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FEATHER RIVER WEST LEVEE PROJECT EIS/EIR

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ES.1 Introduction

The Sutter Butte Flood Control Agency (SBFCA) is proposing the Feather River West Levee Project (FRWLP, or project) to reduce flood risk in the Sutter Basin, which includes portions of Sutter and Butte Counties in the Sacramento Valley of California. SBFCA was formed as a joint powers authority in 2007 through a joint exercise of powers agreement by the Counties of Sutter and Butte; the Cities of Yuba City, Gridley, Live Oak, and Biggs; and Levee Districts 1 and 9 (LD 1, LD 9).

In partnership with the State of California (through the California Department of Water Resources [DWR] and Central Valley Flood Protection Board [CVFPB]), SBFCA embarked on a comprehensive evaluation of the condition of the levees protecting the area in 2007, the results of which are also being used by the U.S. Army Corps of Engineers (USACE). The evaluation was necessary to identify the magnitude and severity of deficiencies and determine measures to address the deficiencies. The results of the comprehensive evaluation revealed that substantial construction is necessary to meet current flood protection standards.

As described in Section 1.5.2, the USACE is conducting a feasibility study (the Sutter Basin Pilot Feasibility Study or Sutter Basin Feasibility Study). The FRWLP is being advanced by SBFCA to expeditiously reduce flood risk before the feasibility study is completed. USACE plans to release for public review a draft integrated study report and environmental impact statement (EIS)/environmental impact report (EIR) in February 2013. Because the FRWLP and the USACE study may affect the same general area, have similar purposes, and share potential measures and effects, the EIS/EIR prepared for the feasibility study is expected to incorporate by reference much of the information, analyses, and conclusions contained within this document. The EIS/EIR would supplement this EIS/EIR focusing on additional alternatives, their effects, or new information not addressed in this document.

To construct the FRWLP, SBFCA is requesting permission from USACE pursuant to Section 14 of the Rivers and Harbors Act of 1899 (Title 33 of the U.S. Government Code [USC], Section 408, [33 USC 408]), hereinafter referred to as *Section 408*, for the alteration of a levee as part of the Sacramento River Flood Control Project (SRFCP), a Federal work.

ES.1.1 Document Purpose and Structure

ES.1.1.1 Document Overview

This document is a joint EIS/EIR and is intended to satisfy the requirements of NEPA and the California Environmental Quality Act (CEQA) for disclosing environmental effects and recommended mitigation measures related to a proposed action (or project), and alternatives, prior to making a decision on project approval. Specifically, this document analyzes the FRWLP to support a NEPA Record of Decision (ROD) and CEQA Notice of Determination (NOD).

As the lead federal agency, USACE is preparing this EIS for the purposes of compliance with NEPA due to its authority over alteration to Federal project levees.

SBFCA is the lead agency and implementing agency preparing this EIR for the purposes of compliance with CEQA.

ES.1.1.2 Application of NEPA and CEQA Principles and Terminology

For this environmental evaluation, the more rigorous of the two laws was applied in cases in which NEPA and CEQA differ. In some cases in this document, both NEPA and CEQA terminology are used, as in Chapter 1, where the project purpose and need and project objectives are discussed. The terms *environmental consequences, environmental impacts,* and *environmental effects* are considered synonymous in this analysis, and *effects* is used for consistency.

Technical terms used in the EIS/EIR are typically defined in their first instance of use in the text. A list of acronyms and abbreviations precedes Chapter 1.

ES.1.1.3 Resource Analysis Structure

Chapter 3, *Affected Environment and Environmental Consequences*, contains the project-level analyses for the FRWLP, following the structure below.

- Introduction.
  - Sources of information
- Affected environment.
  - Regulatory setting
  - Environmental setting
- Environmental consequences.
  - Assessment methods
  - Determination of effects
  - Effects and mitigation measures

Table ES-1 provides a key for relating the effects findings by relative severity (increasing in degree of adversity to the environment).

Table ES-1. Key to Effect Findings (by increasing adversity)

Finding
Beneficial
No Effect
Less than Significant
Significant
Significant and Unavoidable

ES.1.2 Setting and Study Area

The regional setting of the FRWLP is the Sacramento River Flood Control Project (SRFCP), beginning as far north as Redding, California, and extending south to the Sacramento–San Joaquin River Delta (Delta) (Plate 1-1). The regional setting is important relative to other flood risk reduction projects occurring within the SRFCP (Plate 1-2). These and other projects are described under Section 1.5, *Related Actions, Programs, and Planning Efforts*. For the analysis of effects (direct, indirect, or cumulative), the regional context of the SRFCP is taken into consideration.

Scoping down in regional setting, the Sutter Basin is part of the SRFCP, located in north-central California in Sutter and Butte Counties. The elongated, irregularly shaped basin covers about 326 square miles and is about 44 miles long north to south and up to 14 miles wide east to west. It is roughly bounded by the Feather River (to the east), Cherokee Canal, the Sutter Buttes, and Sutter Bypass (to the west, listed from north to south). Floodwaters potentially threatening the basin originate from the Feather River watershed or the upper Sacramento River watershed, above Colusa Weir. These waterways have drainage areas of 5,921 and 12,090 square miles, respectively. In addition to Yuba City, communities in the basin include Biggs, Gridley, Live Oak, and Sutter.

The project area for the FRWLP, a subset of the Sutter Basin described above, is focused on the corridor along the west levee of the Feather River from Thermalito Afterbay on the north to approximately 4 miles north of the Sutter Bypass on the south. This corridor is roughly 500 feet toward the land side of the existing levees and 100 feet toward the water side. This corridor was determined as the area in which levee improvements, such as seepage berms, stability berms, relief wells, setback levees, erosion protection, and slurry cutoff walls, are likely to occur. The corridor is approximately 41 miles long, divided into 41 relatively homogeneous reaches for ease of describing existing conditions, proposed actions, the affected environment, and potential environmental effects (note that this number is coincidental and one reach does not consistently correspond to a length of 1 mile; additionally, Reach 1 is not a part of the FRWLP), shown on Plates 1-3a and 1-3b. The project area would also include borrow/spoil sites or project mitigation sites outside of this corridor, as further described in Chapter 2, *Alternatives*. The reaches are listed in Table 1-3. Plates 1-4 through 1-10 show representative photos of the project area.

For the purposes of this document, the *study area* and *planning area* are considered the same, defined as the area within SBFCA's planning authority in which potential actions would occur and where environmental effects are likely to occur. The *project area* is defined as the area in which potential actions (i.e., alternatives) would occur. The *affected area* is defined as the location of resources that would be directly, indirectly, or cumulatively affected by the project alternatives.

ES.1.3 Project Background

ES.1.3.1 Flood Management History

Prior to European settlement in the mid-19th century, the floodplain of the Sacramento River in the 150 miles between the city of Redding and the Delta varied from 2 to 30 miles wide and annually covered more than 1 million acres. Low, discontinuous levees were built by individual landowners from the 1840s to the 1890s. Those levees concentrated floodflows and contributed to problems that were worsened by upstream hydraulic mining in the Sierra Nevada foothills in the late 1800s.

The SRFCP was authorized by Congress in 1917 as the first Federal flood control project outside the Mississippi River Valley and was the major project for flood control on the Sacramento River and its tributaries. The non-Federal sponsor was the Reclamation Board of the State of California (Reclamation Board, reauthorized in 2007 as the CVFPB). With the authorization of the SRFCP, USACE and the State of California began managing the project as a regional system, constructing improvements to approximately 1,100 miles of levees and creating bypasses and floodways. Additional information is provided in Section 3.1, *Flood Control and Geomorphology*.

Although the flood control structures have been extensively improved and upgraded since construction, the underlying foundation of most of the levees and channels pre-dates any state or USACE involvement and still retains the original materials that include dredged riverbed sands, soil, and organic matter. At the time of the SRFCP authorization in 1917, the areas being protected by the levees were primarily agricultural with minimal improved infrastructure such as railroads and highways. Today, the area remains largely agricultural with population centers including Yuba City, Biggs, Gridley, Live Oak, and Sutter.

The Federal government maintains oversight but has no ownership of or direct responsibilities for performing maintenance of the Federal levee system, except for few select features that continue to be owned and operated by USACE. Considering these exceptions, the great majority of levees, channels, and related flood control structures are owned, operated, and maintained by the State of California and local levee and reclamation districts as governed by USACE operations and maintenance (O&M) manuals. Most of the levee and reclamation districts existed prior to the SRFCP authorization in 1917 and have been carrying out maintenance responsibilities. Today, many of the levee districts are substantially underfunded and unable to maintain the system to meet current Federal standards. The levees in the planning area are maintained by LD 9; DWR's Maintenance Areas (MAs) 3, 7, and 16; and LD 1. MA 3 is responsible for the lowermost reaches of the project area, followed by LD 1, LD 9, MA 16, and MA 7 from south to north.

In addition to the SRFCP levee system, two major flood management reservoirs are located within the Feather River watershed. Oroville Dam and reservoir (Lake Oroville) were constructed on the Feather River in 1967 as an element of the California State Water Project. The reservoir has 3,358,000 acre-feet of storage with 750,000 acre-feet of dedicated flood management space. New Bullards Bar Dam and reservoir were constructed on the Yuba River in 1970 by the Yuba County Water Agency. The reservoir has 966,000 acre-feet of storage with 170,000 acre-feet of dedicated flood management space.

A notable milestone in improving the local levee system was construction of a 3,000-foot setback levee at Star Bend on the Feather River West Levee in 2009. Located about 10 miles south of Yuba City and north of the Sutter Bypass confluence, this project is within the FRWLP project area and the proposed FRWLP activities would adjoin the new setback levee upstream and downstream. LD 1 is the local maintaining agency and was the project proponent and owner, with major funding from the State of California through Propositions 1E and 84, as well as LD 1, Calpine Corporation, Sutter County, and the City of Yuba City. The new levee was built to current standards and included a slurry cutoff wall for under-seepage protection. The old levee was degraded and the new expanded floodplain is an ecosystem restoration site, with surplus area available intended to provide for habitat mitigation for the FRWLP.

Major flood events occurred along the Feather River in 1955, 1958, 1964, 1986, 1997, and 1998. Of these, the more significant events that caused levee failures and flooding of the Sutter Basin and surrounding areas were in 1955, 1986, and 1997. In December of 1955, the most significant flood event along the Feather River is reported to have occurred. Several levee embankment failures caused major flooding of nearly all of Yuba City as well as flooding in Nicolaus. Approximately 156 square miles were flooded during this event. In February of 1986, heavy snow pack and warm rains elevated water levels and caused a levee embankment failure on the adjacent segment of the Yuba River near Linda, flooding nearly 30 square miles including Linda and Olivehurst, causing a fatality and an estimated $20 million in damages (1986 dollars). Over the new-year transition from 1996 to 1997, heavy snow pack and warm rains again elevated water levels. All citizens in Yuba City, Marysville, Linda, and Olivehurst were ordered to evacuate. Ultimately, in January of 1997, a levee embankment failure occurred south of Olivehurst flooding nearly 50 square miles including Olivehurst and Arboga, causing four fatalities and an estimated $41 million in damages (1997 dollars) (HDR et al. 2011).

Over that past two decades, several studies have been conducted by USACE, DWR, or SBFCA to evaluate the condition of the levees protecting the planning area relative to criteria for stability, seepage, erosion, geometry, and levee height. These studies have indicated that the levee system is deficient and that the consequences of levee failure from a major flood event would be significant (described under the No Action Alternative in Chapter 2). Specifically, as a result of knowledge gained from its regional comprehensive study (the Sacramento–San Joaquin River Basins Comprehensive Study, also known as the Comp Study) initiated after the 1997 flood, USACE revised its levee criteria regarding through-seepage and under-seepage, problems known to exist within the SBFCA levee system (U.S. Army Corps of Engineers and the Reclamation Board for the State of California 2002).

Further evaluation has demonstrated that much of the existing system does not provide protection from the 100-year flood event, the commonly accepted minimum level of flood protection per the Federal Emergency Management Agency's (FEMA's) National Flood Insurance Program (NFIP), as well as being less than the 200-year level targeted by the State of California for urban areas. In addition, an emergency preparedness mapping study analyzed hypothetical levee failures and determined the rate and depth at which water would flood SBFCA's planning area if a levee failure occurred in the studied reaches; this study predicted flooding depths that could range from about 1 foot to more than 20 feet in some areas.

According to records from the local maintaining agencies (MAs and LDs) compiled by the SBFCA engineering team, there have been more than 125 observed levee performance problem locations in the project area since 1955. These problems include seepage, erosion, boils, breaks, and cracks. This accounting includes the catastrophic floods of 1955, 1986, and 1997.

ES.1.3.2 Overview of Levee Failure Mechanisms and Deficiencies

As discussed above, USACE, DWR, and SBFCA have commissioned studies to determine the type, location, and severity of deficiencies in the SBFCA flood management system. In simple terms, floods typically occur from levee failure mechanisms and deficiencies such as when one of the following events occurs.

- Water moves through the levee structure (through-seepage).
- Water moves under the levee structure (under-seepage).
- Levee slopes are overly steepened or levees have inadequate section to resist floodwaters or other forces (slope stability and geometry).

- Water carries soil away from the levee slope (erosion).
- Vegetation and other encroachments, such as structures, impede levee O&M (non-compliant vegetation and levee encroachments).

Table ES-2 shows deficiencies by reach. Plate 1-11 illustrates levee seepage and Plate 1-12 illustrates other typical deficiencies.

Table ES-2. Summary of Levee Deficiencies by Reach

Study Reach	Through-Seepage[a]	Under-Seepage[b]	Slope Stability[c]	Erosion	Encroachments
1	Not part of the project proposed at this time.				
2	X	X	*		X
3	X	X	*		X
4	X	X	*		X
5	X	X	*		X
6					
7	X	X	*		X
8	X	X	*		X
9	X	X	*		X
10	X	X	*		
11	X	X	*		X
12					
13	X	X	*		
14					
15	X	X	*		X
16			X	X	X
17	X	X	*		X
18	X	X	*		X
19	X	X	*		X
20		X	*		X
21		X	*		X
22	X	X	*		X
23		X	*		X
24		X	*		X
25					
26	X	X	*		X
27	X	X	*		X
28		X	X		X
29					
30	X	X	*		X
31		X	X		X
32	X	X	*		X
33	X	X	*		X
34	X	X	*		X
35	X	X	*		X
36	X	X	*		X
37	X	X	*		X

Study Reach	Through-Seepage[a]	Under-Seepage[b]	Slope Stability[c]	Erosion	Encroachments
38	X	X	*		X
39					
40	X	X	*		X
41	X	X	*		X

Source: PFR August 2011.
Notes: An X signifies the levee deficiency applies to the levee reach.
[a] Through-seepage issues based on phreatic surface existing on the landside slope.
[b] Under-seepage issues based on exit gradient greater than 0.5 at the landside levee toe.
[c] An * signifies areas where through- and under-seepage issues exist and slope stability was not independently verified.

ES.1.3.3 Formation of SBFCA and Development of the FRWLP

Currently, there are several major flood risk-reduction projects being planned or implemented within the SRFCP area (Plate 1-2), discussed in further detail under Section 1.5, *Related Actions, Programs, and Planning Efforts*.

SBFCA was formed in 2007 to take a proactive rather than reactive stance with respect to flood risk reduction specific to the Sutter Basin area. At that time, FEMA was revising its Flood Insurance Rate Maps (FIRMs) in the study area through a nationwide program entitled RiskMAP (mapping, assessment, and planning) that would likely lead to the study area being mapped within the 100-year floodplain. This would make flood insurance mandatory for all Federally guaranteed loans and restrict development. SBFCA concluded that it was necessary to perform a comprehensive evaluation of the Feather River West Levee to determine the current level of flood protection based on current engineering criteria, determine the magnitude and severity of any deficiencies, and develop recommended strategies for improvement.

As introduced previously, specific levee deficiencies along the Feather River West Levee are through-seepage, under-seepage, erosion, levee instability, and encroachments. There are also improvement needs for long-term O&M of the flood management corridor. The FRWLP as proposed by SBFCA will address these deficiencies and needs for that portion of the perimeter of the planning area to assist in incrementally reducing local flood risk.

In July 2010, SBFCA formed an assessment district to raise local funds for levee improvements and repairs from property owners. The majority of funding to improve the levees will be obtained through state and local assistance; Federal crediting is being pursued. The property owners recognized the flood risks and indicated their willingness to participate in improvements by voting to approve an annual parcel assessment in 2010. This funding source facilitated SBFCA's advancement of the FRWLP.

ES.1.4 Project Purpose, Objectives, and Need

ES.1.4.1 Project Purpose

SBFCA's goal is to achieve a minimum of 200-year flood protection for the more urbanized areas with population centers and 100-year flood protection for the remaining more rural agricultural parts of the planning area. A 200-year flood is a flood that has a 0.5% chance of occurring in any given year, also referred to as a 0.5% annual exceedance probability (AEP). A 100-year flood has a 1% AEP.

The primary purpose of the FRWLP is to reduce flood risk for the entire planning area by addressing known levee deficiencies along the Feather River West Levee from Thermalito Afterbay downstream to approximately 4 miles upstream of the confluence with the Sutter Bypass. While the FRWLP would not by itself reduce all flood risks affecting the planning area, it would address the most immediate risk based on the following.

- The proximity of the Feather River to population centers and key infrastructure.
- The nature of Feather River West Levee being the longest and most contiguous portion of the planning area perimeter.
- The location of known levee deficiencies and the clarity and feasibility of available measures to address them.

Future phases may be implemented by SBFCA in coordination with the State of California and USACE based on available funding, the outcome of the Sutter Basin Feasibility Study, and implementation of the Central Valley Flood Protection Plan (CVFPP) and other flood management programs (or multi-objective programs that include flood management).

ES.1.4.2 Project Objectives

The following objectives provide additional detail in support of the project purpose above.

- Protect existing populations and minimize exposure to flooding for agricultural commodities, infrastructure use, and other property.
- Reduce flood risk from Feather River toward a target of 200-year protection for Yuba City and to the north of the planning area and 100-year protection south of Yuba City, in compliance with Senate Bill (SB) 5 mandates for 200-year protection for urbanized areas.
- Address known deficiencies and observed performance issues.
- Construct a project as soon as possible to reduce flood risk as quickly as possible.
- Construct a project that is economically, environmentally, politically, and socially acceptable.
- Facilitate compatibility with the CVFPP and Sutter Basin Feasibility Study such that proposed activities would be "no regrets" and not inconsistent with any future plans.
- Facilitate compatibility with recreation and restoration goals in the planning area.

ES.1.4.3 Need for Action

Four needs have been identified for action.

- Study results from levee evaluations have shown that the Feather River West Levee needs improvements to reduce the current level of risk to human health, safety, property, and the adverse economic effect that serious flooding would cause.
- Study results have further shown that the levees in SBFCA's planning area, and, specifically, that on the west of the Feather River, are deficient when compared against current Federal and state standards.
- Improvements are necessary to meet FEMA's minimum acceptable level of flood protection (commonly referred to as the 100-year flood) as specified by the NFIP. Draft revised FEMA maps

show that all or parts of SBFCA's planning area may not meet 100-year flood standards. SBFCA intends to incrementally reduce risk to meet or exceed the FEMA standards.

- As mandated by SB 5, the CVFPB will require a 200-year level of flood protection for urban areas by the year 2025 and calls for building and development limitations after 2015 if adequate progress towards achieving this standard is not met. Improvements to the Feather River West Levee are necessary to meet that requirement.

To further demonstrate the need for action, details about flood risk in SBFCA's planning area and the consequences of levee failure are described in Chapter 2, *Alternatives*. Additional context for the objectives of, purpose of, and need for the FRWLP can be found in Chapter 1.

ES.1.5 Related Actions, Programs, and Planning Efforts

This section lists other flood management activities that comprise the regional planning context for the FRWLRP.

- System-wide efforts.
  - Central Valley Flood Protection Act (including Sutter Bypass Expansion and Fish Passage Improvements
  - Sacramento River Flood Control System Evaluation
  - Sacramento–San Joaquin River Basins Comprehensive Study and Central Valley Integrated Flood Management Study
  - Sacramento River Bank Protection Project
  - Flood Control and Coastal Storm Emergency Act
- Federal projects within the region.
  - Sutter Basin Feasibility Study
  - Yuba Basin Project
  - American River Common Features Project
  - West Sacramento General Reevaluation Report
- State and local projects within the region.
  - Lower Feather River Corridor Management Program
  - Three Rivers Levee Improvement Program
  - Natomas Levee Improvements Program
  - West Sacramento Levee Improvements Program

ES.1.6 Community Outreach, Agency Coordination, and Issues of Known Controversy

ES.1.6.1 Community Outreach

USACE and SBFCA have established a proactive multi-media outreach program to affected communities, the general public, and stakeholders about the FRWLP. The approach to the outreach program has been to go beyond the guidelines and requirements of NEPA and CEQA for public noticing to ensure the affected community and other interested stakeholders are informed, engaged, and involved through an accessible, open, and transparent process. Thus far, the FRWLP outreach program has included meetings, publications, web-postings, presentations, and other community involvement activities.

The FRWLP scoping effort was conducted jointly with the Sutter Basin Feasibility Study. The two projects are related in their study area, purpose, potential measures and potential effects. Despite joint scoping, two separate EIS/EIRs are being developed for each project. A more detailed accounting of the scoping process conducted in June 2011 is provided in Appendix B.

To date, the results of the FRWLP outreach program have been favorable, constructive, and supportive. The tone and substance of the input has been consistent with the voter-approved assessment to fund the local share of the project.

ES.1.6.2 Agency Consultation and Coordination

The FRWLP has been planned in coordination and cooperation with numerous local, state, and Federal agencies. In Chapter 3, the regulatory setting for each respective resource describes the compliance with applicable Federal, state, regional, and local laws and regulations, including coordination to date with various agencies, such U.S. Fish and Wildlife Service (USFWS), and the California Department of Fish and Game (DFG).

This EIS/EIR would be used by Responsible and Trustee Agencies to determine the effects of the proposed action.

ES.1.6.3 Issues of Known or Expected Controversy

NEPA requires that project proponents identify issues of known controversy that have been raised in the scoping process and throughout the development of the project. The following are potentially controversial issues.

- Construction-related effects.
- Property acquisition.
- Levee encroachments and vegetation.
- Climate change and sea-level rise.
- River access for recreation.

ES.2 Alternatives

ES.2.1 Introduction

Chapter 2 describes the following elements, which are summarized in this section.

- Action alternatives.
- Construction timing.
- Detailed measures comprising the alternatives.
- Common elements, assumptions, and environmental commitments incorporated into each action alternative.
- A no action alternative
- Alternatives screening.

ES.2.2 Action Alternatives

ES.2.2.1 Overview of Measures Carried Forward in Alternatives Development

A number of measures or combination of measures can be used to counteract levee deficiencies and reduce flood risk. Table ES-3 summarizes the deficiencies identified in the project area and potential measures that could be applied to resolve each deficiency. These measures have been combined to compose the action alternatives.

Table ES-3. Summary of Measures and Deficiencies

	Deficiency				
Measure	Through-Seepage	Under-Seepage	Slope Stability and Geometry	Erosion	Encroachments
Slurry cutoff wall	✓	✓			
Slope flattening	✓		✓		
Stability berm	✓				
Levee reconstruction	✓		✓		✓
Sheet-pile wall	✓				
Seepage berm		✓			
Relief wells		✓			
Depression/ditch infilling		✓			
Clay ditch lining		✓			
Limited encroachment removal					✓
Canal seepage treatment		✓			

ES.2.2.2 Overview of Alternatives Carried Forward

NEPA and CEQA require that an EIS or EIR (respectively) consider a range of alternatives that would attain most of the project purpose, need, and objectives while avoiding or substantially lessening project effects; a no action or no project alternative is also required. Consistent with NEPA standards, alternatives are analyzed on an equal basis and at an equal level of detail; however, because the role of USACE as the Federal lead agency is one of granting permission rather than as a sponsor or proponent of the project, SBFCA as the applicant may identify an applicant-preferred alternative.

Based on SBFCA's planning process and engineering studies, the measures listed in Table ES-3 have been combined, developed, and screened into three project alternatives for the FRWLP to be carried forward for study in the EIS/EIR (in addition to the no action alternative). The alternatives are summarized below based on their primary formulation concept, followed by a table of measures used in each alternative (Table ES-4). A detailed table of the measures proposed by reach is provided in Chapter 2 (Table 2-4). Plate 2-1 illustrates the alternatives.

- **Alternative 1.** Alternative 1 is focused on those measures that would predominantly keep within the existing footprint of the Feather River West Levee. Advantages of an alternative formulated on this basis are that it may minimize real estate acquisition and changes in land use. This alternative primarily proposes cutoff walls as a technique to address the deficiencies (along with other measures) while minimizing change in the existing levee footprint.
- **Alternative 2.** Alternative 2 includes measures that would not be constrained by the existing footprint of the Feather River West Levee. Advantages of an alternative formulated on this basis are that it may more effectively address the deficiency or may be less in cost compared to measures within the levee footprint. This alternative primarily proposes stability berms and seepage berms (along with other measures), which would substantially extend beyond the current levee footprint.
- **Alternative 3.** Alternative 3 is a blend of the flood management measures identified in Alternatives 1 and 2, optimized based on the screening criteria. Optimized means a number of factors have been considered, such as effectiveness in addressing the deficiencies, compatibility with land use, minimization of real estate acquisition, avoidance of effects, and cost; the footprint has been considered but not held as a primary constraint. This alternative proposes a combination of cutoff walls and berms (along with other measures). Alternative 3 is the applicant-preferred alternative (APA) and has been optimized to avoid and minimize environmental effects.

Section 2.1.4 provides detailed descriptions of proposed measures by reach for each alternative. Borrow sites are discussed in Section 2.3.5. Section 2.7.3 provides a description of screening for alternatives carried forward.

Table ES-4. Summary of Measures Used by Alternative

Measure	Alternative 1	Alternative 2	Alternative 3
Slurry cutoff wall	✓	✓	✓
Slope flattening	✓	✓	✓
Stability berm		✓	✓
Levee reconstruction	✓	✓	✓
Seepage berm	✓	✓	✓
Relief wells		✓	✓
Depression/ditch infilling	✓	✓	✓
Clay ditch lining	✓		
Limited encroachment removal	✓	✓	✓
Canal seepage treatment	✓		✓

Note: Sheet-pile walls may be used for limited, site-specific conditions in any alternative but are not planned for large-scale application for a project reach.

ES.2.2.3 Construction Timing

Specific sequencing of construction would be dynamic throughout project planning and design, subject to change based on factors including the following.

- Further engineering in determining the clarity and efficacy of site-specific measures.
- Easement and right-of-way acquisition (where necessary).
- Availability of proximate, suitable, and cost-effective borrow material.
- Environmental clearances based on wildlife presence, lifecycle activity, and location of habitats.

Based on current planning analysis, under each of the three alternatives, construction would occur in more than one annual construction season (typically April 15 to November 30, subject to conditions).

It is anticipated the construction of the FRWLP would be divided into four separate construction contracts (i.e., A, B, C and D). Although subject to change, the four contracts and their respective areas for construction of the FRWLP are identified in Table ES-5 below.

Table ES-5. Construction Contracts, FRWLP Reaches and Years for Construction

Construction Contract	FRWLP Reaches	Years for Construction
A	2–5	2014–2015
B	6–12	2014–2015
C	13–25	2013–2014
D	26–41	2014–2015

ES.2.3 No Action Alternative

ES.2.3.1 Introduction to No Action

Identification and analysis of a no action alternative is required pursuant to NEPA, and a no project alternative is required for CEQA. The purpose of the no action or no project alternative is to serve as a benchmark against which the effects of the action alternatives may be evaluated. For NEPA, no action is defined as those conditions that would result if USACE were to issue neither Section 408 permission nor permits under Section 404 of the Clean Water Act (CWA) and Section 10 of the Rivers and Harbors Act. For CEQA, *no project* is defined as those conditions that would result if SBFCA were to not adopt and implement a project. Because the action alternatives would require Section 408 permission from USACE for SBFCA to implement a project, the NEPA no action and CEQA no project are considered to be the same and are simply referred to as the No Action Alternative for this EIS/EIR.

Under the No Action Alternative, SBFCA would not implement flood risk-reduction measures and no levee repair or strengthening would be implemented, the purpose and objectives would not be met, and the current level of flood risk would continue. Current conditions and O&M practices would be expected to occur in the foreseeable future.

Future State or Federal Action

Despite the possibility of eventual state- or Federally led implementation of repairs, for the purpose of evaluating effects under the No Action Alternative, the EIS/EIR assumes that flood risk-reduction measures would not occur. This assumption provides the most conservative approach for disclosure and comparison of potential effects. Again, as stated above, the No Action Alternative therefore assumes the project purpose and objectives would not be met and the current level of flood risk would continue.

Consequences of Levee Failure

Assuming that no levee repair or strengthening would occur under the No Action Alternative means that the affected area levee system would remain susceptible to failure as a result of identified deficiencies such as seepage, levee instability, and inadequate geometry. These conditions could cause portions of the levee system to fail, triggering widespread flooding, extensive damage to the planning area's existing residential, commercial, agricultural, and industrial structures, and potential loss of life and property. Extensive damage to utilities, roadways, major interstate transportation corridors, and other infrastructure systems could occur. Water supply and sewage facilities would likely fail. Floodwaters would become contaminated by chemicals released from inundated vehicles, homes, industrial and agricultural facilities, businesses, and equipment. The magnitude of the flood damage would depend upon the location of the levee breach, severity of the storm, and river flows at the time of a potential levee failure.

Flood depth maps prepared for the affected area indicate that under a 200-year flood event scenario, inundation levels would range from 1 foot to 25 feet, depending on the local elevation of the land surface. Plates 2-13 through 2-19 show the ultimate estimated inundation depths for a 200-year flood event based on levee failures from north to south (upstream to downstream), as well as a composite of failures along the project area levee.

ES.2.3.2 Relationship of FEMA RiskMAP to No Action

Further complicating the future no action scenario is the FEMA RiskMAP process, a national effort to revise FIRMs. FEMA is in the process of reevaluating the level of flood protection provided by the levee system protecting the planning area. Portions of the planning area are currently designated as falling under Zone X, meaning it has less than a 1% chance of flooding in any given year (100-year flood protection). If these areas were remapped out of Zone X and into an A, AE, AR, or A-99 Zone, flood insurance would become mandatory for all citizens and businesses that hold Federally guaranteed mortgage loans. In addition, Federal and state regulations would prevent or constrain further development in the basin.

ES.2.3.3 Levee Vegetation Policy and No Action

Compliance with USACE levee vegetation policy in the Sacramento Valley is complex, due to the overlays of flood management objectives, protected fish and wildlife habitat, environmental regulations, overlapping jurisdictional authorities, and recreation and other social values.

In light of these circumstances, the No Action Alternative reflects multiple possible future scenarios. At this time, it is considered too speculative to adopt and consider a single one of these future scenarios as the sole or most likely outcome. Therefore, this document acknowledges and analyzes the following conditions in regard to the USACE levee vegetation policy as it relates to the No Action Alternative for the actions under consideration.

- Full application of USACE levee vegetation policy, as detailed in Engineering Technical Letter 1110-2-571, *Guidelines for Landscape Planting and Vegetation Management at Levees, Floodwalls, Embankment Dams, and Appurtenant Structures* (ETL), meaning prohibition and removal of woody vegetation within the levee prism or within 15 feet of the landside or waterside levee toes (U.S. Army Corps of Engineers 2009).
- Modified application of the ETL; assumes the continued existence into the future of the vegetation conditions at the time of the analysis. This may include future application of a variance (not as part of the FRWLP) or application of the CVFPP concepts for management of woody vegetation, meaning trimming and thinning to allow visibility and accessibility, selective retention and removal based on engineering inspection and evaluation, and LCM (as described under encroachment removal and vegetation policy compliance).

ES.2.4 Alternative Screening

ES.2.4.1 Screening Criteria

SBFCA established and applied nine criteria to qualitatively evaluate measures and alternatives and eliminate those that did not adequately meet the criteria. The criteria are below, along with the options for evaluation. Public feedback, including that gained through the NEPA and CEQA process, is considered as part of the evaluation in screening.

- Meet the project objectives to reduce risk.
- Geography and jurisdictional authority.
- Avoidance of hydraulic effects.
- Land use compatibility.

- Avoidance, minimization, and mitigation of environmental effects.
- Facilitation of multi-use objectives.
- Cost.

ES.2.4.2 Measures and Alternatives Not Carried Forward

Several measures and alternatives for the FRWLP were considered but not carried forward based on the screening criteria presented above. These alternatives are listed below and briefly described in Section 2.7.2.

- Alternative levee alignments.
- Setback levees.
- Ring levees.
- J-levee.
- Reoperation of upstream reservoirs and bypasses.
- Development of additional upstream storage.
- Construction of Feather River Bypass.
- Raising Building Pads.
- River Dredging.

ES.2.5 Environmental Commitments

Environmental commitments are measures incorporated as part of the project description, meaning they are proposed as elements of the proposed action and are to be considered in conducting the environmental analysis and determining effects and findings. Environmental commitments apply to each and all improvements other than the No Action Alternative.

To avoid and minimize construction-related effects, SBFCA will implement the following environmental commitments to reduce or offset short-term, construction-related effects. Measures have been developed for each of the topics below, to be applied to the FRWLP project resource analyses.

- Avoidance measures for valley elderberry longhorn beetle.
- Avoidance measures for Giant garter snake.
- Avoidance measures for Swainson's hawk.
- Avoidance measures for Raptors.
- Measures for protected and riparian trees.
- Invasive plant species prevention measures.
- Construction limitations near residences.
- Use of native wildflower species in erosion control seed mix.
- Soil borrow site reclamation plan.

- Postconstruction operations and maintenance.
- Stormwater pollution prevention plan.
- Bentonite slurry spill contingency plan.
- Spill prevention, control and counter-measure plan.
- Monitoring of turbidity in adjacent water bodies.

Detailed measures have been developed relating to the construction practices and methods for the following features and activities. Detailed discussion is provided in Section 2.5.

- Slurry cutoff walls.
- Slope flattening.
- Stability berms.
- Levee reconstruction.
- Sheet-pile walls.
- Seepage berms.
- Relief wells.
- Depression/ditch infilling.
- Clay ditch lining.
- Encroachment removal and vegetation policy compliance.
- Canal seepage treatment.

Table ES-6 is a summary of the effects of the FRWLP. The effects that are significant and unavoidable or potentially significant and unavoidable are listed below.

- Effect AQ-2: Exceedance of Applicable Thresholds for Construction Emissions
- Effect NOI-1: Exposure of Sensitive Receptors to Temporary Construction-Related Noise
- Effect NOI-2: Exposure of Sensitive Receptors to Temporary Construction-Related Vibration
- Effect VEG-1: Disturbance or Removal of Riparian Trees
- Effect VEG-4: Potential Loss of Special-Status Plant Populations Caused by Habitat Loss Resulting from Project Construction
- Effect VIS-1: Result in Temporary Visual Effects from Construction
- Effect VIS-2: Adversely Affect a Scenic Vista
- Effect VIS-3: Substantially Degrade the Existing Visual Character or Quality of the Site and its Surroundings
- Effect VIS-4: Create a New Source of Substantial Light or Glare that would Adversely Affect Day and Nighttime Public Views
- Effect CR-1: Effects on Identified Archaeological Sites Resulting from Construction of Levee Improvements and Ancillary Features
- Effect CR-2: Potential to Disturb Unidentified Archaeological Sites

- Effect CR-3: Potential to Disturb Human Remains
- Effect CR-4: Direct and Indirect Effects on Identified Historic Architectural/Built Environment Resources Resulting from Construction Activities

1 **Table ES-6. Summary of Effects and Mitigation Measures for the Feather River West Levee Project**

Effect	Alternative	Duration	Quantification of Impact (Where Applicable)	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
3.1, Flood Control and Geomorphic Conditions						
Effect FC-1: Change in Water Surface Elevations and Flood Safety Attributable to Project Design	No Action	Operational-intermittent	NA	No effect	None required	No effect
	1, 2, and 3	Operational-intermittent	NA	No effect	None required	No effect
Effect FC-2: Increase in Channel Bed Incision and Bank Erosion Attributable to Project Design	No Action	Operational-intermittent	NA	No effect	None required	No effect
	1, 2, and 3	Operational-intermittent	NA	No effect	None required	No effect
Effect FC-3: Decrease in Through- and Under-Seepage	No Action	Operational-intermittent	NA	No effect	None required	No effect
	1, 2, and 3	Operational-intermittent	NA	Beneficial	None required	Beneficial
Effect FC-4: Decrease in Risk of Levee Failure as a Result of Erosion or Seepage	No Action	Operational-intermittent	NA	No effect	None required	No effect
	1, 2, and 3	Operational-intermittent	NA	Beneficial	None required	Beneficial
Effect FC-5: Change in Stream Energy and Modification of Floodplain Scour/Deposition	No Action	Operational-intermittent	NA	No effect	None required	No effect
	1, 2, and 3	Operational-intermittent	NA	No effect	None required	No effect
Effect FC-6: Alteration of the Existing Drainage Pattern of the Site or Area	No Action	Operational-intermittent	NA	No effect	None required	No effect

Effect	Alternative	Duration	Quantification of Impact (Where Applicable)	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
	1, 2, and 3	Operational-intermittent	NA	Significant	FC-MM-1: Coordinate with Owners and Operators, Prepare Drainage Studies as Needed, and Remediate Effects through Project Design	No effect
Effect FC-7: Increase in Levee Slope Stability	No Action	Permanent	NA	No effect	None required	No effect
	1, 2 and 3	Permanent	NA	Beneficial	None required	Beneficial
3.2, Water Quality and Groundwater Resources						
Effect WQ-1: Effects on Surface Water Quality from Excessive Turbidity or Total Suspended Solids	No Action	NA	NA	No effect	None required	No effect
	1, 2, and 3	Temporary	Unquantifiable	Less than significant	None required	Less than significant
Effect WQ-2: Release of Contaminants into Adjacent Surface Water Bodies from Construction-Related Hazardous Materials	No Action	Temporary	NA	No effect	None required	No effect
	1, 2, and 3	Temporary	Unquantifiable	Less than significant	None required	Less than significant
Effect WQ-3: Effects on Groundwater or Surface Water Quality Resulting from Contact with the Water Table	No Action	Temporary	NA	No effect	None required	No effect
	1, 2, and 3	Temporary	Unquantifiable	Significant	WQ-MM-1: Implement Provisions for Dewatering	Less than significant
Effect WQ-4: Effects on Groundwater Wells Due to Project Encroachment	No Action	Permanent	NA	No effect	None required	No effect
	1, 2, and 3	Permanent	Negligible to 3-foot increase in groundwater	Less than significant	None required	Less than significant

Effect	Alternative	Duration	Quantification of Impact (Where Applicable)	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
			levels			
3.3, Geology, Seismicity, Soils and Mineral Resources						
Effect GEO-1: Beneficial Change in Levee Stability	No Action	Permanent	NA	No effect	None required	No effect
	1, 2, and 3	Permanent	Increase to 200-year flood protection in urban areas; 100-year flood protection in rural areas	Beneficial	None required	Beneficial
Effect GEO-2: Increase Exposure of People or Structures to Hazards Related to Strong Seismic Ground Shaking	No Action	Operational-intermittent	NA	No effect	None required	No effect
	1, 2, and 3	Operational-intermittent	NA	Less than significant	None required	Less than significant
Effect GEO-3: Cause Accelerated Erosion and Sedimentation Resulting from Construction-Related Ground Disturbance	No Action	Temporary	NA	No effect	None required	No effect
	1, 2, and 3	Temporary	NA	Less than significant	None required	Less than significant
Effect GEO-4: Cause Structural Damage and Injury Resulting from Development on Expansive Soils	No Action	Permanent	NA	No effect	None required	No effect
	1, 2, and 3	Permanent	NA	Less than significant	None required	Less than significant
Effect GEO-5: Cause Accelerated Erosion and Sedimentation Resulting from Use of Imported Borrow	No Action	Temporary	NA	No effect	None required	No effect
	1, 2, and 3	Temporary	NA	Less than significant	None required	Less than

Effect	Alternative	Duration	Quantification of Impact (Where Applicable)	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
						significant
Effect GEO-6: Loss, Injury, or Death from Slope Failure at Borrow Sites	No Action	Temporary	NA	No effect	None required	No effect
	1, 2, and 3	Temporary	NA	Less than significant	None required	Less than significant
Effect GEO-7: Cause the Loss of a Known Mineral Resource of Regional or Local Importance as a Result of Construction of Proposed Project	No Action	NA	Tons of aggregate	No effect	None required	No effect
	1, 2, and 3	NA	Tons of aggregate: Alt. 1: 109,000 Alt. 2: 87,125 Alt. 3: 105,900	Less than significant	None required	Less than significant
Effect GEO-8: Cause the Loss of a Known Mineral Resource of Regional or Local Importance as a Result of Placement of Proposed Project	No Action	Permanent	NA	No effect	None required	No effect
	1, 2, and 3	Permanent	NA	Less than significant	None required	Less than significant
3.4, Transportation And Navigation						
Effect TRA-1: Temporary Increase in Traffic Volumes from Construction-Generated Traffic	No Action	Temporary	Road segment LOS within Caltrans standards	No effect	None required	No effect
	1, 2, and 3	Temporary	Road segment LOS within Caltrans standards	Less than significant	None required	Less than significant
Effect TRA-2: Temporary Road Closures	No Action	Temporary	NA	No effect	None required	No effect
	1, 2, and 3	Temporary	NA	Less than significant	None required	Less than

Effect	Alternative	Duration	Quantification of Impact (Where Applicable)	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
						significant
Effect TRA-3: Increase in Safety Hazards Attributable to Construction-Generated Traffic	No Action	Temporary	NA	No effect	None required	No effect
	1, 2, and 3	Temporary	NA	Less than significant	None required	Less than significant
Effect TRA-4: Increase in Emergency Response Times	No Action	Temporary	NA	No effect	None required	No effect
	1, 2, and 3	Temporary	NA	Less than significant	None required	Less than significant
Effect TRA-5: Inadequate Parking Supply to Meet Parking Demand for Construction Equipment and Construction Workers	No Action	Temporary	NA	No effect	None required	No effect
	1, 2, and 3	Temporary	NA	Less than significant	None required	Less than significant
Effect TRA-6: Disruption of Alternative Transportation Modes as a Result of Temporary Road Closures	No Action	Temporary	NA	No effect	None required	No effect
	1, 2, and 3	Temporary	NA	Less than significant	None required	Less than significant
Effect TRA-7: Temporary Changes to Navigation	No Action	Temporary	NA	No effect	None required	No effect
	1, 2, and 3	Temporary	NA	Less than significant	None required	Less than significant
Effect TRA-8: Damage to Roadway Surfaces during Construction of Facilities	No Action	Temporary	NA	No effect	None required	No effect
	1, 2, and 3	Temporary	NA	Less than significant	None required	Less than significant

Effect	Alternative	Duration	Quantification of Impact (Where Applicable)	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
3.5, Air Quality						
Effect AQ-1: Obstruction of an Applicable Air Quality Plan	No Action	Temporary	NA	No effect	None required	No effect
	1, 2, and 3	Temporary	NA	Less than significant	None required	Less than significant
Effect AQ-2: Exceedance of Applicable Thresholds for Construction Emissions	No Action	Temporary	NA	No effect	None required	No effect
	1, 2, and 3	Temporary	Alt. 1, 2: Exceedance of CEQA emission thresholds for ROG, NO_X and PM10 in the FRAQMD, and NO_X and PM10 thresholds in the BCAQMD Alt. 3: Exceedance of CEQA emission thresholds for ROG, NO_X and PM10 in the FRAQMD, and NO_X thresholds in the BCAQMD	Significant	AQ-MM-1 Provide Advance Notification of Construction Schedule and 24-Hour Hotline to Residents AQ-MM-2: Implement Fugitive Dust Control Plan If Unmitigated Emissions Exceed PM10 or PM 2.5 Thresholds AQ-MM-3. General Measures to Reduce Emissions AQ-MM-4: Fleet-Wide Emission Reductions for Large Off-Road Equipment AQ-MM-5: Pay Required Fees to FRAQMD and BCAQMD to Offset Annual Construction NO_X Emissions to Net Zero (0)	Significant and unavoidable
Effect AQ-3: Exceedance of the Federal General Conformity Thresholds during Construction	No Action	Temporary	NA	No effect	None required	No effect
	1, 2, and 3	Temporary	Exceedance of the federal de minimis threshold for NO_X for all construction years	Significant	AQ-MM-5: Pay Required Fees to FRAQMD and BCAQMD to Offset Annual Construction NO_X Emissions to Net Zero (0)	Less than significant
Effect AQ-4: Long-Term	No Action	Permanent	NA	No effect	None required	No effect

Effect	Alternative	Duration	Quantification of Impact (Where Applicable)	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
Operation and Maintenance Emissions of ROG, NO_X, and PM10						
	1, 2, and 3	Permanent	NA	Less than significant	None required	Less than significant
Effect AQ-5: Exposure of Sensitive Receptors to Toxic Air Emissions	No Action	Temporary	NA	No effect	None required	No effect
	1, 2, and 3	Temporary	NA	Less than significant	None required	Less than significant
Effect AQ-6: Exposure to Objectionable Odors from Diesel Exhaust	No Action	Temporary	NA	No effect	None required	No effect
	1, 2, and 3	Temporary	NA	Less than significant	None required	Less than significant
3.6, Climate Change and Greenhouse Gas						
Effect CC-1: Increase in GHG Emissions during Construction Exceeding Threshold	No Action	Temporary	NA	No effect	None required	No effect
	1, 2, and 3	Temporary	CO_2 emissions project-wide tons/year: Alt. 1: 486 Alt.2: 761 Alt. 3: 528 Annualized over the 50-year levee lifespan. Presumptive threshold is 7,000 metric tons/year.	Less than significant	CC-MM-1: Implement Measures to Minimize GHG Emissions during Construction	Less than significant
Effect CC-2: Conflict with an Applicable Plan, Policy, or Regulation Adopted for the Purpose of Reducing the Emissions of GHGs	No Action	Temporary	NA	No effect	None required	No effect

Effect	Alternative	Duration	Quantification of Impact (Where Applicable)	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
	1, 2, and 3	Temporary	NA	Less than significant	None required	Less than significant
Effect CC-3: Failure to Address Changes in Flood Frequency and Floodwater Elevation Caused by Global Climate Change	No Action	Permanent	NA	Too speculative	None required	Too speculative
	1, 2, and 3	Permanent	NA	Beneficial	None required	Beneficial
3.7, Noise						
Effect NOI-1: Exposure of Sensitive Receptors to Temporary Construction-Related Noise	No Action	Temporary	NA	No effect	None required	No effect
	1, 2, and 3	Temporary	Under all construction contracts, scattered rural residences and residences in some nearby cities could be exposed to noise exceeding 60 dBA-L_{eq} during daytime hours and 45 dBA-L_{eq} during nighttime hours.	Significant	NOI-MM-1: Employ Noise-Reducing Construction Practices	Significant and unavoidable
Effect NOI-2: Exposure of Sensitive Receptors to Temporary Construction-Related Vibration	No Action	Temporary	NA	No effect	None required	No effect
	1, 2, and 3	Temporary	Ground vibration could exceed 0.2 inch per second when necessary to operate equipment within 30 feet of residences and other structures.	Significant	NOI-MM-2: Employ Vibration-Reducing Construction Practices	Significant and unavoidable
3.8, Vegetation and Wetlands						
Effect VEG-1: Disturbance or	No Action	Permanent	Full application of ETL:	Significant and	Assumed that vegetation loss	Significant and

Effect	Alternative	Duration	Quantification of Impact (Where Applicable)	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
Removal of Riparian Trees			approximately 1,000 trees removed	unavoidable in the short term, less than significant after establishment of compensatory vegetation	would be mitigated	unavoidable in the short term, less than significant after establishment of compensatory vegetation
			Modified application of ETL: unknown number of trees, but expected to be relatively low	Less than significant	Assumed that vegetation loss would be mitigated	Less than significant
	1, 2, and 3	Permanent	Alt. 1: Loss of 13.03 acres of riparian forest and 0.33 acre of riparian scrub Alt. 2: Loss of 16.95 acres of riparian forest and 0.53 acre of riparian scrub Alt. 3: Loss of 15.44 acres of riparian forest and 0.47 acre of riparian scrub	Significant	VEG-MM-1: Compensate for the Loss of Woody Riparian Trees VEG-MM-2: Install Exclusion Fencing and/or K-rails along the Perimeter of the Construction Work Area and Implement General Measures to Avoid Effects on Sensitive Natural Communities and Special-Status Species VEG-MM-3: Conduct Mandatory Contractor/Worker Awareness Training for Construction Personnel VEG-MM-4: Retain a Biological Monitor	Significant and unavoidable (short term) Less than significant (long term after establishment of compensatory vegetation)
Effect VEG-2: Loss of Wetlands and Other Waters of the United States as a Result of Project Construction	No Action	Permanent	Acres	No effect	None required	No effect
	1, 2, and 3	Permanent	Alt. 1 and 2: Loss of 0.01 acre of	Significant	VEG-MM-2: Install Exclusion Fencing and/or K-rails along the	Less than significant

Effect	Alternative	Duration	Quantification of Impact (Where Applicable)	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
			irrigation ditch, 0.07 acre of open water and 0.01 acre of seasonal wetlands Alt. 3: Loss of 0.01 acre of irrigation ditch, 0.09 acre of open water and 0.01 acre of seasonal wetlands		Perimeter of the Construction Work Area and Implement General Measures to Avoid Effects on Sensitive Natural Communities and Special-Status Species VEG-MM-3: Conduct Mandatory Contractor/Worker Awareness Training for Construction Personnel VEG-MM-4: Retain a Biological Monitor VEG-MM-5: Compensate for the Loss of Wetlands and Other Waters	
Effect VEG-3: Disturbance or Removal of Protected Trees as a Result of Project Construction	No Action	Permanent	Individual trees	No effect	None required	No effect

Effect	Alternative	Duration	Quantification of Impact (Where Applicable)	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
	1, 2, and 3	Permanent	Numerous riparian and non-riparian trees	Significant	VEG-MM-2: Install Exclusion Fencing and/or K-rails along the Perimeter of the Construction Work Area and Implement General Measures to Avoid Effects on Sensitive Natural Communities and Special-Status Species VEG-MM-3: Conduct Mandatory Contractor/Worker Awareness Training for Construction Personnel VEG-MM-4: Retain a Biological Monitor VEG-MM-6: Conduct a Tree Survey VEG-MM-7: Compensate for Loss of Protected Trees	Less than significant
Effect VEG-4: Potential Loss of Special-Status Plant Populations Caused by Habitat Loss Resulting from Project Construction	No Action	Permanent	NA	No effect	None required	No effect

Effect	Alternative	Duration	Quantification of Impact (Where Applicable)	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
	1, 2, and 3	Permanent	NA	Significant	VEG-MM-2: Install Exclusion Fencing and/or K-rails along the Perimeter of the Construction Work Area and Implement General Measures to Avoid Effects on Sensitive Natural Communities and Special-Status Species VEG-MM-3: Conduct Mandatory Contractor/Worker Awareness Training for Construction Personnel VEG-MM-4: Retain a Biological Monitor VEG-MM-8: Retain Qualified Botanists to Conduct Floristic Surveys for Special-Status Plants during Appropriate Identification Periods VEG-MM-9: Avoid or Compensate for Substantial Effects on Special-Status Plants	Significant and unavoidable until surveys can demonstrate efficacy of mitigation measures; less than significant if mitigation measures demonstrate avoidance
Effect VEG-5: Introduction or Spread of Invasive Plants as a Result of Project Construction	No Action	Permanent	NA	No effect	None required	No effect
	1, 2, and 3	Permanent	NA	Less than significant	None required	Less than significant
Effect VEG-6: Conflict with Provisions of an Adopted HCP/NCCP or Other Approved Local, Regional, or State Habitat Conservation Plan	No Action	Permanent	NA	No effect	None required	No effect

Effect	Alternative	Duration	Quantification of Impact (Where Applicable)	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
	1, 2, and 3	Permanent	NA	No effect	None required	No effect
3.9, Wildlife						
Effect WILD-1: Potential Mortality of or Loss of Habitat for Antioch Dunes Anthicid, Sacramento Anthicid, and Sacramento Valley Tiger Beetle	No Action	Permanent or temporary	NA	No effect	None required	No effect
	1, 2, and 3	Permanent and temporary	Permanent/Temporary effects on habitat: Alts. 1,2, and 3: 0 /0 acres	Significant	WILD-MM-1: Conduct Focused Surveys for Habitat for Antioch Dunes Anthicid, Sacramento Anthicid, and Sacramento Valley Tiger Beetle and Implement Protective Measures	Less than significant
Effect WILD-2: Potential Mortality or Disturbance of VELB and its Habitat (Elderberry Shrubs)	No Action	Permanent or temporary	NA	No effect	None required	No effect
	1, 2, and 3	Permanent and temporary	Permanent/temporary effect on elderberry shrubs: Alt. 1: 90 /72 Alt. 2: 89/72 Alt. 3: 82/83	Significant	WILD-MM-2: Implement Protective Measures and Compensate for Effects on VELB and its Habitat	Less than significant
Effect WILD-3: Potential Mortality or Disturbance of Western Pond Turtle	No Action	Permanent or temporary	NA	No effect	None required	No effect
	1, 2, and 3	Permanent and temporary	Permanent/temporary (acres of habitat) Alts. 1, 2: 0.96 / 0 Alt. 3: 1.31 / 0.01	Significant	WILD-MM-3: Conduct Preconstruction Surveys for Western Pond Turtle and Monitor Construction Activities if Turtles are Observed	Less than significant
Effect WILD-4: Potential Disturbance or Mortality of	No Action	Permanent or	NA	No effect	None required	No effect

Effect	Alternative	Duration	Quantification of Impact (Where Applicable)	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
and Loss of Suitable Habitat for Giant Garter Snake		temporary				
	1, 2, and 3	Permanent and temporary	Permanent/temporary Acres aquatic habitat: Alt. 1, 2: 0.96/0 Alt. 3: 1.31/0.01 Acres upland habitat: Alt. 1, 2: 4.17/0 Alt. 3: 4.08/0.24	Significant	WILD-MM-4: Avoid and Minimize Effects on Giant Garter Snake WILD-MM-5: Compensate for Loss of Suitable Giant Garter Snake Habitat	Less than significant
Effect WILD-5: Potential Loss or Disturbance of Nesting Swainson's Hawk and Loss of Nesting and Foraging Habitat	No Action	Permanent or temporary	NA	No effect	None required	No effect
	1, 2, and 3	Permanent and temporary	Permanent/temporary Loss of nesting and foraging habitat (acres of riparian forest): Alt. 1: 13.03/0.47 Alt. 2: 16.95/0.61 Alt. 3: 15.44/7.95 Loss of foraging habitat (acres of field and row crops and ruderal): Alt. 1: 568.37 / 10.65 Alt. 2: 674.53 / 8.88 Alt. 3: 533.09 / 104.21	Significant	WILD-MM-6: Conduct Vegetation Removal Activities outside the Breeding Season for Birds WILD-MM-7: Conduct Focused Surveys for Nesting Swainson's Hawk prior to Construction and Implement Protective Measures during Construction WILD-MM-8: Compensate for the Loss of Foraging Habitat for Swainson's Hawk	Less than significant

Effect	Alternative	Duration	Quantification of Impact (Where Applicable)	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
Effect WILD-6: Potential Mortality or Disturbance of Nesting Special-Status and Non–Special Status Birds and Removal of Suitable Breeding Habitat	No Action	Permanent or temporary	NA	No effect	None required	No effect
	1, 2, and 3	Permanent and temporary	Removal of riparian forest, ruderal areas, and field crops, and nest trees during breeding season	Significant	WILD-MM-6: Conduct Vegetation Removal Activities outside the Breeding Season for Birds WILD-MM-90: Conduct Nesting Surveys for Special-Status and Non–Special Status Birds and Implement Protective Measures during Construction	Less than significant
Effect WILD-7: Potential Loss or Disturbance of Western Burrowing Owl and Loss of Nesting and Foraging Habitat	No Action	Permanent or temporary	NA	No effect	None required	No effect
	1, 2, and 3	Permanent and temporary	Permanent/temporary (acres of field and row crops and ruderal): Alt. 1: 568.37 / 10.65 Alt. 2: 674.53 / 8.88 Alt. 3: 533.09 / 104.21	Significant	WILD-6: Conduct Vegetation Removal Activities outside the Breeding Season for Birds WILD-MM-10: Conduct Surveys for Western Burrowing Owl prior to Construction and Implement Protective Measures if Found WILD-MM-11: Compensate for the Loss of Occupied Burrowing Owl Habitat	Less than significant
Effect WILD-8: Potential Injury, Mortality or Disturbance of Tree-Roosting Bats and Removal of Roosting Habitat	No Action	Permanent or temporary	NA	No effect	None required	No effect

Effect	Alternative	Duration	Quantification of Impact (Where Applicable)	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
	1, 2, and 3	Permanent and temporary	Permanent/Temporary (acres roosting habitat): Alt. 1: 265.62/27.89 Alt. 2: 706.66/29/97 Alt. 3: 113.21/14.39	Significant	WILD-MM-6: Conduct Vegetation Removal Activities outside the Breeding Season for Birds WILD-MM-12: Conduct Preconstruction Surveys for Roosting Bats and Implement Avoidance and Protective Measures	Less than significant
Effect WILD-9: Disturbance to or Loss of Common Wildlife Species and Their Habitats	No Action	Permanent or temporary	NA	No effect	None required	No effect
	1, 2, and 3	Permanent and temporary	NA	Less than significant	None required	Less than significant
Effect WILD-10: Potential Disruption of Wildlife Movement Corridors	No Action	Permanent or temporary	NA	No effect	None required	No effect
	1, 2, and 3	Permanent or temporary	NA	Less than significant	None required	No effect
Effect WILD-11: Conflict with Provisions of an Adopted HCP/NCCP or other Approved Local, Regional, or State Habitat Conservation Plan	No Action	Permanent	NA	No effect	None required	No effect
	1, 2, and 3	Permanent	NA	No effect	None required	No effect

Effect	Alternative	Duration	Quantification of Impact (Where Applicable)	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
3.10, Fish and Aquatic Resources						
Effect FISH-1: Loss or Degradation of Riparian and SRA Cover (including Critical Habitat)	No Action	Permanent	Full application of ETL: approx. 1,000 trees on water-side of levee removed	Significant and unavoidable in the short term and less than significant in the long term with compensatory vegetation	Assumed compensatory vegetation	Significant and unavoidable in the short term and less than significant in the long term with compensatory vegetation
			Modified application of ETL: unknown number of trees, but expected to be relatively low	Less than significant	None required	Less than significant
	1, 2, and 3	Permanent and temporary	Linear feet and acreage	Less than significant	None required	Less than significant
Effect FISH-2: Construction-Related Erosion Resulting in Substantially Increased Sedimentation and Turbidity	No Action	Temporary	NA	No effect	None required	No effect
	1, 2, and 3	Temporary	NA	Less than significant	None required	Less than signficant
Effect FISH-3: Adverse Effects on Fish Health and Survival Associated with Potential Discharge of Contaminants during Construction Activities	No Action	Temporary	NA	No effect	None required	No effect
	1, 2, and 3	Temporary	NA	Less than significant	None required	Less than significant
Effect FISH-4: Adverse Effects Caused by Construction Equipment Noise and	No Action	Temporary	NA	No effect	None required	No effect

Effect	Alternative	Duration	Quantification of Impact (Where Applicable)	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
Vibration						
	1, 2, and 3	Temporary	NA	Less than significant	None required	Less than significant
3.11, Agriculture, Land Use, and Socioeconomics						
Effect AG-1: Temporary Conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance to Accommodate Construction Activities	No Action	Temporary	Acreage	No effect	None required	No effect
	1, 2, and 3	Temporary	Sutter County: Alt. 1: 18.7 ac prime farmland; 4.99 ac farmland of statewide importance Alt. 2: 18.8 ac prime farmland, 5.24 ac farmland of statewide importance Alt. 3: 5.57 ac prime, 0.57 ac farmland of statewide importance Butte County: Alt. 1: 11.77 ac prime farmland Alt. 2: 12.11 ac prime farmland Alt. 3: 8.2 ac prime, 0.25 ac farmland of statewide importance	Less than significant	None required	Less than significant
Effect AG-2: Irretrievable Conversion of Prime Farmland, Unique Farmland,	No Action	Permanent and temporary	NA	Too speculative	None required	Too speculative

Effect	Alternative	Duration	Quantification of Impact (Where Applicable)	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
or Farmland of Statewide Importance						
	1, 2, and 3	Permanent	Sutter County: Alt.1: 181.72 ac prime farmland (0.11%), 2.79 ac unique farmland (0.02%), 6.37 ac (0.03%) farmland of statewide importance Alt. 2: 555.24 ac prime farmland (0.34%), 2.79 ac unique farmland (0.02%), 117.87 ac farmland of statewide importance (0.1%) Alt. 3: 85.03 ac prime farmland (0.05%), 4.37 ac unique farmland (0.02%), 13.83 ac farmland of statewide importance (0.01%) Butte County: Alt. 1: 82.49 ac (0.04%) prime farmland 3.08 ac (0/01%) unique farmland Alt. 2: 166.78 ac prime farmland (0.09%), 3.19 ac unique farmland (0.01%) Alt. 3: 41.38 ac prime farmland (0.02%), 4.65 ac unique farmland (0.02%)	Less than significant	None required	Less than significant
Effect AG-3: Conflict with Existing Zoning for Agricultural Use	No Action	Permanent	NA	No effect	None required	No effect

Effect	Alternative	Duration	Quantification of Impact (Where Applicable)	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
	1, 2, and 3	Permanent	NA	Less than significant	None required	Less than significant
Effect AG-4: Conflict with Williamson Act Contract	No Action	Permanent	NA	No effect	None required	No effect
	1, 2, and 3	Permanent	Permanent/Temporary (acres) Alt. 1: 83.02 / 4,89 Alt. 2: 133.99 / 4.9 Alt. 3: 67.65 / 13.67	Less than significant	None required	Less than significant
Effect AG-5: Loss of Agricultural Production	No Action	Permanent	NA	No effect	None required	No effect
	1, 2, and 3	Permanent	Loss in acres (% of total in Sutter and Butte Co): Alt. 1: 587.46 (0.06%) Alt. 2: 1,126.88 (0.1%) Alt. 3: 430.38 (0.05%)	Less than significant	None required	Less than significant
Effect LU-1: Conflict with Applicable Land Use Plan, Policy, or Regulation	No Action	Permanent	NA	No effect	None required	No effect
	1, 2, and 3	Permanent	NA	Less than significant	None required	Less than significant
Effect SOC-1: Temporary Increase in Study Area Employment during Construction	No Action	Temporary	NA	No effect	None required	No effect
	1, 2, and 3	Temporary	Total construction-related expenditures (direct costs): Alt. 1: $321,535,000 Alt. 2: $527,373,000 Alt. 3: $288,847,000	Beneficial	None required	Beneficial
Effect SOC-2: Conflict with Applicable Land Use Plan,	No Action	Permanent	NA	No effect	None required	No effect

Effect	Alternative	Duration	Quantification of Impact (Where Applicable)	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
Policy, or Regulation						
	1, 2, and 3	Permanent	NA	Less than significant	None required	Less than significant
3.12, Population, Housing, and Environmental Justice						
Effect POP-1: Displacement of Existing Housing Units	No Action	Permanent and temporary	NA	No effect	None required	No effect
	1, 2, and 3	Permanent and temporary	Residences to be acquired: Alt. 1: 5 Alt. 2: 17 Alt. 3: 5 Potential for temporary displacement under all alternatives	Significant	POP-MM-1: Property Acquisition Compensation and Resident Relocation Plan	Less than significant
Effect EJ-1: Result in a Disproportionately High and Adverse Human Health or Environmental Effect on Minority Populations and Low-Income Populations from Construction Activities	No Action	Temporary	NA	No effect	None required	No effect
	1, 2, and 3	Temporary	NA	Less than significant	None required	Less than significant
3.13, Visual Resources						
Effect VIS-1: Result in Temporary Visual Effects from Construction	No Action	Temporary	NA	No effect	None required	No effect
	1 and 3	Temporary	NA	Less than significant	None required	Less than significant
	2	Temporary	NA	Significant and unavoidable	None available	Significant and unavoidable
Effect VIS-2: Adversely Affect a Scenic Vista	No Action	Permanent	NA	No effect	None required	No effect

Effect	Alternative	Duration	Quantification of Impact (Where Applicable)	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
	1 and 3	Permanent	NA	Less than significant	None required	Less than significant
Reaches 6, 12–15, 17, 24, 25–28, 34, 39; 2, 4, 16, 20, 22, 31–33, 35, 37, 38	2	Permanent	NA	Less than significant	None required	Less than significant
Reaches 3, 5, 7–11, 18, 19, 21, 23, 30, 36, 40, 41	2	Permanent	NA	Significant and unavoidable	None available	Significant and unavoidable
Effect VIS-3: Substantially Degrade the Existing Visual Character or Quality of the Site and Its Surroundings	No Action	Permanent	NA	No effect	None required	No effect
	1 and 3	Permanent	NA	Less than significant	None required	Less than significant
Reaches 6, 12–15, 17, 24–29, 34, 39; 2, 4, 16, 20, 22, 31–33, 35, 37, 38	2	Permanent	NA	Less than significant	None required	Less than significant
Reaches 3, 5, 7–11, 18, 19, 21, 23, 30, 36, 40, 41	2	Permanent	NA	Significant and unavoidable	None available	Significant and unavoidable
Effect VIS-4: Create a New Source of Substantial Light or Glare That Would Adversely Affect Day and Nighttime Public Views	No Action	Permanent	NA	No effect	None required	No effect
	1 and 3	Permanent	NA	Less than significant	None required	Less than significant
	2	Permanent	NA	Less than significant	None required	Less than significant
3.14, Recreation						
Effect REC-1: Temporary Changes in Recreation Opportunities during Construction	No Action	Temporary	NA	No effect	None required	No effect
	1, 2, and 3	Temporary	Less than 0.1% of	Less than significant	None required	Less than

Effect	Alternative	Duration	Quantification of Impact (Where Applicable)	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
			recreation areas			significant
Effect REC-2: Long-Term or Permanent Loss of Recreation Opportunities in the Levee Corridor	No Action	Permanent	NA	Too speculative	None required	Too speculative
	1, 2, and 3	Permanent	Less than 2% of recreation areas	Less than significant	None required	Less than significant
3.15, Utilities and Public Services						
Effect UTL-1: Potential Temporary Disruption of Irrigation/Drainage Facilities and Agricultural and Domestic Water Supply	No Action	Temporary	NA	No effect	None required	No effect
	1, 2, and 3	Temporary	NA	Significant	UTL-MM-1: Coordinate with Water Supply Users before and during All Water Supply Infrastructure Modifications and Implement Measures to Minimize Interruptions of Supply	Less than significant
Effect UTL-2: Damage of Public Utility Infrastructure and Disruption of Service	No Action	Temporary	NA	No effect	None required	No effect
	1, 2, and 3	Temporary	NA	Significant	UTL-MM-2: Verify Utility Locations, Coordinate with Utility Providers, Prepare a Response Plan, and Conduct Worker Training	Less than significant
Effect UTL-3: Increase in Solid Waste Generation	No Action	Temporary	NA	No effect	None required	No effect

Effect	Alternative	Duration	Quantification of Impact (Where Applicable)	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
	1, 2, and 3	Temporary	Cubic yards of solid waste generated during construction Alt. 1: 819,097 Alt. 2: 378,800 Alt. 3: 813,152	Less than significant	None required	Less than significant
Effect UTL-4: Increase in Emergency Response Times	No Action	Temporary	NA	No effect	None required	No effect
	1, 2, and 3	Temporary	NA	Less than significant	None required	Less than significant
3.16, Public Health and Environmental Hazards						
Effect PH-1: Temporary Exposure to or Release of Hazardous Materials during Construction	No Action	Temporary	NA	No effect	None required	No effect
	1, 2, and 3	Temporary	NA	Significant	PH-MM-1: Complete Phase I and Phase II (if Necessary) Environmental Site Assessment Investigations and Implement Required Measures	Less than significant
Effect PH-2: Exposure of the Environment to Hazardous Materials during Ground-Disturbing Activities	No Action	Temporary	NA	No effect	None required	No effect
	1, 2, and 3	Temporary	NA	Significant	Environmental Commitment: Stormwater Pollution Protection Plan PH-MM-2: Employment of a Toxic Release Contingency Plan	Less than significant
Effect PH-3: Temporary Exposure to Safety Hazards from the Construction Site and Vehicles	No Action	Temporary	NA	No effect	None required	No effect

Effect	Alternative	Duration	Quantification of Impact (Where Applicable)	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
	1, 2, and 3	Temporary	NA	Significant	PH-MM-3: Implementation of Construction Site Safety Measures PH-MM-4: Implementation of an Emergency Response Plan	Less than significant
Effect PH-4: Exposure of People or Structures to Increased Flood Risk	No Action	Permanent	NA	Too speculative	None required	Too speculative
	1, 2, and 3	Permanent	NA	Beneficial	None required	Beneficial
3.17, Cultural Resources						
Effect CR-1: Effects on Identified Archaeological Sites Resulting From Construction of Levee Improvements and Ancillary Facilities	No Action	Permanent	NA	No effect	None required	No effect
	1, 2, and 3	Permanent	NA	Significant	CR-MM-1: Perform Field Studies, Evaluate Identified Resources and Determine Effects, Develop Treatment to Resolve Significant Effects	Significant and unavoidable
Effect CR-2: Potential to Disturb Unidentified Archaeological Sites	No Action	Permanent	NA	Too speculative	None required	Too speculative
	1, 2, and 3	Permanent		Significant	CR-MM-2: Implement a Cultural Resources Discovery Plan, Perform Training of Construction Workers, and Conduct Construction Monitoring	Significant and unavoidable
Effect CR-3: Potential to Disturb Human Remains	No Action	Permanent	NA	Too speculative	None required	Too speculative

Effect	Alternative	Duration	Quantification of Impact (Where Applicable)	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
	1, 2, and 3	Permanent	NA	Significant	CR-MM-3: Monitor Culturally Sensitive Areas during Construction, Follow State and Federal Law Governing Human Remains if Such Resources are Discovered during Construction	Significant and unavoidable
Effect CR-4: Direct and Indirect Effects on Built Environment Resources Resulting from Construction Activities	No Action	Permanent	NA	No effect	None required	No effect
	1, 2, and 3	Permanent	NA	Significant	CR-MM-4: Conduct Inventory, Evaluate Identified Properties, Assess Effects, and Prepare Treatment to Resolve and Mitigate Significant Effects	Significant and unavoidable

NA = not applicable.

ES.2.6 Major Conclusions of the Environmental Analysis

ES.2.6.1 Flood Control and Geomorphic Conditions

Construction of any of the FRWLP EIS/EIR alternatives would be a flood control benefit in the planning area although existing drainage patterns could be altered. This impact would be mitigated to less than significant by coordinating with owners and operators, preparing drainage studies, and remediating effects through project design.

Water Quality and Groundwater Resources

Dewatering of construction areas (e.g. removing groundwater that may fill trenches dug for cutoff wall construction) could result in the release of contaminants to surface or groundwater. This impact would be mitigated to less than significant by implementing provisions for dewatering effluent before it is discharged.

Geology, Soils, Seismicity, and Mineral Resources

Construction activities associated with any of the FRWLP EIS/EIR alternatives would not result in any significant impacts to geology, soils, seismicity, and mineral resources. Without project implementation, beneficial effects, such as improved levee stability and decreased levee bank erosion would not be realized.

Traffic, Transportation, and Navigation

Temporary increases in construction-related traffic, temporary road closures, emergency response times, and other traffic, transportation and navigation effects from project implementation were determined to be less than significant under all action alternatives.

Air Quality

Implementation of the FRWLP would result in temporary construction-related emissions that would be partially mitigated by reducing vehicle and equipment emissions and implementing a fugitive dust plan. Regardless of the mitigation measures, the temporary construction emissions produced by the FRWLP would be significant and unavoidable on a project-level basis.

Climate Change and Greenhouse Gas

Construction activity for the FRWLP would cause a temporary and less than significant increase in greenhouse gas emissions.

Noise

Implementation of any of the project alternatives would result in temporary but significant effects related to construction noise and vibration in the affected area. Mitigation measures to employ noise-reducing and vibration-reducing construction practices will not be sufficient to reduce the exposure of sensitive receptors to temporary construction noise and vibration to less than significant.

Vegetation and Wetlands

Project implementation would result in permanent loss of vegetation and wetlands. Compensation of lost vegetation and wetlands would mitigate those effects with the goal of no net loss.

Wildlife

Construction of any of the FRWLP alternatives would result in the injury, mortality, or disturbance of special-status and common species during construction, which could affect local populations. Implementation of mitigation measures would minimize or avoid these impacts and bring the effects down to a less than significant level.

Fish and Aquatic Resources

The project would have no effect on SRA cover and critical habitat; however, there may be effects on ESA-listed fish species due to loss of floodplain riparian vegetation. Vegetation loss would be minimized and all activities would occur above the ordinary high water mark on the waterside levee slopes and toe. Thus, the project is not expected to contribute to significant effects on fish and aquatic resources.

Agriculture, Land Use, and Socioeconomics

Implementation of the FRWLP would permanently convert farmland to nonagricultural use in the direct footprint of the project. Overall, the project is intended to preserve existing land use and socioeconomic conditions, especially for agriculture. Additionally, flood control activities are typically considered public uses, which are largely consistent with the land use policies and regulations governing the project area. Construction activities would temporarily increase employment and personal income in the local area.

Population, Housing, and Environmental Justice

Project implementation of any of the FRWLP alternatives will require displacement of existing housing units. Permanent acquisition, relocation, and compensation services will be conducted in compliance with Federal and state relocation laws. In cases where project construction is temporarily disruptive to nearby residents, SBFCA will provide assistance for residents to relocate temporarily during construction activities and provide compensation to residents for reasonable rent and living expenses incurred as a result of relocation.

The FRWLP alternatives would not result in disproportionately high and adverse effects on minority populations and low-income populations from acquisition of homes because plenty of vacant homes exist within the affected area to serve as replacement housing.

Visual Resources

The FRWLP could potentially result in significant visual effects in reaches with sensitive viewers for one or more project alternatives. The effect mechanisms are primarily vegetation removal and replacement of agricultural and developed land use with seepage berms. Construction activities would also have temporary visual effects.

Recreation

The FRWLP would not have any permanent effects on recreation in the project area. Temporary access to recreational facilities along the Feather River would be an impact and addressed by providing notification of construction area closures to protect public safety.

Utilities and Public Services

Construction of the project may damage drainage and irrigation systems and public utility infrastructure, resulting in temporary disruptions to service. Coordination with drainage and irrigation systems users, consultation with service providers, and implementation of appropriate protection measures would minimize the possibility of any significant effects.

Public Health and Environmental Hazards

Project implementation has the potential to slightly increase risks to the public during construction through use of equipment and fuels, but the increased risk is temporary. These risks are minimized by implementation of a stormwater pollution prevention plan and the best management practices it contains to control accelerated erosion, sedimentation, and other pollutants during and after project construction.

Cultural Resources

Cultural resources are known to exist throughout the planning area. Cultural resources would be disturbed and destroyed under any of the project alternatives. While mitigation measures have been identified, the mitigation does not reduce the contribution of the project alternatives to less than significant.

Contents

Appendices (Included on Attached CD)

Tables

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Figures and Plates

Acronyms and Abbreviations

°F	Fahrenheit
2009 Plan	Northern Sacramento Valley Planning Area 2009 Triennial Air Quality Attainment Plan
ACHP	Advisory Council on Historic Preservation
ACS	American Community Survey
ADT	average daily traffic
ADWF	average dry weather flow
AEP	annual exceedance probability
Alquist-Priolo Act	Alquist-Priolo Earthquake Fault Zoning Act
APA	applicant-preferred alternative
APE	area of potential effects
ARB	California Air Resources Board
ARPA	Archaeological Resources Protection Act
AST	aboveground storage tank
ASTM	American Society for Testing and Materials
BA	biological assessment
Basin Plan	Water Quality Control Basin Plan, Central Valley Region – The Sacramento River Basin and the San Joaquin River Basin
BCAQMD	Butte County Air Quality Management District
BFE	base flood elevation
BMP	best management practice
BO	biological opinion
BOD	biochemical oxygen demand
BRCP	Butte Regional Conservation Plan
BSSCP	bentonite slurry spill contingency plan
CAA	Clean Air Act
CAAA	1990 Clean Air Act amendments
CAAQS	California Ambient Air Quality Standards
Cal-IPC	California Invasive Plant Council
Caltrans	California Department of Transportation
CAP	Climate Action Plan
CAR	Coordination Act Report
CBSC	California Building Standards Code
CCAA	California Clean Air Act
CCR	California Code of Regulations
CDEC	California Data Exchange Center
CDFA	California Department of Food and Agriculture
CEC	California Energy Commission
CEQ	Council on Environmental Quality

CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CGS	California Geological Survey
CH4	methane
CHRIS	California Historical Information System
CIWMP	countywide integrated waste management plan
CL	lean clay
CL or CH	clay
CLSM	Controlled Low Strength Material
CNDDB	California Natural Diversity Database
CNEL	community noise equivalent level
CNPPA	California Native Plant Protection Act of 1977
CNPS	California Native Plant Society
CO	carbon monoxide
Common Features	American River Common Features Project
Comp Study	Sacramento–San Joaquin River Basins Comprehensive Study
CPUC	California Public Utilities Commission
CRHR	California Register of Historical Resources
CRS	Community Rating System
CSLC	California State Lands Commission
CTR	California Toxics Rule
CVFPA	Central Valley Flood Protection Act
CVFPB	Central Valley Flood Protection Board
CVFPP	Central Valley Flood Protection Plan
CVHM	Central Valley Hydrologic Model
CVIFMS	Central Valley Integrated Flood Management Study
CVP	Central Valley Project
CWA	Clean Water Act
dB	decibel
dBA	A-weighted decibels
DDT	Dichlorodiphenyltrichloroethane
DEIR	Draft Environmental Impact Report
Delta	Sacramento–San Joaquin River Delta
DFG	California Department of Fish and Game
DO	dissolved oxygen
DOI	U.S. Department of the Interior
DPM	diesel particulate matter
DPR	California Department of Parks and Recreation
DPS	distinct population segment

DSM	Deep soil mixing
DSOD	Division of Safety of Dams
DTSC	Department of Toxic Substances Control
DWR	California Department of Water Resources
EC	Electrical conductivity
EFH	essential fish habitat
EIP	early implementation project
EIS	environmental impact statement
EM	2004 Engineering Manual 1110-1-400
EO	executive order
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ESU	evolutionarily significant unit
ETL	Engineering Technical Letter 1110-2-571, Guidelines for Landscape Planting and Vegetation Management at Levees, Floodwalls, Embankment Dams, and Appurtenant Structures
FEIS/FEIR	final environmental impact statement/final environmental impact report
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FMMP	Farmland Mapping and Monitoring Program
FPIIB	Flood Project Integrity and Inspection Branch
FPPA	Farmland Protection Policy Act
FR	Federal Register
FRAQMD	Feather River Air Quality Management District
FRM	flood-risk management
FRWA	Feather River Wildlife Area
FRWLP, or project	Feather River West Levee Project
G	the acceleration speed of gravity
GC	Government Code
GHG	greenhouse gase
GIS	geographic information systems
GLO	General Land Office
GPS	geographic positioning system
GRR	General Reevaluation Report
GWP	global warming potential
HCP	habitat conservation plan
HCPs/NCCP	Habitat Conservation Plans/Natural Community Conservation Plan
HEC-RAS	Hydraulic Engineering Center River Analysis System
HFCs	hydrofluorocarbons
HTRW threats	Hazardous, Toxic, or Radioactive Waste
HUC	Hydrologic Unit Code
Hz	Hertz

in/sec	inches per second
IPCC	Intergovernmental Panel on Climate Change
IWM	instream woody material
LCM	life-cycle management
LD	Levee District
L_{dn}	day-night sound level
L_{eq}	equivalent sound level
LFRCMP	Lower Feather River Corridor Management Plan
LL	Liquid Limit
LM	levee mile
L_{min} and L_{max}	minimum and maximum sound levels
LOS	level of service
LPG	liquid propane gas
LRR	Limited Reevaluation Report
L_{xx}	percentile-exceeded sound levels
MAF	million acre-feet
Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation and Management Act
MA	Maintenance Area
MBTA	Migratory Bird Treaty Act
MCL	maximum contaminant level
MG	million gallons
mg/L	milligrams per liter
mgd	million gallons per day
ML	silt
MLD	most likely descendant
MOU	memorandum of understanding
MS4 General Permit	General Permit for Municipal Separate Storm Sewer Systems
MT	metric tons
Mw	expected earthquake magnitudes
N2O	nitrous oxide
NAAQS	national ambient air quality standards
NAGPRA	Native American Graves Protection and Repatriation Act
NAHC	Native American Heritage Commission
NAICS	North American Industry Classification System
NAVD 88	North American Vertical Datum of 1988
NCCP	natural community conservation plan
NEIC	Northeastern Information Center
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NGO	non-governmental organization

NGVD 29	National Geodetic Vertical Datum of 1929
NHPA	National Historic Preservation Act
NLIP	Natomas Levee Improvements Program
NMFS	National Marine Fisheries Service
NO	nitric oxide
NO_2	nitrogen dioxide
NOD	Notice of Determination
NOI	Notice of Intent
NOP	Notice of Preparation
NO_X	oxides of nitrogen
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSF/ANSI	National Sanitation Foundation/American National Standards Institute
NTR	National Toxics Rule
NTU	nephelometric turbidity unit
O&M	operations and maintenance
O_3	ozone
OHWM	ordinary high water mark
OWA	Oroville Wildlife Area
P1GDR	Phase 1 Geotechnical Data Report
P1GER	Phase 1 Preliminary Geotechnical Evaluation Report
PA	programmatic agreement
Pb	lead
PBI	Peterson Brustad Inc.
P-C	Production-Consumption
PCB	Polychlorinated biphenyl
PFC	perfluorocarbon
PG&E	The Pacific Gas and Electric Company
pH	potential of hydrogen
PI	Plasticity Index
PL	Public Law
PM	particulate matter
PM10	particulate matter 10 microns in diameter or less
PM2.5	particulate matter 2.5 microns in diameter or less
ppm	part per million
PPMP	pollution prevention and monitoring program
PPV	peak particle velocity
PRC	Public Resources Code
RD	Reclamation District
Reclamation Board	Reclamation Board of the State of California
RFDG	Recreation Facility Design Guidelines

risk MAP	mapping, assessment, and planning
RM	River Mile
ROD	Record of Decision
ROG	reactive organic gases
ROW	right-of-way
RPW	relatively permanent water
RWQCB	Regional Water Quality Control Board
SacRCEM	Sacramento Roadway Construction Emission Model Version 6.3.2, July 2009
SAFCA	Sacramento Area Flood Control Agency
SB	Senate Bill
SBC	Sutter Butte Canal
SBFCA	Sutter Butte Flood Control Agency
SF6	sulfur hexafluoride
SGDR	Supplemental Geotechnical Data Report
SHPO	State Historic Preservation Officer
SIP	state implementation plan
SM or SC	silty sand and clayey sand
SMARA	Surface Mining and Reclamation Act of 1975
SO2	sulfur dioxide
SPCCP	spill prevention, control, and counter-measure plan
SR	State Route
SRA	Shaded riverine aquatic
SRBPP	Sacramento River Bank Protection Project
SRFCP	Sacramento River Flood Control Project
SSIA	State Systemwide Investment Approach
State Water Board	State Water Resources Control Board
Superfund	Comprehensive Environmental Response, Compensation, and Liability Act
SVAB	Sacramento Valley Air Basin
SWANCC	Solid Waste Agency of Northern Cook County v. United States Army Corps of Engineers
SWIF	system-wide improvement framework
SWMP	Stormwater Management Plan
SWP	State Water Project
SWPPP	stormwater pollution prevention plan
System Evaluation	Sacramento River Flood Control System Evaluation
TACs	toxic air contaminants
TBR	Technical Background Report
TCM	traffic control measure
TDS	total dissolved solids
TMDL	total maximum daily load
TNW	tributaries of navigable waters

TRLIA	Three Rivers Levee Improvement Authority
TSS	Total suspended sediment
UBC	Uniform Building Code
ULDC	Urban Levee Design Criteria
Uniform Act	Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended in 1987
UPRR	Union Pacific Railroad
USACE	U.S. Army Corps of Engineers
USACE Model	USACE Common Features
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UST	underground storage tank
V/C	volume-to-capacity
valley	Sacramento Valley
VELB	valley elderberry longhorn beetle
VFZ	vegetation free zones
WDR	waste discharge requirement
WRDA	Water Resources Development Act
WSAFCA	West Sacramento Area Flood Control Agency
WSE	water surface elevation
WWTP	wastewater treatment plant
Yuba-Sutter NCCP/HCP	Yuba-Sutter Natural Community Conservation Plan and Habitat Conservation Plan
μg/L	micrograms per liter
μS/cm	microSiemens per centimeter

Chapter 1
Introduction

The Sutter Butte Flood Control Agency (SBFCA) is proposing the Feather River West Levee Project (FRWLP, or project) to reduce flood risk in the Sutter Basin, which includes portions of Sutter and Butte Counties in the Sacramento Valley of California.

To protect human health and safety and prevent adverse effects on property and the regional economy, SBFCA was formed as a joint powers authority in 2007 through a joint exercise of powers agreement by the Counties of Sutter and Butte; the Cities of Yuba City, Gridley, Live Oak, and Biggs; and Levee Districts (LDs) 1 and 9. SBFCA was established to coordinate the planning and construction of flood protection facilities and to finance the local share of flood management projects. SBFCA's member agencies as well as the State of California are responsible for the operations and maintenance of the detention basins, pump stations, and levees that protect the area.

In partnership with the State of California (through the Department of Water Resources [DWR] and Central Valley Flood Protection Board [CVFPB]), SBFCA embarked on a comprehensive evaluation of the condition of the levees protecting the area in 2007, the results of which are also being used by the U.S. Army Corps of Engineers (USACE). The evaluation was necessary to identify the magnitude and severity of deficiencies and determine measures to address the deficiencies. The results of the comprehensive evaluation revealed that substantial construction is necessary to meet current flood protection standards.

In light of the flood risk to the area, SBFCA is leading the planning, design, and construction of the FRWLP, in partnership with DWR. This project is being conducted in coordination and parallel with a separate planning study led by USACE in partnership with SBFCA, DWR, and the CVFPB, to determine the Federal interest in a flood risk reduction project in the Sutter Basin. The project is undergoing a feasibility study led by USACE, Sacramento District, as described in Section 1.5.2; this has been termed the *Sutter Basin Pilot Feasibility Study* or *Sutter Basin Feasibility Study*. The FRWLP is being advanced by SBFCA to expeditiously reduce flood risk before the feasibility study is completed and an anticipated recommendation is made to Congress for project authorization and eventual appropriation—typically a lengthy process that may take 10 or more years. SBFCA anticipates that (1) rehabilitation of remaining segments of the levee system (not of covered by FRWLP) would be implemented by USACE and (2) the non-Federal costs SBFCA incurs for the FRWLP will be credited against the remaining non-Federal share of the cost of the project approved under the feasibility study. USACE plans to release for public review a draft integrated study report and environmental impact statement (EIS)/environmental impact report (EIR) in February 2013. The final integrated feasibility study report would then be completed and presented to Congress in 2014. Because the FRWLP and the USACE study may affect the same general area, have similar purposes, and share potential measures and effects, the EIS/EIR prepared for the feasibility study is expected to incorporate by reference much of the information, analyses, and conclusions contained within this document. The EIS/EIR would supplement this EIS/EIR focusing on additional alternatives, their effects, or new information not addressed in this document.

To construct the FRWLP, SBFCA is requesting permission from USACE pursuant to Section 14 of the Rivers and Harbors Act of 1899 (Title 33 of the United States Code [USC], Section 408, [33 USC 408])—hereinafter referred to as *Section 408*—for the alteration of a levee as part of the Sacramento

River Flood Control Project (SRFCP), a Federal work. USACE's authority to grant permission for the FRWLP under Section 408 triggers the requirement for USACE to comply with the National Environmental Policy Act (NEPA). The project is also subject to Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act, whose authorities also lie under USACE. A more detailed discussion of relevant laws, policies, plans, and regulations is included in Chapter 5, *Compliance with Applicable Laws, Policies, and Plans and Regulatory Framework*.

1.1 Document Purpose and Structure

1.1.1 Document Overview

This document is a joint EIS/EIR and is intended to satisfy the requirements of NEPA and the California Environmental Quality Act (CEQA) for disclosing environmental effects and recommended mitigation measures related to a proposed project, and alternatives, prior to making a decision on project approval. Specifically, this document analyzes the FRWLP to support a NEPA Record of Decision (ROD) and CEQA Notice of Determination (NOD).

The following information is provided in this section.

- Background of NEPA and CEQA requirements.
- NEPA and CEQA lead agency roles.
- Use of a combined document for NEPA and CEQA compliance.
- Use of NEPA and CEQA terminology.
- Resource analysis structure.
- Discussion of the vertical datum used in this document.

1.1.2 NEPA and CEQA Requirements

The Council on Environmental Quality's (CEQ's) regulations for implementing NEPA specify that a Federal agency preparing an EIS must consider the effects of the proposed action and alternatives on the environment; these include effects on ecological, aesthetic, historical, and cultural resources as well as economic, social, and health effects. Environmental effects are categorized as direct, indirect, or cumulative. An EIS also must discuss possible conflicts with the objectives of Federal, state, regional, and local land use plans, policies, or controls for the area concerned; energy requirements and conservation potential; urban quality; the relationship between short-term uses of the environment and long-term productivity; and irreversible or irretrievable commitments of resources. An EIS must identify relevant, reasonable mitigation measures not already included in the proposed action or alternatives that could avoid, minimize, rectify, reduce, eliminate, or compensate for the project's adverse environmental effects (40 Code of Federal Regulations [CFR] 1502.14, 1502.16, and 1508.8.).

