to +6.5 ft NAVD88. Ultimately, these onsite locations were rejected because existing land elevations relative to the tides were not feasible and extensive grading would be required; the Project would lie on the lowest elevation lands and adjacent to tidal influences.

#### *Offsite Restoration Locations*

Within the context of a broader scope of the Delta Plan and the BDCP, there are major regional planning efforts currently underway for wetland restoration opportunities and there are constraints in the Delta and Suisun Marsh (see **Figure 5-1**). Some of these properties now being planned for restoration activities would not be able to serve as offsite alternatives (refer to **Figure 4.9-1**). For example, DWR is planning to restore the Prospect Island site (south of the Project site), which was identified in comments on the Notice of Preparation as a potential offsite alternative. Currently, the construction phase for Prospect Island is estimated to commence no earlier than 2016 and does not fit within the scheduled timeframe objective for the Project.

Additionally, the potential restoration of any of these offsite locations would entail different combinations of environmental impacts. It is unknown, at this time, if alternative locations are available that could substantially reduce one or more of the Project’s significant impacts (a key issue noted in the *State CEQA Guidelines,* CCR § 15126.6(f)(2)(A)). Even if such offsite locations could avoid or substantially one or more of the Project’s significant impact, such sites would simply replace one significant impact for another. For example, sites on Delta islands may result in the loss of superior agricultural soils compared with those of the Project site, but may require less grading and associated air pollutant emissions. Habitats, sensitive species, proximity to water intakes, MeHg, DO, DOC, tidal flood protection requirements (e.g., new or upgraded levees), and archaeological resources also would vary from site to site, and thus alternative offsite locations would have the potential of having significant environmental effects in these environmental resource categories.

Consequently, sites that are already planned for restoration by other agencies would not be available as offsite alternative locations to the Project. It is not feasible, practical, or prudent for this Draft EIR to consider and duplicate what is now being accomplished at this more macro level of regional planning and analyses.

Lastly, feasibility also entails economic and regulatory considerations; whether the project proponent already owns the site; whether the project proponent can acquire, control, or have access to the site if it does not own it (*State CEQA Guidelines*, CCR § 15126.6[f][1)]and CCR § 15364). Permissible considerations for a finding of infeasibility include whether an alternative is impractical or undesirable from a policy standpoint (*California Native Plant Society v. City of Santa Cruz* (2009) 177 Cal.App.4th 957). Yolo Ranch (the larger of the two properties that comprise the Project site) is already owned by Westlands Water District, a member agency of SFCWA, and it would provide an ideal site to implement, in a timely fashion consistent with the requirements of the BiOps, the proposed restoration efforts. Other offsite locations would require considerable additional time for property acquisition, restoration planning, and permitting and therefore would not be feasible as alternatives to the Project, in terms of meeting the timing of implementation progress stipulated by the regulatory obligations of the BiOps. Known properties suitable for restoration efforts have been considered as part of the cumulative impacts in Section 4.10.

## 5.7.3 Alternative Soil Disposal Locations

Alternative soil disposal sites were also considered, but ultimately rejected for a variety of reasons discussed below. Both onsite and offsite locations were identified and evaluated.

### *Onsite Disposal Options*

#### Scenario #1: Onsite Soil Spreading Option

Under this scenario, approximately 1,180 ac of tidal marsh would be created and 2.5 mcy of excavated soil would be placed on the Project site by spreading this material on the remaining grazing lands. Afterwards, some amount of erosion of the material would occur, especially if flooding occurred shortly thereafter. Over time and with mature vegetative cover, scouring impacts would lessen and the material would become stable.

With Scenario #1, the excavated soils would create an average fill depth of 9.3 inches. Though not modeled, this placement would undoubtedly result in a water level rise of about 9 inches across the entire width of the lower Yolo Bypass from levee to levee within the region of the

Project site. The basis for this forecast is that the tidal channel excavation would do little to help flood conveyance, the restored wetlands would increase hydraulic "roughness" and thereby impede the flood flow, and the excavated materials would reduce critical cross-sectional depth to the land. Hence, Scenario #1 would result in a significant and unavoidable impact for flood conveyance. This substantial rise and spread of flooding would not be allowed nor permitted by regulatory agencies, including USACE, DWR, or the Central Valley Flood Protection Board (CVFPB). Raising the federal flood control levees in the lower Yolo Bypass would likely correct this danger; however, it would be extremely expensive and time consuming due to extensive regulatory requirements under § 408 of the federal Rivers and Harbors Act.

Other significant and unavoidable impacts would include water quality (due to scouring from flood events) and placement of fill within jurisdictional wetlands, such as vernal pools, thereby triggering extensive analysis under the federal Clean Water Act (CWA) and the federal and state Endangered Species Acts. The USACE and U.S. Environmental Protection Agency (USEPA) would also require the preparation of a § 404(b)(1) Alternatives Analysis under the federal CWA that requires demonstration that fill placed for non-water oriented purposes would be the least environmentally damaging practicable alternative. It would be highly unlikely that USACE and USEPA would concur that this scenario would be appropriate under the CWA requirements or other regulatory requirements mentioned above.

#### Scenario #2: Onsite Soil Disposal Option with Excavation of Tidal Channels Only

Under this scenario, the tidal channels would be excavated solely on Yolo Ranch. Approximately, 500,000 cy of soil would be excavated and about 300 ac of tidal marsh wetlands would be restored. No filling of the west Yolo Bypass levee ditch would be required; hence, the impact to the hydrology would be less than significant with a small increase of about one inch in flood conveyance. This scenario would result in a substantially smaller restoration effort than that of the proposed Project.

Scenario #2 would incrementally meet the Project's goals and objectives; however, given the timeframe established by the federal regulatory agencies in the BiOps to restore 8,000 ac of intertidal wetlands prior to 2018, it would represent only a very modest 3.8 percent towards that goal. In comparison, the Project's goal would meet over 15 percent of this requirement. Hence, the sizable cost in carrying out the restoration effort, the extensive regulatory process to undertake throughout the life of the Project, the incremental benefits attained versus full implementation of the Project, and the deadline imposed by the USFWS to meet the 8,000-ac requirement prior to 2018, all factor into rejecting Scenario #2 as a feasible alternative.

### *Offsite Soil Disposal Options*

An analysis was conducted on potential sites on adjacent and nearby properties in Yolo and Solano counties. Of the many sites studied, two were moved forward as feasible alternative sites, S-11 and Sierra Sod Farm) (refer to Section 5.4.3) with the remaining sites determined to be not feasible (**Table 5-5**). Several factors were instrumental in rejecting these offsite soil disposal options from further consideration, including regulatory constraints, readiness, significant impacts either more severe than the Project or an inability to avoid or substantially reduce one or more of the Project's significant impacts.

**CEQA and/or National Environmental Policy Act (NEPA) Constraints.** Both state and federal environmental review processes, if not yet completed on offsite soil disposal locations, would cause further delay to the Project's schedule and result in a failure to meet the deadline set forth in the BiOps/RPA for habitat restoration to benefit the delta smelt and salmonids.

**Table 5-5. Offsite Soil Disposal Locations and Their Constraints**

| Name of Site | Haul Distance (miles) | Readiness to Receive Soil | Other Constraints |
|---|---|---|---|
| Northern Liberty Island Fish Conservation Bank | 7.4 | No. Potential implementation date is unknown at this time. | NEPA pending. Permitting process would be extensive and time consuming for open water soil disposal. |
| Prospect Island Project | 7.8 | No. Construction date anticipated for 2016. | NEPA pending. No funding authorized to date. Plans are still conceptual and estimated to be completed by 2013. Not yet permitted. |
| Little Hastings Tract | 7.9 | No. Potential implementation date is unknown at this time. | Permitting process would be extensive and time consuming for open water soil disposal. |
| Grand Island USACE Soil Disposal Site | 13 | Somewhat. It is an existing disposal site; however, equipment would have to be installed to receive the offloaded materials. | Extensive vegetative cover exists onsite and would have to be surveyed to determine if there are sensitive biological resources present; extensive coordination with wildlife regulatory agencies and further mitigation requirements would result in further costs and Project delay. |
| McCormack-Williamson Habitat Project | 28 | No. Construction date unknown. | Program still under development; subsequent CEQA/NEPA pending; permitting being sought. |
| West Sacramento Levee Improvements Program | 21 - 41 | Yes. Construction date anticipated for 2013. | CEQA/NEPA complete. Port of West Sacramento, while initially interested, has found a cheaper source of dirt for its project. |
| Dutch Slough Tidal Marsh Restoration Project | 32 | No. Construction date unknown. | Program still under development; NEPA pending; permitting being sought. |
| Mein's Landing Habitat Project | 31 - 34 | No. Construction date unknown. | Program still under development; permitting being sought. |
| Bacon Island Levee Project | 40 | Yes. Construction date anticipated for 2013. | Significant and unavoidable air quality and vessel transportation impacts |

CEQA = California Environmental Quality Act NEPA = National Environmental Policy Act
USACE = U.S. Army Corps of Engineers

**Regulatory Constraints.** Open water disposal of material would be the most difficult to permit – e.g. Lower Liberty or Little Hastings. The easiest sites, from a regulatory standpoint, would be those that are currently or soon to be permitted. For the Dutch Slough Tidal Marsh Restoration Project, excavated soil would be loaded into barges, transported across the Delta to Dutch

Slough, and offloaded onto the interior of the Dutch Slough project site. DWR would then transport and grade the material as needed for that wetland restoration project. The certified Dutch Slough Final EIR has already evaluated the environmental consequences at the receiving site of placing up to 1.2 mcy of imported soils for its wetland restoration (DWR 2010). For other projects, the Bacon Island levee project environmental documentation is being developed, and the USACE disposal sites are assumed to still be active (these sites will be investigate further if warranted – one such site, S-11, is under consideration in Section 5.4-3). For the Bacon Island Levee Project, the excavated soils would be loaded into barges, transported across the Delta to Bacon Island, and then offloaded onto the eastern interior side of Bacon Island along Middle River. The local reclamation district would then place this material on the interior of the levee to construct a toe berm for the purpose of improving the stability of that levee.

**Readiness.** Another key factor would be whether the sites would be ready and available to receive material within the timeframe of the Project, which is detailed in **Table 5.5** above.

**Synergistic Benefits.** Finally, a consideration in determining the preferred disposal option would be the ancillary or synergistic benefits certain sites would provide. For example, material barged to Bacon Island for levee toe berms would reduce slumping during an earthquake. Reduced slumping would likely reduce the period of water supply outage by facilitating Middle River Pathway repairs needed to isolate fresh and saline waters.

Of the habitat projects mentioned above, DWR's Prospect Island project was determined to be the most cost effective. Using the latest elevation surveys for Prospect Island, about 1.5 mcy of soil would raise about 400 ac of subtidal habitat to inter-tidal elevations needed to support tule marsh. However, DWR estimates project construction would not commence until 2016. Combining the two projects or advancing the schedule was not deemed viable by DWR.

### 5.7.4 Construction Schedule Extension Option

This option would extend the construction phase from one to two consecutive years, outside of the annual flood season. While the air quality impacts for $NO_x$ and $PM_{10}$ would be reduced to less than significant with no mitigation required under this option, the GHG emissions and energy consumption would double and be greater than with the proposed Project's impacts, but still less than significant. Other impacts would remain the same or be similar in nature to that of the Project for such environmental categories as cultural resources, hydrology, and cumulative impacts. Potential risks to water quality, terrestrial biological resources, aquatic resources, and hazards/hazardous materials would similarly be extended for the second year. Irrigation to agricultural resources would also be affected for the second year, by temporarily ceasing operations for remaining infrastructure improvements. Additional costs, a second mobilization effort by the contractor, and an additional delay to completing this Project prior to 2018 to meet the federal OCAP requirements were also considered prior to rejecting this option.