The State CEQA Guidelines explain that the environmental analysis for an EIR must evaluate impacts associated with the project and identify mitigation for any potentially significant impacts. All phases of a proposed project, including construction and operation, are evaluated in the analysis. Section 15126.2 of the State CEQA Guidelines states:

> An EIR shall identify and focus on the significant environmental effects of the proposed project. In assessing the impact of a proposed project on the environment, the lead agency should normally limit its examination to changes in the existing physical conditions in the affected area as they exist at the time the notice of preparation is published, or where no notice of preparation is published, at the time environmental analysis is commenced. Direct and indirect significant effects of the project on the environment shall be clearly identified and described, giving due consideration to both the short-term and long-term effects. The discussion should include relevant specifics of the area, the resources involved, physical changes, alterations to ecological systems, and changes induced in population distribution, population concentration, and human use of the land (including commercial and residential development), health and safety problems caused by the physical changes, and other aspects of the resource base such as water, historical resources, scenic quality, and public services. The EIR shall also analyze any significant environmental effects the project might cause by bringing development and people into the area affected.

An EIR also must discuss inconsistencies between the proposed project and applicable general plans and regional plans (State CEQA Guidelines Section 15125[d]).

An EIR must describe any feasible measures that could minimize significant adverse impacts, and the measures are to be fully enforceable through permit conditions, agreements, or other legally binding instruments (State CEQA Guidelines Section 15126.4[a]). Mitigation measures are not required for impacts that are found to be less than significant.

1.1.2.1 NEPA Lead Agency

USACE is preparing this EIS for the purposes of compliance with NEPA due to its authority over alteration of Federal project levees. That authority, pursuant to Section 14 of the Rivers and Harbors Act of 1899 (33 USC 408), is commonly referred to as *Section 408 approval* and is the nexus for USACE's responsibility for NEPA compliance. Through that Federal nexus, NEPA and the CEQ's NEPA implementing regulations require Federal agencies to evaluate the environmental impacts of a proposed Federal action. In this case, USACE's decision to provide Section 408 approval to SBFCA (via CVFPB) is the Federal action that triggers USACE's designation as lead agency under NEPA. Furthermore, since SBFCA's FRWLP is not a USACE civil works project, USACE's responsibilities are limited to NEPA compliance, Section 408 approval, and compliance with other applicable laws such as the Endangered Species Act and National Historic Preservation Act, and consideration of future crediting based on the outcome of the Feasibility Study. USACE has no responsibilities for funding, design, or project implementation and construction.

USACE has further authority relative to the FRWLP under Section 10 of the Rivers and Harbors Act of 1899 for potential effects in, under, or over navigable waters and Section 404 of the Clean Water Act for potential placement of dredged or fill material in jurisdictional waters. This document executes NEPA compliance for all USACE project authorities.

1.1.2.2 CEQA Lead Agency

SBFCA is the lead agency and implementing agency preparing this EIR for the purposes of compliance with CEQA. Pursuant to Section 15126(d) of the State CEQA Guidelines, an EIR must describe and evaluate a reasonable range of alternatives that would feasibly attain most of the basic project objectives and would avoid or substantially lessen any significant impact of the project as proposed.

1.1.3 Application of NEPA and CEQA Principles and Terminology

NEPA and CEQA are similar in that both laws require the preparation of an environmental study to evaluate the environmental effects of proposed government activities. However, there are several differences between the two regarding terminology, procedures, environmental document content, and substantive mandates to protect the environment. For this environmental evaluation, the more rigorous of the two laws was applied in cases in which NEPA and CEQA differ.

Table 1-1 below compares the terminology of NEPA and CEQA for common concepts.

Table 1-1. Key to General NEPA and CEQA Terminology

NEPA Term	Correlating CEQA Term
Lead agency	Lead agency
Cooperating agency	Responsible agency
Environmental impact statement	Environmental impact report
Record of decision	Findings
Preferred alternative	Proposed project
Project purpose	Project objectives
No Action alternative	No project alternative
Affected environment	Environmental setting
Effect/impact	Impact

In some cases in this document, both NEPA and CEQA terminology are used, as in this chapter where the project purpose and need and project objectives are discussed. The terms *environmental consequences, environmental impacts,* and *environmental effects* are considered synonymous in this analysis, and *effects* is used for consistency. Similarly, in general, the terms *significant* and *less than significant* are used rather than *adverse* and *not adverse*.

Technical terms used in the EIS/EIR are typically defined in their first instance of use in the text. A list of acronyms and abbreviations precedes this chapter. An index follows Chapter 9.

1.1.4 Resource Analysis Structure

Chapter 3, *Affected Environment and Environmental Consequences*, contains the project-level analyses for the FRWLP, following the structure below.

- **Introduction.** This section introduces the scope of the resource analysis.
  - **Sources of Information.** This section lists the sources of information pertinent to the analysis of project impacts on this specific resource.
- **Affected Environment.** This section includes two sections, *Regulatory Setting* and *Environmental Setting*.
  - **Regulatory Setting.** This section summarizes laws, regulations, and policies that affect the resource or the assessment of effects on the resource. Often the regulatory framework is the basis for the conclusion of the level of significance and therefore plays a crucial role in effect

assessment. Appendix A provides a more exhaustive description of potentially applicable regulations, including local policies from municipal general plans and ordinances.

- **Environmental Setting.** This section provides an overview of the physical environmental conditions in the area at the time of or prior to the publication of the Notice of Preparation that could be affected by implementation of the proposed alternatives in accordance with NEPA regulations (40 CFR 1502.15) and State CEQA Guidelines Section 15125.

- **Environmental Consequences.** This section describes the analysis of effects relating to each resource area for each of the alternatives in accordance with NEPA regulations (40 CFR 1502.16) and with State CEQA Guidelines Section 15126, 15126.2, and 15143.
  - **Assessment Methods.** This section describes the methods, models, process, procedures, data sources, and/or assumptions used to conduct the effect analysis. Where possible, effects are evaluated quantitatively. Where quantification is not possible, effects are evaluated qualitatively.
  - **Determination of Effects.** This section provides the criteria used in this document to define the level at which an effect would be considered significant in accordance with CEQA and adverse in accordance with NEPA. Significance criteria (sometimes called thresholds of significance) used in this EIS/EIR are based on the checklist presented in Appendix G of the State CEQA Guidelines; factual or scientific information and data; and regulatory standards of Federal, state, and local agencies. Under NEPA, preparation of an EIS is triggered if a Federal action has the potential to "significantly affect the quality of the human environment," which is based on the context and intensity of each potential effect. The significance thresholds used in this EIS/EIR also encompass the factors taken into account under NEPA to evaluate the context and the intensity of the effects of an action.
  - **Effects and Mitigation Measures.** To comply with NEPA and CEQA, effects are considered and evaluated as to whether they are direct, indirect, or cumulative. Direct effects are those that are caused by the action and occur at the same time and place. Indirect effects are reasonably foreseeable consequences to the physical environment that may occur at a later time or at a distance from the project area. Because direct and indirect effects are often interrelated, typically there is no distinction made between the two in the effects discussion. Cumulative effects for all resource areas are combined and discussed in Chapter 4, *Growth-Inducing and Cumulative Effects*.

    Effects are listed numerically and sequentially throughout each section. An effect statement precedes the discussion of each effect and provides a summary of the effect topic. The numbering system provides a mechanism for tracking unique effects by resource area.

    Each effect is accompanied by a finding or conclusion, as required under NEPA and CEQA. Table 1-2 provides a key for relating the effect findings by relative severity (increasing in degree of adversity to the environment).

Table 1-2. Key to Effect Findings (by increasing adversity)

Finding
Beneficial
No Effect
Less than significant
Significant
Significant and unavoidable

For the purposes of the analyses in this document, the effect findings are defined more specifically below.

- **Beneficial.** This effect would provide benefit to the environment as defined for that resource.
- **No Effect.** This effect would cause no discernible change in the environment as measured by the applicable significance criterion; therefore, no mitigation would be required.
- **Less than Significant.** This effect would cause no substantial adverse change in the environment as measured by the applicable significance criterion; therefore, no mitigation would be required.
- **Significant.** This effect would cause a substantial adverse change in the physical conditions of the environment. Effects determined to be significant based on the significance criteria fall into two categories: those for which there is feasible mitigation available that would avoid or reduce the environmental effects to less-than-significant levels and those for which there is either no feasible mitigation available or for which, even with implementation of feasible mitigation measures, there would remain a significant adverse effect on the environment. Those effects that cannot be reduced to a less-than-significant level by mitigation are identified as significant and unavoidable, described below.
- **Significant and Unavoidable**. This effect would cause a substantial adverse change in the environment that cannot be avoided or mitigated to a less-than-significant level if the project is implemented. Even if the effect finding is still considered significant with the application of mitigation, the applicant is obligated to incorporate all feasible measures to reduce the severity of the effect.
- **Mitigation Measures.** Measures to mitigate (i.e., avoid, minimize, rectify, reduce, eliminate, or compensate for) significant effects accompany each effect discussion. Similar to the effect descriptions, mitigation measures are listed numerically and sequentially throughout each section. A mitigation measure statement precedes the discussion of each measure and provides a summary of the measure topic. The numbering system provides a mechanism for tracking unique measures by resource area.

1.1.5 Elevation Datum Used in This Document

Elevations used in this document are referenced to the North American Vertical Datum of 1988 (NAVD 88) to the greatest extent feasible. It should be noted that many of the studies cited in the alternatives descriptions and analyses were originally conducted in the National Geodetic Vertical Datum of 1929 (NGVD 29) and have been converted where feasible. In some cases, such as where a figure has been borrowed from another study, the elevations have not been converted to preserve the integrity of the source study.

1.2 Setting and Study Area

The regional setting of the FRWLP is the SRFCP, beginning as far north as Redding, California, and extending south to the Sacramento–San Joaquin River Delta (Delta) (Plate 1-1). The regional setting is important relative to other flood risk reduction projects occurring within the SRFCP, namely USACE's Sutter Basin Feasibility Study, American River Common Features Project, West Sacramento Project, and Yuba Basin Project, and the non-Federally led Natomas Levee Improvement Program as well as other projects undertaken by the Sacramento Area Flood Control Agency (SAFCA), projects undertaken by the Three Rivers Levee Improvement Authority (TRLIA), and projects undertaken by the West Sacramento Area Flood Control Agency (WSAFCA) (Plate 1-2). These and other projects are described under Section 1.5, *Related Actions, Programs, and Planning Efforts*. For the analysis of effects (direct, indirect, or cumulative), the regional context of the SRFCP is taken into consideration.

Scoping down in regional setting, the Sutter Basin is part of the SRFCP, located in north-central California in Sutter and Butte Counties. The elongated, irregularly shaped basin covers about 326 square miles and is about 44 miles long north to south and up to 14 miles wide east to west. It is roughly bounded by the Feather River (to the east), Cherokee Canal, the Sutter Buttes, and Sutter Bypass (to the west, listed from north to south). Floodwaters potentially threatening the basin originate from the Feather River watershed or the upper Sacramento River watershed, above Colusa Weir. These waterways have drainage areas of 5,921 and 12,090 square miles, respectively. In addition to Yuba City, communities in the basin include Biggs, Gridley, Live Oak, and Sutter.

The project area for the FRWLP, a subset of the Sutter Basin described above, is focused on the corridor along the west levee of the Feather River from Thermalito Afterbay on the north to approximately 4 miles north of the Sutter Bypass on the south. This corridor is roughly 500 feet toward the land side of the existing levees and 100 feet toward the water side. This corridor was determined as the area in which levee improvements, such as seepage berms, stability berms, relief wells, setback levees, erosion protection, and slurry cutoff walls, are likely to occur. The corridor is approximately 41 miles long, divided into 41 relatively homogeneous reaches for ease of describing existing conditions, proposed actions, the affected environment, and potential environmental effects (note that this number is coincidental and one reach does not consistently correspond to a length of 1 mile; also, Reach 1 is not a part of the FRWLP), shown on Plates 1-3a and 1-3b. The project area would also include borrow/spoil sites or project mitigation sites outside of this corridor, as further described in Chapter 2, *Alternatives*. The reaches are listed in Table 1-3. Plates 1-4 through 1-10 show representative photos of the project area.

For the purposes of this document, the *study area* and *planning area* are considered the same, defined as the area within SBFCA's planning authority in which potential actions would occur and where environmental effects are likely to occur. The *project area* is defined as the area in which potential actions (i.e., alternatives) would occur. The *affected area* is defined as the location of resources that would be directly, indirectly, or cumulatively affected by the project alternatives.

Table 1-3. Summary of Study Reaches

Reach	Beginning Station	Ending Station	Length (feet)	Landmarks	Dominant Adjacent Land Uses
1	0+00	202+50	Not part of the project proposed at this time.		
2	202+50	218+66	1,616		Ruderal grassland; open space
3	218+66	300+66	8,200	Cypress Avenue	Ruderal grassland; open space
4	300+66	410+67	11,001	Central Street; Wilkie Avenue	Orchard; ruderal grassland; riparian forest
5	410+67	478+68	6,801	Wilkie Avenue	Orchard
6	478+68	510+37	3,169	Star Bend	Orchard
7	510+37	596+00	8,563	Abbott Lake	Ruderal grassland; open space
8	596+00	654+75	5,875		Ruderal grassland; open space
9	654+75	706+50	5,175	Boyd's Boat Launch; Nursery	Ruderal grassland; open space
10	706+50	774+00	6,750	Barry Road	Ruderal grassland; open space
11	774+00	830+00	5,600		Ruderal grassland; open space
12	830+00	845+00	1,500	Shanghai Bend	Ruderal grassland; open space
13	845+00	927+00	8,200		Ruderal grassland; open space
14	927+00	954+40	2,740	Airport	Ruderal grassland; open space
15	954+40	968+50	1,410	Airport	Developed; ruderal grassland
16	968+50	1080+00	11,150	Garden Highway, 2nd Street; Twin Cities Memorial Bridge; Colusa Avenue	Developed; ruderal grassland
17	1080+00	1130+86	5,086	Live Oak Boulevard; Union Pacific Railroad	Developed; ruderal grassland
18	1130+86	1213+85	8,299	Live Oak Boulevard; Union Pacific Railroad; Rednall Road	Orchard
19	1213+85	1297+83	8,398		Orchard
20	1297+83	1374+33	7,650		Orchard; ruderal grassland
21	1374+33	1433+83	5,950		Ruderal grassland
22	1433+83	1503+83	7,000		Riparian forest; ruderal grassland
23	1503+83	1609+37	10,554		Orchard
24	1609+37	1623+86	1,449		Riparian forest; ruderal grassland
25	1623+86	1674+37	5,051		Orchard; ruderal grassland
26	1674+37	1707+11	3,274		Orchard
27	1707+11	1721+60	1,449		Ruderal grassland
28	1721+60	1769+31	4,771		Orchard
29	1769+31	1813+33	4,402		Orchard; riparian forest
30	1813+33	1902+00	8,867		Orchard
31	1902+00	1958+00	5,600		Orchard; ruderal grassland
32	1958+00	1989+00	3,100		Orchard
33	1989+00	2122+00	13,300		Orchard
34	2122+00	2182+00	6,000		Orchard

Reach	Beginning Station	Ending Station	Length (feet)	Landmarks	Dominant Adjacent Land Uses
35	2182+00	2224+00	4,200		Orchard; ruderal grassland
36	2224+00	2259+00	3,500		Orchard; ruderal grassland
37	2259+00	2290+00	3,100		Orchard; ruderal grassland
38	2290+00	2303+00	1,300		Ruderal grassland
39	2303+00	2319+00	1,600		Ruderal grassland
40	2319+00	2359+00	4,000		Ruderal grassland
41	2359+00	2368+00	900	Thermalito Afterbay	Ruderal grassland

Note: Certain planning and engineering studies for the project make reference to segments within the planning area under which the reaches above are grouped. These segment designations do not have substantial bearing on the alternatives descriptions, environmental setting, or determination of effects and therefore are not used in this document for simplicity.

1.3 Project Background

1.3.1 Flood Management History

Prior to European settlement in the mid-19th century, the floodplain of the Sacramento River in the 150 miles between the city of Redding and the Delta varied from 2 to 30 miles wide and annually covered more than 1 million acres. Low, discontinuous levees were built by individual landowners from the 1840s to the 1890s. Those levees concentrated floodflows and contributed to problems that were worsened by upstream hydraulic mining in the Sierra Nevada foothills in the late 1800s.

The SRFCP was authorized by Congress in 1917 as the first Federal flood control project outside the Mississippi River Valley and was the major project for flood control on the Sacramento River and its tributaries. The non-Federal sponsor was the Reclamation Board of the State of California (Reclamation Board, reauthorized in 2007 as the CVFPB). With the authorization of the SRFCP, USACE and the State of California began managing the project as a regional system, constructing improvements to approximately 1,100 miles of levees and creating bypasses and floodways. Additional information is provided in the environmental setting discussion of Section 3.1, *Flood Control and Geomorphic Conditions*.

Although the flood control structures have been extensively improved and upgraded since construction, the underlying foundation of most of the levees and channels pre-dates any state or USACE involvement and still retains the original materials that include dredged riverbed sands, soil, and organic matter. At the time of the SRFCP authorization in 1917, the areas being protected by the levees were primarily agricultural with minimal improved infrastructure such as railroads and highways. Today, the area remains largely agricultural with population centers including Yuba City, Biggs, Gridley, Live Oak, and Sutter.

The Federal government maintains oversight but has no ownership of or direct responsibilities for performing maintenance of the Federal levee system, except for a few select features that continue to be owned and operated by USACE. Considering these exceptions, the great majority of levees, channels, and related flood control structures are owned, operated, and maintained by the State of

California and local levee and reclamation districts as governed by USACE operations and maintenance (O&M) manuals. Most of the levee and reclamation districts existed prior to the SRFCP authorization in 1917 and have been carrying out maintenance responsibilities. Today, many of the levee districts are substantially underfunded and unable to maintain the system to meet current Federal standards. The levees in the planning area are maintained by LD 9; DWR's Maintenance Areas (MAs) 3, 7, and 16; and LD 1. The May 1955 Standard Operations & Maintenance Manual for the Sacramento River Flood Protection Project is the primary O&M manual for the area, in addition to four supplemental manuals completed in August 1955 that cover the area from Western Canal Intake (Thermalito Afterbay) to the Sutter Bypass. Two additional supplements were prepared for habitat mitigation, one in 2003 for seven sites in or near the study area and one in 2011 for the Star Bend project (described below). MA 3 is responsible for the lowermost reaches of the project area, followed by LD 1, LD 9, MA 16, and MA 7 from south to north.

In addition to the SRFCP levee system, two major flood management reservoirs are located within the Feather River watershed. Oroville Dam and reservoir (Lake Oroville) were constructed on the Feather River in 1967 as an element of the California State Water Project. The reservoir has 3,358,000 acre-feet of storage with 750,000 acre-feet of dedicated flood management space. New Bullards Bar Dam and reservoir were constructed on the Yuba River in 1970 by the Yuba County Water Agency. The reservoir has 966,000 acre-feet of storage with 170,000 acre-feet of dedicated flood management space.

A notable milestone in improving the local levee system was construction of a 3,000-foot setback levee at Star Bend on the Feather River West Levee in 2009. Located about 10 miles south of Yuba City and north of the Sutter Bypass confluence, this project is within the FRWLP project area, and the proposed FRWLP activities would adjoin the new setback levee upstream and downstream. LD 1 is the local maintaining agency and was the project proponent and owner, with major funding from the State of California through Propositions 1E and 84, as well as LD 1, Calpine Corporation, Sutter County, and the City of Yuba City. The new levee was built to current standards and included a slurry cutoff wall for under-seepage protection. The old levee was degraded, and the new expanded floodplain is an ecosystem restoration site with surplus area available intended to provide for habitat mitigation for the FRWLP.

Major flood events occurred along the Feather River in 1955, 1958, 1964, 1986, 1997, and 1998. Of these, the more significant events that caused levee failures and flooding of the Sutter Basin and surrounding areas were in 1955, 1986, and 1997. In December of 1955, the most significant flood event along the Feather River is reported to have occurred. Several levee embankment failures caused major flooding of nearly all of Yuba City as well as flooding in Nicolaus. Approximately 156 square miles were flooded during this event. In February of 1986, heavy snow pack and warm rains elevated water levels and caused a levee embankment failure on the adjacent segment of the Yuba River near Linda, flooding nearly 30 square miles including Linda and Olivehurst, causing a fatality and an estimated $20 million in damages (1986 dollars). Over the new-year transition from 1996 to 1997, heavy snow pack and warm rains again elevated water levels. All citizens in Yuba City, Marysville, Linda, and Olivehurst were ordered to evacuate. Ultimately, in January of 1997, a levee embankment failure occurred south of Olivehurst flooding nearly 50 square miles including Olivehurst and Arboga, causing four fatalities and an estimated $41 million in damages (1997 dollars). (HDR et al. 2011.)

Over that past two decades, several studies have been conducted by USACE, DWR, or SBFCA to evaluate the condition of the levees protecting the planning area relative to criteria for stability, seepage, erosion, geometry, and levee height. These studies have indicated that the levee system is deficient and that the consequences of levee failure from a major flood event would be significant (described under the No Action Alternative in Chapter 2). Specifically, as a result of knowledge gained from its regional comprehensive study (the Sacramento–San Joaquin River Basins Comprehensive Study, also known as the Comp Study) initiated after the 1997 flood, USACE revised its levee criteria regarding through-seepage and under-seepage, problems known to exist within the SBFCA levee system (U.S. Army Corps of Engineers and the Reclamation Board for the State of California 2002).

Further evaluation has demonstrated that much of the existing system does not provide protection from the 100-year flood event, the commonly accepted minimum level of flood protection per the Federal Emergency Management Agency's (FEMA's) National Flood Insurance Program (NFIP), as well as being less than the 200-year level targeted by the State of California for urban areas. In addition, an emergency preparedness mapping study analyzed hypothetical levee failures and determined the rate and depth at which water would flood SBFCA's planning area if a levee failure occurred in the studied reaches; this study predicted flooding depths that could range from about 1 foot to more than 20 feet in some areas.

According to records from the local maintaining agencies (MAs and LDs) compiled by the SBFCA engineering team, there have been more than 125 observed levee performance problem locations in the project area since 1955. These problems include seepage, boils, erosion, boils, breaks, and cracks. This accounting includes the catastrophic floods of 1955, 1986, and 1997.

1.3.2 Overview of Levee Failure Mechanisms and Deficiencies

As discussed above, USACE, DWR, and SBFCA have commissioned studies to determine the type, location, and severity of deficiencies in the SBFCA flood management system. In simple terms, floods typically occur from levee failure mechanisms and deficiencies such as when one of the following events occurs.

- Water moves through the levee structure (through-seepage).
- Water moves under the levee structure (under-seepage).
- Levee slopes are overly steepened or levees have inadequate section to resist floodwaters or other forces (slope stability and geometry).
- Water carries soil away from the levee slope (erosion).
- Vegetation and other encroachments, such as structures, impede levee O&M (non-compliant vegetation and levee encroachments).

These failure mechanisms and deficiencies are more fully described below, preceded by a table of the deficiencies by reach (Table 1-4). Plate 1-11 illustrates levee seepage and Plate 1-12 illustrates other typical deficiencies.

Note: Additional information on the deficiencies can be found in a pre-design formulation report (HDR et al. 2011). The deficiencies and alternatives have been refined and focused through progressive stages in the planning process to form the basis of the purpose, need, objectives, and proposed activities that are the foundation of the EIS/EIR; and, therefore, may differ slightly among these documents.

Table 1-4. Summary of Levee Deficiencies by Reach

Study Reach	Through-Seepage[a]	Under-Seepage[b]	Slope Stability[c]	Erosion	Encroachments
1	Not part of the project proposed at this time.				
2	X	X	*		X
3	X	X	*		X
4	X	X	*		X
5	X	X	*		X
6					
7	X	X	*		X
8	X	X	*		X
9	X	X	*		X
10	X	X	*		
11	X	X	*		X
12					
13	X	X	*		
14					
15	X	X	*		X
16			X	X	X
17	X	X	*		X
18	X	X	*		X
19	X	X	*		X
20		X	*		X
21		X	*		X
22	X	X	*		X
23		X	*		X
24		X	*		X
25					
26	X	X	*		X
27	X	X	*		X
28		X	X		X
29					
30	X	X	*		X
31		X	X		X
32	X	X	*		X
33	X	X	*		X
34	X	X	*		X
35	X	X	*		X
36	X	X	*		X
37	X	X	*		X
38	X	X	*		X
39					
40	X	X	*		X
41	X	X	*		X

Source: HDR et al. 2011.
Notes: An X signifies the levee deficiency applies to the levee reach.
[a] Through-seepage issues based on phreatic surface existing on the landside slope.
[b] Under-seepage issues based on exit gradient greater than 0.5 at the landside levee toe.
[c] An * signifies areas where through- and under-seepage issues exist and slope stability was not independently verified.

1.3.2.1 Through-Seepage

Through-seepage occurs when water moves outward from the river channel through the levee cross section (Plate 1-11). The key problem associated with through-seepage is levee breach or collapse, which occurs when the earthen material within the levee is transported by the pressure of the seeping water. Soil piping can also occur as the result of seepage. Soil piping is when a hole in a levee becomes exploited by moving water (which naturally seeks the path of least resistance), causing the hole to increase rapidly and threaten the levee integrity. Several factors contribute to through-seepage, including high water pressure (such as during periods of high water in the river or bypass), and pervious earth material (i.e., sandy soils) within or underlying the levee.

1.3.2.2 Under-Seepage

Similar to through-seepage, under-seepage occurs when water moves outward and downward from the river channel below the levee and surrounding land surface (Plate 1-11). The key problem with under-seepage occurs when the earth particles which compose the levee foundation are transported from underneath the levee due to the pressure of the seeping water. This undermining of the levee may result in levee instability or collapse. As with through-seepage, soil piping may occur and cause the levee to breach or collapse, threatening overall levee integrity. Evidence of under-seepage can often be seen as boils on the land surface on the landward side of the levee. The factors that contribute to under-seepage are the same as those discussed above in through-seepage.

1.3.2.3 Slope Stability

Slope stability is a desirable quality and refers to the resistance of the levee slope to change (landside or waterside). A slope that has an unfavorable horizontal to vertical ratio can be unstable and vulnerable to slipping or sloughing, exacerbated by high flood water elevations. Generally, the approach to determining slope stability can be divided into two categories: steady state and rapid drawdown. Steady state assumes that the flood-stage water surface is present for a significant duration, and the presence of water in the levee and the weakening of the levee interior due to through-seepage can cause the landside slope of the levee to slip and wash away. Rapid drawdown also assumes that the flood-stage water surface is present for a significant amount of time, and then is removed quickly as if the river were drained. The water remaining within the levee section weakens the integrity of the levee and when the water surface drops, the waterside slope is vulnerable to slipping and washing away.

1.3.2.4 Erosion

Erosion is the loss of levee material typically from the force of flowing water, which may be exacerbated by high water velocities, waves, wind action, and boat wake. The high variability in levee soil material, water surface elevation, flow velocities, and relationship of the levee to the active channel results in commensurate variation in the point at which the levee is at risk (e.g., at lower flows, the levee toe is at risk to erosion; at high flows, the levee face may be at risk).

1.3.2.5 Levee Encroachments

Federal project levees, like those on the Feather River, are subject to USACE O&M standards. These standards are outlined in general policies and technical publications that universally apply to all Federal project levees and in project-specific O&M manuals. Recent general guidance from USACE provides greater specificity for the location, type, and degree of encroachments and vegetation allowable on or near levees. USACE has a levee vegetation policy, detailed in Engineering Technical Letter 1110-2-571, Guidelines for Landscape Planting and Vegetation Management at Levees, Floodwalls, Embankment Dams, and Appurtenant Structures (ETL), which generally prohibits woody vegetation within the levee prism or within 15 feet of the landside or waterside levee toes (U.S. Army Corps of Engineers 2009).

Under certain circumstances, encroachments and vegetation can exacerbate local erosion (factoring stage, discharge, and bank configuration, single trees, or other encroachments can affect near-bank velocities such that localized scour could occur), limit the ability to observe levee performance, impair O&M practices, and otherwise affect levee integrity. Encroachments may include penetrations (e.g., pipes, conduits, and cables), power poles, pump stations, retaining walls, or similar features.

It should be noted that not all encroachments or non-compliant vegetation in the project area would be addressed by the FRWLP. The FRWLP is primarily targeted at addressing known geotechnical deficiencies (such as seepage and slope stability), which are generally regarded as posing the most substantial risk to levee failure and flooding. Unlike some other areas of the Central Valley (such as much of the Sacramento River) the Feather River West Levee is largely ETL-compliant in its current condition because of local O&M practices and because the levee is considerably distant from the active channel of the Feather River, allowing for floodplain habitat that does not encroach on the levee. Therefore, as part of the FRWLP, SBFCA proposes to remove only that vegetation that is in the direct disturbance footprint of the project for constructing levee improvements to address other deficiencies. SBFCA is working cooperatively with the State of California and USACE for a long-term solution to address other non-compliant vegetation and encroachments, and, because Section 408 permission does not require ETL compliance outside of the disturbed areas, any future activity for ETL compliance is not part of the FRWLP nor is a variance being requested at this time. However, all vegetation will be removed from within the FRWLP construction footprint under all action alternatives, and will not be replaced in a manner that does not comply with the ETL.

Long term beyond the FRWLP, SBFCA supports and has an ultimate goal toward woody vegetation management consistent with the CVFPP, which proposes that levees with preexisting woody vegetation would be managed according to levee vegetation inspection criteria. That long-term CVFPP vegetation management strategy is defined below.

The inspection criteria establish a vegetation management zone in which trees are trimmed up to 5 feet above the ground (12-foot clearance above the crown road) and thinned for visibility and access. Brush, weeds, or other such vegetation over 12 inches high are to be removed in an authorized manner. The vegetation management zone includes the entire landside levee slope plus 15 feet beyond the landside toe (or less, if the existing easement is less than 15 feet), the levee crown, and the top 20 feet (slope length) of the waterside levee slope.

Waterside vegetation below the vegetation management zone should remain in place without trimming or thinning, unless it poses an unacceptable threat to levee integrity.

The CVFPP proposes a long-term, adaptive, vegetation life-cycle management (LCM) plan that would lead to the eventual elimination of trees and other woody vegetation through removal of immature trees and woody vegetation. LCM would be implemented in the vegetation management zone, as described above.

This plan would allow existing “legacy” trees and other woody vegetation beyond a certain size to live out their normal life cycles on the levee, unless they pose an unacceptable threat. Under the LCM plan, removing immature trees and woody vegetation less than 4 inches in diameter at breast height would be conducted in consultation with the appropriate resources agencies.

Per the draft Urban Levee Design Criteria (California Department of Water Resources 2012), before any tree removal, an engineering inspection and evaluation should be conducted to identify trees and woody vegetation (alive or dead) that pose an unacceptable threat to the integrity of the levee.

1.3.2.6 Levee Height

Levee height is not a deficiency in the planning area. The levees on the Feather River were substantially built prior to construction of Lake Oroville, a major reservoir upstream on the river. The effect of Lake Oroville is that it at least partially attenuates flows in the watershed, resulting in lower water surface elevation in the river during peak flows than it would be without the reservoir. Therefore, because the levee heights in the project area were determined prior to construction of the reservoir and designed for a higher water surface elevation in the river than current conditions, levee height is not a deficiency in the project area.

1.3.3 Formation of SBFCA and Development of the FRWLP

Currently, there are several major flood risk-reduction projects being planned or implemented within the SRFCP area (Plate 1-2), discussed in further detail under Section 1.5, *Related Actions, Programs, and Planning Efforts*.

SBFCA was formed in 2007 to take a proactive rather than reactive stance with respect to flood risk reduction specific to the Sutter Basin area. At that time, FEMA was revising its Flood Insurance Rate Maps (FIRMs) in the study area through a nationwide program entitled RiskMAP (mapping, assessment, and planning) that would likely lead to the study area being mapped within the 100-year floodplain. This would make flood insurance mandatory for all Federally guaranteed loans and restrict development. SBFCA concluded that it was necessary to perform a comprehensive evaluation of the Feather River West Levee to determine the current level of flood protection based on current engineering criteria, determine the magnitude and severity of any deficiencies, and develop recommended strategies for improvement.

As introduced previously, specific levee deficiencies along the Feather River West Levee are through-seepage, under-seepage, erosion, levee instability, and encroachments. There are also improvement needs for long-term O&M of the flood management corridor. The FRWLP as proposed by SBFCA will address these deficiencies and needs for that portion of the perimeter of the planning area to assist in incrementally reducing local flood risk.

In addition, other factors prompted SBFCA to embark on the FRWLP.

- State of California Senate Bill (SB) 5 (signed by Governor Schwarzenegger in October 2007 and enacted as California Water Code Sections 9600 through 9603, 9610 through 9616, and 9620 through 9625) requires 200-year flood protection for urban areas by the year 2025. The time and effort required to fully evaluate approximately 41 miles of levees, develop recommended measures, and implement those measures prompted action without further delay.
- The Federal authorization and appropriation process to approve funding and begin evaluation can be lengthy. Through the civil works process, a feasibility study is being conducted by USACE and its non-Federal sponsors for the Sutter Basin Feasibility Study. SBFCA is serving as a non-Federal sponsor for this effort in coordination with CVFPB. The feasibility study is more fully

described in Section 1.5.2. In light of these circumstances, SBFCA launched the FRWLP in a parallel process to address urgent needs. SBFCA would construct the FRWLP in advance of USACE's project being studied under the Sutter Basin Feasibility Study. In combination, the FRWLP and actions under the Sutter Basin Feasibility Study would comprehensively address the deficiencies and needs for flood risk reduction for the entire planning area.

In July 2010, SBFCA formed an assessment district to raise local funds for levee improvements and repairs from property owners. The majority of funding to improve the levees will be obtained through state and local assistance; Federal crediting is being pursued. The property owners recognized the flood risks and indicated their willingness to participate in improvements by voting to approve an annual parcel assessment in 2010. This funding source facilitated SBFCA's advancement of the FRWLP.

1.4 Project Purpose, Objectives, and Need

1.4.1 Project Purpose

SBFCA's goal is to achieve a minimum of 200-year flood protection for the more urbanized areas with population centers and 100-year for the remaining more rural agricultural parts of the planning area. A 200-year flood is a flood that has a 0.5% chance of occurring in any given year, also referred to as a 0.5% annual exceedance probability (AEP). A 100-year flood has a 1% AEP.

The primary purpose of the FRWLP is to reduce flood risk for the entire planning area by addressing known levee deficiencies along the Feather River West Levee from Thermalito Afterbay downstream to approximately 4 miles upstream of the confluence with the Sutter Bypass. While the FRWLP would not by itself reduce all flood risks affecting the planning area, it would address the most immediate risk based on the following.

- The proximity of the Feather River to population centers and key infrastructure.
- The nature of Feather River West Levee being the longest and most contiguous portion of the planning area perimeter.
- The location of known levee deficiencies and the clarity and feasibility of available measures to address them.

Future phases may be implemented by SBFCA in coordination with the State of California and USACE based on available funding, the outcome of the Sutter Basin Feasibility Study, and implementation of the Central Valley Flood Protection Plan (CVFPP) and other flood management programs (or multi-objective programs that include flood management).

1.4.2 Project Objectives

The following objectives provide additional detail in support of the project purpose above.

- Protect existing populations and minimize exposure to flooding for agricultural commodities, infrastructure use, and other property.
- Reduce flood risk from Feather River toward a target of 200-year protection for Yuba City and to the north of the planning area and 100-year protection south of Yuba City, in compliance with SB 5 mandates for 200-year protection for urbanized areas.

- Address known deficiencies and observed performance issues.
- Construct a project as soon as possible to reduce flood risk as quickly as possible.
- Construct a project that is economically, environmentally, politically, and socially acceptable.
- Facilitate compatibility with the CVFPP and Sutter Basin Feasibility Study such that proposed activities would be "no regrets" and not inconsistent with any future plans.
- Facilitate compatibility with recreation and restoration goals in the planning area.

1.4.3 Need for Action

Four needs have been identified for action.

- Study results from levee evaluations have shown that the Feather River West Levee needs improvements to reduce the current level of risk to human health, safety, property, and the adverse economic effect that serious flooding would cause.
- Study results have further shown that the levees in SBFCA's planning area, and, specifically, that on the west of the Feather River, are deficient when compared against current Federal and state standards.
- Improvements are necessary to meet FEMA's minimum acceptable level of flood protection (commonly referred to as the 100-year flood) as specified by the NFIP. Draft revised FEMA maps show that all or parts of SBFCA's planning area may not meet 100-year flood standards. SBFCA intends to incrementally reduce risk to meet or exceed the FEMA standards.
- As mandated by SB 5, the CVFPB will require a 200-year level of flood protection for urban areas by the year 2025 and calls for building and development limitations after 2015 if adequate progress towards achieving this standard is not met. Improvements to the Feather River West Levee are necessary to meet that requirement.

To further demonstrate the need for action, details about flood risk in SBFCA's planning area and the consequences of levee failure are described in Chapter 2, *Alternatives*. Some of the key infrastructure and facilities in study area that are at risk for flooding are listed in Table 1-5.

Table 1-5. Key Infrastructure and Facilities in SBFCA's Planning Area

Police	
California Highway Patrol (Yuba City)	Yuba City Police Department
Gridley/Biggs Police Department	U.S. Air Force Police
Marysville Police Department	
Fire	
Biggs Fire Department	Oswald-Tudor Fire Department
East Nicolaus Fire Department	Solon Fire Control
Feather River Surgery Center	
Gridley Fire Department	Sutter County Fire Department (Live Oak, CA)
Linda Fire Department	Sutter County Fire Department (Sutter, CA)
Live Oak Fire Department	Walton Fire Department (Clark Avenue)
Marysville Fire Department	Walton Fire Department (Butte House Road)
Northtree Fire International	Yuba City Fire Department
Emergency	
Ambulance Service Bi-County	Peach Tree Clinic Inc.
American Red Cross of Northeastern California	Phillips Lifeline Inc.
Biggs-Gridley Memorial Hospital	Rideout Memorial Hospital (Marysville)
California Emergency Physicians	Sutter North Urgent Care
Families First Urgent Care and Weight Loss Center	Rideout Memorial Hospital (Gridley)
Fremont-Rideout Urgent Care Center	Yuba County Emergency Services
Marysville Immediate Care	Yuba Sutter Call Center
Transportation	
Sutter County Airport	
Energy Companies	
Calpine Corporation	Yuba City Energy Center
Agricultural Labs	
Boeger Bros Rice Dryer	Sutter Rice Co
Rice Experiment	
Agricultural Packing	
Feather River Packing	Sunrise Kiwi Packing (Biggs)
Golden Valley Fruit Packing	Sunrise Kiwi Packing (Gridley)
Gridley Packing Inc.	Sunsweet Growers, Inc.
Packing Shed LLC	Valley View Packing Co
Rio Pluma Co LLC	Wilbur Packing Co Inc.
Sacramento Packing Inc. (Tudor Road)	Wil-Ker-Son Ranch & Packing Co
Sacramento Packing Inc. (Lorraine Way)	

1.5 Related Actions, Programs, and Planning Efforts

This section provides an overview of other flood management activities that compose the regional planning context. Whereas the previous section provides historical background, the following section includes current and future actions which may be considered as part of the cumulative effects analysis.

1.5.1 System-Wide Efforts

Related current and future efforts affecting the entire SRFCP (or beyond) are described below.

1.5.1.1 Central Valley Flood Protection Act

The Central Valley Flood Protection Act (CVFPA), enacted in California in 2009, called for DWR to prepare the CVFPP, which was adopted by the CVFBP in June 2012. The CVFPP provides a comprehensive framework for system-wide flood management and flood risk reduction in the Central Valley. The CVFPA also establishes a new standard of 200-year flood protection for urban areas in the Central Valley and requires this standard to be achieved by 2025.

The CVFPP presents three preliminary approaches for addressing current challenges and affordably meeting the CVFPP goals. The State has assembled what it views as the most promising, affordable, and timely elements of the three preliminary approaches into the State Systemwide Investment Approach (SSIA), which provides guidance for future State participation in projects and programs for integrated flood management in the Central Valley. Improvements proposed in the SSIA that could influence, or be influenced by, the FRWLP, include the following.

- **Sutter Bypass Expansion.** The CVFPP recommends increasing the capacity of the Sutter Bypass to convey large flood events. Expansion would likely require building a new levee for about 15 miles along one side of the bypass to widen the bypass for increased flow capacity. Although the required width of the bypass has not been determined, DWR used a 1,000-foot increase in the bypass width for planning purposes. The evaluations for planning purposes were initially based on 75% of the new width allocated to agricultural use and 25% allocated to habitat restoration.
- **Fish Passage Improvements.** The SSIA includes plans to improve fish passage at flood diversions, flashboard dams, and flood management structures. This includes connecting fishery habitat from the Delta to the Yolo and Sutter Bypasses and to the Butte Basin. These actions would assist in increasing and improving habitat connectivity and promoting the recovery of anadromous fish populations.

The CVFPB removed the Feather River Bypass from the CVFPP, as originally proposed by DWR. The proposed bypass would require construction of about 16 miles of new levee on one side of the Cherokee Canal. However, the bypass may be brought forward in the 2017 update of the CVFPP after further technical review with stakeholder and public engagement. Regardless, analysis performed by SBFCA discloses that the proposed bypass does not significantly reduce the need for FRWLP or modify the proposed remedial measures.

The people of California passed two bond measures (Propositions 84 and 1E) that provide approximately $5 billion toward flood improvements to reduce flood risk, particularly to state-Federal levees protecting urban areas in the Central Valley. These levee improvements are expected to be made over the 10 years following authorization of the bonds in 2006. However, there were urgent needs to improve inadequate flood protection in existing urban areas in advance of the overall comprehensive effort. These advance efforts are termed early implementation projects (EIPs). EIPs can be implemented ahead of and in parallel with the comprehensive effort as long as they are designed to ensure that they do not eliminate opportunity or prejudice future flood risk-management alternatives that would provide regional or system-wide benefits. Local agencies and the State are identifying and planning EIPs in a parallel process to be compatible with comprehensive, system-wide studies. Several EIPs have been implemented, such as those under the programs of SAFCA and WSAFCA.

Along with the requirement for increased flood protection by 2025, one of the objectives of the CVFPP is:

> increasing the engagement of local agencies willing to participate in flood protection, ensuring a better connection between state flood protection decisions and local land use decisions (Draft Framework for Early Implementation Projects and Section 408 Approval).

In line with that objective, SBFCA has proposed the FRWLP as an EIP.

1.5.1.2 Sacramento River Flood Control System Evaluation

Following the flood of 1986, USACE and the State of California, along with local partners, completed a comprehensive evaluation of the SRFCP and initiated a flood risk management program aimed at repairing, raising, and strengthening urban levees, among other activities. This effort, known as the Sacramento River Flood Control System Evaluation (commonly referred to as System Evaluation) resulted in the repair of more than 70 miles of deficient levees by USACE. However, to date, not all the authorized repairs have been completed. Moreover, the completed repairs were built to standards in place at the time which are no longer current.

Due to the large scale of the evaluation, the review was split into five phases. The results were published in the Sacramento River Flood Control System Evaluation, Phase II-V, Programmatic EIS/EIR, dated May 1992. Phases I and II evaluations include the Sacramento urban area and Marysville/Yuba City area. Phase III is the Mid-Valley area in and around the town of Knights Landing, approximately 27 miles northwest of Sacramento. Phase IV and V includes the lower Sacramento River area south of Sacramento and the upper Sacramento River area north of Knights Landing. According to the November 2002 SRFCP Limited Reevaluation Report (LRR), Phase VI was more recently added to evaluate additional potential sits in all phases, but its supplemental design memorandum had not been completed at that time.

Phase III is the only currently active phase and is being designed for dike slurry wall work at three sites along the right bank of the Sacramento River (River Mile [RM] 84.1 to 87.2). The work also involves dike reconstruction, with final design being recently completed, at three sites along the left bank of the Knights Landing Ridge Cut. The State of California is proposing to complete the Knights Landing Ridge Cut work under an EIP or USACE would complete all work in 2015–2016.

1.5.1.3 Sacramento–San Joaquin River Basins Comprehensive Study and Central Valley Integrated Flood Management Study

Following the 1997 flood, the Sacramento–San Joaquin River Basins Comprehensive Study (Comp Study) was initiated by the State and USACE to formulate comprehensive plans for flood risk reduction and environmental restoration. This study was unable to stimulate widespread public or political interest in flood risk reduction or environmental restoration activity beyond the ongoing urban levee improvement programs. The study did result in a new set of engineering criteria for the design and evaluation of urban levees and a greatly expanded scope and cost for the ongoing urban levee improvement efforts on the Sacramento and American Rivers. In addition, the adequacy of previous repairs was reviewed.

Presently, the Central Valley Integrated Flood Management Study (CVIFMS) is a continuation of the Comp Study in which USACE and the State are defining a long-range program for the Sacramento and San Joaquin River Basins and the corresponding level of Federal participation. This program will identify opportunities to reduce flood risk by improving the flood capacity of the system while restoring and protecting floodplain and environmental features including wetlands and other fish and wildlife habitat. The approaches and management strategies under CVIFMS include the following.

- Conduct a watershed study to provide long-term reduction of flood risk and environmental restoration needs.
- Coordinate closely with the CVFPP development to produce joint products for mutual benefits and use.
- Provide leadership in specific disciplinary areas to ensure consistency in national management directives and guidelines.
- Coordinate with ongoing projects and programs to incorporate relevant information and actions in the study development.

Subject to continued appropriation, USACE plans to complete the CVIFMS by 2017.

1.5.1.4 Sacramento River Bank Protection Project

USACE is responsible for implementation of the Sacramento River Bank Protection Project (SRBPP) in conjunction with its non-Federal partner, CVFPB. The SRBPP is a continuing construction project authorized by Section 203 of the Flood Control Act of 1960. The purpose of this project is to provide protection from erosion to the existing levee and flood control facilities of the SRFCP. To date, work has been carried out in two phases. Phase I consisted of 435,000 feet and Phase II's original authorization included 405,000 feet. An additional 80,000 feet (a supplement to Phase II) has been authorized under the Water Resources Development Act (WRDA) of 2007 and is being supported by a Post Authorization Change Report, Engineering Documentation Report, and EIS/EIR under development. This authorization would be applied by USACE to the Feather River and other sites within the SRFCP that are identified as critical levee erosion sites. Further description of the SRBPP is provided in the environmental setting discussion of Section 3.1, *Flood Control and Geomorphic Conditions*.

1.5.1.5 Flood Control and Coastal Storm Emergency Act

The Flood Control and Coastal Storm Emergency Act (Public Law [PL] 84-99) authorizes USACE if requested by the sponsor to undertake activities including disaster preparedness, advance measures, emergency operations, rehabilitation of flood control works threatened or destroyed by flood, protection or repair of federally authorized shore protective works threatened or damaged by coastal storms, and provisions of emergency water due to drought or contaminated source. PL 84-99 establishes an emergency fund for emergency response preparations for natural disasters, for flood fighting and rescue operations, and for rehabilitation of flood control and hurricane protection structures. Under PL 84-99, an eligible flood protection system, such as the SRFCP, can be rehabilitated if damaged by a flood event.

1.5.2 Federal Projects within the Region

Related current and future Federal efforts within the SRFCP are noted below.

1.5.2.1 Sutter Basin Feasibility Study

SBFCA and the State of California are the non-Federal sponsors of a feasibility study for the Sutter Basin, which may eventually provide the Sutter Basin with a local objective of 100- to 200-year flood protection (depending upon location). The Sutter Basin is bounded roughly by the Feather River, Cherokee Canal, Sutter Buttes, and the Sutter Bypass, and contains the cities of Biggs, Gridley, Live Oak, and Yuba City, as well as a significant amount of agricultural land. Past flood events and geotechnical analysis show that the levees surrounding the Sutter Basin (including the Feather River West Levee) have a higher probability of failure related to through- and under-seepage than levees designed to meet current standards. Additionally, the levees are at risk of overtopping from floods greater than they are designed to withstand.

The Sutter Basin Project is undergoing a feasibility study by USACE, Sacramento District, to determine Federal interest in implementing a flood-risk management (FRM) project. The feasibility study will evaluate structural and nonstructural flood risk management measures, including improvements to existing levees; construction of new levees; and other storage, conveyance, and nonstructural options. Any ecosystem restoration measures associated with FRM measures likely would include restoration of floodplain function and habitat. Any recreation measures associated to FRM measures would include those outdoor recreation opportunities associated with sustainable water resource development. As of September 2012, USACE anticipates that the draft integrated study report and EIS/EIR for the feasibility study will be released in February 2013.

In regard to the relationship between the FRWLP and the Sutter Basin Project, it is intended that some or all of the FRWLP will be constructed prior to any Sutter Basin Project construction, which can only occur after authorization of, and appropriation for, the Sutter Basin Project by Congress following completion of the feasibility study. SBFCA anticipates that State and SBFCA costs (non-Federal costs) to implement the FRWLP could be credited against the remaining non-Federal share of the cost of the Sutter Basin Project studied under the feasibility study. Credit is only available if the flood protection improvements constructed as part of the FRWLP are found to be integral to the Sutter Basin Project recommended in the feasibility study.

More specifically, requests for general credit for flood control under Section 221 of the Flood Control Act of 1970 (as amended by Section 2003 of the WRDA of 2007) may allow the work conducted by SBFCA and described in the feasibility study to be credited against the local cost sharing requirements of the Sutter Basin Project as long as the project features constructed are integral to the USACE project.

Because implementation of the improvements by SBFCA does not immediately use Federal funds, it would not result in a commitment of Federal resources that would prejudice selection of a feasibility study alternative before a final decision on the feasibility study alternatives is made. In addition, the project-specific improvements considered in this EIS/EIR are limited to a portion of the overall flood protection system considered in the feasibility study. In summary, the FRWLP is intended to be integral to the ultimate Sutter Basin Project.

1.5.2.2 Yuba Basin Project

The Yuba Basin Project is an initiative to provide a 200-year level of protection and higher for communities in Yuba County. When complete, it will be the first community in California's Central Valley to achieve the State's requirement of 200-year flood protection.

The State and local interests (Yuba County, Yuba County Water Agency, and Three Rivers Levee Improvement Authority), began an advanced levee construction program in the southern portion of the county. Work is now complete on all of the 29.3 miles of levees, including the construction of two new setback levees on the east bank: the 2-mile long Bear River setback and the 6-mile long Feather River setback (downstream of, and unrelated to, the FRWLP). Besides providing greater regional flood protection, these setback levees resulted in the creation of nearly 2,000 acres of wildlife habitat.

All of this advanced work is being evaluated by USACE in the Yuba River Basin Project General Reevaluation Report (GRR), scheduled for completion in 2012. The scheduled work for the 7.5-mile long Marysville Ring Levee is the final piece to the entire project. In 2008, USACE approved a "separable element" for Marysville, so that work could begin while the GRR was underway. Construction in Marysville began in 2010 and several additional phases of the project are designed and ready for construction in 2013. Both the Marysville element and GRR are in need of additional appropriation for completion.

1.5.2.3 American River Common Features Project

To increase flood protection for the city of Sacramento, which is bordered by the left bank of the Sacramento River, the American River Common Features Project (Common Features) was authorized by Congress in the WRDA of 1996. This authorization called for strengthening the north and south levees of the American River and raising and strengthening the upper 12 miles of the left levee of the Sacramento River in the Natomas area, just north of the city of Sacramento. These improvements were considered *common features* of any comprehensive plan of flood protection for the Sacramento area that might ultimately be approved by Congress. In the WRDA of 1999, the scope of the Common Features authorization was expanded to include raising portions of the north and south levees of the American River (including the Mayhew Levee), additionally strengthening portions of the north levee of the American River, and raising and strengthening the north and south levees of the Natomas Cross Canal in the Natomas area.

With the goal of strengthening the American River levees to enable them to pass a flow of 160,000 cubic feet per second (cfs), Common Features has installed roughly 24 miles of slurry wall up to depths of 80 feet, raised levees to provide adequate freeboard, addressed slope stability issues, and corrected some erosion problems. Because of the considerable cost increase of seepage remediation on the American River, all funds appropriated by Congress throughout the late 1990s and the early part of the 2000s were used for construction activities on the American River instead of for design efforts for the Natomas Basin. In 2006, the Common Features authorization was deemed sufficient to cover improvements to the left levee of the Sacramento River near the Pioneer Reservoir and in the Pocket/Freeport area.

USACE is currently developing two post-authorization change studies. The Common Features GRR is reevaluating the previous Common Features project and identifying levee improvements needed to provide the city of Sacramento and the Natomas area to the north with at least a 200-year level of flood protection. The Common Features GRR is planned for completion in 2014. Construction associated with the report would begin approximately 1 year after adoption of the report by Congress. Much of this work was completed or is underway by SAFCA as an EIP and Section 408 action (see Section 1.5.3.3). The Natomas Post-Authorization Change Report documents the evaluation of features in the Natomas Basin portion of the Common Features project and was submitted to Congress in October 2010.

1.5.2.4 West Sacramento General Reevaluation Report

USACE and DWR published the previous Sacramento Metropolitan Area General Reevaluation Report in 1992. The purpose of that report was to recommend a program of improvements needed to remedy structural problems and limitations of the levee system that were revealed by the 1986 flood. The subsequent 1997 flood and revisions to USACE levee construction standards after the 2005 New Orleans flood shifted attention to under-seepage deficiencies that had not been considered in the previous study. Presently, USACE and WSAFCA are developing a GRR for West Sacramento levee improvements to assess the entirety of the levees protecting the city of West Sacramento in light of most recent criteria and knowledge regarding levee design, with particular attention to remediation of seepage deficiencies.

USACE uses GRRs to present the results of a reevaluation of a previously completed study, using current planning criteria and policies, due to changed conditions and/or assumptions. The results may reaffirm the previous plan, reformulate and modify it, or find that no plan is currently justified. The results are documented in a GRR which, if recommended and supported, also serves as the decision document for a Federal action (U.S. Army Corps of Engineers and Central Valley Flood Protection Board 2009).

The primary objective of the West Sacramento GRR is to determine the extent of Federal interest in additionally reducing the flood risk within the study area while concurrently exploring opportunities to increase recreation and restore the ecosystem along the Sacramento River within the study area. Much of this work was completed or is underway by WSAFCA as an EIP and Section 408 action (see Section 1.5.3.4). USACE anticipates completion of the GRR in 2014.

1.5.3 State and Local Projects within the Region

Related current and future state- and locally led efforts within the SRFCP are described below.

1.5.3.1 Lower Feather River Corridor Management Program

DWR is developing the Lower Feather River Corridor Management Plan (LFRCMP) as an integrated strategy for managing the 20-mile river corridor between the cities of Marysville and Yuba City and the Sutter Bypass. The lower 16 miles of the Feather River West Levee falls within the LFRCMP planning area (up to about Reach 16). The LFRCMP will provide guidance and recommendations for planners, land managers and decision-makers to manage the lower Feather River in a way that accomplishes the following primary purposes: protects public safety, facilitates flood protection system management and maintenance of flood control facilities, and conserves and enhances or restores habitat and ecosystem functions. The plan also has the following secondary purposes:

promoting economic sustainability, land use compatibility, and recreational opportunities. As a part of this effort, DWR is developing a comprehensive permitting approach, and hopes to obtain programmatic permits, with advance mitigation, for routine and extraordinary maintenance of the flood control system and for restoration activities in the corridor. As of publication of this EIS/EIR, a public draft of the LFRCMP has not been released. DWR anticipates publishing a draft LFRCMP in 2012.

1.5.3.2 Three Rivers Levee Improvement Program

TRLIA, a joint powers agency, was established in May 2004 by the County of Yuba and Reclamation District (RD) 784 to finance and construct levee improvements in south Yuba County. The goal of the Three Rivers Levee Improvement Program is to provide 200-year flood protection to more than 40,000 residents in Linda, Olivehurst, and Plumas Lake. Four work phases, covering 29 miles of levees, were identified to achieve this goal. All of the work identified in the four phases has been completed as of the end of 2011.

The levees affected by this project are the south levee of the Yuba River, the east levee of the Feather River, the north levee of the Bear River, and the west levee of the Western Pacific Interceptor Canal. Improvements included stability berms, slurry cutoff walls, erosion protection, corrections to levee geometry, levee height increases, relief wells, monitoring wells, and detention basins. Setback levees were constructed along a portion of the Bear River north levee and the Feather River east levee. The land within the setback areas of both levees totals 1,750 acres, and will be used for habitat restoration and agricultural purposes.

TRLIA is currently evaluating a portion of the Yuba Goldfields to determine if it is sufficient to provide 200-year flood protection. TRLIA hopes to complete this evaluation by the end of 2012 and receive 200-year certification for the Goldfields shortly thereafter.

1.5.3.3 Natomas Levee Improvements Program

As part of its long-term program to improve the Natomas Basin levee system, SAFCA proposes to continue waterside and landside levee-strengthening efforts, including levee raises, seepage remediation, increased bank protection, levee stabilization, and flattening of landside levee slopes under the Natomas Levee Improvements Program (NLIP), an EIP and Section 408 action.

The ultimate goal of the NLIP is to provide the Natomas Basin with a 200-year level of flood protection by improving conditions along approximately 26 miles of levees surrounding the Natomas Basin. These levees include the Natomas Cross Canal South Levee, Sacramento River East Levee, American River North Levee, Natomas East Main Drainage Canal West Levee, and the Pleasant Grove Creek Canal West Levee. The NLIP is a four-phase construction program: Phase 1 occurred in 2008, Phase 2 in 2009 and 2010, Phase 3 in 2010 and 2011, and a majority of Phase 4a work was completed in 2011 with the remainder scheduled for 2013. Phases 1 through 4a focus on the Natomas Cross Canal South Levee and a large portion of the Sacramento River East Levee.

Portions of work under the Phase 3, 4A, and 4B along the Sacramento River East Levee, the American River North Levee, the Natomas East Main Drainage Canal West Levee, the Pleasant Grove Creek Canal West Levee, and water supply and drainage pump station improvements are still needed but have been deferred from SAFCA's EIP construction program. The USACE completed the Post Authorization Change Report and Interim General Re-evaluation Report, American River Common Features Project, Natomas Basin, Sacramento and Sutter Counties, California study and has an approved Chief's report that is currently under consideration for Congressional authorization. After Federal authorization is secured, SAFCA will work with the State and USACE to continue implementation of the NLIP.

1.5.3.4 West Sacramento Levee Improvements Program

WSAFCA proposes to implement the Southport project along the right bank of the urbanized reach of the Sacramento River as an EIP and Section 408 action. The study reach is approximately 6 miles, beginning at the upstream limit where a SRBPP element terminates south of the barge canal connecting the Sacramento River to the Sacramento River Deep Water Ship Channel and extending downstream to West Sacramento city limit at the southern cross levee. The project would most immediately protect the part of the city known as Southport and is targeted at addressing under-seepage, through-seepage, erosion, and slope instability. This project is presently undergoing design development and an EIS/EIR is being prepared with USACE as the Federal lead agency for NEPA based on USACE's responsibilities under Section 408, Section 404, and Section 10. Similar to the relationship of the FRWLP to the Sutter Basin Feasibility Study, WSAFCA's Southport project is being coordinated with the ongoing West Sacramento Project GRR (described previously). This project follows three others implemented by WSAFCA as EIPs and Section 408 actions, namely, the I Street Bridge project (completed in 2008) and the CHP Academy and The Rivers projects (completed in 2011).

1.6 Community Outreach, Agency Coordination, and Issues of Known Controversy

1.6.1 Community Outreach

USACE and SBFCA have established a proactive multi-media outreach program to affected communities, the general public, and stakeholders about the FRWLP. The approach to the outreach program has been to go beyond the guidelines and requirements of NEPA and CEQA for public noticing to ensure the affected community and other interested stakeholders are informed, engaged, and involved through an accessible, open, and transparent process. Thus far, the FRWLP outreach program has included the following actions.

- Holding four scoping meetings for the environmental document.
- Publication of notices in local newspapers of major circulation.
- Publication in the Federal Register.
- Notification to the State Clearinghouse.
- Posting NEPA notices on the USACE website.
- Posting CEQA notices and project information on the SBFCA website.
- Publication in a local newsletter, distributed quarterly to all parties subject to the assessment district for updates and information about flood management activities.
- Presentation and discussion of the status of the project at various public meetings for elected boards and commissions.

- Phone calls to public agencies.
- Small-group meetings with interested stakeholders.
- Posting of notices in public places.

The FRWLP scoping effort was conducted jointly with a separate but related USACE project, a feasibility study for the Sutter Basin, mentioned earlier. The two projects are related in their study area, purpose, potential measures, and potential effects. Despite joint scoping, two separate EIS/EIRs are being developed for each project. A more detailed accounting of the scoping process conducted in June 2011 is provided in Appendix B.

As the proposed improvements and FRWLP EIS/EIR are further developed, the outreach program would continue in a broad sense through the methods listed above and would expand through more targeted specific outreach to residents and businesses who might be more directly affected by construction or operation of the proposed improvements.

To date, the results of the FRWLP outreach program have been favorable, constructive, and supportive. The tone and substance of the input has been consistent with the voter-approved assessment to fund the local share of the project.

1.6.2 Agency Consultation and Coordination

The FRWLP has been planned in coordination and cooperation with numerous local, state, and Federal agencies. In Chapter 3, the regulatory setting for each respective resource describes compliance with applicable Federal, state, regional, and local laws and regulations, including consultation to date with various agencies. Additional regulatory context is presented in Appendix A.

1.6.2.1 Responsible and Trustee Agencies

This EIS/EIR would be used by Responsible and Trustee Agencies to determine the effects of the proposed action. Responsible Agencies are those that may have a legal responsibility to approve the project. These agencies are required to rely on the Lead Agency's environmental document in acting on whatever aspect of the project requires their approval but must prepare and issue their own findings regarding the project (CEQA Guidelines Section 15096). Trustee Agencies are those that have jurisdiction over certain resources held in trust for the people of California but do not have legal authority over approving or carrying out the project. Potential Responsible and Trustee Agencies for the FRWLP are presented in Table 1-6.

Table 1-6. Potential Responsible and Trustee Agencies for the FRWLP

Agency	Jurisdiction
Trustee Agency	
California Department of Fish and Game	Fish and wildlife Native plants designated as rare or endangered Game refuges Ecological reserves
California Department of Conservation	Williamson Act lands
California State Lands Commission	State-owned "sovereign" lands
Responsible Agency	
U.S. Environmental Protection Agency	NEPA and CWA coordination
U.S. Fish and Wildlife Service	Fish and wildlife and Endangered Species Act
National Marine Fisheries Service	Anadromous fish and Endangered Species Act
U.S. Department of Agriculture	Prime farmland conversion
California Department of Fish and Game	Fish and wildlife Native plants designated as rare or endangered Game refuges Ecological reserves
Office of Historic Preservation	Historic and cultural resources
Central Valley Flood Protection Board	Levee modifications
California Air Resources Board	Air quality
Regional Water Quality Control Board (#5)	Water quality and discharges to water bodies
California Department of Water Resources	State water and flood control interests
Sutter and Butte Counties/State Mining and Geology Board	Surface mining and reclamation activities associated with borrow

1.6.3 Issues of Known or Expected Controversy

NEPA requires that project proponents identify issues of known controversy that have been raised in the scoping process and throughout the development of the project.

1.6.3.1 Construction-Related Effects

As the levee system in the study area is in close proximity to residential areas and other developed land uses, flood improvements proposed under the FRWLP are likely to result in construction-related effects. These effects include those under the topics of public safety, noise, traffic, and air quality and are specifically described in Chapter 3 as well as temporary effects on property use and access.

1.6.3.2 Property Acquisition

A specific subset of construction-related effects involves potential conflicts with private property underlying or near proposed improvements. In some cases there may be temporary property use in the form of construction easements to build the project and permanent acquisition for operations and maintenance of the project. These effects are described under the land use sections in Chapter 3.

1.6.3.3 Levee Encroachments and Vegetation

The FRWLP alternatives are likely to include removal, relocation, or replacement of features in, on, or under the levee or adjacent O&M corridors such as structures, pipelines, walls, stairs, utilities, and other elements such as vegetation.

USACE published technical guidance and reinforcement of policies restricting woody vegetation on Federal project levees. Implementation of such guidance has stirred controversy in the Sacramento Valley as cursory assessments have shown that much vegetation may require removal, resulting in effects on fish and wildlife habitat, including habitat for endangered and threatened species, and social values like recreation and aesthetics. The FRWLP would be subject to this guidance. This issue is further described previously in Section 1.3.2.5 and in Chapter 2, *Alternatives*, and under the effects discussions for vegetation, fish, wildlife, visual resources, and recreation. Other encroachments are addressed in the land use, utilities, and housing sections of Chapter 3.

1.6.3.4 Climate Change and Sea-Level Rise

Global climate change and resultant sea-level rise are phenomena receiving international attention. These issues are further analyzed in the effects discussions in Chapter 3 under the *Air Quality* and *Climate Change and Greenhouse Gas* sections.

1.6.3.5 River Access for Recreation

The Feather River is popular for recreation activities such as fishing, boating, walking, wildlife viewing, and other passive uses. There is demand to increase opportunities for public access to the river corridor.

Chapter 2
Alternatives

2.1 Introduction

This chapter describes the following elements.

- Project alternatives.
- Construction timing.
- Detailed measures comprising the project alternatives.
- Common elements, assumptions, and environmental commitments incorporated into each project alternative.
- A no action alternative
- Alternatives screening.

2.2 Project Alternatives

2.2.1 Overview of Measures Carried Forward in Alternatives Development

For each deficiency noted in Chapter 1, a number of measures or combination of measures can be used to reduce flood risk. Table 2-1 summarizes the deficiencies identified in the project area and potential measures that could be applied to resolve each deficiency. These measures have been combined to comprise the project alternatives. Section 2.5, *Detailed Measure Descriptions*, provides a more detailed description of each measure in terms of its objective, design and construction, equipment needs, and operations and maintenance requirements.

Table 2-1. Summary of Measures and Deficiencies

	Deficiency				
Measure	Through-Seepage	Under-Seepage	Slope Stability and Geometry	Erosion	Encroachments
Slurry cutoff wall	✓	✓			
Slope flattening	✓		✓		
Stability berm	✓				
Levee reconstruction	✓		✓		✓
Sheet pile wall	✓				
Seepage berm		✓			
Relief wells		✓			
Depression/ditch infilling		✓			
Clay ditch lining		✓			
Limited encroachment removal					✓
Canal seepage treatment		✓			

2.2.2 Overview of Alternatives Carried Forward

NEPA and CEQA require that an EIS or EIR (respectively) consider a range of alternatives that would attain most of the project purpose, need, and objectives while avoiding or substantially lessening project effects. A range of reasonable alternatives is analyzed to sharply define the issues and provide a clear basis for comparison among the options. The NEPA/CEQA analysis also must include an analysis of a no action or no project alternative. Consistent with NEPA standards, alternatives are analyzed on an equal basis and at an equal level of detail; however, because the role of USACE as the Federal lead agency is one of granting permission rather than as a sponsor or proponent of the project, SBFCA as the applicant may identify an applicant-preferred alternative.

Based on SBFCA's planning process and engineering studies, the measures listed in Table 2-1 have been combined, developed, and screened into three project alternatives for the FRWLP to be carried forward for study in the EIS/EIR (in addition to the no action alternative). In keeping with NEPA, each alternative is analyzed at an equal level of detail. The alternatives are summarized below based on their primary formulation concept, followed by a table of measures used in each alternative (Table 2-2), a table highlighting how the reaches are broken out by construction contract and the respective timelines for construction (Table 2-3), and a detailed table of the measures proposed by reach (Table 2-4). Plate 2-1 illustrates the alternatives.

- **Alternative 1.** Alternative 1 is focused on those measures which would predominantly keep within the existing footprint of the Feather River West Levee. Advantages of an alternative formulated on this basis are that it may minimize real estate acquisition and changes in land use. This alternative primarily proposes cutoff walls as a technique to address the deficiencies (along with other measures) while minimizing change in the existing levee footprint.

- **Alternative 2.** Alternative 2 includes measures which would not be constrained by the existing footprint of the Feather River West Levee. Advantages of an alternative formulated on this basis are that it may more effectively address the deficiency or may be less in cost compared to measures within the levee footprint. This alternative primarily proposes stability berms and seepage berms (along with other measures), which would substantially extend beyond the current levee footprint.
- **Alternative 3.** Alternative 3 is a blend of the flood management measures identified in Alternatives 1 and 2, optimized based on the screening criteria. Optimized means a number of factors have been considered, such as effectiveness in addressing the deficiencies, compatibility with land use, minimization of real estate acquisition, avoidance of effects, and cost; the footprint has been considered but not held as a primary constraint. This alternative proposes a combination of cutoff walls and berms (along with other measures). Alternative 3 is the applicant-preferred alternative (APA) and has been optimized to avoid and minimize environmental effects. Alternative 3 is also considered to be the environmentally preferable alternative because it balances borrow material import needs, emissions, real estate acquisition and land use change, habitat effects (see Table 3.8-6), and construction-related disturbance. While it may not be the least impactful alternative for every resource category, it is the least impactful as a composite across all resource categories (see Table (ES-6).

Section 2.7.3, *Screening of Alternatives Carried Forward*, provides a description of screening for alternatives carried forward.

Table 2-2. Summary of Measures Used by Alternative

Measure	Alternative 1	Alternative 2	Alternative 3
Slurry cutoff wall	✓	✓	✓
Slope flattening	✓	✓	✓
Stability berm		✓	✓
Levee reconstruction	✓	✓	✓
Seepage berm	✓	✓	✓
Relief wells		✓	✓
Depression/ditch infilling	✓	✓	✓
Clay ditch lining	✓		
Limited encroachment removal	✓	✓	✓
Canal seepage treatment	✓		✓

Note: Sheet pile walls may be used for limited, site-specific conditions in any alternative but are not planned for large-scale application for a project reach.

2.2.3 Construction Timing

Specific sequencing of construction would be dynamic throughout project planning and design, subject to change based on factors including the following.

- Further engineering in determining the clarity and efficacy of site-specific measures.
- Easement and right-of-way acquisition (where necessary).
- Availability of proximate, suitable, and cost-effective borrow material.
- Environmental clearances based on wildlife presence, lifecycle activity, and location of habitats.

Based on current planning analysis, under each of the three alternatives, construction would occur in more than one annual construction season (typically April 15 to November 30, subject to conditions) and would proceed as noted below.

It is anticipated the construction of the FRWLP would be divided into four separate construction contracts (i.e., A, B, C, and D). Although subject to change, the four contracts and their respective areas for construction of the FRWLP are identified in Table 2-3. Figure 2-1 also identifies which reaches are within each construction contract.

Table 2-3. Construction Contracts, FRWLP Reaches, and Years for Construction

Construction Contract	FRWLP Reaches	Years for Construction
A	2–5	2014–2015
B	6–12	2014–2015
C	13–25	2013–2014
D	26–41	2014–2015

Contract A of the FRWLP begins at Levee Station 202+50 near the intersection of the Feather River West Levee and Laurel Road, and continues north to the beginning of the improvements constructed as part of the Star Bend Setback Levee project, Levee Station 478+68. The total length of the levee in this portion of the FRWLP is 27,618 linear feet.

Contract B of the Feather River West Levee begins at Levee Station 478+66, the end of the improvements constructed as part of the Star Bend Setback Levee project, and continues north to Levee Station 831+50. The total length of the levee in this portion of the FRWLP is 31,963 linear feet.

Contract C begins at Levee Station 845+00, near the north end of the Shanghai Bend Setback Levee, and continues north to Levee Station 1674+37. The total length of the levee in this portion of the FRWLP is 77,886 linear feet.

Contract D begins at Levee Station 1674+37 and continues north Levee Station 2368+00. The total length of the levee in this portion of the FRWLP is 69,363 linear feet.

Reach 1 is not currently part of the FRWLP.

The construction of each contract is anticipated to occur in single 10-hour shifts, 6 days a week. An exception to this schedule is cutoff wall construction, which is anticipated to occur in two 10-hour shifts (essentially 24-hour construction), 6 days a week. While actual construction would not occur

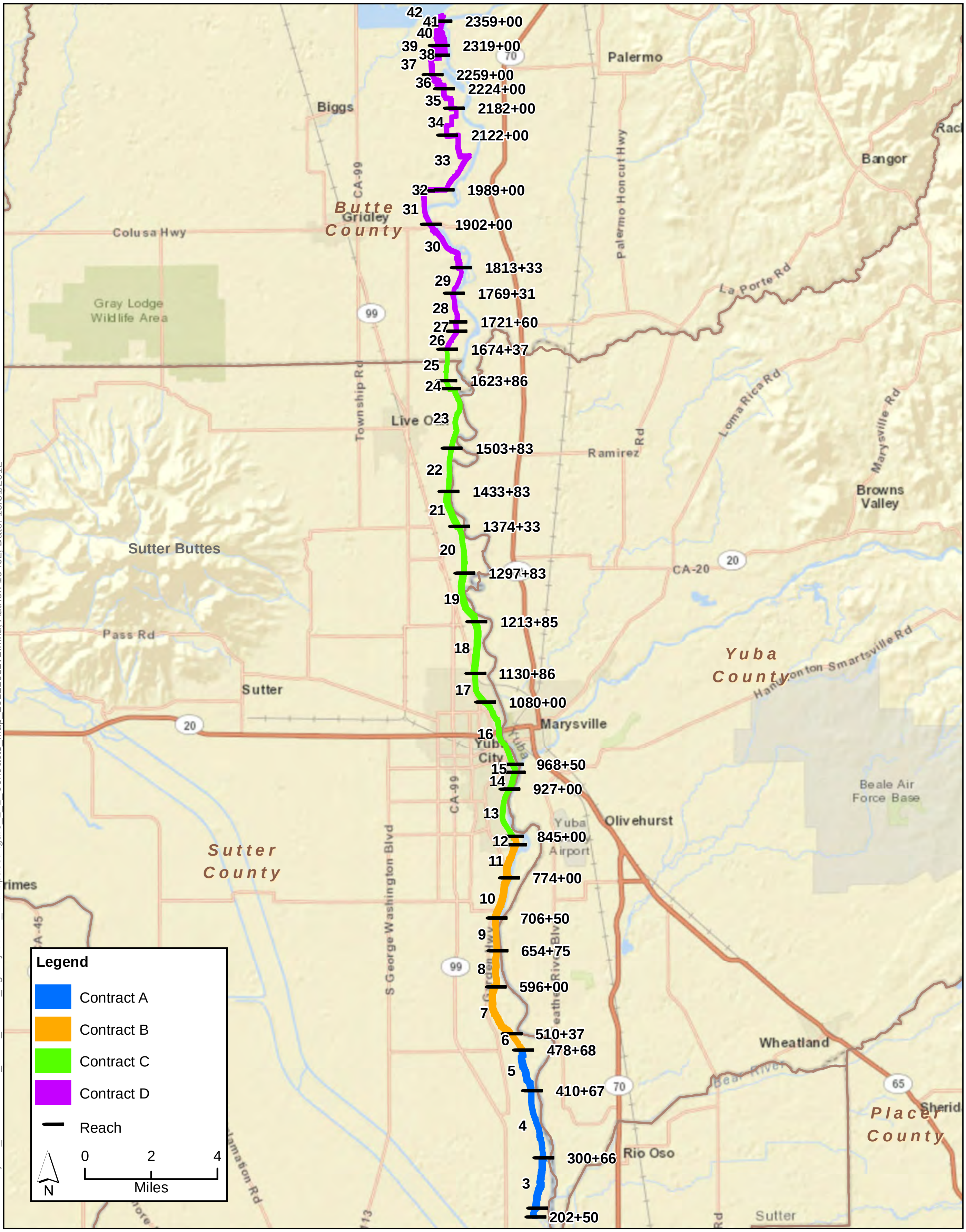

Figure 2-1
Project Contract Reaches

between the two 10-hour shifts, equipment maintenance and preparations for the upcoming work shift would occur. Maintenance work is also anticipated on Sundays.

Table 2-4. FRWLP Action Alternatives by Reach

Construction Contract	Reach	Length (feet)	Alternative 1 Flood Management Measure	Alternative 2 Flood Management Measure	Alternative 3 Flood Management Measure
A	2	1,616	202+50 to 220+00, cutoff wall tip elevation (-)73' with full levee degrade.	202+500 to 218+66, cutoff wall tip elevation 30' with 100'-wide undrained seepage berm.	202+50 to 218+66, cutoff wall extending to an elevation of 25' with 100'-wide undrained seepage berm. Seepage berm 5' thick at berm toe.
A	3	8,200	218+66 to 230+00 cutoff wall tip elevation 20'; 230+00 to 250+00 cutoff wall tip elevation (-)35'; 250+00 to 289+00 cutoff wall tip elevation (-)20'; 289+00 to 300+66 cutoff wall tip elevation 15'.	8'-tall drained stability berm on 300'-wide undrained seepage berm with monitoring for seepage at the toe of the berm.	218+66 to 230+00 cutoff wall extending to an elevation of 25' with 100'-wide undrained seepage berm. Seepage berm 5' thick at berm toe; 230+00 to 250+00 cutoff wall tip elevation (-)35'; 250+00 to 289+00 cutoff wall tip elevation (-)20'; 289+00 to 300+66 cutoff wall tip elevation (-)12'.
A	4	11,001	300+66 to 349+00 cutoff wall tip elevation 15'; 349+00 to 368+00 cutoff wall tip elevation 10'; 368+00 to 410+67 cutoff wall tip elevation 20'.	8'-tall drained stability berm on 100'-wide undrained seepage berm.	300+66 to 312+00 cutoff wall tip elevation 15'; 312+00 to 349+00 cutoff wall tip elevation 15'; 349+00 to 368+00 cutoff wall tip elevation 10'; 368+00 to 410+67 cutoff wall tip elevation 20'.
A	5	6,801	410+67 to 417+00, cutoff wall tip elevation 20'; 417+00 to 425+00, cutoff wall tip elevation 10'; 425+00 to 456+00, cutoff wall tip elevation 15'; 456+00 to 478+68, cutoff wall tip elevation 15' with 200'-wide undrained seepage berm.	410+67 to 444+00, 300' wide seepage berm; 444+00 to 478+67, 300' wide seepage berm with monitoring for seepage at the toe of the berm.	410+67 to 417+00, cutoff wall tip elevation 20'; 417+00 to 425+00, cutoff wall tip elevation 10'; 425+00 to 456+00, cutoff wall tip elevation 15'; 456+00 to 475+35, cutoff wall tip elevation 15' with 300' wide undrained seepage berm. Seepage berm 5' thick at berm toe; 475+35 to 478+68 no flood management required

Construction Contract	Reach	Length (feet)	Alternative 1 Flood Management Measure	Alternative 2 Flood Management Measure	Alternative 3 Flood Management Measure
B	6	3,169	510+00 to 510+50, potential pipe crossing work to install positive closure device and correct pipe size.	510+00 to 510+50, potential pipe crossing work to install positive closure device and correct pipe size.	510+00 to 510+50, potential pipe crossing work to install positive closure device and correct pipe size.
B	7	8,563	510+37 to 528+00, cutoff wall tip elevation 15’; 528+00 to 546+00, cutoff wall tip elevation (-)10’; 546+00 to 565+00, (-)65’ with Full Levee Degrade; 565+00 to 576+00, cutoff wall tip elevation (-)50’; 576+00 to 584+00, cutoff wall tip elevation (-)10’; 584+00 to 598+87, cutoff wall tip elevation 20’.	9.5’-tall and 13’-wide, at the top, drained stability berm on 300’-wide undrained seepage berm with monitoring for seepage at the toe of the berm. Height of seepage berm at levee toe is 7’.	510+37 to 514+37 no flood management required 514+00 to 526+00, cutoff wall tip elevation 15’; 526+00 to 570+00, cutoff wall tip elevation 5’; 545+00 to 570+00, Relief wells with 60’ spacing and 50’ depth over one half of the length, distributed at various locations over this stretch of levee; 570+00 to 575+00, cutoff wall tip elevation 5’; 575+00 to 595+00, cutoff wall tip elevation (-)10’; 595+00 to 596+00, cutoff wall tip elevation 15’.
B	8	5,875	598+87 to 646+00, cutoff wall tip elevation 15’; 646+00 to 654+75, cutoff wall tip elevation (-)15’.	Shallow cutoff wall tip elevation 38’ with 130’-wide seepage berm. Height of seepage berm at levee toe is 5’.	596+00 to 654+75, cutoff wall tip elevation 15’.
B	9	5,175	654+75 to 668+00, cutoff wall tip elevation (-)15’; 668+00 to 706+00, cutoff wall tip elevation 20’.	Shallow cutoff wall tip elevation 35’ with 110’-wide seepage berm. Height of seepage berm at levee toe is 5’.	654+75 to 670+00, cutoff wall tip elevation 15’; 670+00 to 697+00, cutoff wall tip elevation 20’; 697+00 to 706+50: cutoff wall tip elevation 10’.
B	10	6,750	706+50 to 745+00, cutoff wall tip elevation (-)5’; 745+00 to 774+00, cutoff wall tip elevation 25’.	Shallow cutoff wall tip elevation 30’ with 300’-wide seepage berm. Height of seepage berm at levee toe is 7’.	706+50 to 726+00, cutoff wall tip elevation (-)10’; 726+00 to 746+00, cutoff wall tip elevation (-)5’; 746+00 to 754+50, cutoff wall tip elevation 5’; 754+50 to 774+00, cutoff wall tip elevation 25’.

Construction Contract	Reach	Length (feet)	Alternative 1 Flood Management Measure	Alternative 2 Flood Management Measure	Alternative 3 Flood Management Measure
B	11	5,600	774+00 to 784+00, cutoff wall tip elevation 25’; 784+00 to 824+00, cutoff wall tip elevation (-)5’; 824+00 to 830+00, cutoff wall tip elevation 25’.	7.5’ wide drained stability berm on 300’-wide seepage berm. Height of seepage berm at levee toe is 7’.	774+00 to 784+50, cutoff wall tip elevation 25’; 784+50 to 827+50, cutoff wall tip elevation 5’; 827+50 to 831+50, cutoff wall tip elevation 25’.
B	12	1,500	832+30, relocate two 24-inch sewer pipes.	832+30, relocate two 24-inch sewer pipes.	832+30, relocate two 24-inch sewer pipes.
C	13	8,200	845+00 to 857+00, cutoff wall tip elevation (-)33’; 857+00 to 927+00, cutoff wall tip elevation (-)28’.	Shallow cutoff wall tip elevation 35’ with relief wells at 200’ spacing and 65’ deep.	844+50 to 923+75: cutoff wall tip elevation (-)30’. Full levee degrade from 844+50 to 897+50.
C	14	2,740	952+00 investigation of 12 kv cable to determine if it meets Title 23.	952+00 investigation of 12 kv cable to determine if it meets Title 23.	952+00 investigation of 12 kv cable to determine if it meets Title 23.
C	15	1,410	No flood management measures required.	No flood management measures required.	No flood management measures required.
C	16	11,150	Flatten Waterside Slope 1007+00 and 1025+20 Cutoff wall via TRD, jet grouting or a sheet pile wall.	Flatten Waterside Slope 1007+00 and 1025+20 Cutoff wall gap closure using TRD, jet grouting or sheet piling method.	Closure of gap in cutoff wall at 5th Street bridge crossing around Station 1007+00, cutoff wall tip elevation 40’; Closure of gap in cutoff wall at 10th Street bridge crossing around Station 1026+00, by using a seepage berm within the abandoned railroad tunnel; 1077+85 to 1080+00, cutoff wall tip elevation 30’ and backfill landside toe depression. Miscellaneous landside encroachment relocations/removals
C	17	5,086	Cutoff wall tip elevation 35’; Fill-in the landside toe depression (depression is 4’ deep and 40’ wide).	Shallow cutoff wall tip elevation 58’ with relief wells at 45’ spacing and 38.5’ deep.	1080+00 to 1089+00, cutoff wall tip elevation 30’ and backfill landside toe depression; 1089+00 to 1125+00, cutoff wall tip elevation 35’ and backfill landside toe depression; 1125+00 to 1130+86, cutoff wall tip elevation 0’.

Construction Contract	Reach	Length (feet)	Alternative 1 Flood Management Measure	Alternative 2 Flood Management Measure	Alternative 3 Flood Management Measure
C	18	8,299	1130+86 to 1149+50, cutoff wall tip elevation 0; 1149+50 to 1190+00, cutoff wall tip elevation 30; 1190+00 to 1213+85, cutoff wall tip elevation 40 1131+00 Cutoff wall gap closure using TRD, jet grouting or sheet piling method.	300'-wide undrained seepage berm (thickness at the levee toe: 7') with relief wells at 100' spacing and 30' deep; 1131+00 cutoff wall gap closure using TRD, jet grouting or sheet piling method.	1130+86 to 1151+50, cutoff wall tip elevation 0'; 1151+50 to 1159+50: cutoff wall tip elevation 30'; 1159+50 to 1169+50: cutoff wall tip elevation 25'; 1169+50 to 1189+50: cutoff wall tip elevation 30'; 1189+50 to 1209+50: cutoff wall tip elevation 40'; 1209+50 to 1213+85: cutoff wall tip elevation 35'.
C	19	8,398	1213+85 to 1224+00 cutoff wall tip elevation 40'; 1224+00 to 1240+00 cutoff wall tip elevation (-)27'; 1240+00 to 1269+00 cutoff wall tip elevation 5'; 1269+00 to 1297+83 cutoff wall tip elevation 35'.	10'-tall drained stability berm on 300'-wide undrained seepage berm (thickness at the levee to: 7') with relief wells 100' spacing and 50' deep.	1213+85 to 1219+75, cutoff wall tip elevation 35'; 1219+75 to 1224+00, cutoff wall tip elevation 5'; 1224+00 to 1238+00, cutoff wall tip elevation (-)28'; 1238+00 to 1248+00, cutoff wall tip elevation (-)42'; 1248+00 to 1268+75, cutoff wall tip elevation 3'; 1268+75 to 1297+83, cutoff wall tip elevation 35'.
C	20	7,650	1297+83 to 1359+00, cutoff wall tip elevation 50'; 1359+00 to 1369+00, cutoff wall tip elevation 40'; 1369+00 to 1374+33 cutoff wall tip elevation 50'.	70'-wide seepage berm, seepage berm (thickness at the levee toe: 5'); 1297+83 to 1309+00 and 1320+00 to 1374+33, 8.5'-tall drained stability berm.	1297+83 to 1298+75, cutoff wall tip elevation 35'; 1298+75 to 1359+00, cutoff wall tip elevation 50'; 1359+00 to 1369+00: cutoff wall tip elevation 40'; 1369+00 to 1374+33: cutoff wall tip elevation 32'.
C	21	5,950	1374+33 to 1379+00, cutoff wall tip elevation 40'; 1379+00 to 1389+00, cutoff wall tip elevation 50'; 1389+00 to 1409+00, cutoff wall tip elevation 60'; 1409+00 to 1433+83 cutoff wall tip elevation 40'.	8'-tall drained stability berm on 300'-wide undrained seepage berm (thickness at the levee toe: 6.5'); relief wells at 100' spacing and 20' deep.	1374+33 to 1386+00 cutoff wall tip elevation 32'; 1386+00 to 1408+00: cutoff wall tip elevation 55'; 1408+00 to 1433+00: cutoff wall tip elevation 40'.

Construction Contract	Reach	Length (feet)	Alternative 1 Flood Management Measure	Alternative 2 Flood Management Measure	Alternative 3 Flood Management Measure
C	22	7,000	1433+83 to 1449+00, cutoff wall tip elevation 40’; 1449+00 to 1469+00, cutoff wall tip elevation 50’; 1469+00 to 1503+83, cutoff wall tip elevation 55’; 1433+83 to 1459+77, full levee degrade and reconstruction.	Sutter Butte Canal (SBC) seepage treatment (see section 2.5.11); 1433+83 to 1459+77, full levee degrade and reconstruction; 1459+77 to 1503+83, 10’-tall drained stability berm.	1433+83 to 1448+75, cutoff wall tip elevation 40’; 1448+75 to 1468+83, cutoff wall tip elevation 50’; 1455+00 to 1461+00, full levee degrade and reconstruction; 1468+83 to 1503+83, cutoff wall tip elevation 55’.
C	23	10,554	1503+83 to 1509+00, cutoff wall tip elevation 55’; 1509+00 to 1529+00, cutoff wall tip elevation 60’; 1529+00 to 1566+00, cutoff wall tip elevation 55’; 1566+00 to 1589+00, cutoff wall tip elevation 60’; 1589+00 to 1609+37, cutoff wall tip elevation 40’.	100’-wide undrained seepage berm (thickness at the levee toe: 5’).	1503+83 to 1508+50, cutoff wall tip elevation 55’; 1508+50 to 1528+75, cutoff wall tip elevation 60’; 1528+75 to 1566+50, cutoff wall tip elevation 55’; 1566+50 to 1608+75, cutoff wall tip elevation 60’.
C	24	1,449	Cutoff wall tip elevation 64’; Excavate and place 4.5’-thick compacted clay fill at bottom of adjacent ditch.	SBC seepage treatment (see section 2.5.11).	1608+75 to 1623+86, cutoff wall tip elevation 28’.
C	25	5,051	1623+86 to 1625+00, cutoff wall tip elevation 28’; 1673+00 to 1674+37, cutoff wall tip elevation 65’ 1639+00 replace two 24-inch steel storm drain pipes.	1623+86 to 1625+00, cutoff wall tip elevation 28’; 1673+00 to 1674+37, cutoff wall tip elevation 65’ 1639+00 replace two 24-inch steel storm drain pipes.	1623+86 to 1625+00, cutoff wall tip elevation 28’; 1673+00 to 1674+37, cutoff wall tip elevation 65’ 1639+00 replace two 24-inch steel storm drain pipes.
D	26	3,274	1674+37 to 1686+00, cutoff wall tip elevation 75’; 1686+00 to 1707+11, cutoff wall tip elevation 65’ and reconstruct landside slope.	SBC seepage treatment (see section 2.5.11).	1674+37 to 1707+11, cutoff wall tip elevation 65’; Reconstruction of landside slope extends down to elevation of bottom of SBC.
D	27	1,449	Cutoff wall tip elevation 65’ and reconstruct landside slope.	SBC seepage treatment (see section 2.5.11).	1707+11 to 1721+60: cutoff wall tip elevation 65’; Reconstruction of landside slope extends down to elevation of bottom of SBC.

Construction Contract	Reach	Length (feet)	Alternative 1 Flood Management Measure	Alternative 2 Flood Management Measure	Alternative 3 Flood Management Measure
D	28	4,771	1721+60 to 1728+00, cutoff wall tip elevation 65’; 1728+00 to 1749+00, cutoff wall tip elevation 80’; 1749+00 to 1769+31, cutoff wall tip elevation 45’ and reconstruct landside slope.	SBC seepage treatment (see section 2.5.11).	1721+60 to 1727+75, cutoff wall tip elevation 65’; 1727+75 to 1748+50, cutoff wall tip elevation 70’; 1748+50 to 1769+31, cutoff wall tip elevation 45’; Reconstruction of landside slope extends down to elevation of bottom of SBC.
D	29	4,402	1770+00, 1785+24, 1785+55, 1792+96, 1799+44, 1809+65 storm drain and irrigation pipe replacements.	1770+00, 1785+24, 1785+55, 1792+96, 1799+44, 1809+65 storm drain and irrigation pipe replacements.	1770+00, 1785+24, 1785+55, 1792+96, 1799+44, 1809+65 storm drain and irrigation pipe replacements.
D	30	8,867	1813+33 to 1816+40, cutoff wall tip elevation 80’; 1816+40 to 1865+90, cutoff wall tip elevation 40’; 1865+90 to 1877+90, cutoff wall tip elevation 50’; 1877+90 to 1902+00, cutoff wall tip elevation 30’.	1813+33 to 1831+00, 300’-wide undrained seepage berm (6.5’ thick at levee toe); 1831+00 to 1888+00, 100’-wide undrained seepage berm (5 feet thick at levee toe); 1888+00 to 1895+00, 300’-wide undrained seepage berm (6.5’ thick at levee toe); 1895+00 to 1902+00, 100’-wide undrained seepage berm (5’ thick at levee toe); 1813+33 to 1902+00, 4’-tall drained stability berm on top seepage berms.	1813+33 to 1816+50, cutoff wall tip elevation 80’, with full levee degrade and reconstruction; 1816+50 to 1848+25, cutoff wall tip elevation 30’; 1848+25 to 1866+00, cutoff wall tip elevation 70’; 1866+00 to 1877+75, cutoff wall tip elevation 47’; 1877+75 to 1883+00, cutoff wall tip elevation 40’; 1883+00 to 1902+00, cutoff wall tip elevation 27’. .
D	31	5,600	1902+00 to 1916+90, cutoff wall tip elevation 30’; 1916+90 to 1933+90, cutoff wall tip elevation 75’; 1933+90 to 1958+00, cutoff wall tip elevation 40’; 1902+00 cutoff wall gap closure using TRD, jet grouting or sheet piling method.	SBC seepage treatment (see section 2.5.11);1902+00 cutoff wall gap closure using TRD, jet grouting or sheet piling method.	1902+00 to 1907+50, cutoff wall tip elevation 27’; 1907+50 to 1917+50, cutoff wall tip elevation 44’; 1907+92 to 1909+42, waterside slope flattening or other remedial measure; 1917+50 to 1927+50, cutoff wall tip elevation 75’; 1927+50 to 1937+00, cutoff wall tip elevation 50’; 1937+00 to 1958+00, cutoff wall tip elevation 40’.

Construction Contract	Reach	Length (feet)	Alternative 1 Flood Management Measure	Alternative 2 Flood Management Measure	Alternative 3 Flood Management Measure
D	32	3,100	1958+00 to 1965+80, cutoff wall tip elevation 40’; 1965+80 to 1986+80, cutoff wall tip elevation 58’; 1986+80 to 1989+00, cutoff wall tip elevation 10’.	1958+00 to 1982+00, 6’-tall drained stability berm on 120’-wide undrained seepage berm (6’ thick at levee toe; 1982+00 to 1989+00, 4’-tall drained stability berm on 50’ undrained seepage berm (5’ thick at levee toe).	1958+00 to 1971+80, cutoff wall tip elevation 40’; 1971+80 to 1987+25, cutoff wall tip elevation 48’; 1987+25 to 1989+00, cutoff wall tip elevation 10’.
D	33	13,300	1989+00 to 2000+80, cutoff wall tip elevation 10’; 2000+80 to 2026+80, cutoff wall tip elevation 90’; 2026+80 to 2036+90, cutoff wall tip elevation 20’; 2036+90 to 2086+90, cutoff wall tip elevation 35’; 2086+90 to 2122+00, cutoff wall tip elevation 90’.	1989+00 to 2020+00, 50’-wide undrained seepage berm (5’ thick at levee toe); 2020+00 to 2028+00, 100’-wide undrained seepage berm (5’ thick at levee toe); 2028+00 to 2037+00, 50’-wide undrained seepage berm (5’ thick at levee toe); 2037+00 to 2050+00, 100’-wide undrained seepage berm (6’ thick at levee toe); 2050+00 to 2065+00, connect berms; 2065+00 to 2087+00, 100’-wide undrained seepage berm (6’ thick at levee toe); 2087+00 to 2102+00, 50’-wide undrained seepage berm (5’ thick at levee toe);	1989+00 to 2002+00, cutoff wall tip elevation 10’; 2002+00 to 2016+75, cutoff wall tip elevation 90’; 2016+75 to 2036+75, cutoff wall tip elevation 20’; 2036+75 to 2041+00, cutoff wall tip elevation 53’; 2041+00 to 2067+00, cutoff wall tip elevation 38’; 2067+00 to 2088+00, cutoff wall tip elevation 33’; 2088+00 to 2122+00, cutoff wall tip elevation 90’.
				2102+00 to 2106+00, connect berm across bend; 2106+00 to 2122+00, 60’-wide undrained seepage berm (5’ thick at levee toe); 1989+00 to 2122+00, 4’-tall drained stability berm on top of seepage berms.	
D	34	6,000	2122+00 to 2137+00, cutoff wall tip elevation 90’; 2137+00 to 2148+00, cutoff wall tip elevation 20’; 2148+00 to 2164+00, cutoff wall tip elevation 90’; 2164+00 to 2182+00, cutoff wall tip elevation 50’.	2122+00 to 2182+00, 4’ high drained stability berm on 60’ wide seepage berm (5’ thick at levee toe);	2122+00 to 2137+00, cutoff wall tip elevation 90’; 2137+00 to 2148+00, cutoff wall tip elevation 20’; 2148+00 to 2164+00, cutoff wall tip elevation 90’; 2164+00 to 2182+00, cutoff wall tip elevation 50’.

Construction Contract	Reach	Length (feet)	Alternative 1 Flood Management Measure	Alternative 2 Flood Management Measure	Alternative 3 Flood Management Measure
D	35	4,200	2182+00 to 2224+00, cutoff wall tip elevation 55’.	2182+00 to 2199+00, 65’-wide undrained seepage berm (5’ thick at levee toe); 2199+00 to 2203+00, connect berm across bend; 2203+00 to 2224+00, 5’-tall drained stability berm on 65’-wide undrained seepage berm (5’ thick at levee toe).	2182+00 to 2196+50, cutoff wall tip elevation 40’; 2196+50 to 2212+00, cutoff wall tip elevation 45’; 2212+00 to 2218+25, cutoff wall tip elevation 50’; 2218+25 to 2224+00, cutoff wall tip elevation 55’
D	36	3,500	2224+00 to 2259+00 Cutoff, Wall Tip Elevation 75’	2224+00 to 2227+00, 5’ tall drained stability berm on 65’ wide undrained seepage berm (5’ thick at levee toe); 2227+00 to 2233+00, connect berms across bend; 2233+00 to 2259+00, 4’ tall drained stability berm on 300’ wide undrained seepage berm (7.5’ thick at levee toe)	2224+00 to 2233+50, cutoff wall tip elevation 55’; 2233+50 to 2245+75, cutoff wall tip elevation 70’; 2245+75 to 2259+00, cutoff wall tip elevation 42’.
D	37	3,100	Cutoff wall tip elevation 45’.	6’-tall drained stability berm on 65’-wide undrained seepage berm (5.5’ thick at levee toe).	2259+00 to 2277+00, cutoff wall tip elevation 42’; 2277+00 to 2290+00, cutoff wall tip elevation 45’
D	38	1,300	Cutoff wall tip elevation 45’	De-grade and reconstruct levee with zoned filter at base and 300’ wide drained seepage berm (5’ thick at levee toe) with filter carried through berm	2290+00 to 2292+00 cutoff wall to elevation +45’. 2290+00 to 2303+00 construct 11’ high seepage berm, 50’ wide at the top and 170’ wide from levee centerline.
D	39	1,600	2312+10 remove 24-inch storm drain pipe.	2312+10 remove 24-inch storm drain pipe.	2312+10 remove 24-inch storm drain pipe.

Construction Contract	Reach	Length (feet)	Alternative 1 Flood Management Measure	Alternative 2 Flood Management Measure	Alternative 3 Flood Management Measure
D	40	4,000	2319+00 to 2336+90, cutoff wall tip elevation 50’; 2336+90 to 2359+00, cutoff wall tip elevation 20’.	2321+00 to 2332+00; fill landside pit (up to elevation 120’); 2321+00 to 2329+00, 7’ tall drained stability berm on 65’-wide undrained seepage berm (5’ thick at levee toe); 2333+00 to 2343+00, fill landside pits; 2331+00 to 2346+00, 10’-tall drained stability berm on 120’-wide undrained seepage berm (5’ thick at levee toe); 2346+00 to 2359+00, 4’-tall drained stability berm on 300’-wide undrained seepage berm (5’ thick at levee toe).	2321+00 to 2332+00; Fill Landside Pit (up to Elevation 120’); 2321+00 to 2329+00, 7’ tall Drained Stability Berm on 65’ wide Undrained Seepage berm (5’ thick at levee toe); 2333+00 to 2343+00, fill landside pits; 2331+00 to 2335+00 construct 120’-wide seepage berm; 2335+00 to 2359+00 100’-wide seepage berm. Berms are 9’ thick at the levee toe and 3’ thick at the berm toe.
D	41	900	Cutoff wall tip elevation 20’ at 2359+00 and 70’ at 2368+00 (constantly decreasing depth).	70’-wide undrained seepage berm (5’ thick at levee toe) with drainage relief trench along berm toe (50’ wide at grade, 12’ deep, with 1.5:1 side slopes, filled with drain gravel and a filter zones adjacent in-situ soils.	2359+00 to 2368+00, construct 100’-wide seepage berm with 1’-thick drain layer; 2360+00; fill waterside pit.(up to Elevation 130’)

Alt 1	Sum of Feet	Alt 2	Sum of Feet	Alt 3	Sum of Feet
Berm	2,253	Berm	127,761	Berm	3,791
Cutoff wall	183,344	Cutoff wall	43,817	Cutoff wall	175,512
Cutoff wall with ditch fill	6,523	Cutoff wall with ditch fill	8,177	Cutoff wall with ditch fill	3,598
Encroachments	18,430	Ditch fill	12,122	Ditch fill	2,237
No work area	5,812	Encroachments	18,430	Encroachments	18,184
		No work area	6,055	No work area	13,040
Grand Total	**216,362**	**Grand Total**	**216,362**	**Grand Total**	**216,362**

kv = kilovolt

2.2.4 Alternative Descriptions

2.2.4.1 Alternative 1

Alternative 1 would construct a cutoff wall along the centerline of the existing levee to a varying depth and a seepage berm along a portion of the landside levee toe.

For Reaches 2 through 5, Alternative 1 would construct a cutoff wall ranging between 30 feet and 127 feet in depth along the centerline of the levee. The levee would be degraded approximately 50% of its overall height with 2,900 feet of the levee being fully degraded. Cutoff wall construction would be completed as described under Section 2.5.1.2*.* In addition to the cutoff wall, Alternative 1 would construct a 200-foot wide seepage berm for 2,268 feet. Seepage berm construction would be completed as described under Section 2.5.6.2.

For Reaches 7 through 11, Alternative 1 would construct a cutoff wall ranging between 39 feet and 124 feet in depth along the centerline of the levee. The levee would be degraded approximately 50% of its overall height with 1,900 feet of the levee being fully degraded. SBFCA would acquire a temporary construction easement equal to 50 feet from the existing levee toe or toe of the proposed seepage berm for construction of the levee improvements. An additional 20-foot easement would be obtained where required for the relocation of existing utilities.

For Reaches 13 through 24, Alternative 1 would construct a cutoff wall ranging between 21 and 105 feet in depth along the centerline of the levee. The levee would be degraded approximately 50% of its overall height with approximately 2,600 feet of the levee being fully degraded. In addition to the cutoff wall, Alternative 1 would include approximately 11,150 feet of waterside slope flattening, approximately 5,100 feet of depression infill and approximately 1,500 feet of ditch lining. The slope flattening, depression/ditch infilling, and ditch lining construction would be constructed as described in Sections 2.5.2.2, 2.5.8.2, and 2.5.9.2, respectively.

For Reaches 26 through 41, Alternative 1 would construct a cutoff wall ranging between 18 feet and 97 feet in depth along the centerline of the levee. The levee would be degraded by approximately 50% of its overall height.

Materials imported to the project site would include water, bentonite, cement, incidental construction support materials, aggregate base rock, hydroseed, and up to 1,902,150 cubic yards of embankment fill material for the new levee surfaces from offsite commercial borrow sites. For backfill of new pipelines crossing the levee, Controlled Low Strength Material (CLSM) (otherwise known as light-weight concrete) is required to be placed to the pipeline's spring line.

2.2.4.2 Alternative 2

Alternative 2 would construct seepage and stability berms along the landside toe of the levee and a shallow cutoff wall along a portion of the centerline of the levee. In addition, Alternative 2 would include the filling of the existing canal adjacent to the levee in Reaches 22, 24, 26, 27, 28 and 31 with water during periods of high water surface elevation in the river. This would require the construction of regulating structures within the canal to maintain the water level within the canal as described under Section 2.5.11.2.

For Reaches 2 through 5, Alternative 2 would construct an undrained seepage berm ranging between 100 feet and 300 feet in width along the landside toe of the levee. Seepage berm construction would be completed as described under Section 2.5.6.2. Additionally, an 8-foot high stability berm would be constructed along 20,817 feet of the project. Stability berm construction would be completed as described under Section 2.5.3.2. Also, a shallow cutoff wall 20 feet in depth would be constructed along the levee centerline for 1,616 feet of the project. The levee would be degraded approximately 50% of its overall height. Cutoff wall construction would be completed as described under Section 2.5.1.2.

For Reaches 7 through 11, Alternative 2 would construct an undrained seepage berm ranging between 110 feet and 300 feet in width along the landside toe of the levee. A stability berm approximately 9.5 feet tall would be constructed along 14,163 feet of the project. Also, a shallow cutoff wall ranging between 23 feet and 35 feet in depth would be constructed along the levee centerline for 17,800 feet of the project. A portion of the existing Garden Highway would need to be removed and reconstructed to allow construction of the seepage berm.

For Reaches 13 through 24, Alternative 2 would construct an undrained seepage berm ranging between 70 feet and 300 feet in width along the landside toe of the levee. An 8- to 10-foot high stability berm would be constructed along approximately 24,200 feet of the project. A shallow cutoff wall 20 feet in depth would be constructed along the levee centerline for approximately 14,700 feet of the project. Relief wells would be installed for approximately 37,400 feet of the project. To facilitate construction of the cutoff wall and to maintain stability of the levee, the levee would be degraded by approximately 50% of its overall height.

For Reaches 26 through 41, Alternative 2 would construct an undrained seepage berm ranging between 50 feet and 300 feet in width along the landside toe of the levee. A 4- to 10-foot-tall stability berm would be constructed along approximately 38,600 feet of the project. Approximately 1,300 feet of the existing levee would need to be removed and reconstructed with a zoned filter at the base in combination with a seepage berm. Levee reconstruction would be completed as described in Section 2.5.4.2.

Materials imported to the project site would include water, bentonite, cement, incidental construction support materials, aggregate base rock, hydroseed, and up to 7,245,200 cubic yards of embankment fill material for the new levee surfaces from offsite commercial borrow sites. For backfill of new pipelines crossing the levee, CLSM is required to be placed to the pipeline's spring line.

2.2.4.3 Alternative 3

As introduced previously, Alternative 3 is the APA, combining mitigation measures from both Alternative 1 and Alternative 2 to produce the optimized alternative based on screening criteria.

For Reaches 2 through 5, Alternative 3 would construct a cutoff wall ranging between 20 feet and 127 feet in depth along the centerline of the levee. The levee would be degraded approximately 50% of its overall height. Cutoff wall construction would be completed as described under Section 2.5.1.2. In addition to the cutoff wall, Alternative 3 would construct a 100-foot wide seepage berm for 1,616 feet and a 200-foot wide seepage berm for 2,268 feet. Seepage berm construction would be completed as described under Section 2.5.6.2.

For Reaches 7 through 11, Alternative 3 would construct a cutoff wall ranging between 39 feet and 124 feet in depth along the centerline of the levee. Relief wells with 60 feet spacing and 50 feet in depth would be distributed at various locations in Reach 7.

For Reaches 13 through 24, Alternative 3 would construct a cutoff wall ranging between 21 and 105 feet in depth along the centerline of the levee. The levee would be degraded by approximately 50% of its overall height with approximately 2,600 feet of the levee being fully degraded. In addition to the cutoff wall, Alternative 3 would include approximately 5,100 feet of depression infill which would be constructed as described in Section2.5.8.2.

For Reaches 26 through 41, Alternative 3 would construct a cutoff wall ranging between 18 feet and 97 feet in depth along the centerline of the levee. The levee would be by degraded approximately 50% of its overall height. Approximately 1,300 feet of levee would be degraded and reconstructed with a 5 to 1 slope (horizontal to vertical). Levee reconstruction would be completed as described under Section 2.5.4.2. Reconstruction of the SBC embankment slope nearest the levee would occur in Reaches 26, 27, and 28. This activity would remove approximately 7,500 to 10,000 cubic yards of material by excavator from the top of the slope over a length of 9,484 feet of the canal, effectively laying back the canal slope. While considered dredging from a regulatory standpoint because it involves excavation below the ordinary high water mark, the work would take place when the canal is dry, either during the time of year when it is typically dry because it is not in operation for irrigation water deliveries or via not allowing it to fill.

Reach 31 includes cutoff walls as described in Section 2.5. In Reach 38 an 11-foot high and 170-foot wide (from the levee centerline) seepage berm would be constructed as described in Section 2.5.6. In Reach 41, a 100-feet wide drained seepage berm would be constructed as described in Section 2.5.6.2. The seepage berm would include a 1-foot thick filter drain along the bottom. The filter drain would provide drainage for seepage through the levee. The existing concrete outfall structure located at the south end of this reach would remain in place and would be backfilled with earth materials. This alternative would also include filling of the waterside pit located at the south end of Reach 41. The pit is approximately 200-feet by 80-feet at the bottom and 20-feet deep. A 30-foot wide construction access area would be provided at the toe of the seepage berm.

Approximately 9,500 feet of canal would be kept in place and monitored with a Flood Safety Plan as discussed in Section 2.5.11.2.

Materials imported to the project site would include water, bentonite, cement, incidental construction support materials, aggregate base rock, hydroseed, and up to 1,934,400 cubic yards of embankment fill material for the new levee surfaces from offsite commercial borrow sites. For backfill of new pipelines crossing the levee, CLSM is required to be placed to the pipeline's spring line.

2.3 Common Elements, Assumptions, and Commitments for All Action Alternatives

Though the alternatives vary, several common elements and assumptions are shared among each and are described below.

These elements include environmental commitments, which are measures incorporated as part of the project, meaning they are proposed as elements that apply to each and all action alternatives and are to be considered in conducting the environmental analysis and determining effects and findings. The purpose of environmental commitments is to reflect and incorporate best practices into the project that avoid, minimize, or offset potential environmental effects. These best practices tend to be relatively standardized and compulsory; they represent sound and proven methods to reduce the potential effects of an action. The rationale behind including environmental commitments is that the project proponent commits to undertake and implement these measures as part of the project in advance of effect findings and determinations in good faith to improve the quality and integrity of the project, streamline the environmental analysis, and demonstrate responsiveness and sensitivity to environmental quality.

2.3.1 Project Footprint and Land Acquisition

Throughout the project length, the State and/or local levee maintaining agencies hold various easements and fee rights to the land beneath and adjacent to the Feather River West Levee. Due to the age of the system, and the numerous projects to upgrade the levee system over the years, the land rights vary significantly throughout the project. One objective of the project is to, where feasible, upgrade these rights so that the State and local maintaining agencies have appropriate and consistent land rights throughout the length to construct the project and to operate and maintain the levee system. To this end, SBFCA would coordinate with the CVFPB and DWR to attempt to acquire 15 feet on the waterside of the levee and up to 30 feet on the landside in areas which are undeveloped. In developed areas, SBFCA would seek to acquire right-of-way to the extent necessary to facilitate construction of the project. For temporary construction purposes, SBFCA would seek to acquire an additional 10 feet landside of the levee in areas where orchards or other continuous obstructions are not present. Where the current rights beneath or adjacent to the levee are currently owned as an easement, the project would attempt to upgrade the rights to fee ownership in most cases.

In undeveloped areas, for the landside right-of-way, the 30 feet to be obtained landward of the levee, seepage berm, or other facility, existing trees, and encroachments would be removed to the extent necessary to facilitate construction of the project and to support long-term operations and maintenance activities. The outer 10 feet would be acquired only as an easement and allowed to return to agricultural use following construction. In developed areas, encroachments would be removed if they are deemed by SBFCA to pose a threat to levee integrity.

Each alternative may require land acquisition to accommodate the footprint of the project for measures such as relief wells, seepage berms, slope flattening, and stability berms. The land within the footprint, which includes the proposed flood risk–reduction measure and the waterside and landside O&M easements, would be acquired to prevent encroachment into the flood protection corridor. Permanent acquisition, relocation, and compensation services would be conducted in compliance with Federal and state relocation laws, which are the Uniform Act of 1970 (42 USC 4601 et seq.) and implementing regulation, 49 CFR Part 24; and California Government Code Section 7267 et seq. These laws require that appropriate compensation be provided to displaced landowners and tenants, and that residents be relocated to comparable replacement housing.

2.3.2 Relocations, Demolition, and Removals

Existing facilities found within the footprint of an alternative may require removal and replacement nearby, abandonment, or relocation. Encroachments are numerous along the Feather River West Levee and may need to be addressed if they present either a threat to the stability of the levee, do not currently comply with the levee encroachment criteria, or would be disrupted or otherwise affected by construction activities. Of the over 400 identified encroachments in the affected area, some have been reviewed and permitted by the CVFPB, some are included in the as-builts of the original project, while others have an unknown status. Typical encroachments include pressure pipelines (water supply pipelines from waterside pump stations and drainage pipelines from landside drainage pump stations), gravity drainage pipes, gas lines, telephone utilities, overhead utilities, structural encroachments, and other types and variations.

Vegetation removal would involve stripping of herbaceous (non-woody) vegetation by bulldozer. Removal of woody vegetation would be as described in Section 2.5.10, *Encroachment Removal and Vegetation Policy Compliance*. Vegetation would be removed only from within the direct construction footprint and the minimum areas necessary for staging and access.

Debris from structure and vegetation removal and embankment fill material of poor quality would be hauled off site to a permitted disposal site within 20 miles of the removal location.

The work items identified in Table 2-5 are known relocations, demolitions, and removals, categorized as described below.

- **Pipe crossing replacements** are existing pipelines for landside drainage, water supply, or wastewater or sewer that are located under or in the levee prism, perpendicular to the levee. For the identified locations, they would be replaced in-kind in accordance with current design standards for levee penetrations.
- **Adjacent pipe relocations** are existing pipelines for landside water supply or wastewater or sewer that are located to the landside of the levee toe, parallel to the levee. For the identified locations, they would be replaced in-kind approximately 30 feet landward from the levee toe.
- **Well relocations** are replacements of existing irrigation wells, typically caused by construction of a seepage berm. The wells would be replaced in-kind landward of the berm or levee toe.
- **Pipe crossing removals** are for pipelines similar to those described for pipe crossing replacements with the exception that they would not be replaced; they are complete demolition and removals.
- **Water wells or pipe crossings** are existing water supplies for which the determination has not yet been made for replacement type. They may be the development of a new water well or extension of a pipeline to replace the pre-project water supply. The determination would be made in coordination with the owner.
- **Structure demolitions** are vertical aboveground elements that would be demolished and removed.

Table 2-5. Relocation, Demolition, and Removal Items

Construction Contract	Reach	Station #	Work Item
Pipe Crossing Replacements			
C	16	972+00	2-Inch Water Pipe
C	16	988+50	Remove 3-Inch Pipe
C	16	1020+85	Remove 4-Inch Pipe
C	16	1043+52	Remove 27-Inch Pipe
C	16	1073+41	PG&E 12-Inch Gas Line
D	29	1777+00	Waller 24-Inch SD Pipe
D	29	1785+24	24-Inch SD Pipe
D	29	1785+55	24-Inch SD Pipe
D	29	1792+96	24-Inch SD Pipe
D	29	1809+65	24-Inch SD Pipe
Adjacent Pipe Relocations			
A	4	396+50 to 409+00	Feather Water District 42-Inch Main
A	4	396+50 to 409+00	Taylor Brothers 15-Inch Main
A	4	409+00 to 430+00	Taylor Brothers 15-Inch Main
B	8	596+00 to 642+00	Sierra Gold 12-Inch Main
C	20	1349+00 to 1375+00	Filter Irrigation Pipe
D	30	1888+50	Housing Authority 6-Inch Waste Water Main
Well Relocations			
A	3	241+75	GHMWC Water Well #18 Relocation
A	3	219+00	GHMWC Water Well #19 Relocation
A	3	274+50	GHMWC Water Well #22 Relocation
A	3	298+67	GHMWC Water Well #23 Relocation
A	4	407+72	Taylor Brothers IR Water Well Relocation
B	8	603+50	Sierra Gold Nursery IR Water Well
B	8	638+20	Sierra Gold Nursery IR Water Well
B	9	655+50	Irrigation Water Well
B	9	669+20	Sierra Gold Nursery IR Water Well
B	9	688+90	OMWC IR Water Well
C	18	1174+05	Wilbur Ranch Water Well
C	18	1200+69	Wilbur Ranch Water Well
D	33	2006+05	Irrigation Water Well
D	35	2208+56	Irrigation Water Well
Pipe Crossing Removals			
B	11	828+55	24-Inch Sewer Pipe
B	12	832+20	24-Inch Sewer Pipe
B	12	832+25	24-Inch Sewer Pipe
C	16	1043+03	Gilsizer SD 16-Inch Pipe
C	16	1043+22	Gilsizer SD 24-Inch Pipe
C	16	1043+27	Gilsizer SD 24-Inch Pipe
C	16	1043+45	Gilsizer SD 36-Inch Pipe
D	39	2312+05	24-Inch SD Pipe

Construction Contract	Reach	Station #	Work Item
Water Wells or Pipe Crossings (to be determined)			
C	19	1229+41	Richland Enterprise
C	19	1265+59	Kewall Singh
D	28	1765+15	Pamma
D	30	1834+42	Farmland
D	33	2004+86	Mariani
D	37	2283+44	Fredricks
D	40	2345+79	Irrigation Pipe
Structure Demolitions			
C	16	989+50	Residential Garage
C	16	990+50	Residential Structure
C	16	990+75	Residential Structure
C	16	992+75	Residential Shed
C	16	995+00	Parking Structure
C	22	1482+25	Barn
C	22	1484+00	Barn
C	22	1485+00	Residential Home
C	23	1556+00	Utility Barn
C	24	1611+00	Utility Barn
C	24	1612+25	Residential Home
D	28	1738+50	Residential Home
D	31	1955+75	Structure
D	31	1956+00	Residential Trailer
D	31	1956+00	Silo/Fuel Tank
D	31	1956+50	Tank
D	31	1957+25	Structure
D	31	1957+50	Fuel Pumps

SD = storm drain.

Additionally, prior to and/or concurrent with levee rehabilitation construction, PG&E will relocate existing power transmission lines and gas distribution pipelines as required to comply with CVFPB and USACE utility encroachment standards and to facilitate levee rehabilitation construction. Work to be performed by PG&E will include (but not necessarily be limited to) placement of new utility poles and anchors, transfer of existing power transmission lines from existing utility poles to new utility poles, removal of existing utility poles, placement of new gas distribution pipelines, connection of new gas distribution pipelines to existing facilities, and removal of existing gas distribution pipelines. Temporary and/or permanent easements as required for the construction and maintenance of these facilities are being acquired by SBFCA. The locations of the facilities to be relocated by PG&E are shown on Plate 2-3.

2.3.3 Construction Staging, Access, and Temporary Facilities

Staging areas would only be provided within the project right-of-way and easement limits. The contractor would be responsible for obtaining all required local, state, and Federal permits for any staging areas outside of these limits. Staging areas would be used for staging construction activities and to provide space to house construction equipment and materials, project offices, employee parking, and other uses needed for project construction.

To facilitate project construction, temporary earthen ramps would be constructed for equipment access between the levee crown and the staging area(s). The earthen ramps would be removed when construction is complete.

Cutoff wall construction requires temporary establishment of an onsite slurry batch plant that would occupy about 1 to 2 acres. Batch plants would be located at approximately 1-mile intervals within the project footprint. The batch plant site would likely contain tanks for water storage, bulk bag supplies of bentonite, bentonite storage silos, a cyclone mixer, pumps, and two generators that meet air quality requirements. The site would also accommodate slurry tanks to store the blended slurries temporarily until they are pumped to the work sites. Slurry ingredients would be mixed with water at the batch plant and the mixture would be pumped from the tanks through pipes to the cutoff wall construction work sites. The batch plant would produce two different slurry mixes, one for trench stabilization and one for the soil backfill mix. Therefore, two slurry pipes or hoses, typically 4- or 6-inch high-density polyethelene pipes, would be laid on the ground and would extend to all work sites. An additional pipe may be used to supply water to the work sites.

Staging, access, and other temporary construction areas would be located away from wetlands, woody vegetated areas, wildlife species habitat, known cultural resources, or other sensitive areas and would be limited to disturbed or ruderal grasslands subject to review by USACE and Federal and state resource agencies.

2.3.4 Property Access Limitations, Disturbances, and Service Disruptions

2.3.4.1 Public Use Areas

For public use areas, SBFCA would ensure that the contractor posts notice of construction activities and intended days of construction area closure at least 30 days in advance of closures in and near public use areas. The contractor would post notice of construction activities and closures at least 10 days in advance in all other areas. Notice should be posted adjacent to access roads, and signs would be at least 3 square feet in size and provide a contact for questions regarding project construction. SBFCA also would ensure that the construction area is fenced off to keep members of the public out of harm's way.

SBFCA would ensure that access to any public boat launch facilities is maintained to the greatest degree possible during construction of levee improvements. If access restrictions cannot be avoided, SBFCA would post notice regarding the location of alternative boat launch facilities at least 30 days in advance of closure and would ensure that closure time is minimized and/or provide alternate access routes to the facilities. See recreation analysis in Section 3.14 for further discussion.

2.3.4.2 Private Property

For private areas, during some periods of time, construction activities would be directly adjacent residences, business, and agricultural properties. Information related to any future construction activities would be available by calling the project hotline at (530) 870-4425 or by visiting the project web site at http://sutterbutteflood.org.

For noise and vibration disturbance, SBFCA would require the construction contractor to follow noise-reducing construction practices such that noise from construction does not exceed applicable jurisdictional noise ordinance limits or, at a minimum, implements measures to reduce noise to acceptable levels. Measures that can be used to limit noise may include but are not limited to the following actions.

- Locating equipment as far as practical from noise-sensitive uses.
- Using sound control devices such as mufflers on equipment.
- Using equipment that is quieter than standard equipment.
- Using noise-reducing enclosures around noise-generating equipment.
- Provide for temporary relocation if noise exceeds acceptable levels for an extended duration (as discussed below).

In some cases, construction may result in temporary disruption of utilities (water, telephone, electricity, gas, and sanitary sewer) or loss of vehicle or pedestrian access could occur for durations too lengthy for convenient day-to-day living and/or construction-related noise may occur outside ordinance limits. Disruptions in service would be up to four hours per episode for electrical, communications, and gas and up to 8 hours per episode for water and sanitary sewer. Access by auto and by foot would be maintained, subject to detour and periodic closure (less than 4 hours). If necessary, SBFCA would provide assistance for residents to relocate during construction activities and provide compensation to residents for reasonable rent and living expenses incurred due to relocation. In accordance with the Uniform Relocation Assistance and Real Property Acquisition Act, residents would be provided with decent, safe, and sanitary housing.

SBFCA would develop a Temporary Resident Relocation Plan to guide temporary relocation services and compensation, and at a minimum would ensure all compensation and relocation activities are conducted in compliance with Federal and state relocation laws.

2.3.4.3 Temporary Road and Railroad Closures, Traffic Control, and Road Maintenance

SBFCA, in coordination with relevant city and county public works departments, would develop and implement a traffic control plan(s) for the proposed project. A traffic control plan describes the methods of traffic control to be used during construction. All on-street construction traffic would be required to comply with the local jurisdiction's standard construction specifications. The plan would reduce the effects of construction on the roadway system in the project area throughout the construction period. Construction contractors would follow the standard construction specifications of affected jurisdictions and obtain the appropriate encroachment permits, if required. The conditions of the encroachment permit would be incorporated into the construction contract and would be enforced by the agency that issues the encroachment permit.

Road closures may be of varying duration, measured in hourly periods or up to several weeks in some instances. Proposed lane closures during the AM and PM commuting hours would be coordinated with the appropriate jurisdiction and minimized during the morning and evening peak traffic periods. Commuters would be notified of the construction schedule to help avoid potential disruptions. Standard construction specifications also typically limit lane closures during commuting hours. Lane closures would be kept as short as possible and detour signage, if detours are available, would be posted around construction sites. Advance notice signs of upcoming construction activities would be posted at least 1 week in advance so that road and rail users are able to avoid traveling through the construction area during these times or at least aware of inconveniences.

Safe pedestrian and bicyclist access, if any exists on the current roadway, would be maintained in or around the construction areas at all times. Construction areas would be secured as required by the applicable jurisdiction to prevent pedestrians and bicyclists from entering the work site, and all stationary equipment would be located as far away as possible from areas where bicyclists and pedestrians are present. SBFCA would notify and consult with emergency service providers to maintain emergency access and facilitate the passage of emergency vehicles on city streets.

SBFCA would require contractors to provide adequate parking for construction trucks, equipment, and construction workers within the designated staging areas throughout the construction period. If inadequate space for parking is available at a given work site, SBFCA would require contractor to provide an offsite staging area and, as needed, coordinate the daily transport of construction vehicles, equipment, and personnel to and from the work site.

SBFCA would coordinate with the local jurisdictions prior to starting any construction activities to determine if any other projects would disrupt traffic or require detours affecting the same roads. If so, SBFCA would modify haul routes, timing, or otherwise work with the local jurisdictions and other project proponents to minimize cumulative disruptions to roadways.

The traffic control plan would also include the information listed below.

- A street layout showing the location of construction activity and surrounding streets to be used as detour routes, including special signage.
- A tentative start date and construction duration period for each phase of construction.
- The name, address, and emergency contact number for those responsible for maintaining the traffic control devices during the course of construction.

Additionally, the traffic control plan would include the stipulations listed below.

- Access for driveways and private roads would be maintained, except for brief periods of construction, in which case property owners would be notified.
- Traffic controls may include flag persons wearing Occupational Safety and Health Administration-approved vests and using a Stop/Slow paddle to warn motorists of construction activity.
- Access to transit services would be maintained and public transit vehicles would be detoured.
- Contractors would be informed in writing of appropriate routes to and from construction sites, and weight and speed limits for local roads used to access construction sites. All such written notifications would be submitted to the local jurisdiction's planning department.

SBFCA would assess damage to roadways used during construction and would repair all potholes, fractures, or other damages. Silt fences, straw wattles, and stabilized construction entrances/exits would be implemented to control mud and dirt from spilling on streets.

In addition to roadway issues, SBFCA would coordinate directly with railroad officials regarding the timing of temporary railroad closures and/or removals as necessary during program implementation. SBFCA would ensure minimization of any disruption to service by utilizing the most recent and available construction methods to expedite activities. Because the temporary loss of service along some railroads could result in financial loss for various companies that use the rail lines, SBFCA would ensure that the appropriate entities are compensated for monetary losses attributed to the reduction in rail service.

2.3.5 Material Importation, Reuse, and Borrow

Materials imported to the project site would include water, bentonite, cement, incidental construction support materials, aggregate base rock, asphalt, concrete, hydroseed, and embankment fill soil. Each alternative would require the use of large quantities of fill soil, or borrow. To meet borrow demands, embankment fill material excavated as part of construction would be evaluated for reuse. Embankment fill material deemed suitable would be used as part of levee reconstruction and berms.

2.3.5.1 Borrow Volume

Depending on the alternative, the total volume of material required ranges from 1,902,150 to 7,245,200 cubic yards. The quantities were calculated assuming a 20% shrinkage factor between excavation at the borrow site and placement at the levee. Only material suitable for placement in levee construction may be borrowed for the project (HDR et al. 2012). These materials are identified as low to medium plasticity soils classified in accordance with American Society for Testing and Materials (ASTM) D 2487 as silty sand and clayey sand (SM or SC), silt (ML), or clay (CL or CH). The materials should have a Liquid Limit (LL) less than or equal to 45 (may be extended up to 55 with justification and approval from the USACE and the CVFPB), a Plasticity Index (PI) greater than or equal to 8 and less than 40, and a fines content greater than or equal to 30%. Material borrowed for the levee core would contain fines in excess of 50%. The material should be free from visible organics and be no greater than 2 inches in any dimension.

2.3.5.2 Borrow Site Selection Factors

SBFCA's first choice for fill or borrow material would be from a local commercial quarry or other permitted source. In the event that material is desired from a source that is not presently permitted, for reasons such as quality, proximity, or volume available, SBFCA would implement soil supply protection measures. One such measure would be maximizing on-site use through gradation, placement, and treatment. Another measure would be the preservation and replacement of topsoil at borrow sites, so that they could be continued to be used for their current use or otherwise returned to their pre-project condition. As part of borrow operations, the upper 12 inches of topsoil would be set aside and replaced after project construction in each construction season. After the project is completed, the borrow site would be re-contoured and reclaimed. An additional measure would be independent environmental documentation and regulatory compliance, as required. Specific regulations related to soil resources are detailed in Section 3.3.2.1 and Appendix A, *Regulatory Background*.

Factors determining borrow sources and sites are (followed by a description of each factor and discussion of potential borrow sources).

- Hauling distance and haul route
- Depth to groundwater
- Royalty fees
- Post-construction land use
- Environmental factors

Hauling Distance and Routes. The cost for borrow site excavation and hauling is directly related to the distance required to haul the material and the route by which the materials must be transported. To the extent possible, sites should be selected that minimize haul route length and the use of public roadways (Wood Rodgers2011).

Depth to Groundwater. Because the top layer of a borrow site must be removed and stockpiled to exclude organics from the borrow material, it is economical to maximize the depth of the excavation. This maximum depth is typically governed by the normal seasonal depth of groundwater. Once excavation extends to within a few feet of the groundwater table, additional expense is incurred to implement dewatering at the site. Groundwater elevations generally fluctuate throughout the year and can be influenced by standing water or irrigation activities on adjacent lands. Typically, groundwater depths are higher at the beginning of spring, and become deeper toward the end of summer (Wood Rodgers 2011).

Royalty Fees. Royalty fees for material excavated directly affect the cost of the borrow and also typically trigger more substantial permitting requirements. It is desirable to find a property owner who wishes to have excavation carried out for his own purposes, such as creating a detention basin to support future development, so that royalty fees and a SMARA permit are avoided (Wood Rodgers 2011).

Post-Construction Land Use. The post-construction use of the property can also effect the depth of excavation. Borrow sites must be free draining after the material is excavated, and therefore cannot be extended deeper than the offsite drainage facilities can accommodate(Wood Rodgers 2011).

Environmental Factors. Environmental factors, including the need for mitigation for special-status species and wetlands encroachments, are also a factor in selecting borrow sites. Consideration should also be given to haul routes when evaluating environmental effects. Routes which could be unavailable during the early months of the construction season due to the presence of nesting raptors should be avoided (Wood Rodgers 2011). If waterside borrow sites outside the construction footprint are needed, only sites that do not impact woody vegetation associated with fish-inhabited waters should be considered. All sites will be surveyed for potential wildlife habitat, jurisdictional waters, cultural resources, and other environmental regulatory triggers prior to use, and environmental documentation and permits will be secured independently or supplemental to the FRWLP documentation and permits.

2.3.5.3 Potential Borrow Sites

Potential borrow sites have been identified in the project area and each are summarized below. An investigation of each of the identified sites was based upon the quantity of available material, hauling distance, material composition, groundwater elevation, and prospects for acquisition. The purpose of the investigation is to identify the sites with the greatest potential to provide material economically for the project. Economical hauling has been determined to be within a 2-miles radius and marginally economic hauling within a 10-mile radius. Borrowing outside radius is not recommended and additional sites would be identified to supply material within these limits.

As a result of the borrow analysis, sufficient fill volume was generally determined to range from immediately adjacent to the levee improvement to approximately a 10-mile round-trip haul distance from the area of construction. Borrow source sites, material reuse, and importation associated with each alternative are described in more detail under the alternative descriptions and in relevant resource chapters.

If all of the material available at each of the identified sites was determined to be geotechnically suitable, the sites could provide up to 2.7 million or 180% of the total target volume. Preliminary indications are that the approximately 50% of the material at the borrow sites would be suitable for use as levee fill on the project. Additional sites may need to be identified to provide sites with a greater potential to yield material meeting levee fill requirements, and to provide sites closer to the levee. SBFCA would be responsible for the independent environmental review if new unpermitted borrow sources are needed. Borrow sites would not have a USACE trigger unless there is a 404 action.

Through outreach efforts, SBFCA identified a number of sites owned by individuals or government agencies willing to sell their property or provide material on a cubic yard basis. Plate 2-2 illustrates each of the properties identified thus far, and a description of each is outlined below.

Oroville Wildlife Area Dredge Tailings Area

This site is within the Oroville Wildlife Area (OWA) and consists of several mounds of dredge tailings waterward of the existing levee. The material is suitable for use in seepage berms at Reaches 40 and 41. The availability of tailings in the area should be sufficient to meet the total deficit for berm material in these reaches. The excavation of the material would be coordinated to maximize hydraulic benefits from the reshaping of the overbank area. The site also represents an opportunity to provide waterside habitat enhancements. The area of this this site could be approximately 75 acres. The depth of excavation could be upwards of 10 feet. The yield of material from this site could be 375,000 cubic yards. Hauling from this site would not take place on public roads. It is anticipated the contractor would use an existing waterside levee ramp (or create one), directly accessing the levee patrol road. The future land use for this site would be similar to its present day use (managed habitat area).

Live Oak City Detention Basin

The City of Live Oak owns the property formerly known as the Caltrans Detention Basin Site located west of SR 99 and south of Paseo Avenue. The site is currently fallow. The City of Live Oak intends to construct soccer fields and a stormwater detention basin at the site in 2013 or later. Although the site would require hauling for a short distance through a residential neighborhood, it is anticipated the residents would be amenable to the hauling as it would be a part of the public amenity constructed by the City of Live Oak. The material at this site is anticipated to be lean clay (CL) from a depth of 1 to 2.5 feet, followed by more sandy material to a depth of 6 feet. This site is approximately 25 acres and the depth of excavation is anticipated to be 3–6 feet. The yield of material from this site could be 125,000 cubic yards. The haul route would be from the site along Linda Street, to Allen Street, to Larkin Road, to Broadway, to Elm Street, to Larkin Road, to Pennington Road. The levee would be accessed at Pennington Road. The post-project use of the site would be a community park and stormwater detention basin facility.

Lanza 235-Acre Borrow Source

David Lanza is seeking to acquire this 235-acre property near Township Road and Schroeder Road southeast of the City of Live Oak. The property is currently planted in rice. The potential owner wishes to construct an agricultural water holding pond on the property, and may be agreeable to lowering large portions of the property to obtain additional material. Mr. Lanza has indicated that the total quantity of material available would depend on the price negotiated (the more material sold, the lower the unit cost). Initial investigations indicate this site has Type 1 material in the upper 3 feet. Groundwater at this location is as shallow as 5 feet below the surface. The area used for borrow at this site would be determined following the completion of geotechnical investigations and negotiations with the landowner. It is possible a large portion of it (100 acres) could be excavated uniformly to a depth of up to 3 feet. The yield of material from this site could be 250,000 cubic yards. A smaller area could also be excavated to a deeper extent to provide material. The haul route from this site would be Township Road to Pennington Road, accessing the levee at Pennington Road. The post-project land use would be rice production. Should a deeper excavation over a smaller area occur on the property, an agricultural return water storage pond may be constructed at the site.

Nevis 40-Acre Property

The Nevis property is located at Township and Clark Roads southeast of the City of Live Oak. The site is currently planted in rice. The owner is interested in either selling borrow material to SBFCA or selling the property outright. Initial investigations indicate that the site is underlain by approximately 2.5 feet of fat to lean clay, with greater than 50% passing the No. 200 sieve, Plasticity Index tests ranging from 16 to 39, and Liquid Limits between 24 and 54. Most of this material will qualify as Type 1 material. Additional material at greater depths may be classified as Type 1 as well. Groundwater was not encountered at the site during the investigation. The area is approximately 40 acres . Excavation is likely to occur across the entire acreage, to depths up to 6 feet. The yield of material from this site could be 200,000 cubic yards. The likely haul route from the property would be Clark Road to Live Oak Boulevard, to Pennington Road, accessing the levee at Pennington Road. Alternatively, the haul route could be Township Road to Pennington Road. The post-project land use for the property would be rice production.

Lanza 40-Acre Property

Similar to the Nevis property, the Lanza 40-acre property is currently farmed in rice and is located at North Township Road and Pease Road south of Live Oak and north of Yuba City. The site has not yet been investigated to determine the types of materials present. Excavation of the site to a depth of 6 feet may occur. The yield of material from this site could be 200,000 cubic yards. The likely haul route would be along Pease Road directly east to the levee. The post-project land use for the property would be rice production.

Marler Property

The Marler Property is a 10-acre property at Johnson Road near Messick Road north of Star Bend and south of Shanghai Bend. The site is currently an orchard. The depth of excavation could be upwards of 6 feet. The yield of material from this site could be 75,000 cubic yards. The likely haul road would be Johnson Road to Messick Road to the Garden Highway, accessing the levee near Oswald Road. The post-project land use for the property would be agricultural production, likely row crops or orchard.

Schmidl Property

The Schmidl property is a 100-acre parcel located at State Highway 20, two-thirds of a mile west of Humphrey Road. It is currently farmed in rice. Preliminary investigations indicate the site is likely to provide Type 1 material to a depth of 3 feet or more. There are some cemented materials at the 2–3-foot depth that will need to be processed during the operation for the borrow operation, or for future farming. As the site would remain in rice following the borrow operation, the site would be land-leveled to a depth of 2–3 feet to ensure future drainage. If upon further investigation it is determined that the site cannot be lowered 2–3 feet and still positively drain to adjacent irrigation ditches, material not meeting levee specifications may be hauled back from the levee and placed at the site to raise the grade. It may not be fully restored to its current elevation, only to the elevation necessary to drain. Hauling from the site to areas south of Yuba City would be from State Highway 20 east to George Washington Road (or SR 99), south to Bogue Road, then east to the Garden Highway, south to Shanghai Bend Road, and east to the Feather River levee. For areas north of Yuba City, hauling would be along State Highway 20 east to SR 99, north to Queens Avenue, east to Live Oak Boulevard, then to the levee by way of the ramp opposite of Northgate Drive.

2.3.6 Cutoff Wall Gap Closure and Special Crossings

Three reaches of the Feather River West Levee—Reaches 14, 15, and 16—have had cutoff walls constructed along the approximate levee centerline. However, the projects skipped two major bridge crossings, the 5th Street bridge at Station 1007+00 and State Route (SR) 20 bridge at Station 1025+20, creating gaps in the cutoff wall. In addition, there are two other crossings that require special consideration for the cutoff wall construction: the Union Pacific Railroad (UPRR) crossing at Station 1131+00 and the 10th Street Bridge at Station 1902+00.

The Yuba City Department of Public Works is working to replace the existing 5th Street Bridge with a new bridge located just north of the existing bridge alignment. The new bridge would be in an area where the USACE previously constructed a cutoff wall through the levee. SBFCA intends to wait until Yuba City completes the new bridge and takes the existing bridge out of service. At that time, the gap in the existing cutoff wall can be closed using conventional cutoff wall construction techniques.

For the 10th Street Bridge, three alternatives were considered. Alternative 1 consisted of a cutoff wall across the roadway constructed by the jet grout method. Alternative 2 consisted of a cutoff wall by the sheet pile method. Alternative 3 consisted of a seepage berm constructed within and adjacent to the abandoned railroad tunnel beneath the roadway on the landside of the levee. The seepage berm was selected as the preferred alternative.

For the UPRR Railroad, two alternatives were considered. Alternative 1 consisted of a cutoff wall constructed by the jet grout method. Alternative 2 consisted of installing sheet piles through the track alignment. Based on discussions with UPRR, the existing tracks are a main route that may not be taken out of service for an extended period. This effectively eliminated installation of sheet piles as an alternative because that approach would require removal of a portion of the tracks . Therefore, Alternative 1, the jet grout cutoff wall, was selected. The wall would be constructed by installing a rectangular jet grout wall panel to the required depth from injection points adjacent to the tracks. The jet grout wall would only extend laterally a short distance beyond the track limits to minimize cost. From the termination points of the jet grout wall, steel sheet piles would be used to connect the ends of the jet grout wall to the endpoints of the conventional soil-bentonite wall, which would be constructed during the 2013/2014 season. The end points of the conventional soil-bentonite wall are established by determining where the open excavation of the soil-bentonite wall trench would no longer be under the load influence of the railroad tracks.

2.4 Environmental Commitments

Environmental commitments are measures incorporated as part of the project description, meaning they are proposed as elements of the proposed project and are to be considered in conducting the environmental analysis and determining effects and findings. The purpose of environmental commitments is to reflect and incorporate best practices into the project that avoid, minimize, or offset potential environmental effects. *Note: The term* mitigation *is specifically applied in this EIS/EIR only to designate measures required to reduce environmental effects triggering a finding of significance.* These best practices tend to be relatively standardized and compulsory; they represent sound and proven methods to reduce the potential effects of a project. By incorporating environmental commitments into the project, the project proponent commits in good faith to undertaking and implementing these measures in advance of effect findings and determinations to improve the quality and integrity of the project, streamline the environmental analysis, and demonstrate responsiveness and sensitivity to protecting the environment. The environmental commitments would be implemented under all project alternatives, with the exception of the No Action Alternative.

To avoid and minimize construction-related effects, SBFCA would implement the following environmental commitments to reduce or offset short-term, construction-related effects. Measures have been developed for each of the topics below, to be applied to the FRWLP project resource analyses.

2.4.1 Protective Barrier Fencing

The construction specifications would require that SBFCA retain a qualified biologist to identify sensitive biological resources (e.g., special-status species, riparian habitat, wetlands, and elderberry shrubs) adjacent to the construction zone that are to be avoided during construction. Fencing would include K-rail concrete barriers, orange construction fencing, and exclusion fencing. Barrier fencing type and placement as it relates to each habitat and species is discussed in the species-specific measures that follow.

Before construction, the contractor would work with the project engineer and a resource specialist to identify the barrier fencing locations and would place stakes around the sensitive biological resources to indicate their locations. The protected area would be clearly identified on the construction drawings. The fencing would be installed at least 20 feet from each sensitive biological resource (where feasible) and would be in place before construction activities are initiated. The fencing would be maintained by SBFCA or its contractor throughout the duration of the construction period. If the fencing is removed, damaged, or otherwise compromised during construction, construction activities would cease until the fencing is replaced.

2.4.2 Avoidance Measures for Valley Elderberry Longhorn Beetle

Elderberry shrub survey results are presented in Section 3.9, *Wildlife*, Table 3.9-1, and the locations of shrubs are shown in Plate 3.9-1.

The following measures would be implemented as part of the FRWLP to avoid and minimize effects on valley elderberry longhorn beetle (VELB).

- Before ground disturbance, all construction personnel would participate in a U.S. Fish and Wildlife Service (USFWS)-approved worker environmental awareness program. A qualified biologist approved by the USFWS would inform all construction personnel about the life history of VELB and the importance of its host shrub, the elderberry. Proof of this instruction would be submitted to the USFWS.
- For shrubs within the vicinity of construction activities, a buffer area would be established by installing concrete barriers and temporary orange construction fencing (4-foot-high commercial- quality woven polypropylene). Within buffer areas, signs would be posted along fencing for the duration of construction. The signs would contain the following information.

  > This area is habitat of the valley elderberry longhorn beetle, a threatened species, and must not be disturbed. This species is protected by the Federal Endangered Species Act of 1973 (ESA), as amended. Violators are subject to prosecution, fines, and imprisonment.

- Buffer area fences around elderberry shrubs/clusters would be inspected weekly by a qualified biologist during ground-disturbing activities and monthly after ground-disturbing activities until project construction is complete or until the fences are removed, as approved by the biological monitor and the resident engineer. The biological monitor would be responsible for ensuring that the contractor maintains the buffer area fences around elderberry shrubs throughout construction. The monitor would provide biological inspection reports to SBFCA and USFWS.
- SBFCA would ensure that the project site is be watered down as necessary to prevent dust from becoming airborne and accumulating on elderberry shrubs in and adjacent to construction sites.

2.4.3 Avoidance Measures for Giant Garter Snake

Giant garter snakes have the potential to use aquatic habitat in the project area, including depressional wetland and open water areas. Upland areas adjacent to these aquatic habitats could also be used by giant garter snakes for basking, cover, and refuge areas.

SBFCA would implement the following measures to avoid and minimize effects on giant garter snake and their habitat.

- To reduce the likelihood of snakes entering these areas during construction activities, SBFCA would install exclusion fencing along the depressional wetlands and open water areas to be preserved (areas within 200 feet of suitable habitat). The exclusion fencing would be installed and maintained for the duration of active construction to reduce the potential for direct loss. The fencing would consist of 3- to 4-foot-tall erosion fencing buried at least 6 to 8 inches below ground level. The fencing would ensure that giant garter snakes are excluded from the construction area and that suitable upland and aquatic habitat is protected throughout construction. To ensure that construction equipment and personnel do not affect aquatic habitat for giant garter snake outside the construction corridor, a combination of K-rail fencing and orange barrier fencing would be erected (in addition to the exclusion fencing) to clearly define the aquatic habitat to be avoided.

- A USFWS-approved biologist would conduct a preconstruction survey in suitable habitat no more than 24 hours before construction. Prior to construction each morning, construction personnel would inspect exclusion and orange barrier fencing to ensure they are both in good working order. If any snakes are observed within the construction area during this inspection or at any other time during construction the project biologist would be contacted to survey the site for snakes. The project area would be re-inspected and surveyed whenever a lapse in construction activity of 2 weeks or more occurs. If a snake (believed to be a giant garter snake) is encountered during construction, activities would cease until appropriate corrective measures have been completed or it has been determined that the snake would not be harmed.
- Vegetation clearing within 200 feet of the banks of potential giant garter snake aquatic habitat would be limited to the minimum area necessary. Avoided giant garter snake habitat within or adjacent to the project area would be flagged and designated as an environmentally sensitive area, to be avoided by all construction personnel.
- The movement of heavy equipment within 200 feet of the banks of potential giant garter snake aquatic habitat would be confined to designated haul routes to minimize habitat disturbance.
- Before ground disturbance, all construction personnel would participate in a USFWS-approved worker environmental awareness program. A qualified biologist approved by the USFWS would inform all construction personnel about the life history of giant garter snakes and the importance of both aquatic and upland habitat areas. Proof of this instruction would be submitted to the USFWS.

2.4.4 Avoidance Measures for Swainson's Hawk

Swainson's hawks are known to nest in and adjacent to the project area, and project construction could affect Swainson's hawk, either directly or through habitat modification.

To avoid and minimize effects on Swainson's hawk, SBFCA would implement the following measures.

- Before ground disturbance, all construction personnel would participate in a California Department of Fish and Game (DFG)-approved worker environmental awareness program. A qualified biologist would inform all construction personnel about the life history of Swainson's hawk and the importance of nest sites and foraging habitat.
- Install construction barrier fencing to delineate the construction area and protect sensitive resources.
- A breeding season (generally February 1–August 31) survey for nesting migratory birds would be conducted for all trees and shrubs located within 500 feet (0.25 mile for Swainson's hawk) of construction activities, including grading. Swainson's hawk surveys would be completed during at least two of the following survey periods: January 1 to March 20, March 20 to April 5, April 5 to April 20, and June 10 to July 30 with no fewer than three surveys completed in at least two survey periods, and with at least one of these surveys occurring immediately prior (within 48 hours) to project initiation (Swainson's Hawk Technical Advisory Committee 2000). The

results of the surveys would be submitted to DFG. Other migratory bird nest surveys can be conducted concurrent with Swainson's hawk surveys. If the biologist determines that the area surveyed does not contain any active migratory bird nests, construction activities, including vegetation removal or pruning of trees and shrubs, can commence without any further mitigation.

- If active nests are found, SBFCA would maintain a 0.25-mile buffer or other distance determined appropriate through consultation with DFG, between construction activities and the active nest(s) until young have been determined to have fledged. In addition, a qualified biologist (experienced with raptor behavior) would be present onsite (daily) during construction activities occurring during the breeding season to watch for any signs of stress. If nesting birds are observed to exhibit agitated behavior indicating that they are experiencing stress, construction activities would cease until a qualified biologist, in consultation with DFG, determines that young have fledged the active nest.

To avoid removing or disturbing any active Swainson's hawk nests, other special-status bird nests, or non-special-status migratory bird nests, tree and shrub removal would be conducted during the non-breeding season (generally September 1 through January 31) or after a qualified biologist determines that fledglings have left an active nest.

2.4.5 Avoidance Measures for Raptors

For construction between March 1 and August 1, SBFCA would perform preconstruction surveys to determine whether raptors are nesting or roosting at or adjacent to staging or construction areas. In the event nesting or roosting raptors are identified, SBFCA would coordinate with DFG to identify measures to ensure raptors are not adversely affected. These measures may include implementation of suitable buffers and phasing of construction.

2.4.6 Measures for Protected and Riparian Trees

SBFCA would comply with existing tree ordinance requirements and would implement the following measures.

- Protect heritage trees that occur in the vicinity of the project site and outside the construction area by installing protective fencing. Protective fencing would be installed along the edge of the construction area (including temporary and permanent access roads) where construction would occur within 20 feet of the dripline of an oak or native tree 6 inches or more in diameter at 4.5 feet above the ground (as determined by a qualified biologist or arborist).
- Provide signs along the protective fencing at a maximum spacing of one sign per 100 feet of fencing stating that the area is environmentally sensitive and that no construction or other operations may occur beyond the fencing.
- Retain a certified arborist to perform any necessary pruning of oak or native trees along the construction area, in accordance with International Society of Arboriculture standards.

Prepare tree and riparian habitat mitigation and monitoring plans. Potential mitigation areas would be evaluated by a qualified restoration ecologist, biologist, or certified arborist to determine their suitability to support the target native tree species.

2.4.7 Invasive Plant Species Prevention Measures

The project proponent would implement one or more of the following actions to avoid and minimize the spread or introduction of invasive plant species. In addition, the project proponent would coordinate with the Agricultural Commissioners for Sutter and Butte Counties to ensure that the appropriate best management practices (BMPs) are implemented for the duration of the construction projects.

- Clean construction equipment and vehicles in a designated wash area prior to entering and exiting the project site.
- Educate construction supervisors and managers about invasive plant identification and the importance of controlling and preventing the spread of invasive plant infestations.
- Treat small, isolated infestations with eradication methods that have been approved by or developed in conjunction with the Sutter and Butte County Agricultural Commissioners to prevent and/or destroy viable plant parts or seeds.
- Minimize surface disturbance to the greatest extent feasible to complete the work.
- Use native, non-invasive species or non-persistent hybrids in erosion-control plantings to stabilize site conditions and prevent invasive plant species from colonizing.
- Use weed-free imported erosion-control materials (or rice straw) in upland areas.
- One year after construction, conduct a monitoring visit to ensure that no new occurrences have established.

2.4.8 Construction Limitations near Residences

Construction activities scheduled to occur between 7 a.m. and 7 p.m. would not take place before or past daylight hours (which varies according to season) within 0.25 mile of sensitive residential receptors. This would eliminate the need to introduce high-wattage lighting to operate in the dark.

2.4.9 Use of Native Wildflower Species in Erosion Control Grassland Seed Mix

SBFCA would require construction contractors to use wildflower seed in erosion control measures. Only native wildflower species would be incorporated into the seed mix and applied to all exposed slopes. Wildflowers would provide seasonal variation. Species selected would be native and indigenous to the area and appropriate for the surrounding habitat. If not appropriate for the surrounding habitat, wildflowers should not be included in the seed mix. Under no circumstances would invasive plant species be used in any erosion control measures.

2.4.10 Soil Borrow Site Reclamation Plan

This project would develop measures to remediate exposed soil and terrain to make it suitable for agriculture, planned development, or reuse as a natural habitat and to mitigate visual effects where the borrow sites are not intended for detention basins. The reclamation plan could return the land to agricultural uses, development, recreational uses, or mixed uses. All restoration plantings would be native and indigenous to the area, and no invasive plant species would be used under any conditions. In areas to be used for agriculture, the reclamation grading plan would mimic the preexisting landform pattern to the highest degree possible, given geotechnical constraints.

All terrain would be designed and graded to be rounded, avoiding sharp angles and steep or abrupt grade breaks. Special attention would be paid to the transition from undisturbed to disturbed terrain to ensure that the transition appears as natural as possible, and to blend the lines between the two for a natural, organic appearance. In addition, before any vegetation removal the site would be surveyed visually for the presence of rock outcroppings, downed trees, or similar features. Where appropriate, features such as downed trees salvaged during site preparation and excavation activities would be replaced.

2.4.11 Postconstruction Operations and Maintenance

After construction completion, the levee and staging areas and levee slopes would be hydroseeded for erosion protection, dust abatement, and to prevent colonization of exotic vegetation.

The FRWLP is part of the SRFCP as described in Section 1.3.1, *Flood Management History*, and its O&M is covered in the manual and four supplements for the SRFCP (also as described in that section).

To meet Federal Flood Control Regulations (33 CFR 208.10) and state requirements (California Water Code Section 8370), the Federal flood control facilities are inspected four times annually, at intervals not exceeding 90 days. DWR would inspect the system twice a year, and the local maintaining authorities would inspect it twice a year and immediately following major high water events. The findings of these inspections would be reported to the CVFPB's Chief Engineer through DWR's Flood Project Integrity and Inspection Branch (FPIIB).

Typical maintenance activities would include vegetation control through mowing, herbicide application, and/or slope dragging; rodent control; patrol road maintenance; and erosion control and repair. Vegetation control typically would be performed twice a year. Herbicide and bait station application would be conducted under county permit by experts licensed by the state for pest control. Erosion control and slope repair activities would include re-sloping and compacting; fill and repair of damage from rodent burrows would be treated similarly. These activities are performed for approximately 20 days annually. Patrol road reconditioning activities would typically be performed once a year and would include placing, spreading, grading, and compacting aggregate base or substrate.

2.4.12 Stormwater Pollution Prevention Plan

Because ground disturbance for the project would be greater than 1 acre, SBFCA would obtain coverage under the U.S. Environmental Protection Agency's (EPA's) National Pollutant Discharge Elimination System (NPDES) general construction activity stormwater permit. The Central Valley Regional Water Quality Control Board (RWQCB) administers the NPDES storm water permit program in Sutter and Butte counties. Obtaining coverage under the NPDES general construction activity permit generally requires that the project applicant prepare a stormwater pollution prevention plan (SWPPP) that describes the BMPs that would be implemented to control accelerated erosion, sedimentation, and other pollutants during and after project construction. The SWPPP would be prepared prior to commencing earth-moving construction activities.

The specific BMPs that would be incorporated into the erosion and sediment control plan and SWPPP would be site-specific and would be prepared by the construction contractor in accordance with the California RWQCB Field Manual. However, the plan likely would include one or more of the following standard erosion and sediment control BMPs.

- **Timing of construction**. The construction contractor would conduct all construction activities during the typical construction season to avoid ground disturbance during the rainy season.
- **Staging of construction equipment and materials**. To the extent possible, equipment and materials would be staged in areas that have already been disturbed.
- **Minimize soil and vegetation disturbance**. The construction contractor would minimize ground disturbance and the disturbance/destruction of existing vegetation. This would be accomplished in part through the establishment of designated equipment staging areas, ingress and egress corridors, and equipment exclusion zones prior to the commencement of any grading operations.
- **Stabilize grading spoils**. Grading spoils generated during construction would be temporarily stockpiled in staging areas. Silt fences, fiber rolls, or similar devices would be installed around the base of the temporary stockpiles to intercept runoff and sediment during storm events. If necessary, temporary stockpiles may be covered with an appropriate geotextile to increase protection from wind and water erosion.
- **Install sediment barriers**. The construction contractor may install silt fences, fiber rolls, or similar devices to prevent sediment-laden runoff from leaving the construction area.
- **Stormwater drain inlet protection**. The construction contractor may install silt fences, drop inlet sediment traps, sandbag barriers, and/or other similar devices.
- **Permanent site stabilization**. The construction contractor would install structural and vegetative methods to permanently stabilize all graded or otherwise disturbed areas once construction is complete. Structural methods may include the installation of biodegradable fiber rolls and erosion control blankets. Vegetative methods may involve the application of organic mulch and tackifier and/or the application of an erosion control seed mix. Implementation of a SWPPP would substantially minimize the potential for project-related erosion and associated adverse effects on water quality.

2.4.13 Bentonite Slurry Spill Contingency Plan (Frac-Out Plan)

Before excavation begins, SBFCA would ensure the contractor would prepare and implement a bentonite slurry spill contingency plan (BSSCP) for any excavation activities that use pressurized fluids (other than water). If the contactor prepares the plan, it would be subject to approval by USACE, National Marine Fisheries Service (NMFS), and SBFCA before excavation can begin. The BSSCP would include measures intended to minimize the potential for a frac-out (short for "fracture-out event") associated with excavation and tunneling activities; provide for the timely detection of frac-outs; and ensure an organized, timely, and *minimum-effect* response in the event of a frac-out and release of excavation fluid (i.e., bentonite). The BSSCP would require, at a minimum, the following measures.

- If a frac-out is identified, all work would stop, including the recycling of the bentonite fluid. In the event of a frac-out into water, the location and extent of the frac-out would be determined, and the frac-out would be monitored for 4 hours to determine whether the fluid congeals (bentonite usually hardens, effectively sealing the frac-out location).

- NMFS, DFG, and the RWQCB would be notified immediately of any spills and would be consulted regarding cleanup procedures. A Brady barrel would be onsite and used if a frac-out occurs. Containment materials, such as straw bales, also would be onsite prior to and during all operations and a vacuum truck would be on retainer and available to be operational onsite within notice of 2 hours. The site supervisor would take any necessary follow-up response actions in coordination with agency representatives. The site supervisor would coordinate the mobilization of equipment stored at staging areas (e.g., vacuum trucks) as needed.
- If the frac-out has reached the surface, any material contaminated with bentonite would be removed by hand to a depth of 1-foot, contained, and properly disposed of, as required by law. The drilling contractor would be responsible for ensuring that the bentonite is either properly disposed of at an approved Class II disposal facility or properly recycled in an approved manner.
- If the bentonite fluid congeals, no other actions, such as disturbance of the streambed, would be taken that would potentially suspend sediments in the water column.
- The site supervisor has overall responsibility for implementing this BSSCP. The site supervisor would be notified immediately when a frac-out is detected. The site supervisor would be responsible for ensuring that the biological monitor is aware of the frac-out and for coordinating personnel, response, cleanup, regulatory agency notification, and coordination to ensure proper cleanup, disposal of recovered material, and timely reporting of the incident. The site supervisor would ensure all waste materials are properly containerized, labeled, and removed from the site to an approved Class II disposal facility by personnel experienced in the removal, transport, and disposal of drilling mud.
- The site supervisor would be familiar with the contents of the BSSCP and the conditions of approval under which the activity is permitted to take place. The site supervisor would have the authority to stop work and commit the resources (personnel and equipment) necessary to implement the BSSCP. The site supervisor would ensure that a copy of the BSSCP is available (onsite) and accessible to all construction personnel. The site supervisor would ensure that all workers are properly trained and familiar with the necessary procedures for response to a frac-out, prior to commencement of excavation operations.

2.4.14 Spill Prevention, Control, and Counter-Measure Plan

A spill prevention, control, and counter-measure plan (SPCCP) is intended to prevent any discharge of oil into navigable water or adjoining shorelines. SBFCA or its contractor would develop and implement an SPCCP to minimize the potential for and effects from spills of hazardous, toxic, or petroleum substances during construction and operation activities. The SPCCP would be completed before any construction activities begin. Implementation of this measure would comply with state and Federal water quality regulations. The SPCCP would describe spill sources and spill pathways in addition to the actions that would be taken in the event of a spill (e.g., an oil spill from engine refueling would be immediately cleaned up with oil absorbents). The SPCCP would outline descriptions of containment facilities and practices such as doubled-walled tanks, containment berms, emergency shut-offs, drip pans, fueling procedures and spill response kits. It would also describe how and when employees are trained in proper handling procedure and spill prevention and response procedures.

SBFCA would review and approve the SPCCP before onset of construction activities and routinely inspect the construction area to verify that the measures specified in the SPCCP are properly implemented and maintained. SBFCA would notify its contractors immediately if there is a non-compliance issue and would require compliance.

The Federal reportable spill quantity for petroleum products, as defined in 40 CFR 110, is any oil spill that results in the following.

- Violates applicable water quality standards.
- Causes a film or sheen on or discoloration of the water surface or adjoining shoreline.
- Causes a sludge or emulsion to be deposited beneath the surface of the water or adjoining shorelines.

If a spill is reportable, the contractor's superintendent would notify SBFCA, and SBFCA would take action to contact the appropriate safety and cleanup crews to ensure that the SPCCP is followed. A written description of reportable releases must be submitted to the Central Valley RWQCB. This submittal must contain a description of the release, including the type of material and an estimate of the amount spilled, the date of the release, an explanation of why the spill occurred, and a description of the steps taken to prevent and control future releases. The releases would be documented on a spill report form.

2.4.15 Monitoring of Turbidity in Adjacent Water Bodies

SBFCA or its contractor would monitor turbidity in the adjacent water bodies, where applicable criteria apply, to determine whether turbidity is being affected by construction and ensure that construction does not affect turbidity levels, which ultimately increase the sedimentation loads.

The Basin Plan contains turbidity objectives for the Sacramento River and its tributaries, including the Feather River. Specifically, the plan states that where natural turbidity is between 5 and 50 Nephelometric turbidity units (NTUs), turbidity levels may not be elevated by 20% above ambient conditions. Where ambient conditions are between 50 and 100 NTUs, conditions may not be increased by more than 10 NTUs.

SBFCA or its contractor would monitor ambient turbidity conditions upstream during construction. Monitoring would continue approximately 200 feet downstream of construction activities to determine whether turbidity is being affected by construction. Grab samples would be collected at a downstream location that is representative of the flow near the construction site. If there is a visible sediment plume created as a result of construction, the sample would be expected to represent this plume. Monitoring would occur once a week on a random basis as long as construction does not encroach into the Feather River. If construction does encroach into the Feather River, monitoring frequency would increase to hourly.

If turbidity limits exceed Basin Plan standards, construction-related earth-disturbing activities would slow to a point that results in alleviating the problem. SBFCA would notify the Central Valley RWQCB of the issue and provide an explanation of the cause.

2.5 Detailed Measure Descriptions

2.5.1 Slurry Cutoff Wall

2.5.1.1 Objective

A slurry cutoff wall consists of impermeable material that is placed parallel to the levee, typically through the center of the levee crown (Plate 2-4). There are three methods for constructing a slurry cutoff wall: (1) conventional slot trench, (2) deep soil mixing (DSM), and (3) jet grouting. The first two methods are for application over longer areas while jet grouting is a spot application based on limiting conditions for the primary methods. A slurry cutoff wall addresses the deficiency of seepage (through- and under-seepage).

Please see Table 2-5 for proposed location of slurry walls in the project design.

2.5.1.2 Design and Construction

Conventional Slot Trench Method

To begin construction, the construction site and any necessary construction staging or slurry mixing areas are cleared, grubbed, and stripped.

In the conventional slot trench method, a trench is excavated at the top center of the levee and into subsurface materials. The size of the trench is based on the severity of the seepage but can be typically 3 feet wide and up to 80–90 feet deep. As the trench is excavated, it is filled temporarily with bentonite water slurry to prevent cave in. The soil from the excavated trench then is hauled to a nearby location where it is mixed with hydrated bentonite to reduce permeability and cement in some applications where increased strength is desired. The soil-bentonite mixture then is returned to the levee and backfilled into the trench. This mixture hardens and creates the impermeable barrier wall in the levee.

In most cases, degradation of the levee crown is necessary to create a large enough working platform and reduce the risk of hydraulic fracturing from the insertion of slurry fluids, also allowing greater depths to be reached. Dependent on the conditions of the particular levee, it may be necessary to degrade the levee by one- to two-thirds its existing height. The excavated material is hauled to a nearby stockpile area. Following completion of the slurry cutoff wall, the material is hauled back to the levee to restore the levee to its original dimensions. The material may need to be hauled offsite and borrow material may need to be imported if the in-situ levee material is found to be unsuitable for current levee standards.

One construction crew typically is able to construct 75 to 100 linear feet of slurry wall (approximately 70 to 80 feet deep) in an 8-hour shift. Equipment needed for the crew includes a long-reach track hoe, three or four dump trucks (15-cubic- yard capacity each), two loaders at the mixing location, bulldozers, excavators, loaders, a rough terrain forklift, compactors, maintainers, and a water truck. Vertical clearance of about 40 feet is needed for the excavator boom. Horizontal clearance of about 30 feet beyond the levee crest may be required for excavator swing when loading dump trucks.

A mixing area is located at the construction staging area. The mixing area is to prepare the soil-bentonite mixture and supply bentonite-water slurry. The mixing area is contained to avoid inadvertent dispersal of the mixing materials. Dump trucks haul material between the excavator and the mixing area along the levee.

An access road made of aggregate base rock is constructed on the levee crown to enable regular levee inspections.

A listing of the construction equipment and materials necessary to construct a slurry cutoff wall by this method are listed in Table 2-6. Post-construction, areas used for construction staging, mixing, the levee crown, slopes, and any other disturbed areas are hydroseeded.

Table 2-6. Conventional Slot Trench Slurry Wall—Phases, Equipment, and Materials

Phases of Construction	Equipment	Materials
Site preparation (clearing, grubbing, and stripping)	Scraper	
Work platform and trench excavation	Excavator or track hoe	Bentonite
Mixing/placement of soil bentonite mix	Long reach track hoe	Bentonite
Replacement of levee material	Bulldozer	Embankment fill material
	Haul truck	Water
Finish grading	Bulldozer	Aggregate base rock
Site restoration and demobilization	Haul truck	Hydroseed
	Front end loader	
	Compactor	Miscellaneous construction support materials
	Maintainer	Embankment fill material (if existing material is of poor quality)
	Water truck	Water
	Rough terrain forklift	

Deep Soil Mixing Method

The DSM method of constructing a slurry cutoff wall uses a crane-supported set of two to four mixing augers (typically 36 inches in diameter) set side by side. These augers are drilled through the levee crown and foundation to the required depth (capable of a maximum depth of about 200 feet). As the augers are inserted and withdrawn, a soil-bentonite grout is injected through the augers and mixed with the native soil. An overlapping series of mixed columns is drilled to create a continuous seepage cutoff barrier (Plate 2-5).

To provide a wide enough working platform on the levee crown, the upper portion of some segments of the levee requires excavation with a paddle wheel scraper. Material is scraped and stockpiled at a nearby stockpile area. Dependent on the depth of the wall required, vertical clearance for the crane also may be needed. An excavator manipulates injector return spoils near the DSM rig, and transport trucks are used to haul spoils off site. A crane is used for in-place sampling of DSM material and also for loading bentonite into the batch plant hopper. A mobile batch plant (diesel-powered) is required near each DSM rig at the work area to prepare the cement-bentonite grout. The grout is transported to the DSM rig through flexible hoses. Each batch plant requires a pad of 50 by 100 feet. Hauling at the work area involves scraper runs along the levee to the staging area and cement and bentonite deliveries to the batch plant.

During DSM slurry wall construction, one DSM rig typically can construct 50 linear feet of DSM wall per 8-hour shift (for wall depths up to 135 feet).

The equipment and materials necessary to construct a DSM slurry wall are listed in Table 2-7. Post-construction, areas used for construction staging, the levee slopes, and any other disturbed areas are hydroseeded.

Table 2-7. Deep Soil Mixing Slurry Wall—Phases, Equipment, and Materials

Phases of Construction	Equipment	Materials
Site preparation (clearing, grubbing, and stripping)	Scraper	
Work platform excavation	Excavator or track hoe	
Deep soil mixing (DSM)	DSM crane	Bentonite
	Mobile batch plant	
	Piping from drill rig to batch plant	
Replacement of levee material	Bulldozer	Water
	Haul truck	Embankment fill material
Finish grading	Bulldozer	Aggregate base rock
Site restoration and demobilization	Haul truck	Hydroseed
	Front end loader	Miscellaneous construction support materials
	Paddle wheel scraper	Embankment fill material (if existing material is of poor quality)
	Water truck	Water

Jet Grouting Method

Jet grouting involves injecting fluids or binders into the soil at very high pressure. The injected fluid can be grout; grout and air; or grout, air, and water. Jet grouting breaks up soil and, with the aid of a binder, forms a homogenous mass that solidifies over time to create a mass of low permeability (Plate 2-6). Jet grouting typically is used in constructing a slurry cutoff wall (described later in this chapter) to access areas other methods cannot. In this regard, it is typically a spot application rather than a treatment to be applied on a large scale along an entire reach. Jet grouting addresses the deficiency of seepage (through- or under-seepage).

Equipment required for jet grouting consists of a drill rig fitted with a special drill string; a high pressure, high flow pump; and an efficient batching plant with sufficient capacity for the required amount of grout and water. The high-pressure pump conveys the grout, air, and/or water through the drill string to a set of nozzles located just above the drill bit. The diameter of the jet grout column is dependent on site specific variables such as soil conditions, grout mix, nozzle diameter, rotation speed, withdrawal rate, and grout pressure. Jet grouted columns range from 1 to 16 feet in diameter and are typically interconnected to form cutoff barriers or structural sections. One construction crew, consisting of a site supervisor, pump operator, batch plant operator, chuck tender, and driller under ideal conditions, can construct two 6-foot diameter, 50 foot columns per day consisting of approximately 100 cubic yards of grout injected per 8 hour shift. Ideal conditions would be characterized by no technical issues occurring at either the batch plant or the drilling site, such as loss of fluid pressure, breakdown of equipment, or subsurface obstructions to drilling operations.

To initiate jet grouting, a borehole is drilled through the levee crown and foundation to the required depth (to a maximum depth of approximately 130 feet) by rotary or rotary-percussive methods using water, compressed air, bentonite, or a binder as the flushing medium. When the required depth is reached, the grout is injected at a very high pressure as the drill string is rotated and slowly withdrawn. Rotation speeds range between 10 and 30 rpm and the withdrawal rates vary between 2 and 12 inches per minute. Use of the double, triple, and superjet systems create eroded spoil materials that are expelled out of the top of the borehole. The spoil material contains significant grout content and is frequently used as a construction fill.

To provide a wide enough working platform on the levee crown, the upper portion of some segments of the levee may require degradation with a paddle wheel scrapper. Material is scraped and stockpiled at a nearby stockpile area. Hauling at the work area involves scraper runs along the levee to the staging area and grout, bentonite, and water deliveries to the batch plant.

Batch plants are typically centrally located to the injection site, with pipelines for mixed grout that run the length of the work. Grout mixing and injection equipment consists of grout mixers, high powered grout pumps and supporting generators and air compressors, holding tanks, water tanks, with bulk silos of grout typically used to feed large mixers. Smaller equipment can be used in combination with the single phase-fluid system and can be permanently trailer mounted to permit efficient mobilization and easy movement at the job site.

Prior to commencing production jet grouting, a field test program is typically completed to evaluate injection parameters and to assess jet grout column geometries, and mechanical and permeability properties. Where possible, jet grout test elements are exposed by excavation and properties are obtained by direct measurement. Bulk samples are collected and delivered to a laboratory for unconfined compressive strength and permeability testing, as required. Where excavation is not possible, core drilling is employed to obtain samples from the jet grout test columns for strength testing.

Types of Jet Grouting Systems

A single phase jet grouting system uses the binder to break up and provide soil mixing of the soils surrounding the drill rods. The single jet grouting system is the most versatile; it can be applied at any inclination and in areas where space is restricted. Set up and excavation times are considerably shorter; the method is also less expensive, cleaner, and less noisy than the three-fluid jet grouting system.

A double phase jet grouting system improves the range of influence of the single phase jet grouting system using an aureole of compressed air concentric about the jet of binder. The diameter of a column of soil treated by the single phase jet grouting system can be increased by adding the air component. Additional equipment includes a two-way coaxial drill string and an air compressor.

The triple phase or Kajima jet grouting system uses water and air to break up the soil to produce partial substitution of the finer soil particles to create a column of stabilized material whose diameter may exceed 6 feet. Additional equipment includes a three-way coaxial drill string, an air compressor, and an additional pump and lines for the water phase.

The superjet grouting system is a modified double phase jet grouting system that uses tooling design efficiencies and increased energy that allows for the construction of large columns, up to 16 feet in diameter. The superjet system operates by mechanically and hydraulically focusing the injection of the grout for pinpoint cutting and erosion of very large volumes of soil in situ. The excess soil-grout mixture is simultaneously expelled at the surface, preventing subsurface pressurization and hydrofracturing. A listing of equipment and materials necessary to construct the jet grouting system is provided in Table 2-8. Areas used for construction staging, the levee slope, and any other disturbed areas are restored and hydroseeded following construction.

Table 2-8. Jet Grouting Phases, Equipment, and Materials

Phases of Construction	Equipment	Materials
Site preparation (clearing, grubbing, and stripping)	Scraper	
Work platform excavation	Excavator or track hoe	
Jet grouting	Jet grouting drill rig	
	Mobile batch plant	Cement, bentonite
	High pressure, high flow pump	Water
	Piping from drill rig to batch plant (spoil line)	
	Piping from batch plant to drill rig	
Replacement of levee material	Bulldozer	Water
	Haul truck	Embankment fill material
Finish grading	Bulldozer	
Site restoration and demobilization	Haul truck	Miscellaneous construction support materials
	Front end loader	Embankment fill material
	Paddle wheel scraper	Water
	Water truck	

2.5.1.3 Operations and Maintenance

Post-construction, the only permanent facility is the levee with the embedded slurry cutoff wall. O&M would be as described in Section 2.4.11

2.5.2 Slope Flattening

2.5.2.1 Objective

Slope flattening is a mechanical method to repair or reshape slopes that do not meet standards for geometry and stability (Plate 2-7). Levee slopes are typically subject to a standard of 3H:1V, but this may vary based on site-specific conditions and supporting engineering analysis. Slope flattening addresses the deficiency of slope stability and geometry.

Please see Table 2-4for proposed location of slope flattening in the project design.

2.5.2.2 Design and Construction

To begin slope flattening activities, the area is cleared, grubbed, and stripped to provide space for construction and reshaping of slopes. Additional embankment fill material may be necessary to achieve slope flattening. If so, bulldozers excavate and stockpile borrow material from a nearby permitted borrow site. Front-end loaders load haul trucks with the borrow material. The haul trucks transport the material to slope flattening site. Motor graders spread material evenly according to levee design plans, and sheepsfoot rollers compact the material. Water trucks distribute water over the material to ensure proper moisture for compaction.

To reshape a waterside slope, the existing crown of the levee is shifted farther landward and the waterside slope is trimmed and reshaped to a 3:1 slope. The shifted levee crown would be a minimum of 20 feet wide, with a 3:1 slope on the landward side. An access road made of aggregate base rock is constructed on the levee crown.

Equipment and materials necessary to implement slope flattening treatment are listed in Table 2-9. Post-construction, the construction staging areas, levee slopes, and any other disturbed areas would be hydroseeded.

Table 2-9. Slope Flattening—Phases, Equipment, and Materials

Phases of Construction	Equipment	Materials
Site preparation (clearing, grubbing, and stripping)	Scraper	Embankment fill material
Reshaping of slopes and placement of additional fill (if necessary)	Haul truck	Water
	Excavator or track hoe	Embankment fill material
Finish grading	Bulldozer	Aggregate base rock
Site restoration and demobilization	Front end loader	Hydroseed
	Haul truck	Water
	Motor grader	
	Sheepsfoot roller	
	Water truck	

2.5.2.3 Operations and Maintenance

Post-construction, the only permanent facility is the improved levee. O&M would be as described in Section 2.4.11.

2.5.3 Stability Berm

2.5.3.1 Objective

A stability berm would be constructed against the landside slope of the existing levee with the purpose of supplying support as a buttress (Plate 2-8). The height of the stability berm is generally two-thirds the height of the levee; the structural needs of the levee determine the distance it extends along that reach. A stability berm addresses the deficiency of stability.

Please see Table 2-4for proposed location of stability berms in the project design.

2.5.3.2 Design and Construction

To begin the construction of a stability berm, the site is cleared, grubbed, and stripped to provide space for construction and shaping of the berm. Embankment fill material necessary to construct the berm is excavated by a bulldozer from a nearby borrow site. Front-end loaders load haul trucks with the borrow material and the haul trucks transport the material to the stability berm site. Motor graders spread the material evenly according to design specifications, and a sheepsfoot roller compacts the material. Water trucks distribute water over the material to ensure proper moisture for compaction.

Stability berms may be drained or undrained. An undrained berm consists of embankment fill only. A drained berm includes a layer of drain rock placed along the ground surface underneath the fill material, separated by a casing of filter fabric. Drainage water seeping from the berm would sheetflow on the adjacent landside surface.

Equipment and materials necessary to construct a stability berm are listed in Table 2-10.

Table 2-10. Stability Berm—Phases, Equipment, and Materials

Phases of Construction	Equipment	Materials
Site preparation (clearing, grubbing, and stripping)	Scraper	
Construction and shaping of stability berm	Excavator or track hoe	Embankment fill material
Finish grading	Bulldozer	Water
Site restoration and demobilization	Front end loader	Hydroseed
	Haul truck	Water
	Motor grader	
	Sheepsfoot roller	
	Water truck	

2.5.3.3 Operations and Maintenance

The only post-construction permanent facility is the berm. O&M would be as described in Section 2.4.11

2.5.4 Levee Reconstruction

2.5.4.1 Objective

Levee reconstruction would be necessary where a levee has been degraded to facilitate implementation of another measure (such as a slurry cutoff wall), where a substantial encroachment has been removed from within the levee prism, or otherwise where the levee is found to be deficient and needs to be replaced with materials and methods that meet current engineering standards.

Please see Table 2-4 for proposed levee relocations in the project design.

2.5.4.2 Design and Construction

The existing levee is first cleared, grubbed, and stripped to the desired surface to allow a working platform for other measures (such as a slurry cutoff wall), to remove an encroachment, or to remove substandard material. Embankment fill material necessary to construct the new levee is excavated by a bulldozer from a nearby borrow site. Front-end loaders load haul trucks with the borrow material and the haul trucks transport the material to the stability berm site. Motor graders spread the material evenly according to design specifications, and a sheepsfoot roller compacts the material. Water trucks distribute water over the material to ensure proper moisture for compaction. The new levee would be built in cross section to meet current engineering standards.

Equipment and materials necessary for levee reconstruction are listed in Table 2-11.

Table 2-11. Levee Reconstruction—Phases, Equipment, and Materials

Phases of Construction	Equipment	Materials
Site preparation (clearing, grubbing, and stripping)	Scraper	
	Bulldozer	
Construction and shaping of levee	Haul truck	Embankment fill material
	Excavator or track hoe	
	Bulldozer	
Finish grading	Bulldozer	Water
	Water truck	Aggregate base rock
Site restoration and demobilization	Front end loader	Hydroseed
	Haul truck	Water
	Motor grader	
	Sheepsfoot roller	
	Water truck	

2.5.4.3 Operations and Maintenance

The only post-construction permanent facility is the reconstructed levee. O&M would be as described in Section 2.4.11

2.5.5 Sheet Pile Wall

2.5.5.1 Objective

A sheet pile wall is a series of vertical panels of interlocking steel that is placed parallel to the levee, typically through the center of the levee crown to provide an impermeable barrier (Plate 2-9).
A sheet pile wall addresses the deficiencies of seepage and would be used only as a site-specific treatment (rather than applied on a reach-wide basis) such as at roadway or railroad crossings.

Please see Table 2-4 for proposed location of sheet pile walls in the project design.