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# Chapter 6 CEQA Topical Analyses

## 6.1 Growth Inducement

### 6.1.1 Setting

An environmental impact report (EIR) must describe any growth-inducing impacts of the proposed Project (California Environmental Quality Act [CEQA]: Public Resources Code [PRC], § 21100[b][5]; *State CEQA Guidelines*: California Code of Regulations [CCR] § 15126[d]). Growth inducement occurs when an action encourages growth or removes impediments to growth, ultimately causing either direct or indirect changes to the physical environment.

The Project site is located in the unincorporated area of Yolo County. This jurisdiction encourages and directs growth, i.e., urban development, through its land use policies towards incorporated cities and unincorporated communities such as Capay, Clarksburg, Dunnigan, Esparto, Guinda, Knights Landing, Madison, and Yolo (County of Yolo 2009). The highest population and housing densities currently are in the City of Davis and the adjacent University of California at Davis, with its large student population, followed by the City of West Sacramento. Yolo County has a high jobs/housing ratio, with much of the employment located in the cities of Davis and West Sacramento (SACOG 2012).

From a regional perspective, the Sacramento Area Council of Governments (SACOG) provides transportation planning and funding in its six-county jurisdiction (which includes Yolo County). It also serves as a forum for the study and resolution of regional issues, including growth and regional forecasting for population and housing.

In April 2012, SACOG certified its Final Environmental Impact Report (Final EIR) and approved the Metropolitan Transportation Plan/Sustainable Communities Strategy 2035 (MTP/SCS). SACOG's MTP/SCS identifies a growth pattern in the greater Sacramento region that will accommodate forecasted population and employment growth, a transportation system that is appropriate for the growth pattern, and policies and strategies that will support the implementation of this plan (SACOG 2012).

Regional planning efforts also include water supply assessments and urban water management plans. A number of agencies (e.g., municipalities, water districts, county service areas, and community service districts) provide water supplies throughout Yolo County. In particular, the North Delta Water Agency studies and implements programs in parts of Yolo, Sacramento, San Joaquin, and Solano counties. The North Delta Water Agency studies and identifies programs to protect the water supply from salt water intrusion, and assures a dependable and adequate water supply and quality to meet the present and future needs of the lands within the agency's jurisdiction (SACOG 2012).

Additionally, the boundaries of the Solano County Water Agency include not only the entire County of Solano, but also the property of the University of California at Davis in Yolo County and about 2,800 acres (ac) of Reclamation District No. 2068 that is also in Yolo County. Both agencies must anticipate for and provide water supply planning in conjunction with the land use agencies, both at the local and regional levels.

### 6.1.2 Significance Criteria

The CEQA statute requires that an EIR evaluate the ways in which the project could directly or indirectly foster economic or population growth or the construction of new housing in the surrounding environment (*State CEQA Guidelines*: CCR § 15126.2[d]). The Guidelines note that "it must not be assumed that growth in any area is necessarily beneficial, detrimental, or of little significance to the environment." Therefore, the nature of the effects of any induced growth also must be considered to determine, if the impacts of that growth are potentially significant.

Equally important, the *State CEQA Guidelines* (CCR § 15064[d][3]) also declare that an indirect physical change is to be considered only if that change is "a reasonably foreseeable impact which may be caused by the project. A change which is speculative or unlikely to occur is not reasonably foreseeable."

Pursuant to CCR § 15126.2(d) of the *State CEQA Guidelines*, a project may have a growth-inducing effect (either direct or indirect) if it would:

1. Foster economic or population growth or the construction of additional housing, either directly or indirectly in the surrounding environment.
2. Remove obstacles to population growth.
3. Require the construction of additional community service facilities that could cause significant environmental effects.
4. Encourage and facilitate other activities that would significantly affect the environment, either individually or cumulatively.

Some projects may be considered growth inducing, while others may be growth accommodating (i.e., they are intended to support planned growth identified by local, regional, or state agencies with land use authority, but do not induce that growth). The distinction here is primarily whether or not a project removes an obstacle to growth. If growth is already planned for in a jurisdiction's general plan, then infrastructure supporting that development is growth accommodating rather than growth inducing. When a planned development cannot move forward absent a particular infrastructure project, or the development is substantially encouraged by that infrastructure, then that project is generally considered growth inducing.

## 6.1.3 Impacts

### Impact 6.1-1: Foster Economic or Population Growth or Additional Housing Construction

*Applicable Significance Criterion: 1*

The regional impacts of growth have been previously addressed in planning documents and related CEQA analyses (e.g., environmental impact reports) by regional and local planning agencies, such as SACOG and Yolo County. In turn, water agencies, such as the North Delta Water Agency and the Solano County Water Agency, use this information for their planning purposes and forecasted demands. Urban water management plans are developed by the local water purveyors that describe strategies for meeting this projected demand. Such strategies are then implemented as appropriate to accommodate the projected demand.

As a wetlands restoration effort, the Project would not substantially affect growth, since it would not create new housing or infrastructure. There would be a short-term effect from construction expenditures on the Project, because it would employ up to 50 construction workers (see Section 3.4.1, Construction Personnel and Equipment). In a preliminary economic study commissioned for the Project, between 250 and 304 full-time equivalent (FTE) numbers of labor[49] would be generated by the Project; such positions would involve performing biological and water quality monitoring activities onsite, primarily in the first few years of operation, lessening thereafter as monitoring results were evaluated (M.Cubed 2012; see **Appendix G** of the Draft EIR). No long-term loss of employment on the Project site would be expected, as it is anticipated that current agricultural labor lost to habitat restoration would be supplanted by habitat land management responsibilities utilizing the same personnel. Accordingly, a **beneficial effect** would result in the economic growth within the County of Yolo.

Besides the restoration efforts, the Project would partially fulfill the biological opinions (BiOps) requirement of 8,000 ac of habitat restoration for the delta smelt and salmonids in conjunction with the continued, existing operations (OCAP) of the Central Valley Project (CVP) and State Water Project (SWP) facilities, and not their expansion. Hence, **no impact** (either direct or indirect) would result, because the Project would not foster new growth into the region (i.e., new housing or related infrastructure).

### Impact 6.1-2: Remove Obstacles to Population Growth

*Applicable Significance Criterion: 2*

The Project would not remove obstacles to growth, because development on the Project site is already heavily restricted due to flooding constraints and building code requirements in the Yolo Bypass. The proposed Project would not include any policies that would increase the development of housing, or that would cause utility services or roadways to be extended into

[49] The phrase "full-time equivalent (FTE) numbers of labor" refers to the ratio of the total number of paid hours during a set period (part-time, full-time, contracted) by the number of working hours in that period Mondays through Fridays. Therefore, the ratio units (FTE) units or equivalent employees are assumed to be working full-time. For example, one FTE is equivalent to one employee working full-time or two employees each working half-time.

regions that currently lack them. Accordingly, **no impact** would result in reducing obstacles to population growth with Project implementation.

### Impact 6.1-3: Require Additional Community Service Facilities

*Applicable Significance Criterion: 3*

Where increases in population for the Yolo County area are projected to occur, investments will be needed in new public facilities and infrastructure, including roads and transportation facilities, water and sewer treatment facilities, fire and police stations and schools. Construction of these public facilities and infrastructure would not be dependent on the proposed Project, and would in fact proceed regardless with appropriate environmental reviews and regulatory permits.

State and Federal Contractors Water Agency (SFCWA), as the CEQA Lead Agency, does not have authority to control the location or means of use of the water that its member agencies' distribute within their service areas. It is the responsibility of the member agencies to plan for facilities to meet demand needs for growth that is planned for and approved by cities and counties in which the member agencies provide water service. These facilities are planned and constructed to meet the forecasted demands, as determined by population growth and other factors (such as restrictions in building within the floodways). Additionally, Yolo County has local land use policies that direct growth away from undeveloped areas. Hence, **no impact** would result with Project implementation, in connection with the planned construction of additional community service facilities by other agencies within the Project's area.

### Impact 6.1-4: Encourage and Facilitate Other Activities that Significantly Impact Growth

*Applicable Significance Criterion: 4*

The Project would generate approximately up to 50 construction jobs, but this would be a short-term, temporary effect (i.e., less than one year), and between 250 and 304 FTE numbers of labor for several years related to monitoring and other scientific activities. This positive economic effect by the Project would not provide substantial economic growth to the region, requiring the addition of other facilities or endeavors that would favor growth inducement.

The proposed Project is one of several wetland restoration projects that have either been constructed or are planned or proposed in the Delta region either through the CALFED Bay-Delta Program, through natural causes, or as in the case of the Project to partially fulfill the BiOps issued by the U.S. Fish and Wildlife Service and National Marine Fisheries Service for the continued operations of the CVP and SWP. Development of the Project would not induce development of other similar projects, because each project would be subject to distinct site constraints, permitting challenges, environmental constraints, and economic considerations. Project-specific impacts and cumulative impacts for this Project combined with related projects can be found in Section 4.10. Therefore, the Project would not individually or cumulatively facilitate growth inducement (either directly or indirectly) and would result in **no impact**.

### 6.1.4 Mitigations

Because none of the growth-inducing impacts listed in Section 6.1.3 would be significant or potentially significant, no mitigation measures would be required with Project implementation.

## 6.2 Unavoidable Significant Adverse Impacts

An EIR must address potentially significant or significant impacts to the physical environment that cannot be avoided if a project would be implemented (CEQA: PRC § 21100[b][2][A]). Under each environmental resource topic, significant adverse impacts identified have been analyzed in detail with proposed mitigation (refer to Chapter 4) per *State CEQA Guidelines*: CCR § 15126.2(b). All such impacts would be mitigated to levels that would be less than significant. Hence, no unavoidable significant adverse impact would occur or persist with Project implementation.

## 6.3 Effects Not Found to be Significant

The *State CEQA Guidelines* (CCR § 15128) requires that an EIR briefly discuss the reasons why various environmental resource topics were not deemed significant and therefore not discussed in any detail in the EIR. For this subsection, summaries from both the Notice of Preparation/Initial Study (NOP/IS) and the Draft EIR are provided that support the impact determinations of either none or less than significant for the environmental resources/impact topics identified below.

### 6.3.1 Effects Described as None in the Notice of Preparation

An NOP/IS for the proposed Project was prepared and processed in March 2011 (see **Appendix A**). The NOP/IS identified the following environmental resource topics and subtopics that would not be affected by the proposed Project:

- **Aesthetics.** Substantially damage scenic resources (Initial Study, p. 27).
- **Agriculture and Forestry Resources.** Conflict with existing zoning of forest land or result in the loss of forest land (*id.*, pp. 32-33).
- **Air Quality.** Exposure to sensitive noise receptors or create odors (*id.*, pp. 36-37).
- **Biological Resources.** Conflict with local ordinances or with HCPs/NCCPs (*id.*, p. 51).
- **Geology and Soils.** Exposure to earthquakes and landslides, locate on expansive soils, or placement on soils incapable of supporting wastewater systems (*id.*, pp. 55-59).
- **Greenhouse Gas Emissions.** Conflict with adopted greenhouse gas reduction plans (*id.*, p. 60-61).
- **Hazards and Hazardous Materials.** Emit hazardous emissions, cause a safety hazard at either a public use airport or private airstrip, interfere with emergency plans or access, or create potential risk of exposure to wildland fires (*id.*, pp. 66-67).