2.5.5.2 Design and Construction

The site where sheet piles are to be installed is cleared, grubbed, and stripped to allow for construction activities, including removal of the roadway or railroad. A hydraulic- or pneumatically operated pile-driving head attached to a crane drives the sheet pile into the levee crown to the desired depth (up to 135 feet). If the levee material is particularly solid, pre-drilling may be necessary. The conditions of the site and the desired life of the project determine the thickness and configuration of the sheet piles.

Equipment and materials necessary to construct sheet pile walls are listed in Table 2-12. Post-construction, construction staging areas, the levee crown, slopes, and any other disturbed areas are hydroseeded and the roadway or railroad would be replaced in-kind to the pre-project condition.

Table 2-12. Sheet Pile Wall—Phases, Equipment, and Materials

Phases of Construction	Equipment	Materials
Site preparation (clearing, grubbing, and stripping)	Scraper	
Pile driving of sheet piles	Crane	Steel sheet piles
Finish grading	Bulldozer	Aggregate base rock
Site restoration and demobilization	Front end loader	Hydroseed
	Haul truck	Water
	Crane	
	Water truck	

2.5.5.3 Operations and Maintenance

The only post-construction permanent facility is the sheet pile wall. O&M would be as described in Section 2.4.11.

2.5.6 Seepage Berm

2.5.6.1 Objective

Seepage berms are wide embankment structures made up of low-permeability materials that resist accumulated water pressure and safely release seeping water (Plate 2-10). A seepage berm is typically one-third the height of the levee, extending outward from the landside levee toe approximately 300 to 400 feet, and laterally along the levee as needed relative to the seepage conditions. A seepage berm addresses the deficiency of under-seepage.

Please see Table 2-4 for proposed location of seepage berms in the project design.

2.5.6.2 Design and Construction

A seepage berm can vary in width, from a minimum of four times the levee height to a maximum of 300 feet. Berm heights can also vary but are typically a minimum of 5 feet tall at the landside toe of the levee and generally taper down to 3 feet at the end of the berm.

Construction consists of clearing, grubbing, and stripping the ground surface. Bulldozers then excavate and stockpile borrow material from a nearby borrow site. Front-end loaders load haul trucks, and the haul trucks subsequently transport the borrow material to the berm site. The haul trucks dump the material and motor graders spread it evenly, placing approximately 3 to 5 feet of embankment fill material. Sheepsfoot rollers compact the material, and water trucks distribute water over the material to ensure proper moisture for compaction.

Seepage berms may have an optional feature of a drainage relief trench under the toe of the berm. Drained seepage berms include the installation of a drainage layer (gravel or clean sand) beneath the seepage berm backfill and above the native material at the levee landside toe. A drained seepage berm does not increase the overall footprint of the berm.

Equipment and materials necessary to construct drained and undrained seepage berms are listed in Table 2-13.

Table 2-13. Seepage Berm—Phases, Equipment, and Materials

Phases of Construction	Equipment	Materials
Site preparation (clearing, grubbing, and stripping)	Scraper	
Embankment fill material placement (if drained berm, drain rock is also placed)	Haul truck	Water
	Excavator or track hoe	Embankment fill material
	Bulldozer	Drain rock (if drained berm)
	Water truck	
Finish grading	Bulldozer	Aggregate base rock
Site restoration and demobilization	Haul truck	Hydroseed
	Motor grader	Water
	Sheepsfoot roller	
	Water truck	

Post-construction, areas used for construction staging, the levee, the berm, and any other disturbed areas are hydroseeded.

2.5.6.3 Operations and Maintenance

The only post-construction permanent facility is the berm. O&M would be as described in Section 2.4.11.

2.5.7 Relief Wells

2.5.7.1 Objective

Relief wells are passive systems that are constructed near the levee landside toe to provide a low-resistance pathway for under-seepage to exit to the ground surface in a controlled and observable manner (Plate 2-11). A low-resistance pathway allows under-seepage to exit without creating sand boils or piping levee foundation materials. Relief wells are an option only in reaches where geotechnical analyses have identified continuous sand and gravel layers. Relief wells are used to address the levee deficiency of under-seepage.

Please see Table 2-4for proposed location of relief wells in the project design.

2.5.7.2 Design and Construction

Relief wells are constructed using soil-boring equipment to drill a hole vertically through the fine-grained blanket layer (sand) into the coarse-grained aquifer layer (gravel) beneath. Pipe casings and gravel/sand filters are installed to allow water to flow freely to the ground surface, relieving the pressure beneath the clay blanket without transporting fine materials to the surface, which can undermine the levee foundation. Relief wells would be designed to discharge onto a cobble splash and the water would then sheet flow into adjacent agricultural fields. In areas where sheet flow is not feasible, a swale would be excavated and connected to a drainage canal.

Relief wells generally are spaced at 50- to 100-foot intervals, dependent upon the amount of under-seepage, and extend to depths of up to 150 feet. Areas for relief well construction are cleared, grubbed, and stripped. During relief well construction, a typical well-drilling rig is used to drill to the required depth and construct the well (including well casing, gravel pack material, and well seal) beneath the ground surface. The drill rig likely would be an all-terrain, track-mounted rig that could access the well locations from the levee toe.

Areas along the levee toe may be used to store equipment and supplies during construction of each well. Construction of each well and the lateral drainage system typically takes 10 to 20 days. Additional time may be required for site restoration.

Equipment and materials necessary to construct a relief well are listed in Table 2-14.

Table 2-14. Relief Wells—Phases, Equipment, and Materials

Phases of Construction	Equipment	Materials
Site preparation (clearing, grubbing, and stripping)	Scraper	Well casing
Drilling and well installation	Drill rig	Well casing
Finish grading	Bulldozer	
Site restoration and demobilization	Equipment support vehicle	Drain pipe
	Haul truck	Hydroseed
	Motor grader	Concrete
	Sheepsfoot roller	Water
	Water truck	
	Small compactor	

Post-construction, areas used for construction staging, the levee slopes, and any other disturbed areas are hydroseeded.

2.5.7.3 Operations and Maintenance

Relief wells require regular maintenance to ensure proper operation. Piezometers, also called monitoring wells, could be installed between relief wells to allow monitoring of groundwater levels to ensure the wells are relieving the pressure within the aquifer.

Permanent facilities associated with relief wells include the wells themselves and surface drainage trenches to control the discharge. Inspection of the relief wells is required at least annually, and observation of flow from the wells is required during high river stages. The wells are test-pumped periodically. The collection ditch is maintained to allow free flow of water.

2.5.8 Depression/Ditch Infilling

2.5.8.1 Objective

Depressions and ditches can contribute to risk of levee failure if a seepage pathway forms under the levee and the water then surfaces through the depression or ditch, exploiting its less resistive nature compared to surrounding soil mass. This measure involves placing fill soil in such depressions and ditches to remove localized susceptibility to seepage.

Please see Table 2-4 for proposed location of depression/ditch infilling in the project design.

2.5.8.2 Design and Construction

Construction consists of clearing, grubbing, and stripping the ditch or depression surface to remove vegetative material. Bulldozers then excavate and stockpile borrow material from a nearby borrow site. Front-end loaders load haul trucks, and the haul trucks subsequently transport the borrow material to the fill site. The depression or ditch may be further excavated to provide a surface that the fill soil may be keyed into. The haul trucks dump the material and motor graders or bulldozers smooth the material level with the surrounding land surface. An excavator may also be used for placement. Sheepsfoot rollers compact the material, and water trucks distribute water over the material to ensure proper moisture for compaction.

Equipment and materials necessary to fill depressions and ditches are listed in Table 2-15.

Table 2-15. Depression/Ditch Infilling—Phases, Equipment, and Materials

Phases of Construction	Equipment	Materials
Site preparation (clearing, grubbing, and stripping)	Excavator	
	Bulldozer	
	Scraper	
Fill material placement	Haul truck	Embankment fill material
	Excavator or track hoe	Water
	Bulldozer	
Finish grading	Bulldozer	
Site restoration and demobilization	Haul truck	Hydroseed
	Motor grader	Water
	Sheepsfoot roller	
	Water truck	

Post-construction, areas used for construction staging, filling, and any other disturbed areas are hydroseeded.

2.5.8.3 Operations and Maintenance

The only post-construction permanent facility is the placed fill. O&M would be as described in Section 2.4.11.

2.5.9 Clay Ditch Lining

2.5.9.1 Objective

As described for depression/ditch infilling, ditches can contribute to risk of levee failure if a seepage pathway forms under the levee and the water then surfaces through the ditch, exploiting its less resistive nature compared to surrounding soil mass. This measure involves replacing the native material on the ditch bottom with more resistive clay to remove localized susceptibility to seepage.

Please see Table 2-4for proposed location of clay ditch lining in the project design.

2.5.9.2 Design and Construction

Construction consists of clearing, grubbing, and stripping the ditch surface to remove vegetative material and the native soil. More resistive clay would be imported from a nearby borrow site or commercial source by haul trucks. The ditch may be further excavated to provide a surface that the clay lining may be keyed into. The haul trucks dump the material which would then be placed by excavator. Sheepsfoot rollers compact the material, and water trucks distribute water over the material to ensure proper moisture for compaction.

Equipment and materials necessary to perform clay ditch lining are listed in Table 2-16.

Table 2-16. Clay Ditch Lining—Phases, Equipment, and Materials

Phases of Construction	Equipment	Materials
Site preparation (clearing, grubbing, and stripping)	Excavator	
	Bulldozer	
Clay lining placement	Haul truck	Clay fill
	Excavator	Water
	Water truck	
Finish grading	Bulldozer	Water
	Sheepsfoot roller	
	Water truck	
Site restoration and demobilization	Haul truck	Hydroseed
	Water truck	Water

Post-construction, areas used for construction staging, filling, and any other disturbed areas are hydroseeded.

2.5.9.3 Operations and Maintenance

The only post-construction permanent facility is the placed fill. O&M would be as described in Section 2.4.11.

2.5.10 Encroachment Removal and Vegetation Policy Compliance

2.5.10.1 Objective

Encroachments such as structures, certain vegetation, levee penetrations (e.g., pipes, conduits, and cables), power poles, pump stations, retaining walls, or similar features may require removal from the levee prism to meet standards. This measure would include the demolition of such features and relocation or reconstruction as appropriate on a case-by-case basis (or retrofit to comply with standards).

Please see Table 2-4for proposed location of encroachment removals and vegetation policy compliance activities in the project design.

2.5.10.2 Design and Construction

General Description

Encroachment removal techniques would be implemented based on the needs of the specific encroaching feature. Smaller encroachments would be removed, relocated, or retrofitted via manual labor of small crews (approximately 2 to 10 laborers) using hand tools. Larger encroachments would require machinery such as an excavator, skid-steer, and bulldozer. Dump trucks would be used for offsite hauling and disposal of removed material at a permitted commercial source. Encroachments that substantially penetrate the levee (like footings or large woody vegetation) would require levee reconstruction, discussed as a separate measure. Equipment and materials necessary for encroachment removal are listed in Table 2-17. Relocations would require similar equipment.

Table 2-17. Encroachment Removal—Phases, Equipment, and Materials

Phases of Construction	Equipment	Materials
Encroachment removal and/or relocation	Excavator	Debris
	Skid-steer	
	Bulldozer	
	Loader	
	Dump truck	
Site restoration and demobilization	Haul truck	Hydroseed
	Water truck	Water

Post-construction, areas disturbed by the equipment are hydroseeded.

Vegetation Policy Compliance

As introduced in Chapter 1, vegetation removal under the FRWLP would be limited only to vegetation that is in the direct disturbance footprint of the project for constructing measures to address other deficiencies (such as a slurry cutoff wall). It is not the intent for the FRWLP to be the mechanism for full compliance with USACE levee vegetation policy for the entire project area because the FRWLP is focusing resources to address substantial geotechnical deficiencies contributing to flood risk (such as seepage). SBFCA is working cooperatively with the State of California and USACE for a long-term USACE levee vegetation policy compliance approach, but any future activity for compliance is not part of the FRWLP nor is a variance being requested at this time.

Consistent with the CVFPP guidance for levee repair or improvement, vegetation would be removed to meet specific project objectives. Any vegetation removed as part of direct construction activities would not be replaced at that location, but would require offsite, in-kind mitigation, to be determined in consultation with the appropriate resource agencies.

In accordance with USACE levee vegetation guidance, SBFCA would submit a detailed removal plan to the local USACE District Levee Safety Officer for review and comment prior to removal of vegetation. Methods for removing noncompliant vegetation are identified below.

- By excavation, remove the trunk (or stem), stump, rootball, and all roots greater than 0.5 inch in diameter—all such roots in, or within 15 feet of, the flood damage–reduction structure would be completely removed.
- Ensure that the resulting void is free of organic debris.
- Cut poles to salvage propagation materials for replanting, such as willows and cottonwoods.
- Conduct hand clearing using chainsaws and trimmers.
- Conduct mass clearing using bulldozers.

2.5.10.3 Operations and Maintenance

General O&M

Typical O&M would be as described under Section 2.4.11. Any remaining or replaced encroachments would be maintained as they were pre-project.

Management of Woody Vegetation

For woody vegetation remaining after construction, and until an alternative long-term compliance strategy is agreed upon (which may ultimately include a variance but not as part of this project), the levees would be maintained per the approved USACE O&M manual applicable to each reach (subject to revision).

2.5.11 Canal Seepage Treatment

2.5.11.1 Objective

The SBC is located adjacent to the levee toe through Reaches 26, 27, and 28. The under-seepage deficiency in these reaches occurs if the canal were to be empty and the river is at flood stage. This measure involves two optional treatments to reduce risk from under-seepage during this condition: canal hydration or relocation.

Note: A third optional treatment for this condition is implementation of a slurry cutoff wall combined with slope flattening. These measures are previously described separately.

2.5.11.2 Design and Construction

Canal Hydration Option

One option to address seepage risk through the canal is to ensure the canal is full of water (i.e., hydrated) during times of high river stage so that the water in the canal provides resistive force against any under-seepage flows. Implementing a Flood Safety Plan would allow the canal to remain in place and kept full of water at a designated flood stage. Additionally, weir structures would be constructed at the upstream and downstream ends adjacent to the sections of the canals that are located along the levee toe to keep the canal full of water. New water supply wells would also be constructed to facilitate filling of the canal, in accordance with the Flood Safety Plan, when they are not in operation, which is typically in the winter, from early October of one year to April of the following year.

Water supply wells generally are spaced at 3,200 lineal foot intervals, dependent upon the depth and production rate. Construction would be similar to that as described for relief wells, with the addition of a pump to raise the water. The pump would be powered by an electrical drop from a nearby existing power line with a diesel engine as back-up.

Weirs are constructed by clearing and grubbing the weir footprint followed by finish grading to shape the weir. The surface is lined with poured-in-place concrete with rock placed around the perimeter and aprons.

Equipment and materials necessary to construct the canal hydration option are listed in Table 2-18.

Table 2-18. Canal Hydration Option—Phases, Equipment, and Materials

Phases of Construction	Equipment	Materials
Site preparation (clearing, grubbing, and stripping)	Scraper	
Drilling and well installation	Drill rig	Sand and gravel concrete
		Well casing
		Pipe
Weir installation	Skid-steer	Concrete
	Trench excavator or track hoe	Rock
	Concrete mixer truck	Concrete forms
Site restoration and demobilization	Equipment support vehicle	Hydroseed
	Haul truck	Water
	Motor grader	
	Sheepsfoot roller	
	Water truck	
	Small compactor	

Post-construction, areas used for construction staging and any other disturbed areas are hydroseeded.

Canal Relocation Option

Another option to address seepage risk through the canal is to fill it with earthen material in its current location and relocate it farther from the levee toe where it would present less of risk for under-seepage. This action would be as described for the depression/ditch infilling measure described previously, plus a new canal would be constructed of similar dimensions and functions as the filled canal. Equipment and materials necessary to relocate the canal are listed in Table 2-19.

Table 2-19. Canal Relocation Option—Phases, Equipment, and Materials

Phases of Construction	Equipment	Materials
Site preparation (clearing, grubbing, and stripping)	Excavator	
	Bulldozer	
	Scraper	
Fill material placement	Excavator or track hoe	Embankment fill material
	Bulldozer	Water
Canal excavation	Excavator or track hoe	
Finish grading	Bulldozer	
Site restoration and demobilization	Haul truck	Hydroseed
	Motor grader	Water
	Sheepsfoot roller	
	Water truck	

Post-construction, areas used for construction staging, filling, and any other disturbed areas are hydroseeded.

2.5.11.3 Operations and Maintenance

Canal Hydration Option

Permanent facilities associated with canal hydration option are the water supply wells, piping, and weirs, in addition to the existing canal. Water supply wells require annual maintenance and testing to ensure proper operation. Inspection of the weirs is required annually, and observation of flow from the weirs and wells and the water level in the canal is required during high river stages. An operation manual would be developed to dictate protocols and procedures for operating the wells and weirs.

Canal Relocation Option

The only post-construction permanent facilities are the placed fill and relocated canal. The filled area is subject to typical O&M as described in Section 2.4.11 and the new canal would be subject to the same O&M as the pre-project canal.

2.6 No Action Alternative

2.6.1 Introduction to No Action

Identification and analysis of a no action alternative is required pursuant to NEPA, and a no project alternative is required for CEQA. The purpose of the no action or no project alternative is to serve as a benchmark against which the effects of the action alternatives may be evaluated. For NEPA, no action is defined as those conditions that would result if USACE were to issue neither Section 408 permission nor permits under Section 404 of the Clean Water Act (CWA) and Section 10 of the Rivers and Harbors Act. For CEQA, *no project* is defined as those conditions that would result if SBFCA were to not adopt and implement a project. Because the action alternatives would require Section 408 permission from USACE for SBFCA to implement a project, the NEPA no action and CEQA no project are considered to be the same and are simply referred to as the No Action Alternative for this EIS/EIR.

In general, the No Action Alternative consists of continuation of current conditions and O&M practices that reasonably would be expected to occur in the foreseeable future if the FRWLP was not implemented. A more detailed description of the No Action Alternative is below.

2.6.2 No Flood Risk-Reduction Measures Implemented under the No Action Alternative

Under the No Action Alternative, SBFCA would not implement flood risk-reduction measures. The levees protecting the Sutter Basin would continue to require risk-reduction measures to meet current levee standards, FEMA's minimum acceptable level of flood protection, and State requirements for 200-year for urbanized areas. In addition, the associated risk to human health and safety, property, and the adverse economic effects that serious flooding could cause would continue, and the risk of a catastrophic flood would remain high. Again, however, regular O&M of the levee system would continue as presently executed by the local maintaining entities.

Because of uncertainties in local, state, and Federal funding; future state and Federal authorization; and other approvals, it is not reasonable to predict construction of levee improvements within a reasonable timeframe (see below for further discussion). Therefore, for the purpose of evaluating effects under the No Action Alternative, the EIS/EIR assumes no levee repair or strengthening would be implemented, the purpose and objectives would not be met, and the current level of flood risk would continue.

2.6.2.1 Future State or Federal Action

As these levees have known deficiencies, even if SBFCA were not pursuing improvements, it is likely that USACE and/or the State of California would repair the levees around the Sutter basin at some time in the future in order to meet Federal and/or state flood protection obligations associated with the Federal flood control system.

One such example of possible Federal action is the Sutter Basin Project Feasibility Study. As discussed in Chapter 1, the study area of the Sutter Basin Project includes the FRWLP area. The primary objective of the Feasibility Study is to determine the extent of Federal interest in reducing flood risk in the study area while exploring opportunities to increase recreation and restore the ecosystem along the Feather River and tributaries. Based on the criteria used by SBFCA to screen the FRWLP, the FRWLP project action is consistent with those considered through the Sutter Basin Project Feasibility Study process and that would be implemented by USACE or the state. The environmental effects in turn would be the same as or similar to those analyzed in this EIS/EIR (the Feasibility Study is subject to independent NEPA review). The Feasibility Study is expected to be presented to Congress for authorization in 2014, meaning the earliest that Federal levee flood risk-reduction measure would be constructed under the Feasibility Study is 2017. However, Federal funding for USACE projects has been on a downward trend, and the outlook for subsequent funding appropriation if a project were to be authorized is highly uncertain.

Other Federal programs such as the SRBPP or PL 84-99 have implemented repairs on the levees in the study area; however, these programs are targeted at dynamically shifting site-specific emergent conditions (most typically erosion) across a geographic scope widely ranging far beyond the project area. Therefore, any future repairs under these programs, even if they were to occur in the project area, would not comprehensively address the deficiencies affecting flood risk and level of protection in the planning area. Further, future authorization and appropriation of these programs is uncertain, making them unreliable from a flood-risk-management planning perspective.

At the state level, regional flood management plans are being developed under the CVFPP, including the study area. However, construction of projects under the CVFPP is presently unfunded for comprehensive and complete implementation.

Despite the possibility of eventual state- or Federally led implementation of repairs, for the purpose of evaluating effects under the No Action Alternative, the EIS/EIR assumes that flood risk-reduction measures would not occur. This assumption provides the most conservative approach for disclosure and comparison of potential effects. Again, as stated above, the No Action Alternative therefore assumes the project purpose and objectives would not be met and the current level of flood risk would continue.

2.6.2.2 Consequences of Levee Failure

Assuming that no levee repair or strengthening would occur under the No Action Alternative means that the affected area levee system would remain susceptible to failure as a result of identified deficiencies such as seepage, levee instability, and inadequate geometry. These conditions could cause portions of the levee system to fail, triggering widespread flooding, extensive damage to the planning area's existing residential, commercial, agricultural, and industrial structures, and potential loss of life and property. Extensive damage to utilities, roadways, major interstate transportation corridors, and other infrastructure systems could occur. Water supply and sewage facilities would likely fail. Floodwaters would become contaminated by chemicals released from inundated vehicles, homes, industrial and agricultural facilities, businesses, and equipment. The magnitude of the flood damage would depend upon the location of the levee breach, severity of the storm, and river flows at the time of a potential levee failure.

Flood depth maps prepared for the affected area indicate that under a 200-year flood event scenario, inundation levels would range from 1 foot to 25 feet, depending on the local elevation of the land surface. Plates 2-13 through 2-19 show the ultimate estimated inundation depths for a 200-year flood event based on levee failures from north to south (upstream to downstream), as well as a composite of failures along the project area levee.

As of 2010, there were 99,154 people living in both the incorporated and unincorporated areas of Sutter County. Nearly two-thirds of these residents live in the City of Yuba City and Live Oak (California Department of Finance 2010). As of April 2010 there were 33,858 housing units within Sutter County. As of 2010, there were 221,768 residents living in in both the incorporated and unincorporated areas of Butte County (California Department of Finance 2010). As of April 2010 Butte County had 95,835 total housing units (California Department of Finance 2011). While it should be acknowledged that the planning area reaches only into a small portion of Butte County, in a flood event, far more would be affected than only those people and residences in the planning area.

Manyof these residents could be displaced by a catastrophic flood event and residences damaged or destroyed. as of 2009, Sutter County is home to 25,860 wage and salary jobs (California Department of Transportation 2012a), 328,208 acres of farmland, 1,171 acres of commercial and industrial zoned land, and 44,919 acres of open space, golf courses, and parks (Sutter County 2010). As of 2009 Butte County is home to 75,258 wage and salary jobs (California Department of Transportation 2012b) It is also home to 599,040 acres of farmland, 5,544 acres of commercial, office and industrial zoned land, and 178,400 acres of open space (Butte County 2010). These lands, in both counties, would all be affected by a flood event. Agricultural resources could also sustain major damage in a flood event considering roughly 86% and 58% of Sutter and Butte counties' land, respectively, is used to support that industry. If a catastrophic flood event occurred it would result in the loss of hundreds of thousands of dollars in agricultural lands, employment centers, homes and other structures.

A flood event could cause severe public health hazards as well. Flooding could upset and spread stored hazardous materials, creating hazardous conditions for the public and the environment. Flood damage to homes and other structures could render them dangerous, due to structural damage as well as contamination. Additionally, the floodwaters and ponds left behind could provide a wide breeding ground for mosquitoes and other disease vectors. Effects to the water supply system could be particularly severe in a flood event, and could leave residents and businesses without a reliable water supply for a significant amount of time. In population centers such as Yuba City, a single break in a water delivery pipe or main could contaminate the entire city's water supply. A major flood event could also result in substantial stress or disruption to the region's emergency response capacity, hospital services, and other critical lifelines.

During the recovery period after a flood event, area residents would require temporary housing, and displacement of many or all occupants would occur while levees, buildings, and other infrastructure were repaired. Businesses, social services, and other employers occupying affected structures would be forced to relocate. The potential number of displaced residents and lost businesses resulting in demand for temporary quarters would likely exceed the available supply of vacant buildings surrounding the project area. Thus, many displaced residents and businesses may be forced to relocate to areas a considerable distance from affected area communities, resulting in substantial intermediate-term and long-term economic effects on the area and its people. These effects include changes in employment numbers and patterns, business and personal incomes, tax revenues, and regional economic activity.

A flood event in the affected area would also disrupt state and interstate highway and rail traffic, causing long-term effects on the region's and the state's economy and ability to move people and goods. Flooding of this transportation and distribution infrastructure would cut off major statewide and interstate transportation corridors. Other critical facilities and infrastructure are listed in Table 1-5.

2.6.3 Relationship of FEMA RiskMAP to No Action

Further complicating the future no action scenario is the FEMA RiskMAP process, a national effort to revise FIRMs. FEMA is in the process of reevaluating the level of flood protection provided by the levee system protecting the planning area. Portions of the planning area are currently designated as falling under Zone X, meaning it has less than a 1% chance of flooding in any given year (100-year flood protection). If these areas were remapped out of Zone X and into an A, AE, AR, or A-99 Zone, flood insurance would become mandatory for all citizens and businesses that hold Federally guaranteed mortgage loans. In addition, Federal and state regulations would prevent or constrain further development in the basin.

FEMA flood zone mapping from 202+50 in the south to Stewart Road in the north reflects that those lands are categorized as Special Flood Hazard Areas (this includes A, AE, AR, AH, AO, Zone V, Zone VE, and A-99 Zones) and are subject to inundation by the 1% annual chance of flooding. More specifically, lands nearest the west levee of the Feather River are categorized as AE, meaning base flood elevations have been determined. The west levee of the Feather River from the Sutter/Butte County line to the Thermalito Afterbay is categorized as Zone A, in which base flood elevations have not been determined. Lands to the west of the levee in this area are primarily categorized as Zone X. Mapping of lands between Stewart Road and the Sutter/Butte County line is in progress and is expected in 2014 (Plate 2-20).

2.6.4 Levee Vegetation Policy and No Action

Compliance with USACE levee vegetation policy in the Sacramento Valley is complex, due to the overlays of flood management objectives, protected fish and wildlife habitat, environmental regulations, overlapping jurisdictional authorities, and recreation and other social values.

In light of these circumstances, the No Action Alternative reflects multiple possible future scenarios. At this time, it is considered too speculative to adopt and consider a single one of these future scenarios as the sole or most likely outcome. Therefore, this document acknowledges and analyzes the following conditions in regard to the USACE levee vegetation policy as it relates to the No Action Alternative for the actions under consideration.

- Full application of USACE levee vegetation policy, as detailed in the ETL, meaning prohibition and removal of woody vegetation within the levee prism or within 15 feet of the landside or waterside levee toes (U.S. Army Corps of Engineers 2009).
- Modified application of the ETL; assumes the continued existence into the future of the vegetation conditions at the time of the analysis. This may include future application of a variance (not as part of the FRWLP) or application of the CVFPP concepts for management of woody vegetation, meaning trimming and thinning to allow visibility and accessibility, selective retention and removal based on engineering inspection and evaluation, and LCM (as described under encroachment removal and vegetation policy compliance). A system-wide improvement framework (SWIF) may also be a component of future compliance.

2.7 Alternative Screening

2.7.1 Screening Criteria

SBFCA established and applied nine criteria to qualitatively evaluate measures and alternatives and eliminate those that did not adequately meet the criteria. The criteria are below, along with the options for evaluation. Public feedback, including that gained through the NEPA and CEQA process, is considered as part of the evaluation in screening.

An alternatives analysis per the guidelines of 404(b)(1) for a CWA Section 404 Individual Permit would be conducted separately, if required.

- **Meet the project objectives to reduce risk.** The objective of the project is to address flood management deficiencies of through- and under-seepage, erosion, and slope stability on the Feather River West Levee to make a substantial contribution toward achieving 100-year protection for the entire assessment district and 200-year for the populated areas. This criterion is essentially a pass or fail evaluation and a failing alternative would be eliminated from further consideration.
- **Geography and jurisdictional authority.** This criterion eliminates those measures that are outside the control of SBFCA as a sponsor to implement, operate, and/or maintain. This criterion is essentially a pass or fail evaluation and a failing alternative would be eliminated from further consideration.
- **Avoidance of hydraulic effects.** An alternative must not measurably and substantially increase or transfer flood risk within or outside the affected area (upstream, adjacent, or downstream). This criterion is essentially a pass or fail evaluation and a failing alternative would be eliminated from further consideration.
- **Land use compatibility**. The current and planned land use of the affected area should be taken into consideration. If known projects exist or have been locally approved, alternatives should be evaluated with consideration of the degree to which they disrupt or interfere with such land uses. Alternatives that do not require modification to existing land-use plans are favored; specifically, alternatives that are consistent with facilitating continued agriculture and sustainable smart growth and economic development. This criterion would be evaluated as a relative scale, such as less, moderately, or more favorable.
- **Avoidance, minimization, and mitigation of environmental effects.** This is an important criterion to ensure an alternative does not have onerous environmental effects relative to other alternatives, and, moreover, that alternatives are selected to avoid, minimize, and mitigation environmental effects (in that order of precedence). The purpose is to ensure that a proposed project minimizes effects on the environment as well as avoiding permitting process which may delay the project or increase cost. This criterion would be evaluated as a relative scale, such as less, moderately, or more favorable.
- **Facilitation of multi-use objectives.** While the FRWLP is focused on flood management only, it should not preclude opportunities for future recreation and ecosystem restoration, consistent with the Feasibility Study goals and the State's criteria. Alternatives that facilitate or do not preclude realization of other objectives within the project area are favored. This criterion would be evaluated as a relative scale, such as less, moderately, or more favorable.

- **Cost.** Costs for construction, operations, and maintenance are considered and compared relative to one another and means of applicable local, state, and Federal programs. This criterion would be evaluated as a relative scale, such as less, moderately, or more favorable.

2.7.2 Measures and Alternatives Not Carried Forward

Several measures and alternatives for the FRWLP were considered but not carried forward based on the screening criteria presented above. These alternatives are briefly described below.

2.7.2.1 Alternative Levee Alignments

Construction of a new levee may allow for higher certainty as to how the levee meets Federal and State standards for factors such as through- and under-seepage, geometry, and slope stability. For example, the selection and placement of embankment fill can be directly controlled according to current standards using modern construction, material testing, and inspection practices. Moreover, construction of a new levee also allows for consideration of a new alignment (i.e., location) factoring hydrology, hydraulics, habitat, land use, characteristics of the area to be protected, O&M needs, and other factors. Three types of alternative levee alignments were considered for the FRWLP, described below.

Setback Levees

The concept of a setback levee is to construct a new levee landward of the existing levee alignment, whereby the old levee is then often degraded, breached, or partially removed to allow expansion of the floodplain. A new levee would be built to meet current Federal and State standards. Table 2-20 summarizes the analysis of setback levees relative to the screening criteria.

Table 2-20. Setback Levee Screening Summary

Criterion	Comment
Meet the project objectives to reduce risk	Pass; a setback levee could be designed and implemented to meet the project objectives.
Geography and jurisdictional authority	Pass; a setback levee could be designed and implemented within SBFCA's area and scope of authority.
Avoidance of hydraulic effects	Pass; a setback levee could be designed and implemented to avoid hydraulic effects within and outside of the affected area.
Land use compatibility	Less favorable; a setback levee may affect land uses by converting current land uses such as agriculture, residential, and commercial and subjecting additional lands to flooding.
Avoidance, minimization, and mitigation of environmental effects	Less to moderately favorable; while a setback levee may allow for substantial environmental benefits by increasing fish and wildlife habitat, it may also have significant environmental effects on land use, mineral resources, transportation, air quality, noise, and other resources.
Facilitation of multi-use objectives	More favorable; a setback levee may allow for accommodation of flood management, fish and wildlife habitat, recreation, and agriculture within the expanded floodplain.

Criterion	Comment
Cost	Less favorable; a setback levee may have high implementation costs due to land acquisition, materials, and earthwork ($8,000 to 10,000 per linear foot compared to $1,200 to 2,000 per linear foot for fix-in-place measures).

Setback levees within the project area do not fail any of the critical pass/fail criteria; however, they do not rate as well in the categories of land use compatibility, environmental effects, and cost for the study reaches relative to actions focused on addressing deficiencies of the Feather River West Levee in place. Setback levees have been removed from going forward as part of the FRWLP but merit further evaluation for other reaches within the study area but outside of the FRWLP. They are specifically under consideration for future action south of the FRWLP where there may be fewer constraints from land use, environmental effects, and cost, as well as potentially greater benefits from multiple floodplain uses.

Ring Levees

The concept of a ring levee is to construct a new levee surrounding a select area to be protected, such as a population center like Yuba City. Ring levees focus on increasing flood protection for the area within the ring while not addressing the level of protection outside of the ring. Table 2-21 summarizes the analysis of ring levees relative to the screening criteria.

Table 2-21. Ring Levee Screening Summary

Criterion	Comment
Meet the project objectives to reduce risk	Fail; ring levee(s) may achieve 200-year protection for the area within the ring (or areas within multiple rings) but would not address the project objective to reduce flood risk for the entire planning area. The vast majority of the planning area would remain at current or heightened risk levels, especially agricultural communities, commodities, and infrastructure.
Geography and jurisdictional authority	Pass; ring levee(s) could be designed and implemented within SBFCA's area and scope of authority.
Avoidance of hydraulic effects	Fail; ring levee(s) may increase the risk of flooding outside the area protected by the ring.
Land use compatibility	Less favorable; ring levee(s) may affect land uses by subjecting substantial lands to flooding by not reducing flood risk outside of the ring and by changing land use for the direct footprint of the levee.
Avoidance, minimization, and mitigation of environmental effects	Less to moderately favorable; ring levee(s) may have significant environmental effects on land use, mineral resources, transportation, air quality, noise, and other resources.
Facilitation of multi-use objectives	Less to moderately favorable; ring levee(s) may allow for accommodation of flood management, fish and wildlife habitat, recreation, and agriculture outside of the ring.
Cost	Less favorable; ring levee(s) may have high implementation costs due to land acquisition, materials, and earthwork.

Ring levees within the project area fail at least two of the critical pass/fail criteria and also do not rate as well in nearly all other categories relative to actions focused on addressing deficiencies of the Feather River West Levee in place. Ring levees have been removed from going forward as part of the FRWLP.

J-Levee

A J-levee is a special hybrid of repair-in-place of existing levees and ring levees, with the "J" referring to the shape of the levee in planform. Rather than entirely encircling a limited area like a ring levee, a J-levee would combine repair-in-place of existing levees connected with a partial ring levee (forming the "J" shape). Specifically, a J-levee has been studied in the mid/northern part of the project area, where the long leg of the "J" corresponds to the existing Feather River West Levee and the hook part of the ''J" represents a new levee alignment heading to the west just south of Yuba City. The area north of the J-levee would be designed to a 200-year level of protection but the area south of the "J" would receive lesser protection. Table 2-22 summarizes the analysis of a J-levee relative to the screening criteria.

Table 2-22. J-Levee Screening Summary

Criterion	Comment
Meet the project objectives to reduce risk	Uncertain; a J-levee levee may need further evaluation to determine ability to meet the project objective to reduce flood risk for the entire planning area.
Geography and jurisdictional authority	Pass; a J-levee could be designed and implemented within SBFCA's area and scope of authority.
Avoidance of hydraulic effects	Uncertain; a J-levee may need further evaluation to determine avoidance of hydraulic effects within and outside of the planning area.
Land use compatibility	Less favorable; a J-levee may affect land uses by subjecting additional lands to flooding and by changing land use for the direct footprint of the hook part of the ''J" levee.
Avoidance, minimization, and mitigation of environmental effects	Less to moderately favorable; a J-levee may also have significant environmental effects on land use, mineral resources, transportation, air quality, noise, and other resources.
Facilitation of multi-use objectives	Moderately to more favorable; a J-levee may allow for accommodation of flood management, fish and wildlife habitat, recreation, and agriculture outside of the J levee.
Cost	Less favorable; a J-levee may have high implementation costs due to land acquisition, materials, and earthwork.

A J-levee has uncertainty relative to the critical pass/fail criteria and does not rate as well in nearly all other categories relative to actions focused on addressing deficiencies of the Feather River West Levee in place. A J-levee has been removed from going forward as part of the FRWLP.

2.7.2.2 Reoperation of Upstream Reservoirs and Bypasses

Upstream reservoirs are currently operated to meet a number of different objectives, including water supply, flood management, power production, water quality, and fisheries. Similarly, the bypass system that is part of the SRFCP to reduce peak flows from the primary river channels is governed by complex operating criteria. Table 2-23 summarizes the analysis of reoperation of upstream reservoirs and bypasses relative to the screening criteria.

Table 2-23. Reoperation of Upstream Reservoirs and Bypasses Screening Summary

Criterion	Comment
Meet the project objectives to reduce risk	Uncertain; reoperation of upstream reservoirs and bypasses may need further evaluation to determine ability to meet the project objective to reduce flood risk for the entire planning area.
Geography and jurisdictional authority	Fail; reoperation of upstream reservoirs and bypasses could not be planned and implemented within SBFCA's area and scope of authority and would require cooperation with numerous Federal, state, and local agencies.
Avoidance of hydraulic effects	Uncertain; reoperation of upstream reservoirs and bypasses may need further evaluation to determine avoidance of hydraulic effects within and outside of the planning area.
Land use compatibility	Moderately to more favorable; reoperation of upstream reservoirs and bypasses would not affect land uses although changed hydrology could affect uses within the bypass and reservoir footprints.
Avoidance, minimization, and mitigation of environmental effects	Moderately to more favorable; reoperation of upstream reservoirs and bypasses would not affect land uses although changed hydrology could affect habitat within the bypass and reservoir footprints.
Facilitation of multi-use objectives	Uncertain; reoperation of upstream reservoirs and bypasses could affect boating and fishing by changing water levels and flows within those facilities and the river channel as well as affecting shoreline habitat; in addition, agriculture within bypasses could be affected as well as shoreline recreational facilities in bypasses and at reservoirs.
Cost	Uncertain; reoperation of upstream reservoirs and bypasses has unknown costs in terms of modifications to these facilities to accommodate different operating regimes.

Reoperation of reservoirs and bypasses to optimize attenuation of flood flows could potentially reduce flood risk to SBFCA, but may compromise the ability to meet other mandated management objectives. Given that many agencies and other stakeholders would need to be involved, it is unlikely that an agreement with respect to reoperation would be reached in the near term, if possible at all to achieve any meaningful benefit to SBFCA. Based on the screening criteria, this alternative has many uncertain ratings and a failure rating in a critical category; therefore, it has not been carried forward as part of the FRWLP.

2.7.2.3 Development of Additional Upstream Storage

Similar to reoperation of upstream reservoirs, development of increased capacity for flood water storage within the SRFCP upstream of SBFCA's area (such as through new reservoirs, enlarged bypasses, and setback levees) presents a possibility for reducing flood risk within the planning area. Table 2-24 summarizes the analysis of developing additional upstream storage relative to the screening criteria.

Table 2-24. Development of Additional Upstream Storage Screening Summary

Criterion	Comment
Meet the project objectives to reduce risk	Uncertain; development of additional upstream storage may need further evaluation to determine ability to meet the project objective to reduce flood risk for the entire planning area.
Geography and jurisdictional authority	Fail; development of additional upstream storage could not be planned and implemented within SBFCA's area and scope of authority and would require cooperation with numerous Federal, state, and local agencies.
Avoidance of hydraulic effects	Uncertain; development of additional upstream storage may need further evaluation to determine avoidance of hydraulic effects within and outside of the planning area.
Land use compatibility	Less favorable; development of additional upstream storage may affect land uses if reservoirs and bypasses would need to be increased in footprint to allow additional capacity, which would require land acquisition and land use change.
Avoidance, minimization, and mitigation of environmental effects	Less favorable; development of additional upstream storage may have substantial environmental effects if reservoirs and bypasses would need to be increased in footprint to allow additional capacity.
Facilitation of multi-use objectives	Uncertain; development of additional upstream storage could affect boating and fishing by changing water levels and flows within those facilities and the river channel as well as affecting shoreline habitat; in addition, agriculture within bypasses could be affected as well as shoreline recreational facilities in bypasses and at reservoirs.
Cost	Uncertain; development of additional storage has unknown costs in terms of modifications to these facilities.

Likewise with reoperation of upstream reservoirs and bypasses, SBFCA does not own or control upstream properties for developing additional storage. Based on the screening criteria, this alternative has many uncertain ratings and a failure rating in a critical category; therefore, it has not been carried forward as part of the FRWLP.

2.7.2.4 Construction of Feather River Bypass

This alternative would construct a new bypass that would divert flows from the Feather River near the Thermalito Afterbay to an expanded Cherokee Canal and Sutter Bypass. This would entail building a new bypass canal along the top of the Sutter Basin from the Feather River to Cherokee Canal, expanding Cherokee Canal to the Sutter Bypass, and expanding the Sutter Bypass to the Feather River confluence. Table 2-25 summarizes the analysis of the development and construction of a Feather River Bypass relative to the screening criteria.

Table 2-25. Construction of Feather River Bypass Screening Summary

Criterion	Comment
Meet the project objectives to reduce risk	Fail; construction of a new bypass, while it would divert peak flows, would not address under-seepage and through-seepage risk from the Feather River West Levee.
Geography and jurisdictional authority	Fail; construction of a new bypass could not be planned and implemented within SBFCA's area and scope of authority and would require cooperation with numerous Federal, state, and local agencies.
Avoidance of hydraulic effects	Uncertain; construction of a new bypass has the potential to significantly change the hydraulics of the Cherokee Canal and the Sutter Bypass with unknown consequences.
Land use compatibility	Uncertain; construction of a new bypass may affect land use such as agriculture in the Sutter Bypass; roads, railroads, and irrigation canals would need to be modified to accommodate the new bypass and existing residential and other structures would need to be removed/relocated.
Avoidance, minimization, and mitigation of environmental effects	Uncertain; construction of a new bypass would have considerable construction-related effects such as equipment emissions; effects on resources within the construction footprint are not known.
Facilitation of multi-use objectives	More favorable; the construction of a new bypass could expand fish and wildlife habitat and recreation.
Cost	Less favorable; the cost of constructing a new bypass would exceed the cost of fix-in-place measures and also necessitates enlarging of the Cherokee Canal and Sutter Bypass, which would incur more costs.

While a new bypass diverting water to Cherokee Canal and the Sutter Bypass would result in water surface elevation reductions, reductions would be relatively modest in the lower reaches of the Feather River and would be unlikely to sufficiently reduce risk from under-seepage and through-seepage. Based on the screening criteria, this alternative has many uncertain ratings and failure ratings in critical categories; therefore, it has not been carried forward as part of the FRWLP. However, it should be noted that USACE identified this measure in the Sutter Basin Project Feasibility Study; therefore, it may be pursued separate from the FRWLP.

2.7.2.5 Raising Building Pads

This alternative involves raising building pads to an elevation above the floodplain. Table 2-26 summarizes the analysis of raising building pads relative to the screening criteria.

Table 2-26. Raising Building Pads Screening Summary

Criterion	Comment
Meet the project objectives to reduce risk	Fail; raising building pads would not meet the objective to reduce flood risk for the entire planning area because approximately 30,000 existing structures would need to be modified which is not reasonably feasible and because tens of thousands of acres of agricultural lands would remain at risk.
Geography and jurisdictional authority	Pass; raising building pads would be in the area and scope of authority of SBFCA through its member agencies.
Avoidance of hydraulic effects	Pass; raising building pads would not likely induce hydraulic effects within or outside of the planning area.
Land use compatibility	More favorable; raising building pads would likely not affect land use.
Avoidance, minimization, and mitigation of environmental effects	Less favorable; raising building pads may have substantial environmental effects on mineral resources, transportation, air quality, noise, and other resources through extensive construction activities to implement.
Facilitation of multi-use objectives	More favorable; raising building pads would not preclude multi-use objectives.
Cost	Less favorable; raising building pads would have substantial costs to implement and would be complicated by implementation on private facilities.

While it may be technically possible for existing development to be retrofitted to be flood-proofed or to raise all habitable buildings above the 200-year flood level and for new development to be designed and built to this standard, implementation would require substantial cost, time, and re-evaluation of environmental effects and local permitting, review, and approval processes. This alternative would not substantially meet the project objectives in that it would not reduce flood risk in an expedited fashion for the entire population of the planning area due to the fact that construction activities would likely be staged over tens of years, leaving parts of the population at greater risk than others. Furthermore, it would not provide flood protection for all property because farmland, non-habitable buildings, streets, and parking lots would not be raised above the 100-year or 200-year flood level. Further complicating this alternative is that potential flood depths in the some parts of the affected area are too great to feasibly enable the raising of building pads or structural retrofits. Based on the screening criteria, this alternative has not been carried forward as part of the FRWLP.

2.7.2.6 River Dredging

This measure, which likely would be a component of an alternative rather than a complete alternative unto itself, would entail removal of river bottom material via dredging to increase channel capacity. Dredging would be conducted from a barge via clamshell or suction cutter head and the deposits would be placed outside the river channel on floodplain areas or landward of the levee. Dredging would likely entail ongoing maintenance dredging to restore channel capacity because siltation over time would replace the removed material. Table 2-27 summarizes the analysis of river dredging.

Table 2-27. River Dredging Screening Summary

Criterion	Comment
Meet the project objectives to reduce risk	Fail; river dredging may result in localized increases in channel capacity but would not reduce water surface elevation sufficiently to reduce risk from seepage from the Feather River West Levee.
Geography and jurisdictional authority	Pass; river dredging could be planned and implemented within SBFCA's area and scope of authority with cooperation from numerous Federal, state, and local agencies.
Avoidance of hydraulic effects	Uncertain; river dredging has the potential to significantly change river hydraulics, especially upstream and downstream effects.
Land use compatibility	More favorable; river dredging would have no effect on land use except for dredge disposal areas, which could be designed to be compatible with land use.
Avoidance, minimization, and mitigation of environmental effects	Less favorable; dredging may be considerably constrained by fish and wildlife habitat and water quality restrictions within the aquatic environment of the dredging activity as well as the terrestrial environment of the dredge disposal sites.
Facilitation of multi-use objectives	Moderately favorable; dredging would neither create nor preclude opportunities for recreation or habitat.
Cost	Less favorable; river dredging would not by itself address any of the deficiencies relative to state and Federal levee criteria, and therefore would not be cost-effective because other measures would need to be employed.

Because river dredging by itself does not directly or substantially contribute toward addressing any of the deficiencies in the project area, it has not been carried forward as part of the FRWLP.

2.7.3 Screening of Alternatives Carried Forward

2.7.3.1 Alternative 1

This alternative entails constructing a cutoff wall along the centerline of the existing levee to a varying depth and a seepage berm along a portion of the landside levee toe; a detailed description is presented earlier in this chapter. The Alternative 1 screening summary is provided in Table 2-28.

Table 2-28. Alternative 1 Screening Summary

Criterion	Comment
Meet the project objectives to reduce risk	Pass; Alternative 1 could be designed and implemented to meet the project objectives to address levee deficiencies and achieve the target levels of protection.
Geography and jurisdictional authority	Pass; construction of Alternative 1 would be in the area and scope of authority of SBFCA through its member agencies.
Avoidance of hydraulic effects	Pass; Alternative 1 would not likely induce hydraulic effects within or outside of the planning area and could be designed and constructed for hydraulic benefit or neutrality.
Land use compatibility	More favorable; Alternative 1 keeps predominantly within the existing FRWLP footprint minimizing land use changes.
Avoidance, minimization, and mitigation of environmental effects	More favorable; the smaller footprint of Alternative 1 would minimize environmental effects although some loss of vegetation would be required for project constructability.
Facilitation of multi-use objectives	Moderately favorable; Alternative 1 would neither create nor preclude opportunities for recreation or habitat.
Cost	Less favorable; cutoff walls are costly to construct.

Alternative 1 minimizes real estate acquisitions and changes in land use, however the cost of utilizing cutoff walls as the primary flood management measure may be a limitation. This alternative was recommended for further consideration and inclusion in the NEPA/CEQA analysis.

2.7.3.2 Alternative 2

This alternative entails constructing seepage and stability berms along the landside toe of the levee and a shallow cutoff wall along a portion of the centerline of the levee. Alternative 2 also included filling the existing canal adjacent to the levee in Reaches 26, 27, and 28 with water during periods of high water surface elevation in the river; a detailed description is presented earlier in this chapter. The Alternative 2 screening summary is presented in Table 2-29.

Table 2-29. Alternative 2 Screening Summary

Criterion	Comment
Meet the project objectives to reduce risk	Pass; Alternative 2 could be designed and implemented to meet the project objectives to address levee deficiencies and achieve the target levels of protection.
Geography and jurisdictional authority	Pass; constructing Alternative 2 would be in the area and scope of authority of SBFCA through its member agencies.
Avoidance of hydraulic effects	Pass; constructing seepage and stability berms would not likely induce hydraulic effects within or outside of the planning area and could be designed and constructed for hydraulic benefit or neutrality.
Land use compatibility	Less favorable; Alternative 2 requires considerable land acquisition which could result in relocation of a large number of homes and infrastructure.
Avoidance, minimization, and mitigation of environmental effects	Less favorable; Alternative 2 may have substantial environmental effects on air quality, transportation, and noise because of the greater amount of earthwork required.
Facilitation of multi-use objectives	Moderately favorable; Alternative 2 would neither create nor preclude opportunities for recreation or habitat.
Cost	Less to moderately favorable; cost of constructing seepage and stability berms is less expensive than cutoff walls, but more property would need to be acquired for project execution and environmental mitigation costs would be higher. Borrow needs would be considerably greater, necessitating acquisition, transportation, and placement, and reclamation.

Alternative 2 effectively addresses the identified levee deficiencies, and may be less in cost compared to measures within the levee footprint, however the use of seepage and stability berms expands environmental effects across the entire project area. This alternative was recommended for further consideration and inclusion in the NEPA/CEQA analysis.

2.7.3.3 Alternative 3

This alternative entails combining flood management measures from Alternative 1 and Alternative 2 to produce the optimized alternative to avoid and minimize environmental effects. This alternative proposes a combination of cutoff walls and berms (along with other measures); a detailed description is presented earlier in this chapter. The Alternative 3 screening summary is presented in Table 2-30.

Table 2-30. Alternative 3 Screening Summary

Criterion	Comment
Meet the project objectives to reduce risk	Pass; Alternative 3 could be designed and implemented to meet the project objectives to address levee deficiencies and achieve the target levels of protection.
Geography and jurisdictional authority	Pass; constructing Alternative 3 would be in the area and scope of authority of SBFCA through its member agencies.
Avoidance of hydraulic effects	Pass; constructing Alternative 3 would not likely induce hydraulic effects within or outside of the planning area and could be designed and constructed for hydraulic benefit or neutrality.
Land use compatibility	More favorable; although Alternative 3 employs seepage and stability berms in several locations, the primary measure to be utilized is cutoff walls minimizing required land use changes.
Avoidance, minimization, and mitigation of environmental effects	More favorable; Alternative 3 would have some environmental effects because of the limited number of seepage and stability berms, but the project primarily would remain within the existing levee footprint by utilizing cutoff walls as the most employed measure.
Facilitation of multi-use objectives	Moderately favorable; Alternative 3 would neither create nor preclude opportunities for recreation or habitat.
Cost	More favorable; Alternative 3 primarily utilizes cutoff walls which is less expensive than other measures considered.

Alternative 3 effectively addresses the identified levee deficiencies, is compatible with land use plans, requires minimal real estate acquisition, avoids or minimizes environmental effects, is cost effective, and has a moderate footprint. This alternative was recommended for further consideration and inclusion in the NEPA/CEQA analysis and has been identified as the APA.

Chapter 3
Affected Environment and Environmental Consequences

This chapter provides the affected environment and environmental consequences for the FRWLP EIS/EIR. The baseline environmental conditions assumed in the preparation of this chapter consist of the existing physical environment as of May 20, 2011, when SBFCA published the Notice of Preparation (NOP) to prepare an EIR with the State Clearinghouse. USACE published a Notice of Intent (NOI) to prepare an EIS in the Federal Register on May 20, 2011. The chapter contents are listed below.

- Section 3.1, *Flood Control and Geomorphic Conditions*
- Section 3.2, *Water Quality and Groundwater Resources*
- Section 3.3, *Geology, Soils, Seismicity, and Mineral Resources*
- Section 3.4, *Traffic, Transportation, and Navigation*
- Section 3.5, *Air Quality*
- Section 3.6, *Climate Change and Greenhouse Gas*
- Section 3.7, *Noise*
- Section 3.8, *Vegetation and Wetlands*
- Section 3.9, *Wildlife*
- Section 3.10, *Fish and Aquatic Resources*
- Section 3.11, *Agriculture, Land Use, and Socioeconomics*
- Section 3.12, *Population, Housing, and Environmental Justice*
- Section 3.13, *Visual Resources*
- Section 3.14, *Recreation*
- Section 3.15, *Utilities and Public Services*
- Section 3.16, *Public Health and Environmental Hazards*
- Section 3.17, *Cultural Resources*

3.1 Flood Control and Geomorphic Conditions

3.1.1 Introduction

This section describes the regulatory and environmental setting for flood control and geomorphic conditions; effects on flood control and geomorphic conditions that would result from the No Action Alternative and Alternatives 1, 2, and 3; and mitigation measures that would reduce significant effects.

3.1.2 Affected Environment

This section describes the affected environment for flood control and geomorphic conditions in the project area. The key sources of data and information used in the preparation of this section are listed below.

- Butte County Multi-Jurisdictional All-Hazard Pre-Disaster Mitigation Plan (Butte County 2007).
- Butte County General Plan 2030 (Butte County 2010).
- City of Gridley 2030 General Plan (City of Gridley 2010).
- City of Live Oak 2030 General Plan (City of Live Oak 2010).
- City of Yuba City General Plan (City of Yuba City 2004).
- Geologic map of the late Cenozoic deposits of the Sacramento Valley and northern Sierran foothills, California (Helley and Harwood 1985).
- Preliminary Problem Identification and Conceptual Alternatives Analysis Report Feather River West Levee Evaluation, Volumes 1 and 2 (Kleinfelder 2009).
- City of Biggs General Plan 1997–2015 (City of Biggs 1998).
- Sutter Butte Flood Control Agency's Early Implementation Program Project Report for the Feather River West Levee Rehabilitation Project (Peterson Brustad 2010).
- Sutter County General Plan Update Technical Background Report (Sutter County 2008).
- Sutter County General Plan, Public Draft (Sutter County 2010).
- Phase 1 Geotechnical Data Report (P1GDR), Sutter Study Area (URS 2008a).
- Phase 1 Preliminary Geotechnical Evaluation Report (P1GER), Sutter Study Area (URS 2008b).
- Supplemental Geotechnical Data Report (SGDR), Sutter Study Area (URS 2010).
- Sacramento and San Joaquin River Basins Comprehensive Study, December 2002 Interim Report (U.S. Army Corps of Engineers 2002a).
- Sacramento and San Joaquin River Basins Comprehensive Study, Technical Studies Documentation, December 2002 (U.S. Army Corps of Engineers 2002b).
- Geomorphic Analysis of Reach from Colusa to Red Bluff Diversion Dam, River Mile 143 to River Mile 243: Final Phase II Report (Water Engineering & Technology 1989).

- Geomorphic Analysis and Bank Protection Alternatives Report for Sacramento River (RM 78–194) and Feather River (RM 0–28) (Water Engineering & Technology 1990a).
- Geomorphic Analysis of the Sacramento River, Phase II Report (Water Engineering & Technology 1990b).
- Geomorphic Analysis and Bank Protection Alternatives Report for Sacramento River (RM 0–78), Feather River (RM 29–61), Yuba River (RM 0–11), Bear River (RM 0–17), American River (RM 0–23), and portions of Three Mile, Steamboat, Sutter, Miner, Georgiana, Elk and Cache Sloughs (Water Engineering & Technology 1991).
- Butte County Flood Mitigation Plan (Wood Rodgers 2006).

3.1.2.1 Regulatory Setting

This section summarizes key Federal and state regulatory information that applies to flood control and geomorphic conditions. Additional regulatory information appears in Appendix A.

Federal

The following Federal policies related to flood control and geomorphic conditions may apply to implementation of the proposed project. Additional Federal policies potentially relevant to the implementation of the project can be found in Appendix A.

National Flood Insurance Program

The National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973 were intended to reduce the need for large, publicly funded flood control structures and disaster relief by restricting development on floodplains. FEMA administers the NFIP to subsidize flood insurance to communities that comply with FEMA regulations limiting development in floodplains. FEMA issues FIRMs for communities participating in the NFIP. These maps delineate flood hazard zones in the community. These maps are designed for flood insurance purposes only and do not necessarily show all areas subject to flooding. The maps designate lands likely to be inundated during a 100-year storm event and elevations of the base flood. They also depict areas between the limits affected by 100-year and 500-year events and areas of minimal flooding. These maps often are used to establish building pad elevations to protect new development from flooding effects. The locations of FEMA-designated floodplains in the proposed planning area are discussed in Section 3.1.2.2, *Environmental Setting*.

Requirements for Federal Emergency Management Agency Certification

For guidance on floodplain management and floodplain hazard identification, communities turn to FEMA guidelines, as defined in 44 CFR 59 through 77. In order for a levee to be recognized by FEMA under the NFIP, the community must provide evidence demonstrating that adequate design and operation and maintenance systems are in place to provide reasonable assurance that protection from the base flood (1% or 100-year flood) exists. These specific requirements are outlined in 44 CFR 65.10, Mapping of Areas Protected by Levee Systems, and are summarized below.

Levee height. Riverine levees must provide a minimum freeboard (the height of the top of a levee above a given level of water in a river) of 3 feet above the water-surface level of the base flood. An additional 1 foot above the minimum is required within 100 feet of either side of structures (such as bridges) riverward of the levee or wherever the flow is constricted. An additional 0.5 foot above the minimum at the upstream end of the levee, tapering to not less than the minimum at the downstream end of the levee, also is required.

Closures. All openings must be provided with closure devices that are structural parts of the system during operation and designed according to sound engineering practice.

Embankment protection. Engineering analyses must be submitted that demonstrate that no appreciable erosion of the levee embankment can be expected during the base flood, as a result of either currents or waves, and that anticipated erosion will not result in failure of the levee embankment or foundation directly or indirectly through reduction of the seepage path and subsequent instability.

Embankment and foundation stability. Engineering analyses that evaluate levee embankment stability must be submitted to FEMA. The analyses provided must evaluate expected seepage during loading conditions associated with the base flood and shall demonstrate that seepage into or through the levee foundation and embankment will not jeopardize embankment or foundation stability.

Settlement. Engineering analyses must be submitted that assess the potential and magnitude of future losses of levee height as a result of levee settlement and demonstrate that freeboard will be maintained within the minimum standards.

Interior drainage. An analysis must be submitted that identifies the source(s) of such flooding, the extent of the flooded area, and, if the average depth is greater than 1 foot, the water-surface elevation(s) of the base flood.

Operation plans. For a levee system to be recognized, a formal plan of operation must be provided to FEMA. All closure devices or mechanical systems for internal drainage, whether manual or automatic, must be operated in accordance with an officially adopted operational manual, a copy of which must be provided to FEMA.

Maintenance plans. For levee systems to be recognized as providing protection from the base flood, they must be maintained in accordance with an officially adopted maintenance plan. All maintenance activities must be under the jurisdiction of a Federal or state agency, an agency created by Federal or state law, or an agency of a community participating in the NFIP that must assume ultimate responsibility for maintenance. The plan must document the formal procedure that ensures that the stability, height, and overall integrity of the levee and its associated structures and systems are maintained. At a minimum, maintenance plans must specify the maintenance activities to be performed, the frequency of their performance, and the person by name or title responsible for their performance.

U.S. Army Corps of Engineers Levee Design Criteria

All levees included in the proposed project area are Federally authorized and fall within the jurisdiction of USACE. The levee evaluation for the proposed project area conforms to the engineering criteria established by USACE for the assessment and repair of levees. USACE technical criteria in the following list should be used as guidance unless noted otherwise.

- Overtopping of Flood Control Levees and Floodwalls (Publication ETL 1110-2-299, August 22, 1986).

- Structural Design of Closure Structures for Local Flood Protection Projects (Publication EM 1110-2-2705, March 31, 1994).
- Design of Coastal Revetments, Seawalls, and Bulkheads (Publication EM 1110-2-1614, June 30, 1995).
- Design Guidance on Levees (Publication ETL 1110-2-555, November 30, 1997).
- Conduits, Culverts, and Pipes (Publication EM 1110-2-2902, March 31, 1998).
- Guidelines on Ground Improvement for Structures and Facilities (Publication ETL 1110-1-185, February 1, 1999).
- Engineering and Design for Civil Works Projects (Publication ER 1110-2-1150, August 31, 1999).
- Design and Construction of Levees (Publication EM 1110-2-1913, April 30, 2000).
- Geotechnical Investigations (Publication EM 1110-1-1804, January 1, 2001).
- USACE CESPK Levee Task Force, Recommendations for Seepage Design Criteria, Evaluation and Design Practices (2003a).
- Slope Stability (Publication EM 1110-2-1902, October 31, 2003).
- Geotechnical Levee Practice (Publication SOP EDG-03, June 28, 2004).
- Engineering and Design—Design Guidance for Levee Underseepage (Publication ETL 1110-2-569, May 1, 2005(a)).
- Quality Management (Publication ER 1110-1-12, September 30, 2006).
- ETL 1110-2-571 Guidelines For Landscape Planting and Vegetation Management at Levees, Floodwalls, Embankment Dams, and Appurtenant Structures (April 10, 2009(a)).

Sacramento River Flood Control Project Levee Height Requirements

As specified in the Design Memorandum, Volume I of II for the Sacramento River Flood Control Project, California, Mid-Valley Area, Phase III (U.S. Army Corps of Engineers 1996:2-12), the following minimum levee height (freeboard) requirements apply to the various reaches of the proposed project area[1].

- Feather River Levee Upstream of Confluence with Sutter Bypass: 3 feet.

State

The following state policies related to flood control and geomorphic conditions may apply to implementation of the proposed project. Additional state policies potentially relevant to the implementation of the project can be found in Appendix A.

Central Valley Flood Protection Plan

According to California Government Code Sections 65302.9 and 65860.1, every jurisdiction located within the Sacramento–San Joaquin Valley is required to update its general plan and zoning

[1] The freeboard requirements listed are for the SRFCP, specifically the “1957 USACE design” profiles for Sacramento River and many of its tributaries.

ordinance in a manner consistent with the CVFPP within 24 months after the CVFPP's adoption[2], which occurred on June 29, 2012. In addition, the locations of the state and local flood management facilities, locations of flood hazard zones, and the properties located in these areas must be mapped and consistent with the CVFPP.

The proposed project is intended to be consistent with the CVFPP, as the state seeks to continue to work with SBFCA to develop and implement projects to achieve an urban level of flood protection for Yuba City and other population centers in the affected area. This includes reconstructing and/or improving levees to urban design criteria (see below) along the west bank of the Feather River, adjacent to and upstream from Yuba City, as part of the FRWLP.

Department of Water Resources Urban Levee Design Criteria

Pursuant to SB 5 (Government Code (GC) §65007(l)), the Urban Levee Design Criteria (ULDC) define the urban level of flood protection as the level of protection that is necessary to withstand flooding that has a 1-in-200 chance of occurring in any given year using criteria consistent with, or developed by, DWR. While cities and counties located outside of the Sacramento–San Joaquin Valley are not required to make findings related to the urban level of flood protection, the ULDC can help inform engineering and local land use decisions for areas at risk of flooding anywhere in California. The ULDC was developed through a collaborative process with stakeholders from local government (including representatives from the Central Valley, San Francisco Bay Area, and Los Angeles Region), state government, and the Federal government.

The ULDC provide criteria and guidance for design, construction, operation, and maintenance of levees and floodwalls in urban and urbanizing areas. When finalized, the ULDC will supersede the Interim Levee Design Criteria for Urban and Urbanizing Areas in the Sacramento–San Joaquin Valley (Version 4), dated December 15, 2010. The ULDC contain numerous revisions and refinements from Version 4.

Local

Butte County, Sutter County, City of Yuba City, City of Live Oak, City of Biggs, and City of Gridley each have adopted goals and policies related to flood control, detailed in Appendix A.

3.1.2.2 Environmental Setting

The following considerations are relevant to flood control and geomorphic conditions in the proposed project area. The proposed project area is the Feather River and approximately 39 miles of its west bank extending from the Thermalito Afterbay south to a few miles above the Sutter Bypass.

Flood Control

Sacramento River Flood Control Project

The SRFCP was authorized by Congress in 1917. The SRFCP was the major project for flood control on the Sacramento River and its tributaries. It was sponsored by The Reclamation Board of the State of California (today reauthorized as the CVFPB) and was the first Federal flood control project constructed outside the Mississippi River Valley (U.S. Army Corps of Engineers 2009b).

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[2] The Public Draft of the CVFPP was completed in December 2011.

The SRFCP includes approximately 980 miles of levees, overflow weirs, pumping plants, and bypass channels that protect communities and agricultural lands in the Sacramento Valley and the Delta. Currently, the SRFCP extends from the Sacramento River's mouth near Collinsville in the Delta to near Chico Landing in the northern Sacramento Valley. Approximately 980 miles of levees were constructed as part of the project, providing flood protection to roughly 800,000 acres of highly productive agricultural lands, the cities of Sacramento and Marysville, and numerous other small communities. Although the SRFCP levees often were constructed of poor foundation materials such as river dredge spoils that would not meet current engineering standards, the levees are relied upon to provide flood protection during major storms to more than 2 million people in approximately 50 communities with an estimated $37 billion in urban and agricultural development.

Sacramento River Bank Protection Project (SRBPP)

The SRBPP is a continuing long-term project authorized by Section 203 of the Flood Control Act of 1960 (Public Law 86-645). The SRBPP was authorized to provide protection to the existing levee and flood control facilities of the SRFCP.

The SRBPP has been divided into three phases. Phase I bank protection was completed in 1975 and resulted in 435,953 feet of bank protection. Current bank protection is being carried out under Phase II. The work authorized through Section 3031 of the WRDA of 2007 is a continuation of Phase II bank protection, and increases the amount of currently authorized bank protection by 80,000 linear feet. Phase III is future work that will be formulated in a general reevaluation of SRFCP. As construction of the Phase II supplemental authority is completed, implementation of Phase III will be critical to ensuring the Sacramento River levees that are seriously threatened by erosion will receive corrective measures to prevent levee failure, catastrophic damage, and possible loss of life. Planning for Phase III is expected to conclude in 2013.

Watercourse Description and Ownership

Plate 1-1 shows the location of the SRFCP levees and the locations of the watercourse features in the proposed project area.

After the Feather River flows through the Oroville Dam it enters the town of Oroville and continues south, is joined by the Yuba River at Marysville and Yuba City, and eventually joins the Sacramento River. Its confluence with the Sutter Bypass is located about 3 miles downriver from the rural community of Nicolaus, at (Feather River) RM 7. The Feather River levees in the project area are operated and maintained by DWR (MAs 3, 7, and 16) and Sutter/Butte County Levee Districts 1 and 9.

Flooding

The planning area is within the Sutter-Butte basin. The basin is generally bounded by the Sutter Bypass to the west and south, the Feather River to the east and south, and the Thermalito Afterbay to the north. Additional background on the flood basins in the Sacramento Valley can be found in Appendix C.

Past and Present Flood Concerns

Flooding was historically and still is a concern in planning area. Historical floods occurred on the Feather and Yuba Rivers in the early 1800s, 1825–26, 1849–50, 1852–53, 1861–62, 1867, 1875, 1881, 1890, and 1907. Floods later were recorded in 1909, 1914, 1937, 1940, 1955, 1964, and 1970.

Floods of record occurred in December 1937, December 1955, December 1964, February 1986, January 1995, and January 1997, ranging from 20-year to more than 100-year storms, and caused hundreds of thousands of dollars of damage (Butte County 2007:81).

However, major flood improvements have been made since flooding in these areas has been documented. Therefore, flood events since the construction of Oroville Dam (1968) and New Bullards Bar Dam (1971) are of most relevance to describing the current flood risk in the planning area.

The planning area is susceptible to four types of floods: levee failure/overtopping, localized flooding, riverine (slow rise) flooding, and dam failure inundation. These types of floods are described below.

Levees and Flood Protection

Major storm events can produce high flows throughout the Feather River system. The primary method of flood protection in the planning area is by a system of levees or earthen embankments along the Feather River, combined with flood storage at the Oroville Dam and the New Bullards Bar Dam, that contain high river flows within these constructed channels[3]. There are approximately 41 miles of levees protecting the planning area lands from flooding. These levees provide the planning area with protection against flooding from the Feather, Yuba, and Bear Rivers[4]. All levees on the Feather River within the proposed project area are part of the SRFCP that was constructed by the USACE and some are now owned and maintained by the State of California, specifically DWR, while others are maintained by local levee districts.

Recent and ongoing studies have found that some levees in the proposed project area do not meet, or have not been certified as meeting, the current levee design criteria (especially for the 200-year storm events). As a result, much of the planning area is considered vulnerable to flooding from levee failure. Plate 3.1-1 shows the maximum amount of inundation that could occur if a proposed project area levee were to fail or overtop in the proposed project area. As shown on Plate 3.1-1 inundation amounts in the proposed planning area are unknown north of the Sutter Buttes and are greater than 3 feet (ranging up to a maximum of 25 feet) below the Sutter Buttes.

As described in Section 5.5, *Flood Hazards*, of the 2008 Sutter County General Plan Update Technical Background Report (TBR) (Sutter County 2008:5.5-2 through 5.5-3), a number of studies have been completed or are in progress whose recommendations may possibly affect flood protection and FEMA flood mapping within the county. These include the Lower Feather River Floodplain Mapping Study, Upper Feather River Floodplain Mapping Study, Natomas Basin Project, Sutter County Feasibility Study, and the DWR Levee Evaluation Program.

The current delineated FEMA flood zones are shown in Plate 2-20 and are described below.

Localized Flooding

Localized flooding problems often are caused by storm drain system overload, severe weather, or an unusually heavy amount of rainfall. Flooding from these intense weather events usually occurs in

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[3] The planning area also has a few drainage facilities with pump stations that keep the interior from flooding in certain locations.

[4] The Yuba and Bear Rivers' levees are not within the proposed project area; however, the contribution of flows from these rivers directly affects the channel capacity of the Feather River and thus the integrity and stability of the Feather River West Levee in the proposed project area.

areas experiencing an increase in runoff from impervious surfaces associated with urbanization and development as well as inadequate storm drainage systems. The term *flash flood* describes localized floods of great magnitude and short duration. In contrast to riverine flooding, this type of flooding usually results from a heavy rainfall on a relatively small drainage area. Precipitation of this sort typically occurs in the winter and spring. However, much of the land in the planning area is agricultural in nature; as such, localized flooding does not present as significant a hazard as riverine flooding and is not a significant concern (AMEC 2007:44–45).

Riverine Flooding

Riverine flooding, defined as when a watercourse exceeds its bankfull capacity (i.e., overbank flow), generally occurs as a result of prolonged rainfall, or rainfall that is combined with already saturated soils from previous rain events. This type of flooding occurs in river systems whose tributaries may drain large geographic areas and include one or more independent river basins. The onset and duration of riverine floods may vary from a few hours to many days. Factors that directly affect the amount of flood runoff include precipitation amount, intensity and distribution, the amount of soil moisture, seasonal variation in vegetation, snow depth, and water-resistance of the surface as a result of urbanization (AMEC 2007:45).

In the planning area, slow-rise riverine flooding occurs predominantly from heavy and continued rains, sometimes combined with snowmelt, increased outflows from upstream dams, and heavy streamflow from tributary streams. These intense storm events can overwhelm the local waterways in the planning area as well as the integrity of the levee system. Slow-rise flooding is a well-established and potentially large-scale threat to the planning area (AMEC 2007:45).

Dam Failure Inundation

In addition to levee failure or overtopping of the levees, there is a potential for flooding as a result of a dam failure. There are 10 large dams listed in the 2008 Sutter County General Plan Update TBR (Sutter County 2008:5.5-4), all under the jurisdiction of DWR's Division of Safety of Dams (DSOD), that have the potential to cause significant flooding in the planning area if any were to fail. These dams are operated by various entities for several purposes, including flood control, water supply, fisheries, and other beneficial uses.

There have been no dam failures within or affecting the planning area to date. With regard to the likelihood of future occurrences, all area dams have performed well during past floods, but the planning area remains at risk of dam failures from numerous dams under a variety of ownership and control and of varying ages and condition. As a result, the potential exists for future dam failures to occur that could adversely affect public safety and property in the planning area (AMEC 2007:44–45). Plate 3.1-2 shows the general inundation areas for specific dams in Butte and Sutter Counties. In Butte County (on the left side of the figure), the failures of either the Lake Almanor Dam (located on the North Fork of the Feather River in the Almanor Basin) or the Lake Oroville Dam would lead to catastrophic flooding in the planning area. In Sutter County (on the right side of the figure), failure of these same dams, as well as failure of the Thermalito Afterbay Dam, would affect the planning area. Note that Plate 3.1-2 has two separate legends side by side.

Federal Emergency Management Agency Mapping Efforts

Based on the FEMA FIRMs, the locations of the designated floodplains in the planning area are shown on Plate 2-20[5], and are summarized below.

- Most of the northern portion of the planning area, especially the interior section, is designated as (Unshaded) Zone X (outside the 0.2% annual chance floodplain) and (Shaded) Zone X (areas of 0.2% annual chance of flood; areas of 1% annual chance of flood with average depths of less than one foot or within drainage areas less than one square mile; and areas protected by levees from 1% annual chance flood).
- The remainder of the planning area (the northern fringes associated with the Cherokee Canal and the Feather River) is designated as either Zone A (inundated by 100-year flooding; base flood elevations [BFEs] have not been determined), or is currently being revised with up-to-date FIRM mapping (i.e., the central portion of the planning area).

Plate 2-20 implies that large portions of the planning area are not susceptible to 100-year flooding; nonetheless, as described below, many of these levee segments are vulnerable to a range of conditions that currently make them susceptible to weakness and/or failure.

It should be noted that FEMA is updating and modernizing existing FIRMs for most of the United States, including California. Accordingly, and given known levee deficiencies, FIRM data for Colusa, Glenn, Yolo, and Yuba Counties (last revised in 1996) may not be entirely indicative of the present status of designated floodplains in the planning area. Butte County's FIRM data is from 2011 and is considered up-to-date.

Channel Capacity, Levee Dimensions, and Site-Specific Flood and Discharge Information

Common Flood Frequency Terminology

Synthetic flood events typically are developed with a 50%, 10%, 4%, 2%, 1%, 0.5%, and 0.2% chance of occurring in any given year. Because there are numerous ways to describe the statistical frequency of a flood event, Table 3.1-1 provides a reference of equivalent terminology. For a typical 30-year mortgage, with a 1 in 30 chance that a specific flood event will occur in any given year, the probability that a flood of this magnitude will occur (or be exceeded) in any given year would be 3% and the period of time between flood events of this magnitude would be 30 years.

[5] Plate 2-20 is derived from a compilation of parcels that encompass the proposed project area.

Table 3.1-1. Common Flood Frequency Terminology

Chance of Occurring in Any Given Year—The chance that a specific flood event will occur in any given year	**Probability of Exceedance**—The probability that a flood of this magnitude will occur (or be exceeded) in any given year, commonly expressed as a percentage	**Average Return Frequency, Years**—The period of time between flood events of this magnitude, averaged over many thousands of years, expressed in years
1 in 2	50%	2
1 in 10	10%	10
1 in 25	4%	25
1 in 50	2%	50
1 in 100	1%	100
1 in 200	0.5%	200
1 in 500	0.2%	500

Feather River

Flooding in the Feather River has been attributed to several sources: the upstream forks of the Feather River, Dry Creek and its tributaries, stormwater drainage in the local cities, Wyman Ravine, and other tributaries. Additionally, as in any watershed, increased encroachment on floodplains, as well as increased impervious surfaces and localized drainage problems, could have a cumulative effect that would exacerbate the potential for flooding and overwhelm the existing flood control regime of the river (Wood Rodgers 2006).

DWR has estimated the channel capacity of the Feather River from Oroville to its confluence with the Yuba River to be 210,000 cfs; 300,000 cfs from the confluence with the Yuba River to the Bear River; and 320,000 cfs from the confluence with the Bear River to the Yolo Bypass (California Department of Water Resources 2010: 3–6; U.S. Army Corps of Engineers 2002b:20).

Because of channel limitations of the Feather River near the Yuba River and below the Bear River, the maximum allowed release criterion for Oroville Dam is 160,000 cfs. Oroville Dam flood operations are defined by the release schedule provided in the operations manual (U.S. Army Corps of Engineers 1970). Operations are not to exceed the forecast flow upstream and downstream of the Yuba River. Structurally, the release gates can allow controlled releases of up to 250,000 cfs. Emergency spillway design capacity of Oroville Dam would allow up to an additional 629,000 cfs of uncontrolled release (City of Biggs 1998:6-5 through 6-6).

DWR has estimated that a 200-year storm event would require releases of 170,000 cfs from Oroville Dam and that a 500-year storm event would require releases of 250,000 cfs. In the event that conditions require unusually high release rates (in excess of 150,000 cfs) DWR would notify local jurisdictions and emergency response agencies. Additionally, flows would be increased incrementally to allow evacuation if determined necessary (City of Biggs 1998:6-5 through 6-6).

The Feather River can generate more than 300,000 cfs during large flood events. Unlike much of the Sacramento River, the levees along the Feather River are set back from the channel, forming wide floodways. Several rural residential communities are located in low-lying basins (on the landside of the levees) that can experience flood depths up to 20 feet in the event of a levee failure. Prior to construction of the flood management system, the Feather River historically overflowed toward the west during major flood events, mingling with floodflows in the Butte and Sutter basins (U.S. Army Corps of Engineers 2002a:95–96).

Water Surface Elevations

The Hydraulic Engineering Center River Analysis System (HEC-RAS) model developed by the USACE for the Feather River and its tributaries as part of the USACE Common Features (USACE Model) was used as the base model for the hydraulic analysis conducted by Peterson Brustad Inc. (PBI [PBI Model]) for the Feasibility Study and SBFCA special benefit assessment district. Since its development in 2005, the model has been updated independently by the USACE and MBK Engineers (MBK Model). The MBK Model was developed to support the levee improvement projects that were constructed as part of the TRLIA. In support of the Feasibility Study, SBFCA retained PBI to develop an updated model for the Feather River and the Sutter Bypass using the USACE model as the base and incorporating certain features from the MBK Engineers model (Peterson Brustad 2010:7).

The PBI Model water surface elevation (WSE) profiles were developed to compare the 100-year and 200-year WSE profiles to the "1957 USACE design" profile and top of levee profile. As Plates 3.1-3 and 3.1-4 show, the existing Feather River West Levee has sufficient freeboard for 100-year and 200-year events, which for the most part are lower than the 1957 USACE design profile.

Flow Frequency

Mean annual flow calculations for locations along the Feather River are presented in Table 3.1-2. As shown in this table, the mean annual flow in the vicinity of the Feather River's confluence with the Bear River is 15,202 cfs.

Table 3.1-2. Mean Annual Flow Calculations for the Feather River, Oroville to Confluence with Sutter Bypass and Sacramento River

USGS Station #	USGS Station Name	Drainage Area	Mean Annual Flow (cfs)	Basis (WY–WY)
11407000	Feather River at Oroville	3,624	1,090	1969–2004
11406920	Thermalito Afterbay release to Feather River	–	3,769	1968–2004
	Feather River above Yuba City sub-total		4,859	
11407150	Feather River at Gridley	3,676	12,418	1964–1998
11421000	Yuba River near Marysville	1,339	2,376	1970–2004
	Feather River below Yuba City sub-total		14,794	
11424000	Bear River near Wheatland	292	408	1966–2004
	Feather River below Bear River sub-total		15,202	

Source: U.S. Geological Survey 2005.
USGS = U.S. Geological Survey.
cfs = cubic feet per second.
WY = water year.

Levee Materials and Dimensions (West Bank Only)

The levees on the lower Feather River area were constructed from a wide variety of soil types, including sand, silty sand, sandy silt, silt, and clay. Most of the levees have at least some sand or silty sand in the embankment. The levees on the upper Feather River area were constructed on mining debris or dredge tailings of varying thickness, deposited over semi-consolidated Modesto or Riverbank formation sediments. Multiple hardpans appear to be present beneath the levees, associated with periods of non-deposition. Hardpans have been incised or removed during flood events and alluvial processes at some locations. See Section 3.3, *Geology, Soils, Seismicity, and Mineral Resources*, for additional information on levee materials and subsurface conditions.

The average levee crest width on the west bank levees is approximately 24 feet, with a minimum of 12 feet and a maximum of 40 feet. The landside slope ratio ranges from 2:1 to 4:1, with most landside ratio slopes being 3:1. The waterside slope ratio ranges from 3:1 to 4:1, with most waterside ratio slopes being 4:1.

Levee heights on the lowest 5 miles of the Feather River West Levee vary from 15 to 20 feet above ground. Upstream of this to just north of Yuba City, levee heights vary from 18 to 27 feet with a typical height of 20 feet above ground. Above this point on the upper Feather River, levee heights above ground are variable.

Other Available Information

For additional information about the Feather River and its floodplain, refer to the Upper Feather River Floodplain Mapping Study (U.S. Army Corps of Engineers 2008) and the Lower Feather River Floodplain Mapping Study (U.S. Army Corps of Engineers 2005b). DWR commissioned USACE to prepare a floodplain mapping study along the upper and lower sections of the Feather River. The upper study extends from the mouth of the Yuba River upstream to Oroville Dam, approximately 44 miles in length. The study delineates the 100-, 200-, and 500-year floodplains along the Feather River between the Yuba River and Oroville Dam. The lower study addresses flooding from the Feather River downstream from the Yuba River confluence to the mouth of the Feather River at the Sacramento River. It also addresses flooding from the Bear River downstream of SR 65 and several tributaries to the Bear River.

Levee Deficiency Evaluation

In 2009, SBFCA retained Kleinfelder, Inc. to prepare a problem identification analysis for the 24 miles of the Feather River West Levee from the Thermalito Afterbay to north Yuba City. Using geotechnical data collected and developed under the auspices of DWR's Urban Levee Evaluation program, Kleinfelder analyzed the existing levee at select locations (Kleinfelder 2009). The primary focus of Kleinfelder's effort was to identify locations where the levee did not meet current DWR standards for through-seepage, under-seepage, and levee slope stability (Peterson Brustad 2010:12). For a discussion of levee deficiencies outside of the Kleinfelder 2009 assessment area, refer to the *Potential Levee Failure Mechanisms* section below.

Through-Seepage

The likelihood of through-seepage exiting the landside slope of the levee is dependent on such factors as levee embankment composition, geometry (levee width and landside slope angle), and duration of flood stage. Through-seepage is a concern for two reasons. First, through-seepage affects slope stability because the higher water level on the levee embankment reduces effective stress and therefore reduces the shear strength of levee and foundation materials. The reduction in strength attributable to higher water level occurs in all types of soil. Secondly, through-seepage can cause erosion (specifically what is referred to as *piping*) of the levee embankment (Peterson Brustad 2010:12).

The risk of internal erosion or piping is greatest for non-plastic soils such as silt and sand. Clayey soils tend to be comparatively resistant to internal erosion and piping. Through-seepage in clayey levee embankments may contribute to shallow slope instability. These shallow slopes are typically not a threat to levee integrity and are most often attributed to desiccation and cracking of the levee shell and subsequent saturation by rainfall (Peterson Brustad 2010:12).

Kleinfelder found that levee through-seepage is possible along the Feather River West Levee during periods of high river stage. They also found that the Feather River West Levee was constructed from a wide variety of materials and most of the levee embankment includes at least some non-plastic soil that is susceptible to internal erosion and piping. Mitigation measure alternatives identified by Kleinfelder for addressing through-seepage included seepage slurry cutoff walls, drained stability berms, and flattening the landside levee slope (Peterson Brustad 2010:12).

Under-Seepage

Kleinfelder also analyzed the levees for the potential of under-seepage. Levee under-seepage is a concern because it creates the potential for two modes of levee failure: (1) blowout/erosion at the landside toe because of excess seepage pressure (exit gradient), and (2) increased seepage pressures decreasing the landside slope stability. In their analysis, Kleinfelder used an exit gradient of less than 0.5 at the landside levee toe for the 1957 USACE design WSE, 100-year WSE, and 200-year WSE as the exit gradient acceptance criterion. For the 200-year plus 3 feet WSE, an exit gradient less than 0.6 at the landside levee toe was the exit gradient acceptance criterion used (Peterson Brustad 2010:12–13).

The under-seepage analyses performed by Kleinfelder at selected locations along the levee generally resulted in exit gradients exceeding the design criteria for the 100-year, 200-year, and 1957 WSE at the landside toe. Mitigation measure alternatives identified by Kleinfelder for addressing under-seepage included seepage slurry cutoff walls, seepage berms, and seepage relief trenches (Peterson Brustad 2010:12–13).

Slope Stability

Kleinfelder also found that the Feather River West Levee could potentially be subject to several types of slope failure.

- Shallow sloughing of the landside slope surface that does not extend to the levee crown.
- Wedge-type slip surfaces that intersect the levee crown.
- Circular-type slip surfaces that intersect the levee crown.

Shallow sloughing that does not extend to the levee crown is generally considered a maintenance issue and not a risk to levee integrity; therefore Kleinfelder did not evaluate these types of slope failures. Wedge-type failures can occur along planes of weakness within the levee and/or the underlying foundation soils. Kleinfelder did not perform any wedge-type slope stability analyses. Kleinfelder recommended that as additional geotechnical information becomes available during any future project design phases, it should be evaluated for conditions that may warrant wedge-type slope stability analyses (Peterson Brustad 2010:13).

Kleinfelder analyzed circular-type failures that intersect the levee crown. Kleinfelder used a slope stability factor of safety of greater than 1.4 for the 1957 USACE design WSE, 100-year WSE, and 200-year WSE as the slope stability acceptance criterion. For the 200-year plus 3 feet WSE, a slope stability factor of safety of greater than 1.3 was the acceptance criterion used. In locations where slope stability factors of safety were not met, Kleinfelder identified landside stability berms and flattening the landside levee slope as potential mitigation measures (Peterson Brustad 2010:13).

Summary

Kleinfelder's problem identification analysis determined that almost the entire Feather River West Levee from Thermalito to north Yuba City requires some level of levee rehabilitation. In addition, Levee District 1 has determined that the levee from north Yuba City to Star Bend requires similar levee rehabilitation (Peterson Brustad 2010:13).

Emergency Levee Repair Program Sites

According to DWR's database of Emergency Levee Repair Program Sites (California Department of Water Resources 2007), approximately three emergency levee repairs occurred in 2005 and 2006 on the Feather River; however, these occurred outside of the proposed project area on the east bank of the river and are not discussed herein. Approximately two emergency levee repairs occurred in 2005 and 2006 on the Sutter Bypass. Site identification number 20051230-008-001 occurred on the west bank of levee mile (LM) 18.5 of the Sutter Bypass to address bank erosion concerns; its total length of repair was approximately 400 feet, the repairs consisted of relief wells and lining the canal. RD 1500 was the lead agency. Site identification number 20051230-019-001 occurred on the west bank of LM 0.55 of the Sutter Bypass to address bank erosion concerns; its total length of repair was approximately 150 feet, the repairs consisted of rock slope protection RD 70 was the lead agency.

Refer to <http://www.water.ca.gov/levees/projects/> for additional information.

Sacramento River Bank Protection Project Annual Erosion Sites Survey

Under the SRBPP, the USACE conducts annual surveys to identify erosion sites. Each year, personnel from the USACE, Sacramento District, and their local sponsor, DWR, conduct a field reconnaissance review of the Sacramento River flood control system. The primary purposes of the review are to: (a) monitor and document the condition of previously identified erosion sites, (b) inventory any new erosion sites, and (c) identify critical erosion sites that appear to be an imminent threat to the structural integrity of the flood control system.

Specific criteria are used to identify erosion sites within the system. In most cases the criteria are consistent from year to year and are based on bank and levee conditions that are threatening the function of the flood control system. An erosion site is defined as follows.

> A site that is at risk of an erosional failure during floods and/or normal flow conditions; the term "critical" is used to indicate erosion sites that are an imminent threat to the integrity of the flood control system and of the highest priority for repair.

The project team field identifies erosion sites as being critical based on familiarity with the system and experience with levee failures by the erosion process.

As of 2009, there are nine identified erosion sites on the Feather River (Plate 3.1-5). None of the identified erosion sites were identified as critical[6] (Ayres Associates 2010:9-10).

Potential Levee Failure Mechanisms

Reconstructed levee performance issues and corrective actions are described in detail on pages 2-24 through 2-26 and pages 2-41 through 2-42 of the November URS (2008a) report. In brief, under-seepage, through-seepage, and erosion issues all have been documented at various locations on the Feather River.

For additional information about present and historical levee performance, refer to the URS (2008a) and pages 2-6 through 2-12 of the March URS (2008b) report.

More recent synthesis of the surficial mapping and geotechnical data indicates that subsurface stratigraphy in the Sutter Bypass area locally may be conducive to levee under-seepage. In the lower Feather River, lateral and vertical variability in the shallow subsurface deposits has resulted from past geomorphic processes. The conceptual subsurface stratigraphic framework suggests that stratigraphic relationships may promote localized levee under-seepage, given certain hydraulic conditions, particularly along the lowest reaches (Appendix O of Volume 4 of URS 2010:9; Appendix O of Volume 5 of URS 2010:9 [included in this report as Appendix C]).

In brief, significant portions of the levees on the Feather River do not meet project criteria for steady state stability at the 200-year WSE because of under-seepage, through-seepage, the presence of a soft layer above the hardpan, or a combination thereof (URS 2008b:ES-2 through ES-3).

Geomorphic Conditions

General Geomorphic Setting

The Sacramento Valley is the northern portion of the Great Central Valley of California. The river basin is an elongated synclinal trough, bounded by the Sierra Nevada plutonic complex to the east and the Coast Ranges to the west. The Sacramento Valley is underlain by marine sedimentary rocks overlain by recent alluvial deposits and, to a lesser extent, some volcanic rocks. The levees and river sediments associated with the planning area are composed of Quaternary alluvium deposits that consist of loose to medium-dense, unweathered gravel, sand, silt, and clay. These sediments are estimated to have been deposited 200 to 10,000 years before present in naturally formed riverbanks and floodplains along the Feather River (Helley and Harwood 1985).

In geologic history, the Sacramento and Feather Rivers migrated frequently and freely within their meander belts, which typically exceeded several thousand feet in width (Buer 1984 as cited in North State Resources and Stillwater Sciences 2009:3-134). Prior to Euroamerican settlement, the mainstem Sacramento and Feather Rivers and tributaries along the valley floor would naturally overtop their banks at regular cycles and flood the adjacent lands, replenishing and depositing sediments. Despite overbank sediment deposition, these flood basins have maintained a low topographic profile, which, as mentioned previously, suggests that the flood basins are subsiding at a rate equal to or greater than overbank deposition (Gilbert 1917; Water Engineering & Technology 1990a:34; Water Engineering & Technology 1989 as cited in Water Engineering & Technology 1990a:34; Harvey 1988 as cited in Water Engineering & Technology 1990a:34). These floodplains

[6] Although a site may not be listed in the survey, it does not mean that there are no concerns with that site's levee stability.

historically have provided crucial fluvial geomorphic roles for the Sacramento and Feather Rivers, as the flow loss to the flood basins causes the Sacramento and Feather Rivers to downsize in the downstream direction in the lower reaches (Water Engineering & Technology 1990a:35).

Beginning in the late 1800s, the Sacramento and Feather Rivers' channel morphology and sediment transport regime have been progressively altered by human activities, including upstream hydraulic mining and the clearing of riparian vegetation and the construction of levees and upstream dams for flood control and water supply. Bank armoring of the levees has resulted in lower sinuosity, fewer overbank flows, and an altered pattern of channel migration and meander cutoff (Brice 1977 as cited in North State Resources and Stillwater Sciences 2009:3-134; Larsen et al. 1997, 2004 as cited in North State Resources and Stillwater Sciences 2009:3-134; Larsen and Greco 2002 as cited in North State Resources and Stillwater Sciences 2009:3-134).

The geomorphic history of the Feather River has been substantially affected by hydraulic mining over the last century[7]. Prior to the onset of mining, the river was similar to the Sacramento River upstream of Colusa. The rapid introduction of mining debris resulted in extensive shoaling of bendways and a reduction in channel sinuosity. The initial pulse or surge of mining sediment was very fine-grained, silt-dominated material (referred to as *slickens*), which was followed by quartz-dominated sands and gravels. Channel infilling from mining debris resulted in a dramatic decrease in channel capacity on the Feather River. Extensive flooding and overbank deposition onto urban areas and agricultural lands in the planning area resulted. The Feather River subsequently has degraded into these sediments so that hydraulic mining debris presently constitutes the channel banks. The fine-grained slickens form a continuous, cohesive bank toe along the entire proposed project area up to RM 28. This erosion-resistant toe generally has resulted in a stable river planform.

If degradation continues, however, coarse-grained, non-cohesive pre-mining sediments will be exposed. As a result, channel stability may decrease. Upstream of Marysville, the Feather River is significantly different from the lower Feather River in that it did not receive the tremendous sediment influx introduced by hydraulic and dredge mining. Although hydraulic mining did occur on the upper Feather River, the amount of material introduced was significantly less than that on the Yuba River (Water Engineering & Technology 1990a: xix, 1991:137–139).

See Section 3.3, *Geology, Soils, Seismicity, and Mineral Resources*, for a description of sedimentology in the proposed project area. Additional background on channel network classification, reach specific geomorphic conditions, surficial geology, channel incision, and sinuosity, channel migration, bank failures can be found in Appendix C.

3.1.3 Environmental Consequences

This section describes the environmental consequences relating to flood control and geomorphic conditions for the proposed project. It describes the methods used to determine the effects of the project and lists the thresholds used to conclude whether an effect would be significant. The effects

[7] It is estimated that between 1848 and 1909, nearly 44% of the total of some 1,555,000,000 cubic yards of gold-bearing material mined by the hydraulic method was washed into the Yuba River (Hagwood 1981 as cited in Water Engineering & Technology 1990a:22). In addition to this 685 million cubic yards of material that entered the Yuba River, 100 million cubic yards of sediment were washed into the upper Feather River and 255 million cubic yards entered the Bear River. Consequently, the Feather River in the proposed project area has been affected by mining debris from all three sources, with the greatest effects from the influx of sediment from the Yuba River (Water Engineering & Technology 1990a:22).

that would result from implementation of the project, findings with or without mitigation, and applicable mitigation measures are presented in a table under each alternative.

3.1.3.1 Assessment Methods

This evaluation of flood control and geomorphic conditions is based on professional standards and information cited throughout the section. The key effects were identified and evaluated based on the environmental characteristics of the proposed project area and the magnitude, intensity, and duration of activities related to the construction and operation of this project.

Assessment of environmental consequences associated with flood control and geomorphology has also been accomplished through the following means.

- An evaluation of existing conditions of proposed project area levees and projected bank erosion rate estimates.
- Qualitative assessments of sedimentation/scour potential based on existing Federal and state channel hydraulic design standards and guidelines.

3.1.3.2 Determination of Effects

For this analysis, an effect pertaining to flood control and geomorphic conditions was analyzed under NEPA and CEQA if it would result in any of the following environmental effects, which are based on NEPA standards, State CEQA Guidelines Appendix G (14 California Code of Regulations [CCR] 15000 et seq.), and standards of professional practice.

Effects on hydrologic or geomorphic conditions may be considered significant if implementation of an alternative would result in any of the following conditions.

- 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.
- Substantially alter the existing drainage pattern of the site or area, including the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on or off site.
- Place within a 100-year flood hazard area structures that would impede or redirect floodflows.
- Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam.

Effects on flood control may be considered significant if implementation of an alternative would result in the following conditions.

- Significantly raise flood stage elevations.
- Increase the frequency and duration of inundation of lands.
- Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee.

An effect on the levee system is considered significant if an alternative would substantially increase any of the following.

- Seepage.
- Levee settlement.
- Wind erosion.
- Bank erosion or bed scour.
- Sediment deposition.
- Subsidence of land adjacent to levees.

In addition, an effect on the levee system is considered significant if an alternative would substantially decrease any of the following.

- Levee stability.
- Inspection, maintenance, or repair capabilities.
- Current level of levee slope protection.
- Emergency response capabilities.
- Channel conveyance capacity.
- The ability of the levees to withstand seismic forces.

3.1.4 Effects and Mitigation Measures

Effects and mitigation measure requirements concerning flood control and geomorphic conditions are summarized in Table 3.1-3.

Table 3.1-3. Summary of Effects for Flood Control and Geomorphic Conditions

Effect	Finding	Mitigation Measure	With Mitigation
Alternative 1			
Effect FC-1: Change in Water Surface Elevations and Flood Safety Attributable to Project Design	No effect	None required	No effect
Effect FC-2: Increase in Channel Bed Incision and Bank Erosion Attributable to Project Design	No effect	None required	No effect
Effect FC-3: Decrease in Through- and Under-Seepage	Beneficial	None required	Beneficial
Effect FC-4: Decrease in Risk of Levee Failure as a Result of Erosion or Seepage	Beneficial	None required	Beneficial
Effect FC-5: Change in Stream Energy and Modification of Floodplain Scour/Deposition	No effect	None required	No effect
Effect FC-6: Alteration of the Existing Drainage Pattern of the Site or Area	Significant	FC-MM-1: Coordinate with Owners and Operators, Prepare Drainage Studies as Needed, and Remediate Effects through Project Design	No effect

Effect	Finding	Mitigation Measure	With Mitigation
Effect FC-7: Increase in Levee Slope Stability	No effect	None required	No effect
Alternatives 2 and 3			
Effect FC-1: Change in Water Surface Elevations and Flood Safety Attributable to Project Design	No effect	None required	No effect
Effect FC-2: Increase in Channel Bed Incision and Bank Erosion Attributable to Project Design	No effect	None required	No effect
Effect FC-3: Decrease in Through- and Under-Seepage	Beneficial	None required	Beneficial
Effect FC-4: Decrease in Risk of Levee Failure as a Result of Erosion or Seepage	Beneficial	None required	Beneficial
Effect FC-5: Change in Stream Energy and Modification of Floodplain Scour/Deposition	No effect	None required	No effect
Effect FC-6: Alteration of the Existing Drainage Pattern of the Site or Area	Significant	FC-MM-1: Coordinate with Owners and Operators, Prepare Drainage Studies as Needed, and Remediate Effects through Project Design	No effect
Effect FC-7: Increase in Levee Slope Stability	Beneficial	None required	Beneficial

3.1.4.1 No Action Alternative

The No Action Alternative represents the continuation of the existing deficiencies along the portion of the Feather River in the FRWLP area. Current levee operations and maintenance activities would continue, but there would be no change in the geomorphic and flood control regimes relative to existing conditions.

However, without levee improvements, there is the continued risk of levee failure. Under-seepage and loss of levee foundation soils would be expected to continue. A catastrophic levee failure would result in collapse of levee slopes and loss of soil. Furthermore, if a levee breach were to occur, emergency construction and repair activities would be implemented without the use of best management practices and could result in loss of channel capacity (and henceforth a decrease in the existing flood protection conditions) and alteration of present-day geomorphic processes.

Refer to Section 2.6.2.2, *Consequences of Levee Failure*, for additional information.

3.1.4.2 Alternative 1

Implementation of Alternative 1 would potentially result in effects on flood control and geomorphic conditions. These potential effects and related mitigation measure requirements are summarized in Table 3.1-4 and discussed below.

Table 3.1-4. Flood Control and Geomorphic Conditions Effects and Mitigation Measures for Alternative 1

Effect	Finding	Mitigation Measure	With Mitigation
Effect FC-1: Change in Water Surface Elevations and Flood Safety Attributable to Project Design	No effect	None required	No effect
Effect FC-2: Increase in Channel Bed Incision and Bank Erosion Attributable to Project Design	No effect	None required	No effect
Effect FC-3: Decrease in Through- and Under-Seepage	Beneficial	None required	Beneficial
Effect FC-4: Decrease in Risk of Levee Failure as a Result of Erosion or Seepage	Beneficial	None required	Beneficial
Effect FC-5: Change in Stream Energy and Modification of Floodplain Scour/Deposition	No effect	None required	No effect
Effect FC-6: Alteration of the Existing Drainage Pattern of the Site or Area	Significant	FC-MM-1: Coordinate with Owners and Operators, Prepare Drainage Studies as Needed, and Remediate Effects through Project Design	No effect
Effect FC-7: Increase in Levee Slope Stability	Beneficial	None required	Beneficial

Effect FC-1: Change in Water Surface Elevations and Flood Safety Attributable to Project Design

No adverse local, upstream, or downstream flood control–related effects are associated with the various proposed seepage control and erosion treatments, as these treatments would help minimize flooding locally behind the improved levee and enable it to meet associated regulatory criteria.

Local, upstream, or downstream water levels would not be affected by the various proposed seepage control and erosion treatments, as these treatments would not affect the height of the existing levees.

These treatments would not significantly change the geometry of the Feather River and therefore would not cause significant changes to water flow in the river or cause negative hydraulic effects upstream or downstream of the project reach. The various proposed seepage control and erosion treatments would not expose people or structures to a significant risk of flooding. Rather, this risk would be alleviated because these treatments would reduce the risk of levee failure for the 100- and 200-year floods. Because these treatments would upgrade existing levees using up-to-date design and construction standards, their implementation would reduce the risk of flooding for the planning area.

Furthermore, these improvements would be consistent with the principles that have guided the management of the SRFCP over the past century and with the policies adopted by the state legislature calling for an immediate and comprehensive effort to increase the level of flood protection provided to the region in the SRFCP area. Finally, the CVFPB resolution adopting the CVFPP (Resolution No. 2012-25) states that ". . . the Board has consistently found that no adverse hydraulic impacts are associated with levee strengthening projects that do not change the alignment or height of the levee, or the cross section of the channel and overflow area."

Alternative 1 would therefore have no effect related to changes in water surface elevations and flood safety. Mitigation is not required.

Effect FC-2: Increase in Channel Bed Incision and Bank Erosion Attributable to Project Design

Stream energy has the potential to erode the channel bed and banks due to lateral confinement during high flow events. However, the various proposed seepage control and erosion treatments would not increase or intensify these current geomorphic processes. Additionally, none of the project alternatives involve an increase in levee height, which can potentially further increase erosion of the channel bed and banks depending on the longitudinal position of the river reach within the drainage network. Alternative 1 would therefore have no effect on channel bed incision or bank erosion. Mitigation is not required.

Effect FC-3: Decrease in Through- and Under-Seepage

Through- and under-seepage has the potential to weaken levee foundations. Slurry cutoff walls would reduce or eliminate the potential for seepage. Slurry cutoff walls create walls of impermeable material that act as a barrier to water moving laterally through a levee, greatly reducing or eliminating the potential for through-and under-seepage. Similarly, seepage berms result in a wide embankment structure that resists accumulated water pressure and safely releases seeping water. Finally, clay ditch lining and depression/ditch infilling would also help to remediate through- and under-seepage by either creating hydraulic barriers or by infilling depressions and ditches where seepage exits. These project features would result in beneficial effects on flood conditions in the planning area.

Effect FC-4: Decrease in Risk of Levee Failure as a Result of Erosion or Seepage

Slope flattening would help to decrease relative erosion rates by alleviating over-steepened banks. Slope flattening would involve up-to-date design and construction methods to avoid erosion, and it is assumed that bank erosion on the newly reshaped bank on the water side would remain minimal, as features associated with this treatment would be engineered to withstand the forces of erosion by flowing water.

Slope flattening is not anticipated to have a measurable effect on through- and under-seepage potential. In the project area itself, other treatments aim to rectify through- and under-seepage concerns.

Effect FC-5: Change in Stream Energy and Modification of Floodplain Scour/Deposition

Because Alternative 1 would leave the existing levee in place, no geomorphic assessment of scour and/or deposition patterns was completed. Floodplain capacity would remain similar to existing conditions under most flows. However, for flows greater than the 200-year event that overtopped the existing levee, there is potential for both scour of and deposition onto the floodplain. However, overtopping of the levees in the project area is not common and the various proposed seepage control and erosion treatments would not increase or intensify these current geomorphic processes. Encroachment removal would not present an adverse effect as the encroachment removals would be localized in nature. Alternative 1 would therefore have no effect on related to change in stream energy and modification of floodplain scour/deposition. Mitigation is not required.

Effect FC-6: Alteration of the Existing Drainage Pattern of the Site or Area

Implementation of certain elements associated with Alternative 1 (e.g., full levee degradations and reconstructions) would involve disturbance to the entire levee. Drainage infrastructure maintained by local landowners or local agencies could be affected in some locations, and local surface runoff patterns could be altered. Because interference with drainage could cause or exacerbate localized flooding, this effect would be adverse. The implementation of Mitigation Measure FC-MM-1 would reduce this effect to not adverse.

Mitigation Measure FC-MM-1: Coordinate with Owners and Operators, Prepare Drainage Studies as Needed, and Remediate Effects through Project Design

The agencies implementing project components and their primary contractors for engineering design and construction will ensure that the following measures are implemented to avoid adverse effects associated with disruption of local drainage systems.

During final project design, project engineers will coordinate with owners and operators of local drainage systems and landowners served by the systems to evaluate pre- and post-project drainage needs and design features to remediate any project-related substantial drainage disruption or alteration in runoff that would increase the potential for localized flooding. If substantial alteration of runoff patterns or disruption of a local drainage system could result from a project feature, a drainage study will be prepared as part of final project design. The study will consider the design flows of any existing facilities that would be crossed by project features and develop appropriate plans for relocation or other modification of these facilities and construction of new facilities, as needed, to ensure equivalent functioning of the system during and after construction. If no drainage facilities (e.g., ditches, canals) would be affected, but project features would have a substantial adverse effect on runoff amounts and/or patterns, new drainage systems will be included in the design of project alternatives to ensure that the project would not result in new or increased localized flooding. Any necessary features to remediate project-induced drainage problems will be installed before the project is completed or as part of the project, depending on site-specific conditions.

Effect FC-7: Increase in Levee Slope Stability

Alternative 1 involves all cut-off walls that would benefit levee slope stability. Cut-off walls act to limit the through-flow of water the levee foundation. Treatments that increase levee slope stability would have beneficial effects on geomorphic and flood conditions in the planning area. Alternative 1 would therefore have a beneficial effect on levee slope stability.

3.1.4.3 Alternative 2

Implementation of Alternative 2 would potentially result in effects on flood control and geomorphic conditions. These potential effects and related mitigation measure requirements are summarized in Table 3.1-5 and discussed below.

Table 3.1-5. Flood Control and Geomorphic Conditions Effects and Mitigation Measures for Alternative 2

Effect	Finding	Mitigation Measure	With Mitigation
Effect FC-1: Change in Water Surface Elevations and Flood Safety Attributable to Project Design	No effect	None required	No effect
Effect FC-2: Increase in Channel Bed Incision and Bank Erosion Attributable to Project Design	No effect	None required	No effect
Effect FC-3: Decrease in Through- and Under-Seepage	Beneficial	None required	Beneficial
Effect FC-4: Decrease in Risk of Levee Failure as a Result of Erosion or Seepage	Beneficial	None required	Beneficial
Effect FC-5: Change in Stream Energy and Modification of Floodplain Scour/Deposition	No effect	None required	No effect
Effect FC-6: Alteration of the Existing Drainage Pattern of the Site or Area	Significant	FC-MM-1: Coordinate with Owners and Operators, Prepare Drainage Studies as Needed, and Remediate Effects through Project Design	No effect
Effect FC-7: Increase in Levee Slope Stability	Beneficial	None required	Beneficial

Effect FC-1: Change in Water Surface Elevations and Flood Safety Attributable to Project Design

Effects associated with Effect FC-1 under Alternative 2 are identical to those described above for Effect FC-1 under Alternative 1. Alternative 2 would therefore have no effect related to changes in water surface elevations and flood safety. Mitigation is not required.

Effect FC-2: Increase in Channel Bed Incision and Bank Erosion Attributable to Project Design

Effects associated with Effect FC-2 under Alternative 2 are identical to those described above for Effect FC-2 under Alternative 1. Alternative 2 would therefore have no effect on channel bed incision or bank erosion. Mitigation is not required.

Effect FC-3: Decrease in Through- and Under-Seepage

Effects associated with Effect FC-4 under Alternative 2 are similar to those described above for Effect FC-4 under Alternative 1. Alternative 2 would therefore have a beneficial effect related to through- and under-seepage.

Effect FC-4: Decrease in Risk of Levee Failure as a Result of Erosion or Seepage

Effects associated with Effect FC-5 under Alternative 2 are similar to those described above for Effect FC-5 under Alternative 1. Alternative 2 would therefore have a beneficial effect related to risk of levee failure as a result of erosion or seepage.

Effect FC-5: Change in Stream Energy and Modification of Floodplain Scour/Deposition

Effects associated with Effect FC-6 under Alternative 2 are identical to those described above for Effect FC-6 under Alternative 1. Alternative 2 would therefore have no effect related to change in stream energy and modification of floodplain scour/deposition.

Effect FC-6: Alteration of the Existing Drainage Pattern of the Site or Area

Implementation of certain elements associated with Alternative 2 (e.g., stability berms and relief wells) would involve earthwork on the top and/or landward side of the levee. The new material on the land side could cross drainage infrastructure maintained by local landowners or local agencies in some locations or alter surface runoff patterns. Because interference with drainage could cause or exacerbate localized flooding, this effect would be adverse. The presence of a newly modified levee itself (via levee degradation and reconstruction) also could alter the course of local runoff, as described above under Effect FC-6 under Alternative 1. The implementation of Mitigation Measure FC-MM-1 would reduce this effect to not adverse.

Effect FC-7: Increase in Levee Slope Stability

Stability berms can result in increased levee slope stability. A stability berm typically is constructed against the landside slope of the levee and acts as a buttress to stabilize slopes. Treatments that increase levee slope stability would have beneficial effects on geomorphic and flood conditions in the planning area. Alternative 2 would therefore have a beneficial effect on levee slope stability.

3.1.4.4 Alternative 3

Implementation of Alternative 3 would potentially result in effects on flood control and geomorphic conditions. These potential effects and related mitigation measure requirements are summarized in Table 3.1-6 and discussed below.

Table 3.1-6. Flood Control and Geomorphic Conditions Effects and Mitigation Measures for Alternative 3

Effect	Finding	Mitigation Measure	With Mitigation
Effect FC-1: Change in Water Surface Elevations and Flood Safety Attributable to Project Design	No effect	None required	No effect
Effect FC-2: Increase in Channel Bed Incision and Bank Erosion Attributable to Project Design	No effect	None required	No effect
Effect FC-3: Decrease in Through- and Under-Seepage	Beneficial	None required	Beneficial
Effect FC-4: Decrease in Risk of Levee Failure as a Result of Erosion or Seepage	Beneficial	None required	Beneficial
Effect FC-5: Change in Stream Energy and Modification of Floodplain Scour/Deposition	No effect	None required	No effect
Effect FC-6: Alteration of the Existing Drainage Pattern of the Site or Area	Significant	FC-MM-1: Coordinate with Owners and Operators, Prepare Drainage Studies as Needed, and Remediate Effects through Project Design	No effect

Effect	Finding	Mitigation Measure	With Mitigation
Effect FC-7: Increase in Levee Slope Stability	Beneficial	None required	Beneficial

Effect FC-1: Change in Water Surface Elevations and Flood Safety Attributable to Project Design

Effects associated with Effect FC-1 under Alternative 3 are identical to those described above for Effect FC-1 under Alternatives 1 and 2. Alternative 3 would therefore have no effect related to change in water surface elevations and flood safety.

Effect FC-2: Increase in Channel Bed Incision and Bank Erosion Attributable to Project Design

Effects associated with Effect FC-2 under Alternative 3 are identical to those described above for Effect FC-2 under Alternatives 1 and 2. Alternative 3 would therefore have no effect on channel bed incision or bank erosion.

Effect FC-3: Decrease in Through- and Under-Seepage

Effects associated with Effect FC-3 under Alternative 3 are similar to those described above for Effect FC-3 under Alternatives 1 and 2. Alternative 3 would therefore have a beneficial effect on through- and under-seepage.

Effect FC-4: Decrease in Risk of Levee Failure as a Result of Erosion or Seepage

Effects associated with Effect FC-4 under Alternative 3 are similar to those described above for Effect FC-4 under Alternatives 1 and 2. Alternative 3 would therefore have a beneficial effect related to risk of levee failure as a result of erosion or seepage.

Effect FC-5: Change in Stream Energy and Modification of Floodplain Scour/Deposition

Effects associated with Effect FC-5 under Alternative 3 are identical to those described above for Effect FC-5 under Alternatives 1 and 2. Alternative 3 would therefore have no effect related to change in stream energy and modification of floodplain scour/deposition.

Effect FC-6: Alteration of the Existing Drainage Pattern of the Site or Area

Effects associated with Effect FC-6 under Alternative 3 are similar to those described above for Effect FC-6 under Alternatives 1 and 2. However, effects associated with Effect FC-6 under Alternative 3 are less adverse than under Alternatives 1 and 2 because there is less landward disturbance associated with Alternative 3. The implementation of Mitigation Measure FC-MM-1 would reduce this effect to not adverse.

Effect FC-7: Increase in Levee Slope Stability

Effects associated with Effect FC-7 under Alternative 3 are similar to those described above for Effect FC-7 under Alternatives 1 and 2. Alternative 3 would therefore have a beneficial effect on levee slope stability.

3.2 Water Quality and Groundwater Resources

3.2.1 Introduction

This section describes the regulatory and environmental setting for water quality and groundwater resources; effects on water quality and groundwater resources that would result from the No Action Alternative and Alternatives 1, 2, and 3; and mitigation measures that would reduce significant effects.

3.2.2 Affected Environment

This section describes the affected environment for water quality and groundwater resources in the project area. The key sources of data and information used in the preparation of this section are listed below.

- California Water Plan Update 2009, Bulletin 160-09 (California Department of Water Resources 2009).
- Central Valley Regional Water Quality Control Board Water Quality Control Basin Plan, Central Valley Region – The Sacramento River Basin and the San Joaquin River Basin (Central Valley Regional Water Quality Control Board 2009).
- Butte County General Plan 2030 (Butte County 2010).
- Sutter County General Plan, Public Draft (Sutter County 2010).
- City of Yuba City General Plan (City of Yuba City 2004).
- City of Live Oak 2030 General Plan (City of Live Oak 2010).
- City of Biggs General Plan 1997–2015 (City of Biggs 1998).
- City of Gridley 2030 General Plan (City of Gridley 2010).
- The Sacramento Valley Integrated Regional Water Management Plan (California Department of Water Resources 2007).
- West Sacramento Levee Improvements Program, 408 Permission Environmental Impact Statement/Environmental Impact Report (ICF International 2010a).

3.2.2.1 Regulatory Setting

This section summarizes key Federal and state regulatory information that applies to water quality and groundwater resources. Additional regulatory information appears in Appendix A.

Federal

Clean Water Act

The State Water Resources Control Board (State Water Board) is the state agency with primary responsibility for implementing the CWA, which establishes regulations relating to water resources issues. Typically, all regulatory requirements are implemented by the State Water Board through nine Regional Water Quality Control Boards (RWQCBs) established throughout the state. The Central Valley RWQCB is responsible for regulating discharges to the Feather River and its tributaries.

The CWA is the primary Federal law that protects the quality of the nation's surface waters, including lakes, rivers, and coastal wetlands. It operates on the principle that all discharges into the nation's waters are unlawful unless specifically authorized by a permit. Permit review is the CWA's primary regulatory tool under the following sections.

- Section 404, which regulates the discharge of dredged and fill materials into "waters of the United States," which include oceans, bays, rivers, streams, lakes, ponds, and wetlands. Project proponents must obtain a permit from USACE for all discharges of dredged or fill material into waters of the United States before proceeding with a proposed activity. The Feather River and other features in the project area may be jurisdictional waters of the Unites States and subject to Section 404.
- Section 402, regulates discharges to surface waters through the NPDES program, administered by EPA. In California, the State Water Board is authorized by EPA to oversee the NPDES program through the RWQCBs. The NPDES program provides for both general permits (those that cover a number of similar or related activities) and individual permits. A SWPPP and pollution prevention and monitoring program (PPMP) may be required for construction of the FRWLP to comply with the Construction General Permit and General Dewatering Permit, respectively, under Section 402.
- Section 401, under which applicants for a Federal license or permit to conduct activities that may result in the discharge of a pollutant into waters of the United States must obtain certification from the state in which the discharge would originate. In this case, the RWQCB must issue a certification to USACE or their applicant for USACE Section 404 action.
- Section 303, under which California adopts water quality standards to protect beneficial uses of state waters as required by CWA Section 303 and the Porter-Cologne Water Quality Control Act of 1969. Section 303(d) of the CWA requires the identification of water bodies that do not meet, or are not expected to meet, water quality standards (i.e., impaired water bodies). In California, the State Water Board develops the list of water quality-limited segments and the EPA approves the state's list. Section 3.2.2.2.2, *Feather River Water Quality*, discusses impaired water bodies within the planning area.

State

Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act, passed in 1969, complements the CWA. It established the State Water Board and divided the state into nine regions, each overseen by an RWQCB. The State Water Board is the primary state agency responsible for protecting the quality of the state's surface and groundwater supplies, although much of its daily implementation authority is delegated to the RWQCBs, which are responsible for implementing CWA Sections 402 and 303(d). In general, the State Water Board manages both water rights and statewide regulation of water quality, while the RWQCBs focus exclusively on water quality within their regions.

The Porter-Cologne Water Quality Control Act provides for the development and periodic review of water quality control plans (basin plans) for each region. The Central Valley RWQCB is responsible for implementing the Water Quality Control Basin Plan, Central Valley Region – The Sacramento River Basin and the San Joaquin River Basin (Basin Plan) (Central Valley Regional Water Quality Control Board 2009) for the Feather River and its tributaries. The basin plan identifies beneficial uses of the river and its tributaries and water quality objectives to protect those uses. Numerical and narrative criteria are contained in the basin plan for several key water quality constituents, including dissolved oxygen (DO), water temperature, trace metals, turbidity, suspended material, pesticides, salinity, radioactivity, and other related constituents.

Basin plans are implemented primarily by using the NPDES permitting system to regulate waste discharges so that water quality objectives are met (see discussion of the NPDES program under CWA, Section 402, above). Basin plans are supposed to be updated every 3 years and provide the technical basis for determining waste discharge requirements (WDRs) and taking enforcement actions. The Central Valley RWQCB Basin Plan was last revised in 2009. Another method the Central Valley RWQCB uses to implement the Basin Plan criteria is issuing WDRs. WDRs are issued to any entity that discharges to a surface water body and does not meet certain water quality criteria such as those related to sediment. The WDR/NPDES permit also serves as a Federally required NPDES permit (under the CWA) and incorporates the requirements of other applicable regulations.

Beneficial Uses

Beneficial uses represent the services and qualities of a water body (i.e., the reasons the water body is considered valuable). The Basin Plan describes beneficial uses for the waters in the Sacramento River watershed (Central Valley Regional Water Quality Control Board 2009). Table 3.2-1 lists the beneficial uses for water bodies that are within or have influence on the hydrology of the affected area and could be affected by project activities.

Table 3.2-1. Designated Beneficial Uses for Water Bodies within or with Influence on the Hydrology of the Study Area

Beneficial Uses	Sutter Bypass	Feather River (Fish barrier dam to Sacramento River)	Yuba River (Englebright Reservoir to the Feather River)	Bear River
Municipal and Domestic	X	X	X	X
Agriculture—Irrigation		X	X	X
Agriculture—Stock Watering			X	X
Hydropower			X	X
Rec-1—Contact	X	X	X	X
Rec-1—Canoeing and Rafting		X	X	X
Rec-2—Other Noncontact		X	X	X
Freshwater Habitat—Warm	X	X	X	X
Freshwater Habitat—Cold		X	X	X
Migration—Warm		X	X	X
Migration—Cold	X	X	X	X
Spawning—Warm		X	X	X
Spawning—Cold	X	X	X	X
Wildlife Habitat	X	X	X	X
Navigation		X		

Source: Central Valley Regional Water Quality Control Board 2009.
X = present or potential beneficial use.

Water Quality Objectives

Water quality objectives represent the standards necessary to protect and support designated beneficial uses. The RWQCBs have set water quality objectives for all surface waters in their respective regions (including the Feather River) for the following substances and parameters: ammonia, bacteria, biostimulatory substances, chemical constituents, color, DO, floating material, oil and grease, pH, pesticides, radioactivity, salinity, sediment, settleable material, suspended material, tastes and odors, temperature, toxicity, and turbidity.

State Implementation Plan

In 1994, the State Water Board and EPA agreed to a coordinated approach for addressing priority toxic pollutants in inland surface waters, enclosed bays, and estuaries of California. In March 2000, the State Water Board adopted a state implementation plan (SIP) for priority toxic pollutant water quality criteria contained in the California Toxics Rule (CTR). The EPA promulgated the CTR in May 2000. The SIP also implements National Toxics Rule (NTR) criteria and applicable priority pollutant objectives in the basin plans. In combination, the CTR and NTR and applicable basin plan objectives, existing RWQCB beneficial use designations, and SIP compose water quality standards and implementation procedures for priority toxic pollutants in non-ocean surface waters in California, such as the Feather River.

California Department of Fish and Game 1601 Streambed Alteration Agreement

Section 1602 of the California Fish and Game Code requires project proponents to notify DFG before any project that would divert, obstruct, or change the natural flow, bed, channel, or bank of any river, stream, or lake. Preliminary notification and project review generally occur during the environmental process. When water quality or supply may be substantially adversely affected, DFG is required to propose reasonable changes to the project to protect the resource. These modifications are formalized in a Streambed Alteration Agreement that becomes part of the plans, specifications, and bid documents for the project.

Local

As detailed in Appendix A, Sutter County, Butte County, City of Yuba City, City of Live Oak, City of Biggs, and City of Gridley have each adopted general plan goals and policies aimed toward preserving and protecting water supply and quality. In addition, the following stormwater management programs are in place.

Yuba City-Sutter County Storm Water Management Program

Sutter County and the City of Yuba City are co-permittees of the NPDES Phase II General Permit for Municipal Separate Storm Sewer Systems (MS4 General Permit), which requires the development of a Stormwater Management Plan (SWMP). Adopted in 2003, the Yuba City-Sutter County SWMP is a combined effort of the city and county, which addresses stormwater discharges to the Sutter Bypass and the Feather River through pumping stations located along several levees. This SWMP describes the approach to reduce stormwater pollution. It includes the required six minimum control measures required under the NPDES Phase II MS4 program: public education and outreach; public participation/involvement; illicit discharge detection and elimination; construction site runoff control; post-construction runoff control; and pollution prevention/good housekeeping (City of Yuba City and Sutter County 2003).

Butte County Storm Water Management Program

Butte County has been covered under an NPDES Phase II MS4 General Permit since 2004. Currently, Butte County's MS4 General Permit covers the urbanized unincorporated areas within and around the City of Chico. As part of permit compliance, the Butte County Department of Public Works implements a SWMP (Butte County Public Works 2009).

3.2.2.2 Environmental Setting

The following considerations are relevant to water quality and groundwater resources conditions in the proposed project area.

Climate

The climate of the affected area is characterized by hot/dry summers, with highs in the upper 90s (degrees Fahrenheit [°F]) and lows in the low 60s (°F), and cool/wet winters, with highs in the mid-50s (°F) and lows in the upper 20s (°F).

Precipitation in the planning area occurs mostly as rain, and yearly totals average approximately 20 inches (U.S. Army Corps of Engineers 2004). Approximately 95% of the annual rainfall occurs between October and April (U.S. Army Corps of Engineers 2004). Precipitation increases with elevation. The mean annual precipitation is 18.0 inches at Marysville, at an elevation of 57 feet, just east of the project area (David Ford Consulting Engineers, Sutter Basin Design Rainfall Memo, dated June 14, 2011). In the upper Feather River Basin near Lassen Peak, as much as 90 inches of precipitation fall annually (U.S. Army Corps of Engineers 2004).

Feather River Water Quality

The lower Feather River originates at the Oroville Dam and meanders south to its confluence with the Sacramento River near Verona and drains the western slope of the Sierra Nevada Mountains and the Sutter Buttes. The lower Feather River watershed consists of approximately 788 square miles or about 13% of the entire Feather River drainage (Foothill Associates 2010:27). It is entirely contained by a series of levees and native high ground.

Flows from the Feather River are captured, stored, and diverted for hydroelectric power production, irrigation, flood control, domestic water supply, and recreation (Foothill Associates 2010:27). The Feather River watershed is one of the most hydrologically modified river basins in California largely due to releases from the Oroville Dam. Water is released from the Oroville Facilities as part of a coordinated effort to meet water supply, flood protection, water quality improvement, and fish and wildlife enhancement requirements. Lake Oroville is owned and operated by DWR, and is the largest reservoir in the State Water Project (SWP) with a capacity of 3.5 million acre-feet (MAF) (Sutter County 2008). Built in 1968, the Oroville Dam is located on the Feather River, 4 miles northeast of the City of Oroville.

The Oroville Dam is used as a peak operating power facility[1] in conjunction with the Thermalito Facilities; this system of facilities is known as the Oroville-Thermalito Complex. Water released from Lake Oroville is used to produce electricity by the Hyatt Pumping-Generating Plant. Because of power operations, releases are made on a peaking basis of up to 16,950 cfs when power is in high

[1] During normal operation, a 24-hour supply of water flows through both plants during a peak 6–10 hour window of the day when power production is most needed.

demand (on-peak) with little or no release the remainder of the day (off-peak). The water that flows through the Hyatt Pumping-Generating Plant is discharged into the Thermalito Diversion Pool, where the flows are diverted into the Thermalito Forebay, the Feather River Fish Hatchery, or the Low Flow Channel. From the Thermalito Forebay, flows can be diverted into either several canals or released through the Thermalito Pumping–Generating Plant to the Thermalito Afterbay. From the Thermalito Afterbay, flows can be diverted into several canals or released to the Feather River.

Water quality in the Lower Feather River Watershed is primarily influenced by agricultural and urban runoff, as well as municipal water use in surrounding areas. Contaminants from urban runoff can vary depending on rainfall intensity and occurrence, geographic features, land use, vehicle traffic, and percent of impervious surface (Sacramento River Watershed Program 2010). During the dry period in the affected area (May–October), pollutants from various sources—such as vehicles; residential, industrial, and agricultural land uses; and atmospheric fallout—accumulate on the land surrounding water bodies. These contaminants can be mobilized from stormwater runoff during the wet season (November–April). The initial runoff, known as the *first flush*, typically contains peak pollutant levels.

Water quality dynamics also have been influenced by the operation of flow-regulating facilities within and around the affected area. Variations in some water quality parameters may be correlated with fluctuations in flow throughout the year. The storage and diversion of water for hydroelectric and other purposes can have an effect on downstream beneficial uses by affecting water temperature and turbidity. Turbidity and sediment levels spike during heavy storm runoff in the winter and spring. In the spring and early summer, the water quality is primarily affected by agricultural drainage and natural runoff. During periods of low flows, specifically the late summer–early fall, water quality decreases due to high water temperatures and concentrations of pollutants.

Table 3.2-2 summarizes water quality impairments in surface waters in the planning area and the sources of these impairments. The information provided in Table 3.2-2 is based on the 2010 proposed 303(d) list. Updates to the 303(d) list must be finalized by the EPA before becoming effective.

Table 3.2-2. CWA Section 303(d)-Listed Impaired Water Bodies and Associated Potential Sources within the Planning Area Watershed

Water Body	Listed Pollutants	Associated Potential Sources
Feather River, Lower (Lake Oroville Dam to Confluence with Sacramento River)	Chlorpyrifos Group A pesticides Mercury PCBs Unknown toxicity	Agriculture Agriculture Resource extraction Unknown Unknown
Oroville Wildlife Area Fishing Pond (Butte County)	Unknown toxicity	Unknown
Gilsizer Slough (from Yuba City to downstream of Township Road, Sutter County)	Diazinon Oxyfluofen pH	Agriculture Agriculture Unknown
Wadsworth Canal	Chlorpyrifos Diazinon	Agriculture Agriculture
Morrison Slough	Diazinon	Unknown
Sutter Bypass	Mercury	Resources extraction
Live Oak Slough	Diazinon Oxyfluorfen Dissolved oxygen	Agriculture Agriculture Unknown

Source: 2010 Integrated Report (State Water Resources Control Board 2010).
PCBs = polychlorinated biphenyls.
DDT = dichlorodiphenyltrichloroethane.
Note: The proposed project would likely only affect the Feather River.

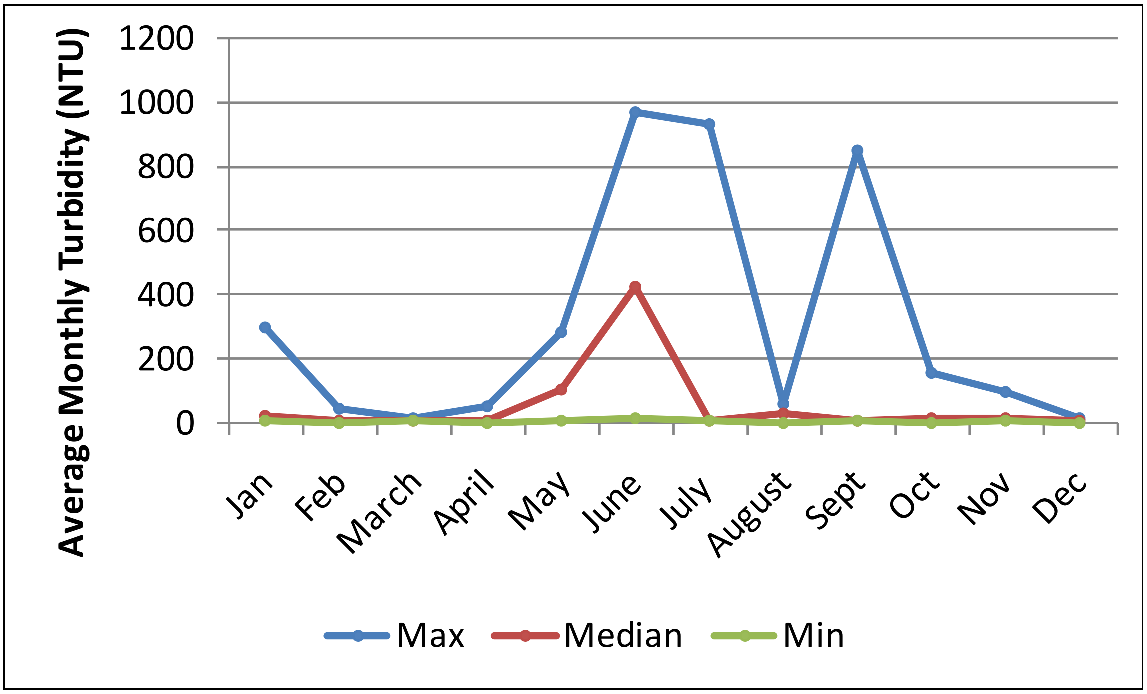
Total Suspended Sediment and Turbidity

Total suspended sediment (TSS) is indicative of upstream scouring, bank erosion, and agricultural return flow transporting and depositing sediment (ICF International 2010a). Turbidity is a convenient field measurement that can be switched to TSS using simple conversions. Excessive soil erosion and sedimentation can affect beneficial uses of water by (1) silting over fish spawning habitats; (2) clogging drinking water intakes; (3) decreasing channel capacity and increasing downstream flooding; (4) creating unstable stream channels; and (5) losing riparian habitat (California Department of Water Resources 2009). In addition, other contaminants may be adsorbed onto sediment.

Although sedimentation is a natural part of the flow regime for rivers, the Central Valley RWQCB also considers it a pollutant. Excessive sedimentation from construction practices such as placement of riprap on levees or constructing slurry cutoff walls can smother filter-feeding stream organisms and cause other serious water quality related issues. The Basin Plan states that where ambient turbidity is between 5 and 50 NTUs, projects shall not increase turbidity on the Feather River by more than 20% above the ambient conditions (Central Valley Regional Water Quality Control Board 2009). Furthermore, if the background diurnal variation in turbidity fluctuates in and out of the 5-and-50 NTU threshold, the Basin Plan states that averaging periods can be applied to data to determine compliance. Where the ambient turbidity is between 50 and 100 NTUs, a project must not cause turbidity to increase by more than10 NTUs above ambient conditions. Construction BMPs would minimize the temporary increases in TSS and turbidity caused by construction activities that disturb the land and allow higher TSS or turbidity during storm event runoff.

Turbidity in the Feather River is variable and depends on water source and flow (velocity). Average monthly turbidity (NTU) from the California Data Exchange Center (CDEC) Station on the Feather River at Gridley (Plate 3.2-1) shows that median turbidity values appear to increase during the time of spring snowmelt.

Plate 3.2-1. Average Monthly Turbidity (NTU) on the Feather River at Gridley (2003–2006)



Dissolved Oxygen, Temperature, Electrical Conductivity, and pH

DO is a critical component for all forms of aquatic life. It also can naturally be variable and subject to fluctuations in short time periods. High DO concentrations (within 1 or 2 milligrams per liter [mg/L] of saturated DO) are usually maintained by surface re-aeration, unless there is a high biochemical oxygen demand (BOD) from a discharge or from algae. Some water bodies can thermally stratify, causing deeper zones to have low DO concentrations. Algae blooms can cause large swings in DO levels, producing oxygen while growing but consuming oxygen while decaying.

When DO concentrations fall below certain limits, the resulting low-DO zones can act as a barrier to fish migration and potentially adversely affect spawning success. In extreme cases, persistent low concentrations of DO can result in mortality of benthic organisms and other aquatic species. The Basin Plan objective for DO in the Feather River (from Fish Barrier Dam at Oroville to Honcut Creek) is 8.0 mg/L between September 1 and May 31 of each year (Central Valley Regional Water Quality Control Board 2009).

Water temperature is a critical constituent from the standpoint of aquatic life. The Basin Plan objective for temperature requires that it not be increased more than 5°F above natural receiving water temperature (Central Valley Regional Water Quality Control Board 2009). The Oroville

Facilities are currently operated to meet water temperature objectives for fish at the intake to the Feather River Fish Hatchery, and at the Robinson Riffle in the Low Flow Channel, about 5 miles below the Thermalito Diversion Dam. Water temperatures at these two locations are managed by DWR using multi-level intakes for the releases from Oroville to control water temperatures of the release from Oroville Reservoir and the heating that takes place in the Low Flow Channel to Robinson Riffle (U.S. Bureau of Reclamation 2008).

The potential of hydrogen (pH) is a unit for measuring the acidity (hydrogen ion activity) in water. Many biological functions can occur only within a narrow range of pH values. The Basin Plan objective for pH is between 6.5 and 8.5. Furthermore, discharges cannot result in changes of pH that exceed 0.5. Some construction materials such as concrete or other chemicals could affect the pH of nearby streams if a discharge were to occur.

Electrical conductivity (EC) is a water quality parameter that can be conveniently measured in the field and that is representative of salinity and total dissolved solids (TDS). TDS and EC are general indicators of salinity and are regulated under the Basin Plan. Basin Plan objectives for EC on the Feather River from the Fish Barrier Dam to the Sacramento River are 150 microsiemens per centimeter (μS/cm) in well-mixed waters.

Pesticides

Pesticides such as diazinon and chlorpyrifos are used to exterminate destructive pests and insects such as aphids, spider mites, fleas, ants, roaches, and boring insects. A significant reduction in the use of diazinon and chlorpyrifos has occurred in the past decade since non-agricultural uses of diazinon were banned in December 2004 and non-agricultural uses of chlorpyrifos were banned in December 2001.

In October 2003, the Central Valley RWQCB established total maximum daily load (TMDL) regulations for diazinon in the lower Feather River. The TMDL document recommended three strategies for reducing diazinon loading: (1) reducing diazinon use, (2) reducing surface water runoff from sprayed orchards, and (3) delaying and/or filtering orchard runoff containing diazinon. Recent monitoring (2006 and 2007) indicated diazinon loading to the lower Feather River has been reduced significantly (Sacramento River Watershed Program 2010).

The Basin Plan states that “beginning August 11, 2008, the direct or indirect discharge of diazinon or chlorpyrifos into the Sacramento and Feather Rivers is prohibited if, in the previous year (July–June), any exceedance of the diazinon or chlorpyrifos water quality objectives, or diazinon and chlorpyrifos loading capacity occurred.” However, these prohibitions do not apply if the discharge of diazinon or chlorpyrifos is subject to a waiver of WDRS or governed by individual or general WDRs.

Water quality objectives for these pesticides along the Feather River from the Fish Barrier Dam to the Sacramento River are shown in Table 3.2-3.

Table 3.2-3. Water Quality Objectives for Pesticides along the Feather River

Pesticide Name	Maximum Concentration and Averaging Period
Chlorpyrifos	0.025 μg/L; 1-hour average (acute) 0.015 μg/L; 4-day average (chronic) Not to be exceeded more than once in a 3-year period.
Diazinon	0.16 μg/L; 1-hour average (acute) 0.10 μg/L; 4-day average (chronic) Not to be exceeded more than once in a 3-year period.

Source: Central Valley Regional Water Quality Control Board 2009.
μg/L = micrograms per liter.

Contaminants

In the Sacramento and San Joaquin River basins, industrial and municipal discharge and agricultural runoff transport contaminants into rivers and streams that ultimately flow into the Delta. Principal pollutants in the Delta are agricultural chemicals and their derivatives (Herbold et al. 1992). Organophosphate insecticides, such as carbofuran, chlorpyrifos, and diazinon, are present throughout the Central Valley and dispersed in agricultural and urban runoff. The *first-flush* storm event or the *dormant spray* storm event is of most concern because of the higher concentration of contaminants in the runoff. In particular, diazinon and chlorpyrifos are applied to control wood-boring insects in dormant stone fruit orchards from December to February (Zamora et al. 2003). These contaminants enter rivers in winter runoff and enter the estuary in concentrations that can be toxic to invertebrates (CALFED Bay-Delta Program 2000). Unlike severe bioaccumulators such as organochlorine pesticides, organophosphate pesticides are typically metabolized by most invertebrates. However, some organophosphate pesticides do not bioaccumulate, and some do bioaccumulate. In particular, diazinon has a solubility of 68.9 mg/L (at 68°F), but should not bioaccumulate in aquatic organisms (Zamora et al. 2003). Chlorpyrifos, on the other hand, is more persistent in the environment and tends to be hydrophobic to the water column. Chlorpyrifos has a lower solubility than diazinon (1.12 mg/L at 75°F) and has a significant potential to bioaccumulate in aquatic organisms (Zamora et al. 2003). Because some organophosphate may accumulate in living organisms, they may become toxic to fish species, especially those life stages that remain in the system year-round and spend considerable time there during the early stages of development, such as Chinook salmon, steelhead, splittail, and green sturgeon.

Mercury contamination from historical mining activities is extensive on both sides of the Central Valley and occurs primarily from widely scattered hydraulic mining debris along eastside tributaries and active abandoned mines and associated debris piles on the west side. These sources continue to deposit significant amounts of mercury into the Bay-Delta system. The Cosumnes River, Yolo Bypass, and Sacramento River are the primary ongoing sources of mercury contamination in the Bay-Delta. Mercury occurs in several forms, including pure elemental mercury and toxic methylmercury. Mercury is mobile in aquatic systems as aqueous mercury or when attached to suspended particulate matter. Methylmercury is a significant water quality concern because small amounts can bioaccumulate in fish to levels that are toxic to humans and wildlife. In the Delta, mercury concentrations in bluegill, Sacramento sucker, and largemouth bass have been found to exceed the human health standard of 0.5 part per million (ppm) by two to six times (Slotten 1991).

Other contaminants of particular concern in the Bay-Delta system include high concentrations of trace elements such as selenium, copper, cadmium, and chromium; however, their effects on higher trophic levels are poorly understood, in part as a result of the complex distribution of high concentrations in both time and space (Herbold et al. 1992). In general, it appears that the highest concentrations occur in areas where human activity adjacent to the bay is also the highest. Although these trace elements also occur naturally, concentrations of these trace elements have been found to be high enough to adversely affect the growth and reproduction of aquatic animals in laboratory experiments (Herbold et al. 1992).

In the Feather River, historical gold mining practices as well as the development of municipal and industrial land uses in the upper watershed and along the lower Feather River, continue to be the primary sources for most of the metals found in the river. Pesticides are used to control mosquitoes and herbicides are applied for routine and ongoing maintenance of recreational and other facilities (California Department of Water Resources 2007).

Groundwater Quantity and Quality

The project area is located within the East Butte and Sutter groundwater subbasins of the greater Sacramento Valley Groundwater Basin (Sutter County 2008). Groundwater is extracted for agricultural, municipal, industrial, and environmental wetland uses. The East Butte Subbasin is bounded on the north by the confluence of Butte Creek and the Sacramento River and Sutter Buttes, on the west by the Sacramento River, on the south by the confluence of the Sacramento River and the Sutter Bypass, and on the east by the Feather River. The subbasin has groundwater level fluctuations between 4 feet during normal years and up to 10 feet during drought years (Sutter County 2008). The Sutter Subbasin is bounded on the north by the confluence of Butte Creek and the Sacramento River and Sutter Buttes, on the west by the Sacramento River, on the south by the confluence of the Sacramento River and the Sutter Bypass, and on the east by the Feather River. The Sutter Subbasin has relatively constant groundwater levels that tend to be within 10 feet of the ground surface (Sutter County 2008).

Four major freshwater aquifer formations exist in the northern Sacramento Valley: (1) the Alluvial deposits; (2) the Tuscan Formation, Units A and B; (3) the Tuscan Formation, Unit C; and (4) the Tehama Formation. These deposits overlie the marine, or saline, formations and are the major source of fresh groundwater to wells (Fulton et al. 2003).

The Alluvial aquifer system is the uppermost groundwater bearing unit, reaching from ground surface to maximum depth of about 200 feet. Many domestic wells draw water from this aquifer system. The Upper Tuscan aquifer (Tuscan Unit C) system is exposed on the east side of the valley along the foothills and is found at a depth of about 800 feet in the central portion of the valley. This aquifer system extends west past the Sacramento River under the surface, and underlies the Alluvial aquifer system. The Lower Tuscan aquifer (Tuscan Units A and B) system lies beneath the Upper Tuscan system, and is also exposed on the east side of the valley. In the central portion of the valley, it is found at a depth of about 1,000 feet below ground surface. The Tuscan Formation is considered an important deep system that is theorized to underlie most of the valley area. The highest-producing wells in alluvial uplands occur when older alluvium or the deeper Tuscan volcanic rocks are tapped (Butte County 2005). The Tehama Formation aquifer system is exposed on the west side of the Sacramento Valley, at a depth ranging from the ground surface to about 1,000 feet.

There are numerous groundwater wells used for both crop irrigation and drinking water supply in the affected area. The Sacramento Valley portion of Butte County has approximately 9,400 wells (Butte County 2005). Although groundwater levels are known to drop during drought periods and groundwater overdraft has historically occurred in portions of the planning area, overdraft conditions are reported to be relatively stable at present (Sutter County 2008). Spring to fall fluctuation of groundwater levels in the unconfined portion of the aquifer system averages only 1 to 2 feet during years of normal precipitation and years of drought, respectively. Groundwater levels rise during the summer months as the upper aquifer recharges due to flood irrigation for rice production (Butte County Water Commission 2010).

Groundwater quality in Sutter County ranges from poor to very good and includes contaminants in some areas resulting from both natural conditions and human influence (Sutter County 2008). Some groundwater is hard water (high calcium and magnesium), and some has higher levels of iron, manganese, and arsenic, and some areas also have high nitrates. Constituents of general concern for groundwater are TDS, nitrate, and several other individual chemical constituents (Sacramento River Watershed Program 2010). Septic systems can introduce nitrates, salts, bacteria, viruses, medications, household chemicals, and other contaminants into the groundwater. Nitrate contamination can also come from agricultural practices.

Prior to 1969, all urban water demands were met with groundwater. In 1969, a new surface water treatment plant began to deliver treated surface water from the Feather River to Yuba City. The switch to surface water was needed because of water quality problems associated with the use of groundwater, including high levels of manganese, arsenic, sulfides, nitrates, and iron (California Department of Water Resources 2007). High nitrate levels have been found to be generally concentrated around Yuba City, with isolated areas of high concentration in the northern part of Sutter County and in the southern portion south of the Bear River (Sutter County 2008). In 2001, Yuba City received a notice from the County Department of Health Services for nitrate exceedance of drinking water standards in its groundwater, Region 5—Tierra Buena water system. This same year, Yuba City purchased Hillcrest Water District, which was located southwest of the city, and continued to use the district's three wells to meet the water needs of its customers. Currently, about 20% of Yuba City's water needs are met with the groundwater from the three purchased wells (California Department of Water Resources 2007).

Not all of the wells meet the arsenic standards approved by EPA (ICF International 2010b). Arsenic occurs naturally in the soils/bedrock of several areas in Sutter County (Sutter County 2008). Naturally occurring arsenic enters the groundwater at concentrations that exceed EPA's maximum contaminant level (MCL) of 10 micrograms per liter (μg/L). The EPA arsenic MCL applies only to public water systems (not to private wells). Many of the private and public groundwater wells in the county do not meet the current MCL. Groundwater in local districts near Yuba City has an average arsenic concentration of 14.4 μg/L. The city is evaluating options related to converting these customers from groundwater supply to surface water supply, or treating the groundwater to meet all primary and secondary standards.

3.2.3 Environmental Consequences

This section describes the environmental consequences relating to water quality and groundwater resources for the proposed project. It describes the methods used to determine the effects of the project and lists the thresholds used to conclude whether an effect would be significant. The effects that would result from implementation of the project, findings with or without mitigation, and applicable mitigation measures are presented in a table under each alternative.

3.2.3.1 Assessment Methods

This evaluation of water quality and groundwater resources is based on professional standards and information cited throughout the section. The key effects were identified and evaluated based on the environmental characteristics of the project area and the magnitude, intensity, and duration of activities related to the construction and operation of this project.

3.2.3.2 Determination of Effects

For this analysis, an effect pertaining to water quality and groundwater resources was analyzed under NEPA and CEQA if it would result in any of the following environmental effects, which are based on NEPA standards, State CEQA Guidelines Appendix G (14 CCR 15000 et seq.), and standards of professional practice.

- Violate any water quality standards or WDRs.
- Substantially deplete groundwater supplies or interfere substantially with groundwater recharge, resulting in 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 that would not support existing land uses or planned uses for which permits have been granted).
- Create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff.
- Substantially degrade water quality.

As part of the project, four environmental commitments could reduce or eliminate water quality and groundwater effects (see Section 2.4 of Chapter 2, *Alternatives*). These environmental commitments call for development and implementation of four plans and were included in the assessment of project effects.

- SWPPP.
- BSSCP, also known as a frac-out plan.
- SPCCP.
- Turbidity monitoring plan.

3.2.4 Effects and Mitigation Measures

Effects and mitigation measure requirements concerning water quality and groundwater resources are summarized in Table 3.2-4.

Table 3.2-4. Summary of Effects for Water Quality and Groundwater Resources

Effect	Finding	Mitigation Measures	With Mitigation
Alternatives 1, 2, and 3			
Effect WQ-1: Effects on Surface Water Quality from Excessive Turbidity or Total Suspended Solids	Less than significant	None required	Less than significant
Effect WQ-2: Release of Contaminants into Adjacent Surface Water Bodies from Construction-Related Hazardous Materials	Less than significant	None required	Less than significant
Effect WQ-3: Effects on Groundwater or Surface Water Quality Resulting from Contact with the Water Table	Significant	WQ-MM-1: Implement Provisions for Dewatering	Less than significant
Effect WQ-4: Effects on Groundwater Wells Due to Project Encroachment	Less than significant	None required	Less than significant

3.2.4.1 No Action Alternative

The No Action Alternative represents the continuation of the existing deficiencies along the portion of the Feather River in the FRWLP area. Current levee operations and maintenance activities would continue, but there would be no change in the geomorphic and flood control regimes relative to existing conditions. No levee improvements would be made to increase the level of protection. No construction-related effects relating to water quality and groundwater resources such as release of contaminants or sediments to surface water would occur. Therefore, there would be no effect on water quality and groundwater resources attributable to the implementation of the No Action Alternative.

However, without levee improvements, there is the continued risk of levee failure. Under-seepage and loss of levee foundation soils would be expected to continue. A catastrophic levee failure would result in collapse of levee slopes and loss of soil. Furthermore, if a levee breach were to occur, emergency construction and repair activities would be implemented without the use of BMPs and could result in release of contaminants into the soil (groundwater) and adjacent surface water, as well as increased erosion, which could raise TSS and turbidity in adjacent water bodies.

3.2.4.2 Alternative 1

Implementation of Alternative 1 would potentially result in effects on water quality and groundwater resources. These potential effects and related mitigation measure requirements are summarized in Table 3.2-5 and discussed below.

Table 3.2-5. Water Quality and Groundwater Resources Effects and Mitigation Measures for Alternative 1

Effect	Finding	Mitigation Measure	With Mitigation
Effect WQ-1: Effects on Surface Water Quality from Excessive Turbidity or Total Suspended Solids	Less than significant	None required	Less than significant
Effect WQ-2: Release of Contaminants into Adjacent Surface Water Bodies from Construction-Related Hazardous Materials	Less than significant	None required	Less than significant
Effect WQ-3: Effects on Groundwater or Surface Water Quality Resulting from Contact with the Water Table	Significant	WQ-MM-1: Implement Provisions for Dewatering	Less than significant
Effect WQ-4: Effects on Groundwater Wells Due to Project Encroachment	Less than significant	None required	Less than significant

Effect WQ-1: Effects on Surface Water Quality from Excessive Turbidity or Total Suspended Solids

Construction of Alternative 1 would require the construction of slurry cutoff walls, slope flattening, levee reconstruction, seepage berms, depression/ditch infilling, clay ditch lining, and encroachment removal. These construction activities would include earth disturbance that could cause erosion and sedimentation in adjacent water bodies. Although this type of construction would occur close to the Feather River, significant sedimentation and turbidity would be unlikely to occur in the river because the majority of the construction would occur on the land side of the existing levee. Two environmental commitments are targeted at reducing or eliminating erosion and sedimentation effects: the SWPPP environmental commitment (Section 2.4.12) and the turbidity monitoring plan environmental commitment (Section 2.4.15). The SWPPP would include erosion control measures to ensure the land disturbance activities do not cause erosion that would increase sediment in the Feather River. Site-specific erosion control measures would be developed as part of a SWPPP, a requirement of the NPDES Construction General Permit. A SWPPP typically contains, but is not limited to, the following BMPs.

- **Timing of construction**. The construction contractor will conduct all construction activities during the typical construction season to avoid ground disturbance during the rainy season.
- **Staging of construction equipment and materials**. To the extent possible, equipment and materials will be staged in areas that have already been disturbed.
- **Minimize soil and vegetation disturbance**. The construction contractor will minimize ground disturbance and the disturbance/destruction of existing vegetation. This will be accomplished in part through the establishment of designated equipment staging areas, ingress and egress corridors, and equipment exclusion zones prior to the commencement of any grading operations.
- **Stabilize grading spoils**. Grading spoils generated during construction will be temporarily stockpiled in staging areas. Silt fences, fiber rolls, or similar devices will be installed around the base of the temporary stockpiles to intercept runoff and sediment during storm events. If

necessary, temporary stockpiles may be covered with an appropriate geotextile to increase protection from wind and water erosion.

- **Install sediment barriers**. The construction contractor may install silt fences, fiber rolls, or similar devices to prevent sediment-laden runoff from leaving the construction area.
- **Stormwater drain inlet protection**. The construction contractor may install silt fences, drop inlet sediment traps, sandbag barriers, and similar devices.
- **Permanent site stabilization**. The construction contractor will install structural and vegetative methods to permanently stabilize all graded or otherwise disturbed areas once construction is complete. Structural methods may include the installation of biodegradable fiber rolls and erosion control blankets. Vegetative methods may involve the application of organic mulch and tackifier and/or the application of an erosion control seed mix. Implementation of a SWPPP will substantially minimize the potential for project-related erosion and associated adverse effects on water quality.

As part of a turbidity monitoring plan (Section 2.4.15), SBFCA or its contractor would monitor turbidity in the adjacent water bodies, where applicable criteria apply, to determine whether turbidity is being affected by construction and ensure that construction does not result in a substantial rise in turbidity levels above ambient conditions, in accordance with the Basin Plan turbidity objectives. The monitoring program would include monitoring ambient turbidity conditions 200 feet upstream and 200 feet downstream of construction activities. Grab samples would be collected at a downstream location that is representative of the flow near the construction site. If construction is creating a visible sediment plume, the sample would represent the plume. During all in-water construction activities, samples would be collected hourly to ensure compliance. During all other construction activities, samples would be collected on a random weekly basis.

If turbidity limits exceed Basin Plan standards, construction-related earth-disturbing activities would be modified to alleviate the problem. SBFCA or its contractor would notify the Central Valley RWQCB of the issue and provide an explanation of the cause.

The implementation of these environmental commitments would reduce potential effects on surface water quality from construction-related turbidity or TSS to a less-than-significant level. No mitigation is required.

Effect WQ-2: Release of Contaminants into Adjacent Surface Water Bodies from Construction-Related Hazardous Materials

Alternative 1 might involve storage and use of toxic and other harmful substances near the Feather River (or in areas that drain to the Feather River or other water bodies), which could result in discharge of these substances to the Feather River or other water bodies. Construction activities would involve the use of heavy equipment, cranes, compactors, and other construction equipment that use petroleum products such as fuels, lubricants, hydraulic fluids, and coolants, all of which can be toxic to fish and other aquatic organisms. In addition, placement of riprap may involve the use of a tow boat/crane and a barge carrying the riprap if the Feather River is deep enough in certain locations. The use of this equipment could contribute a direct source of contamination if equipment and construction practices were not properly followed. An accidental spill or inadvertent discharge from such equipment could affect the water quality of the river or water body.

The combination of the environmental commitments described in Chapter 2, *Alternatives*, (see Section 2.4, *Environmental Commitments*) would reduce the effect of such a release, should it occur, or reduce the likelihood that a release would occur. These environmental commitments include the development of the SWPPP, an SPCCP, a BSSCP, and a turbidity monitoring plan. All of the environmental commitments are described in detail in Section 2.4 of Chapter 2 and are summarized in Effect WQ-1. All plans would be prepared prior to the commencement of construction activities.

An SPCCP is intended to prevent discharge of petroleum products into navigable water or adjoining shorelines. SBFCA or its contractor would develop and implement an SPCCP to minimize the potential for effects from spills of hazardous, toxic, or petroleum substances during construction and operation activities. The SPCCP would be completed before construction activities begin. Implementation of this measure would comply with state and Federal water quality regulations. The SPCCP would describe spill sources and spill pathways, methods to reduce the likelihood of spills, and actions that would be taken in the event of a spill (e.g., an oil spill from engine refueling would be immediately cleaned up with oil absorbents). The SPCCP would outline descriptions of containment facilities and practices such as doubled-walled tanks, containment berms, emergency shut-offs, drip pans, fueling procedures, and spill response kits. It would also describe how and when employees are trained in proper handling procedures and spill prevention and response procedures.

A BSSCP is typically developed for activities that involve the use of bentonite materials (e.g., the construction of slurry walls). The BSSCP is intended to minimize the potential for accidental release of bentonite (which is used in excavation and tunneling activities), provide for timely detection of accidental bentonite release, and ensure a *minimum-effect* response in the event of an accidental bentonite release.

If the SWPPP and SPCCP fail to prevent a spill, then construction would stop, and the spill would be properly cleaned up.

Adherence to these environmental commitments would reduce this effect on surface water bodies from construction-related hazardous materials use to a less-than-significant level. No mitigation is required.

Effect WQ-3: Effects on Groundwater or Surface Water Quality Resulting from Contact with the Water Table

Construction of Alternative 1 would also involve trenching and excavation associated with a cutoff wall and or levee reconstruction. Such construction activities could extend to a depth that would expose the water table, create an immediate and direct path to the groundwater basin that would allow contaminants to enter the groundwater system. Primary construction-related contaminants that could reach groundwater include increased sediment, oil and grease, and hazardous materials.

Dewatering of the construction area (e.g., removing groundwater that may fill trenches dug for cutoff wall construction) is not expected to occur during project construction. However, if it became necessary, it could result in the release of contaminants to surface or groundwater.

The construction of a cutoff wall is not expected to require digging or trenching at depths where groundwater aquifers are used for drinking water. If trenching activities were to incidentally reach a groundwater aquifer used for drinking water, the slurry wall material is relatively benign and would not remain in a liquid state long enough to allow for significant lateral movement within the aquifer.

As discussed in Section 3.16, *Public Health and Environmental Hazards*, prior to all construction activities, SBFCA would complete Phase I and, if necessary, Phase II environmental site assessment investigations that would include analysis of soil and/or groundwater samples for potential contamination sites that have not yet been discovered by previous investigations. In accordance with Mitigation Measure PH-MM-1, if hazardous substances are encountered during environmental site assessment investigations or during construction, SBFCA or its contractor will implement required measures for the proper transport and disposal of such materials in accordance with the appropriate local, state, and Federal laws and regulations.

The project proponents would adhere to environmental commitments of the SWPPP, the SPCCP, and the BSSCP, as summarized under Effects WQ-1 and WQ-2. Adherence to those environmental commitments and implementation of Mitigation Measure WQ-MM-1 would reduce effect WQ-3 to a less-than-significant level.

Mitigation Measure WQ-MM-1: Implement Provisions for Dewatering

Before discharging any dewatered effluent to surface water, SBFCA or its contractors will obtain a Low Threat Discharge and Dewatering NPDES permit from the Central Valley RWQCB if the dewatering is not covered under the Central Valley RWQCB's NPDES Construction General Permit. Under the dewatering permit, discharging activities involve extensive water quality monitoring in order to adhere to the strict effluent and receiving water quality criteria outlined in the permit. As part of the permit, the permittee will design and implement measures as necessary so that the discharge limits identified in the relevant permit are met.

For example, if dewatering is needed during the construction of any cutoff walls, the Low Threat Discharge and Dewatering NPDES permit would require treatment or proper disposal of the water prior to discharge. Treatment measures will be selected to achieve maximum sediment removal and represent the best available technology that is economically achievable. Implemented measures could include the retention of dewatering effluent until particulate matter has settled before it is discharged, use of infiltration areas, and other BMPs.

Final selection of water quality control measures will be subject to approval by SBFCA. SBFCA will verify that coverage under the appropriate NPDES permit has been obtained before allowing dewatering activities to begin. SBFCA or its agent will perform routine inspections of the construction area to verify that the water quality control measures are properly implemented and maintained. SBFCA will notify its contractors immediately if there is a non-compliance issue and will require compliance.

Effect WQ-4: Effects on Groundwater Wells Due to Project Encroachment

Effects on groundwater and drinking water quality from operation and construction might be significant if drinking water wells are located in close proximity to construction zones where a slurry cutoff wall is being considered because the cutoff wall may block lateral water transfer from the river to the aquifer. Less water available to the well would not only inhibit well function but may also affect well water quality. In addition, if local drinking water or agricultural wells are affected from cutoff walls, water quality may also be affected because the well pump may take in more sediment due to the potential lowering of the aquifer. HDR prepared a technical memorandum which used two models to determine the potential effects from the slurry cutoff walls. The Central Valley Hydrologic Model (CVHM) (a USGS Model) was used with a developed Local Model. Results of the CVHM model indicated that there would be a 3-foot increase in groundwater levels in the southern planning area, and a negligible change in the northern planning area along the Feather River. However, the depth to groundwater in the southern area is 10 to 30 feet below the ground surface and a 3-foot change would likely not have any significant effect on groundwater in the area. This negligible change also applies to the Sutter Bypass area. The Local Model also divided the Feather River into a northern and southern project boundary along with the Sutter Bypass. The results for all model scenarios showed a negligible change in groundwater levels. The effect on groundwater wells is considered less than significant. No mitigation is required.

3.2.4.3 Alternative 2

Implementation of Alternative 2 would potentially result in effects on water quality and groundwater resources. These potential effects and related mitigation measure requirements are summarized in Table 3.2-6 and discussed below.

Table 3.2-6. Water Quality and Groundwater Resources Effects and Mitigation Measures for Alternative 2

Effect	Finding	Mitigation Measure	With Mitigation
Effect WQ-1: Effects on Surface Water Quality from Excessive Turbidity or Total Suspended Solids	Less than significant	None required	Less than significant
Effect WQ-2: Release of Contaminants into Adjacent Surface Water Bodies from Construction-Related Hazardous Materials	Less than significant	None required	Less than significant
Effect WQ-3: Effects on Groundwater or Surface Water Quality Resulting from Contact with the Water Table	Significant	WQ-MM-1: Implement Provisions for Dewatering	Less than significant
Effect WQ-4: Effects on Groundwater Wells Due to Project Encroachment	Less than significant	None required	Less than significant

Effect WQ-1: Effects on Surface Water Quality from Excessive Turbidity or Total Suspended Solids

Construction of Alternative 2 involves all the measures under Alternative 1, along with a stability berm and relief wells. However, clay ditch lining is not part of this alternative. It is not anticipated that construction of a stability berm or relief wells would have any greater effect on water quality than any of the measures proposed under Alternative 1.

Implementation of the environmental commitments detailed in the Alternative 1, Effect WQ-1 discussion above, and Chapter 2, *Alternatives*, would ensure that water quality is protected from excessive turbidity and TSS from the construction proposed under Alternative 2. The effect would be less than significant. No mitigation is required.

Effect WQ-2: Release of Contaminants into Adjacent Surface Water Bodies from Construction-Related Hazardous Materials

Construction practices occurring under this alternative would be similar to those occurring under Alternative 1, except this alternative would include stability berms and relief wells, but no clay ditch lining. It is not anticipated that construction of a stability berm or relief wells would have any greater effect on water quality than any of the measures proposed for construction under Alternative 1 as similar construction equipment would be used.

Implementation of the environmental commitments detailed in the Alternative 1, Effect WQ-1, and Effect WQ-2 discussion above, and detailed in Chapter 2, *Alternatives*, would ensure that water quality is protected from construction-related hazardous materials. This effect would be less than significant. No mitigation is required.

Effect WQ-3: Effects on Groundwater or Surface Water Quality Resulting from Contact with the Water Table

Construction practices occurring under this alternative would be similar to those occurring under Alternative 1, with the exception that this alternative would include a stability berm and relief wells, but no clay ditch lining. It is not anticipated that construction of a stability berm would have any greater effect on water quality than the measures proposed for construction under Alternative 1 because similar construction equipment would be used.

The project proponents would adhere to environmental commitments of the SWPPP, the SPCCP, and the BSSCP, as summarized under Effects WQ-1 and WQ-2 in the Alternative 1 discussion above. Adherence to the environmental commitments and implementation of Mitigation Measure WQ-MM-1 would reduce Effect WQ-3 to a less-than-significant level.

Effect WQ-4: Effects on Groundwater Wells Due to Project Encroachment

Effects on groundwater and drinking water quality from operation and construction might be significant if drinking water wells are located in close proximity to construction zones where a slurry cutoff wall is being considered because the cutoff wall may block lateral water transfer from the river to the aquifer. In addition, if local drinking water or agricultural wells are affected by cutoff walls, water quality may be affected because the well pump may take in more sediment due to the potential lowering of the aquifer. As stated in Effect WQ-4 under Alternative 1, the model prepared by HDR estimated a 3-foot change in groundwater levels in the southern portion of the planning area, which is the largest change in the entire planning area. Such change is not anticipated to be a significant effect on groundwater levels. This effect is considered less than significant. No mitigation is required.

3.2.4.4 Alternative 3

Implementation of Alternative 3 would potentially result in effects on water quality and groundwater resources. These potential effects and related mitigation measure requirements are summarized in Table 3.2-7 and discussed below.

Table 3.2-7. Water Quality and Groundwater Resources Effects and Mitigation Measures for Alternative 3

Effect	Finding	Mitigation Measure	With Mitigation
Effect WQ-1: Effects on Surface Water Quality from Excessive Turbidity or Total Suspended Solids	Less than significant	None required	Less than significant
Effect WQ-2: Release of Contaminants into Adjacent Surface Water Bodies from Construction-Related Hazardous Materials	Less than significant	None required	Less than significant
Effect WQ-3: Effects on Groundwater or Surface Water Quality Resulting from Contact with the Water Table	Significant	WQ-MM-1: Implement Provisions for Dewatering	Less than significant
Effect WQ-4: Effects on Groundwater Wells Due to Project Encroachment	Less than significant	None required	Less than significant

Effect WQ-1: Effects on Surface Water Quality from Excessive Turbidity or Total Suspended Solids

Construction of Alternative 3 involves all the measures under Alternative 1, in addition to stability berms, relief wells, and canal hydration. It is not anticipated that construction of a stability berm, canal hydration, or relief wells would have any greater effect on water quality than the measures proposed under Alternative 1.

Implementation of the environmental commitments detailed in Effect WQ-1 and Chapter 2, *Alternatives*, would ensure that water quality is protected from excessive turbidity and TSS from the construction measures proposed under this alternative. No mitigation is required.

Effect WQ-2: Release of Contaminants into Adjacent Surface Water Bodies from Construction-Related Hazardous Materials

Construction practices occurring under this alternative would be similar to those occurring under Alternative 1 with the addition of stability berms, relief wells, and canal hydration. It is not anticipated that construction under this alternative would have any greater effect on water quality than the measures proposed for construction under Alternative 1 because similar construction equipment would be used.

However, implementation of the environmental commitments detailed in Effect WQ-1, Effect WQ-2, and discussed in more detail in Chapter 2, *Alternatives*, would ensure that water quality is protected from construction-related hazardous materials. No mitigation is required.

Effect WQ-3: Effects on Groundwater or Surface Water Quality Resulting from Contact with the Water Table

Construction practices occurring under this alternative would be similar to those occurring under Alternative 1 with the addition of stability berms, relief wells, and canal hydration. It is not anticipated that construction under this alternative would have any greater effect on water quality than the measures proposed for construction under Alternative 1 because similar construction equipment would be used.

The project proponents would adhere to environmental commitments of the SWPPP, the SPCCP, and the BSSCP, as summarized under Effects WQ-1 and WQ-2 in the Alternative 1 discussion above. Adherence to those environmental commitments and implementation of Mitigation Measure WQ-MM-1 would reduce Effect WQ-3 to a less-than-significant level.

Effect WQ-4: Effects on Groundwater Wells Due to Project Encroachment

Effects on groundwater and drinking water quality from operation and construction might be significant if drinking water wells are located in close proximity to construction zones where a slurry cutoff wall (or relief well and canal hydration) is being considered, because the cutoff wall may block lateral water transfer from the river to the aquifer and relief wells may dewater from the ground. In addition, if local drinking water or agricultural wells are affected by cutoff walls, water quality may be affected because the well pump may take in more sediment due to the potential lowering of the aquifer. As stated in Effect WQ-4 under Alternative 1, the model prepared by HDR estimated a 3-foot change in groundwater levels in the southern portion of the planning area, which is the largest change in the entire planning area. Such change is not anticipated to be significant effect on groundwater levels. This effect is considered less than significant. No mitigation is required.

3.3 Geology, Soils, Seismicity, and Mineral Resources

3.3.1 Introduction

This section describes the regulatory and environmental setting for geology, soils, seismicity, and mineral resources; effects caused by or on geology, soils, seismicity, and mineral resources that would result from the No Action Alternative and Alternatives 1, 2, and 3; and mitigation measures that would reduce significant effects. Additional information on the geology of the area is provided in Appendix C.

3.3.2 Affected Environment

This section describes the affected environment for geology, soils, seismicity, and mineral resources in the project area. The key sources of data and information used in the preparation of this section are listed below.

- Geologic map of late Cenozoic deposits of the Sacramento Valley and northern Sierran foothills, California (Helley and Harwood 1985).
- Memoranda prepared by WLA, "Surficial Geologic Maps and Geomorphic Assessment of the Sutter Study Area, Urban Levee Geotechnical Evaluation, Sutter and Butte Counties, California," which were included in the SGDR as Appendix O (URS 2010).
- Technical Memorandum, SBFCA, Feather River West Levee Project, Preliminary Assessment of Borrow Requirements and Potential Borrow Sites (Wood Rodgers 2011).

3.3.2.1 Regulatory Setting

This section summarizes key Federal and state regulatory information that applies to geology, soils, seismicity, and mineral resources. Additional regulatory information appears in Appendix A.

Federal

Clean Water Act

As introduced in Section 3.2, *Water Quality and Groundwater Resources*, CWA Section 402 regulates discharges to surface waters through the NPDES program, administered by EPA. In California, the State Water Board is authorized by EPA to oversee the NPDES program through the RWQCBs. The NPDES program provides for both general permits (those that cover a number of similar or related activities) and individual permits. A SWPPP and PPMP may be required for construction of the FRWLP to comply with the Construction General Permit and General Dewatering Permit, respectively, under Section 402.

State

Alquist-Priolo Earthquake Fault Zoning Act and Seismic Hazards Mapping Act

California's Alquist-Priolo Earthquake Fault Zoning Act (Alquist-Priolo Act) (Public Resources Code [PRC] Section 2621 et seq.) and the Seismic Hazards Mapping Act of 1990 (PRC Sections 2690–2699.6) are intended to reduce damage resulting from earthquakes.

California Building Standards Code

California's minimum standards for structural design and construction are given in the California Building Standards Code (CBSC) (24 CCR). The CBSC provides standards for various aspects of construction, including excavation, grading, and earthwork construction; fills and embankments; expansive soils; foundation investigations; and liquefaction potential and soil strength loss. In accordance with California law, certain aspects of the project would be required to comply with all provisions of the CBSC.

California Surface Mining and Reclamation Act of 1975

The principal legislation addressing mineral resources in California is the Surface Mining and Reclamation Act of 1975 (SMARA) (PRC Sections 2710–2719), which was enacted to provide a comprehensive surface mining and reclamation policy that would encourage the production and conservation of mineral resources while ensuring that adverse environmental effects of mining are prevented or minimized; that mined lands are reclaimed and residual hazards to public health and safety are eliminated; and that consideration is given to recreation, watershed, wildlife, aesthetic, and other related values. Although the State of California is responsible for identifying areas containing mineral resources, the county or city is responsible for SMARA implementation and enforcement by providing annual mining inspection reports and coordinating with California Geological Survey (CGS).

Mining activities that disturb more than 1 acre or 1,000 cubic yards of material require a SMARA permit from the lead agency, which is the county, city, or board that is responsible for ensuring that adverse environmental effects of mining are prevented or minimized. The lead agency establishes its own local regulations and requires a mining applicant to obtain a surface mining permit, submit a reclamation plan, and provide financial assurances, pursuant to SMARA.

Certain mining activities do not require a permit, such as excavation related to farming, grading related to restoring the site of a natural disaster, and grading related to construction.

Local

Sutter County, Butte County, City of Yuba City, City of Live Oak, City of Biggs, and City of Gridley have each adopted policies related to seismic safety, geologic hazards, erosion and siltation control, and soil and mineral resource conservation, detailed in Appendix A.

3.3.2.2 Environmental Setting

The following considerations are relevant to geology, soils, seismicity, and mineral resources conditions in the project area.

This section discusses the environmental setting as of February 2012 related to geology, soils, seismicity, and mineral resources in the project area. The project area is located in Sutter and Butte Counties. It covers about 326 square miles and is about 43 miles long, north to south and up to 14 miles wide east to west (Plate 1-1). It is roughly bounded by the Feather River (to the east), Cherokee Canal, the Sutter Buttes, and Sutter Bypass (to the west, listed from north to south). Floodwaters potentially threatening the project area originate from the Feather River watershed or the upper Sacramento River watershed, above Colusa Weir. These waterways have drainage areas of 5,921 and 12,090 square miles, respectively. In addition to Yuba City, communities in the project area include Biggs, Gridley, Live Oak, and Sutter. The term *project corridor* refers to the corridor along the west levee of the Feather River from Thermalito Afterbay on the north to the Sutter Bypass on the south. This corridor is roughly 500 feet toward the land side of the existing levees and 100 feet toward the water side and approximately 41 miles long (Plate 1-3).

Geology and Seismicity

Regional Geology

The project area is located in the central portion of the Sacramento Valley, which forms the northern portion of California's Great Valley geomorphic province (Norris and Webb 1990:412; California Geological Survey 2002:2).

The Great Valley, also called the Central Valley, is a nearly flat alluvial plain that lies between the Sierra Nevada on the east and the Coast Ranges on the west. Its south end is defined by the Tehachapi Mountains north of Los Angeles, and its north end is defined by the Klamath Mountains. Subdivided into the Sacramento Valley to the north and the San Joaquin Valley to the south, the valley has an average width of about 50 miles and is about 400 miles long overall (Norris and Webb 1990:412–417; Bartow 1991:1).

The Great Valley is floored by a thick sequence of sedimentary deposits that range in age from Jurassic through Quaternary. Under the eastern and central portions of the valley, the base of the sequence likely rests on Mesozoic crystalline rock allied to the plutons of the Sierra Nevada; to the west, basement rocks are believed to be Franciscan metasediments and/or mélange similar to exposures in the Coast Ranges. Mesozoic sedimentary rocks now in the subsurface record marine deposition. They are overlain by Tertiary strata reflecting marine, estuarine, and terrestrial conditions, which are in turn overlain by Quaternary fluvial and alluvial strata, recording uplift and erosion of the Sierra Nevada and Coast Ranges to approximately their present shape (Norris and Webb 1990:412–419; Bartow 1991:1).

Local Geology

The description of the local geology presented here is a summary of regional mapping done by Helley and Harwood (1985) and detailed mapping done by WLA in a series of technical memoranda that were included in the SGDR (URS 2010) as Appendix O, "Surficial Geologic Maps and Geomorphic Assessment of the Sutter Study Area, Urban Levee Geotechnical Evaluation, Sutter and Butte Counties, California." The WLA report is included in Appendix C, and reference to more detailed map units in that report are included here. In particular, WLA focused on more detailed mapping of late Holocene alluvium and geomorphic features.

The descriptions of geologic units below are presented in order of age from oldest to youngest and are shown in Plate 3.3-1.

Tuff Breccia: The Pliocene-Pleistocene tuff breccia (QTm) is made up of consolidated coarse material derived from the volcanic rocks of the Sutter Buttes. It occurs as a ring around the Sutter Buttes.

Riverbank Formation: The Quaternary Riverbank Formation (lower and upper members, Qrl and Qru) is made up of fan deposits formed from alluvium from the Sutter Buttes and Sierra Nevada during the late to middle Pleistocene (about 130,000 to 450,000 years ago). The Riverbank Formation is semi-consolidated, and its upper surface is marked by a soil hardpan (or duripan) layer that formed when the unit was an exposed land surface, and which was later covered by younger deposits. The Riverbank occurs in the shallow subsurface in much of the project area and is exposed near East Biggs.

Modesto Formation: The late Pleistocene Modesto Formation is divided into a lower (older) unit (42,000 to 29,000 years old, Qml) and an upper (younger) unit (24,000 to 12,000 years old, Qmu) (Helley and Harwood 1985). The lower unit consists of unconsolidated, slightly weathered gravel; sand; silt; and clay. The upper unit consists of sand, silt, and some gravel and has a moderate amount of secondary (pedogenic) clay accumulation. The Modesto Formation occurs in the project area along the margins of the Feather River and in a wide half-ring around the Sutter Buttes beyond the tuff breccia.

Basin, alluvial, and marsh deposits: The Holocene (less than 11,000 years old) basin and alluvial deposits (Qb; Qn in Appendix C) are widespread throughout the project area, are 4–8 feet thick, and overlie the Modesto Formation. Undifferentiated Quaternary alluvium (Qa; Qa or Ha in Appendix C) occurs along the Sutter Bypass and Feather River. Around the southwestern Sutter Buttes, this Holocene alluvium is mapped at the surface as alluvial-fan deposits, which likely consist of poorly sorted mixtures of fine gravel, sand, and silt derived from the volcanic rocks of the Buttes. The Quaternary marsh (Qm; Qs in Appendix C) deposits occur between the levees of the Sutter Bypass and are made up of fine-grained deposits. WLA distinguished these deposits from basin deposits because they were generally underwater or had standing water in historical 1937 photographs that were studied as part of their mapping.

Alluvial channels: Not mapped at the regional scale are the Holocene alluvial channels (Hch in Appendix C), which occur as a network of moderately sinuous channels with southwesterly orientations. The lower portions of the deposits are made up of relatively loose, coarse sand that fines upward into fine-grained silt and clay.

Historical alluvial channels: Also not mapped at the regional scale are the historical alluvial channels, which are less than 150 years old (Rch in Appendix C) and also occur as a network of moderately sinuous channels with southwesterly orientations.

Seismicity

The project area is located in a region of California characterized by relatively low seismic activity. The Uniform Building Code (UBC) recognizes no active seismic sources in the vicinity of the project area (International Conference of Building Officials 1997), and no active faults are known to cross the project area.

Primary Seismic Hazards

The State of California considers two aspects of earthquake events as primary seismic hazards: surface fault rupture (disruption at the ground surface as a result of fault activity) and seismic ground shaking.

Surface Fault Rupture

The project area is not located in an Alquist-Priolo Earthquake Fault Zone (Bryant and Hart 2007; California Division of Mines and Geology 2001), and no active faults were identified during the geologic evaluation (Jennings and Bryant 2010; U.S. Geological Survey 2009; International Conference of Building Officials 1997; California Geological Survey 2010a); therefore, the risk of surface fault rupture at the project area is considered low. The nearest active faults are the Foothills Fault System (northern reach section, Cleveland Hill fault), located 9 miles east of the project area, and the Green Valley fault zone (Green Valley fault), located 55 miles southwest of the project area (Plate 3.3-2).

Strong Ground Shaking

Unlike surface rupture, ground shaking is not confined to the trace of a fault but, rather, propagates into the surrounding areas during an earthquake. The intensity of ground shaking typically diminishes with distance from the fault, but ground shaking may be locally amplified and/or prolonged by some types of substrate materials.

Based on a probabilistic seismic hazard map that depicts the peak horizontal ground acceleration values exceeded at a 10% probability in 50 years (California Geological Survey 2007b; Cao et al. 2003), the probabilistic peak horizontal ground acceleration values for the project area are 0.1 to 0.2g (where g equals the acceleration of gravity) (Plate 3.3-3). As a point of comparison, probabilistic peak horizontal ground acceleration values for the San Francisco Bay Area range from 0.4g to more than 0.8g. This indicates that the ground-shaking hazard in the project area is low. Farther to the west, the ground shaking hazard increases, coinciding with the increase in abundance of associated faults and fault complexes (California Geological Survey 2007b; Cao et al. 2003).

Seismic deformation analyses were conducted for the project area to determine the amount of deformation that could occur during an earthquake and the post seismic flood protection that the levees would provide. The study used expected earthquake magnitudes (Mw) associated with the three return period events (Mw of 6.5 for 100-year return period event, Mw of 7.0 for 200-year return period event, and Mw of 8.0 for 500-year return period) and typical winter conditions (mean February water levels). Results of the study indicate that strong ground shaking would not compromise most levee reaches but some levee reaches could experience offset of up to 4.3 feet and a few could experience flow conditions (URS 2008:5-38–5-53).