- **Hydrology and Water Quality.** Degrade water quality substantially; place housing within a 100-year floodplain; expose people to flooding; and inundate by seiche, tsunami, or mudflows (*id.*, pp. 76-77).
- **Land Use and Planning.** Divide an established community (*id.*, p. 79).
- **Noise.** Create substantial, permanent noise levels; and expose people to higher levels of noise at either a public use airport or a private airstrip (*id.*, pp. 86-87).
- **Population and Housing.** Induce substantial growth, displace substantial housing, or displace substantial numbers of people (*id.*, p. 88).
- **Public Services.** Require new or expanded facilities and services of the following public services: fire protection, police protection, schools, or parks (*id.*, pp. 89-90).
- **Recreation.** Require new or expanded recreational facilities and services (*id.*, p. 92).
- **Transportation and Traffic.** Change in air traffic patterns, cause inadequate emergency access, or conflict with adopted alternative transportation plans (*id.*, p. 95).
- **Utilities and Service Systems.** Exceed wastewater treatment requirements, result in construction of new water or wastewater treatment facilities, require wastewater treatment provider to expand capacity, require landfill operator to expand capacity, or not comply with laws and regulations related to solid waste (*id.*, p. 97-99).

## 6.3.2 Effects Described as None or Less than Significant in the Draft Environmental Impact Report

**Table 6-1** lists the environmental impacts of the proposed Project that would have no impact, less-than-significant impact, and/or beneficial effects, as identified through the environmental review process, i.e., PRC § 21100(c). Those impacts found to be either potentially significant or less than significant with mitigation measures incorporated are fully disclosed in Chapter 4, Environmental Setting, Impacts, and Mitigation Measures.

## Table 6-1. Summary of Less than Significant Project Impacts by Environmental Resource Topic

| Environmental Topic[1] | Beneficial Effect | No Impact/Less-than-significant Impact | Discussion in Draft EIR |
|---|---|---|---|
| **Hydrology** | • Flood conveyance stability with Soils Reuse Option #1 | • Effects to Agricultural Irrigation:<br>o Availability of water for irrigation purposes<br>o Irrigation patterns onsite and offsite<br>• Effects to Agricultural Drainage<br>• Effects to Winter Storm-water Drainage<br>• Impacts to Flood Conveyance (with Soils Reuse Option #1)<br>• Impacts on Local Groundwater | Section 4.1 |
| **Water Quality** | • Reduction in methylmercury (MeHg) concentration<br>• Net increase in dissolved oxygen concentrations | • Temporary Impacts to Water Quality from Pollutants or Soil Erosion<br>• Increase in MeHg Loading<br>• Project Dissolved Organic Carbon/Total Organic Carbon Levels at the Barker Slough Pumping Plant<br>• Contribution to Low Dissolved Oxygen Plumes or Excessive Biological Oxygen Demand<br>• Effect on Domestic Supply Well Onsite | Section 4.2 |
| **Terrestrial Biological Resources** | • Substantial improvement to the wetland functions and values for the delta smelt and salmonids<br>• Net increase in habitat suitable for giant garter snake<br>• Net increase in habitat suitable for western pond turtle | • Effects to Wetland Communities:<br>o Permanent conversion of wetland communities<br>• Loss of or Disturbance to Riparian Woodland and Scrub<br>• Effects to Special-status Plants:<br>o Potential threat of noxious weed populations to special-status plants<br>• Impacts on Giant Garter Snake or Giant Garter Snake Habitat:<br>o Stranding and trapping of individual giant garter snakes in restored tidal channels<br>o Long-term conversion of giant garter snake habitat<br>• Impacts on Western Pond Turtle or Western Pond Turtle Habitat:<br>o Long-term conversion of western pond turtle habitat | Section 4.3 |
| **Aquatic Biological Resources** | • Increase in shallow-water and tidal marsh habitats for special-status species<br>• Increase in organic matter loading to improve aquatic food web for delta smelt | • Effects to Aquatic and Riparian Habitats:<br>o Alteration of aquatic and riparian habitats<br>o Alterations in habitat leading to increased predation on native fish<br>o Alterations in habitat composition due to increases in colonizing invasive plant species<br>o Effects from ground-disturbing activities to aquatic and riparian habitats<br>• Direct Fish Lethality or Injury:<br>o Temporary impacts from tidal connection construction<br>o Potential stranding of fish on the Project site<br>• Temporary Noise Impacts Impeding or Delaying Fish Migration<br>• Water Quality Impacts on Fish and Aquatic Resources:<br>o Suspended solids/turbidity<br>o MeHg uptake<br>o Pesticides<br>o Long-term water temperature impacts to fish and other aquatic resources<br>o Long-term dissolved oxygen impacts to fish | Section 4.4 |

## Table 6-1. Summary of Less than Significant Project Impacts by Environmental Resource Topic

| Environmental Topic[1] | Beneficial Effect | No Impact/Less-than-significant Impact | Discussion in Draft EIR |
|---|---|---|---|
| **Agricultural Resources** | • Improved/upgraded irrigation and drainage systems for continued onsite grazing operations and ongoing offsite agricultural uses | • Loss of Important Farmland and Productivity<br>• Inconsistent with Existing Williamson Act Contracts<br>• Inconsistent with Planning Requirements | Section 4.5 |
| **Air Quality and Greenhouse Gases** | • Opportunities for additional sequestration of carbon and greenhouse gases offsets from the atmosphere | • Short-term Construction Emissions of Criteria Pollutants that May Contribute to Existing Air Quality Violations:<br>o Short-term construction emissions containing toxic air contaminants<br>• Conflict with or Obstruction of the Applicable Air Quality Plan Implementation<br>• Greenhouse Gases and Global Climate Change Contributions | Section 4.6 |
| **Cultural Resources** | ---- | • Impacts to Historic Resources | Section 4.7 |
| **Hazards and Hazardous Materials** | • Reduction in mosquito habitat and mosquito production | • Impacts related to Mosquito Control:<br>o Physical impacts from new or altered Sacramento-Yolo Mosquito and Vector Control District facilities<br>o Environmental health effects from mosquito production | Section 4.8 |
| **Energy Consumption** | ---- | • Impacts related to Natural Gas Usage<br>• Impacts related to Electricity Usage<br>• Impacts from Transportation Fuel Consumption | Section 4.9 |
| **Cumulative Impacts** | See above for each environmental topic | • **Hydrology:** Flood Conveyance, Other Hydrological Issues<br>• **Water Quality:** MeHg Loading, Dissolved Organic Carbon Levels, Dissolved Oxygen and Biological Oxygen Demand, Other Water Quality Issues<br>• **Terrestrial Biological Resources:** Wetlands, Riparian Woodland and Scrub<br>• **Aquatic Biological Resources:** Aquatic Habitats, Special-status Fishes, and Fish Populations<br>• **Agricultural Resources:** Farmland and Productivity Loss, Other Agricultural Resources Issues<br>• **Greenhouse Gases:** Greenhouse Gases, Global Climate Change<br>• **Cultural Resources:** Historic Resources<br>• **Hazards and Hazardous Materials:** Mosquito Control<br>• **Energy Consumption:** Natural Gas, Electricity, and Transportation Fuels | Section 4.10 |

[1]The environmental topics listed in this summary table may also have environmental resource categories that would result in potentially significant or significant impacts with Project implementation. For further information, refer to Chapter 4, Environmental Setting, Impacts, and Mitigation Measures.

# Chapter 7 Consultations and Coordination

## 7.0 Overview

Consultations and coordination efforts have been carried out prior to and during the environmental review process, ensuring that all potential significant environmental impacts would be fully examined and disclosed in the Lower Yolo Restoration Project (Project) Draft Environmental Impact Report (Draft EIR) (*State CEQA Guidelines:* California Code of Regulations [CCR] §§ 15083 and 15086). Additionally, these consultations, as initiated by the State and Federal Contractors Water Agency (SFCWA), have been used to further refine the design aspects of the Project and its implementation protocols, along with examining a range of feasible alternatives to the proposed Project. Lastly, these discussions have focused on complying with applicable laws and permits at the federal, state, and local levels (see Section 1.4, Agency Approvals and Permits).

## 7.1 Public Agencies and Organizations

Various public agencies, private organizations, technical experts, local stakeholders, and interested parties were contacted to solicit input that would help identify potential environmental impacts, while simultaneously disseminating information on the proposed Project. Methods of consultation and coordination included written communiqués (e.g., letters, memoranda, and emails), phone calls, individual meetings, or committee/forum meetings (informal and structured as information sharing sessions). These discussions are ongoing and are anticipated to continue should the proposed Project be approved and advanced through the regulatory process.

The list below identifies the entity contacted/consulted during the EIR process:

- **Cache Slough Complex Habitat Restoration Committee**
    - California Department of Fish and Wildlife
    - California Department of Water Resources
    - National Marine Fisheries Service
    - U.S. Bureau of Reclamation
    - U.S. Fish and Wildlife Service
- **California Department of Conservation**
    - **Division of Land Resource Protection**
    - **Division of Oil, Gas, and Geothermal Resources**
- **California Department of Fish and Wildlife**
- **California Department of Transportation**

- **California Department of Water Resources**
- **California State Lands Commission**
- **Central Valley Flood Protection Board**
- **Central Valley Regional Water Quality Control Board**
- **Delta Conservancy**
- **Delta Protection Commission**
- **Delta Stewardship Council**
- **Ducks Unlimited**
- **Expert Review Panel**[50]
    - cbec Ecological Engineering
    - California Department of Fish and Wildlife
    - California Department of Water Resources
    - Central Valley Regional Water Quality Control Board
    - Delta Stewardship Council
    - ESA PWA
    - San Francisco Estuary Institute
    - U.S. Bureau of Reclamation
    - U.S. Environmental Protection Agency
    - U.S. Fish and Wildlife Service
    - U.S. Geological Survey
    - University of California, Davis
    - Wetlands and Water Resources
- **Fishery Agency Strategy Team**
    - California Department of Fish and Wildlife
    - National Marine Fisheries Service
    - U.S. Bureau of Reclamation
    - U.S. Fish and Wildlife Service

[50] This panel was established in early 2013, at the request of SFCWA, to provide additional expert recommendations in light of critical issues associated with habitat restoration. The guidance presented will be considered by SFCWA during the latter stages of the design and regulatory processes related to the proposed Project. Such recommendations would further clarify what has been presented conceptually in the EIR.