Secondary Seismic Hazards

Secondary seismic hazards refers to seismically induced landsliding, liquefaction,[1] and related types of ground failure. As discussed in Section 3.3.2.1, *Regulatory Setting*, the State of California maps

[1] Liquefaction is a phenomenon in which the strength and stiffness of a soil are reduced by earthquake shaking or other rapidly applied loading. Liquefaction and related types of ground failure are of greatest concern in areas where well-sorted, sandy, unconsolidated sediments are present in the subsurface and the water table is comparatively shallow.

areas that are subject to secondary seismic hazards pursuant to the Seismic Hazards Mapping Act of 1990. The State of California has not yet published seismic hazard mapping in Sutter or Butte Counties under the Seismic Hazards Mapping Program (California Geological Survey 2009). These hazards are addressed briefly below based on available information.

Landslide and Other Slope Stability Hazards

Most of the project area is located on very gentle valley floor topography. Consequently, the potential for slope failure, including seismically induced landsliding, is low (Butte County 2010:295; City of Yuba City 2004:9–11).

There is the potential for slope instability associated with the levees in the project area. See Section 3.1, *Flood Control and Geomorphic Conditions*, for further information on levee stability.

Liquefaction

Liquefaction is the process in which soils and sediments lose shear strength and fail during seismic ground shaking. The vibration caused by an earthquake can increase pore pressure in saturated materials. If the pore pressure is raised to be equivalent to the load pressure, this causes a temporary loss of shear strength, allowing the material to flow as a fluid. This temporary condition can result in severe settlement of foundations and slope failure. The susceptibility of an area to liquefaction is determined largely by the depth to groundwater and the properties (e.g., grain size and density) of the soil and sediment within and above the groundwater. The sediments most susceptible to liquefaction are saturated, unconsolidated sand and silt within 50 feet of the ground surface (California Division of Mines and Geology 1997).

The potential for liquefaction in the project area varies by location. Although sandy units and shallow groundwater occur in much of the project area, particularly near the rivers, the risk of strong ground shaking is low (California Geological Survey 2003; Cao et al. 2003; City of Yuba City 2004:9–11). This condition would suggest a relatively low liquefaction hazard. However, according to the Butte County General Plan, much of the western and southwestern portions of the county have a moderate to high susceptibility to liquefaction.

In addition, geotechnical investigations of project area levees indicate that certain layers in the levees are susceptible to liquefaction. Detailed descriptions of the soil composition of the levees are provided in the Phase 1 Preliminary Geotechnical Evaluation Report (URS 2008:5-40–5-46).

Land Subsidence

Subsidence is the sinking of a large area of ground surface in which the material is displaced vertically downward, with little or no horizontal movement. Many areas in the Central Valley have experienced subsidence, most notably the San Joaquin Valley and Delta (Plate 3.3-4) (Faunt 2009:99). Subsidence occurs in primarily three ways: as a result of groundwater overdraft or oil and gas withdrawal, compaction and oxidation of peat soils, and hydrocompaction (U.S. Geological Survey 2000:1–2). Land subsidence as a result of groundwater overdraft is discussed briefly below. Land subsidence as a result of compaction and oxidation of peat soils and/or hydrocompaction are not significant concerns in the northern Sacramento Valley and are not further discussed.

Land subsidence as a result of groundwater overdraft occurs when excessive groundwater pumping depletes an aquifer and the semi-consolidated sediments of the aquifer collapse together, becoming compacted. This reduction in pore space (i.e., space between sediments that had been occupied by groundwater) is permanent and cannot be recovered (U.S. Geological Survey 2000:1–2).

The damaging effects of subsidence include gradient changes in roads, streams, canals, drains, sewers, and dikes. Many such systems are constructed with slight gradients and may be significantly damaged by even small elevation changes. Other damaging effects include damage to water wells resulting from sediment compaction and increased likelihood of flooding of low-lying areas (Butte County 2005).

Land subsidence is a potential hazard for the portions of Butte County located in the Sacramento Valley. Areas of potentially significant subsidence are shown in Figure 16-6 of the Butte County General Plan Technical Update, Background Report (Butte County 2005). The greatest potential subsidence areas are those where heavy groundwater withdrawal is occurring and in gas-producing areas. According to investigations by the U.S. Geological Survey (USGS), the areas of heaviest groundwater withdrawal extend about 2 miles north and south of Chico and in a 1-mile radius around Gridley. The amount of subsidence that could take place in the county depends primarily on the amount of groundwater overdraft (Butte County 2005).

Sutter County is not subject to significant subsidence. A number of the previously described factors needed to cause subsidence do not exist in Sutter County. The factors contributing to the low subsidence potential are as follows.

- Although Sutter County does contain several natural gas withdrawal locations in the western and southern portions of the county, these gas fields are spread out over a large area (not producing concentrated drawdowns) and do not individually generate a high volume of gas.
- Although Sutter County does have groundwater drawdowns for domestic and agricultural water supply, the subsurface geology of the county has a significant recharge capability from the Sacramento River, the Feather River ,and runoff from the Sierra Nevada snow melt.
- A large portion of Sutter County households (in Yuba City and Live Oak) do not rely on groundwater because the public water supply is delivered from surface withdrawal off the Feather River.
- Sutter County does not have oil withdrawal drawdowns (Sutter County 1996b*).*

However, Sutter County expects that subsidence could occur during prolonged periods of drought and where there is a significant increase in natural gas withdrawal.

Soils

Because of its large size, many soils occur in the project area; therefore, soil data are presented at the soil association level. Plate 3.3-5 shows the location and extent of the soil associations in the project area, and Table 3.3-1 provides general information on the soil associations. Hydric soils in the project area are addressed in Section 3.8, *Vegetation and Wetlands*.

An issue of concern in the project area is the shrink-swell potential of several of the soil series that make up the soil associations (Butte County 2010:294, 297; Sutter County 1996a:63; Natural Resources Conservation Service 2010a). Soils with a moderate to high shrink-swell potential, also known as expansive soils, expand and contract with changes in moisture content and therefore do not provide a suitable substrate for construction without modification. In the project area, expansive soils tend to occur in basins and basin rims with high clay content in Sutter County (Sutter County

1996a:63) and in level areas in the valley in Butte County. Examples of locations with expansive soils include the Oroville, Biggs, and Gridley areas (Butte County 2010:294, 297).

Table 3.3-1. General Characteristics of Soils in the Project Area

Soil Association	Landform	Typical Surface Layer Texture	Drainage Class	Slope (percent)	Shrink-Swell Potential
Olashes	Alluvial fans and fan terraces	Sandy loam	Very deep well drained	0 to 5	Low to moderate
Redding-Corning	Moderately deep to duripan, soils that formed in alluvium/gravelly alluvium	Gravelly loam	Well or moderately well drained/very deep, well or moderately well drained	0 to 30	Low to high/unknown
San Joaquin	Undulating low terraces	Sandy loam to loam	Well and moderately well drained	0 to 9	Low to high
Stockton-Clear Lake-Capay	Deep to duripan, soils that formed in alluvium/fine textured alluvium/ moderately fine and fine textured alluvium	Clay to clay loam/silty clay to clay/silty clay to clay	Somewhat poorly drained/very deep, poorly drained/very deep, moderately well drained	0 to 2/0 to 2	Unknown/ moderate to high
Stohlman-Palls	Residuum	Stony sandy loam	Well drained	9 to 50/9 to 60	Low
Subaco-Oswald-Gridley	Alluvium	Clay/clay loam	Moderately deep, somewhat poorly drained/moderately deep, poorly drained/ moderately deep, moderately well drained	0 to 2/ less than 1	Low to high/high/low to high
Sycamore-Shanghai-Nueva-Columbia	Alluvium	Silty clay loam/ silt loam/loam/ sandy loam	Very deep, somewhat poorly drained/very deep, somewhat poorly drained/very deep, moderately well drained	Nearly level/ 0 to 2/0 to 2/ 0 to 8	Unknown/low to high/low to moderate/low to high
Tisdale-Kilaga-Conejo	Alluvium	Clay to clay loam/loam to clay/clay loam	Moderately deep, well drained/deep and very deep, well drained/very deep, well drained	0 to 2/0 to 9	Low to moderate/ unknown/low to moderate
Vina-Brentwood	Alluvium/alluvial fans and flood plains	Loam/clay loam	Very deep, well drained/well to moderately well drained	0 to 9	Low/unknown

Source: Compilation of Natural Resources Conservation Service 2010a and 2010b.
Note: Data represent general characteristics and do not apply to every soil map unit in the series.

Mineral Resources

Regional

Mining in the project area dates back to the Gold Rush of the 1800s but is now limited to mainly small aggregate mines. The focus of this section is on aggregate resources, which are the primary mineral resource of economic importance in the project area. Aggregate resources are important because they are necessary for most construction, cannot be replaced with other products, and are most economical when used close to the area where they are mined because of the high cost of transportation (California Geological Survey 2007a:2).

The most notable aggregate production area in the vicinity of the project area is the Yuba-Marysville Production-Consumption (P-C) region, which extends from Marysville east into much of Yuba County (Plate 3.3-6). In all parts of California, except the Yuba-Marysville P-C region (Plate 3.3-7), the 50-year demand for aggregate resources exceeds the permitted aggregate resources. In contrast, the permitted aggregate material in the Yuba-Marysville P-C region exceeds the 50-year demand, and approximately 70% of its supply is exported to nearby counties, such as Sacramento and Placer Counties (California Geological Survey 2006:6).

Natural gas resources also occur and are extracted in the project area, particularly in Sutter County (Sutter County 1996a:50) (California Department of Conservation 2008:66, 2009:1), as do some gold mining operations (Butte County 2010:244). Producing natural gas wells are located primarily on the east side of the project area, predominantly in the vicinity of Sutter Buttes (Plate 3.3-8).

Local

The predominant mineral resources in Butte County are sand and gravel. Current mining activities occur primarily in a gravel belt that runs north–south through the center of the county. The sand and gravel are used, together with Portland cement or asphalt, for construction and road building. Historically, extensive sand and gravel mining also occurred along the Feather River, but most of those operations have ceased (Butte County 2010:243).

The State Geologist has not yet mapped mineral resources in Butte County, but several companies have petitioned to have properties mapped under SMARA. Butte County has three areas designated as mineral resources of statewide or regional importance (MRZ 2) and active aggregate mines (Plates 3.3-6 and 3.3-7). The Martin Marietta Materials Table Mountain Quarry is a basalt mine near Oroville and the M&T Chico Ranch is a previously proposed but nonoperational mine (Butte County 2010:245). The Power House Aggregate Project site was classified as MRZ 2 in December 2010. This site, which is located 7 miles south of Oroville between the east side of the Feather River and SR 70, was classified as MRZ 2 for Portland cement concrete-grade aggregate and contains resources in excess of the threshold value of $17,157,910 (2010 dollars) required for classification as MRZ 2 (State Mining and Geology Board 2010; California Geological Survey 2010b).

The State Geologist has not yet mapped mineral resources in Sutter County and there are no MRZs in the county.

There are no active mines or known minable mineral deposits in the incorporated cities of the project area. In addition, land use conflicts make the startup of new mining operations in urban areas generally unlikely.

3.3.3 Environmental Consequences

This section describes the environmental consequences relating to geology, soils, seismicity, and mineral resources for the proposed project. It describes the methods used to determine the effects of the project and lists the thresholds used to conclude whether an effect would be significant. The effects that would result from implementation of the project, findings with or without mitigation, and applicable mitigation measures are presented in a table under each alternative.

3.3.3.1 Assessment Methods

This evaluation of geology, soils, seismicity, and mineral resources is based on professional standards and information cited throughout the section. The key effects were identified and evaluated based on the environmental characteristics of the project area and the magnitude, intensity, and duration of activities related to the construction and operation of this project.

The following assumptions were made regarding project effects on geology, seismicity, soils and minerals in the project area.

- Fill or borrow material would be obtained from a quarry or other authorized (i.e., permitted) location.
- SBFCA would conform to the latest CBSC standards, city and county standards, and NPDES requirements.
- There are no active faults, potentially active faults, or Alquist-Priolo Earthquake Fault Zones located in or adjacent to the project area.
- The project would be located along the existing levee (i.e., no new alignments).
- No natural gas wells are in or near the construction footprint.
- The borrow excavation sites needed in addition to those listed in the project description would not require a SMARA permit because no royalty fees would be charged (as described in the borrow report [Wood Rodgers 2011]).

For mineral resources, it is important to note the difference between the terms *aggregate* and *borrow* as used in this report.

- The term *aggregate* refers to sand and gravel or crushed stone that meets standard specifications for use in Portland cement concrete or asphalt concrete (California Geological Survey 2006).
- The term *borrow* refers to the materials suitable for use in levee construction. The materials would be low to medium plasticity soils classified (ASTM D 2487) as silty sand and clayey sand, silt, or clay; have a liquid limit less than or equal to 45; have a plasticity index between 8 and 40; have a fines content of 30% or greater; be free from visible organics; and be no greater than 2 inches in any dimension (Wood Rodgers 2011). It is preferable that these would be obtained without royalty fees and therefore without the need for a SMARA.

Table 3.3-2 shows the estimated amount of aggregate and borrow needed for each alternative.

Table 3.3-2. Approximate Borrow and Aggregate Needs by Alternative

Alternative	Borrow Site Excavation (cubic yards)	Aggregate (tons)
1	1,902,150	109,000
2	7,245,200	87,125
3	1,934,400	105,900

Source: HDR and Wood Rodgers 2012.

Note: Excludes materials for through-seepage barrier at four locations, which would be the same under all project alternatives: 5th Street Bridge at station 1007+00 (Reach 16), SR 20 Bridge at station 1131+00 (Reach 18), East Gridley Road at station 1902+00 (transition between Reaches 30 and 31), and the UPRR crossing at station 1131+00 (Reach 18).

3.3.3.2 Determination of Effects

For this analysis, an effect pertaining to geology, seismicity, soils and minerals was analyzed under NEPA and CEQA if it would result in any of the following environmental effects, which are based on NEPA standards, State CEQA Guidelines Appendix G (14 CCR 15000 et seq.), and standards of professional practice.

- Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
  - Strong seismic ground shaking.
  - Seismic-related ground failure, including liquefaction.
  - Landslides.
- Result in substantial soil erosion or the loss of topsoil.
- Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse.
- Be located on expansive soil, creating substantial risks to life or property.
- Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state.
- Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other lands use plan.

The project area is not in an Alquist-Priolo Earthquake Fault Zone, and no active faults are located in or adjacent to the project area. In addition, the project would not include installation of septic systems or alternative wastewater disposal. Therefore, there is no need to address effects related to these two CEQA criteria.

3.3.4 Effects and Mitigation Measures

Effects and mitigation measure requirements concerning geology, soils, seismicity, and mineral resources are summarized in Table 3.3-3.

Table 3.3-3. Summary of Effects for Geology, Soils, Seismicity, and Mineral Resources

Effect	Finding	Mitigation Measures	With Mitigation
Alternatives 1, 2, and 3			
Effect GEO-1: Beneficial Change in Levee Stability	Beneficial	None required	Beneficial
Effect GEO-2: Increase Exposure of People or Structures to Hazards Related to Strong Seismic Ground Shaking	Less than significant	None required	Less than significant
Effect GEO-3: Cause Accelerated Erosion and Sedimentation Resulting from Construction-Related Ground Disturbance	Less than significant	None required	Less than significant
Effect GEO-4: Cause Structural Damage and Injury Resulting from Development on Expansive Soils	Less than significant	None required	Less than significant
Effect GEO-5: Cause Accelerated Erosion and Sedimentation Resulting from Use of Imported Borrow	Less than significant	None required	Less than significant
Effect GEO-6: Loss, Injury, or Death from Slope Failure at Borrow Sites	Less than significant	None required	Less than significant
Effect GEO-7: Cause the Loss of a Known Mineral Resource of Regional or Local Importance as a Result of Construction of Proposed Project	Less than significant	None required	Less than significant
Effect GEO-8: Cause the Loss of a Known Mineral Resource of Regional or Local Importance as a Result of Placement of Proposed Project	Less than significant	None required	Less than significant

3.3.4.1 No Action Alternative

The No Action Alternative represents the continuation of the existing deficiencies along the portion of the Feather River in the FRWLP area. Current levee operations and maintenance activities would continue, but there would be no change in the geomorphic and flood control regimes relative to existing conditions.

Without levee alternatives, there is the continued risk of levee failure, continued under-seepage and through-seepage, and loss of levee foundation soil. If a levee overtopping or breach were to occur, floodwaters would likely erode topsoil. A catastrophic levee failure could collapse miles of levee slopes, alter regional and local hydrology, and increase erosion and sedimentation. This condition would cause severe damage to soils and cause areas of scour holes, and eroded and unstable landforms. Moreover, subsequent flooding could occur prior to levee repairs that would result in additional erosion and loss of topsoil. It is assumed that these effects would be significant; however, given the uncertainty of the occurrence or magnitude of such an event, the effects cannot be quantified based on available information.

Furthermore, the beneficial effects of project implementation, such as improved levee stability and decreased levee bank erosion, would not be realized under the No Action Alternative.

3.3.4.2 Alternative 1

Implementation of Alternative 1 would potentially result in effects on geology, soils, seismicity, and mineral resources. These potential effects and related mitigation measure requirements are summarized in Table 3.3-4 and discussed below.

Table 3.3-4. Geology, Seismicity, Soils, and Mineral Resources Effects and Mitigation Measures for Alternative 1

Effect	Finding	Mitigation Measure	With Mitigation
Effect GEO-1: Beneficial Change in Levee Stability	Beneficial	None required	Beneficial
Effect GEO-2: Increase Exposure of People or Structures to Hazards Related to Strong Seismic Ground Shaking	Less than significant	None required	Less than significant
Effect GEO-3: Cause Accelerated Erosion and Sedimentation Resulting from Construction-Related Ground Disturbance	Less than significant	None required	Less than significant
Effect GEO-4: Cause Structural Damage and Injury Resulting from Development on Expansive Soils	Less than significant	None required	Less than significant
Effect GEO-5: Cause Accelerated Erosion and Sedimentation Resulting from Use of Imported Borrow	Less than significant	None required	Less than significant
Effect GEO-6: Loss, Injury, or Death from Slope Failure at Borrow Sites	Less than significant	None required	Less than significant
Effect GEO-7: Cause the Loss of a Known Mineral Resource of Regional or Local Importance as a Result of Construction of Proposed Project	Less than significant	None required	Less than significant
Effect GEO-8: Cause the Loss of a Known Mineral Resource of Regional or Local Importance as a Result of Placement of Proposed Project	Less than significant	None required	Less than significant

Effect GEO-1: Beneficial Change in Levee Stability

The proposed slurry cutoff walls and easements under Alternative 1 would improve the stability of the Feather River West Levee by reducing through- and under-seepage and the potential for seepage-related failures by reducing hydrostatic exit gradients (i.e., the average head loss per foot for seepage traveling upward through a blanket layer). These improvements would result in 200-year level of flood protection in urban areas and 100-year level of flood protection in rural areas in the project area. These improvements would be a beneficial effect.

Effect GEO-2: Increase Exposure of People or Structures to Hazards Related to Strong Seismic Ground Shaking

Although the risk of strong ground shaking in the project area is relatively low for California, a large earthquake on a nearby fault could cause ground shaking in the project area that could result in levee deformation, liquefaction, or secondary ground failure, such as, lateral spreading or differential settlement, which could result in structural loss, injury, and death.

Implementation of Alternative 1 would not substantially alter the overall composition of the levees or foundation soils. The risk associated with levee deformation would occur only when river levels were high and the potential for levee failure from ground shaking would depend on the degree of the levee saturation during an earthquake. High water levels and a high level of saturation would likely occur only during a major flood event. The probability that a large regional earthquake would occur during a major flood event is relatively low, but such coincidence is not impossible. In addition, the DWR Interim Levee Design Criteria require that if seismic damage is expected after all 200-year flood rehabilitation measures are in place, a post-earthquake remediation plan would be required for quickly restoring the levee system to a 10-year level of protection. If seismic damage to the levee system would be so significant and widespread that this would be infeasible within a few months, seismic strengthening may be required for 200-year certification. Nonetheless, because of the relatively small likelihood of such coincidental events, and because the expected magnitude of ground shaking from large regional earthquakes is relatively low in the project area, the potential for failure or damage of the slurry cutoff wall is considered less than significant. No mitigation is required.

Effect GEO-3: Cause Accelerated Erosion and Sedimentation Resulting from Construction-Related Ground Disturbance

The grading, trenching, clearing for slurry batch plant, and other earthwork that would be conducted during construction of Alternative 1 would result in substantial ground and vegetation disturbance. Although Alternative 1 would require the least amount of ground disturbance of all alternatives because it involves moving the least amount of material and has the smallest footprint, ground disturbances would increase the hazard of erosion and could temporarily increase erosion and sedimentation rates above existing levels. Because most of the earthwork would be conducted on and immediately adjacent to the levee, accelerated erosion and sedimentation resulting from construction-related ground and vegetation disturbance would not result in the loss of appreciable quantities of native topsoil resources. In addition, most ground-disturbing activities would occur during the typical construction season, when conditions are generally dry, further reducing the potential for construction-related erosion.

Site-specific measures that would control erosion would be described in more detail in the SWPPP, which is included in the environmental commitments of the proposed project, described in further detail in Section 2.4 of Chapter 2, *Alternatives*, and summarized in Section 3.2, *Water Quality and Groundwater Resources*. The SWPPP is a requirement of the NPDES General Permit.

With implementation of the SWPPP, erosion and sediment-related effects would be less than significant. No mitigation is required.

Effect GEO-4: Cause Structural Damage and Injury Resulting from Development on Expansive Soils

According to the Sutter and Butte County general plans (Butte County 2010:294, 297; Sutter County 1996a:63) and the Natural Resources Conservation Service (2010a), soils with moderate to high shrink-swell potential (soil expansiveness) occur in the project area, including the project corridor. If these soils occur in the project corridor or levees, they could lead to levee instability or surface cracking.

The design specifications for the slurry cutoff wall would consider the characteristics of the existing levee materials. During final design, if expansive or weak soils are documented onsite, modifications to the cutoff wall specifications would be made. In addition, materials used to construct the cutoff wall, whether local or imported, would be required to meet strict material specifications (URS 2012). Also, materials used to cap the levees would be required to have a low plasticity so that the material does not crack over time. The effect of expansive soils would therefore be less than significant. No mitigation is required.

Effect GEO-5: Cause Accelerated Erosion and Sedimentation Resulting from Use of Imported Borrow

Excavation of borrow material at offsite locations could cause accelerated erosion and loss of topsoil. Alternative 1 would require the least amount of borrow (Table 3.3-2), because it would not involve any levee expansion. As described in Chapter 2, *Alternatives,* SBFCA's first choice for borrow material would be from a local commercial quarry or other permitted source. In the event that material is desired from a source that is not presently permitted, for reasons such as quality, proximity, or volume available, SBFCA would implement soil supply protection measures, such as maximizing onsite use through gradation, placement, and treatment and preserving and replacing topsoil at borrow sites, so that they could be continued to be used for their current use or otherwise returned to their pre-project condition. As part of borrow operations, the upper 12 inches of topsoil would be set aside and replaced after project construction in each construction season. After the project is completed, the borrow site would be re-contoured and reclaimed. If necessary, an additional measure would be independent environmental documentation and regulatory compliance, as required. Specific regulations related to soil resources are detailed in Section 3.3.2.1, *Regulatory Setting*. Project design would reduce effects to a less-than-significant level. No mitigation is required.

Effect GEO-6: Loss, Injury, or Death from Slope Failure at Borrow Sites

Excavation of borrow material could result in failure of cut slopes, potentially causing injury or death of workers at the construction sites. Soils and sediments, especially those consisting of loose alluvium, would be particularly prone to failure and movement.

Excavations in borrow areas would be designed to avoid excessive ground movements on adjacent areas and areas would be free draining after excavation (i.e., no standing water at the bottom of the excavation).

SBFCA would ensure that geotechnical design recommendations are included in the design of project facilities and construction specifications to minimize the potential effects from failure of excavations. SBFCA would also ensure that the design specifications are properly executed and that all California Division of Occupational Safety and Health regulations are followed during construction.

Adherence to these and other applicable design specifications and standards would ensure that the hazard of failure of excavations and settlement would be controlled to a safe level. This effect would be less than significant. No mitigation is required.

Effect GEO-7: Cause the Loss of a Known Mineral Resource of Regional or Local Importance as a Result of Construction of Proposed Project

Construction of Alternative 1 would require large amounts of aggregate[2] (Table 3.3-2), including important mineral resources like bentonite for the slurry cutoff wall and aggregate base rock for the top of the levee surface. Because aggregate is an important building material, and its availability can affect a region's potential for development. However, the project area is located in a region with a permitted aggregate supply that exceeds its expected need over the next 50 years. The amount of aggregate needed for the project is therefore not expected to substantially affect the availability of this resource. In addition, bentonite is not a locally mined mineral resource. This effect is therefore less than significant. No mitigation is required.

Effect GEO-8: Cause the Loss of a Known Mineral Resource of Regional or Local Importance as a Result of Placement of Proposed Project

The placement of a structure can preclude the mining of a local mineral, making that mineral resource unavailable if the land uses are incompatible. However, the project does not propose construction of new levees and would not interfere with access to permitted mineral resources. In addition, there are no permitted mineral resource extraction mines or MRZs in the project corridor. There would therefore be no effect on the availability of aggregate resources. No mitigation is required.

3.3.4.3 Alternative 2

Implementation of Alternative 2 would potentially result in effects on geology, soils, seismicity, and mineral resources. These potential effects and related mitigation measure requirements are summarized in Table 3.3-5 and discussed below.

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[2] Borrow is not considered a mineral resource because it does not fall under SMARA.

Table 3.3-5. Geology, Seismicity, Soils, and Mineral Effects and Mitigation Measures for Alternative 2

Effect	Finding	Mitigation Measure	With Mitigation
Effect GEO-1: Beneficial Change in Levee Stability	Beneficial	None required	Beneficial
Effect GEO-2: Increase Exposure of People or Structures to Hazards Related to Strong Seismic Ground Shaking	Less than significant	None required	Less than significant
Effect GEO-3: Cause Accelerated Erosion and Sedimentation Resulting from Construction-Related Ground Disturbance	Less than significant	None required	Less than significant
Effect GEO-4: Cause Structural Damage and Injury Resulting from Development on Expansive Soils	Less than significant	None required	Less than significant
Effect GEO-5: Cause Accelerated Erosion and Sedimentation Resulting from Use of Imported Borrow	Less than significant	None required	Less than significant
Effect GEO-6: Loss, Injury, or Death from Slope Failure at Borrow Sites	Less than significant	None required	Less than significant
Effect GEO-7: Cause the Loss of a Known Mineral Resource of Regional or Local Importance as a Result of Construction of Proposed Project	Less than significant	None required	Less than significant
Effect GEO-8: Cause the Loss of a Known Mineral Resource of Regional or Local Importance as a Result of Placement of Proposed Project	Less than significant	None required	Less than significant

Effect GEO-1: Beneficial Change in Levee Stability

The proposed combination of seepage and stability berms, shallow cutoff wall, infilling of the canal adjacent to portions of the levee, and relief wells under Alternative 2 would improve the stability of the Feather River West Levee by reducing through- and under-seepage and improving levee geometry. As with Alternative 1, these improvements would result in 200-year level of flood protection in urban areas and 100-year level of flood protection in rural areas in the project area. These improvements would be a beneficial effect.

Effect GEO-2: Increase Exposure of People or Structures to Hazards Related to Strong Seismic Ground Shaking

Although the risk of strong ground shaking in the project area is relatively low for California, a large earthquake on a nearby fault could cause ground shaking in the project area that could cause levee deformation, liquefaction, or secondary ground failure, such as, lateral spreading or differential settlement, which could result in structural loss, injury, and death.

The effects related to ground shaking under Alternative 2 would be similar to those of Alternative 1, in that neither would affect the overall composition of the existing levee or foundation soils. However, the seepage and stability berms would add greater mass to the levee, which could make it more resistant to deformation. In addition, the materials used in these berms would be less susceptible to ground failure because they would be designed to modern building codes. The effect would be less that significant. No mitigation is required.

Effect GEO-3: Cause Accelerated Erosion and Sedimentation Resulting from Construction-Related Ground Disturbance

The grading, trenching, clearing for slurry batch plant, and earthwork associated with building the seepage and stability berms that would be conducted during construction of Alternative 2 would result in substantial ground and vegetation disturbance. Alternative 2 would likely require the greatest amount of ground disturbance of all project alternatives because it has the largest construction footprint as a result of the seepage and stability berms. As with Alternative 1, these ground disturbances would increase the hazard of erosion and could temporarily increase erosion and sedimentation rates above existing levels. Although these effects would be of a greater magnitude than under Alternative 1, because of the project design they would be less than significant. No mitigation is required.

Effect GEO-4: Cause Structural Damage and Injury Resulting from Development on Expansive Soils

The effects related to expansive soil under Alternative 2 would be similar to those described for Alternative 1. As with Alternative 1, design specifications would take into consideration the existing levee materials. The effect of expansive soils would be less than significant. No mitigation is required.

Effect GEO-5: Cause Accelerated Erosion and Sedimentation Resulting from Use of Imported Borrow

The effects related to accelerated erosion and loss of topsoil under Alternative 2 would be similar to those described for Alternative 1 but of greater magnitude because more borrow would be required (Table 3.3-2). Alternative 2 would require the greatest amount of borrow because it would involve seepage and stability berms. Although Alternative 2 would require the use of more borrow materials, project design would reduce effects to a less-than-significant level. No mitigation is required.

Effect GEO-6: Loss, Injury, or Death from Slope Failure at Borrow Sites

The effects related to slope failure at borrow sites under Alternative 2 would be similar to those described for Alternative 1 but of greater magnitude. As with Alternative 1, adherence to applicable design specifications and standards would ensure that the hazard of failure of excavations and settlement would be controlled to a safe level. This effect would be less than significant. No mitigation is required.

Effect GEO-7: Cause the Loss of a Known Mineral Resource of Regional or Local Importance as a Result of Construction of Proposed Project

The effects related to loss of important mineral resources as a result of construction under Alternative 2 would be the same as described for Alternative 1 but of lesser magnitude because less aggregate would be required (Table 3.3-2). This effect would be less than significant. No mitigation is required.

Effect GEO-8: Cause the Loss of a Known Mineral Resource of Regional or Local Importance as a Result of Placement of Proposed Project

The effects related to loss of important mineral resources as a result of placement of Alternative 2 would be the same as described for Alternative 1. This effect would be less than significant. No mitigation is required.

3.3.4.4 Alternative 3

Implementation of Alternative 3 would potentially result in effects on geology, soils, seismicity, and mineral resources. These potential effects and related mitigation measure requirements are summarized in Table 3.3-6 and discussed below.

Table 3.3-6. Geology, Seismicity, Soils, and Mineral Effects and Mitigation Measures for Alternative 3

Effect	Finding	Mitigation Measure	With Mitigation
Effect GEO-1: Beneficial Change in Levee Stability	Beneficial	None required	Beneficial
Effect GEO-2: Increase Exposure of People or Structures to Hazards Related to Strong Seismic Ground Shaking	Less than significant	None required	Less than significant
Effect GEO-3: Cause Accelerated Erosion and Sedimentation Resulting from Construction-Related Ground Disturbance	Less than significant	None required	Less than significant
Effect GEO-4: Cause Structural Damage and Injury Resulting from Development on Expansive Soils	Less than significant	None required	Less than significant
Effect GEO-5: Cause Accelerated Erosion and Sedimentation Resulting from Use of Imported Borrow	Less than significant	None required	Less than significant
Effect GEO-6: Loss, Injury, or Death from Slope Failure at Borrow Sites	Less than significant	None required	Less than significant
Effect GEO-7: Cause the Loss of a Known Mineral Resource of Regional or Local Importance as a Result of Construction of Proposed Project	Less than significant	None required	Less than significant
Effect GEO-8: Cause the Loss of a Known Mineral Resource of Regional or Local Importance as a Result of Placement of Proposed Project	Less than significant	None required	Less than significant

Effect GEO-1: Beneficial Change in Levee Stability

The combination of proposed levee improvement measures under Alternative 3 would improve the stability of the Feather River West Levee by reducing through- and under-seepage and improving levee geometry. As with Alternatives 1 and 2, these improvements would result in 200-year level of flood protection in urban areas and 100-year level of flood protection in rural areas in the project area. These improvements would be a beneficial effect.

Effect GEO-2: Increase Exposure of People or Structures to Hazards Related to Strong Seismic Ground Shaking

The effects related to risk of strong ground shaking under Alternative 3 would be the same as those described for Alternatives 1 and 2. The effect would be less that significant. No mitigation is required.

Effect GEO-3: Cause Accelerated Erosion and Sedimentation Resulting from Construction-Related Ground Disturbance

The effects related to accelerated erosion and sedimentation under Alternative 3 would be the same as those described for Alternatives 1 and 2. As under Alternatives 1 and 2, because of the project design effects under Alternative 3 would be less than significant. No mitigation is required.

Effect GEO-4: Cause Structural Damage and Injury Resulting from Development on Expansive Soils

The effects related to expansive soil under Alternative 3 would be similar to those described for Alternatives 1 and 2. As with those alternatives, design specifications would take into consideration the existing levee materials. The effect of expansive soils would be less than significant. No mitigation is required.

Effect GEO-5: Cause Accelerated Erosion and Sedimentation Resulting from Use of Imported Borrow

The effects related to accelerated erosion and loss of topsoil under Alternative 3 would be similar to those described for Alternatives 1 and 2. Alternative 3 would require slightly more borrow than Alternative 1 but significantly less than Alternative 2 (Table 3.3-2). Project design would reduce effects to a less-than-significant level. No mitigation is required.

Effect GEO-6: Loss, Injury, or Death from Slope Failure at Borrow Sites

The effects related to slope failure at borrow sites under Alternative 3 would be the same as those described for Alternatives 1 and 2. As with those alternatives, adherence to applicable design specifications and standards would ensure that the hazard of failure of excavations and settlement would be controlled to a safe level. This effect would be less than significant. No mitigation is required.

Effect GEO-7: Cause the Loss of a Known Mineral Resource of Regional or Local Importance as a Result of Construction of Proposed Project

The effects related to loss of important mineral resources as a result of construction under Alternative 3 would be the same as described for Alternatives 1 and 2 because similar amounts of aggregate would be required (Table 3.3-2). This effect would be less than significant. No mitigation is required.

Effect GEO-8: Cause the Loss of a Known Mineral Resource of Regional or Local Importance as a Result of Placement of Proposed Project

The effects related to loss of important mineral resources as a result of placement of Alternative 3 would be the same as described for Alternatives 1 and 2. This effect would be less than significant. No mitigation is required.

3.4 Traffic, Transportation, and Navigation

3.4.1 Introduction

This section describes the regulatory and environmental setting for traffic, transportation, and navigation; effects on traffic, transportation, and navigation that would result from the No Action Alternative and Alternatives 1, 2, and 3; and mitigation measures that would reduce significant effects.

3.4.2 Affected Environment

This section describes the affected environment for traffic, transportation, and navigation in the project area. The key sources of data and information used in the preparation of this section are listed below.

- Butte County General Plan 2030 (Butte County 2010).
- Butte County General Plan Draft EIR (Butte County 2010b).
- California Department of Transportation (Caltrans) Traffic and Vehicle Data Systems Unit, 2010 All Traffic Volumes on CSHS (California Department of Transportation 2010a).
- City of Biggs General Plan 1997–2015 (City of Biggs 1998).
- City of Gridley 2030 General Plan (City of Gridley 2010).
- City of Live Oak 2030 General Plan (City of Live Oak 2010).
- City of Yuba City General Plan (City of Yuba City 2004).
- Sutter County General Plan Update Technical Background Report (Sutter County 2008).
- Sutter County General Plan (Sutter County 2011).

3.4.2.1 Terminology

Following are definitions of key traffic and transportation terms used in this section.

- **Level of service (LOS):** A scale used to determine the operating quality of a roadway segment or intersection based on volume-to-capacity (V/C) ratios or average delay experienced by vehicles on the facility. The levels range from A to F with LOS A representing free-flow traffic and LOS F representing severe traffic congestion. Agencies adopt LOS standards that define the level of operations that are acceptable within their jurisdictions.
- **V/C ratio:** The number of vehicles that travel on a transportation facility divided by the vehicular capacity of that facility (the number of vehicles the facility was designed to convey).
- **Delay:** The additional travel time experienced by a vehicle or traveler because of inability to travel at optimal speed and/or stops due to congestion or traffic control.
- **Average daily traffic (ADT):** Average traffic volume on a roadway section during a typical 24-hour day.

3.4.2.2 Regulatory Setting

This section summarizes key Federal and state regulatory information that applies to traffic, transportation, and navigation. Additional regulatory information appears in Appendix A.

Federal

Federal Highway Administration standards are implemented in California by Caltrans, which is responsible for planning, designing, constructing, operating, and maintaining all state-owned roadways in the planning area. Caltrans also enforces various policies and regulations related to the modification of, or encroachment on, state-owned roadways.

River and Harbors Appropriation Act of 1899

The River and Harbors Appropriation Act of 1899 addresses activities that involve the construction of dams, bridges, dikes, and other structures that cross any navigable water; that place obstructions to navigation outside established Federal lines; and that excavate from or deposit material in such waters. Such activities require permits from USACE. *Navigable waters* are defined in Section 329.4 as:

> Those waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. A determination of navigability, once made, applies laterally over the entire surface of the water body, and is not extinguished by later actions or events which impede or destroy navigable capacity.

In USACE Sacramento District, navigable waters of the United States in the project vicinity that are subject to the requirements of the River and Harbors Appropriation Act include the Feather River from its mouth to the railroad bridge at Marysville (U.S. Army Corps of Engineers 2003). The section of the River and Harbors Act applicable to the proposed project is summarized below.

Section 10

Section 10 (33 USC 403) prohibits the unauthorized obstruction or alteration of any navigable water of the United States. This section provides that the construction of any structure in or over any navigable water of the United States, or the accomplishment of any other work affecting the course, location, condition, or physical capacity of such waters, is unlawful unless the work has been authorized by the Chief of Engineers.

State

Federal highway standards are implemented in California by Caltrans, which is responsible for planning, designing, constructing, operating, and maintaining all state-owned roadways in the planning area. Caltrans enforces various policies and regulations related to the modification of, or encroachment on, state-owned roadways.

Caltrans Route Concept Reports

Caltrans has completed route concept reports for SR 20 and SR 99. These reports identify long-range improvements and establish the "concept"—or desired—LOS for specific corridor segments. These reports identify long-range improvements needed to bring the existing facilities up to the expected standards needed to adequately serve 20-year traffic forecasts. Additionally, the reports identify the ultimate design concept for conditions beyond the immediate 20-year design period (California Department of Transportation 2009, 2010b).

Local

Transportation analysis in the affected area is guided by policies and standards set by local jurisdictions. Because the affected area is located in Sutter and Butte Counties, planning would adhere to the adopted county and city transportation policies in the respective general plans. A summary of the goals and policies adopted by Sutter County, Butte County, City of Yuba City, City of Live Oak, City of Biggs, and City of Gridley in relation to transportation is provided in Appendix A.

LOS is a measure by which the quality of service on roads or intersections is determined and classified. Table 3.4-1 provides definitions for each level of service used in the affected area.

Table 3.4-1. Level of Service Definitions

Level of Service	Definition
A	Complete free flow.
B	Free flow, presence of other vehicles noticeable.
C	Ability to maneuver and select operating speed affected.
D	Unstable flow, speeds, and ability to maneuver restricted.
E	At or near capacity, flow quite unstable.
F	Forced flow, breakdown.

3.4.2.3 Environmental Setting

This section discusses the existing conditions related to traffic in the project area, as well as roadways that may provide access to the project area during construction. The project area is bounded by the Feather River to the east and a 500-foot buffer from the Feather River levee to the west. The area is predominantly rural with agricultural uses.

Roadways

Butte County

The Butte County portion of the project area is served primarily by rural roadways. SR 99 is the main highway that provides access to the project area, running north/south to the west of the project area. The highway segments that may provide access to the project area are listed in Table 3.4-2 with their roadway type, ADT, and LOS.

Table 3.4-2. Butte County Highway Segments that Provide Access to the Project Area

Road	From	To	Roadway Type	ADT	LOS
SR 99	Sutter County Line	Live Oak Gridley Road	Two-lane arterial	14,900	D
	Live Oak Gridley Road	Archer Avenue	Two -lane arterial	18,100	E
	Archer Avenue	Wilson Street	Four-lane undivided arterial	18,500	D
	Wilson Street	Spruce Street	Four-lane undivided arterial	22,200	D
	Spruce Street	East Biggs Highway	Major two-lane highway	14,500	D
	East Biggs Highway	Junction Route 162 West	Major two-lane highway	10,900	D
	Junction Route 162 West	Junction Route 162 East	Major two-lane highway	10,700	D
	Junction Route 162 East	Study area boundary	Major two-lane highway	10,000	D

Source: California Department of Transportation 2010a.
ADT = average daily traffic; LOS = level of service; SR = State Route.

County and local roads that would provide access to the project area are listed in Table 3.4-3. Butte County does not have LOS A and LOS B thresholds for arterial roads; accordingly, LOS C is the best LOS designation provided.

Table 3.4-3. County and Local Roads in Butte County that Provide Access to the Project Area

Road	From	To	Roadway Type	ADT	LOS
East Biggs Highway	Biggs	SR 99	Two-lane arterial	2,000	C
	SR 99	Larkin Road	Two-lane arterial	2,500	C
East Gridley Road	SR 99	Larkin Road	Two-lane arterial	5,510	C
	Larkin Road	SR 70	Two-lane arterial	5,500	C
Larkin Road	SR 162	East Hamilton Road	Two-lane arterial	3,580	C
	East Hamilton Road	East Biggs Highway	Two-lane arterial	1,000	C
	East Biggs Highway	Gridley Highway	Two-lane arterial	500	C
	Gridley Highway	East Evans Reimer Road	Two-lane arterial	2,500	C

Source: Butte County 2010b.
ADT = average daily traffic; LOS = level of service; SR = State Route.

Local roads in Butte County that would provide access to the project area but have no traffic data available include Chandon Avenue, Campbell Avenue, East Evans Reimer Road, Richards Avenue, Kirk Road, Keifer Avenue, East Gridley Road, Almond Avenue, Palm Avenue, Cherry Avenue, Vance Avenue, and two unnamed roads.

Sutter County

The Sutter County portion of the project area is served by a system of primarily rural roadways. SR 99 is the main highway that serves the project area, with SR 20 also providing access. SR 99 runs primarily north/south to the west of the project area, and SR 20 runs east/west through Yuba City. The highway segments that may provide access to the project area are listed in Table 3.4-4 with their roadway type, ADT, and LOS. All highway segments in the Sutter County portion of the project area have an LOS standard of E. As Sutter County does not provide LOS thresholds for A and B, highway segments with an LOS better than C are designated A/B.

Table 3.4-4. Sutter County Highway Segments that Provide Access to the Project Area

Road	From	To	Roadway Type	ADT	LOS
SR 20	Junction SR 99	Live Oak Boulevard	Four-lane expressway	41,750	C
	Live Oak Boulevard	Plumas Street	Four-lane expressway	43,000	D
	Plumas Street	Sutter Street	Four-lane expressway	38,000	C
	Sutter Street	Yuba County Line	Four-lane expressway	41,000	C
SR 99	Garden Highway	Sacramento Avenue	Four-lane expressway	16,100	A/B
	Sacramento Avenue	Tudor Road/Garden Highway	Four-lane expressway	15,800	A/B
	Tudor Road/Garden Highway	Junction SR 113	Four-lane expressway	13,200	A/B
	Junction SR 113	Oswald Road	Four-lane expressway	15,400	A/B
	Oswald Road	Barry Road	Four-lane expressway	17,200	A/B
	Barry Road	Bogue Road	Four-lane expressway	18,500	A/B
	Bogue Road	Lincoln Road	Four-lane expressway	23,200	A/B
	Lincoln Road	Franklin Road	Four-lane expressway	29,000	A/B
	Franklin Road	Bridge Street	Four-lane expressway	33,000	C
	Bridge Street	Onstott Road	Four-lane expressway	29,500	C
	Onstott Road	Junction SR 20	Four-lane expressway	29,500	C
	Junction SR 20	Queens Avenue	Four-lane freeway	20,500	A/B
	Queens Avenue	Eager Road	Four-lane freeway	19,400	A/B
	Eager Road	End of freeway	Four-lane freeway	17,000	A/B
	End of freeway	Encinal/Live Oak Boulevard	Two-lane rural	17,000	E
	Encinal/Live Oak Boulevard	Pennington Road	Two -lane rural	19,200	E
	Pennington Road	Live Oak City Limit	Two-lane rural	18,700	E
	Live Oak City Limit	Butte County Line	Two-lane rural	14,900	D

Source: California Department of Transportation 2010a.
ADT = average daily traffic; LOS = level of service; SR = State Route.

County and local roads that would provide access to the project area are listed in Table 3.4-5. As Sutter County does not provide LOS thresholds for A and B, road segments with an LOS better than C are designated A/B. As noted in the table, some ADTs are from the City of Yuba City General Plan.

Table 3.4-5. County and Local Roads in Sutter County that Provide Access to the Project Area

Road Name	From	To	Roadway Type	ADT	LOS
2nd Street	B Street	Franklin Road	Two-lane minor arterial	13,240*	C*
Bogue Road	SR 99	Railroad Avenue	Two-lane rural collector	5,860*	B*
Bridge Street	Clark Avenue	Plumas Street	Two-lane major arterial	18,130*	C*
	East of 2nd Street	Twin Cities Bridge	Two-lane minor arterial	22,000*	F*
Franklin Road	Gray Avenue	Clark Avenue	Two-lane minor arterial	12,920*	C*
	Park Avenue	Percy Avenue	Two-lane minor arterial	8,320*	B*
Garden Highway	Stewart Road	Messick Road	Two-lane rural collector	5,230	A/B
	Messick Road	O'Banion Road	Two-lane rural collector	4,290	A/B
	O'Banion Road	SR 99	Two-lane rural collector	4,280	A/B
	SR 99	Catlett Road	Two-lane rural collector	520	A/B
Larkin Road	Butte County Line	Live Oak City Limit	Two-lane rural collector	2,990	A/B
	Live Oak City Limit	Paseo Avenue	Two-lane rural collector	1,500	A/B
	Paseo Avenue	Clark Road	Two-lane rural collector	1,500	A/B
	Clark Road	Encinal Road	Two-lane rural collector	1,450	A/B
	Encinal Road	Eager Road	Two-lane rural collector	150	A/B
Lincoln Road	Clements Road	Township Road	Two-lane rural collector	560	A/B
	Township Road	George Washington Boulevard	Two-lane rural collector	1,040	A/B
	George Washington Boulevard	Sanborn Road	Two-lane rural collector	3,670	A/B
Live Oak Boulevard	SR 99	Yuba City city limit	Two-lane rural collector	6,620	A/B
	Pease Road	Northgate Drive	Two-lane minor arterial	7,910*	C*
Market Street	Lynn Way	Ainsley Avenue	Two-lane minor arterial	7,580*	B*
Queens Avenue	Clark Avenue	Live Oak Boulevard	Two-lane minor arterial	8,420*	B*
Railroad Avenue	Bogue Road	Stewart Road	Three-lane urban collector	2,250	A/B
	Stewart Road	Barry Road	Three-lane urban collector	1,320	A/B
	Barry Road	Oswald Road	Two-lane rural collector	1,050	A/B

Sources: Sutter County 2008; City of Yuba City 2004.
* From City of Yuba City General Plan (2004).
ADT = average daily traffic; LOS = level of service; SR = State Route.

Local roads in Sutter County that would provide access to the project area but have no traffic data available are Laurel Avenue, Oak Avenue, Cypress Avenue, Central Avenue, Wilkie Avenue, Tudor Road, Star Bend Road, O'Banion Road, Messick Road, Oswald Road, Barry Road, Shanghai Bend Road, Sutter Street, Teegarden Avenue, Del Norte Avenue, Von Geldern Way, Queens Avenue, Market Street, Lynn Way, Northgate Drive, Pease Road, Eager Road, Rednall Road, Morse Road, Clark Road, Kent Avenue, Koch Lane, Hermanson Street, Bridgeford Road, Paseo Avenue, Bishop Avenue, Archer Avenue, Pennington Road, Metteer Road, Cooley Road, Riviera Road, Campbell Road, and six unnamed roads.

Navigation

Navigation in the project area is confined to the Feather River, which runs adjacent to the project levees on their eastern side. The Feather River is considered navigable for the 28 miles from the mouth of the river to the railroad bridge at Marysville. The width and depth of the river vary greatly, and traffic is limited to recreational watercraft. There are no marinas or boat ramps in the project area. However, Yuba City has a boat ramp between the levee and the river, where the levee is set back several hundred feet from the water, and there is also a boat ramp at the end of Pennington Road that is between the project area and the river.

3.4.3 Environmental Consequences

This section describes the environmental consequences of the proposed project relating to traffic, transportation, and navigation. It describes the methods used to determine the effects of the project and lists the thresholds used to conclude whether an effect would be significant. The effects that would result from implementation of the project, findings with or without mitigation, and applicable mitigation measures are presented in a table under each alternative.

3.4.3.1 Assessment Methods

This evaluation of traffic, transportation, and navigation is based on professional standards and information cited throughout the section. The key effects were identified and evaluated based on the environmental characteristics of the project area and the magnitude, intensity, and duration of activities related to the construction and operation of this project. The proposed project would construct levee alternatives along a section of the Feather River West Levee, which would require the hauling of material from nearby borrow sites described in Chapter 2, *Alternatives*. For all three alternatives, hauling of material from different borrow sites could occur simultaneously. Because of the earthwork involved and the need for material deliveries from borrow sites, construction would intermittently generate substantial volumes of traffic. Once the construction is completed, operation and maintenance activities would not generate traffic levels higher than current conditions. Analysis of traffic effects therefore concentrates on the construction of levee alternatives.

Project activities were analyzed according to truck and worker trip effects on roadway operation and circulation. This analysis used estimated construction traffic generation (expressed as average trips per day) to develop a quantitative evaluation of short-term effects on the local and regional roadways in the project vicinity. Based on preliminary construction information provided by the HDR/Wood Rodgers design team in its January 17, 2012, technical memo regarding the Feather River West Levee project description, the phase of construction involving the importation of borrow material would have the highest amount of traffic trips and therefore would represent the maximum daily trips that would occur during construction. Daily truck trips required to import fill materials are estimated based on a typical capacity of 12 cubic yards per truck. Because of their size and slow acceleration, each dump truck was estimated to have a passenger-car equivalent of 1.5 when calculating estimated maximum daily truck trips. Each truck and each worker would generate two construction-related trips. For each construction contract of the project (A through D), the total daily borrow site truck trips and worker trips were added to the main haul route that would be used to access each of the four construction contracts and the access roads for each individual reach. The total truck trips and worker trips then were divided equally among the levee access roadways that would be used to access the project construction areas from the main haul route.

Table 3.4-6 shows the projected main haul route and secondary levee access route roadways for each construction contract. These haul routes were identified based on professional judgment to perform an initial review of effects. These haul routes would be applied identically to each alternative.

Table 3.4-6. Haul Routes by Construction Contract

Construction Contract (Reaches)	Main Haul Route(s)	Secondary Levee Access Route Roadways
A (2–5)	SR 99	Laurel Avenue
		Oak Avenue
		Cypress Avenue
		Central Avenue
		Tudor Road–Garden Highway–Wilkie Avenue
B (6–12)	SR 99	Tudor Road–Garden Highway–Wilkie Avenue
		Tudor Road–Garden Highway–Starbend Road
		O'Banion Road–Garden Highway–Unnamed Road
		Messick Road–Garden Highway–Unnamed Road
		Messick Road–Garden Highway–Unnamed Road
		Oswald Road–Garden Highway–Unnamed Road
		Barry Road–Garden Highway–Unnamed Road
C (13–25)	SR 99	Bogue Road–Garden Highway–Shanghai Bend Road
		Franklin Avenue–Garden Highway–2nd Street
		Bridge Street–Twin Cities Memorial Bridge
		SR 20–Sutter Street–Teegarden Avenue
		SR 20–Live Oak Blvd–Del Norte Avenue–Sutter Street–Von Geldern Way
		Queens Avenue–Market Street–Lynn Way
		Northgate Drive
		Pease Road–Live Oak Boulevard
		Eager Road–Live Oak Boulevard–Rednall Road
		Eager Road–Live Oak Boulevard–Unnamed Road
		Morse Road
	SR 99	Clark Road–Kent Avenue–Koch Lane
		Clark Road–Kent Avenue–Hermanson Street
		Clark Road–Kent Avenue–Bridgeford Road
		Paseo Avenue
		Bishop Avenue
		Archer Avenue
		Pennington Road
		Pennington Road–Metteer Road–Cooley Road
	Larkin Road	Riviera Road–Metteer Road–Campbell Road

Construction Contract (Reaches)	Main Haul Route(s)	Secondary Levee Access Route Roadways
D (26–41)	Larkin Road	Chandon Avenue
		Campbell Avenue
		East Evans Reimer Road
		Richards Avenue–Kirk Road–Keifer Avenue
		East Gridley Road
		Unnamed Road
		Almond Avenue
		Palm Avenue
		Cherry Avenue
		Vance Avenue
		Unnamed Road

SR = State Route.

Table 3.4-7 shows the estimated maximum daily construction traffic for the proposed project for each of the main haul route segments for each alternative and the secondary individual levee access road traffic increases. These estimates include haul truck trips to and from borrow sites as well as worker trips to and from the project site. As stated above, truck trips are multiplied by 1.5, and total vehicle trips are divided equally among the secondary levee access road segments.

Table 3.4-7. Maximum Daily Construction Traffic Increases by Alternative and Construction Contract

Alternative (Construction Contract)	Main Haul Route Truck Trips	Main Haul Route Worker Trips	Main Haul Route Total Trips	Secondary Levee Access Route Total Trips
1(A)	1,017	250	1,267	254
1(B)	2,490	240	2,730	390
1(C)	1,022	320	1,342	67
1(D)	917	320	1,237	112
2(A)	2,394	410	2,804	561
2(B)	4,025	400	4,425	632
2(C)	3,725	420	4,145	207
2(D)	813	320	1,133	103
3(A)	1,382	250	1,632	326
3(B)	2,097	240	2,337	334
3(C)	1,022	320	1,342	67
3(D)	917	320	1,237	112

3.4.3.2 Determination of Effects

For this analysis, an effect pertaining to traffic, transportation, and navigation was analyzed under NEPA and CEQA if it would result in any of the following environmental effects, which are based on NEPA standards, State CEQA Guidelines Appendix G (14 CCR 15000 et seq.), standards of professional practice, the Sutter and Butte County general plans, and the City of Live Oak and City of Yuba City general plans.

- Conflict with an applicable plan, ordinance, or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit.
- Conflict with an applicable congestion management program, including, but not limited to, LOS standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways.
- Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks.
- Substantially increase hazards because of a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment).
- Result in inadequate emergency access.
- Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities or otherwise decrease the performance or safety of such facilities.

3.4.4 Effects and Mitigation Measures

Effects and mitigation measure requirements concerning traffic, transportation, and navigation are summarized in Table 3.4-8.

Table 3.4-8. Summary of Effects for Traffic, Transportation, and Navigation

Effect	Finding	Mitigation Measure	With Mitigation
Alternatives 1, 2, and 3			
Effect TRA-1: Temporary Increase in Traffic Volumes from Construction-Generated Traffic	Less than significant	None required	Less than significant
Effect TRA-2: Temporary Road Closures	Less than significant	None required	Less than significant
Effect TRA-3: Increase in Safety Hazards Attributable to Construction-Generated Traffic	Less than significant	None required	Less than significant
Effect TRA-4: Increase in Emergency Response Times	Less than significant	None required	Less than significant
Effect TRA-5: Inadequate Parking Supply to Meet Parking Demand for Construction Equipment and Construction Workers	Less than significant	None required	Less than significant
Effect TRA-6: Disruption of Alternative Transportation Modes as a Result of Temporary Road Closures	Less than significant	None required	Less than significant
Effect TRA-7: Temporary Changes to Navigation	Less than significant	None required	Less than significant
Effect TRA-8: Damage to Roadway Surfaces during Construction of Facilities	Less than significant	None required	Less than significant

3.4.4.1 No Action Alternative

The No Action Alternative represents the continuation of the existing deficiencies along the portion of the Feather River in the FRWLP area. Current levee operations and maintenance activities would continue, but there would be no change in the geomorphic and flood control regimes relative to existing conditions. No construction-related effects relating to traffic, transportation, and navigation such as road closures and modifications would occur. Therefore, there would be no effect on traffic, transportation, and navigation attributable to the implementation of the No Action Alternative.

However, without levee improvements, the risk of levee failure continues. A catastrophic levee failure would result in collapse of levee slopes and loss of soil, which would trigger widespread flooding and damage to roadways and other infrastructure systems. Furthermore, flooding could result in substantial disruption to emergency response capacity and critical lifelines in Sutter and Butte Counties.

3.4.4.2 Alternative 1

Implementation of Alternative 1 would potentially result in effects on traffic, transportation, and navigation. These potential effects and related mitigation measure requirements are summarized in Table 3.4-9 and discussed below.

Table 3.4-9. Traffic, Transportation, and Navigation Effects and Mitigation Measures for Alternative 1

Effect	Finding	Mitigation Measure	With Mitigation
Effect TRA-1: Temporary Increase in Traffic Volumes from Construction-Generated Traffic	Less than significant	None required	Less than significant
Effect TRA-2: Temporary Road Closures	Less than significant	None required	Less than significant
Effect TRA-3: Increase in Safety Hazards Attributable to Construction-Generated Traffic	Less than significant	None required	Less than significant
Effect TRA-4: Increase in Emergency Response Times	Less than significant	None required	Less than significant
Effect TRA-5: Inadequate Parking Supply to Meet Parking Demand for Construction Equipment and Construction Workers	Less than significant	None required	Less than significant
Effect TRA-6: Disruption of Alternative Transportation Modes as a Result of Temporary Road Closures	Less than significant	None required	Less than significant
Effect TRA-7: Temporary Changes to Navigation	Less than significant	None required	Less than significant
Effect TRA-8: Damage to Roadway Surfaces during Construction of Facilities	Less than significant	None required	Less than significant

Effect TRA-1: Temporary Increase in Traffic Volumes from Construction-Generated Traffic

Implementation of Alternative 1 would require hauling of borrow material from borrow sites to the project area along highways and local roadways, as well as usage of the same roads by construction workers. The use of these roadways for hauling and daily worker trips would increase daily traffic. Additionally, the hauling of borrow material would involve slow-moving trucks, which would further affect traffic. The addition of the maximum daily construction-generated traffic shown in Table 3.4-7 to the ADT counts in Tables 3.4-2 through 3.4-5 would result in the construction-period changes to ADT and LOS shown in Table 3.4-10. As transport of borrow material for all four construction contracts may occur simultaneously, traffic totals on the main haul routes for each project were combined when haul routes for each project overlap.

Table 3.4-10. Existing and Projected Average Daily Traffic on Haul Routes for Alternative 1

Street	Limits	Existing ADT	Existing LOS	Max Trips/Day	ADT during Construction	Temp. LOS
SR 99 (P)	Live Oak City Limit to county line	14,900	D	536	15,436	D
	Pennington Road to Live Oak city limit	18,700	E	536	19,236	E
	Encinal/Live Oak Boulevard to Pennington Road	19,200	E	536	19,736	E
	End of freeway to Encinal/Live Oak Boulevard	17,000	E	603	17,603	E
	Eager Road to end of freeway	17,000	A/B	603	17,603	A/B
	Queens Avenue to Eager Road	19,400	A/B	4,737	24,137	A/B
	Junction SR 20 to Queens Avenue	20,500	A/B	4,737	25,237	A/B
	Onstott Road to Junction SR 20	29,500	C	4,737	34,237	C
	Bridge Street to Onstott Road	29,500	C	4,737	34,237	C
	Franklin Road to Bridge Street	33,000	C	4,737	37,737	C
	Lincoln Road to Franklin Road	29,000	A/B	4,737	33,737	A/B
	Bogue Road to Lincoln Road	23,200	A/B	4,737	27,937	A/B
	Barry Road to Bogue Road	18,500	A/B	4,000	22,500	A/B
	Oswald Road to Barry Road	17,200	A/B	3,610	20,810	A/B
	SR 113 to Oswald Road	15,400	A/B	3,220	18,620	A/B
	Tudor Road/Garden Highway to SR 113	13,200	A/B	2,050	15,250	A/B
	Sacramento Avenue to Tudor Road/ Garden Highway	15,800	A/B	1,016	16,816	A/B
Larkin Road (P)	SR 162 to East Hamilton Road	3,580	C	112	3,692	C
	East Hamilton Road to East Biggs Highway	1,000	C	336	1,336	C
	East Biggs Highway to Gridley Highway	500	C	672	1,172	C
	Gridley Highway to East Evans Reimer Road	2,500	C	896	3,396	C
	East Evans Reimer Road to county line	ND	ND	1,232	ND	ND
	County line to Live Oak city limit	2,990	A/B	1,299	4,289	A/B
	Live Oak city limit to Paseo Avenue	1,500	A/B	1,299	2,799	A/B
Laurel Avenue		ND	ND	254	ND	ND
Oak Avenue		ND	ND	254	ND	ND
Cypress Avenue		ND	ND	254	ND	ND
Central Avenue		ND	ND	254	ND	ND
Tudor Road		ND	ND	254	ND	ND
Garden Highway	O’Banion Road to SR 99	4,280	A/B	1,424	5,704	A/B

Street	Limits	Existing ADT	Existing LOS	Max Trips/Day	ADT during Construction	Temp. LOS
	Messick Road to O'Banion Road	4,290	A/B	780	5,070	A/B
	Stewart Road to Messick Road	5,230	A/B	780	6,010	A/B
	Bogue Road to Shanghai Bend Road	ND	ND	67	ND	ND
	Franklin Avenue to 2nd Street	ND	ND	67	ND	ND
Wilkie Avenue		ND	ND	644	ND	ND
Star Bend Road		ND	ND	390	ND	ND
O'Banion Road		ND	ND	390	ND	ND
Unnamed Road 1		ND	ND	390	ND	ND
Messick Road		ND	ND	780	ND	ND
Unnamed Road 2		ND	ND	390	ND	ND
Unnamed Road 3		ND	ND	390	ND	ND
Oswald Road		ND	ND	390	ND	ND
Unnamed Road 4		ND	ND	390	ND	ND
Barry Road		ND	ND	390	ND	ND
Unnamed Road 5		ND	ND	390	ND	ND
Bogue Road	SR 99 to Railroad Avenue	5,860*	B*	67	5,927	ND
Shanghai Bend Road		ND	ND	67	ND	ND
Franklin Avenue	Gray Avenue to Clark Avenue	12,920*	C*	67	12,987	ND
	Park Avenue to Percy Avenue	8,320*	B*	67	8,387	ND
2nd Street	B Street to Franklin Road	13,240*	C*	67	13,307	ND
Bridge Street	Clark Avenue to Plumas Street	18,130*	C*	67	18,197	ND
	East of 2nd Street to Twin Cities Bridge	22,000*	F*	67	22,067	ND
SR 20	Junction Route 99 to Live Oak Boulevard	41,750	C	134	41,884	D
	Live Oak Boulevard to Plumas Street	43,000	D	67	43,067	D
	Plumas Street to Sutter Street	38,000	C	67	38,067	C
Sutter Street		ND	ND	134	ND	ND
Teegarden Avenue		ND	ND	67	ND	ND
Live Oak Boulevard	SR 20 to Del Norte Avenue	ND	ND	67	ND	ND
	SR 99 to Yuba City city limit	6,620	A/B	67	6,687	A/B
	Pease Road to Northgate Drive	7,910*	C*	67	7,977	ND
Del Norte Avenue		ND	ND	67	ND	
Von Geldern Way		ND	ND	67	ND	
Queens Avenue	Clark Avenue to Live Oak Boulevard	8,420*	B*	67	8,487	ND
Market Street	Lynn Way to Ainsley Avenue	7,580*	B*	67	7,647	ND
Lynn Way		ND	ND	67	ND	ND
Northgate Drive		ND	ND	67	ND	ND
Pease Road		ND	ND	67	ND	ND
Eager Road		ND	ND	134	ND	ND
Rednall Road		ND	ND	67	ND	ND

Street	Limits	Existing ADT	Existing LOS	Max Trips/Day	ADT during Construction	Temp. LOS
Unnamed Road 6		ND	ND	67	ND	ND
Morse Road		ND	ND	67	ND	ND
Clark Road		ND	ND	201	ND	ND
Kent Avenue		ND	ND	201	ND	ND
Koch Lane		ND	ND	67	ND	ND
Hermanson Street		ND	ND	67	ND	ND
Bridgeford Road		ND	ND	67	ND	ND
Paseo Avenue		ND	ND	67	ND	ND
Bishop Avenue		ND	ND	67	ND	ND
Archer Avenue		ND	ND	67	ND	ND
Pennington Road		ND	ND	134	ND	ND
Metteer Road		ND	ND	134	ND	ND
Cooley Road		ND	ND	67	ND	ND
Riviera Road		ND	ND	67	ND	ND
Campbell Road		ND	ND	67	ND	ND
Chandon Avenue		ND	ND	112	ND	ND
Campbell Avenue		ND	ND	112	ND	ND
East Evans Reimer Road		ND	ND	112	ND	ND
Richards Avenue		ND	ND	112	ND	ND
Kirk Road		ND	ND	112	ND	ND
Keifer Avenue		ND	ND	112	ND	ND
East Gridley Road	Larkin Road to SR 70	5,500	C	112	5,612	C
Unnamed Road 7		ND	ND	112	ND	ND
Almond Avenue		ND	ND	112	ND	ND
Palm Avenue		ND	ND	112	ND	ND
Cherry Avenue		ND	ND	112	ND	ND
Vance Avenue		ND	ND	112	ND	ND
Unnamed Road 8		ND	ND	112	ND	ND

* From City of Yuba City General Plan (2004), the plan does not provide LOS thresholds to determine temporary LOS.

P = primary haul route (all others are secondary roads); ND = no data available; ADT = average daily traffic; LOS = level of service; SR = State Route.

The construction traffic generated by Alternative 1 would temporarily increase the daily and peak hour traffic along specified road segments shown in Table 3.4-10; however, traffic levels on haul route roads would return to normal levels once construction is completed. These road segments are expected to maintain their current LOS with the exception of SR 20 from its junction with SR 99 to Live Oak Boulevard. Under Alternative 1, this road segment would degrade to an LOS of D. However, this LOS is within the standards of Caltrans; accordingly, this change would not be considered a significant effect.

Slow-moving, heavy trucks could affect traffic flow on all haul routes, particularly if numerous trips occur during the morning or afternoon peak traffic periods. Implementation of the traffic control and road maintenance plan environmental commitment, described in Section 2.3.4.3 of Chapter 2, *Alternatives*, would reduce the effects of construction traffic on all haul routes to a less-than-significant level. No mitigation is required.

Effect TRA-2: Temporary Road Closures

Implementation of Alternative 1 would involve the temporary closure of portions of Garden Highway, 2nd Street in Yuba City, Live Oak Boulevard in Yuba City, and Larkin Road at the northern end of the project area. Temporary road closures would require a detour of normal traffic to adjacent streets. The rerouting of traffic would increase daily traffic volumes on roads in the surrounding areas. The environmental commitment to develop and implement a traffic control and road maintenance plan, as described in Section 2.3.4.3 of Chapter 2, *Alternatives*, would reduce this effect to a less-than-significant level. No mitigation is required.

Effect TRA-3: Increase in Safety Hazards Attributable to Construction-Generated Traffic

The maneuvering of construction-related vehicles and equipment among general-purpose traffic on local roads that provide access to the project area could cause safety hazards. However, execution of the environmental commitment to develop and implement a traffic control and road maintenance plan, described in Section 2.3.4.3 of Chapter 2, *Alternatives*, would minimize construction-related traffic hazards and would reduce the intensity of this effect. This effect would be less than significant; no mitigation is required.

Effect TRA-4: Increase in Emergency Response Times

Emergency access to the areas adjacent to the project could be affected by construction of Alternative 1, as construction-related traffic could delay or obstruct the movement of emergency vehicles. However, execution of the environmental commitment to develop and implement a traffic control and road maintenance plan, described in Section 2.3.4.3 of Chapter 2, *Alternatives*, would minimize construction-related effects on emergency response times. This effect would be less than significant. No mitigation is required.

Effect TRA-5: Inadequate Parking Supply to Meet Parking Demand for Construction Equipment and Construction Workers

A parking area for construction workers and trucks would be provided at staging areas adjacent to work sites or areas within the levee right-of-way; accordingly, this effect would be less than significant. No mitigation is required.

Effect TRA-6: Disruption of Alternative Transportation Modes as a Result of Temporary Road Closures

The hauling of material in large trucks as well as temporary road closures could interfere with bicycle travel along local roads. Implementation of the traffic control and road maintenance plan environmental commitment, described in Section 2.3.4.3 of Chapter 2, *Alternatives*, would minimize construction-related traffic conflicts with bicycle travel. Therefore, this effect would be less than significant. No mitigation is required.

Effect TRA-7: Temporary Changes to Navigation

Placement of material along the waterside slope of the project levee would require the use of two barges along the Feather River, which could cause a temporary reduction in navigability. The use of barges would decrease the available space for navigation of watercraft. However, given the width of the waterways to be used, watercraft still would be able to pass along the section of the river adjacent to the project area. Navigation in the Feather River would return to normal conditions following the placement of material, and there would be no permanent effects. Accordingly, this effect would be less than significant. No mitigation is required.

Effect TRA-8: Damage to Roadway Surfaces during Construction of Facilities

The use and/or transport of heavy machinery on project roadways could result in damage or deterioration of the roads, which would create a safety hazard for drivers once construction is complete. However, as described in Section 2.3.4.3 of Chapter 2, *Alternatives*, SBFCA will assess damage to roadways used during construction and will repair all potholes, fractures, and other damages. Accordingly, this effect would be less than significant. No mitigation is required.

3.4.4.3 Alternative 2

Implementation of Alternative 2 would potentially result in effects on traffic, transportation, and navigation. These potential effects and related mitigation measure requirements are summarized in Table 3.4-11 and discussed below.

Table 3.4-11. Traffic, Transportation, and Navigation Effects and Mitigation Measures for Alternative 2

Effect	Finding	Mitigation Measure	With Mitigation
Effect TRA-1: Temporary Increase in Traffic Volumes from Construction-Generated Traffic	Less than significant	None required	Less than significant
Effect TRA-2: Temporary Road Closures	Less than significant	None required	Less than significant
Effect TRA-3: Increase in Safety Hazards Attributable to Construction-Generated Traffic	Less than significant	None required	Less than significant
Effect TRA-4: Increase in Emergency Response Times	Less than significant	None required	Less than significant
Effect TRA-5: Inadequate Parking Supply to Meet Parking Demand for Construction Equipment and Construction Workers	Less than significant	None required	Less than significant
Effect TRA-6: Disruption of Alternative Transportation Modes as a Result of Temporary Road Closures	Less than significant	None required	Less than significant
Effect TRA-7: Temporary Changes to Navigation	Less than significant	None required	Less than significant
Effect TRA-8: Damage to Roadway Surfaces during Construction of Facilities	Less than significant	None required	Less than significant

Effect TRA-1: Temporary Increase in Traffic Volumes from Construction-Generated Traffic

Implementation of Alternative 2 would require hauling of borrow material from borrow sites to the project area along highways and local roadways, as well as use of the same roads by construction workers. The use of these roadways for hauling and daily worker trips would increase daily traffic. Additionally, the hauling of borrow material would involve slow-moving trucks, which would further affect traffic. The addition of the maximum daily construction-generated traffic shown in Table 3.4-7 to the ADT counts in Tables 3.4-2 through 3.4-5 would result in the construction-period changes to ADT and LOS shown in Table 3.4-12. As transport of borrow material for all four construction contracts may occur simultaneously, traffic totals on the main haul routes for each project were combined when haul routes for each project overlap.

Table 3.4-12. Existing and Projected Average Daily Traffic on Haul Routes for Alternative 2

Street	Limits	Existing ADT	Existing LOS	Max Trips/Day	ADT during Construction	Temp. LOS
SR 99 (P)	Live Oak city limit to county line	14,900	D	1,656	16,556	E
	Pennington Road to Live Oak city limit	18,700	E	1,656	20,356	E
	Encinal/Live Oak Boulevard to Pennington Road	19,200	E	1,656	20,856	E
	End of freeway to Encinal/Live Oak Boulevard	17,000	E	1,863	18,863	E
	Eager Road to end of freeway	17,000	A/B	1,863	18,863	A/B
	Queens Avenue to Eager Road	19,400	A/B	9,506	28,906	A/B
	Junction SR 20 to Queens Avenue	20,500	A/B	9,506	30,006	A/B
	Onstott Road to Junction SR 20	29,500	C	9,506	39,006	C
	Bridge Street to Onstott Road	29,500	C	9,506	39,006	C
	Franklin Road to Bridge Street	33,000	C	9,506	42,506	D
	Lincoln Road to Franklin Road	29,000	A/B	9,506	38,506	C
	Bogue Road to Lincoln Road	23,200	A/B	9,506	32,706	C
	Barry Road to Bogue Road	18,500	A/B	7,229	25,729	A/B
	Oswald Road to Barry Road	17,200	A/B	6,597	23,797	A/B
	SR 113 to Oswald Road	15,400	A/B	5,965	21,365	A/B
	Tudor Road/Garden Highway to SR 113	13,200	A/B	4,069	17,269	A/B
	Sacramento Avenue to Tudor Road/ Garden Highway	15,800	A/B	2,244	18,044	A/B
Larkin Road (P)	SR 162 to East Hamilton Road	3,580	C	103	3,683	C
	East Hamilton Road to East Biggs Highway	1,000	C	309	1,309	C
	East Biggs Highway to Gridley Highway	500	C	618	1,118	C
	Gridley Highway to East Evans Reimer Road	2,500	C	824	3,324	C
	East Evans Reimer Road to county line	ND	ND	1,133	ND	ND
	County line to Live Oak city limit	2,990	A/B	1,340	4,330	A/B
	Live Oak city Limit to Paseo Avenue	1,500	A/B	1,340	2,840	A/B
Laurel Avenue		ND	ND	561	ND	ND

Street	Limits	Existing ADT	Existing LOS	Max Trips/Day	ADT during Construction	Temp. LOS
Oak Avenue		ND	ND	561	ND	ND
Cypress Avenue		ND	ND	561	ND	ND
Central Avenue		ND	ND	561	ND	ND
Tudor Road		ND	ND	561	ND	ND
Garden Highway	O’Banion Road to SR 99	4,280	A/B	2,457	6,737	A/B
	Messick Road to O’Banion Road	4,290	A/B	1,264	5,554	A/B
	Stewart Road to Messick Road	5,230	A/B	1,264	6,494	A/B
	Bogue Road to Shanghai Bend Road	ND	ND	207	ND	ND
	Franklin Avenue to 2nd Street	ND	ND	207	ND	ND
Wilkie Avenue		ND	ND	1,193	ND	ND
Star Bend Road		ND	ND	390	ND	ND
O’Banion Road		ND	ND	390	ND	ND
Unnamed Road 1		ND	ND	390	ND	ND
Messick Road		ND	ND	780	ND	ND
Unnamed Road 2		ND	ND	390	ND	ND
Unnamed Road 3		ND	ND	390	ND	ND
Oswald Road		ND	ND	390	ND	ND
Unnamed Road 4		ND	ND	390	ND	ND
Barry Road		ND	ND	390	ND	ND
Unnamed Road 5		ND	ND	390	ND	ND
Bogue Road	SR 99 to Railroad Avenue	5,860*	B*	207	6,067	ND
Shanghai Bend Road		ND	ND	207	ND	ND
Franklin Avenue	Gray Avenue to Clark Avenue	12,920*	C*	207	13,127	ND
	Park Avenue to Percy Avenue	8,320*	B*	207	8,527	ND
2nd Street	B Street to Franklin Road	13,240*	C*	207	13,447	ND
Bridge Street	Clark Avenue to Plumas Street	18,130*	C*	207	18,337	ND
	East of 2nd Street to Twin Cities Bridge	22,000*	F*	207	22,207	ND
SR 20	Junction Route 99 to Live Oak Boulevard	41,750	C	414	42,164	D
	Live Oak Boulevard to Plumas Street	43,000	D	207	43,207	D
	Plumas Street to Sutter Street	38,000	C	207	38,207	C
Sutter Street		ND	ND	414	ND	ND
Teegarden Avenue		ND	ND	207	ND	ND
Live Oak Boulevard	SR 20 to Del Norte Ave	ND	ND	207	ND	ND
	SR 99 to Yuba City city limit	6,620	A/B	207	6,827	A/B
	Pease Road to Northgate Drive	7,910*	C*	207	8,117	ND
Del Norte Avenue		ND	ND	207	ND	ND
Von Geldern Way		ND	ND	207	ND	ND
Queens Avenue	Clark Avenue to Live Oak Boulevard	8,420*	B*	207	8,627	ND
Market Street	Lynn Way to Ainsley Avenue	7,580*	B*	207	7,787	ND

Street	Limits	Existing ADT	Existing LOS	Max Trips/Day	ADT during Construction	Temp. LOS
Lynn Way		ND	ND	207	ND	ND
Northgate Drive		ND	ND	207	ND	ND
Pease Road		ND	ND	207	ND	ND
Eager Road		ND	ND	414	ND	ND
Rednall Road		ND	ND	207	ND	ND
Unnamed Road 6		ND	ND	207	ND	ND
Morse Road		ND	ND	207	ND	ND
Clark Road		ND	ND	621	ND	ND
Kent Avenue		ND	ND	621	ND	ND
Koch Lane		ND	ND	207	ND	ND
Hermanson Street		ND	ND	207	ND	ND
Bridgeford Road		ND	ND	207	ND	ND
Paseo Avenue		ND	ND	207	ND	ND
Bishop Avenue		ND	ND	207	ND	ND
Archer Avenue		ND	ND	207	ND	ND
Pennington Road		ND	ND	414	ND	ND
Metteer Road		ND	ND	414	ND	ND
Cooley Road		ND	ND	207	ND	ND
Riviera Road		ND	ND	207	ND	ND
Campbell Road		ND	ND	207	ND	ND
Chandon Avenue		ND	ND	103	ND	ND
Campbell Avenue		ND	ND	103	ND	ND
East Evans Reimer Road		ND	ND	103	ND	ND
Richards Avenue		ND	ND	103	ND	ND
Kirk Road		ND	ND	103	ND	ND
Keifer Avenue		ND	ND	103	ND	ND
East Gridley Road	Larkin Road to SR 70	5,500	C	103	5,603	C
Unnamed Road 7		ND	ND	103	ND	ND
Almond Avenue		ND	ND	103	ND	ND
Palm Avenue		ND	ND	103	ND	ND
Cherry Avenue		ND	ND	103	ND	ND
Vance Avenue		ND	ND	103	ND	ND
Unnamed Road 8		ND	ND	103	ND	ND

* From City of Yuba City General Plan (2004), the plan does not provide LOS thresholds to determine temporary LOS.

P = primary haul route (all others are secondary roads); ND = no data available; ADT = average daily traffic; LOS = level of service; SR = State Route.

The construction traffic generated by Alternative 2 would temporarily increase the daily and peak hour traffic along specified road segments shown in Table 3.4-12; however, traffic levels on haul route roads would return to normal levels once construction is completed. These road segments are expected to maintain their current LOS with the exception of SR 99 from the Live Oak city limit to the Sutter County line, SR 99 from Franklin Road to Bridge Street, and SR 20 from its junction with SR 99 to Live Oak Boulevard. Under Alternative 2, these road segments would degrade to an LOS of E, D, and D, respectively. However, these LOS levels are within the standards of Caltrans; accordingly, these changes would not be considered significant effects.

Slow-moving, heavy trucks could affect traffic flow on all haul routes, particularly if numerous trips occur during the morning or afternoon peak traffic periods. Implementation of the traffic control and road maintenance plan environmental commitment, described in Section 2.3.4.3 of Chapter 2, *Alternatives*, would reduce the effects of construction traffic on all haul routes to a less-than-significant level. No mitigation is required.

Effect TRA-2: Temporary Road Closures

This effect would be the same as described under Alternative 1. This effect is considered less than significant. No mitigation is required.

Effect TRA-3: Increase in Safety Hazards Attributable to Construction-Generated Traffic

This effect would be the same as described under Alternative 1. This effect is considered less than significant. No mitigation is required.

Effect TRA-4: Increase in Emergency Response Times

This effect would be the same as described under Alternative 1. This effect is considered less than significant. No mitigation is required.

Effect TRA-5: Inadequate Parking Supply to Meet Parking Demand for Construction Equipment and Construction Workers

This effect would be the same as described under Alternative 1. This effect is considered less than significant. No mitigation is required.

Effect TRA-6: Disruption of Alternative Transportation Modes as a Result of Temporary Road Closures

This effect would be the same as described under Alternative 1. This effect is considered less than significant. No mitigation is required.

Effect TRA-7: Temporary Changes to Navigation

This effect would be the same as described under Alternative 1. This effect is considered less than significant. No mitigation is required.

Effect TRA-8: Damage to Roadway Surfaces during Construction of Facilities

This effect would be the same as described under Alternative 1. This effect is considered less than significant. No mitigation is required.

3.4.4.4 Alternative 3

Implementation of Alternative 3 would potentially result in effects on traffic, transportation, and navigation. These potential effects and related mitigation measure requirements are summarized in Table 3.4-13 and discussed below.

Table 3.4-13. Traffic, Transportation, and Navigation Effects and Mitigation Measures for Alternative 3

Effect	Finding	Mitigation Measure	With Mitigation
Effect TRA-1: Temporary Increase in Traffic Volumes from Construction-Generated Traffic	Less than significant	None required	Less than significant
Effect TRA-2: Temporary Road Closures	Less than significant	None required	Less than significant
Effect TRA-3: Increase in Safety Hazards Attributable to Construction-Generated Traffic	Less than significant	None required	Less than significant
Effect TRA-4: Increase in Emergency Response Times	Less than significant	None required	Less than significant
Effect TRA-5: Inadequate Parking Supply to Meet Parking Demand for Construction Equipment and Construction Workers	Less than significant	None required	Less than significant
Effect TRA-6: Disruption of Alternative Transportation Modes as a Result of Temporary Road Closures	Less than significant	None required	Less than significant
Effect TRA-7: Temporary Changes to Navigation	Less than significant	None required	Less than significant
Effect TRA-8: Damage to Roadway Surfaces during Construction of Facilities	Less than significant	None required	Less than significant

Effect TRA-1: Temporary Increase in Traffic Volumes from Construction-Generated Traffic

Implementation of Alternative 3 would require hauling of borrow material from borrow sites to the project area along highways and local roadways, as well as use of the same roads by construction workers. The use of these roadways for hauling and daily worker trips would increase daily traffic. Additionally, the hauling of borrow material would involve slow-moving trucks, which would further affect traffic. The addition of the maximum daily construction-generated traffic shown in Table 3.4-7 to the ADT counts in Tables 3.4-2 through 3.4-5 would result in the construction-period changes to ADT and LOS shown in Table 3.4-14. As transport of borrow material for all four construction contracts may occur simultaneously, traffic totals on the main haul routes for each project were combined when haul routes for each project overlap.

Table 3.4-14. Existing and Projected Average Daily Traffic on Haul Routes for Alternative 3

Street	Limits	Existing ADT	Existing LOS	Max Trips/Day	ADT during Construction	Temp. LOS
SR 99 (P)	Live Oak City Limit to county line	14,900	D	536	15,436	D
	Pennington Road to Live Oak city limit	18,700	E	536	19,236	E
	Encinal/Live Oak Boulevard to Pennington Road	19,200	E	536	19,736	E
	End of freeway to Encinal/Live Oak Boulevard	17,000	E	603	17,603	E
	Eager Road to end of freeway	17,000	A/B	603	17,603	A/B
	Queens Avenue to Eager Road	19,400	A/B	4,705	24,105	A/B
	Junction SR 20 to Queens Avenue	20,500	A/B	4,705	25,205	A/B
	Onstott Road to Junction SR 20	29,500	C	4,705	34,205	C
	Bridge Street to Onstott Road	29,500	C	4,705	34,205	C
	Franklin Road to Bridge Street	33,000	C	4,705	37,705	C
	Lincoln Road to Franklin Road	29,000	A/B	4,705	33,705	A/B
	Bogue Road to Lincoln Road	23,200	A/B	4,705	27,905	A/B
	Barry Road to Bogue Road	18,500	A/B	3,968	22,468	A/B
	Oswald Road to Barry Road	17,200	A/B	3,634	20,834	A/B
	SR 113 to Oswald Road	15,400	A/B	3,300	18,700	A/B
	Tudor Road/Garden Highway to SR 113	13,200	A/B	2,298	15,498	A/B
	Sacramento Avenue to Tudor Road/ Garden Highway	15,800	A/B	1,304	17,104	A/B
Larkin Road (P)	SR 162 to East Hamilton Road	3,580	C	112	3,692	C
	East Hamilton Road to East Biggs Highway	1,000	C	336	1,336	C
	East Biggs Highway to Gridley Highway	500	C	672	1,172	C
	Gridley Highway to East Evans Reimer Road	2,500	C	896	3,396	C
	East Evans Reimer Road to county line	ND	ND	1,232	ND	ND
	County line to Live Oak city limit	2,990	A/B	1,299	4,289	A/B
	Live Oak city limit to Paseo Avenue	1,500	A/B	1,299	2,799	A/B
Laurel Avenue		ND	ND	326	ND	ND
Oak Avenue		ND	ND	326	ND	ND
Cypress Avenue		ND	ND	326	ND	ND
Central Avenue		ND	ND	326	ND	ND
Tudor Road		ND	ND	326	ND	ND
Garden Highway	O’Banion Road to SR 99	4,280	A/B	1,328	5,608	A/B
	Messick Road to O’Banion Road	4,290	A/B	668	4,958	A/B
	Stewart Road to Messick Road	5,230	A/B	668	5,898	A/B
	Bogue Road to Shanghai Bend Road	ND	ND	67	ND	ND
	Franklin Avenue to 2nd Street	ND	ND	67	ND	ND
Wilkie Avenue		ND	ND	660	ND	ND

Street	Limits	Existing ADT	Existing LOS	Max Trips/Day	ADT during Construction	Temp. LOS
Star Bend Road		ND	ND	334	ND	ND
O'Banion Road		ND	ND	334	ND	ND
Unnamed Road 1		ND	ND	334	ND	ND
Messick Road		ND	ND	668	ND	ND
Unnamed Road 2		ND	ND	334	ND	ND
Unnamed Road 3		ND	ND	334	ND	ND
Oswald Road		ND	ND	334	ND	ND
Unnamed Road 4		ND	ND	334	ND	ND
Barry Road		ND	ND	334	ND	ND
Unnamed Road 5		ND	ND	334	ND	ND
Bogue Road	SR 99 to Railroad Avenue	5,860*	B*	67	5,927	ND
Shanghai Bend Road		ND	ND	67	ND	ND
Franklin Avenue	Gray Avenue to Clark Avenue	12,920*	C*	67	12,987	ND
	Park Avenue to Percy Avenue	8,320*	B*	67	8,387	ND
2nd Street	B Street to Franklin Road	13,240*	C*	67	13,307	ND
Bridge Street	Clark Avenue to Plumas Street	18,130*	C*	67	18,197	ND
	East of 2nd Street to Twin Cities Bridge	22,000*	F*	67	22,067	ND
SR 20	Junction Route 99 to Live Oak Boulevard	41,750	C	134	41,884	D
	Live Oak Boulevard to Plumas Street	43,000	D	67	43,067	D
	Plumas Street to Sutter Street	38,000	C	67	38,067	C
Sutter Street		ND	ND	134	ND	ND
Teegarden Avenue		ND	ND	67	ND	ND
Live Oak Boulevard	SR 20 to Del Norte Avenue	ND	ND	67	ND	ND
	SR 99 to Yuba City city limit	6,620	A/B	67	6,687	A/B
	Pease Road to Northgate Drive	7,910*	C*	67	7,977	ND
Del Norte Avenue		ND	ND	67	ND	ND
Von Geldern Way		ND	ND	67	ND	ND
Queens Avenue	Clark Avenue to Live Oak Boulevard	8,420*	B*	67	8,487	ND
Market Street	Lynn Way to Ainsley Avenue	7,580*	B*	67	7,647	ND
Lynn Way		ND	ND	67	ND	ND
Northgate Drive		ND	ND	67	ND	ND
Pease Road		ND	ND	67	ND	ND
Eager Road		ND	ND	134	ND	ND
Rednall Road		ND	ND	67	ND	ND
Unnamed Road 6		ND	ND	67	ND	ND
Morse Road		ND	ND	67	ND	ND
Clark Road		ND	ND	201	ND	ND
Kent Avenue		ND	ND	201	ND	ND
Koch Lane		ND	ND	201	ND	ND

Street	Limits	Existing ADT	Existing LOS	Max Trips/Day	ADT during Construction	Temp. LOS
Hermanson Street		ND	ND	67	ND	ND
Bridgeford Road		ND	ND	67	ND	ND
Paseo Avenue		ND	ND	67	ND	ND
Bishop Avenue		ND	ND	67	ND	ND
Archer Avenue		ND	ND	67	ND	ND
Pennington Road		ND	ND	134	ND	ND
Metteer Road		ND	ND	134	ND	ND
Cooley Road		ND	ND	67	ND	ND
Riviera Road		ND	ND	67	ND	ND
Campbell Road		ND	ND	67	ND	ND
Chandon Avenue		ND	ND	112	ND	ND
Campbell Avenue		ND	ND	112	ND	ND
East Evans Reimer Road		ND	ND	112	ND	ND
Richards Avenue		ND	ND	112	ND	ND
Kirk Road		ND	ND	112	ND	ND
Keifer Avenue		ND	ND	112	ND	ND
East Gridley Road	Larkin Road to SR 70	5,500	C	112	5,612	C
Unnamed Road 7		ND	ND	112	ND	ND
Almond Avenue		ND	ND	112	ND	ND
Palm Avenue		ND	ND	112	ND	ND
Cherry Avenue		ND	ND	112	ND	ND
Vance Avenue		ND	ND	112	ND	ND
Unnamed Road 8		ND	ND	112	ND	ND

* From City of Yuba City General Plan (2004), which does not provide LOS thresholds to determine temporary LOS.