- **Lower Yolo Bypass Planning Forum**
  - California Department of Fish and Wildlife
  - Reclamation District 99
  - Reclamation District SB6
  - Solano County
  - Solano County Water Agency
  - Yolo County
  - Metropolitan Water District of Southern California
  - Property owners and other interested parties
    - Mound Ranch
    - Glide in Ranch
    - Yolo Basin Foundation
    - Yolo Flyway Farms
    - Center for Collaborative Policy
- **McCormack Farms**
- **National Marine Fisheries Service**
- **Native American Heritage Commission**
- **Pacific Gas & Electric**
- **Port of West Sacramento**
- **Reclamation District 2068**
- **Reclamation District 2093**
- **Sacramento County**
- **Sacramento-Yolo Mosquito and Vector Control District**
- **Santa Clara Valley Water District**
- **Solano County Department of Resource Management**
- **State Historic Preservation Office: Northwest Information Center of the California Historical Resources Information System**
- **State Lands Commission**
- **State Water Contractors**
- **State Water Contractor Project Authority**
- **The Nature Conservancy**

- **U.S. Army Corps of Engineers**
- **U.S. Bureau of Reclamation**
- **U.S. Fish and Wildlife Service**
- **U.S. Geological Survey**
- **West Sacramento Area Flood Control Agency**
- **Westlands Water District**
- **Yocha Dehe Wintun Nation**
- **Yolo County**
- **Yolo Farm Bureau**

## 7.2 Comments Received on Notice of Preparation

The Notice of Preparation/Initial Study (NOP/IS) was distributed for a 30-day agency review, and was also disseminated to the public and affected stakeholders, beginning on March 1, 2011. Copies of the NOP/IS were provided to government agencies and the public via online at: http://www.swampthing.org/Downloads/Lower-Yolo-NOP-IS_2011-0225.pdf or as a hard copy upon request (see **Appendix A**).

Written comments were received from 12 entities: Native American Heritage Commission, California Department of Fish and Wildlife (formerly the California Department of Fish and Game), California Department of Conservation, Yolo Farm Bureau, Caltrans, Yolo County, Solano County Department of Resource Management, West Sacramento Area Flood Control Agency, Central Valley Flood Protection Board, Central Valley Regional Water Quality Control Board, Delta Stewardship Council, and Department of Water Resources (see **Appendix B**).

The summarized comments are presented below and note where the Draft EIR responses are located:

- Impact of conversion of agricultural lands to wetlands from both the Project and cumulative projects (Section 4.5, Agricultural Resources and in Section 4.10, Cumulative Impacts: Agricultural Resources).
- Consistency with Williamson Act (Section 4.5, Agricultural Resources; however, legal and financial aspects of the contracts are not physical environmental impacts and therefore are outside of the scope of the EIR).
- Whether the Project is an "experiment" that may not meet its goals (Chapter 1, Introduction; Chapter 3, Project Description; and Section 5.7.1, Re-sized Restoration Alternatives).
- Consideration of offsite alternatives and/or a smaller alternative to the Project (Addressed in Chapter 1, Introduction and Chapter 5, Alternatives).

- Applicability of Yolo County wetlands restoration conversion moratorium, Delta Protection Act, Delta Plan, Site Zoning and Yolo County Code (Section 4.5, Agricultural Resources and other sections of the EIR as applicable; General Plan and zoning consistency also addressed in the Notice of Preparation/Initial Study [**Appendix A**]).
- Potential conflicts with applicable Habitat Conservation Plans and/or Natural Community Conservation Plans (Chapter 2, Baseline Conditions: Section 2.4 and Section 4.3, Terrestrial Biological Resources).
- Details of adaptive management and long-term stewardship (Chapter 3, Project Description).
- Economic impacts (Economic impacts are not a CEQA issue; however, an analysis on agricultural economics pertaining to the Project has been done. The report is not part of the CEQA process but provided in Volume 2 of the Draft EIR for informational purposes only [M.Cubed 2012]; see **Appendix G** of the Draft EIR).
- Impacts to existing biological resources on/using the Project site (Sections 4.3 and 4.4, Terrestrial and Aquatic Biological Resources, respectively).
- Project effect on greenhouse gases and climate change, including sea level rise (Section 4.6, Air Quality & Greenhouse Gases and Section 4.1, Hydrology).
- Project impacts to water quality, including methylmercury and dissolved organic matter (Section 4.2, Water Quality).
- Impacts to drinking water (Section 4.2, Water Quality).
- Potential to degrade adjacent or nearby flood protection and ship channel levees (Section 4.1, Hydrology).
- Potential of Project vegetation and earth-moving activities to degrade hydraulic flood capacity and drainage in adjacent channels and onsite (Section 4.1, Hydrology).
- Potential to increase mosquito production and vector control (Chapter 3, Project Description; and Section 4.8, Hazards and Hazardous Materials).
- Long-term impact of cumulative wetlands project to tidal budget (Section 4.10, Cumulative Impacts: Hydrology).
- Impact of stockpiled earth on water quality (Section 4.2, Water Quality).
- Impact of invasive aquatic vegetation and inclusion in the Project of a long-term plan to control this vegetation (Chapter 3, Project Description and Section 4.4, Aquatic Biological Resources).
- Project impacts to flood control on properties in Solano County (Section 4.1, Hydrology).
- Potential land use conflicts in Solano County: Section 4.3, Terrestrial Biological Resources (invasive species); Section 4.1, Hydrology; Section 4.2, Water Quality (flooding, irrigation, and drainage); and Section 4.8, Hazards and Hazardous Materials (vectors).

- Significance thresholds should not obviate the need for mitigation. (Significance thresholds are listed in their own subsections just prior to the start of each technical section's impact discussion; feasible mitigation is required for only those impacts deemed significant or potentially significant by the lead agency.)
- The Project applicant should coordinate with all commenting agencies and property owners (Coordination is ongoing; also, refer to Chapter 1 for permits and approvals; Chapter 7: Consultations and Coordination).
- Impacts to existing property owners' mineral rights, water rights, and access to gas wells (No changes would result with Project implementation).

## 7.3 Scoping Meeting

A public scoping meeting was held on March 15, 2011, at the City of West Sacramento City Hall. Notification of the public scoping meeting was published in *The Sacramento Bee* on March 2, 2011. The following agencies and members of the public commented at the scoping meeting:

- Phil Pogledich, Senior Deputy County Counsel, Yolo County
    - A written comment letter from Yolo County Board will be submitted prior to the end of the NOP/IS review process (see **Appendix B** of this Draft EIR).
    - Evaluate the following issues in the Draft EIR: phase approach (start with pilot project) for alternatives; Prospect Island as a superior alternative to the Project; sea level changes; waterfowl and tricolored blackbirds; crop depredation from expanded populations of these birds; economic impacts; Yolo County's agricultural land mitigation ordinance; consistency with Williamson Act contracts; flood protection and navigability of Project channels; water rights with the property; and large-scale hauling of materials on County roads.
- Selby Mohr, Owner, Mound Ranch (commented after the official close of the meeting)
    - Contact property owners of the Project site's mineral rights.
    - Examine potential Project impacts on Mound Ranch's water supply.
    - Evaluate access to onsite gas wells should they be reactivated if gas prices increase.

Oral comments made at the public scoping meeting are addressed in the summary of written comments above.

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The following individuals participated in the preparation, review, and/or processing of this Draft Environmental Impact Report and its associated technical studies:

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# Chapter 9 References

References are presented under headings for each chapter. Wherever possible, websites are noted for easy access. Other reference materials, and documents incorporated by reference in the Draft EIR, are available during regular business hours at the SFCWA headquarters in Sacramento (refer to Section 1.5.3, Availability of Draft EIR).

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# Chapter 10 Acronyms and Abbreviations

| | |
|---|---|
| °C | degrees in Celsius |
| °F | degrees in Fahrenheit |
| µg/g | micrograms per gram |
| µg/L | micrograms per liter |
| µg/m$^3$ | micrograms per cubic meter |
| µmhos/cm | micromhos per centimeter |
| A-1 | Agriculture (zone designation of Yolo County General Plan) |
| A-P | Agricultural Preserve (zoning designation of Yolo County General Plan) |
| AAQS | Ambient Air Quality Standards |
| AB | Assembly Bill |
| ac | acres |
| ac-ft | acre-feet |
| AFSP | Anadromous Fish Screen Program |
| AG | Agriculture (zone designation of Yolo County General Plan) |
| AGR | agricultural water supply (beneficial use) |
| API | American Petroleum Institute |
| APN | Assessor’s parcel number |
| AQMP | air quality management plan |
| BA | biological assessment |
| BCDC | Bay Conservation and Development Commission |
| BDCP | Bay Delta Conservation Plan |
| bgs | below the ground surface |
| BiOp | biological opinion |
| BMI | benthic macro-invertebrate |
| BMP | best management practice |
| BOD | biological oxygen demand |
| BSPP | Barker Slough Pumping Plant |

| | |
|---|---|
| $C_2H_3Cl$ | vinyl chloride |
| CAA | federal Clean Air Act |
| CAAQS | California Ambient Air Quality Standards |
| Cal-EPA | California Environmental Protection Agency |
| CALFED | CALFED Bay Delta Program |
| CAL-IPC | California Invasive Plant Council |
| Cal OSHA | California Occupational Safety and Health Administration |
| Caltrans | California Department of Transportation |
| CARB | California Air Resources Board |
| CCAA | California Clean Air Act |
| CCR | California Code of Regulations |
| CDC | California Department of Conservation |
| CDEC | California Data Exchange Center |
| CDFG | California Department of Fish and Game |
| CDFW | California Department of Fish and Wildlife |
| CEC | California Energy Commission |
| CEDEN | California Environmental Data Exchange Network |
| CEQA | California Environmental Quality Act |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CESA | California Endangered Species Act |
| CFCPA | California Farmland Conservancy Program Act |
| CFG | California Fish and Game Code |
| CFR | Code of Federal Regulations |
| cfs | cubic feet per second |
| CGC | California Government Code |
| $CH_4$ | methane |
| CHHSL | California Human Health Screening Levels |
| CNDDB | California Natural Diversity Database |
| CNPS | California Native Plant Society |
| CO | carbon monoxide |
| $CO_2$ | carbon dioxide |

| | |
|---|---|
| $CO_2e$ | $CO_2$ equivalents |
| COMM | commercial and sport fishing (beneficial use) |
| CRHR | California Register of Historic Resources |
| CSC | California species of special concern |
| CTR | California Toxics Rule |
| CUPA | Certified Unified Program Agencies |
| CVFPB | Central Valley Flood Protection Board |
| CVP | Central Valley Project |
| CVRWQCB | Central Valley Regional Water Quality Control Board |
| CWA | Federal Clean Water Act |
| cy | cubic yards |
| db | decibels |
| dbA | decibels A-weighted |
| DBP | disinfection byproducts |
| DDT | dichlorodiphenyltrichloroethane |
| Delta | Sacramento-San Joaquin River Delta |
| DFG | Department of Fish and Game |
| DO | dissolved oxygen |
| DOC | dissolved organic carbon |
| DOGGR | Division of Oil, Gas, and Geothermal Resources (within the California Department of Conservation) |
| DOM | dissolved organic matter |
| DPC | Delta Protection Commission |
| DPM | diesel particulate matter |
| DPO | Delta Protection Overlay (zoning designation with Yolo County General Plan) |
| DPR | California Department of Parks and Recreation |
| DPS | distinct population segment |
| DRMS | Delta Risk Management Strategy |
| DSC | Delta Stewardship Council |
| DTSC | California Department of Toxic Substances Control |
| DWR | California Department of Water Resources |

| | |
|---|---|
| EFH | Essential Fish Habitat |
| EIR | environmental impact report |
| EIS | environmental impact statement |
| ERP | CALFED's Ecosystem Restoration Program |
| ESA | federal Endangered Species Act |
| ESU | environmentally significant unit |
| FAST | Fishery Agency Strategy Team |
| FC | federal candidate species |
| FE | federally-listed species as endangered |
| FEMA | Federal Emergency Management Agency |
| FGC | California Fish and Game Code |
| FMMP | Farmland Mapping and Monitoring Program |
| FP | fully protected |
| fps | feet per second |
| FPT | federally proposed for listing as threatened |
| FR | Federal Register |
| FRPA | Fish Restoration Program Agreement |
| FT | federally-listed species as threatened |
| ft | feet |
| g | grams |
| GACGC | German Advisory Council on Global Change |
| GGS | giant garter snake |
| GHG | greenhouse gases |
| GIS | geographic information system |
| GLO | General Land Office |
| GPS | global positioning system |
| gWh | giga-watts per hour |
| $H_2S$ | hydrogen sulfide |
| HAA | haloacetic acids |
| HAP | hazardous air pollutant |
| HCP | habitat conservation plan |

| | |
|---|---|
| HDPE | high-density polyethylene |
| HFC | hydrofluorocarbons |
| HU | hydrologic units |
| IPCC | Intergovernmental Panel on Climate Change |
| ITP | incidental take permit |
| JPA | joint powers authority |
| kWh | kilo-watts per hour |
| LESA | Land Evaluation and Site Assessment Model |
| LiDAR | Light Detection and Ranging |
| LSZ | low-salinity zone |
| LURMP | Land Use and Resource Management Plan |
| m | meters |
| maf | million acre feet |
| MBTA | federal Migratory Bird Treaty Act |
| mcy | million cubic yards |
| MeHg | methylmercury |
| mg/L | milligrams per liter |
| MHHW | mean higher high water |
| MHW | mean high water |
| MIGR | warm and cold water migration corridors (beneficial use) |
| MLD | most likely [Native American] descendant |
| MLLW | mean lower low water |
| MLW | mean low water |
| mm | millimeters |
| mm/yr | millimeter per year |
| MMRP | mitigation monitoring and reporting program |
| $MTCO_2e$ | metric tons of $CO_2e$ emissions |
| MOA | memorandum of agreement |
| MOU | memorandum of understanding |
| MPN | mean probable number |

| | |
|---|---|
| MSA | Magnuson-Stevens Act |
| MSDS | material safety data sheets |
| MSL | mean sea level |
| $MTCO_2e$ | metric tons of $CO_2e$ |
| MTL | mean tide level |
| MTP/SCS | Metropolitan Transportation Plan/Sustainable Communities Strategies |
| MUN | municipal and domestic water supply (beneficial use) |
| MWD | The Metropolitan Water District of Southern California |
| $N_2O$ | nitrous oxide |
| NA | not available |
| NAAQS | National Ambient Air Quality Standards |
| NAHC | Native American Heritage Commission |
| NAVD88 | North American Vertical Datum of 1988 |
| NBA | North Bay Aqueduct |
| NBALFS | North Bay Aqueduct Larval Fish Survey |
| NCCP | Natural Community Conservation Plan |
| NCCPA | California Natural Community Conservation Planning Act |
| ND | not detected |
| NDDB | Natural Diversity Database |
| NEPA | National Environmental Policy Act |
| $NF_3$ | nitrogen trifluoride |
| NFH | National Fish Hatchery |
| ng/L | nanograms per liter |
| NHP | National Heritage Program |
| NHPA | National Historic Preservation Act |
| NMFS | National Marine Fisheries Service |
| $NO_2$ | nitrogen dioxide |
| NOAA | National Oceanic and Atmospheric Administration |
| NOP/IS | notice of preparation/initial study |
| NOS | National Ocean Service |
| $NO_x$ | nitrogen oxides |

| | |
|---|---|
| NPDES | National Pollution Discharge Elimination System |
| NPPA | Native Plant Protection Act |
| NRC | National Resource Council |
| NRCS | Natural Resources Conservation Service |
| NRHP | National Register of Historic Places |
| NS | not sampled |
| NTU | nephelometric turbidity units |
| NWIC | Northwest Information Center of the California Historical Resources Information System |
| $O_3$ | ozone |
| OC | organochlorine pesticide |
| OCAP | Operations Criteria and Plan |
| OHP | State Office of Historic Preservation |
| OP | organophosphate pesticide |
| OPR | Governor's Office of Planning and Research |
| OSHA | federal Occupational Safety and Health Administration |
| PAH | polycyclic aromatic hydrocarbons |
| Pb | lead |
| PCB | polychlorinated biphenyl |
| PCE | primary constituent elements |
| PFCs | perfluorocarbons |
| PG&E | Pacific Gas and Electric Company |
| $PM_{2.5}$ | particulate matter measuring 2.5 micrometers or less in diameter |
| $PM_{10}$ | particulate matter measuring 10 micrometers or less in diameter |
| POD | pelagic organism decline |
| ppb | parts per billion |
| ppm | parts per million |
| ppt | parts per trillion |
| PRC | California Public Resources Code |
| PRG | preliminary remediation goal |
| RBDD | Red Bluff Diversion Dam |

| | |
|---|---|
| RCD | Resource Conservation District |
| RCRA | Resource Conservation and Recovery Act |
| RD | Reclamation District |
| REC-1 | water contact recreation (beneficial use) |
| REC-2 | non-contact water recreation (beneficial use) |
| Reclamation | United States Bureau of Reclamation |
| RM | river mile |
| ROA | restoration opportunity areas |
| ROG | reactive organic gases |
| RPA | reasonable and prudent alternative |
| RST | rotary screw tap |
| RWQCB | Regional Water Quality Control Board |
| SAA | Streambed Alteration Agreement |
| SACOG | Sacramento Area Council of Governments |
| SARA | Superfund Amendments and Reauthorization Act |
| SAV | submerged aquatic vegetation |
| SB | Senate Bill |
| SCR | selective catalytic reduction |
| SCWA | Solano County Water Agency |
| SE | state-listed species as endangered |
| SEW | Suisun Ecological Workgroup |
| $SF_6$ | sulfur hexafluoride |
| SFCWA | State and Federal Contractors Water Agency |
| SHPO | State Historic Preservation Office |
| SIP | state implementation plan |
| SJVAPCD | San Joaquin Valley Air Pollution Control District |
| SLR | sea level rise |
| SMAQMD | Sacramento Metropolitan Air Quality Management District |
| $SO_2$ | sulfur dioxide |
| $SO_4$ | sulfates |

| | |
|---|---|
| SPWN | warm water spawning, reproduction, and/or early development (beneficial use) |
| SPCP | spill prevention control plan |
| sq ft | square feet |
| SR | state-listed species as rare |
| SRA | shaded riparian aquatic |
| SRDWSC | Sacramento River Deep Water Ship Channel |
| ST | state-listed as threatened |
| SVAB | Sacramento Valley Air Basin |
| SWC | State Water Contractors |
| SWP | State Water Project |
| SWPPP | stormwater pollution prevention plan |
| SWRCB | State Water Resources Control Board |
| SYMVCD | Sacramento-Yolo Mosquito Vector Control District |
| TAC | toxic air contaminant |
| TDS | total dissolved solids |
| THM | trihalomethanes |
| TMDL | total maximum daily load |
| TOC | total organic carbon |
| TPH | total petroleum hydrocarbons |
| TSCA | Toxic Substances Control Act |
| TSS | total suspended sediment |
| TSS | total suspended solids |
| TTLC | total threshold limit concentration |
| UILT | upper incipient lethal temperature |
| USACE | United States Army Corps of Engineers |
| USC | Unites States Code |
| USDA | United States Department of Agriculture |
| USEPA | United States Environmental Protection Agency |
| USFWS | United States Fish and Wildlife Service |
| USGS | United States Geological Survey |

| | |
|---|---|
| UST | underground storage tank |
| WARM | water freshwater habitat (beneficial use) |
| WBWG | Western Bat Working Group |
| WDR | waste discharge requirement |
| WILD | wildlife habitat (beneficial use) |
| WNV | West Nile viruses |
| WRP | (USDA) Wetland Reserve Program |
| WSE | water surface elevation |
| WWD | Westlands Water District |
| YBF | Yolo Basin Foundation |
| YBWA | Yolo Bypass Wildlife Area |
| YSAQMD | Yolo-Solano Air Quality Management District |

# Chapter 11 Glossary

**Acre-foot:** A common water industry unit of measurement. An acre-foot is 325,851 gallons, or the amount of water needed to cover one acre with water one foot deep. An acre-foot serves the annual needs of two typical California families.

**Ammocoetes:** Larval phase of lampreys.

**Anadromous fish:** Fishes, such as Chinook salmon, steelhead, and lampreys that are born in freshwater, who eventually migrate to the ocean to grow into adults, and then finally return to freshwater to spawn.

**Anaerobic:** Conditions in the absence of oxygen.

**Aqueduct:** A man-made canal or pipeline used to transport water.

**Aquifer:** An underground geologic formation of rock, soil or sediment that is naturally saturated with water; an aquifer stores groundwater.

**Attainment:** An air basin is considered to be in attainment for a particular air pollutant criteria if it meets federal and/or state standards set for that pollutant.

**Backfill:** Material used in refilling excavation, or the process of such refilling; also, material used to fill an excavated trench.

**Basin Plan:** Basin Plans (also called Water Quality Control Plans) provide the basis for protecting water quality in California, as mandated by both the federal Clean Water Act and the state Porter-Cologne Water Quality Act. These plans are designed to preserve and enhance water quality and protect the beneficial uses of all regional waters. Basin Plans typically:

1. Designate beneficial uses of all regional waters.
2. Establish narrative and numerical objectives that must be attained or maintained to protect the designated beneficial uses and conform to the state's anti-degradation policy.
3. Describe implementation programs to protect the beneficial uses of all waters in the region.
4. Describe surveillance and monitoring activities to evaluate the effectiveness of the Basin Plans.

**Bay-Delta:** The Sacramento-San Joaquin Bay-Delta is a unique natural resource of local, state, and national significance. The Delta is home to more than 500,000 people; contains 500,000 acres of agriculture; provides habitat for 700 native plant and animal species; provides water for more than 25 million Californians and 3 million acres of agriculture; is traversed by energy, communications and transportation facilities vital to the economic health of California; and supports a $400 billion economy. This region comprises the entire estuary system of the San Francisco Bay, Sacramento and San Joaquin rivers, and the delta formed by those two rivers.

**Bay Delta Conservation Plan:** A forthcoming conservation plan prepared to meet the requirements of the federal and state Endangered Species Acts and/or the Natural Community Conservation Plan Act to meet the State of California's co-equal goals of a more reliable water supply in California and a comprehensive restoration program for the Bay-Delta region.

**Beneficial use:** "Beneficial uses" of the waters of the State of California that may be protected against water quality degradation including, but are not necessarily limited to, domestic, municipal, agricultural, and industrial supply; power generation; recreation; aesthetic enjoyment; navigation; and preservation and enhancement of fish, wildlife, and other aquatic resources or preserves.

**Benthic:** This term refers to the bottom of rivers, lakes, or oceans.

**Berm:** A horizontal strip or shelf built into an embankment or cut to break the continuity of the slope, usually for the purpose of reducing erosion or to increase the thickness of the embankment at a point of change in a slope or defined water surface elevation.

**Best management practices:** An engineered structure or construction management activity, or combination of these strategies that eliminates or reduces the Project's potentially adverse environmental impacts.

**Bioaccumulation:** The intake and retention of nonfood substances by a living organism from its environment, resulting in a build-up of the substances in the organism.

**Biofuels:** Fuels composed of or produced from biological raw materials, such as ethanol.

**Biological opinion:** Document issued under the authority of the federal Endangered Species Act stating the U.S. Fish and Wildlife Service (USFWS) and/or National Marine Fisheries Service (NMFS) finding as to whether a federal action is likely to jeopardize the continued existence of a threatened or endangered species or result in the destruction or adverse modification of designated critical habitat. As part of the biological opinion, the federal agencies prepare reasonable and prudent alternatives (RPAs) that direct the lead agency or project applicant to implement specific actions to reduce effects that may threatened or endanger listed species.