P = primary haul route (all others are secondary roads); ND = no data available; ADT = average daily traffic; LOS = level of service; SR = State Route.

The construction traffic generated by Alternative 3 would temporarily increase the daily and peak hour traffic along specified road segments shown in Table 3.4-14; however, traffic levels on haul route roads would return to normal levels once construction is completed. These road segments are expected to maintain their current LOS with the exception of SR 20 from its junction with SR 99 to Live Oak Boulevard. Under Alternative 3, this road segment would degrade to an LOS of D. However, this LOS is within the standards of Caltrans; accordingly, this change would not be considered a significant effect.

Slow-moving, heavy trucks could affect traffic flow on all haul routes, particularly if numerous trips occur during the morning or afternoon peak traffic periods. Implementation of the traffic control and road maintenance plan environmental commitment, described in Section 2.3.4.3 of Chapter 2, *Alternatives*, would reduce the effects of construction traffic on all haul routes to a less-than-significant level. No mitigation is required.

Effect TRA-2: Temporary Road Closures

This effect would be the same as described under Alternative 1. This effect is considered less than significant. No mitigation is required.

Effect TRA-3: Increase in Safety Hazards Attributable to Construction-Generated Traffic

This effect would be the same as described under Alternative 1. This effect is considered less than significant. No mitigation is required.

Effect TRA-4: Increase in Emergency Response Times

This effect would be the same as described under Alternative 1. This effect is considered less than significant. No mitigation is required.

Effect TRA-5: Inadequate Parking Supply to Meet Parking Demand for Construction Equipment and Construction Workers

This effect would be the same as described under Alternative 1. This effect is considered less than significant. No mitigation is required.

Effect TRA-6: Disruption of Alternative Transportation Modes as a Result of Temporary Road Closures

This effect would be the same as described under Alternative 1. This effect is considered less than significant. No mitigation is required.

Effect TRA-7: Temporary Changes to Navigation

This effect would be the same as described under Alternative 1. This effect is considered less than significant. No mitigation is required.

Effect TRA-8: Damage to Roadway Surfaces during Construction of Facilities

This effect would be the same as described under Alternative 1. This effect is considered less than significant. No mitigation is required.

3.5 Air Quality

3.5.1 Introduction

This section describes the regulatory and environmental setting for air quality; effects on air quality that would result from the No Action Alternative and Alternatives 1, 2, and 3; and mitigation measures that would reduce significant effects. Additional information on the technical modeling procedures used to quantify air quality effects is provided in Appendix D.

The key sources of data and information used in the preparation of this section are listed below.

- Northern Sacramento Valley Planning Area 2009 Triennial Air Quality Attainment Plan (Sacramento Valley Air Quality Engineering and Enforcement Professionals 2010).
- Indirect Source Review Guidelines (Feather River Air Quality Management District 2010).
- CEQA Air Quality Handbook Guidelines (Butte County Air Quality Management District 2008).
- Ambient Air Quality Standards (California Air Resources Board 2010).
- Air Designation Maps/State and National (California Air Resources Board 2012).
- iADAM Air Quality Data Statistics (California Air Resources Board 2011).
- The Green Book of Nonattainment Areas for Criteria Pollutants (U.S. Environmental Protection Agency 2012).

3.5.2 Affected Environment

The project area and surrounding areas are subject to air quality regulations developed and implemented at the Federal, state, and local levels. At the Federal level, EPA is responsible for implementation of the Clean Air Act (CAA). Some portions of the CAA (e.g., certain mobile-source and other requirements) are implemented directly by EPA. Other portions of the CAA (e.g., stationary-source requirements) are implemented by state and local agencies.

Responsibility for attaining and maintaining air quality in California is divided between the California Air Resources Board (ARB) and regional air quality districts. Areas of control for the regional districts are set by ARB, which divides the state into air basins. These air basins are defined by topography that limits air flow access, or by county boundaries. Plans, policies, and regulations relevant to the proposed project are discussed below.

3.5.2.1 Regulatory Setting

At the Federal level, air quality in the United States and California is governed by the CAA, which is administered by the EPA. Air quality in the State of California also is governed by more stringent regulations in the California Clean Air Act (CCAA), administered by ARB and the local air quality management districts. ARB and local air districts have primary implementation responsibility for both the Federal and state air quality standards. This section summarizes key Federal, state, and local regulatory information that applies to air quality. Additional regulatory information appears in Appendix A.

Federal

The following Federal policies related to air quality may apply to implementation of the proposed project.

Clean Air Act and National Ambient Air Quality Standards

The Federal CAA, promulgated in 1963 and amended several times thereafter, including the 1990 Clean Air Act amendments (CAAA), establishes the framework for modern air pollution control. The act directs the EPA to establish national ambient air quality standards (NAAQS) for the six criteria pollutants: ozone (O_3), carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and particulate matter (PM), which consists of PM 10 microns in diameter or less (PM10) and PM 2.5 microns in diameter or less (PM2.5). The NAAQS are divided into primary and secondary standards; the former are set to protect human health within an adequate margin of safety, and the latter to protect environmental values, such as plant and animal life. Table 3.5-1 summarizes the NAAQS.

The CAA requires states to submit a SIP for areas in nonattainment for Federal standards. The SIP, which is reviewed and approved by EPA, must demonstrate how the Federal standards would be achieved. Failing to submit a plan or secure approval could lead to denial of Federal funding and permits. In cases where the SIP is submitted by the state but fails to demonstrate achievement of the standards, EPA is directed to prepare a Federal implementation plan.

General Conformity Regulation

EPA enacted the Federal general conformity regulation (40 CFR Parts 5, 51, and 93) in 1993. The general conformity rule applies to Federal actions located in nonattainment areas that do not include stationary industrial sources requiring preconstruction air quality permits from local air pollution control agencies. The purpose is to ensure that Federal actions do not generate emissions that interfere with state and local agencies' SIPs and emission-reduction strategies.

The general conformity rule applies in air quality nonattainment or maintenance areas, and only to direct and indirect emissions associated with the portions of any Federal action for which a Federal permitting agency has the authority to impose emission reductions. Because the proposed project is within USACE jurisdiction and would require a permit from the USACE, all direct and indirect emissions generated by project construction would be subject to general conformity.

Table 3.5-1. Ambient Air Quality Standards Applicable in California

			Standard (ppm)		Standard (µg/m³)		Violation Criteria	
Pollutant	Symbol	Average Time	California	National	California	National	California	National
Ozone*	O_3	1 hour	0.09	–	180	–	If exceeded	–
		8 hours	0.070	0.075	137	147	If exceeded	If fourth-highest 8-hour concentration in a year, averaged over 3 years, is exceeded at each monitor in an area
Carbon monoxide	CO	8 hours	9.0	9	10,000	10,000	If exceeded	If exceeded on more than 1 day per year
		1 hour	20	35	23,000	40,000	If exceeded	If exceeded on more than 1 day per year
(Lake Tahoe only)		8 hours	6	–	7,000	–	If equaled or exceeded	–
Nitrogen dioxide	NO_2	Annual arithmetic mean	0.030	0.053	57	100	If exceeded	If exceeded on more than 1 day per year
		1 hour	0.18	0.100	339	188	If exceeded	–
Sulfur dioxide	SO_2	24 hours	0.04	–	105	–	If exceeded	If exceeded on more than 1 day per year
		1 hour	0.25	0.075	655	196	If exceeded	–
		3 hour	0.50*	–	1,300*	–		
Hydrogen sulfide	H_2S	1 hour	0.03	–	42	–	If equaled or exceeded	–
Vinyl chloride	C_2H_3Cl	24 hours	0.01	–	26	–	If equaled or exceeded	–
Inhalable particulate matter	PM10	Annual arithmetic mean	–	–	20	–	–	–
		24 hours	–	–	50	150	If exceeded	If exceeded on more than 1 day per year
	PM2.5	Annual arithmetic mean	–	–	12	15	–	If 3-year average from single or multiple community-oriented monitors is exceeded
		24 hours	–	–	–	35	–	If 3-year average of 98th percentile at each population-oriented monitor in an area is exceeded
Sulfate particles	SO_4	24 hours	–	–	25	–	If equaled or exceeded	–

			Standard (ppm)		Standard (μg/m³)		Violation Criteria	
Pollutant	Symbol	Average Time	California	National	California	National	California	National
Lead particles	Pb	Calendar quarter	–	–	–	1.5	–	If exceeded no more than 1 day per year
		30-day average	–	–	1.5	–	If equaled or exceeded	–
		Rolling 3-month average	–	–	–	0.15	If equaled or exceeded	Averaged over a rolling 3-month period

Source: California Air Resources Board 2010.
* secondary standard.

ppm = parts per million.
μg/m³= micrograms per cubic meter.

The proposed project would generate air pollutant emissions from construction sites in Sutter and Butte Counties, both of which are designated a nonattainment area for O_3 NAAQS and a nonattainment area for PM2.5 NAAQS. Butte County is a moderate maintenance area for CO NAAQS. Based on those designations, the general conformity thresholds are as follows.

- 25 tons per year of oxides of nitrogen (NO_X) (O_3 precursor).
- 25 tons per year of reactive organic gases (ROG) (O_3 precursor).
- 100 tons per year of PM2.5.
- 100 tons per year of CO.

All emission sources (e.g., haul trucks, off-road equipment) that operate on the proposed project components are required to comply with the general conformity thresholds. If the net emissions increases attributable to the action are less than the threshold levels, then the action is presumed to conform and no further conformity evaluation is required. If the emissions increases exceed any of the thresholds, and the action does not meet any of a number of criteria in the rule for exemptions or presumption of conformity, then a formal conformity determination is required. A conformity determination can include air quality modeling studies; consultation with EPA and state air quality agencies; and commitments to revise the SIP, obtain emission offsets, or to implement measures to mitigate air quality effects.

State

The following state policies related to air quality may apply to implementation of the proposed project.

In 1988, the state legislature adopted the CCAA, which established a statewide air pollution control program. The CCAA requires all air districts in the state to endeavor to meet the California Ambient Air Quality Standards (CAAQS) by the earliest practical date. Unlike the Federal CAA, the CAAQS do not set precise attainment deadlines. Instead, the act establishes increasingly stringent requirements for areas that would require more time to achieve the standards. The CAAQS are generally more stringent than the NAAQS and incorporate additional standards for sulfates, hydrogen sulfide, vinyl chloride, and visibility-reducing particles. The CAAQS and NAAQS are listed together in Table 3.5-1.

ARB and local air districts bear responsibility for achieving the CAAQS, which are to be achieved through district-level air quality management plans that would be incorporated into the SIP. In California, EPA has delegated authority to prepare SIPs to ARB, which, in turn, has delegated that authority to individual air districts. ARB traditionally has established state air quality standards, maintaining oversight authority in air quality planning, developing programs for reducing emissions from motor vehicles, developing air emission inventories, collecting air quality and meteorological data, and approving SIPs.

The CCAA substantially adds to the authority and responsibilities of air districts. The CCAA designates air districts as lead air quality planning agencies, requires air districts to prepare air quality plans, and grants air districts authority to implement transportation control measures. The CCAA also emphasizes the control of "indirect and area-wide sources" of air pollutant emissions. The CCAA gives local air pollution control districts explicit authority to regulate indirect sources of air pollution and to establish traffic control measures (TCMs).

Idling Limit Regulation

On June 15, 2008, the ARB adopted a regulation for off-road diesel vehicles. The regulation is designed to reduce toxic air contaminants (TACs) from diesel-powered construction and mining vehicles operating in California. Fleet owners are subject to retrofit or accelerated replacement/repower requirements for which ARB must obtain authorization from EPA prior to enforcement.

The regulation also imposes idling limitations on owners, operators, and renters or lessees of off-road diesel vehicles. The idling limits became effective on June 15, 2008 and require an operator of applicable off-road vehicles (self-propelled diesel-fueled vehicles of 25 horsepower and greater that were not designed for on-road driving) to limit idling to no more than 5 minutes. These requirements are specified in 13 CCR 2449(d)(3).

State Tailpipe Emission Standards

To reduce emissions from offroad diesel equipment, on-road diesel trucks, and harbor craft, the ARB established a series of increasingly strict emission standards for new engines. New construction equipment used for the project, including heavy duty trucks, off-road construction equipment, tugboats, and barges, would be required to comply with the standards.

Local

At the local level, responsibilities of air quality districts include overseeing stationary-source emissions, approving permits, maintaining emission inventories, maintaining air quality stations, overseeing agricultural burning permits, and reviewing air quality–related sections of environmental documents required by CEQA. The air quality districts are also responsible for establishing and enforcing local air quality rules and regulations that address the requirements of Federal and state air quality laws and for ensuring that NAAQS and CAAQS are met.

The following local policies related to air quality may apply to implementation of the proposed project.

Feather River Air Quality Management District

The Feather River Air Quality Management District (FRAQMD) has jurisdiction over local air quality in Sutter County. Under the California CAA, FRAQMD is required to develop an air quality plan for nonattainment criteria pollutants in the air district. Counties in the Sacramento area (Sacramento, Yolo, Placer, El Dorado, Solano, Sutter, and Butte) have adopted the Northern Sacramento Valley Planning Area 2009 Triennial Air Quality Attainment Plan (2009 Plan) (Sacramento Valley Air Quality Engineering and Enforcement Professionals 2010). This plan outlines strategies to achieve the health-based O_3 standard. The Sacramento region is also in the process of developing a plan to address PM.

Butte County Air Quality Management District

The Butte County Air Quality Management District (BCAQMD) has jurisdiction over local air quality in Butte County. BCAQMD has adopted the 2009 Plan to address O_3 in the Sacramento Valley (see above). The air district also has developed measures to control PM, consistent with SB 656, and is developing a PM2.5 air quality attainment plan. The air district assisted in development of the 2004 Revisions to the California State Implementation Plan for Carbon Monoxide. This document was prepared by ARB and demonstrates that 10 nonattainment/maintenance areas, including the Chico urbanized area, attained the 8-hour CO standard between 1992 and 1995 and describes how these areas would continue to maintain compliance with the standard (California Air Resources Board 2004:1).

BCAQMD has specified significance thresholds in its CEQA Air Quality Handbook to determine air quality effects of projects located within district boundaries. BCAQMD has three levels of emission thresholds, and depending on the emissions produced from a proposed project, different mitigation measures are required. The thresholds are intended for operational emissions, but can be used to evaluate construction emissions if construction lasts longer than 12 months (Butte County Air Quality Management District 2008:2-2, 2-4).

3.5.2.2 Environmental Setting

The following considerations are relevant to air quality conditions in the proposed project area.

Climate and Meteorology

The project area is in Butte and Sutter Counties, which are located in the Sacramento Valley Air Basin (SVAB). The SVAB is bounded on the north by the Cascade Range, on the south by the San Joaquin Valley Air Basin, on the east by the Sierra Nevada, and on the west by the Coast Ranges.

The SVAB has a mediterranean climate characterized by hot, dry summers and cool, rainy winters. During winter, the North Pacific storm track intermittently dominates Sacramento Valley weather, and fair weather alternates with periods of extensive clouds and precipitation. Periods of dense and persistent low-level fog, which are most prevalent between storms, are also characteristic of winter weather in the valley. The frequency and persistence of heavy fog in the valley diminish with the approach of spring. The average yearly temperature range for the Sacramento Valley is 20°F to 115°F, with summer high temperatures often exceeding 90°F and winter low temperatures occasionally dropping below freezing.

In general, the prevailing winds are moderate in strength and vary from moist clean breezes from the south to dry land flows from the north. The mountains surrounding the SVAB create a barrier to airflow, which can trap air pollutants under certain meteorological conditions. The highest frequency of air stagnation occurs in the autumn and early winter when large high-pressure cells collect over the Sacramento Valley. The lack of surface wind during these periods and the reduced vertical flow caused by less surface heating reduce the influx of outside air and allow air pollutants to become concentrated in a stable volume of air. The surface concentrations of pollutants are highest when these conditions are combined with temperature inversions that trap pollutants near the ground.

The O_3 season (May through October) in the Sacramento Valley is characterized by stagnant morning air or light winds with the Delta sea breeze arriving in the afternoon out of the southwest. Usually the evening breeze transports the airborne pollutants to the north out of the Sacramento Valley. During about half of the days from July to September, however, a phenomenon called the *Schultz Eddy* prevents this from occurring. Instead of allowing the prevailing wind patterns to move north carrying the pollutants out, the Schultz Eddy causes the wind pattern to circle back to the south. Essentially, this phenomenon causes the air pollutants to be blown south toward the Sacramento Valley and Yolo County. This phenomenon has the effect of exacerbating the pollution levels in the area and increases the likelihood of violating Federal or state standards. The eddy normally dissipates around noon when the Delta sea breeze arrives (Sacramento Metropolitan Air Quality Management District 2009:1-7).

Background Information on Air Pollutants

Air quality studies generally focus on five pollutants most commonly measured and regulated, and referred to as criteria air pollutants: O_3, CO, inhalable PM (PM10 and PM2.5), NO_2, and SO_2. Because O_3, a photochemical oxidant, is not emitted into the air directly from sources, emissions of O_3 precursors, including NO_X and ROG, are regulated with the aim of reducing O_3 formation in the lowermost region of the troposphere.

O_3 and NO_2 are considered regional pollutants because they (or their precursors) affect air quality on a regional scale: NO_2 reacts photochemically with ROG to form O_3, and this reaction occurs at some distance downwind of the source of pollutants. Pollutants such as CO, PM10, and PM2.5 are considered to be local pollutants because they tend to disperse rapidly with distance from the source.

The principal characteristics surrounding these pollutants are discussed below. TACs are also discussed below, although no air quality standards exist for these pollutants.

Ozone

O_3 is an oxidant that attacks synthetic rubber, textiles, and other materials and causes extensive damage to plants by leaf discoloration and cell damage. It is also a severe eye, nose, and throat irritant and increases susceptibility to respiratory infections. O_3 is not emitted directly into the air; it forms from a photochemical reaction in the atmosphere. O_3 precursors, including ROG and NO_X, are emitted by mobile sources and stationary combustion equipment and react in the presence of sunlight to form O_3. Because reaction rates depend on the intensity of ultraviolet light and air temperature, O_3 is primarily a summertime problem.

Carbon Monoxide

CO is essentially inert to most materials and to plants but can significantly affect human health because it combines readily with hemoglobin and thus reduces the amount of oxygen transported in the bloodstream. Effects on humans range from slight headaches to nausea and death. Motor vehicles are the dominant source of CO emissions in most areas. High CO levels develop primarily during winter, when periods of light wind combine with the formation of ground-level temperature inversions—typically from evening through early morning. These conditions result in reduced dispersion of vehicle emissions. Motor vehicles also exhibit increased CO emission rates at low air temperatures.

Particulate Matter

PM refers to finely divided solids or liquids, such as soot, dust, aerosols, and mists. Coarse PM with an aerodynamic diameter of 10 microns or less is referred to as PM10. A subgroup of finer particles that have an aerodynamic diameter of 2.5 microns or less is referred to as PM2.5. Suspended particulates aggravate chronic heart and lung disease problems, produce respiratory problems, and often transport toxic elements. They also absorb sunlight, producing haze and reducing visibility.

PM10 and PM2.5 in Sutter and Butte Counties are caused primarily by dust from grading and excavation activities, agricultural uses, and motor vehicles, particularly diesel-powered vehicles.

These particles pose a greater health risk than larger particles because these fine particles can more easily penetrate the defenses of the human respiratory system. Chronic exposure to PM10 and PM2.5 can lead to respiratory disease and cause lung damage and cancer.

Nitrogen Dioxide

NO_2 is a brownish gas that contributes to the formation of ground-level O_3 pollution. NO_2 increases respiratory disease and irritation and may reduce resistance to certain infections. The majority of ambient NO_2 is not directly emitted but is formed rather quickly from the reaction of nitric oxide (NO) and oxygen in the atmosphere. NO and NO_2 are the primary pollutants that make up the group of pollutants referred to as NO_X. In the presence of sunlight, complex reactions of NO_X with O_3 and other air pollutants produce the majority of NO_2 in the atmosphere. NO_2 is one of the NO_X emitted from high-temperature combustion processes, such as those occurring in trucks, cars, and power plants. Indoors, home heaters and gas stoves also produce substantial amounts of NO_2.

Sulfur Dioxide

SO_2 is a colorless, irritating gas with a “rotten egg” smell, formed primarily by the combustion of sulfur-containing fossil fuels. SO_2 is formed when sulfur-containing fuel is burned by mobile sources, such as locomotives and off-road diesel equipment. SO_2 also is emitted from several industrial processes, such as petroleum refining and metal processing.

Toxic Air Contaminants

TACs are pollutants that may result in an increase in mortality or serious illness, or that may pose a present or potential hazard to human health. Health effects of TACs include cancer, birth defects, neurological damage, damage to the body’s natural defense system, and diseases that lead to death. In 1998, following a 10-year scientific assessment process, ARB identified PM from diesel-fueled engines—commonly called diesel particulate matter (DPM)—as a TAC. Compared to other air toxics ARB has identified, DPM emissions are estimated to be responsible for about 70% of the total ambient air toxics risk (California Air Resources Board 2000:1).

Local Air Quality Conditions

The existing air quality conditions in the project area can be characterized by monitoring data collected in the region. The air quality monitoring station in Sutter County nearest to the project area is the Yuba City-Almond Street station, which is 1.5 miles from the levee in Yuba City. The nearest monitoring station in Butte County is the Gridley station, 2 miles west of the levee in Gridley. The Gridley station monitors only for exceedances of the state 1-hour O_3 standard. The next closest monitoring station in Butte County that measures all criteria pollutants is the Chico station, which is 25 miles from the northern boundary of the project site.

Table 3.5-2 summarizes air quality monitoring data from the Yuba City and Gridley monitoring stations for the last 3 years for which complete data are available (2007–2009). As shown in this table, both stations have experienced occasional violations of the state 1-hour O_3 and PM10 standards, and more frequent violations of the federal PM2.5 and state 8-hour O_3 standards.

Table 3.5-2. Ambient Air Quality Monitoring Data Measured at the Yuba City and Gridley Monitoring Stations

	Yuba City			Gridley		
Pollutant Standards	2007	2008	2009	2007	2008	2009
1-hour ozone (ppm)						
Maximum 1-hour concentration	0.095	0.092	0.089	0.94	0.111	0.080
1-hour California designation value	0.09	0.09	0.09	0.09	0.09	0.09
1-hour expected peak day concentration	0.090	0.091	0.087	0.090	0.094	0.088
Number of days standard exceeded[a]						
CAAQS 1-hour (>0.09 ppm)	1	0	0	0	2	0
8-hour ozone (ppm)						
National maximum 8-hour concentration	0.081	0.080	0.076	0.084	0.096	0.073
National second-highest 8-hour concentration	0.078	0.075	0.067	0.080	0.084	0.070
State maximum 8-hour concentration	0.082	0.080	0.077	0.084	0.097	0.073
State second-highest 8-hour concentration	0.078	0.075	0.068	0.080	0.084	0.071
8-hour national designation value	0.074	0.072	0.068	0.074	0.076	0.074
8-hour California designation value	0.082	0.082	0.080	0.084	0.084	0.083
8-hour expected peak day concentration	0.086	0.086	0.080	0.084	0.085	0.083
Number of days standard exceeded[a]						
NAAQS 8-hour (>0.075 ppm)	3	1	1	3	6	0
CAAQS 8-hour (>0.070 ppm)	6	2	1	10	14	2
Carbon monoxide (ppm)						
National[b] maximum 8-hour concentration	–	–	–	2.16	2.74	2.35
National[b] second-highest 8-hour concentration	–	–	–	2.16	2.39	1.99
California[c] maximum 8-hour concentration	–	–	–	2.16	2.74	2.35
California[c] second-highest 8-hour concentration	–	–	–	2.16	2.39	1.99
Maximum 1-hour concentration	–	–	–	3.3	3.1	–
Second-highest 1-hour concentration	–	–	–	2.8	3.0	–
Number of days standard exceeded[a]						
NAAQS 8-hour (≥9.0 ppm)	–	–	–	0	0	–
CAAQS 8-hour (≥9.0 ppm)	–	–	–	0	0	–
NAAQS 1-hour (≥35.0 ppm)	–	–	–	0	0	–
CAAQS 1-hour (≥20.0 ppm)	–	–	–	0	0	–
Particulate matter (PM10)[d] (μg/m^3)						
National[b] maximum 24-hour concentration	51.0	66.9	50.7	61.9	143.5	48.2
National[b] second-highest 24-hour concentration	42.4	55.6	49.8	61.0	112.4	43.4
State[c] maximum 24-hour concentration	54.0	66.9	50.1	66.1	140.8	47.7
State[c] second-highest 24-hour concentration	45.6	57.0	49.1	65.0	111.6	45.9
State annual average concentration[e]	-	-	22.4	21.7	27.6	20.1
National annual average concentration	19.7	24.4	22.2	21.3	27.3	19.5
Number of days standard exceeded[a]						

Pollutant Standards	Yuba City 2007	Yuba City 2008	Yuba City 2009	Gridley 2007	Gridley 2008	Gridley 2009
NAAQS 24-hour (>150 μg/m³)[f]	0	0	0	0	0	0
CAAQS 24-hour (>50 μg/m³)[f]	1	4	0	2	6	0
Particulate matter (PM2.5) (μg/m³)						
National[b] maximum 24-hour concentration	45.0	127.3	41.8	53.9	107.6	35.1
National[b] second-highest 24-hour concentration	42.0	105.5	36.3	53.0	93.8	30.0
State[c] maximum 24-hour concentration	55.8	147.1	45.3	83.7	190.9	59.2
State[c] second-highest 24-hour concentration	52.7	124.6	44.0	70.2	180.1	54.2
National annual designation value	9.7	10.1	8.9	12.1	13.4	12.4
National annual average concentration	8.1	10.6	7.9	10.6	16.4	10.0
State annual designation value	11	15	15	15	18	18
State annual average concentration[e]	–	14.7	12.2	14.4	18.2	13.0
Number of days standard exceeded[a]						
NAAQS 24-hour (>35 μg/m³)[f]	8	10	2	24	37	0

Sources: California Air Resources Board 2011; U.S. Environmental Protection Agency 2009.
μg/m³ = micrograms per cubic meter.
CAAQS = California ambient air quality standards.
NAAQS = national ambient air quality standards.
ppm = parts per million.
– = insufficient data available to determine the value.
[a] An exceedance is not necessarily a violation.
[b] National statistics are based on standard conditions data. In addition, national statistics are based on samplers using Federal reference or equivalent methods.
[c] State statistics are based on local conditions data, except in the South Coast Air Basin, for which statistics are based on standard conditions data. In addition, state statistics are based on California approved samplers.
[d] Measurements usually are collected every 6 days.
[e] State criteria for ensuring that data are sufficiently complete for calculating valid annual averages are more stringent than the national criteria.
[f] Mathematical estimate of how many days concentrations would have been measured as higher than the level of the standard had each day been monitored. Values have been rounded.

Air Quality Attainment Status

Local monitoring data (Table 3.5-2) are used to designate areas as nonattainment, maintenance, attainment, or unclassified for the NAAQS and CAAQS. The four designations are further defined as follows.

- **Nonattainment**—assigned to areas where monitored pollutant concentrations consistently violate the standard in question.
- **Maintenance**—assigned to areas where monitored pollutant concentrations exceeded the standard in question in the past but are no longer in violation of that standard.
- **Attainment**—assigned to areas where pollutant concentrations meet the standard in question over a designated period of time.

- **Unclassified**—assigned to areas were data are insufficient to determine whether a pollutant is violating the standard in question.

Table 3.5-3 summarizes the attainment status of the project area within Butte and Sutter Counties with regard to the NAAQS and CAAQS.

Table 3.5-3. Federal and State Attainment Status of the Project Area within Butte and Sutter Counties

	Project Area in Butte County		Project Area in Sutter County	
Pollutant	NAAQS	CAAQS	NAAQS	CAAQS
1-hour O_3	–	Moderate Nonattainment	–	Moderate Nonattainment
8-hour O_3	Marginal Nonattainment [a]	Nonattainment	Severe Nonattainment [b] /Attainment Unclassified [c]	Nonattainment-Transitional
CO	Moderate Maintenance [a]	Attainment	Attainment	Attainment
PM2.5	Nonattainment [a]	Nonattainment	Nonattainment [d]	Attainment
PM10	Attainment	Nonattainment	Attainment	Nonattainment

Sources: California Air Resources Board 2012; U.S. Environmental Protection Agency 2012.
– = No applicable standard.
CAAQS = California ambient air quality standards.
CO = carbon monoxide.
NAAQS = national ambient air quality standards.
O_3 = ozone.
PM2.5 = particulate matter less than 2.5 microns in diameter.
PM10 = particulate matter less than 10 microns in diameter.
[a] Designation applies to activities occurring under Contract D in the Chico urbanized area.
[b] Designation applies to activities occurring between Reaches 1 and 2 under Contract A.
[c] Designation applies to activities occurring between Reaches 3 through 25 under Contracts A, B, and C.
[d] Designation applies to activities occurring under Contracts A, B, and C.

Sensitive Receptors

Sensitive receptors are frequently occupied locations where people who might be especially sensitive to air pollution are expected to live, work, or recreate. These types of receptors include schools, churches, health care facilities, convalescent homes, and daycare centers. Table 3.5-4 lists sensitive receptors that were identified in the project area. Of the overall 41-mile project length, most construction would be in rural areas where there are no sensitive receptors. All sensitive receptors listed in Table 3.5-4 are in the urbanized portions of Yuba City.

Table 3.5-4. Sensitive Receptors in the Project Area

Sensitive Receptor	Project Reach	Distance to Levee (feet)
Blackburn Talley Park	12	4,680
Day Care Yuba	13	2,000
Yuba City Rehabilitation Center	16	3,000
Yuba Skilled Nursing Center	16	2,500
Yuba City Swimming Pool	16	1,800
Praise Chapel	17	1,500
River City Network School	17	1,100
Christ Temple Church	18	250
Albert Powell School	18	1,000
Riverbend High School	18	2,000

3.5.3 Environmental Consequences

This section describes the environmental consequences relating to air quality for the proposed project. It describes the methods used to determine the effects of the proposed project and lists the thresholds used to conclude whether an effect would be significant. The effects that would result from implementation of the proposed project, findings with or without mitigation, and applicable mitigation measures are presented in a table under each alternative.

3.5.3.1 Assessment Methods

This evaluation of air quality is based on professional standards and information cited throughout the section. The key effects were identified and evaluated based on the environmental characteristics of the project area and the magnitude, intensity, and duration of activities related to the construction and operation of the proposed project.

Quantitative estimates of fugitive dust and tailpipe emissions during the levee construction project were forecast using construction activity data provided by HDR, SBFCA's professional engineering team, and using the Sacramento Roadway Construction Emission Model (SacRCEM) (version 7.1.2) (Sacramento Metropolitan Air Quality Management District 2012). In its CEQA guidance, FRAQMD directs that CEQA analyses use this model for analysis of air quality effects. BCAQMD suggests the use of URBEMIS in its CEQA guidance; however, in the interest of consistency in the analysis of this project, BCAQMD agreed to the use of SacRCEM. Detailed information on the emission calculation methods is provided in Appendix D. The following types of information were used, and are shown in Appendix D.

- The levee construction would occur in the years 2013–2015. The analysis presents an estimate of maximum daily emissions for each construction year, which corresponds to the periods in which multiple construction phases would occur simultaneously (typically July and August). Total annual emissions generated during each year of construction (2013–2015) are also presented.
- The type of each construction equipment, number of pieces of each type, and the duration of each type of construction activity. This information was provided by the HDR Engineering (2012). The forecast equipment usage is listed in Appendix D. The appendix lists the pieces of

equipment for Construction Contracts A, B, and C within FRAQMD jurisdiction and for Construction Contract D within BCAQMD jurisdiction.

- Duration of each type of construction activity in each project segment. This information was provided by HDR (2012:1-40).
- Quantities of borrow material, spoil material, and supplies to be delivered to the project, for each project segment. This information was provided by HDR (2012).
- Number of employees for each project segment, each of whom was assumed to commute to the site in his or her own vehicle. This information was provided by HDR (2012).
- Default operating parameters for each type of construction equipment (horsepower, load factor and hours per day of usage) were set by the SacRCEM (Sacramento Metropolitan Air Quality Management District 2012).
- Default emission factors for non–road construction equipment, on-road delivery trucks, and on-road commute vehicles, were set by the SacRCEM.

3.5.3.2 Determination of Effects

For this analysis, an effect pertaining to air quality was analyzed based on professional practice and State CEQA Guidelines Appendix G (14 CCR 15000 et seq.). An effect was considered significant if it would result in one of the following conditions.

- Conflict with, or obstruct implementation of, the applicable air quality plan.
- Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is a nonattainment area under NAAQS and CAAQS.
- Exceed thresholds of the federal general conformity regulation.
- Expose sensitive receptors to substantial pollutant concentrations.
- Create objectionable odors affecting a substantial number of people.

The appropriate district-recommended emission thresholds as published in their respective CEQA guidance documents also apply to individual projects under their jurisdiction.

3.5.4 Effects and Mitigation Measures

Effects and mitigation measure requirements concerning air quality are summarized in Table 3.5-5.

Table 3.5-5. Summary of Effects for Air Quality

Effect	Finding	Mitigation Measure	With Mitigation
Alternatives 1, 2, and 3			
Effect AQ-1: Obstruction of an Applicable Air Quality Plan	Less than significant	None required	Less than significant
Effect AQ-2: Exceedance of Applicable Thresholds for Construction Emissions	Significant	AQ-MM-1 Provide Advance Notification of Construction Schedule and 24-Hour Hotline to Residents AQ-MM-2: Implement Fugitive Dust Control Plan If Unmitigated Emissions Exceed PM10 or PM 2.5 Thresholds AQ-MM-3. General Measures to Reduce Emissions AQ-MM-4: Fleet-Wide Emission Reductions for Large Off-Road Equipment AQ-MM-5: Pay Required Fees to FRAQMD and BCAQMD to Offset Annual Construction NO_X Emissions to Net Zero (0)	Significant and unavoidable
Effect AQ-3: Exceedance of the Federal General Conformity Thresholds during Construction	Significant	AQ-MM-5: Pay Required Fees to FRAQMD and BCAQMD to Offset Annual Construction NO_X Emissions to Net Zero (0)	Less than significant
Effect AQ-4: Long-Term Operation and Maintenance Emissions of ROG, NO_X, and PM10	Less than significant	None required	Less than significant
Effect AQ-5: Exposure of Sensitive Receptors to Toxic Air Emissions	Less than significant	None required	Less than significant
Effect AQ-6: Exposure to Objectionable Odors from Diesel Exhaust	Less than significant	None required	Less than significant

3.5.4.1 No Action Alternative

The No Action Alternative represents the continuation of the existing deficiencies along the portion of the Feather River in the FRWLP area. Current levee operations and maintenance activities would continue, but there would be no construction-related emissions from project implementation or maintenance.

Without improvements to the levee system, the risk of levee failure would remain high. Under these conditions, any of the levee deficiencies could cause portions of the levee to fail, triggering widespread flooding and extensive damage. If a catastrophic flood were to occur, emergency flood fighting and clean-up actions would require the use of a considerable amount of heavy construction equipment. Timing and duration of use would directly correlate with flood fighting needs, but it is likely that pollutants emitted would violate air quality standards for pollutants (including those for which the area is already considered nonattainment), increase air pollutant emissions, and expose sensitive receptors to toxic air emissions. Depending on the magnitude of the flood, flood fighting could last for weeks or even months. Furthermore, because of the unpredictable nature of an emergency response, no BMPs to manage emissions would be in place. All of these effects could be considered significant. However, the timing, duration, and magnitude of a flood event are speculative and unpredictable, and therefore a precise determination of significance is not possible.

3.5.4.2 Alternative 1

Implementation of Alternative 1 would potentially result in effects on air quality. These potential effects and related mitigation measure requirements are summarized in Table 3.5-6 and discussed below.

Table 3.5-6. Air Quality Effects and Mitigation Measures for Alternative 1

Effect	Finding	Mitigation Measure	With Mitigation
Effect AQ-1: Obstruction of an Applicable Air Quality Plan	Less than significant	None required	Less than significant
Effect AQ-2: Exceedance of Applicable Thresholds for Construction Emissions	Significant	AQ-MM-1 Provide Advance Notification of Construction Schedule and 24-Hour Hotline to Residents AQ-MM-2: Implement Fugitive Dust Control Plan If Unmitigated Emissions Exceed PM10 or PM 2.5 Thresholds AQ-MM-3. General Measures to Reduce Emissions AQ-MM-4: Fleet-Wide Emission Reductions for Large Off-Road Equipment AQ-MM-5: Pay Required Fees to FRAQMD and BCAQMD to Offset NO_X Emissions to Net Zero (0) for Emissions in Excess of General Conformity *de minimis* thresholds or to Quantities below Applicable FRAQMD and BCAQMD CEQA thresholds (where applicable)	Significant and unavoidable
Effect AQ-3: Exceedance of the Federal General Conformity Thresholds during Construction	Significant	AQ-MM-1 Provide Advance Notification of Construction Schedule and 24-Hour Hotline to Residents AQ-MM-2: Implement Fugitive Dust Control Plan If Unmitigated Emissions Exceed PM10 or PM 2.5 Thresholds AQ-MM-3. General Measures to Reduce Emissions AQ-MM-4: Fleet-Wide Emission Reductions for Large Off-Road Equipment	Less than significant
Effect AQ-4: Long-Term Operation and Maintenance Emissions of ROG, NO_X, and PM10	Less than significant	None required	Less than significant
Effect AQ-5: Exposure of Sensitive Receptors to Toxic Air Emissions	Less than significant	None required	Less than significant
Effect AQ-6: Exposure to Objectionable Odors from Diesel Exhaust	Less than significant	None required	Less than significant

Effect AQ-1: Obstruction of an Applicable Air Quality Plan

A project is deemed inconsistent with an air quality plan if it would result in population or employment growth that exceeds the growth estimates in the applicable air quality plan—thus generating emissions not accounted for in the applicable air quality plan emissions budget. Consequently, proposed projects need to be evaluated to determine whether they would generate population and employment growth and, if so, whether that growth would exceed the growth rate included in the relevant air quality plan.

As described in Chapter 4, *Growth-Inducing and Cumulative Effects*, the implementation of flood risk-reduction measures would maintain or improve the level of flood protection to the standard upon which county and city general plan growth has been based (i.e., 100-year) and for which effects have been analyzed associated with build-out. Therefore, the FRWLP would not conflict with or obstruct the implementation of air quality plans. This effect would be less than significant. No mitigation is required.

Effect AQ-2: Exceedance of Applicable Thresholds for Construction Emissions

Without mitigation, construction-related emissions under the FRWLP would exceed CEQA emission thresholds for ROG, NO_X and PM10 in the FRAQMD and NO_X and PM10 thresholds in the BCAQMD, which would result in a significant effect. Mitigation Measures AQ-MM-1 through AQ-MM-5, described below, would help to reduce these effects.

Table 3.5-7 shows the construction emissions for Construction Contracts A, B, and C in FRAQMD's jurisdiction with and without these mitigation measures, and Table 3.5-8 shows the emission forecasts for Construction Contract D in BCAQMD's jurisdiction. After applying the mitigation measures, the maximum daily emissions would still exceed the ROG CEQA threshold in FRAQMD's jurisdiction. There would be no violations within BCAQMD's jurisdiction. Because ROG emissions would be in excess of FRAQMD's CEQA threshold, this effect would be significant and unavoidable after mitigation.

Table 3.5-7. Alternative 1 (Construction Contracts A, B, and C), Forecast Construction Emissions in FRAQMD Jurisdiction (2013–2015)

	Maximum Daily Emissions, lb/day [a]					
Analysis Year	ROG	NO_X	CO	PM10	PM2.5	CO_2
Maximum Daily Unmitigated Emissions						
2013	57	709	291	89	25	74,001
2014	150	2,023	763	191	60	225,207
2015	99	1,375	498	102	35	162,663
Maximum Daily Emissions after Onsite Mitigation (AQ-MM-1 through AQ-MM-4) [b]						
2013	57	592	291	27	10	74,001
2014	150	1,716	763	60	25	225,207
2015	99	1,173	498	34	15	162,663
Maximum Daily Emissions after Offsite Mitigation (AQ-MM-5)						
2013	57	<25	291	27	10	74,001
2014	150	<25	763	60	25	225,207
2015	99	<25	498	34	15	162,663
FRAQMD CEQA Threshold	25	25	NA	80	NA	NA
Exceeds Threshold (2013)?	Yes	No	NA	No	NA	NA
Exceeds Threshold (2014)?	Yes	No	NA	No	NA	NA
Exceeds Threshold (2015)?	Yes	No	NA	No	NA	NA

NA = not applicable.

[a] Maximum ROG, NO_X, CO, and CO_2 emissions typically occur between July and August, whereas maximum daily PM emissions occur between May and June.

[b] Assumes a 20% reduction in NO_X, a 55% reduction in PM exhaust, and a 75% reduction in fugitive dust.

Table 3.5-8. Alternative 1 (Construction Contract D), Forecast Construction Emissions in BCAQMD Jurisdiction (2014–2015)

	Maximum Daily Emissions, lb/day [a]					
Analysis Year	ROG	NO_X	CO	PM10	PM2.5	CO_2
Maximum Daily Unmitigated Emissions						
2014	42	509	221	68	19	58,863
2015	40	487	215	67	19	58,730
Maximum Daily Emissions after Onsite Mitigation (AQ-MM-1 through AQ-MM-4) [b]						
2014	42	428	221	20	7	58,863
2015	40	408	215	19	7	58,730
Maximum Daily Emissions after Offsite Mitigation (AQ-MM-5)						
2014	42	<137	221	20	7	58,863
2015	40	<137	215	19	7	58,730
BCAQMD CEQA Threshold	137	137	NA	137	NA	NA
Exceeds Threshold (2014)?	No	No	NA	No	NA	NA
Exceeds Threshold (2015)?	No	No	NA	No	NA	NA

NA = not applicable.

[a] Maximum ROG, NO_X, CO, and CO_2 emissions typically occur between July and August, whereas maximum daily PM emissions occur between May and June.

[b] Assumes a 20% reduction in NO_X, a 55% reduction in PM exhaust, and a 75% reduction in fugitive dust.

Mitigation Measure AQ-MM-1: Provide Advance Notification of Construction Schedule and 24-Hour Hotline to Residents

SBFCA will provide advance written notification of the proposed construction activities to all residences and other air quality–sensitive uses within 500 feet of the construction site. Notification will include a brief overview of the proposed project and its purpose, as well as the proposed construction activities and schedule. It also will include the name and contact information of SBFCA's project manager or a representative for ensuring that reasonable measures are implemented to address a problem.

The construction contractor will post a publicly visible sign with the telephone number and person to contact regarding dust complaints. This person will respond and take corrective action within 48 hours. The phone number of the appropriate air quality agency (FRAQMD or BCAQMD) also will be visible to ensure compliance with the agencies' regulations.

Mitigation Measure AQ-MM-2: Implement Fugitive Dust Control Plan If Unmitigated Emissions Exceed PM10 or PM2.5 Thresholds

The construction contractor will implement all applicable and feasible fugitive dust control measures required by FRAQMD and BCAQMD, including those listed below. This requirement will be incorporated into the construction contract.

- Prior to mobilizing to the job site the construction contractor will submit a dust control plan to FRAQMD and BCAQMD.

- Water active unpaved areas at all construction sites at least twice daily in dry conditions or more frequently as required, with the frequency of watering based on the type of operation, soil, and wind exposure.
- Prohibit all grading activities and water all areas of disturbed soil under windy conditions (more than 20 miles per hour).
- Limit onsite vehicles to a speed that prevents visible dust emissions to extend beyond unpaved roads.
- Cover all trucks hauling dirt, sand, or loose materials.
- Cover active and inactive storage piles where appropriate.
- Cover or hydroseed unpaved areas that will remain inactive for extended periods.
- Apply soil stabilizers to active and inactive areas where appropriate.
- Install wheel washers at the entrance to construction sites for all exiting trucks.
- Sweep streets if visible soil material is carried out from the construction site. Sweeping will be done at least once per day unless conditions warrant a more frequent application.
- Install wind fencing and phase grading operations where appropriate.

Fugitive dust emissions from the construction of the FRWLP would be reduced to a less-than-significant level with the implementation of the fugitive dust control measures listed above.

Mitigation Measure AQ-MM-3: General Measures to Reduce Emissions

The SBFCA will implement the following mitigation measures.

- No open burning of removed vegetation. Vegetative material will be chipped or delivered to waste or energy facilities.
- Develop a traffic plan to minimize traffic flow interference from construction activities. The plan may include advance public notice of routing, use of public transportation, and satellite parking areas with a shuttle service. Schedule operations affecting traffic for off-peak hours. Minimize obstruction of through-traffic lanes. Provide a flag person to guide traffic properly and ensure safety at construction sites.
- Reduce use, trips, and unnecessary idling of heavy equipment. Shut down idling equipment that is not used for more than 5 consecutive minutes as required by California law.
- Construction equipment exhaust emissions will not exceed 40% opacity or Ringelmann 2.0. Operators of vehicles and equipment found to exceed opacity limits will take action to repair the equipment within 72 hours or remove the equipment from service.
- Maintain all construction equipment in proper tune according to manufacturer's specifications.
- Locate stationary diesel-powered equipment and haul truck staging areas as far as practical from sensitive receptors.
- Use existing power sources (e.g., power lines) or clean fuel generators rather than conventional diesel generators, when feasible.
- Substitute gasoline-powered for diesel-powered equipment when feasible.

- Portable engines and portable engine-driven equipment units used at the project work site, with the exception of on-road and off-road motor vehicles, may require ARB Portable Equipment Registration with the state or a local district permit. The owner/operator will be responsible for arranging appropriate consultations with ARB or the air districts to determine registration and permitting requirements prior to equipment operation at the site.

Mitigation Measure AQ-MM-4: Fleet-Wide Emission Reductions for Large Off-Road Equipment

Prior to mobilizing to the job site, the construction contractor will assemble a comprehensive inventory list (make, model, engine year, horsepower, emission rates) of all heavy-duty off-road (portable and mobile) equipment (50 horsepower and greater) that will be used an aggregate of 40 or more hours for the construction project. The construction contractor then will apply the following mitigation measure to those pieces of equipment.

The construction contractor will provide a plan, for approval by FRAQMD and BCAQMD, demonstrating that the heavy-duty off-road equipment to be used at the project sites, including owned, leased, and subcontractor equipment, will achieve a project-wide fleet-average reduction of 20% for NO_X and 45% for DPM, compared to the most recent ARB fleet average at time of construction. SBFCA will use the construction mitigation calculator downloaded from the Sacramento Metropolitan Air Quality Management District web site (or similar tool approved by FRAQMD and BCAQMD) to perform the fleet average evaluation (Sacramento Metropolitan Air Quality Management District 2009). Acceptable options for reducing emissions may include use of late model engines, low-emission diesel products, alternative fuels, engine retrofit technology (Carl Moyer Guidelines), or installation of after-treatment emission control devices. FRAQMD and BCAQMD will be contacted to review and approve the alternative measures.

Mitigation Measure AQ-MM-5: Pay Required Fees to FRAQMD and BCAQMD to Offset NO_X Emissions to Net Zero (0) for Emissions in Excess of General Conformity *de minimis* thresholds or to Quantities below Applicable FRAQMD and BCAQMD CEQA thresholds (where applicable)

After implementing the general tailpipe emission control measures listed in AQ-MM-4 to reduce daily-average construction emissions, SBFCA will pay offsite mitigation fees to FRAQMD and BCAQMD to offset NO_X emissions. Emissions in excess of the federal *de minimis* thresholds shall be reduced to net zero (0). Emissions not in excess of the *de minimis* thresholds, but above applicable air district CEQA thresholds shall be reduced to quantities below the numeric thresholds.

Prior to issuance of grading permits for the project, SBFCA will consult with FRAQMD and BCAQMD to define the best construction information and the appropriate computational tools to be used for the calculations. SBFCA will submit calculations to FRAQMD and BCAQMD documenting the tons of NO_X to be offset over the duration of the construction phase of the project. SBFCA will consult with FRAQMD and BCAQMD to define the required fee payment based on the most recent Carl Moyer program cost value. Prior to the approval of project plans or the issuance of grading permits, the SBFCA will submit proof that the offsite air quality mitigation fee has been paid to FRAQMD and BCAQMD, and that the construction air quality mitigation plan has been approved by FRAQMD, BCAQMD, and SBFCA.

Effect AQ-3: Exceedance of the Federal General Conformity Thresholds during Construction

The FRWLP is subject to the Federal general conformity rule, which establishes applicability thresholds based on a region's attainment status with the NAAQS. As shown in Table 3.5-3, activities occurring under Contract D are located in an area currently designated moderate maintenance for the federal CO standard and marginal nonattainment for the federal 8-hour ozone standard. Activities occurring between Reaches 1 and 2 (Contract A) are located in an area designated severe nonattainment for the federal 8-hour ozone standard. The entire project area, including all activities under Contracts A through D, is designated a nonattainment area for the federal PM2.5 standard.

Table 3.5-9 compares annual construction emissions to the appropriate *de minimis* thresholds based on the regional nonattainment status. The emissions presented in Table 3.5-9 assume implementation of MM-AQ-1 through MM-AQ-4, as described under Effect AQ-2. As shown in Table 3.5-9, construction of Alternative 1 would not exceed applicable federal *de minimis* threshold for ROG, NO_X, CO, or PM2.5 for all construction years and activities. Consequently, General Conformity requirements are met as the action would not cause or contribute to new or worsening violations of the ambient air quality standards. No further conformity evaluation is required.

Table 3.5-9. Alternative 1, Annual Construction Emissions for 2013, 2014, and 2015 Compared to Applicable General Conformity Thresholds

Analysis	Contract D			Contract A		Contracts A-D
	ROG	NO_X	CO	ROG	NO_X	PM2.5
Annual Mitigated Emissions after Onsite Mitigation (AQ-MM-1 through AQ-MM-4) [a]						
2013	0	0	0	0	0	0
2014	1	14	8	2	15	2
2015	1	12	7	1	13	2
Attainment Status	Marginal Nonattainment	Marginal Nonattainment	Moderate Maintenance	Severe Nonattainment	Severe Nonattainment	Nonattainment
Applicable Threshold	*100*	*100*	*100*	*25*	*25*	*100*
Exceed Threshold (2013)?	No	No	No	No	No	No
Exceed Threshold (2014)?	No	No	No	No	No	No
Exceed Threshold (2015)?	No	No	No	No	No	No

[a] Assumes a 20% reduction in NO_X, a 55% reduction in PM exhaust, and a 75% reduction in fugitive dust.
[b] Threshold based on the regional nonattainment status.

Effect AQ-4: Long-Term Operation and Maintenance Emissions of ROG, NO_X, and PM10

After the FRWLP is constructed, the facilities generally would be maintained as needed. Maintenance work would be less extensive and would take place over a few days per year. In addition, maintenance and operation activities are part of the existing environmental baseline and thus would not create a substantial source of new emissions. This effect would be less than significant. No mitigation is required.

Effect AQ-5: Exposure of Sensitive Receptors to Toxic Air Emissions

Construction of the proposed project would result in short-term diesel exhaust emissions from on-site heavy duty equipment. Particulate exhaust emissions from diesel-fueled engines (DPM) were identified as a TAC by ARB in 1998. Construction of the project would result in the generation of

DPM emissions from the use of off-road diesel equipment required for site grading and excavation, paving, and other construction activities.

The assessment of health risks associated with exposure to diesel exhaust typically is associated with chronic exposure, in which a 70-year exposure period often is assumed. However, while cancer can result from exposure periods of less than 70 years, acute exposure periods (i.e., exposure periods of 1–3 years) to diesel exhaust are not anticipated to result in an increased health risk, as health risks associated with exposure to diesel exhaust typically are seen in exposures periods that are chronic. Construction of the project is not expected to take place at the same construction site for more than 1 to 2 years, and the number of pieces of heavy equipment expected to be used at the same construction site would be limited. Furthermore, as required by ARB regulation, no in-use off-road diesel vehicles may idle for more than 5 consecutive minutes.

This effect would be less than significant. In addition, implementation of Mitigation Measures AQ-MM-3 and AQ-MM-4 under Effect AQ-2 would further reduce exhaust emissions during construction. No further mitigation is required.

Effect AQ-6: Exposure to Objectionable Odors from Diesel Exhaust

The proposed project would not result in any major sources of odor, nor would it involve operation of any of the common types of facilities that are known to produce odors (e.g., landfill, wastewater treatment facility). In addition, odors associated with diesel exhaust from the use of onsite construction equipment would be intermittent and temporary and would dissipate rapidly from the source with an increase in distance.

Furthermore, as required by ARB regulation, no in-use off-road diesel vehicles may idle for more than 5 consecutive minutes. Implementation of Mitigation Measures AQ-MM-1 through AQ-MM-5 under Effect AQ-2 would further reduce exhaust emissions during construction. This effect would be less than significant. No mitigation is required.

3.5.4.3 Alternative 2

Implementation of Alternative 2 would potentially result in effects on air quality. These potential effects and related mitigation measure requirements are summarized in Table 3.5-10 and discussed below.

Table 3.5-10. Air Quality Effects and Mitigation Measures for Alternative 2

Effect	Finding	Mitigation Measure	With Mitigation
Effect AQ-1: Obstruction of an Applicable Air Quality Plan	Less than significant	None required	Less than significant
Effect AQ-2: Exceedance of Applicable Thresholds for Construction Emissions	Significant	AQ-MM-1 Provide Advance Notification of Construction Schedule and 24-Hour Hotline to Residents AQ-MM-2: Implement Fugitive Dust Control Plan If Unmitigated Emissions Exceed PM10 or PM 2.5 Thresholds AQ-MM-3. General Measures to Reduce Emissions AQ-MM-4: Fleet-Wide Emission Reductions for Large Off-Road Equipment AQ-MM-5: Pay Required Fees to FRAQMD and BCAQMD to Offset NO_X Emissions to Net Zero (0) for Emissions in Excess of General Conformity *de minimis* thresholds or to Quantities below Applicable FRAQMD and BCAQMD CEQA thresholds (where applicable)	Significant and unavoidable
Effect AQ-3: Exceedance of the Federal General Conformity Thresholds during Construction	Significant	AQ-MM-1 Provide Advance Notification of Construction Schedule and 24-Hour Hotline to Residents AQ-MM-2: Implement Fugitive Dust Control Plan If Unmitigated Emissions Exceed PM10 or PM 2.5 Thresholds AQ-MM-3. General Measures to Reduce Emissions AQ-MM-4: Fleet-Wide Emission Reductions for Large Off-Road Equipment AQ-MM-5: Pay Required Fees to FRAQMD and BCAQMD to Offset NO_X Emissions to Net Zero (0) for Emissions in Excess of General Conformity *de minimis* thresholds or to Quantities below Applicable FRAQMD and BCAQMD CEQA thresholds (where applicable)	Less than Significant
Effect AQ-4: Long-Term Operation and Maintenance Emissions of ROG, NO_X, and PM10	Less than significant	None required	Less than significant
Effect AQ-5: Exposure of Sensitive Receptors to Toxic Air Emissions	Less than significant	None required	Less than significant
Effect AQ-6: Exposure to Objectionable Odors from Diesel Exhaust	Less than significant	None required	Less than significant

Effect AQ-1: Obstruction of an Applicable Air Quality Plan

The effect is the same as described under Alternative 1. This effect would be less than significant. No mitigation is required.

Effect AQ-2: Exceedance of Applicable Thresholds for Construction Emissions

This effect would be similar to those described under Alternative 1, although the magnitude of the forecast emission rates during construction are slightly different. Without mitigation, construction-related emissions under the FRWLP would exceed CEQA emission thresholds for ROG, NO_X and PM10 thresholds in the FRAQMD and NO_X thresholds in the BCAQMD, which would result in a significant effect. Table 3.5-11 shows the construction emissions for Construction Contracts A, B, and C in FRAQMD's jurisdiction with and without these mitigation measures, and Table 3.5-12 shows the emission forecasts for Construction Contract D in BCAQMD's jurisdiction. After applying Mitigation Measures AQ-MM-1 through AQ-MM-5, the maximum daily emissions still would exceed the ROG and PM10 CEQA thresholds in the FRAQMD's jurisdiction. There would be no violations within BCAQMD's jurisdiction. Because ROG and PM10 emissions would be in excess of FRAQMD's CEQA threshold, this effect would be significant and unavoidable after mitigation.

Table 3.5-11. Alternative 2 (Construction Contracts A, B, and C), Forecast Construction Emissions in FRAQMD Jurisdiction (2013–2015)

	Maximum Daily Emissions, lb/day [a]					
Analysis Year	ROG	NO_X	CO	PM10	PM2.5	CO_2
Maximum Daily Unmitigated Emissions						
2013	75	1,200	347	345	101	131,244
2014	163	2,680	750	540	140	313,569
2015	125	2,001	579	224	63	243,437
Maximum Daily Emissions after Onsite Mitigation (AQ-MM-1 through AQ-MM-4) [b]						
2013	75	1,054	347	106	42	131,244
2014	163	2,363	750	148	47	313,569
2015	125	1,753	579	63	22	243,437
Maximum Daily Emissions after Offsite Mitigation (AQ-MM-5)						
2013	75	<25	347	106	42	131,244
2014	163	<25	750	148	47	313,569
2015	125	<25	579	63	22	243,437
FRAQMD CEQA Threshold	25	25	NA	80	NA	NA
Exceeds Threshold (2013)?	Yes	No	NA	Yes	NA	NA
Exceeds Threshold (2014)?	Yes	No	NA	Yes	NA	NA
Exceeds Threshold (2015)?	Yes	No	NA	No	NA	NA

[a] NA = not applicable.Maximum ROG, NO_X, CO, and CO_2 emissions typically occur between July and August, whereas maximum daily PM emissions occur between May and June.

[b] Assumes a 20% reduction in NO_X, a 55% reduction in PM exhaust, and a 75% reduction in fugitive dust.

Table 3.5-12. Alternative 2 (Construction Contract D), Forecast Construction Emissions in BCAQMD Jurisdiction (2014–2015)

	Maximum Daily Emissions, lb/day [a]					
Analysis Year	ROG	NO_X	CO	PM10	PM2.5	CO_2
Maximum Daily Unmitigated Emissions						
2014	28	380	122	107	28	38,144
2015	27	366	121	107	27	38,149
Maximum Daily Emissions after Onsite Mitigation (AQ-MM-1 through AQ-MM-4) [b]						
2014	28	321	122	29	9	38,144
2015	27	308	121	29	9	38,149
Maximum Daily Emissions after Offsite Mitigation (AQ-MM-5)						
2014	28	<137	122	29	9	38,144
2015	27	<137	121	29	9	38,149
BCAQMD CEQA Threshold	137	137	NA	137	NA	NA
Exceeds Threshold (2014)?	No	No	NA	No	NA	NA
Exceeds Threshold (2015)?	No	No	NA	No	NA	NA

[a] NA = not applicable.Maximum ROG, NO_X, CO, and CO_2 emissions typically occur between July and August, whereas maximum daily PM emissions occur between May and June.

[b] Assumes a 20% reduction in NO_X, a 55% reduction in PM exhaust, and a 75% reduction in fugitive dust.

Effect AQ-3: Exceedance of the Federal General Conformity Thresholds during Construction

This effect would be similar to Alternative 1, except the magnitude of the emissions are different. The FRWLP is subject to the Federal general conformity rule, which establishes applicability thresholds based on a region's attainment status with the NAAQS. As shown in Table 3.5-3, activities occurring under Contract D are located in an area currently designated moderate maintenance for the federal CO standard and marginal nonattainment for the federal 8-hour ozone standard. Activities occurring between Reaches 1 and 2 (Contract A) are located in an area designated severe nonattainment for the federal 8-hour ozone standard. The entire project area, including all activities under Contracts A through D, is designated a nonattainment area for the federal PM2.5 standard.

Table 3.5-13 compares annual construction emissions to the appropriate *de minimis* thresholds based on the regional nonattainment status. The emissions presented in Table 3.5-13 assume implementation of AQ-MM-1 through AQ-MM-4, as described under Effect AQ-2. As shown in Table 3.5-13, construction of Contract A would exceed the federal *de minimis* threshold for NO_X. There would be no violations of any other *de minimis* thresholds. Since Contract A emissions exceed the federal *de minimis* threshold for NO_X, a general conformity determination must be made to demonstrate that total direct and indirect emissions of NO_X would conform to the appropriate ozone SIP for each year of construction under Contract A (2014–2015).

As shown in Appendix D, USACE demonstrates that emissions generated by Contract A under Alternative 2 would not result in a net increase in regional NO_X emissions, as construction-related NO_X emissions would be fully offset to zero through implementation of AQ-MM-5. Based on the emissions levels estimated for Contract A and the current payment fee of $17,080 per ton of NO_X, total mitigation cost is expected to equal about $1.2 million. AQ-MM-5 will ensure the requirements of the mitigation and offset program are implemented, should Alternative 2 be selected as the APA.

Table 3.5-13. Alternative 2, Annual Construction Emissions for 2013, 2014, and 2015 Compared to General Conformity Thresholds

Analysis	Contract D			Contract A		Contracts A-D
	ROG	NO_X	CO	ROG	NO_X	PM2.5
Annual Mitigated Emissions after Onsite Mitigation (AQ-MM-1 through AQ-MM-4) [a]						
2013	0	0	0	0	0	1
2014	1	17	6	3	37	3
2015	1	16	6	3	35	2
Attainment Status	Marginal Nonattainment	Marginal Nonattainment	Moderate Maintenance	Severe Nonattainment	Severe Nonattainment	Nonattainment
Applicable Threshold	*100*	*100*	*100*	*25*	*25*	*100*
Exceed Threshold (2013)?	No	No	No	No	No	No
Exceed Threshold (2014)?	No	No	No	No	Yes	No
Exceed Threshold (2015)?	No	No	No	No	Yes	No
AQ-MM-5 Required Fees [c]	0	0	0	0	71	0

NA = not applicable.

[a] Assumes a 20% reduction in NO_X, a 55% reduction in PM exhaust, and a 75% reduction in fugitive dust.

[b] Threshold based on the regional nonattainment status.

[c] Fees are required to reduce pollutants in excess of *de minimis* thresholds to net zero (0).

Effect AQ-4: Long-Term Operation and Maintenance Emissions of ROG, NO_X, and PM10

The effect is the same as described under Alternative 1. This effect would be less than significant. No mitigation is required.

Effect AQ-5: Exposure of Sensitive Receptors to Toxic Air Emissions

The effect is the same as described under Alternative 1. This effect would be less than significant. No mitigation is required.

Effect AQ-6: Exposure to Objectionable Odors from Diesel Exhaust

The effect is the same as described under Alternative 1. This effect would be less than significant. No mitigation is required.

3.5.4.4 Alternative 3

Implementation of Alternative 3 would potentially result in effects on air quality. These potential effects and related mitigation measure requirements are summarized in Table 3.5-14 and discussed below.

Table 3.5-14. Air Quality Effects and Mitigation Measures for Alternative 3

Effect	Finding	Mitigation Measure	With Mitigation
Effect AQ-1: Obstruction of an Applicable Air Quality Plan	Less than significant	None required	Less than significant
Effect AQ-2: Exceedance of Applicable Thresholds for Construction Emissions	Significant	AQ-MM-1 Provide Advance Notification of Construction Schedule and 24-Hour Hotline to Residents AQ-MM-2: Implement Fugitive Dust Control Plan If Unmitigated Emissions Exceed PM10 or PM 2.5 Thresholds AQ-MM-3. General Measures to Reduce Emissions AQ-MM-4: Fleet-Wide Emission Reductions for Large Off-Road Equipment AQ-MM-5: Pay Required Fees to FRAQMD and BCAQMD to Offset NO_X Emissions to Net Zero (0) for Emissions in Excess of General Conformity *de minimis* thresholds or to Quantities below Applicable FRAQMD and BCAQMD CEQA thresholds (where applicable)	Significant and unavoidable
Effect AQ-3: Exceedance of the Federal General Conformity Thresholds during Construction	Significant	AQ-MM-1 Provide Advance Notification of Construction Schedule and 24-Hour Hotline to Residents AQ-MM-2: Implement Fugitive Dust Control Plan If Unmitigated Emissions Exceed PM10 or PM 2.5 Thresholds AQ-MM-3. General Measures to Reduce Emissions AQ-MM-4: Fleet-Wide Emission Reductions for Large Off-Road Equipment	Less than significant
Effect AQ-4: Long-Term Operation and Maintenance Emissions of ROG, NO_X, and PM10	Less than significant	None required	Less than significant
Effect AQ-5: Exposure of Sensitive Receptors to Toxic Air Emissions	Less than significant	None required	Less than significant
Effect AQ-6: Exposure to Objectionable Odors from Diesel Exhaust	Less than significant	None required	Less than significant

Effect AQ-1: Obstruction of an Applicable Air Quality Plan

The effect is the same as described under Alternative 1. This effect would be less than significant. No mitigation is required.

Effect AQ-2: Exceedance of Applicable Thresholds for Construction Emissions

This effect would be similar to those described under Alternative 1, although the magnitude of the forecast emission rates during construction are slightly different. Without mitigation, construction-related emissions under the FRWLP would exceed CEQA emission thresholds for ROG, NO_X and

PM10 in the FRAQMD and NO_X thresholds in the BCAQMD, which would result in a significant effect. Table 3.5-15 shows the construction emissions for Construction Contracts A, B, and C in FRAQMD's jurisdiction with and without these mitigation measures, and Table 3.5-16 shows the emission forecasts for Construction Contract D in BCAQMD's jurisdiction. After applying the Mitigation Measures AQ-MM-1 through AQ-MM-5, the maximum daily emissions still would exceed the ROG CEQA threshold in FRAQMD's jurisdiction. There would be no violations within BCAQMD's jurisdiction. Because ROG emissions would be in excess of FRAQMD's CEQA threshold, this effect would be significant and unavoidable after mitigation.

Table 3.5-15. Alternative 3 (Construction Contracts A, B, and C), Forecast Construction Emissions in FRAQMD Jurisdiction (2013–2015)

	Maximum Daily Emissions, lb/day [a]					
Analysis Year	ROG	NO_X	CO	PM10	PM2.5	CO_2
Maximum Daily Unmitigated Emissions						
2013	40	530	192	89	24	54,359
2014	122	1,760	577	192	61	187,019
2015	90	1,235	417	103	37	149,098
Maximum Daily Emissions after Onsite Mitigation (AQ-MM-1 through AQ-MM-4) [b]						
2013	40	448	192	26	9	54,359
2014	122	1,731	577	60	26	187,019
2015	90	1,442	417	35	17	149,098
Maximum Daily Emissions after Offsite Mitigation (AQ-MM-5)						
2013	40	<25	192	26	9	54,359
2014	122	<25	577	60	26	187,019
2015	90	<25	417	35	17	149,098
FRAQMD CEQA Threshold	25	25	NA	80	NA	NA
Exceeds Threshold (2013)?	Yes	No	NA	No	NA	NA
Exceeds Threshold (2014)?	Yes	No	NA	No	NA	NA
Exceeds Threshold (2015)?	Yes	No	NA	No	NA	NA

NA = not applicable.

[a] Maximum ROG, NO_X, CO, and CO_2 emissions typically occur between July and August, whereas maximum daily PM emissions occur between May and June.

[b] Assumes a 20% reduction in NO_X, a 55% reduction in PM exhaust, and a 75% reduction in fugitive dust.

Table 3.5-16. Alternative 3 (Construction Contract D), Forecast Construction Emissions in BCAQMD Jurisdiction (2014–2015)

	Maximum Daily Emissions, lb/day [a]					
Analysis Year	ROG	NO_X	CO	PM10	PM2.5	CO_2
Maximum Daily Unmitigated Emissions						
2014	29	388	132	127	31	38,243
2015	28	374	130	127	31	38,113
Maximum Daily Emissions after Onsite Mitigation (AQ-MM-1 through AQ-MM-4) [b]						
2014	29	325	132	34	10	38,243
2015	28	312	130	34	10	38,113
Maximum Daily Emissions after Offsite Mitigation (AQ-MM-5)						
2014	29	<137	132	34	10	38,243
2015	28	<137	130	34	10	38,113
BCAQMD CEQA Threshold	137	137	NA	137	NA	NA
Exceeds Threshold (2014)?	No	No	NA	No	NA	NA
Exceeds Threshold (2015)?	No	No	NA	No	NA	NA

NA = not applicable.

[a] Maximum ROG, NO_X, CO, and CO_2 emissions typically occur between July and August, whereas maximum daily PM emissions occur between May and June.

[b] Assumes a 20% reduction in NO_X, a 55% reduction in PM exhaust, and a 75% reduction in fugitive dust.

Effect AQ-3: Exceedance of the Federal General Conformity Thresholds during Construction

This effect would be similar to Alternative 1, except the magnitudes of the emissions are different. The FRWLP is subject to the Federal general conformity rule, which establishes applicability thresholds based on a region's attainment status with the NAAQS. As shown in Table 3.5-3, activities occurring under Contract D are located in an area currently designated moderate maintenance for the federal CO standard and marginal nonattainment for the federal 8-hour ozone standard. Activities occurring between Reaches 1 and 2 (Contract A) are located in an area designated severe nonattainment for the federal 8-hour ozone standard. The entire project area, including all activities under Contracts A through D, is designated a nonattainment area for the federal PM2.5 standard.

Table 3.5-17 compares annual construction emissions to the appropriate *de minimis* thresholds based on the regional nonattainment status. The emissions presented in Table 3.5-17 assume implementation of MM-AQ-1 through MM-AQ-4, as described under Effect AQ-2. As shown in Table 3.5-17, construction of Alternative 3 would not exceed applicable federal *de minimis* threshold for ROG, NO_X, CO, or PM2.5 for all construction years and activities. Consequently, General Conformity requirements are met as the action would not cause or contribute to new or worsening violations of the ambient air quality standards. No further conformity evaluation is required.

Table 3.5-17. Alternative 3, Annual Construction Emissions for 2013, 2014, and 2015 Compared to Applicable General Conformity Thresholds

Analysis	Contract D			Contract A		Contracts A-D
	ROG	NO_X	CO	ROG	NO_X	PM2.5
Annual Mitigated Emissions after Onsite Mitigation (AQ-MM-1 through AQ-MM-4) [a]						
2013	0	0	0	0	0	0
2014	1	15	7	2	19	2
2015	1	13	6	2	16	2
Attainment Status	Marginal Nonattainment	Marginal Nonattainment	Moderate Maintenance	Severe Nonattainment	Severe Nonattainment	Nonattainment
Applicable Threshold	*100*	*100*	*100*	*25*	*25*	*100*
Exceed Threshold (2013)?	No	No	No	No	No	No
Exceed Threshold (2014)?	No	No	No	No	No	No
Exceed Threshold (2015)?	No	No	No	No	No	No

NA = not applicable.

[c] Assumes a 20% reduction in NO_X, a 55% reduction in PM exhaust, and a 75% reduction in fugitive dust.

[d] Threshold based on the regional nonattainment status.

Effect AQ-4: Long-Term Operation and Maintenance Emissions of ROG, NO_X, and PM10

The effect is the same as described under Alternative 1. This effect would be less than significant. No mitigation is required.

Effect AQ-5: Exposure of Sensitive Receptors to Toxic Air Emissions

The effect is the same as described under Alternative 1. This effect would be less than significant. No mitigation is required.

Effect AQ-6: Exposure to Objectionable Odors from Diesel Exhaust

The effect is the same as described under Alternative 1. This effect would be less than significant. No mitigation is required.

3.6 Climate Change and Greenhouse Gas

3.6.1 Introduction

This section describes the regulatory and environmental setting for climate change and greenhouse gases (GHGs); effects on climate change and GHGs that would result from the No Action Alternative and Alternatives 1, 2 and 3; and mitigation measures that would reduce significant effects. Additional information on GHG emission calculations is provided in Appendix E.

3.6.2 Affected Environment

This section describes the affected environment for climate change and GHGs in the project area. The key sources of data and information used in the preparation of this section are listed below.

- California Air Resources Board.
- Intergovernmental Panel on Climate Change (IPCC).
- U.S. Environmental Protection Agency.
- Western Regional Climate Center.

3.6.2.1 Regulatory Setting

This section summarizes key Federal, state, and local regulatory information that applies to climate change and GHGs. Additional regulatory information appears in Appendix A.

Federal

Although there is currently no Federal overarching law or policy related to climate change or the regulation of GHGs, recent activity suggests that regulation may be forthcoming. Foremost among recent developments has been the U.S. Supreme Court's decision in Massachusetts et al. v. EPA, the Endangerment Finding, and Cause or Contribute Finding, which are described in Appendix A. Despite these findings, the future of GHG regulations at the Federal level is still uncertain. EPA regulation may be preempted by congressional action, should a cap-and-trade bill be passed prior to adoption of EPA regulation. The following text summarizes the 2010 Draft NEPA guidance related to climate change and GHG emissions.

Draft NEPA Guidance on Consideration of the Effects of Climate Change and GHG Emissions (2010)

On February 18, 2010, Nancy Sutley, chair of the CEQ, issued a memorandum providing guidance on consideration of the effects of climate change and GHG emissions under NEPA. The draft guidance suggests that the effects of projects directly emitting GHGs in excess of 25,000 tons annually be considered in a qualitative and quantitative manner. The CEQ does not propose this reference as a threshold for determining significance, but as "a minimum standard for reporting emissions under the CAA." The draft guidance also recommends that the cumulative effects of climate change on the proposed project be evaluated. The draft guidance is still undergoing public comments and will not be effective until issued in final form(Council on Environmental Quality 2010).

State

The State of California has adopted legislation, and regulatory agencies have enacted policies, addressing various aspects of climate change and GHG emissions mitigation. Much of this legislation and policy activity is not directed at citizens or jurisdictions but rather establishes a broad framework for the state's long-term GHG mitigation and climate change adaptation program. The Governor has issued several executive orders (EOs) related to the state's evolving climate change policy that are summarized in Appendix A.

Assembly Bill 32—The California Global Warming Solutions Act (2006)

AB 32 codified the state's GHG emissions target by requiring that the state's GHG emissions be reduced to 1990 levels by 2020. Since AB 32 was adopted, ARB, California Energy Commission (CEC), California Public Utilities Commission (CPUC), and Building Standards Commission have been developing regulations that will help meet the goals of AB 32 and EO S-03-05. The Scoping Plan for AB 32, developed by ARB as part of the requirements of AB 32, identifies specific measures and actions to reduce GHG emissions to 1990 levels by 2020 and requires ARB and other state agencies to develop and enforce regulations and other initiatives for reducing GHGs.

Climate Change Scoping Plan

On December 11, 2008, pursuant to AB 32, ARB adopted the Climate Change Scoping Plan. This plan outlines how emissions reductions from significant sources of GHGs will be achieved via regulations, market mechanisms, and other actions. Six key elements, outlined in the scoping plan, are identified to achieve emissions reduction targets.

- Expanding and strengthening existing energy efficiency programs and building and appliance standards.
- Achieving a statewide renewable energy mix of 33%.
- Developing a California cap-and-trade program that links with other Western Climate Initiative partner programs to create a regional market system.
- Establishing targets for transportation-related GHG emissions for regions throughout California and pursuing policies and incentives to achieve those targets.
- Adopting and implementing measures pursuant to existing state laws and policies, including California's clean car standards, goods movement measures, and the Low Carbon Fuel Standard.
- Creating targeted fees, including a public goods charge on water use, fees on high–global warming potential (GWP) gases, and a fee to fund the administrative costs of the state's long-term commitment to AB 32 implementation.

The Climate Change Scoping Plan also described recommended measures that were developed to reduce GHG emissions from key sources and activities while improving public health, promoting a cleaner environment, preserving our natural resources, and ensuring that the effects of the reductions are equitable and do not disproportionately affect low-income and minority communities. These measures put the state on a path to meet the long-term 2050 goal of reducing California's GHG emissions to 80% below 1990 levels.

Local

Sutter County

The FRAQMD, which regulates local air policy in Sutter and Yuba Counties, has not adopted rules or regulations establishing limits on GHG emissions from specific projects or thresholds of significance for GHG emissions at the project level. However, the FRAQMD CEQA Handbook does require preliminary documents to address whether a project would (1) "generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment" and (2) conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions (Feather River Air Quality Management District 2010).

The Sutter County General Plan intends to complete a Climate Action Plan (CAP) consistent with AB 32 goals to establish strategies to reduce GHG emissions from sources under the county's jurisdiction, which includes the cities of Live Oak and Yuba City, located in the planning area (Sutter County 2010a).

Butte County

BCAQMD has not adopted rules or regulations establishing limits on GHG emissions from specific projects or thresholds of significance for GHG emissions at the project level. While the BCAQMD CEQA Handbook does include a brief discussion about consistency with AB 32, the general effects of climate change, and the GHG policy guidance from CAPCOA, the District only recommends that a qualitative discussion of GHGs be included for air quality analyses of "sizable projects"(Butte County Air Quality Management District 2008).

Butte County addresses GHG emissions and climate change in a variety of policies and programs throughout their 2030 general plan (Butte County 2010a). The County has expressed a commitment toward reducing its effect on climate change. This commitment is extended to the cities under Butte County jurisdiction, including Biggs and Gridley, which are located in the planning area.

City of Yuba City (Sutter County)

FRAQMD has jurisdiction over air quality and GHG emissions in Sutter County, which includes Yuba City. Further details on FRAQMD's treatment of GHG emissions are described under Sutter County regulations above.

GHG emissions and climate change are not addressed in the City of Yuba City's most recent general plan.

City of Live Oak (Sutter County)

FRAQMD has jurisdiction over air quality and GHG emissions in Sutter County, which includes the city of Live Oak. Further details on FRAQMD's treatment of GHG emissions are described under Sutter County regulations above.

The City of Live Oak 2030 General Plan acknowledges the potential effects and sources of GHGs as a component of air quality as well as the City's role in the fulfillment of AB 32 under Implementation Program Air-1 (City of Live Oak 2010). Under the Key Issues in the general plan, Live Oak will manage land use and transportation planning efforts in accordance with the state's GHG-reduction goals. As a part of their general plan implementation, Live Oak will account for the effects of land use, conservation, and other general plan measures in their citywide GHG reduction target (City of Live Oak 2010).

City of Biggs (Butte County)

BCAQMD has jurisdiction over air quality and GHG emissions in Butte County, which includes the city of Biggs. Further details on BCAQMD's treatment of GHG emissions are described under Butte County regulations above. The City of Biggs has not adopted rules or regulations establishing limits on GHG emissions from specific projects or thresholds of significance for GHG emissions at the project level. GHG emissions are not addressed in the City of Biggs General Plan 1997–2015 (City of Biggs 1998). The update of the Biggs general plan began in 2009 and is underway. The general plan update likely will address GHG emissions and climate change issues considering the AB 32 mandate.

City of Gridley (Butte County)

BCAQMD has jurisdiction over air quality and GHG emissions in Butte County, which includes the city of Gridley. Further details on BCAQMD's treatment of GHG emissions are described under Butte County regulations above. The City's Code of Ordinances does not contain ordinances directed specifically at GHG emissions; however, Gridley's 2030 general plan includes an appendix that outlines more than 200 specific local policies that can be implemented to mitigate GHG emissions or adapt to climate change (City of Gridley 2010). These policies span nearly all sectors of GHG emission sources, including land use, transportation, building energy use, water supply, and solid waste. The Gridley general plan also considers agriculture and flooding safety concerns in regard to climate change adaptation.

3.6.2.2 Environmental Setting

The following considerations are relevant to climate change and GHG conditions in the proposed project area.

Background Information on Climate Change

Global warming refers to the increase in the average temperature of the earth's near-surface air and oceans since the mid-twentieth century and its projected continuation. Warming of the climate system is now considered to be unequivocal (Intergovernmental Panel on Climate Change 2007), with global surface temperature increasing approximately 1.33°F over the last 100 years. Continued warming is projected to increase the average global temperature between 2°F and 11°F over the next 100 years. The causes of this warming have been identified as both natural processes and the result of human actions. IPCC concludes that variations in natural phenomena such as solar radiation and volcanoes produced most of the warming from pre-industrial times to 1950 and had a small cooling effect afterward. However, after 1950, increasing GHG concentrations resulting from human activity such as fossil fuel burning and deforestation have been responsible for most of the observed temperature increase.

Increases in GHG concentrations in the earth's atmosphere are thought to be the main cause of human-induced climate change. GHGs naturally trap heat by impeding the exit of solar radiation that has hit the earth and is reflected back into space. Some GHGs occur naturally and are necessary for keeping the earth's surface inhabitable. However, increases in the concentrations of these gases in the atmosphere during the last 100 years have decreased the amount of solar radiation that is reflected back into space, intensifying the natural greenhouse effect and resulting in the increase of global average temperature.

The principal GHGs are CO_2, methane (CH_4), nitrous oxide (N_2O), sulfur hexafluoride (SF_6), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), and water vapor. Each of the principal GHGs has a long atmospheric lifetime (1 year to several thousand years). In addition, the potential heat-trapping ability of each of these gases varies significantly. CH_4 is 23 times as potent as CO_2, while SF_6 is 22,200 times more potent than CO_2. The most common GHG is CO_2, which constitutes approximately 84% of all emissions of GHGs in California. GHGs are global pollutants, unlike criteria air pollutants (such as ozone precursors) and TACs, which are pollutants of regional and local concern.

Conventionally, GHGs have been reported as CO_2e, an equivalency measure that takes into account the relative potency of non-CO_2 GHGs and converts their quantities to an equivalent amount of CO_2 so that all emissions can be reported as a single quantity. The primary human-made processes that release these gases include burning of fossil fuels for transportation, heating, and electricity generation; agricultural practices that release CH_4 such as livestock grazing and crop residue decomposition; and industrial processes that release smaller amounts of high global warming potential gases such as SF_6, PFCs, and HFCs. Deforestation and land cover conversion also have been identified as contributing to global warming by reducing the earth's capacity to remove CO_2 from the air and altering the earth's albedo or surface reflectance, allowing more solar radiation to be absorbed.

GHGs trap infrared radiation emitted from the earth's surface, which otherwise would be reflected into space. Anthropogenic emissions of GHGs, resulting in ambient concentrations outside of what can be considered the natural range, are thought to be responsible for the enhancement of the natural greenhouse effect or global warming. A warmer lower atmosphere induces changes in weather patterns and increased sea levels as a result of the melting of ice in the polar regions. This phenomenon is often referred to as *climate change*.

The IPCC lists CO_2, CH_4, N_2O, HFCs, PFCs, and SF_6 as six of the major GHGs from anthropomorphic sources. These gases are also listed under the CAA and AB 32. A brief description of the sources of each GHG follows.

Carbon Dioxide

CO_2 is the most abundant anthropogenic GHG and accounts for more than 75% of all anthropogenic GHG emissions. Its long atmospheric lifetime (on the order of decades to centuries) ensures that atmospheric concentrations of CO_2 will remain elevated for decades after GHG mitigation efforts (Intergovernmental Panel on Climate Change 2007) are promulgated.

Primary sources of anthropogenic CO_2 in the atmosphere include the burning of fossil fuels (including motor vehicles), cement production, and land use changes, including deforestation. CO_2 emissions attributable to the burning of fossil fuels represent nearly 60% of worldwide GHG emissions, 23% of which is from transportation.

Methane

CH_4, the main component of natural gas, is the second most abundant GHG and has a GWP 21 times that of CO_2 (Intergovernmental Panel on Climate Change 1996). Anthropogenic emissions of CH_4 are the result of anaerobic emissions from rice paddies, cattle enteric fermentation, combusting natural gas, landfilled waste, and mining coal (National Oceanic and Atmospheric Administration 2005).

Nitrous Oxide

N_2O is a powerful GHG, with a global warming potential 310 times that of CO_2 (Intergovernmental Panel on Climate Change 2007). One of the major sources of N_2O is from biological decomposition and agriculture, such as from manure and fertilizer application. N_2O is also a by-product of vehicle emissions and fuel-fired power plants.

High–Global Warming Potential Gases

High-GWP gases such as HFCs, PFCs, and SF_6 are human-made chemicals used in a variety of industries and applications such as refrigeration (HFCs), aluminum production (PFCs), and electricity transmission (SF_6). Some of these gases have GWP several orders of magnitude greater than CO_2 and can persist in the atmosphere for millennia. SF_6 is the most powerful of the GHGs listed in the IPCC studies, with a GWP of 23,900 (Intergovernmental Panel on Climate Change 2007).

Global Climate Trends and Associated Effects

The rate of increase in global average surface temperature over the last 100 years has not been consistent; the last three decades have warmed at a much faster rate—on average 0.32 degrees Fahrenheit (°F) per decade. Eleven of the 12 years from 1995 to 2006 rank among the twelve warmest years in the instrumental record of global average surface temperature (going back to 1850) (Intergovernmental Panel on Climate Change 2007).

During the same period over which this increased global warming has occurred, many other changes have occurred in other natural systems. Sea levels have risen on average 1.8 millimeters per year; precipitation patterns throughout the world have shifted, with some areas becoming wetter and others drier; tropical cyclone activity in the North Atlantic has increased; peak runoff timing of many glacial and snow-fed rivers has shifted earlier; and numerous other observed conditions. Although it is difficult to prove a definitive cause-and-effect relationship between global warming and other observed changes to natural systems, there is high confidence in the scientific community that these changes are a direct result of increased global temperatures (Intergovernmental Panel on Climate Change 2007).

The planning area is located in the eastern half of the Sacramento Valley Air Basin, about 16 miles west of the Sierra Nevada. This area typically experiences cold winters and hot dry summers. In 2010 temperatures in the Sutter-Butte area ranged from an average winter low of 37°F to an average summer high of 91°F[1] , compared to the historical average winter low of 35°F and an average summer high of 95°F[2] (Western Regional Climate Center 2011). Precipitation falls predominantly as rain in the region. The Sacramento Valley in the Sutter-Butte region generally experiences south-southeasterly winds with average speeds ranging 5–7 miles per hour[3] (Western

[1] Recorded for the city of Oroville, closest approximation for 2010 data (winter low in December, summer high in July) (Weather Underground 2011).

[2] Values were based on Western Regional Climate Center historical data from a monitoring station in Gridley. Most recent historical data is the average of data from 1893 to 1955. This is the most central monitoring station in the project area. Map (Western Regional Climate Center 2006a).

[3] For the closest recorded locations of Oroville Municipal Airport and Marysville Municipal Airport.

Regional Climate Center 2002, 2006b). Temperature, precipitation, and wind data as recorded in 2010 at local weather stations as well as historical ranges are summarized in Table 3.6-1.

Table 3.6-1. Sutter-Butte Region Average Temperature and Precipitation

	Average Winter Low (°F)	Average Summer High (°F)	Annual Precipitation (Rainfall) (inches)	Wind Speed (mph)
2010 (Oroville, CA) (Weather Underground 2010)	37	95	31.6	6
2000–2008 (Oroville, CA) (Western Regional Climate Center 2009)	39	95	23.6	6.1
1971–2000	36.7	95.2	30.53	NA
1961–1990	36.8	96.2	28.49	NA

mph = miles per hour.
NA = not applicable.

California Climate Trends

Maximum (daytime) and minimum (nighttime) temperatures are increasing almost everywhere in California but at different rates. The annual minimum temperature averaged over all of California increased 0.33°F per decade from 1920 to 2003, while the average annual maximum temperature increased 0.1°F per decade (Moser et al. 2009).

With respect to California's water resources, the most significant effects of global warming have been changes to the water cycle and sea level rise. Over the past century, the precipitation mix between snow and rain has shifted in favor of more rainfall and less snow (Mote et al. 2005; Knowles 2007) and snowpack in the Sierra Nevada is melting earlier in the spring (Kapnick and Hall 2009). The average early spring snowpack in the Sierra Nevada has decreased by about 10% during the last century, a loss of 1.5 million acre-feet of snowpack storage (California Department of Water Resources 2008). These changes have significant implications for water supply, flooding, aquatic ecosystems, energy generation, and recreation throughout the state. During the same period, sea levels along California's coast rose 7 inches (California Department of Water Resources 2008). Sea level rise associated with global warming will continue to threaten coastal lands and infrastructure, increase flooding at the mouths of rivers, place additional stress on levees in the Delta, and will intensify the difficulty of managing the Delta as the heart of the state's water supply system.

GHG emissions for the state of California in 2008 were 473.76 million metric tons (MT) CO_2e (California Air Resources Board 2010). Data for 2010 are not yet available, and 2008 emissions data are considered a valid approximation for conditions in 2010. California population in 2008 was 37.9 million, resulting in emissions of 12.5 MT CO_2e per capita[4,5]. The largest single source (37%) of these emissions was from transportation, with 25% from electricity generation, 21% from industrial sources, and 6% from residential emissions (California Air Resources Board 2010; California

[4] Total GHG emissions in 2008 in California (California Air Resources Board 2010) divided by total population in 2008 (37.8 Million): <http://www.dof.ca.gov/research/demographic/reports/estimates/e-4_2001-07/>.

[5] The most recent emissions inventory for California was published in 2010 by ARB, but gives 2008 values (California Air Resources Board 2010). We assumed that 2010 state-wide per capita emissions to have an insignificant change from 2008.