**Brackish water:** This type of water is a mixture of freshwater and saltwater.

**California Endangered Species Act:** The California Endangered Species Act of 1985 (CESA; Fish and Game Code § 2050 *et seq.*) is implemented by the California Department of Fish and Wildlife (CDFW). CESA prohibits the "take" of listed threatened and endangered species. Take under CESA is restricted to the direct killing of a listed species and does not prohibit indirect harm by way of habitat modification.

**California Environmental Quality Act:** This state environmental law requires state and local public agencies to document and consider the environmental impacts of their actions. CEQA also requires an agency to identify ways to avoid or reduce significant environmental damage and to implement those mitigation measures where feasible. In addition, it provides opportunities for public participation in the decision-making process. See Public Resources Code §§ 21001.1, 21002, 21080; *State CEQA Guidelines* (California Code of Regulations [CCR]) § 15002(c).

**California Native Plant Society:** This society is a non-profit organization that seeks to increase understanding of California's native flora and to preserve that flora.

**Canal:** This structure is an artificial channel or ditch filled with water and designed for navigation, or for irrigating, i.e., to move water from one location to another.

**Candidate species:** Any species being considered by the U.S. Secretary of the Interior or U.S. Secretary of Commerce for listing as an endangered or threatened species, but not yet the subject of a proposed rule (see 50 Code of Federal Regulations [CFR] 424.02), or any species accepted as a candidate species by the CDFW pursuant to Fish and Game Code § 2074.2.

**Carbon dioxide:** A colorless, odorless gas that occurs naturally in the earth's atmosphere; substantial quantities are also emitted into the air by fossil fuel combustion.

**Carbon monoxide:** A colorless, odorless gas that is generated in the urban environment, primarily by the incomplete combustion of fossil fuels in motor vehicles.

**Central Valley Project:** California's federally-owned and operated water project, consisting of 20 dams and reservoirs and 500 miles of canals that deliver eight million acre-feet of water each year, primarily to Central Valley farmers.

**Central Valley Project Improvement Act:** This federal legislation, signed into law on October 30, 1992, mandates major changes in the management of the federal Central Valley Project (CVP). The CVPIA puts fish and wildlife on an equal footing with agricultural, municipal, industrial, and hydropower users.

**CEQA Lead Agency:** Under CEQA, a Lead Agency is the local or state governmental agency that has the principal responsibility for carrying out or approving the proposed activity.

**CEQA Responsible Agency:** Under CEQA, a Responsible Agency is a public agency which proposes to carry out or approve a project, for which a Lead Agency is preparing or has prepared an environmental impact report (EIR) or Negative Declaration. This definition includes all public agencies other than the Lead Agency that have discretionary approval over a project.

**CEQA Trustee Agency:** Under CEQA, a Trustee Agency is a state agency having jurisdiction by law over natural resources affected by a project and which are held in trust for the people of the State of California.

**Channel:** This feature is either a natural or artificial watercourse, with a defined bed and banks that allow continuously or periodically restricted flowing water.

**Clearing:** The removal of all vegetation such as trees, shrubs, brush, stumps, exposed roots, down timber, branches, grass, and weeds.

**Climate change:** Climate change refers to any change in climate over time, whether due to natural variability or as a result of human activity.

**Community:** All members of a specified group of species present in a specific area at a certain time.

**Compaction:** This is an activity to make soil dense by mechanical action, which increases the density by reducing the voids or empty spaces in a material.

**Confluence:** The flowing together of two or more streams; the place of meeting of two streams.

**Contaminant:** Any substance or property preventing the use or reducing the usability of water for ordinary purposes such as drinking, bathing, recreation and cooling. It is generally considered synonymous with pollutant.

**Contiguous:** Actual contact with; also, near or adjacent to.

**Contour:** A line of constant elevation.

**Cubic feet per second:** A measurement of water flow equivalent to one cubic foot of water passing a given point in a second. One cubic foot is approximately 7.5 gallons.

**Cultural resource:** An aspect of a cultural system that is valued by or significantly representative of a culture or that contains substantial information about a culture. Properties such as landscapes or districts, sites, buildings, structures, objects, or cultural practices that are usually greater than 50 years of age and possess architectural, historic, scientific, or other technical value are identified as cultural resources.

**Culvert:** A pipe or small bridge for drainage under a highway, railroad, canal, or other embankment.

**Cumulative impact:** For CEQA purposes, defined as the change in the physical environment that results from the incremental impact of the project when added to other, closely related past, present and reasonably foreseeable future projects.

**Cut slope:** A slope that is shaped by excavation or grading.

**Dam:** A barrier built across a river or stream to hold water.

**Decibels:** Units of measurement that express the intensity of sound; degree of loudness.

**Delta:** The site where the rivers empty; an outlet from land to ocean, also where the rivers deposit sediment they carry forming landforms.

**Delta islands:** Islands in the Sacramento-San Joaquin River Delta protected by levees. Delta Islands provide space for numerous functions including agriculture, communities, and important infrastructure such as transmission lines, pipelines, and roadways.

**Delta smelt:** A small, slender-bodied fish with a typical adult size of two to three inches that is found only in the Sacramento-San Joaquin River Delta estuary.

**Dendritic:** Channel pattern of streams with tributaries that branch to form a tree-like pattern.

**Designated critical habitat:** As defined by the federal Endangered Species Act, a specific geographic area(s) containing features essential for the conservation of a threatened or endangered species and that may require special management and protection.

**Dewatering:** A method used to eliminate water from a lake, river, stream, reservoir, or containment that allows construction activities to proceed as intended.

**Discharge:** Volume of water that passes a designated point within a given period of time. Any spilling, leaking, pumping, pouring, emitting, emptying, or dumping not including permitted activities in compliance with § 402 of the federal Clean Water Act.

**Dissolved organic carbon:** DOC is used to describe the thousands of dissolved compounds found in water that derive from organic materials (such as decomposed plant matter).

**Disturbance:** A discrete event, either natural or human induced, that causes a change in the condition of an ecological system.

**Drainage basin:** The area of land from which water drains into a river, for example, the Sacramento River Basin, which drains into the Sacramento River. A drainage basin can also be called a catchment area, watershed, or river basin.

**Dredge:** To dig, gather, or remove bottom materials (e.g., soil, rocks, sediments, etc.) to deepen waterways.

**Drought:** A prolonged period of below-average precipitation.

**Drought conditions:** A time when rainfall and runoff are much less than average. One method to categorize annual rainfall is as follows, with the last two categories being drought conditions: wet, above normal, below normal, or dry critical.

**Duripan:** A geologic term for a horizon in mineral soil characterized by cementation by silica.

**Easement:** An interest in land owned by another individual or organization that entitles its holder to a specific limited use and/or access.

**Ecosystem:** Where living and non-living things interact (coexist) in order to survive. An ecosystem consists of the biological community that occurs in some locale, and the physical and chemical factors that make up its non-living or abiotic environment.

**Electrical conductivity:** A measure of the salt content of water.

**Elevation:** The height of a point above a plane of reference. Generally refers to the height above sea level.

**Embankment:** An earth structure the top of which is higher than the adjoining surface.

**Endangered species:** Any species or subspecies of bird, mammal, fish, amphibian, reptile, or plant that is in serious danger of becoming extinct throughout all or a significant portion of its range, in compliance with the federal Endangered Species Act (ESA). Official federal designations of endangered species are made by the USFWS or NMFS and published in the *Federal Register*. Species are also listed under CESA by the CDFW.

**Environmental Impact Report:** A detailed document prepared by a state or local public agency to comply with CEQA. The EIR describes and analyzes significant or potentially significant effects by a project on the physical environment and discusses actions and strategies to avoid or substantially lessen those effects.

**Epibenthic:** Living on the surface of the channel bottom or on the sea floor.

**Estuary:** A body of water where fresh water meets salt water.

**Evolutionarily Significant Unit:** This distinction of the Pacific salmon is considered to be a distinct population segment and thus a species under the federal ESA.

**Exotic species:** A non-native species that is introduced into an area.

**Extinct:** No longer in existence; i.e., died out leaving no living representatives.

**Facultative plants:** Plant species that occur in both wetlands and uplands. There are three subcategories of these kinds of plants:

1. Facultative wetland plants that usually occur in wetlands (probability = 67 to 99 percent), but may occasionally occur in non-wetlands.
2. Facultative plants that are equally likely to grow in wetlands or non-wetlands (probability = 34 to 66 percent).
3. Facultative upland plants that usually occur in non-wetlands (probability = 67 to 99 percent), but may on occasion be found in wetlands (probability = 1 to 33 percent).

**Farmland of Local Importance:** Farmland of Local Importance is either currently producing crops, has the capability of production, or is used for the production of confined livestock. Farmland of Local Importance is land other than Prime Farmland, Farmland of Statewide Importance or Unique Farmland. This land may be important to the local economy due to its productivity or value. It does not include publicly owned lands for which there is an adopted policy preventing agricultural use. This land includes soils which qualify for Prime Farmland or Farmland of Statewide Importance, but generally are not cultivated or irrigated.

**Farmland of Statewide Importance:** Farmland of Statewide Importance is land other than Prime Farmland which has a good combination of physical and chemical characteristics for the production of crops. It must have been used for the production of irrigated crops at some time during the two update cycles prior to the mapping date. It does not include publicly owned lands for which there is an adopted policy preventing agricultural use.

**Feasible:** A term used to indicate that an alternative or mitigation measure is capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, social, and technological factors.

**Fill:** Manmade deposits of natural soils or rock products and waste materials designed and installed in such a manner as to provide drainage, yet prevent the movement of soil particles due to flowing water. This type of soil has no value, except as bulk.

**Fill slope:** A slope shaped by the placement and compaction of loose "fill" materials, which may be reused from elsewhere on the construction site or imported.

**Flap gate:** A gate hinged along one edge, usually either the top or bottom edge. Examples of bottom-hinged flap gates are tilting gates and fish belly gates – so called from their shape in cross section.

**Flood:** A flood event is a temporary rise in water levels resulting in inundation of areas not normally covered by water.

**Flood bypass:** A region of land or a large man-made structure that is designed to convey excess flood waters from a river or stream in order to reduce the risk of flooding on the natural river or stream near a key point of interest, such as a city. The best example in this situation is the Yolo Bypass in Yolo County.

**Flood control capacity:** This type of capacity is the maximum volume of flood inflows regulated to reduce flood damage downstream.

**Floodplain:** Any land area susceptible to inundation by floodwaters from any source.

**Flora:** All plant life associated with a particular habitat.

**Flow:** Volume of water that passes a specific point within a given period of time.

**Footprint:** Area of the ground surface affected by construction activities.

**Forage:** Vegetation used for animal consumption.

**Freshwater:** Water that contains less than 1,000 milligrams per liter (mg/L) of dissolved solids.

**Front end loader:** A tractor loader used in construction that both digs and dumps in front.

**Fry:** Salmon that have emerged from gravel, completed yolk absorption, remained in freshwater streams, and are less than a few months old.

**Fyke net:** Long, bag-shaped fishing net held open by hoops used to catch eels. The hoops can be constructed from cane, aluminum, or fiberglass over which the netting is secured.

**Gallon:** A unit of measure equal to four quarts.

**Gate:** A movable device/watertight barrier that controls the flow in a conduit, pipe, or tunnel without obstructing any portion of the waterway (e.g., a canal or ditch) when in the fully open position.

**Gauge:** A device that registers water level, discharge, velocity, pressure, etc.

**General plan:** A planning document, usually at the city or county level that encapsulates policies for land use and development over a specified period of time. A general plan may be supplemented by specific plans that address land use and development policies for specific portions of a planning jurisdiction, such as historic districts or areas slated for redevelopment.

**Generator:** A machine that converts mechanical energy into electrical energy.

**Geomorphology:** A scientific branch of geology that studies the characteristics and configuration and evolution of rocks and land forms on the earth’s surface.

**Gigawatt:** Unit of power equal to one billion watts.

**Grade:** The inclination or slope of a pipeline, conduit, stream channel, or natural ground surface; usually expressed in terms of the ratio or percentage of number of units of vertical rise or fall per unit of horizontal distance (“rise over run”).

**Gradient:** General slope or rate of change in vertical elevation per unit of horizontal distance of water surface of a flowing stream. Slope along a specific route, as of a road surface, channel or pipe.

**Grading:** Altering a land surface by cutting, filling and/or smoothing during construction to meet a designated form and function.

**Grazing land:** Grazing land is defined in Government Code § 65570(b)(3) as "...land on which the existing vegetation, whether grown naturally or through management, is suitable for grazing or browsing of livestock." Grazing land does not include land previously designated as Prime Farmland, Farmland of Statewide Importance, Unique Farmland, or Farmland of Local Importance, and heavily brushed, timbered, excessively steep, or rocky lands, which restrict the access and movement of livestock.

**Groundwater:** Water that has percolated into natural, underground aquifers; water in the ground, not water that remains on the ground.

**Groundwater table:** The upper surface of the zone of saturation (all pores of subsoil filled with water), except where the surface is formed by an impermeable body.

**Growing season:** The period, often the frost-free period, during which the climate is such that crops can be produced.

**Growth inducement:** Pertaining to environmental analysis under CEQA, growth inducement occurs when an action encourages growth or removes impediments to growth, ultimately causing either direct or indirect changes to the physical environment. Growth is associated with employment, population, and/or housing. The *State CEQA Guidelines* also indicate that "it must not be assumed that growth in any area is necessarily beneficial, detrimental, or of little significance to the environment."

**Grubbing:** This is the process of removing stumps, roots, and vegetable matter from the ground surface after clearing and prior to excavation.

**Habitat:** The location where a particular taxon of plant or animal lives and its surroundings, both living and non-living; the term includes the presence of a group of particular environmental conditions surrounding an organism including air, water, soil, mineral elements, moisture, temperature, and topography.

**Habitat conservation plan:** Planning document that is a mandatory component of an incidental take permit application under the federal ESA. The plan specifies, among other things, the impacts that are likely to result from take and the measures the permit applicant will undertake to minimize and mitigate such impacts.

**Harass:** Defined in regulations implementing the federal ESA promulgated by the Department of the Interior as "an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, and sheltering." (50 CFR 17.3)

**Hardness:** A characteristic of water determined by the levels of calcium and magnesium. Water hardness is largely the result of geological formations of the water source.

**Hardpan:** A cemented or compacted layer of soil near the surface that is essentially impermeable to water.

**Harm:** Defined in regulations implementing the federal ESA promulgated by the Department of the Interior as an act "which actually kills or injures" listed wildlife; harm 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." (50 CFR 17.3)

**Haul distance:** The distance measured along the center line or most direct practical route between the center of the mass of excavation and the center of mass of the fill as finally placed. It is the distance material is moved.

**Hazardous materials:** Materials that are toxic, flammable, explosive, corrosive, combinations of these, or otherwise injurious to life and health.

**Herbicide:** This type of compound, usually a man-made organic chemical, is used to kill or control plant growth.

**Hydraulic fill:** Fill material that is transported and deposited using water.

**Hydrology:** This is the scientific study of water in nature: its properties, distribution, and behavior. It also examines the occurrence, circulation properties, and distribution of the waters of the earth and their reaction to the environment.

**Hydroseeding:** The application of a slurry of seed, fertilizer, water, and other materials to the land.

**Important farmland:** As defined by the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), Important Farmlands include Prime Farmland, Unique Farmland, Farmland of Statewide Importance, and Farmland of Local Importance. The categorization of farmland is based upon a soil classification system, which accounts for the physical and chemical characteristics of the land and suitability of the land for producing crops.

**Incidental take permit:** Permit issued by the USFWS that authorizes the incidental take of a listed species. The permit does not authorize the activities that result in take. The permit is submitted with a habitat conservation plan.

**Intermittent stream:** An ephemeral stream that flows part of the time, usually after rainstorm, during wet weather, or for only part of the year.

**Intertidal:** The zone between high and low tide.

**Inundate:** To cover with impounded waters or floodwaters.

**Invertebrate:** Any animal that lacks a backbone or spinal column.

**Irrigated acreage:** This type of farmland is irrigated in any one year. It includes irrigated cropland harvested, irrigated pasture, cropland planted but not harvested, and acreage in irrigation rotation used for soil-building crops.

**Irrigation:** Applying water to crops, lawns or other plants using pumps, pipes, hoses, and/or sprinklers.

**Iteroparous:** Capable of breeding or reproducing multiple times.

**Jeopardy opinion:** The opinion of the USFWS or NMFS that a proposed project would likely jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat. The opinion includes reasonable and prudent alternatives, if any.

**Jurisdiction:** Boundary of authorization for a government agency. A term used to describe the level of responsibility a public entity has for a specific geographic area using its rules and regulations.

**Juvenile:** An early life stage of fish older than one year but not yet capable of reproduction.

**Kelts:** Adult salmon that have recently spawned and are usually in poor condition.

**Kilowatt:** An electrical unit of work or power equal to 1,000 watt.

**Kilowatt-hour:** A basic unit of electric energy equal to an average of one kilowatt of power applied over one hour.

**Lead:** A stable element that persists and accumulates both in the physical environment and in humans and animals that can lead to toxic effects.

**Levee:** A natural or man-made barrier that prevents rivers from overflowing their banks.

**Listed:** For the purposes of this section, listed is defined as any species that is identified as candidate, threatened, or endangered pursuant to CESA and/or listed as threatened or endangered under FESA.

**Macroinvertebrates:** An animal without a backbone and is visible to the eye, without the aid of a microscope, such as a crayfish in the aquatic environment.

**Maximum contaminant level:** The highest drinking water contaminant concentration allowed under federal and state Safe Drinking Water Act regulations. This threshold is set by USEPA for a regulated substance in drinking water.

**Microorganism:** An animal or plant that is microscopic in size.

**Mitigation:** Actions taken to avoid or substantially lessen significant environmental impacts when a project is carried out. Mitigation measures shall:

1. Avoid the impact altogether by not taking a certain action or parts of an action.
2. Minimize impacts by limiting the degree or magnitude of the action and its implementation.
3. Rectify the impact by repairing, rehabilitating, or restoring the affected environment.

4. Reduce or eliminate the impact over time by preservation and maintenance operations during the life of the action.
5. Compensate for the impact by replacing or providing substitute resources or environments.

**National Pollutant Discharge Elimination System:** A permitting program under § 402 of the federal CWA required for all point sources discharging pollutants into waters of the United States. The purpose of the NPDES program is to protect human health and the environment.

**National Register of Historic Places:** A federally-maintained register of districts, sites, buildings, structures, architecture, archeology, and culture.

**Natural Community Conservation Plan:** A conservation plan created to meet the requirements of the California Fish and Game Code, § 2800, *et seq*.

**Nitrogen oxides:** A class of pollutant compounds that include nitrogen dioxide ($NO_2$) and nitric oxide (NO), both of which are emitted by motor vehicles.

**No jeopardy opinion:** The opinion of either the USFWS or NMFS that a proposed project would not likely jeopardize the continued existence of listed species or result in the destruction or adverse modification of designated critical habitat.

**Nonattainment:** An air basin is considered to be in nonattainment for a particular air criteria pollutant if it is exceeding federal or state standards for that pollutant.

**Non-consumptive water uses:** Water uses that do not substantially deplete water supplies, including swimming, boating, waterskiing, fishing, maintenance of stream-related fish and wildlife habitat, and hydropower generation.

**Non-native species:** Also called introduced or exotic species, these kinds of species of plants or animals originate elsewhere and are brought/arrive into a new area, where they may dominate the local species or in some way negatively impact the environment for native species.

**Non-point source pollution:** Pollution that is so general or covers such a wide area that no single, localized source of the pollution can be identified. These are forms of diffuse pollution caused by sediment, nutrients, organic and toxic substances originating from land use activities, which are carried to lakes and streams by surface runoff.

**Notice of Preparation:** The notice issued by a CEQA Lead Agency, and to a lesser extent a CEQA Responsible Agency, to publicly announce its intention to analyze a proposed project and write an environmental impact report pursuant to CEQA.

**Nutrients:** Animal, vegetable, or mineral substances, which sustain individual organisms and ecosystems.

**Obligate upland plants:** Plants that occur almost never occur in wetlands (probability <1 percent), but which generally grow in non-wetlands (probably>99 percent) under natural conditions.

**Obligate wetland plants:** Plants that occur almost always in wetlands (probability >99 percent) in wetlands under natural conditions, but which may rarely grow in non-wetlands (probably <1 percent).

**Organism:** Any individual form of life, such as a plant, animal or bacterium.

**Outflow:** The amount of water passing a specified point downstream of a structure, expressed in acre-feet per day or cubic feet per second.

**Overtopping:** Flow of water over the top of a dam or embankment.

**Ozone:** A photochemical oxidant that is a major cause of lung and eye irritation in urban environments.

**Particulate matter:** Liquid and solid particles of a wide range of sizes and compositions; of particular concern for air quality are particles smaller than or equal to 10 microns and 2.5 microns ($PM_{10}$ and $PM_{2.5}$, respectively).

**Parts per million:** A measurement of concentration on a weight or volume basis that is equivalent to milligrams per liter (mg/l). One ppm is comparable to one drop of water in 55 gallons.

**Peat:** Soil formed of dead but not fully decayed plants found in bog areas.

**Pelagic fish:** Fishes that spend most of their lives swimming in the water column with little contact with or dependency on the bottom. Adult spawning usually occurs in open water, often near the surface.

**pH:** A measurement of soil acidity with a relative scale, from 0 to 14. pH indicates how acidic or basic (alkaline) a material is, where a pH of 7 is neutral, and smaller readings become increasingly acid. Natural waters usually have a pH between 6.5 and 8.5.

**Piecemeal:** Made or done in pieces or one stage at a time.

**Piscivorous:** A carnivorous diet consisting largely of fish.

**Plankton:** Tiny, usually microscopic, plants (phytoplankton) and animals (zooplankton) with limited powers of locomotion, usually living free (i.e., floating) in the water away from substrates. Plankton is often a major source of nutrition for larger aquatic life forms.

**Point bars:** Found in abundance in mature or meandering streams; point bars are composed of sediment that is well sorted and typically reflects the overall capacity of the stream.

**Pollutant:** Any inorganic or organic substance that contaminates air, water, or soil. Generally, any substance introduced into the environment that adversely affects the usefulness of a resource.

**Population:** Total number of individuals occupying an area.

**Porter-Cologne Water Quality Control Act:** Also referred to as the 'Porter-Cologne Act', it is contained in the California Water Code, Division 7, § 13000 *et seq*. It is the principle law governing water quality regulation in California and directs the SWRCB to formulate and adopt state policies for controlling water quality.

**Prime Farmland:** Prime Farmland is land that has the best combination of physical and chemical characteristics for the production of crops. It has the soil quality, growing season, and moisture supply needed to produce sustained high yields of crops when treated and managed, including water management, according to current farming methods. Prime Farmland must have been used for the production of irrigated crops at some time during the two update cycles prior to the mapping date. It does not include publicly-owned lands for which there is an adopted policy preventing agricultural use.

**Public participation:** Process of encouraging citizen input into each stage of development and processing of environmental planning documents, as required by CEQA and the *State CEQA Guidelines*.

**Pumping plant:** This type of facility lifts water up and over hills.

**Qualitative:** Descriptive term of kind, type or direction, as opposed to size, magnitude or degree.

**Quantitative:** Descriptive term of having to do with quantity, and/or capable of being measured.

**Range:** Geographic region in which a given plant or animal normally lives or grows.

**Raptor:** A bird species in the order Falconiformes (such as hawks, eagles, kites, and falcons), and in the order Strigiformes (owls).

**Reach:** Any specified length of stream, channel, or other water course.

**Real-time monitoring and operations:** Continuous observation in multiple locations of biological conditions onsite to provide immediate information that is useful in the management and protection of fish species, while allowing the optimal operation of the water supply system.

**Rhizome:** A horizontal underground stem that sends out roots and shoots from its nodes.

**Right-of-way:** A legal right of passage or access over a defined area of real property.

**Riparian area:** The land adjacent to a natural watercourse such as a river or a stream. Riparian areas support vegetation that provides important wildlife habitat, as well as important fish habitat when sufficient to overhang the bank and enter the water.

**Ruderal:** Weedy vegetation that is dominated by introduced species, and is characteristic of areas where native vegetation has been disturbed or removed.

**Runoff:** Water that travels over the surface of the Earth, moving downward due to gravity.

**Sacramento-San Joaquin River Delta:** The legal Bay-Delta, as described in the California Water Code § 12220, generally extends from Sacramento to the north, Tracy to the south, Interstate 5 to the east, and Collinsville to the west. The Bay-Delta covers approximately 738,000 acres.

**Salinity:** Generally, the concentration of mineral salts dissolved in water. Salinity may be measured by weight (total dissolved solids - TDS), electrical conductivity, or osmotic pressure. Where seawater is known to be the major source of salt, salinity is often used to refer to the concentration of chlorides in the water.

**Salmonid fishes:** Family of fish that includes salmon and steelhead.

**Scour:** Erosion in a stream bed, particularly if caused or increased by channel changes.

**Seawater intrusion:** The movement of salt water into a body of fresh water. It can occur in either surface water or groundwater basins.

**Sediment:** Unconsolidated solid material that comes from weathering of rock and is carried by, suspended in, or deposited by water or wind.

**Sediment concentration:** The quantity of sediment relative to the quantity of transporting fluid, or fluid sediment moisture.

**Sediment discharge:** Rate at which sediment passes a stream cross-section in a given period of time, expressed in millions of tons per day.

**Sediment load:** Mass of sediment passing through a stream cross-section in a specified period of time, expressed in millions of tons.

**Sediment yield:** Amount of mineral or organic soil material that is in suspension, is being transported, or has been moved from its site of origin.

**Sedimentation:** The phenomenon of sediment or other fine particulates entering a water body, or being disturbed from the bottom such that they move downstream and settle on the substrate in other aquatic areas.

**Sequestration:** $CO_2$ sequestration is the storage of $CO_2$ (usually captured from the atmosphere) in a solid material through biological or physical processes. Wetlands can provide carbon capture and storage.

**Setback levee:** A constructed embankment to prevent flooding that is positioned some distance from the edge of the river or channel. Setback levees allow wildlife habitat to develop between the levee and the river or stream.

**Settlement:** The sinking of land surfaces because of subsurface compaction, usually occurring when moisture, added deliberately or by nature, causes a reduction in void volumes.

**Shallow water:** Water with just enough depth to allow for sunlight penetration, plant growth, and the development of small organisms that function as fish food. Such habitats serve as spawning areas for the delta smelt.

**Slope:** Change in elevation per unit of horizontal distance. Also, a slope can be characterized as the inclined face of a cut, canal, or embankment.

**Slough:** A muddy or marshy area; a secondary channel of a river delta, usually flushed by the tide.

**Smolt:** A juvenile salmonid migrating to the ocean and undergoing physiological changes (called smoltification) to adapt from a freshwater to a saltwater environment.

**Spawn:** To lay eggs, refers mostly to fish.

**Special-status species:** Species that are in at least one of the following categories: listed as threatened or endangered under the federal ESA; proposed for federal listing under the ESA; federal candidates under ESA; listed as threatened or endangered under the CESA; candidates under CESA; plants listed as rare under the California Native Plant Protection Act; California fully protected species or specified birds under various sections of the California Fish and Game Code; California species of special concern; or California Native Plant Society List 1A, lB, 2, or 3 species.

**Species:** Basic category of biological classification for a single kind of animal or plant.

**Spiles:** Short pieces of pipe buried in the ditch bank.

**Stability:** Tendency of systems, especially ecosystems, to persist, relatively unchanged, through time; also, persistence of a component of a system.

**Stable:** A term for not changing or fluctuating; firmly established.

**Staging area:** Location where construction equipment and materials may be stored prior to use.

**Storm flow:** Surface flow originating from precipitation and runoff, which has not percolated to an underground basin.

**State Water Project:** California's largest water supply project operated and maintained by the California Department of Water Resources that stores surplus water during wet periods and later distributes it to areas of need in the San Francisco Bay area, northern California, San Joaquin Valley, and Southern California. SWP facilities include 23 dams and reservoirs, 18 pumping plants, four generating-pumping plants, five hydroelectric power plants, and approximately 600 miles of canals and pipelines.

**Stockpile:** A storage pile of materials, such as soils.

**Stormwater:** Untreated surface runoff into a body of water during periods of precipitation.

**Stream:** Natural water course containing water at least part of the year.

**Stream capacity:** Total volume of water that a stream can carry within the normal high water channel.

**Subsidence:** A decrease in ground surface elevation in the Bay-Delta region, which result primarily from peat soil being converted into gas.

**Substrate:** A surface on which an organism grows or is attached.

**Sulfur oxides:** Sulfur oxygen compounds that include the important air criteria pollutants, e.g., sulfur dioxide ($SO_2$) and sulfur trioxide ($SO_3$).

**Surface water:** An open body of water, such as a river, stream or lake, and all springs, wells, or other collectors, which are directly influenced by surface water.

**Suspended:** The term applies to the state of floating in water.

**Swale:** A low place in a tract of land, such as a wide, shallow ditch, usually grassed or paved.

**Take:** Defined in FESA as "…harass, harm pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct" on special-status species covered under FESA or CESA.

**Temporary structure:** Any structure that can be readily and completely dismantled and removed from the site between periods of actual use. The structure may or may not be authorized at the same site from season to season or from year to year.

**Terrestrial species:** Types of species of animals and plants that live on or grow from the land.

**Therms:** A measurement unit of heat; one therm equals 29.3 kilowatt hours of energy or about 97 cubic feet of natural gas.

**Threatened species:** Legal status afforded to plant or animal species that are likely to become endangered within the foreseeable future throughout all or a significant portion of the range, as determined by the USFWS or NMFS for federal species and by the CDFW for state species.

**Toe drain:** Open-jointed tile or perforated pipe located at the toe of the dam used in conjunction with horizontal drainage blankets to collect seepage from the embankment and foundation and conveys the seepage to a location downstream from the dam.

**Topographic map:** A map indicating surface elevation and slope, e.g., USGS quadrangle series maps showing the shape of the earth's surface by contours. They also show control data, boundaries, roads, buildings, watercourses, lakes and reservoirs, and other land features. The 7.5-minute series is appropriate for doing inundation mapping.

**Topography:** Physical shape of the ground surface, especially the relief and contour of the land.

**Topsoil:** The topmost layer of soil, usually containing organic matter, which is capable of supporting plant growth.

**Total maximum daily loads:** Estimates of the amount of specific pollutants that a body of water can safely take without threatening beneficial uses.

**Transmission line:** Facility for transmitting electrical energy at high voltage from one point to another point. Transmission line voltages are normally 115-kilovolt or larger.

**Tributary:** River or stream flowing into a larger river or stream.

**Trihalomethanes:** Any of several synthetic organic compounds formed when chlorine or bromine combine with organic materials in water.

**Trophic level:** Ranking of an animal within the food chain.

**Turbidity:** A measure of the cloudiness of water caused by the presence of suspended matter.

**Unique Farmland:** Unique Farmland is land which does not meet the criteria for Prime Farmland or Farmland of Statewide Importance, that has been used for the production of specific high economic value crops at some time during the two update cycles prior to the mapping date. It has the special combination of soil quality, location, growing season, and moisture supply needed to produce sustained high quality and/or high yields of a specific crop when treated and managed according to current farming methods. Examples of such crops may include oranges, olives, avocados, rice, grapes, and cut flowers. It does not include publicly-owned lands for which there is an adopted policy preventing agricultural use.

**Unsuitable material:** Those soils that cannot be compacted in embankment or backfill or where excavated to finished grade result in unstable material.

**Valve:** A device used to control the flow in a conduit, pipe, or tunnel that permanently obstructs a portion of the waterway.

**Vernal pool:** Seasonally-ponded landscape depressions in which water accumulates because of limitations to subsurface drainage and that support a distinct association of plants and animals.

**Volatile organic compound:** A chemical compound that evaporates readily at room temperature and contains carbon.

**Water column:** A section of water extending from the surface of a body of water to its bottom.

**Water quality:** The condition of water as it relates to impurities.

**Water rights:** A legally protected right to take possession of water occurring in a natural waterway and to divert that water for beneficial use.

**Waters of the United States:** As defined in the Clean Water Act §404, waters of the U.S. applies only to surface waters, rivers, lakes, estuaries, coastal waters, and wetlands. Not all surface waters are legally waters of the United States. Generally, those waters include interstate waters and tributaries, intrastate waters and tributaries used in interstate and/or foreign commerce, territorial seas at the cyclical high-tide mark, and wetlands adjacent to the above.

**Watershed:** A region or area where water ultimately drains or flows to a river, stream, lake or other body of water.

**Water table:** The top level of water stored underground.

**Weir:** An overflow structure built across an open channel to raise the upstream water level and/or to measure the flow of water.

**Weir box:** A device to measure/control surface water flows in streams or between ponds.

**Well:** A hole or shaft drilled into the earth to get water or other underground substances.

**Wetland:** A zone that is periodically or continuously submerged or has high soil moisture, has aquatic and/or riparian vegetation components, and is maintained by water supplies significantly in excess of those otherwise available through local precipitation. Lands including swamps, marshes, bogs, and similar areas such as wet meadows, river overflows, mudflats, and ponds.

**Wildlife corridor:** A belt of habitat that is essentially free of physical barriers such as fences, walls, and development, and connects two or more larger areas of habitat, allowing wildlife to move between physically separate areas.

**Williamson Act:** The California Land Conservation Act of 1965, commonly known as the Williamson Act, enables local governments to enter into contracts with private landowners for the purpose of restricting specific parcels of land to agricultural or related open space use for ten years. In return, landowners receive property tax assessments that are based on farming and open space uses as opposed to full market value.