Department of Finance 2010). Emissions from electricity generation are generally lower than the national average because of California's temperate climate and minimal usage of coal (California Energy Commission 2010). Emissions from residential and industrial sectors are attributable primarily to onsite combustion of fossil fuels (natural gas) for heating or cooking.

GHG inventories typically are performed at the city, county, or air district level, and thus an exact overlap of the affected area with an existing GHG inventory is not possible. GHG emissions in the region are discussed generally based on the 2006 GHG emissions inventory of Butte County, the only jurisdiction in the affected area to have completed a GHG inventory (Butte County 2010b). Approximately 50% of the project area is located in Butte County, and the general pattern of emissions and dominant emissions sources in Butte County was considered to be representative of emissions in Sutter County, city of Biggs, city of Gridley, Yuba City and Live Oak. Per capita emissions in the unincorporated portions of Butte County in 2006 were 6.68 MT CO_2e per person, similar to and somewhat lower than nearby cities of comparable populations such as Citrus Heights, Folsom, and Rancho Cordova that have per capita GHG emissions of 6.4, 8.4, and 9.9, respectively (Sacramento County Department of Environmental Review and Assessment 2009). Butte County's inventory may underestimate per capita emissions as the inventory does not fully account for emissions associated with agriculture, a major industry in the county.

Sources of GHG emissions in Butte County include on-road transportation (49.2%), electricity usage (17.8%), agricultural vehicles and equipment (12.8%), natural gas (10.3%), off-road vehicles and equipment (6.8%), landfills (2.4%), and stationary sources (0.7%).The sources and pattern of emissions throughout the region are expected to be similar to those in Butte. Similar to the pattern of emissions at the state level, on-road vehicle travel, building energy use, and agricultural activities are the largest sources of GHG emissions in the affected area (Butte County 2010a).

GHG emissions from agriculture, especially from rice production, are a unique characteristic of the affected area. Agricultural land makes up the vast majority of the affected area and is also a significant economic focus in both counties. In 2010, agriculture accounted for 86% of Sutter County's land and 20% of the total economic output from Sutter County industries (Sutter County 2010a:4-1)[6]. In 2009, rice accounted for 46% and 28% of harvested agricultural land in Sutter and Butte Counties, respectively. Rice was also the most valuable harvested crop in the area with total revenue of $184 million to $224 million in 2009. Rice cultivation results in considerably higher levels of GHGs compared to other crops because of the need to fully inundate crops. Perpetually flooded environments allow the anaerobic fermentation of soil organic matter and the release of CH_4. Because of the significant acreage devoted to rice production in the affected area and because CH_4 has a GWP 21 times that of CO_2, agriculture likely represents a significant source of emissions in the affected area (Sutter County 2010b; Butte County 2010c).

Existing Flood Control Activities

Existing flood control activities in the project area include routine levee repairs, annual vegetation management, periodic well improvements, and monitoring. Activities that involve the use of heavy-duty equipment (e.g., tractors, graders,) combust fossil fuel, thereby generating CO_2 emissions (and some CH_4 emissions depending on the fuel type). In addition, employee travel to conduct routine repairs and inspections would generate GHG emissions. Some portion of these emissions is captured in the GHG inventory for Butte County detailed in the previous section. Emissions from equipment

[6] This information was not available for Butte County.

and vehicles associated with routine maintenance and operations of existing flood control infrastructure are likely a very small fraction of regional emissions.

3.6.3 Environmental Consequences

This section describes the environmental consequences relating to climate change for the proposed project. It describes the methods used to determine the effects of the project and lists the thresholds used to conclude whether an effect would be significant. The effects that would result from implementation of the project, findings with and without mitigation, and applicable mitigation measures are presented in a table under each alternative.

3.6.3.1 Assessment Methods

This evaluation of GHG emissions and climate change is based on professional standards and information cited throughout the section. The key effects were identified and evaluated based on the environmental characteristics of the project area and the magnitude, intensity, and duration of activities related to the construction and operation of this project.

Quantitative estimates of GHG emissions during the levee construction project were forecast using construction activity data provided by HDR Engineering, SBFCA's professional engineering firm, and by using default emission factors from the SacRCEM (Sacramento Municipal Air Quality Management District 2012). Detailed information on the emission calculation methods is provided in Appendix E. The following types of information were used, and are shown in Appendix E.

- Duration of each type of construction activity in each project segment. This information was provided by the HDR Engineering (HDR 2012; pp1-40).
- Type of each construction equipment and number of pieces of each type, during each type of construction activity. This information was provided by HDR Engineering (HDR 2012).
- Quantities of borrow material, spoil material, and supplies to be delivered to the project, for each project segment. This information was provided by HDR Engineering (HDR 2012).
- Default operating parameters for each type of construction equipment (horsepower, load factor and hours per day of usage) derived from the SacRCEM (Sacramento Municipal Air Quality Management District 2012).
- Default emission factors for fuel consumption and GHG emission rates (CO_2 and CH_4) for non–road construction equipment, on-road delivery trucks, and on-road commute vehicles, derived from the SacRCEM.

3.6.3.2 Determination of Effects

For this analysis, an effect pertaining to climate change was analyzed under NEPA and CEQA if it would result in any of the following environmental effects, which are based on NEPA standards, State CEQA Guidelines Appendix G (14 CCR 15000 et seq.), and standards of professional practice. An effect was considered significant if it would:

- Generate GHG emissions that exceed thresholds.
- Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of GHGs.

- Fail to address changes in flood frequency and floodwater elevation caused by global climate change.

None of the counties or air quality agencies with jurisdiction over this project has developed its own numerical CEQA thresholds for GHG emissions. Therefore, a project-specific numerical GHG emission threshold of 7,000 tons per year of CO_2e was derived for this project by reviewing the appropriate CEQA thresholds for commercial and industrial projects that have been developed recently by other jurisdictions in California. They are listed below.

- Bay Area Air Quality Management District: 25,000 tons/year.
- South Coast Air Quality Management District: 10,000 tons/year.
- ARB: 7,000 tons/year.
- Santa Barbara County Air Quality Management District: 10,000 tons/year.
- San Diego County: 990 tons/year.
- Sacramento County Air Quality Management District: No single threshold, effects are set using unit-based thresholds (e.g., 7.8 tons per year per 1,000 square feet of commercial development).
- San Joaquin Valley Air Pollution Control District: no *de minimis* threshold. All applicants are required to use BMPs to reduce emissions by 28% compared to Business As Usual.

Based on the above listing, the project-specific GHG emission threshold of 7,000 tons per year was deemed to be most appropriate for this type of project. That threshold applies to the annualized emissions over the life of the levee project. The design life of the levee is 50 years. Therefore, the initial construction-phase GHG emissions were divided by the 50-year project lifetime to derive the annualized emissions for comparison to the threshold.

3.6.4 Effects and Mitigation Measures

Effects and mitigation measure requirements concerning climate change and GHGs are summarized in Table 3.6-2.

Table 3.6-2. Summary of Effects for Climate Change and Greenhouse Gas

Effect	Finding	Mitigation Measure	With Mitigation
Alternatives 1, 2, and 3			
Effect CC-1: Increase in GHG Emissions during Construction Exceeding Threshold	Less than significant	CC-MM-1: Implement Measures to Minimize GHG Emissions during Construction	Less than significant
Effect CC-2: Conflict with an Applicable Plan, Policy, or Regulation Adopted for the Purpose of Reducing the Emissions of GHGs	Less than significant	None required	Less than significant
Effect CC-3: Failure to Address Changes in Flood Frequency and Floodwater Elevation Caused by Global Climate Change	Less than significant	None required	Less than significant
GHG = greenhouse gas.			

3.6.4.1 No Action Alternative

The No Action Alternative represents the continuation of the existing deficiencies along the portion of the Feather River in the FRWLP area. Current levee operations and maintenance activities would continue, but there would be no change in the geomorphic and flood control regimes relative to existing conditions.

Under the No Action Alternative, construction emissions related to the current maintenance and operation regime would remain the same. Emissions as a result of ongoing levee maintenance would not be substantial. However, without improvements to the levee system, levees may not be able to withstand future changes in river flows caused by climate change, and the risk of levee failure would remain high. Under these conditions, any of the levee deficiencies could cause portions of the levee to fail, triggering widespread flooding and extensive damage. If a catastrophic flood were to occur, emergency flood fighting and clean-up actions would require the use of a considerable amount of heavy construction equipment. Timing and duration of use would directly correlate with flood fighting needs, but it is likely that pollutants emitted would violate air quality standards for pollutants (including those for which the area is already considered nonattainment) and increase GHG emissions. Depending on the magnitude of the flood, flood fighting could last for weeks or even months. Furthermore, because of the unpredictable nature of an emergency response, no BMPs to manage emissions would be in place. All of these effects could be considered significant. However, the timing, duration, and magnitude of a flood event are speculative and unpredictable, and therefore a precise determination of significance is not possible.

3.6.4.2 Alternative 1

Implementation of Alternative 1 would potentially result in effects on climate change and GHGs. These potential effects and related mitigation measure requirements are summarized in Table 3.6-3 and discussed below.

Table 3.6-3. Climate Change Effects and Mitigation Measures for Alternative 1

Effect	Finding	Mitigation Measure	With Mitigation
Effect CC-1: Increase in GHG Emissions during Construction Exceeding Threshold	Less than significant	CC-MM-1: Implement Measures to Minimize GHG Emissions during Construction	Less than significant
Effect CC-2: Conflict with an Applicable Plan, Policy, or Regulation Adopted for the Purpose of Reducing the Emissions of GHGs	Less than significant	None required	Less than significant
Effect CC-3: Failure to Address Changes in Flood Frequency and Floodwater Elevation Caused by Global Climate Change	Less than significant	None required	Less than significant

GHG = greenhouse gas.

Effect CC-1: Increase in GHG Emissions during Construction Exceeding Threshold

Neither FRAQMD nor BCAQMD formally adopted GHG thresholds for projects such as the FRWLP. Therefore, a presumptive threshold of 7,000 MT per year (the lowest threshold of any formally adopted GHG threshold) is compared against the CO_2 emissions for the FRWLP. As noted in Table 3.6-4, the CO_2 emissions project-wide without mitigation would be only 398 tons per year, annualized over the 50-year levee lifespan. Within FRAQMD and BCAQMD, respectively, CO_2 emissions without mitigation would be 325 tons per year and 73 tons per year. These emissions are well below the presumptive threshold, so the effects of GHG emissions during construction are considered less than significant. However, before BCAQMD and FRAQMD develop their significance thresholds for GHG emissions, the project proponent is encouraged to implement Mitigation Measure CC-MM-1 to reduce GHG emissions.

Table 3.6-4. Greenhouse Gas Emissions during Construction

	GHG Constituent Metric Tons			GHG CO_2e Metric Tons			
Emission Category	CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	CO_2e
Alternative 1							
Year 1 (2013)	2,786	0.16	0.07	2,786	3	22	2,812
Year 2 (2014)	10,092	0.57	0.26	10,092	12	80	10,184
Year 3 (2015)	6,822	0.39	0.17	6,822	8	54	6,884
Total	19,701	1.12	0.50	19,701	24	156	19,880
Levee Project Lifetime (years)							50
Annualized GHG Emissions (tons CO_2e per year)							398
Alternative 2							
Year 1 (2013)	4,780	0.27	0.12	4,780	6	38	4,823
Year 2 (2014)	16,346	0.93	0.42	16,346	20	129	16,495
Year 3 (2015)	10,657	0.61	0.27	10,657	13	84	10,754
Total	31,783	1.81	0.81	31,783	38	251	32,072
Levee Project Lifetime (years)							50
Annualized GHG Emissions (tons CO_2e per year)							641
Alternative 3							
Year 1 (2013)	2,091	0.12	0.05	2,091	2	17	2,110
Year 2 (2014)	9,033	0.51	0.23	9,033	11	71	9,116
Year 3 (2015)	6,368	0.36	0.16	6,368	8	50	6,426
Total	17,493	0.99	0.45	17,493	21	138	17,652
Levee Project Lifetime (years)							50
Annualized GHG Emissions (tons CO_2e per year)							353

Note: Values may not add due to rounding.
GHG = greenhouse gas.
CO_2e = carbon dioxide equivalent.
CO_2 = carbon dioxide.
CH_4 = methane.
N_2O = nitrous oxide.

Mitigation Measure CC-MM-1: Implement Measures to Minimize GHG Emissions during Construction

The following measures should be considered to lower GHG emissions during construction. These mitigation measures combine the most stringent aspects of the currently proposed mitigation measures published by Bay Area Air Quality Management District (2010) and other air quality districts in California.

- Comply with all applicable future GHG regulations at the time of project-level permitting and construction.
- Use biodiesel fuel to fuel a substantial portion of the diesel-powered equipment and vehicles (e.g., 15% of the vehicles, as proposed by the Bay Area Air Quality Management District). However, it is important to note that according to a recent EPA report (U.S. Environmental Protection Agency 2009), some renewable fuels (e.g., ethanol, recycled vegetable oil biodiesel) could result in less GHG emissions than petroleum fuels, while some renewable fuels (e.g., soy-based biodiesel) might increase GHG emissions. Therefore, the construction contractors should be cautious with the use of appropriate biodiesel fuels and should avoid using soy-based biodiesel as an attempt to reduce GHG emissions.
- Encourage construction workers to carpool.
- Recycle at least 50% of construction waste and demolition debris.
- Purchase at least 10% of the building materials and imported soil from sources within 100 miles of the project site.
- Use electricity from utility power lines rather than fossil fuel, where appropriate.
- Purchase GHG offset for project GHG emissions (direct emissions plus indirect emissions from on-road haul trucks plus commute vehicles) exceeding future Federal, state, or local significance thresholds applicable at the time of construction. If no GHG significance thresholds have been formally adopted at the time of permitting, a presumptive GHG threshold of 7,000 MT per year of CO_2e (amortized over the 50-year life of the levee project) should be used to define the offset requirement. The 7,000 MT/year presumptive threshold matches the lowest industrial project threshold that has been proposed by any air quality agency in California as of the date of this study. All purchased offsets must be verifiable under protocols set by the California Climate Action Registry, the Chicago Climate Exchange, or comparable auditing programs.

Effect CC-2: Conflict with an Applicable Plan, Policy, or Regulation Adopted for the Purpose of Reducing the Emissions of GHGs

The FRWLP does not pose any apparent conflict with the goals of AB 32, the key elements and GHG reduction measures in the Climate Change Scoping Plan, or any other plans for reduction or mitigation of GHGs. To date, no Federal, state, or local agency with jurisdiction over the proposed project has adopted plans or regulations that set specific goals for emission limits or emission reductions applicable to the proposed levee improvement project. As described in Effect CC-1, the average forecast emissions from the implementation of the proposed project were compared to conservatively low presumptive significance thresholds that were derived from the draft GHG guidelines published by several local air quality agencies. The forecast emission rates are well below the presumptive significance threshold. Therefore, the proposed project would not conflict with or obstruct the implementation of GHG emission reduction plans. This effect would be less than significant. No mitigation is required.

Effect CC-3: Failure to Address Changes in Flood Frequency and Floodwater Elevation Caused by Global Climate Change

Global climate change could affect the hydrology of the Feather River, including the frequency and the intensity of future flood events. Future water levels are not expected to increase substantially as a result of climate change, but the timing and intensity of flood events might change in the future. Section 3.1, *Flood Control and Geomorphology*, notes that the project area is located over 50 feet above sea-level and suggests that the Feather River levee system is relatively insensitive to the projected changes in sea level rise which are projected to be no more than 1.3 meters (4.3 feet) by 2,100 meters (David Ford Consulting Engineers, Sutter Basin Design Rainfall Memo, dated 18 June 14, 2011; Cayan, et.al. 2012: 23). Furthermore, the seepage control features developed for the FRWLP are designed to accommodate future flood intensities. Therefore, this effect would be less than significant. No mitigation is required.

3.6.4.3 Alternative 2

Implementation of Alternative 2 would potentially result in effects on climate change and GHGs. These potential effects and related mitigation measure requirements are summarized in Table 3.6-5 and discussed below.

Table 3.6-5. Climate Change Effects and Mitigation Measures for Alternative 2

Effect	Finding	Mitigation Measure	With Mitigation
Effect CC-1: Increase in GHG Emissions during Construction Exceeding Threshold	Less than significant	CC-MM-1: Implement Measures to Minimize GHG Emissions during Construction	Less than significant
Effect CC-2: Conflict with an Applicable Plan, Policy, or Regulation Adopted for the Purpose of Reducing the Emissions of GHGs	Less than significant	None required	Less than significant
Effect CC-3: Failure to Address Changes in Flood Frequency and Floodwater Elevation Caused by Global Climate Change	Less than significant	None required	Less than significant
GHG = greenhouse gas.			

Effect CC-1: Increase in GHG Emissions during Construction Exceeding Threshold

Neither FRAQMD nor BCAQMD formally adopted GHG thresholds for projects such as the FRWLP. Therefore, a presumptive threshold of 7,000 MT per year (the lowest threshold of any formally adopted GHG threshold) is compared against the CO_2 emissions for the FRWLP. As noted in Table 3.6-4, the CO_2 emissions project-wide without mitigation would be only 641 tons per year, annualized over the 50-year levee lifespan. Within FRAQMD and BCAQMD, respectively, CO_2 emissions without mitigation would be 551 tons per year and 90 tons per year. These emissions are well below the presumptive threshold, so the effects of GHG emissions during construction are considered less than significant. However, before BCAQMD and FRAQMD develop their significance thresholds for GHG emissions, the project proponent is encouraged to implement Mitigation Measure CC-MM-1 to reduce GHG emissions.

Effect CC-2: Conflict with an Applicable Plan, Policy, or Regulation Adopted for the Purpose of Reducing the Emissions of GHGs

The FRWLP does not pose any apparent conflict with the goals of AB 32, the key elements and GHG reduction measures in the Climate Change Scoping Plan, or any other plans for reduction or mitigation of GHGs. To date, no Federal, state, or local agency with jurisdiction over the proposed project has adopted plans or regulations that set specific goals for emission limits or emission reductions applicable to the proposed levee improvement project. As described in Effect CC-1, the average forecast emissions from the implementation of the proposed project were compared to conservatively low presumptive significance thresholds that were derived from the draft GHG guidelines published by several local air quality agencies. The forecast emission rates are well below the presumptive significance threshold. Therefore, the proposed project would not conflict with or obstruct the implementation of GHG emission reduction plans. This effect would be less than significant. No mitigation is required.

Effect CC-3: Failure to Address Changes in Flood Frequency and Floodwater Elevation Caused by Global Climate Change

The effect is the same as described under Alternative 1. This effect would be less than significant. No mitigation is required.

3.6.4.4 Alternative 3

Implementation of Alternative 3 would potentially result in effects on climate change and GHGs. These potential effects and related mitigation measure requirements are summarized in Table 3.6-6 and discussed below.

Table 3.6-6. Climate Change Effects and Mitigation Measures for Alternative 3

Effect	Finding	Mitigation Measure	With Mitigation
Effect CC-1: Increase in GHG Emissions during Construction Exceeding Threshold	Less than significant	CC-MM-1: Implement Measures to Minimize GHG Emissions during Construction	Less than significant
Effect CC-2: Conflict with an Applicable Plan, Policy, or Regulation Adopted for the Purpose of Reducing the Emissions of GHGs	Less than significant	None required	Less than significant
Effect CC-3: Failure to Address Changes in Flood Frequency and Floodwater Elevation Caused by Global Climate Change	Less than significant	None required	Less than significant

GHG = greenhouse gas.

Effect CC-1: Increase in GHG Emissions during Construction Exceeding Threshold

Neither FRAQMD nor BCAQMD formally adopted GHG thresholds for projects such as the FRWLP. Therefore, a presumptive threshold of 7,000 MT per year (the lowest threshold of any formally adopted GHG threshold) is compared against the CO_2 emissions for the FRWLP. As noted in Table 3.6-4, the CO_2 emissions project-wide without mitigation would be only 353 tons per year, annualized over the 50-year levee lifespan. Within FRAQMD and BCAQMD, respectively, CO_2 emissions without mitigation would be 284 tons per year and 69 tons per year. These emissions are well below the presumptive threshold, so the effects of GHG emissions during construction are considered less than significant. However, before BCAQMD and FRAQMD develop their significance thresholds for GHG emissions, the project proponent is encouraged to implement Mitigation Measure CC-MM-1 to reduce GHG emissions.

Effect CC-2: Conflict with an Applicable Plan, Policy, or Regulation Adopted for the Purpose of Reducing the Emissions of GHGs

The FRWLP does not pose any apparent conflict with the goals of AB 32, the key elements and GHG reduction measures in the Climate Change Scoping Plan, or any other plans for reduction or mitigation of GHGs. To date, no Federal, state, or local agency with jurisdiction over the proposed project has adopted plans or regulations that set specific goals for emission limits or emission reductions applicable to the proposed levee improvement project. As described in Effect CC-1, the average forecast emissions from the implementation of the proposed project were compared to conservatively low presumptive significance thresholds that were derived from the draft GHG guidelines published by several local air quality agencies. The forecast emission rates are well below the presumptive significance threshold. Therefore, the proposed project would not conflict with or obstruct the implementation of GHG emission reduction plans. This effect would be less than significant. No mitigation is required.

Effect CC-3: Failure to Address Changes in Flood Frequency and Floodwater Elevation Caused by Global Climate Change

The effect is the same as described under Alternative 1. This effect would be less than significant. No mitigation is required.

3.7 Noise

3.7.1 Introduction

This section describes the regulatory and environmental setting for noise; noise effects that would result from the No Action Alternative and Alternatives 1, 2, and 3; and mitigation measures that would reduce significant effects.

3.7.1.1 Noise Fundamentals

Noise is commonly defined as unwanted sound that annoys or disturbs people and potentially causes a negative psychological or physiological effect on human health. Because noise is an environmental pollutant that can interfere with human activities, evaluation of noise is necessary when considering the environmental effects of a proposed project.

Sound is mechanical energy (vibration) transmitted by pressure waves over a medium such as air or water, and *noise* is generally defined as unwanted sound that annoys or disturbs people. Sound is characterized by various parameters that include the rate of oscillation of sound waves (frequency), the speed of propagation, and the pressure level or energy content (amplitude). In particular, the sound pressure level is the most common descriptor used to characterize the loudness of an ambient (existing) sound level. Although the decibel (dB) scale, a logarithmic scale, is used to quantify sound intensity, it does not accurately describe how sound intensity is perceived by human hearing. The human ear is not equally sensitive to all frequencies in the entire spectrum, so noise measurements are weighted more heavily for frequencies to which humans are sensitive in a process called *A-weighting*, written as *dBA* and referred to as *A-weighted decibels*. Table 3.7-1 provides definitions of sound measurements and other terminology used in this section, and Table 3.7-2 summarizes typical A-weighted sound levels for different noise sources.

In general, human sound perception is such that a change in sound level of 1 dB typically cannot be perceived by the human ear, a change of 3 dB is just noticeable, a change of 5 dB is clearly noticeable, and a change of 10 dB is perceived as doubling or halving the sound level.

Different types of measurements are used to characterize the time-varying nature of sound. These measurements include the equivalent sound level (L_{eq}), the minimum and maximum sound levels (L_{min} and L_{max}), percentile-exceeded sound levels (such as L_{10}, L_{20}), the day-night sound level (L_{dn}), and the community noise equivalent level (CNEL). L_{dn} and CNEL values differ by less than 1 dB. As a matter of practice, L_{dn} and CNEL values are considered to be equivalent and are treated as such in this assessment.

For a point source such as a stationary compressor or construction equipment, sound attenuates based on geometry at rate of 6 dB per doubling of distance. For a line source such as free-flowing traffic on a freeway, sound attenuates at a rate of 3 dB per doubling of distance (California Department of Transportation 2009). Atmospheric conditions including wind, temperature gradients, and humidity can change how sound propagates over distance and can affect the level of sound received at a given location. The degree to which the ground surface absorbs acoustical energy also affects sound propagation. Sound that travels over an acoustically absorptive surface such as grass attenuates at a greater rate than sound that travels over a hard surface such as pavement. The increased attenuation is typically in the range of 1 to 2 dB per doubling of distance. Barriers such as buildings and topography that block the line of sight between a source and receiver also increase the attenuation of sound over distance.

Table 3.7-1. Definition of Sound Measurements

Sound Measurements	Definition
Decibel (dB)	A unitless measure of sound on a logarithmic scale, which indicates the squared ratio of sound pressure amplitude to a reference sound pressure amplitude. The reference pressure is 20 micro-pascals.
A-weighted decibel (dBA)	An overall frequency-weighted sound level in decibels that approximates the frequency response of the human ear.
Maximum sound level (L_{max})	The maximum sound level measured during the measurement period.
Minimum sound level (L_{min})	The minimum sound level measured during the measurement period.
Equivalent sound level (L_{eq})	The equivalent steady state sound level that in a stated period of time would contain the same acoustical energy.
Percentile-exceeded sound level (L_{xx})	The sound level exceeded "x" percent of a specific time period. L_{10} is the sound level exceeded 10% of the time.
Day-night level (L_{dn})	The energy average of the A-weighted sound levels occurring during a 24-hour period, with 10 dB added to the A-weighted sound levels occurring during the period from 10:00 p.m. to 7:00 a.m.
Community noise equivalent level (CNEL)	The energy average of the A-weighted sound levels occurring during a 24-hour period with 5 dB added to the A-weighted sound levels occurring during the period from 7:00 p.m. to 10:00 p.m. and 10 dB added to the A-weighted sound levels occurring during the period from 10:00 p.m. to 7:00 a.m.
Peak particle velocity (peak velocity or PPV)	A measurement of ground vibration defined as the maximum speed (measured in inches per second) at which a particle in the ground is moving relative to its inactive state. PPV is usually expressed in inches per second.
Frequency: hertz (Hz)	The number of complete pressure fluctuations per second above and below atmospheric pressure.

Table 3.7-2. Typical A-Weighted Sound Levels

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	110	Rock band
Jet flyover at 1,000 feet		
	100	
Gas lawnmower at 3 feet		
	90	
Diesel truck at 50 feet at 50 miles per hour		Food blender at 3 feet
	80	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawnmower, 100 feet	70	Vacuum cleaner at 10 feet
Commercial area		Normal speech at 3 feet
Heavy traffic at 300 feet	60	
		Large business office
Quiet urban daytime	50	Dishwasher in next room
Quiet urban nighttime	40	Theater, large conference room (background)
Quiet suburban nighttime		
	30	Library
Quiet rural nighttime		Bedroom at night, concert hall (background)
	20	
		Broadcast/recording studio
	10	
	0	

Source: California Department of Transportation 2009.

3.7.1.2 Vibration Fundamentals

Operation of heavy construction equipment, particularly pile-driving and other impact devices such as pavement breakers, create seismic waves that radiate along the surface of the earth and downward into the earth. These surface waves can be felt as ground vibration. Vibration from operation of this equipment can result in effects ranging from annoyance of people to damage of structures. Varying geology and distance will result in different vibration levels containing different frequencies and displacements. In all cases, vibration amplitudes will decrease with increasing distance.

Perceptible groundborne vibration is generally limited to areas within a few hundred feet of construction activities. As seismic waves travel outward from a vibration source, they excite the particles of rock and soil through which they pass and cause them to oscillate. The actual distance that these particles move is usually only a few ten-thousandths to a few thousandths of an inch. The rate or velocity (in inches per second) at which these particles move is the commonly accepted descriptor of the vibration amplitude, referred to as the *peak particle velocity* (PPV).

Table 3.7-3 summarizes typical vibration levels generated by construction equipment (Federal Transit Administration 2006).

Table 3.7-3. Vibration Source Levels for Construction Equipment

Equipment	PPV at 25 feet
Pile driver (impact)	0.644–1.518
Pile drive (sonic/vibratory)	0.170–0.734
Vibratory roller	0.210
Hoe ram	0.089
Large bulldozer	0.089
Caisson drilling	0.089
Loaded trucks	0.076
Jackhammer	0.035
Small bulldozer	0.003

Source: Federal Transit Administration 2006.

Vibration amplitude attenuates over distance and is a complex function of how energy is imparted into the ground and the soil conditions through which the vibration is traveling. The following equation can be used to estimate the vibration level at a given distance for typical soil conditions (Federal Transit Administration 2006). PPV_{ref} is the reference PPV from Table 3.7-3:

$$PPV = PPV_{ref} \times (25/\text{Distance})^{1.5}$$

Tables 3.7-4 and 3.7-5 summarize the typical human response to transient vibration and continuous vibration that are usually associated with construction activity. Equipment or activities typical of continuous vibration include excavation equipment, static compaction equipment, tracked vehicles, traffic on a highway, vibratory pile drivers, pile-extraction equipment, and vibratory compaction equipment. Equipment or activities typical of single-impact (transient) or low-rate repeated impact vibration include impact pile drivers, blasting, drop balls, “pogo stick” compactors, and crack-and-seat equipment (California Department of Transportation 2004).

Table 3.7-4. Human Response to Transient Vibration

PPV	Human Response
2.0	Severe
0.9	Strongly perceptible
0.24	Distinctly perceptible
0.035	Barely perceptible

Source: California Department of Transportation 2004.

Table 3.7-5. Human Response to Continuous Vibration

PPV	Human Response
3.6 (at 2 Hz) to 0.4 (at 20 Hz)	Very disturbing
0.7 (at 2 Hz) to 0.17 (at 20 Hz	Disturbing
0.10	Strongly perceptible
0.035	Distinctly perceptible
0.012	Slightly perceptible

Source: California Department of Transportation 2004.

The decibel scale can also be used to describe vibration velocity. Root-mean-squared (rms) velocity rather than peak velocity is used in the following equation to express vibration in terms of decibels (Federal Transit Administration 2006):

$Lv = 20 \times \log_{10}(v/v_{ref})$

Where:

L_v = vibration velocity level in decibels

v = the rms velocity amplitude of interest

v_{ref} = the reference velocity amplitude (1×10^{-6} inches/second in the U.S.)

3.7.2 Affected Environment

This section describes the affected environment for noise in the project area. The key sources of data and information used in the preparation of this section are listed below.

- Sutter County General Plan, Public Draft, Noise Element (Sutter County 2010a).
- Sutter County General Plan Draft Environmental Impact Report (Sutter County 2010b).
- Butte County General Plan 2030, Health and Safety Element (Butte County 2010a).
- Butte County General Plan 2030 Draft Environmental Impact Report (Butte County 2010b).

3.7.2.1 Regulatory Setting

This section summarizes key Federal, state, and local regulatory information that applies to noise. Federal

Noise from sources associated with the proposed project are regulated at the local level. There are no applicable Federal regulations.

State

Noise from sources associated with the proposed project are regulated at the local level. There are no applicable state regulations.

Local

Sutter County

Municipal Code or Ordinance

Sutter County does not have a noise ordinance.

General Plan Noise Element

The Noise Element of the Sutter County General Plan establishes noise goals, policies and implementation programs (Sutter County 2010a). The following noise policies relate to the proposed project.

- **N 1.4 New Stationary Noise Sources.** Require new stationary noise sources to mitigate noise impacts on noise-sensitive uses wherever the noise from that source alone exceeds the exterior levels specified in Table 11-3 [shown below as Table 3.7-6].
- **N 1.6 Construction Noise.** Require discretionary projects to limit noise-generating construction activities within 1,000 feet of noise-sensitive uses (i.e., residential uses, daycares, schools, convalescent homes, and medical care facilities) to daytime hours between 7:00 A.M. and 6:00 P.M. on weekdays, 8:00 A.M. and 5:00 P.M. on Saturdays, and prohibit construction on Sundays and holidays unless permission for the latter has been applied for and granted by the County.
- **N 1.7 Vibration Standards.** Require construction projects and new development anticipated to generate a significant amount of vibration to ensure acceptable interior vibration levels at nearby noise-sensitive uses based on Federal Transit Administration criteria (Federal Transit Administration 2006).

Table 3.7-6. Sutter County Noise Level Standards from Stationary Sources

Noise Level Descriptor	Daytime (7 a.m. to 10 p.m.)	Nighttime (10 p.m. to 7 a.m.)
Hourly L_{eq}, dB	55	45
Maximum level, dB	70	65

Butte County

Municipal Code or Ordinance

The Butte County Code of Ordinances, Chapter 24—Zoning, Section 24-150 states the following.

> Noise generated by the commercial use shall be restricted to 60 dB at the common property line for a period of 6 hours per day with no noise exceeding 80 dB.

General Plan Health and Safety Element

The Butte County General Plan 2030 contains the following noise policies that relate to the proposed project.

- **Policy HS-P1.7:** Applicants for discretionary permits shall be required to limit noise-generating construction activities located within 1,000 feet of residential uses to daytime hours between 7:00 a.m. and 6:00 p.m. on weekdays and non-holidays.
- **Policy HS-P1.8:** Noise from generators shall be regulated near existing and future residential uses.

City of Yuba City

Municipal Code or Ordinance

Title 4, *Public Safety,* of the Yuba City Municipal Code prohibits the operation of noise-generating construction equipment before 6:00 a.m. or after 9:00 p.m. daily except Sunday and State or Federal holidays when the prohibited time is before 8:00 a.m. and after 9:00 p.m.

General Plan Noise and Safety Element

The City of Yuba City General Plan contains policies related to noise in its Noise and Safety Element (City of Yuba City 2004), including the following.

- **Policy 9.1-G-1:** Strive to achieve an acceptable noise environment for the present and future residents of Yuba City.

City of Live Oak

Municipal Code or Ordinance

The City of Live Oak does not have a code or ordinance that relates to noise.

General Plan Noise Element

The City of Live Oak 2030 General Plan outlines goals, policies, and implementation programs related to noise (City of Live Oak 2010). Table 3.7-7 summarizes the maximum allowable noise exposure from non-transportation sources specified in the general plan.

Table 3.7-7. City of Live Oak Maximum Allowable Noise Exposure from Non-Transportation Noise Sources at Noise-Sensitive Land Uses

Noise Level Descriptor	Daytime (7 a.m.–10 p.m.)	Nighttime (10 p.m.–7 a.m.)
Hourly L_{eq}	60 dBA	45 dBA
L_{max}	75 dBA	65 dBA
Source: City of Live Oak 2010.		

City of Biggs

Municipal Code or Ordinance

Title 7, Public Peace, Morals and Welfare, of the City of Biggs Municipal Code includes noise ordinances. The code prohibits loading and unloading activities between the hours of 10:00 p.m. and 6:00 a.m. in such manner that creates noise clearly audible across a residential zoned or a commercial zoned real property boundary. The code also prohibits the operation of noise-generating construction equipment between the hours of 7:00 p.m. and 6:00 a.m. on weekdays or at any time on Sundays or holidays in such a manner that creates noise clearly audible across a residential zoned or a commercial zoned real property boundary, except for emergency work being performed by a public agency or a public utility.

General Plan Noise Element

Noise-related goals, programs, and policies are outlined in the Noise Element of the City of Biggs General Plan 1997–2015 (City of Biggs 1998). Table 3.7-8 provides the City's noise level performance standards for non-transportation sources.

Table 3.7-8. City of Biggs Noise Level Performance Standards Non-Transportation Sources

Noise Level Descriptor	Daytime 7 a.m. to 10 p.m.	Nighttime 10 p.m. to 7 a.m.
Hourly L_{eq}, dB	55	45
Maximum dB	75	65

Source: City of Biggs 1998.
Notes:
Noise level standards do not apply to residential units established in conjunction with industrial or commercial uses (e.g., caretaker dwellings).
Transportation noise sources are defined as traffic on public roadways, railroad line operations, and aircraft in flight.

City of Gridley

Municipal Code or Ordinance

Title 9 (Public Peace, Morals, and Welfare) of the City of Gridley Municipal Code includes noise ordinances. The code prohibits loading and unloading activities between the hours of 10:00 p.m. and 6:00 a.m. in such manner that creates noise clearly audible across a residential zoned or a commercial zoned real property boundary. The code also prohibits the operation of noise-generating construction equipment between the hours of 7:00 p.m. and 6:00 a.m. on weekdays or at any time on Sundays or holidays in such a manner that creates noise clearly audible across a residential zoned or a commercial zoned real property boundary, except for emergency work being performed by a public agency or a public utility.

General Plan Noise Element

Noise-related goals, policies, and implementation strategies are outlined in the Noise Element of the City of Gridley 2030 General Plan (City of Gridley 2010). Table 3.7-9 provides noise level performance standards for non-transportation sources identified in the general plan.

Table 3.7-9. City of Gridley Noise Level Performance Standards for New Projects Affected by or Including Non-Transportation Noise Sources

Noise Level Descriptor	Daytime (dB) (7 a.m.–10 p.m.)	Nighttime (dB) (10 p.m.–7 a.m.)
Hourly average level (L_{eq})	60	45
Maximum equivalent levels (L_{max})	75	65

Source: City of Gridley 2010.

Notes: Each of the noise levels specified shall be lowered by 5 decibels for simple tone noises, noises consisting primarily of speech, or music, or for recurring impulsive noises. These noise level standards do not apply to residential units established in conjunction with industrial or commercial uses (e.g., caretaker dwellings). The noise standard is to be applied at the property lines of the generating land use.

3.7.2.2 Environmental Setting

The following discussion identifies noise-sensitive land uses in the affected area and describes the existing noise environment in the affected area.

Noise-Sensitive Land Uses

Noise-sensitive land uses are generally defined as locations where people reside or where the presence of unwanted sound could negatively affect the primary intended use of the land. Noise-sensitive uses typically include residences, schools, healthcare facilities, community centers, and places of worship. Recreational areas such as parks and trails are also areas where noise can negatively affect the purpose of the area.

Noise-sensitive uses within about 2 miles of the project area are located primarily in the main areas of development, which include the cities of Yuba City, Marysville, Live Oak, Gridley, and Biggs. Rural residences and recreational uses are scattered throughout other parts of the affected area. Table 3.7-10 summarizes developed land uses by contract area and reach.

Table 3.7-10. Noise-Sensitive Uses by Construction Contract Areas and FRWLP Reaches

Construction Contract	FRWLP Reaches	Noise-Sensitive Uses
A	2–5	Scattered rural residences Lake of the Woods State Wildlife Area
B	6–12	Scattered rural residences Residences in south end of Yuba City (Reach 11)
C	13–25	Scattered rural residences Residences in Yuba City and Marysville (Reaches 11–18) Residences in Live Oak (Reaches 22–24)
D	26–41	Scattered rural residences Residences in Gridley (Reaches 30–31) Residences in Biggs (Reaches 34–36)

Existing Noise Environment

There are several primary sources of noise in the affected area. Mobile noise sources are those related to transportation and include roadway traffic, railroads, and airports. By far the most prevalent noise source is roadway traffic, which is a constant source of noise compared to the intermittent sounds generated by railroads and airports. Stationary sources of noise in the area include aggregate mines, natural gas extraction facilities, recycling facilities, solid waste transfer stations, agricultural activities, general service commercial and light industrial uses, recreational uses, and parks and school playing fields.

Ambient noise measurements conducted in the affected area indicate that daytime ambient noise levels are in the range of 41 to 76 dBA-L_{eq}, with the lowest noise levels being in undeveloped rural areas and the highest noise levels being near SR 99 (Sutter County 2010b).

The existing noise environment in the affected area can be characterized generally by the area's level of development. The level of development and ambient noise levels tend to be closely correlated. Areas that are not urbanized are relatively quiet, while areas more urbanized are noisier as a result of roadway traffic, industry, and other human activities. Table 3.7-11 summarizes typical ambient noise levels based on level of development. These levels are consistent with the measured levels discussed above.

Table 3.7-11. Population Density and Associated Ambient Noise Levels

	L_{dn}
Rural	40–50
Small town or quiet suburban residential	50
Normal suburban residential	55
Urban residential	60
Noisy urban residential	65
Very noisy urban residential	70
Downtown, major metropolis	75–80
Area adjoining freeway or near major airport	80–90

Source: Hoover and Keith 2000.

Table 3.7-12 summarizes daily traffic volumes along highways in the affected area along with estimated traffic noise levels at 100 feet from the roadway centerline. Traffic volumes are from Sutter County (2010b) and Butte County (2010b). Traffic noise levels were calculated using these volumes and the Federal Highway Administration Traffic Noise Model Version 2.5.

Table 3.7-12. Traffic Volumes and Noise Levels on Highways in the Project Area

County—Roadway From	To	Existing Average Daily Traffic Volume	Existing Traffic Noise Level (L_{dn})[a]
Sutter County—SR 20			
Colusa County Line	Sutter Bypass	7,200	62
Sutter Bypass	Acacia Avenue	7,200	62
Acacia Avenue	Humphrey Road	9,500	63
Humphrey Road	Township Road	9,500	63
Township Road	George Washington Blvd	12,200	64
George Washington Blvd	Yuba City Limits	17,500	66
Sutter County—SR 113			
Yolo County Line	Knights Road	7,400	62
Knights Road	Del Monte Avenue	7,400	62
Del Monte Avenue	Sutter Bypass	5,500	61
Sutter Bypass	George Washington Blvd	5,800	61
George Washington Blvd	Junction Route 99	3,850	59
Sutter County—SR 99			
Garden Highway	Sacramento Avenue	17,400	66
Sacramento Avenue	Tudor Road	17,600	66
Tudor Road	Junction Route 113	14,400	65
Junction Route 113	O'Banion Road	17,300	65
O'Banion Road	Oswald Road	17,300	65
Oswald Road	Barry Road	19,600	66
Barry Road	Bogue Road	21,100	66
Bogue Road	Lincoln Road	26,500	67
Lincoln Road	Franklin Road	26,500	67
Franklin Road	Bridge Street	36,000	69
Bridge Street	Junction Route 20	21,800	66
Junction Route 20	Queens Avenue	20,300	66
Queens Avenue	Pease Avenue	20,300	66
Pease Avenue	Eager Road	20,300	66
Eager Road	End Freeway	17,800	66
End Freeway	Encinal Road	17,800	66
Encinal Road	Live Oak Boulevard	19,900	66
Live Oak Blvd	Paseo Avenue	15,600	65
Paseo Avenue	Live Oak city limits	15,600	65
Live Oak city limits	Pennington Road	15,600	65
Pennington Road	Live Oak city limits	15,600	65
Live Oak city limits	Sutter–Butte county line	15,600	65

County—Roadway From	To	Existing Average Daily Traffic Volume	Existing Traffic Noise Level (L_{dn})[a]
Butte County—SR 99			
Sutter–Butte county line	Archer Avenue	18,000	66
Archer Avenue	Spruce Street (Gridley)	23,500	67
Spruce Street	East Biggs Highway	16,500	65

Source: Sutter County 2010b; Butte County 2010b.
[a] At 100 feet from roadway centerline.

The Union Pacific Railroad track called the Valley Line runs parallel to SR 99. The 70 L_{dn} contour is located about 160 feet from the centerline of the track, the 65 dB-L_{dn} contour is about 340 feet from the centerline of the track, and the 60 dB-L_{dn} contour is 740 feet from the centerline of the track (Butte County 2010b).

One airport, the Sutter County Airport, exists in the affected area. This airport is located along the southeast side of Yuba City. The airport is used primarily for agricultural aerial-spraying purposes and private use. Other uses include flight instruction, aircraft rentals, and aircraft sales. There are approximately 110 flights a day at this airport.

Three small airstrips exist in the area.

- Jones Ag-viation, about 0.5 mile west of Thermalito Afterbay.
- Bowles airstrip, about 2 miles northwest of Live Oak.
- Vanderford Ranch Company airstrip, about 4 miles southwest of Yuba City.

3.7.3 Environmental Consequences

This section describes the environmental consequences relating to noise for the proposed project. It describes the methods used to determine the effects of the project and lists the thresholds used to conclude whether an effect would be significant. The effects that would result from implementation of the project, findings with or without mitigation, and applicable mitigation measures are presented in a table under each alternative.

3.7.3.1 Assessment Methods

This analysis focuses on the potential construction-related noise effects associated with implementation of the FRWLP. There are no new operational activities associated with the proposed project that would generate noise. Current levels of maintenance activities would be maintained. Construction equipment and operational data provided by the project engineers (HDR/Wood Rodgers 2012) and methods recommended by the Federal Highway Administration (2006) have been used to assess construction noise. Temporary groundborne vibration from construction activity has also been assessed using methods recommended by the Federal Transit Administration (2006).

Construction activities under each alternative would occur in four construction contract areas. Table 3.7-13 identifies the construction contract areas by reach.

Table 3.7-13. Construction Contract Areas and FRWLP Reaches

Construction Contract	FRWLP Reaches
A	2–5
B	6–12
C	13–25
D	26–41

Project engineers have developed a list of construction equipment to be used under each phase of construction for each construction contract area and each project alternative (HDR/Wood Rodgers 2012). Similar information has been developed for the two alternatives associated with cutoff wall gap closures and special crossings.

Table 3.7-14 summarizes the equipment expected to be used and typical noise emission levels from Federal Highway Administration (2006). L_{max} and utilization percentage values are shown. L_{eq} values calculated from the L_{max} and utilization percentage values are also shown.

Table 3.7-14. Summary of Noise Emission Assumptions for Construction Equipment

Equipment Listed for Project	Comparable Equipment from FHWA 2006	Acoustical Use Factor (%)	L_{max} at 50 Feet (dBA)	L_{eq} at 50 Feet (dBA)
Elevating scrapers	Scraper	40	84	80
Water trucks	Dump truck	40	76	72
Front-end loaders	Front end loader	40	79	75
Haul trucks	Dump truck	40	76	72
Pickup trucks	Pickup truck	40	75	71
Tractors with discing equipment	Tractor	40	84	80
Excavators	Excavator	40	81	77
Scrapers	Scraper	40	84	80
Vibratory rollers	Roller	20	80	73
Hydraulic excavators	Excavator	40	81	77
Deep soil-mixing auger	Auger drill rig	20	84	77
Extended boom pallet loader	Front end loader	40	79	75
300 kW generators	Generator	50	81	78
Slurry pumps	Pumps	50	81	78
Motor graders	Grader	40	85	81
Backhoes	Backhoe	40	78	74
Rubber tire crane	Crane	16	81	73
Hydroseeding trucks	Dump truck	40	76	72
Paving machine	Paver	50	77	74
Soil mix drill rig	TRD machine	50	80	77
Sand blasting (single nozzle)	Jet grouting machine	20	96	89
Water truck	Dump truck	40	76	72

FHWA = Federal Highway Administration; TRD = Trench Remixing, Deep Method.

Construction noise levels associated with each alternative have been developed based on the source levels in Table 3.7-14 and construction data provided by the project engineers (HDR/Wood Rodgers 2012). To develop a reasonable worst-case assessment of construction noise, all equipment identified within each construction sub-phase is assumed to operate concurrently. Accordingly, sound levels for all equipment within each sub-phase have been added to provide a cumulative construction noise level for each sub-phase.

Based on cumulative noise levels for each sub-phase, the distances within which construction noise from each sub-phase is predicted to exceed daytime and nighttime significance thresholds have also been developed. This calculation is based on point source attenuation of 6 dB per doubling of distance, assuming no shielding between the source and the receiver. In situations where there is substantial shielding between the activity and the receiver (i.e., receivers located on the opposite side of a levee when construction is occurring at the toe of the levee), sound levels would be about 5 dB less than shown, and distances would be about half the indicated distance.

The construction in each contract area is anticipated to occur in single 10-hour shifts, 6 days a week. An exception to this schedule is cutoff wall construction, which is anticipated to occur in two 10-hour shifts (essentially 24-hour construction), 6 days per week. While production work would not occur between the two 10-hour shifts, equipment maintenance and preparations for the upcoming work shift would occur. Maintenance work is also anticipated on Sundays.

3.7.3.2 Determination of Effects

For this analysis, an effect pertaining to noise and vibration was analyzed under NEPA and CEQA if it would result in any of the following environmental effects, which are based on NEPA standards, State CEQA Guidelines Appendix G (14 CCR 15000 et seq.), and standards of professional practice.

A noise effect is normally considered significant if it would result in one or more of the following.

- Expose persons to or generate noise levels in excess of applicable standards.
- Result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project.
- Result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.
- Expose persons to vibration or generation of excessive groundborne noise levels.

There are no specific local noise standards for construction noise. There are however noise standards for permanent non-transportation sources that range between 50 dBA-L_{eq} and 60 dBA-L_{eq} for the hours between 7:00 a.m. and 10:00 p.m. and 45 dBA-L_{eq} for the hours between 10:00 p.m. and 7:00 a.m. Because construction noise is temporary the higher daytime standard is used.

For the purposes of this analysis, a noise or vibration effect is considered to be significant if it would result in one or more of the following.

- Construction noise levels are predicted to exceed 60 dBA-L_{eq} at noise-sensitive uses between the hours of 7:00 a.m. and 10:00 p.m. or 45 dBA-L_{eq} between the hours of 10:00 p.m. and 7:00 a.m.
- Trucks traveling on public roads or on onsite haul routes would result in noise exceeding 60 L_{dn} at residences.

- Construction vibration is predicted to exceed a PPV of 0.2 inches per second (in/sec) at any structure or occupied building based on Caltrans guidance for potential damage to older buildings and annoyance.

3.7.4 Effects and Mitigation Measures

Effects and mitigation measure requirements concerning noise are summarized in Table 3.7-15.

Table 3.7-15. Summary of Effects for Noise

Effect	Finding	Mitigation Measure	With Mitigation
Alternatives 1, 2, and 3			
NOI-1: Exposure of Sensitive Receptors to Temporary Construction-Related Noise	Significant	NOI-MM-1: Employ Noise-Reducing Construction Practices	Significant and unavoidable
NOI-2: Exposure of Sensitive Receptors to Temporary Construction-Related Vibration	Significant	NOI-MM-2: Employ Vibration-Reducing Construction Practices	Significant and unavoidable

3.7.4.1 No Action Alternative

The No Action Alternative represents the continuation of the existing deficiencies along the portion of the Feather River in the FRWLP area. Current levee operations and maintenance activities would continue, and no levee improvements would be made to increase the level of protection. No construction-related effects relating to noise would occur. Accordingly, there would be no noise effects attributable to the implementation of the No Action Alternative.

Because no levee improvements would be made under the No Action Alternative, the risk that the levee could fail due to seepage or slope stability or geometry issues would continue. Failure of the levee, depending on the magnitude of the event, could cause catastrophic flooding. Without improvements to the levee system, the risk of levee failure would remain high. Under these conditions, any of the levee deficiencies could cause portions of the levees to fail, triggering widespread flooding and extensive damage. If a catastrophic flood were to occur, emergency flood fighting and clean-up actions would require the use of a considerable amount of heavy construction equipment. Timing and duration of use would directly correlate with flood fighting needs, but could last for days, weeks, even months. Depending on the magnitude of the flood, people may or may not be present during flood fighting activities. If flooding occurred only west of the Feather River, nearby Marysville residents could still be residing and working near a clean-up area, exposing them to excessive noise and vibration levels for extended periods of time.

Furthermore, because of the unpredictable nature of an emergency response, compliance with local noise ordinances and implementation of BMPs to manage noise levels would not be possible. All of these effects could be considered significant. However, the timing, duration and magnitude of a flood event are speculative and unpredictable, and thus a precise determination of significance is not possible.

3.7.4.2 Alternative 1

Implementation of Alternative 1 would potentially result in effects on noise. These potential effects and related mitigation measure requirements are summarized in Table 3.7-16 and discussed below.

Table 3.7-16. Noise Effects and Mitigation Measures for Alternative 1

Effect	Finding	Mitigation Measure	With Mitigation
NOI-1: Exposure of Sensitive Receptors to Temporary Construction-Related Noise	Significant	NOI-MM-1: Employ Noise-Reducing Construction Practices	Significant and unavoidable
NOI-2: Exposure of Sensitive Receptors to Temporary Construction-Related Vibration	Significant	NOI-MM-2: Employ Vibration-Reducing Construction Practices	Significant and unavoidable

Effect NOI-1: Exposure of Sensitive Receptors to Temporary Construction-Related Noise

Alternative 1—Construction Contract A

Table 3.7-17 summarizes construction noise levels and distances to the 60 dBA-L_{eq} and 45 dBA-L_{eq} noise contours for Alternative 1 Construction Contract A. This indicates that scattered rural residences could be exposed to noise exceeding 60 dBA-L_{eq} during daytime hours and 45 dBA-L_{eq} during nighttime hours.

Table 3.7-17. Summary of Predicted Construction Noise Levels under Alternative 1 Construction Contract A

Construction Phase	Cumulative Noise Level at 50 Feet (dBA-L_{eq})	Distance to 60 dBA-L_{eq} Contour (feet)	Distance to 45 dBA-L_{eq} Contour (feet)
1. Clearing and grubbing/stripping	90	1,626	9,145
2. Borrow site preparation	86	1,022	5,747
3. Levee degrading/work surface construction	93	2,189	12,312
4. Cutoff wall construction	89	1,418	7,975
5. Levee reconstruction/seepage berm construction	94	2,455	13,804
6. Borrow site excavation	90	1,575	8,857
7. Utility reconstruction	84	749	4,209
8. Levee resurfacing	88	1,218	6,851
9. Hydroseeding	80	489	2,747
10. Demobilization/cleanup	78	399	2,243

Note: In situations where there is substantial shielding between the activity and the receiver (i.e., receivers located on the opposite side of a levee when construction is occurring at the toe of the levee), sound levels would be about 5 dB less than shown, and distances would be about half the indicated distance.

Alternative 1—Construction Contract B

Table 3.7-18 summarizes construction noise levels and distances to the 60 dBA-L_{eq} and 45 dBA-L_{eq} noise contours for Alternative 1 Construction Contract B. This indicates that scattered rural residences and residences located in the south end of Yuba City could be exposed to noise exceeding 60 dBA-L_{eq} during daytime hours and 45 dBA-L_{eq} during nighttime hours.

Table 3.7-18. Summary of Predicted Construction Noise Levels under Alternative 1 Construction Contract B

Construction Phase	Cumulative Noise Level at 50 Feet (dBA-L_{eq})	Distance to 60 dBA-L_{eq} Contour (feet)	Distance to 45 dBA-L_{eq} Contour (feet)
1. Clearing and grubbing/stripping	90	1,602	9,006
2. Borrow site preparation	86	1,022	5,747
3. Levee degrading/work surface construction	93	2,189	12,312
4. Cutoff wall construction	90	1,515	8,518
5. Levee reconstruction	94	2,455	13,804
6. Borrow site excavation	90	1,524	8,569
7. Utility reconstruction	84	749	4,209
8. Levee resurfacing	85	923	5,190
9. Hydroseeding	75	282	1,587
10. Demobilization/cleanup	78	399	2,243

Note: In situations where there is substantial shielding between the activity and the receiver (i.e., receivers located on the opposite side of a levee when construction is occurring at the toe of the levee), sound levels would be about 5 dB less than shown, and distances would be about half the indicated distance.

Alternative 1—Construction Contract C

Table 3.7-19 summarizes construction noise levels and distances to the 60 dBA-L_{eq} and 45 dBA-L_{eq} noise contours for Alternative 1 Construction Contract C. This indicates that scattered rural residences and residences located in Yuba City, Marysville, and Live Oak could be exposed to noise exceeding 60 dBA-L_{eq} during daytime hours and 45 dBA-L_{eq} during nighttime hours.

Table 3.7-19. Summary of Predicted Construction Noise Levels under Alternative 1 Construction Contract C

Construction Phase	Cumulative Noise Level at 50 Feet (dBA-L_{eq})	Distance to 60 dBA-L_{eq} Contour (feet)	Distance to 45 dBA-L_{eq} Contour (feet)
1. Clearing and grubbing/stripping	87	1,170	6,581
2. Borrow site preparation	86	1,022	5,747
3. Levee degrading/work surface construction	93	2,141	12,038
4. Cutoff wall construction	92	1,902	10,696
5. Levee reconstruction/seepage berm construction	93	2,184	12,281
6. Borrow site excavation	91	1,796	10,098
7. Utility reconstruction	80	518	2,915
8. Levee resurfacing	85	923	5,190
9. Hydroseeding	78	378	2,126
10. Demobilization/cleanup	78	399	2,243

Note: In situations where there is substantial shielding between the activity and the receiver (i.e., receivers located on the opposite side of a levee when construction is occurring at the toe of the levee), sound levels would be about 5 dB less than shown, and distances would be about half the indicated distance.

Alternative 1—Construction Contract D

Table 3.7-20 summarizes construction noise levels and distances to the 60 dBA-L_{eq} and 45 dBA-L_{eq} noise contours for Alternative 1 Construction Contract D. This indicates that scattered rural residences and residences located in Gridley and Biggs could be exposed to noise exceeding 60 dBA-L_{eq} during daytime hours and 45 dBA-L_{eq} during nighttime hours.

Table 3.7-20. Summary of Predicted Construction Noise Levels under Alternative 1 Construction Contract D

Construction Phase	Cumulative Noise Level at 50 Feet (dBA-L_{eq})	Distance to 60 dBA-L_{eq} Contour (feet)	Distance to 45 dBA-L_{eq} Contour (feet)
1. Clearing and grubbing/stripping	86	996	5,601
2. Borrow site preparation	89	1,445	8,128
3. Levee degrading/work surface construction	93	2,131	11,985
4. Cutoff wall construction	91	1,715	9,643
5. Levee reconstruction	94	2,391	13,447
6. Borrow site excavation	91	1,829	10,283
7. Utility reconstruction	80	518	2,915
8. Levee resurfacing	85	923	5,190
9. Hydroseeding	78	378	2,126
10. Demobilization/cleanup	78	399	2,243

Onsite Haul Truck Activity

Specific borrow site locations and onsite haul routes have not been defined. However, project engineers have stated that there would be up to 15 truck trips per day to each borrow site (Jabbour pers. comm.). This corresponds to 30 truck passes per day. Assuming these trips occur over a 10-hour work day (three passes per hour) at 25 miles per hour, the corresponding noise level at 50 feet is 45 L_{dn}. Because this value is less than 60 L_{dn} the noise effect of haul trucks accessing borrow sites is considered to be less than significant.

Offsite Haul Truck Activity on Public Roads

Specific information on the daily volume of trucks that would travel on public roads has not been determined. However, it would take 50 truck passes per hour at 45 mph over a 10-hour work day (i.e., 500 passes or 250 total daily trips) on any given road to produce a sound level of 60 L_{dn} at 50 feet. Because it is not anticipated that this many trips will need to occur on any given public road, the noise effect of project trips on public roads is considered to be less than significant.

Alternative 1—Effect NOI-1 Conclusion

The results of the construction noise analysis above indicate that noise-sensitive uses could be exposed to construction noise exceeding 60 dBA-L_{eq} during daytime hours and 45 dBA-L_{eq} during nighttime hours. The potential exposure of noise-sensitive receptors to construction noise is considered to be significant.

Noise from haul trucks on the designated onsite haul routes from borrow sites and on public roads is not expected to exceed 60 L_{dn} at adjacent residences and is therefore considered to be less than significant.

Mitigation Measure NOI-MM-1: Employ Noise-Reducing Construction Practices

To the extent feasible construction contractors shall control noise from construction activity such that noise does not exceed applicable noise standards specified by the Cities of Yuba City, Marysville, Live Oak, and Biggs; Sutter County; and Butte County. Where there is not a specific noise standard noise will be limited to 60 dBA-L_{eq} at noise-sensitive uses between the hours of 7:00 a.m. and 10:00 p.m. or 45 dBA-L_{eq} between the hours of 10:00 p.m. and 7:00 a.m.

Measures that can be implemented to control noise include the following.

- Locate noise-generating equipment as far away as practical from residences and other noise-sensitive uses.
- Equip all construction equipment with standard noise attenuation devices such as mufflers to reduce noise and equip all internal combustion engines with intake and exhaust silencers in accordance with manufacturer's standard specifications.
- Establish equipment and material haul routes that avoid residential uses to the extent practical, limit hauling to the hours between 7:00 a.m. and 10:00 p.m., and specify maximum acceptable speeds for each route.
- Employ electrically powered equipment in place of equipment with internal combustion engines where practical, where electric equipment is readily available, and where this equipment accomplishes project work as effectively and efficiently as equipment powered with internal combustion engines.

- Restrict the use of audible warning devices such as bells, whistles, and horns to those situations that are required by law for safety purposes.
- Provide a noise-reducing enclosure around stationary noise-generating equipment.
- Provide temporary construction noise barriers between active construction sites that are in close proximity to residential and other noise-sensitive uses. Temporary barriers can be constructed or created with parked truck trailers, soil piles, or material stock piles.

The construction contractor shall develop a construction noise control plan which identifies specific feasible noise control measures that will be employed and the extent to which the measure will be able to control noise to specific noise ordinance limits. The plan will identify areas where it not considered feasible to comply with applicable noise limits. The noise controlled shall be submitted to and approved by SBFCA before any noise-generating activity begins.

Although implementation of this measure will reduce the effect, it is not anticipated that feasible measures will be available in all situations to reduce noise to below the applicable noise ordinance limits. This effect is therefore considered to be significant and unavoidable.

Effect NOI-2: Exposure of Sensitive Receptors to Temporary Construction-Related Vibration

Table 3.7-21 summarizes typical construction vibration levels for the types of equipment that would likely be used on this project. Using methods specified in Federal Transit Administration (2006), distances are indicated within which vibration is estimated to exceed 0.2 inch per second.

Alternative 1—Effect NOI-2 Conclusion

It is anticipated that construction equipment would not typically operate within approximately 30 feet of residences and structures. However, there may be situations where this is required and where ground vibration could exceed 0.2 inch per second at residences and other structures. This effect is therefore considered to be significant.

Table 3.7-21. Vibration Source Levels for Construction Equipment

Equipment	PPV at 25 feet	Distance within Which Vibration is Estimated to Exceed 0.2 Inch per Second
Pile driver (impact)	1.518	100 feet
Pile drive (sonic/vibratory)	0.734	60 feet
Vibratory roller	0.210	26 feet
Large bulldozer	0.089	15 feet
Loaded trucks	0.076	14 feet
Jackhammer	0.035	<10 feet
Small bulldozer	0.003	<10 feet

Source: Federal Transit Administration 2006.
ppv = peak particle velocity.

Mitigation Measure NOI-MM-2: Employ Vibration-Reducing Construction Practices

The construction contractor will, to the extent feasible, maintain a minimum distance of 150 feet between pile driving equipment and occupied or vibration-sensitive buildings or structures. To the extent feasible, a minimum distance of 50 feet will be maintained between other construction equipment and occupied or vibration-sensitive buildings or structures. For cases where this is not feasible, residents or property owners will be notified in writing prior to construction activity that construction may occur in close proximity to their buildings. SBFCA will inspect the potentially affected buildings prior to construction to inventory existing cracks in paint, plaster, concrete, and other building elements. SBFCA will retain a qualified acoustical consultant or engineering firm to conduct vibration monitoring at potentially affected buildings to measure the actual vibration levels during construction. Following completion of construction, SBFCA will conduct a second inspection to inventory changes in existing cracks and new cracks or damage, if any, that occurred as a result of construction-induced vibration. If new damage is found, then SBFCA will promptly arrange to have the damaged repaired or will reimburse the property owner for appropriate repairs.

In addition, if construction activity is required within 100 feet of residences or other vibration-sensitive buildings, a designated complaint coordinator will be responsible for handling and responding to any complaints received during such periods of construction. A reporting program will be required that documents complaints received, actions taken, and the effectiveness of these actions in resolving disputes.

Although implementation of this measure will reduce the effect, it is not anticipated that feasible measures will be available in all situations to reduce vibration to below the applicable levels. This effect is therefore considered to be significant and unavoidable.

3.7.4.3 Alternative 2

Implementation of Alternative 2 would potentially result in effects on noise. These potential effects and related mitigation measure requirements are summarized in Table 3.7-22 and discussed below.

Table 3.7-22. Noise Effects and Mitigation Measures for Alternative 2

Effect	Finding	Mitigation Measure	With Mitigation
NOI-1: Exposure of Sensitive Receptors to Temporary Construction-Related Noise	Significant	NOI-MM-1: Employ Noise-Reducing Construction Practices	Significant and unavoidable
NOI-2: Exposure of Sensitive Receptors to Temporary Construction-Related Vibration	Significant	NOI-MM-2: Employ Vibration-Reducing Construction Practices	Significant and unavoidable

Effect NOI-1: Exposure of Sensitive Receptors to Temporary Construction-Related Noise

Alternative 2—Construction Contract A

Table 3.7-23 summarizes construction noise levels and distances to the 60 dBA-L_{eq} and 45 dBA-L_{eq} noise contours for Alternative 2 Construction Contract A. This indicates that scattered rural residences could be exposed to noise exceeding 60 dBA-L_{eq} during daytime hours and 45 dBA-L_{eq} during nighttime hours.

Table 3.7-23. Summary of Predicted Construction Noise Levels under Alternative 2 Contract A

Construction Phase	Cumulative Noise Level at 50 Feet (dBA-L_{eq})	Distance to 60 dBA-L_{eq} Contour (feet)	Distance to 45 dBA-L_{eq} Contour (feet)
1. Clearing and grubbing/stripping	90	1,626	9,145
2. Borrow site preparation	90	1,626	9,145
3. Levee degrading/work surface construction	85	921	5,178
4. Cutoff wall construction	86	1,047	5,890
5. Levee reconstruction/seepage and stability	95	2,919	16,416
6. Borrow site excavation	92	2,089	11,748
7. Utility reconstruction	84	749	4,209
8. Levee resurfacing	83	697	3,919
9. Hydroseeding	75	282	1,587
10. Demobilization/cleanup	78	399	2,243

Note: In situations where there is substantial shielding between the activity and the receiver (i.e., receivers located on the opposite side of a levee when construction is occurring at the toe of the levee) sound levels would be about 5 dB less than shown, and distances would be about half the indicated distance.

Alternative 2—Construction Contract B

Table 3.7-24 summarizes construction noise levels and distances to the 60 dBA-L_{eq} and 45 dBA-L_{eq} noise contours for Alternative 2 Construction Contract B. This indicates that scattered rural residences and residences located in the south end of Yuba City could be exposed to noise exceeding 60 dBA-Leq during daytime hours and 45 dBA-L_{eq} during nighttime hours.

Table 3.7-24. Summary of Predicted Construction Noise Levels under Alternative 2 Construction Contract B

Construction Phase	Cumulative Noise Level at 50 Feet (dBA-L_{eq})	Distance to 60 dBA-L_{eq} Contour (feet)	Distance to 45 dBA-L_{eq} Contour (feet)
1. Clearing and grubbing/stripping	90	1,602	9,006
2. Borrow site preparation	89	1,445	8,128
3. Levee degrading/	86	1,003	5,643
4. Cutoff wall construction	88	1,227	6,901
5. Levee reconstruction/seepage and stability/berm construction	95	2,876	16,172
6. Borrow site excavation	92	2,028	11,404
7. Utility reconstruction	84	749	4,209
8. Roadway reconstruction	86	997	5,607
9. Levee resurfacing	85	873	4,909
10. Hydroseeding	75	282	1,587
11. Demobilization/cleanup	78	399	2,243

Note: In situations where there is substantial shielding between the activity and the receiver (i.e., receivers located on the opposite side of a levee when construction is occurring at the toe of the levee) sound levels would be about 5 dB less than shown, and distances would be about half the indicated distance.

Alternative 2—Construction Contract C

Table 3.7-25 summarizes construction noise levels and distances to the 60 dBA-L_{eq} and 45 dBA-L_{eq} noise contours for Alternative 2 Contract Area C. This indicates that scattered rural residences and residences located in Yuba City, Marysville, and Live Oak could be exposed to noise exceeding 60 dBA-L_{eq} during daytime hours and 45 dBA-L_{eq} during nighttime hours.

Table 3.7-25. Summary of Predicted Construction Noise Levels under Alternative 2 Construction Contract C

Construction Phase	Cumulative Noise Level at 50 Feet (dBA-L_{eq})	Distance to 60 dBA-L_{eq} Contour (feet)	Distance to 45 dBA-L_{eq} Contour (feet)
1. Clearing and grubbing/stripping	93	2,124	11,944
2. Borrow site preparation	89	1,445	8,128
3. Levee degrading/work surface construction	93	2,141	12,038
4. Cutoff wall construction	89	1,367	7,687
5. Levee reconstruction/seepage and stability/berm construction	94	2,391	13,447
6. Borrow site excavation	91	1,861	10,464
7. Utility reconstruction	80	518	2,915
8. Levee resurfacing	88	1,274	7,167
9. Hydroseeding	78	378	2,126
10. Demobilization/cleanup	78	399	2,243

Note: In situations where there is substantial shielding between the activity and the receiver (i.e., receivers located on the opposite side of a levee when construction is occurring at the toe of the levee) sound levels would be about 5 dB less than shown, and distances would be about half the indicated distance.

Alternative 2—Construction Contract D

Table 3.7-26 summarizes construction noise levels and distances to the 60 dBA-L_{eq} and 45 dBA-L_{eq} noise contours for Alternative 2 Construction Contract D. This indicates that scattered rural residences and residences located in Gridley and Biggs could be exposed to noise exceeding 60 dBA-L_{eq} during daytime hours and 45 dBA-L_{eq} during nighttime hours.

Table 3.7-26. Summary of Predicted Construction Noise Levels under Alternative 2 Construction Contract D

Construction Phase	Cumulative Noise Level at 50 Feet (dBA-L_{eq})	Distance to 60 dBA-L_{eq} Contour (feet)	Distance to 45 dBA-L_{eq} Contour (feet)
1. Clearing and grubbing/stripping	89	1,331	7,485
2. Borrow site preparation	89	1,445	8,128
3. Levee degrading/work surface construction	NA	NA	NA
4. Cutoff wall construction	NA	NA	NA
5. Levee reconstruction/seepage and stability/berm construction	92	2,004	11,270
6. Borrow site excavation	91	1,796	10,098
7. Utility reconstruction	80	518	2,915
8. Levee resurfacing	85	923	5,190
9. Hydroseeding	78	378	2,126
10. Demobilization/cleanup	78	399	2,243

Note: In situations where there is substantial shielding between the activity and the receiver (i.e., receivers located on the opposite side of a levee when construction is occurring at the toe of the levee) sound levels would be about 5 dB less than shown, and distances would be about half the indicated distance.
NA = not applicable.

Onsite Haul Truck Activity

Specific borrow site locations and onsite haul routes have not been defined. However, project engineers have stated that there would be up to 15 truck trips per day to each borrow site (Jabbour pers. comm.). This corresponds to 30 truck passes per day. Assuming these trips occur over a 10-hour work day (three passes per hour) at 25 miles per hour, the corresponding noise level at 50 feet is 45 L_{dn}. Because this value is less than 60 L_{dn}, the noise impact of haul trucks accessing borrow sites is considered to be less than significant.

Offsite Haul Truck Activity on Public Roads

Specific information on the daily volume of trucks that would travel on public roads has not been determined. However, it would take 50 truck passes per hour at 45 mph over a 10-hour work day (i.e., 500 passes or 250 total daily trips) on any given road to produce a sound level of 60 L_{dn} at 50 feet. Because it is not anticipated that this many trips will need to occur on any given public road, the noise impact of project trips on public roads is considered to be less than significant.

Alternative 2—Effect NOI-1 Conclusion

The results of the construction noise analysis above indicate that noise-sensitive uses could be exposed to construction noise exceeding 60 dBA-L_{eq} during daytime hours and 45 dBA-L_{eq} during nighttime hours. The potential exposure of noise-sensitive receptors to construction noise is considered to be significant.

Noise from haul trucks on the designated onsite haul routes from borrow sites and on public roads is not expected to exceed 60 L_{dn} at adjacent residences and is therefore considered to be less than significant.

Mitigation Measure NOI-MM-1: Employ Noise-Reducing Construction Practices

A full description of NOI-MM-1 is presented above under the Alternative 1 discussion. Although implementation of this measure will reduce the effect, it is not anticipated that feasible measures will be available in all situations to reduce noise to below the applicable noise ordinance limits. This effect is therefore considered to be significant and unavoidable.

Effect NOI-2: Exposure of Sensitive Receptors to Temporary Construction-Related Vibration

Vibration from construction equipment would be a primary concern when pile driving or another similar highly dynamic activity would occur. Highly dynamic equipment such as this would not be employed under Alternative 2. Table 3.7-21 summarizes typical construction vibration levels for the types of equipment that would be used on this project. Using methods specified in Federal Transit Administration (2006), distances are indicated within which vibration is estimated to exceed 0.2 inch per second.

Alternative 2—Effect NOI-2 Conclusion

It is anticipated that construction equipment would not typically operate within approximately 30 feet for residences and structures. However, there may be situations where this is required and where ground vibration could exceed 0.2 inch per second at residences and other structures. This effect is therefore considered to be significant.

Mitigation Measure NOI-MM-2: Employ Vibration-Reducing Construction Practices

A full description of NOI-MM-2 is presented above under the Alternative 1 discussion. Although implementation of this measure will reduce the effect, it is not anticipated that feasible measures will be available in all situations to reduce vibration to below the applicable levels. This effect is therefore considered to be significant and unavoidable.

3.7.4.4 Alternative 3

Implementation of Alternative 3 would potentially result in effects on noise. These potential effects and related mitigation measure requirements are summarized in Table 3.7-27 and discussed below.

Table 3.7-27. Noise Effects and Mitigation Measures for Alternative 3

Effect	Finding	Mitigation Measure	With Mitigation
NOI-1: Exposure of Sensitive Receptors to Temporary Construction-Related Noise	Significant	NOI-MM-1: Employ Noise-Reducing Construction Practices	Significant and unavoidable
NOI-2: Exposure of Sensitive Receptors to Temporary Construction-Related Vibration	Significant	NOI-MM-2: Employ Vibration-Reducing Construction Practices	Significant and unavoidable

Effect NOI-1: Exposure of Sensitive Receptors to Temporary Construction-Related Noise

Alternative 3—Construction Contract A

Table 3.7-28 summarizes construction noise levels and distances to the 60 dBA-L_{eq} and 45 dBA-L_{eq} noise contours for Alternative 3 Construction Contract A. This indicates that scattered rural residences could be exposed to noise exceeding 60 dBA-L_{eq} during daytime hours and 45 dBA-L_{eq} during nighttime hours.

Table 3.7-28. Summary of Predicted Construction Noise Levels under Alternative 3 Construction Contract A

Construction Phase	Cumulative Noise Level at 50 Feet (dBA-L_{eq})	Distance to 60 dBA-L_{eq} Contour (feet)	Distance to 45 dBA-L_{eq} Contour (feet)
1. Clearing and grubbing/stripping	90	1,602	9,006
2. Borrow site preparation	86	1,022	5,747
3. Levee degrading/work surface construction	93	2,189	12,312
4. Cutoff wall construction	90	1,515	8,519
5. Levee reconstruction/seepage and stability/berm construction	94	2,455	13,804
6. Borrow site excavation	90	1,575	8,857
7. Utility reconstruction	84	749	4,209
8. Levee resurfacing	85	923	5,190
9. Hydroseeding	75	282	1,587
10. Demobilization/cleanup	78	399	2,243

Note: In situations where there is substantial shielding between the activity and the receiver (i.e., receivers located on the opposite side of a levee when construction is occurring at the toe of the levee) sound levels would be about 5 dB less than shown, and distances would be about half the indicated distance.

Alternative 3—Construction Contract B

Table 3.7-29 summarizes construction noise levels and distances to the 60 dBA-L_{eq} and 45 dBA-L_{eq} noise contours for Alternative 3 Construction Contract B. This indicates that scattered rural residences and residences located in the south end of Yuba City could be exposed to noise exceeding 60 dBA-L_{eq} during daytime hours and 45 dBA-L_{eq} during nighttime hours.

Table 3.7-29. Summary of Predicted Construction Noise Levels under Alternative 3 Construction Contract B

Construction Phase	Cumulative Noise Level at 50 Feet ($dBA-L_{eq}$)	Distance to 60 $dBA-L_{eq}$ Contour (feet)	Distance to 45 $dBA-L_{eq}$ Contour (feet)
1. Clearing and grubbing/stripping	90	1,602	9,006
2. Borrow site preparation	86	1,022	5,747
3. Levee degrading/work surface construction	93	2,189	12,312
4. Cutoff wall construction	90	1,515	8,518
5. Levee reconstruction	94	2,455	13,804
6. Borrow site excavation	90	1,575	8,857
7. Utility reconstruction	84	790	4,440
8. Levee resurfacing	85	923	5,190
9. Hydroseeding (concurrent with 8)	75	282	1,587
10. Demobilization/cleanup	78	399	2,243

Note: In situations where there is substantial shielding between the activity and the receiver (i.e., receivers located on the opposite side of a levee when construction is occurring at the toe of the levee) sound levels would be about 5 dB less than shown, and distances would be about half the indicated distance.

Alternative 3—Construction Contract C

Table 3.7-30 summarizes construction noise levels and distances to the 60 $dBA-L_{eq}$ and 45 $dBA-L_{eq}$ noise contours for Alternative 3 Construction Contract C. This indicates that scattered rural residences and residences located in Yuba City, Marysville, and Live Oak could be exposed to noise exceeding 60 $dBA-L_{eq}$ during daytime hours and 45 $dBA-L_{eq}$ during nighttime hours.

Table 3.7-30. Summary of Predicted Construction Noise Levels under Alternative 3 Construction Contract C

Construction Phase	Cumulative Noise Level at 50 Feet ($dBA-L_{eq}$)	Distance to 60 $dBA-L_{eq}$ Contour (feet)	Distance to 45 $dBA-L_{eq}$ Contour (feet)
1. Clearing and grubbing/stripping	87	1,115	6,270
2. Borrow site preparation	86	1,022	5,747
3. Levee degrading/work surface construction	93	2,141	12,038
4. Cutoff wall construction	92	1,902	10,696
5. Levee reconstruction/seepage berm construction	93	2,184	12,281
6. Borrow site excavation	91	1,796	10,098
7. Utility reconstruction	80	518	2,915
8. Levee resurfacing	85	923	5,190
9. Hydroseeding	78	378	2,126
10. Demobilization/cleanup	78	399	2,243

Note: In situations where there is substantial shielding between the activity and the receiver (i.e., receivers located on the opposite side of a levee when construction is occurring at the toe of the levee) sound levels would be about 5 dB less than shown, and distances would be about half the indicated distance.

Alternative 3—Construction Contract D

Table 3.7-31summarizes construction noise levels and distances to the 60 dBA-L_{eq} and 45 dBA-L_{eq} noise contours for Alternative 3 Construction Contract D. This indicates that scattered rural residences and residences located in Gridley and Biggs could be exposed to noise exceeding 60 dBA-L_{eq} during daytime hours and 45 dBA-L_{eq} during nighttime hours.

Table 3.7-31. Summary of Predicted Construction Noise Levels under Alternative 3 Construction Contract D

Construction Phase	Cumulative Noise Level at 50 Feet (dBA-L_{eq})	Distance to 60 dBA-L_{eq} Contour (feet)	Distance to 45 dBA-L_{eq} Contour (feet)
1. Clearing and grubbing/stripping	86	996	5,601
2. Borrow site preparation (concurrent with 1)	89	1,445	8,128
3. Levee degrading/work surface construction	93	2,131	11,985
4. Cutoff wall construction	91	1,715	9,643
5. Levee reconstruction	94	2,391	13,447
6. Borrow site excavation	91	1,829	10,283
7. Utility reconstruction	80	518	2,915
8. Levee resurfacing	85	923	5,190
9. Hydroseeding	78	378	2,126
10. Demobilization/cleanup	78	399	2,243

Note: In situations where there is substantial shielding between the activity and the receiver (i.e., receivers located on the opposite side of a levee when construction is occurring at the toe of the levee) sound levels would be about 5 dB less than shown, and distances would be about half the indicated distance.

Onsite Haul Truck Activity

Specific borrow site locations and onsite haul routes have not been defined. However, project engineers have stated that there would be up to 15 truck trips per day to each borrow site (Jabbour pers. comm.). This corresponds to 30 truck passes per day. Assuming these trips occur over a 10-hour work day (three passes per hour) at 25 miles per hour, the corresponding noise level at 50 feet is 45 L_{dn}. Because this value is less than 60 L_{dn}, the noise impact of haul trucks accessing borrow sites is considered to be less than significant.

Offsite Haul Truck Activity on Public Roads

Specific information on the daily volume of trucks that would travel on public roads has not been determined. However, it would take 50 truck passes per hour at 45 mph over a 10-hour work day (i.e., 500 passes or 250 total daily trips) on any given road to produce a sound level of 60 L_{dn} at 50 feet. Because it is not anticipated that this many trips will need to occur on any given public road, the noise impact of project trips on public roads is considered to be less than significant.

Alternative 3—Effect NOI-1 Conclusion

The results of the construction noise analysis above indicate that noise-sensitive uses could be exposed to construction noise exceeding 60 dBA-L_{eq} during daytime hours and 45 dBA-L_{eq} during nighttime hours. The potential exposure of noise-sensitive receptors to construction noise is considered to be significant.

Noise from haul trucks on the designated onsite haul routes from borrow sites and on public roads is not expected to exceed 60 L_{dn} at adjacent residences and is therefore considered to be less than significant.

Mitigation Measure NOI-MM-1: Employ Noise-Reducing Construction Practices

A full description of NOI-MM-1 is presented above under the Alternative 1 discussion. Although implementation of this measure will reduce the effect, it is not anticipated that feasible measures will be available in all situations to reduce noise to below the applicable noise ordinance limits. This effect is therefore considered to be significant and unavoidable.

Effect NOI-2: Exposure of Sensitive Receptors to Temporary Construction-Related Vibration

Vibration from construction equipment would be a primary concern when pile driving or another similar highly dynamic activity would occur. Highly dynamic equipment such as this would not be employed under Alternative 3. Table 3.7-21 summarizes typical construction vibration levels for the types of equipment that would be used on this project. Using methods specified in Federal Transit Administration (2006), distances are indicated within which vibration is estimated to exceed 0.2 inch per second.

Alternative 3—Effect NOI-2 Conclusion

It is anticipated that construction equipment would not typically operate within approximately 30 feet for residences and structures. However, there may be situations where this is required and where ground vibration could exceed 0.2 inch per second at residences and other structures. This effect is therefore considered to be significant.

Mitigation Measure NOI-MM-2: Employ Vibration-Reducing Construction Practices

A full description of NOI-MM-2 is presented above under the Alternative 1 discussion. Although implementation of this measure will reduce the effect, it is not anticipated that feasible measures will be available in all situations to reduce vibration to below the applicable levels. This effect is therefore considered to be significant and unavoidable.

3.8 Vegetation and Wetlands

3.8.1 Introduction

This section describes the regulatory and environmental setting for vegetation and wetlands; effects on vegetation and wetlands that would result from the No Action Alternative and Alternatives 1, 2, and 3; and mitigation measures that would reduce significant effects. Additional information on vegetation and wetlands is provided in Appendix F.

3.8.2 Affected Environment

This section describes the affected environment for vegetation and wetlands in the biological study area, which is defined below in Section 3.8.2.2, *Environmental Setting*. Following are the key sources of data and information used in the preparation of this section.

- A CNDDB query for records pertaining to the biological study area, which includes portions of the following USGS 7.5-minute quadrangles that overlap the biological study area: Nicolaus, Yuba City, Sutter, Olivehurst, Biggs, Gridley, Palermo (Appendix F) (California Department of Fish and Game 2012).
- A USFWS list of endangered, threatened, and proposed species for the aforementioned seven USGS quadrangles (Appendix F) (U.S. Fish and Wildlife Service 2012).
- DFG's List of Special Vascular Plants, Bryophytes, and Lichens (California Department of Fish and Game 2010).
- A list from the California Native Plant Society's (CNPS's) 2012 online Inventory of Rare and Endangered Plants for the aforementioned seven USGS quadrangles (Appendix F) (California Native Plant Society 2012).
- The California Department of Food and Agriculture's (CDFA's) Pest Ratings of Noxious Weed Species and Noxious Weed Seed (California Department of Food and Agriculture 2010).
- The California Invasive Plant Council's (Cal-IPC's) California Invasive Plant Inventory (California Invasive Plant Council 2006, 2007).
- General plans for counties and cities in the biological study area.
    - Butte County General Plan 2030 (Butte County 2010).
    - Sutter County General Plan, Public Draft (Sutter County 2010).
    - City of Yuba City General Plan (City of Yuba City 2004).
    - City of Biggs General Plan 1997–2015 (City of Biggs 1998).
    - City of Gridley 2030 General Plan (City of Gridley 2010).
    - City of Live Oak 2030 General Plan (City of Live Oak 2010).
- Draft habitat conservation plans/natural community conservation plans (HCPs/NCCPs) being prepared for the biological study area.
    - Butte County Regional HCP/NCCP (in preparation; status available at www.buttehcp.com).

- Yuba-Sutter HCP/NCCP (in preparation; status available at www.yubasutterhcp.org).
- Existing SBFCA documents.
  - Biological Survey Memo for SBFCA Preliminary Environmental Planning Support for the Feather River West Levee Rehabilitation Early Implementation Project (Ladd pers. comm.).
  - Draft Sutter Basin Feasibility Study Environmental Without-Project Conditions Report (ICF International 2011).
  - Lower Feather River HUC/Honcut Creek Watershed Existing Conditions Assessment (Foothill Associates 2010).
  - Sutter Basin Feasibility Study—Restoration Opportunities, Measures, and Sponsors (ICF International 2010).

3.8.2.1 Regulatory Setting

This section summarizes key Federal and state regulatory information that applies to vegetation and wetlands. Additional regulatory information appears in Appendix A.

Federal

The following Federal policies related to vegetation and wetlands may apply to implementation of the proposed project.

National Environmental Policy Act

NEPA was enacted to address concerns about environmental quality. NEPA acts to ensure that Federal agencies evaluate the potential environmental effects of proposed programs, projects, and actions before decisions are made to implement them, inform the public of Federal agency proposed activities that have the potential to significantly affect environmental quality, and encourage and facilitate public involvement in the decision-making process.

Federal Endangered Species Act

The Federal Endangered Species Act (ESA) of 1973 and subsequent amendments provide for the conservation of listed endangered or threatened species or candidates for listing and the ecosystems on which they depend. USFWS has jurisdiction over federally listed plants, wildlife, and resident fish, and NMFS has jurisdiction over anadromous fish and marine fish and mammals.

Endangered Species Act Authorization Process for Federal Actions (Section 7)

Section 7 of the ESA provides a means for authorizing take of threatened and endangered species by Federal agencies. It applies to actions that are conducted, permitted, or funded by a Federal agency. Under ESA Section 7, the lead Federal agency conducting, funding, or permitting an action must consult with USFWS or NMFS, as appropriate, to ensure that a proposed action will not jeopardize the continued existence of an endangered or threatened species or destroy or adversely modify designated critical habitat. If a proposed action may affect a listed species or designated critical habitat, the lead agency is required to prepare a biological assessment (BA) evaluating the nature and severity of the expected effect. In response, USFWS or NMFS issues a biological opinion (BO), with one of the following determinations about the proposed action

- May jeopardize the continued existence of one or more listed species (*jeopardy finding*) or result in the destruction or adverse modification of critical habitat (*adverse modification finding*).
- Will not jeopardize the continued existence of any listed species (*no jeopardy finding*) or result in adverse modification of critical habitat (*no adverse modification finding*).

The BO issued by USFWS or NMFS may stipulate mandatory *reasonable and prudent measures* and *terms and conditions*. If it is determined the proposed project would not jeopardize the continued existence of a listed species, USFWS or NMFS would issue an incidental take statement to authorize the proposed activity.

Endangered Species Act Prohibitions (Section 9)

Section 9 prohibits removing, cutting, and maliciously damaging or destroying federally listed plants on sites under Federal jurisdiction. Take of threatened species also is prohibited under Section 9 unless otherwise authorized by Federal regulations.[1]

Clean Water Act

The CWA was enacted as an amendment to the Federal Water Pollution Control Act of 1972, which outlined the basic structure for regulating discharges of pollutants to waters of the United States. The CWA serves as the primary Federal law protecting the quality of the nation's surface waters, including lakes, rivers, and coastal wetlands.

The CWA empowers the EPA to set national water quality standards and effluent limitations and includes programs addressing both point-source and nonpoint-source pollution. *Point-source pollution* is pollution that originates or enters surface waters at a single, discrete location, such as an outfall structure or an excavation or construction site. *Nonpoint-source pollution* originates over a broader area and includes urban contaminants in stormwater runoff and sediment loading from upstream areas. The CWA operates on the principle that all discharges into the nation's waters are unlawful unless specifically authorized by a permit; permit review is the CWA's primary regulatory tool. The following sections provide additional details on specific sections of the CWA.

Permits for Fill Placement in Waters and Wetlands (Section 404)

CWA Section 404 regulates the discharge of dredged and fill materials into waters of the United States, which are oceans, bays, rivers, streams, lakes, ponds, and wetlands, including any or all of the following.

- Areas within the ordinary high water mark (OHWM) of a stream, including nonperennial streams with a defined bed and bank and any stream channel that conveys natural runoff, even if it has been realigned.
- Seasonal and perennial wetlands, including coastal wetlands.

On January 9, 2001, the U.S. Supreme Court made a decision in *Solid Waste Agency of Northern Cook County v. United States Army Corps of Engineers* (SWANCC) [121 S.CT. 675, 2001] that affected the USACE's jurisdiction in isolated waters. Based on SWANCC, USACE no longer has jurisdiction or

[1] In some cases, exceptions may be made for threatened species under ESA Section 4[d]; in such cases, USFWS or NMFS issues a "4[d] rule" describing protections for the threatened species and specifying the circumstances under which take is allowed.

regulates isolated wetlands (i.e., wetlands that have no hydrologic connection with a water of the United States).

More recently, a Federal ruling on two consolidated cases (June 19, 2006; *Rapanos v. United States* and *Carabell v. U.S. Army Corps of Engineers*), referred to as the *Rapanos decision*, affects whether some waters or wetlands are considered jurisdictional under the CWA. In these cases, the U.S. Supreme Court reviewed the USACE's definition of waters of the United States and whether or not it extended out to tributaries of navigable waters (TNW) or wetlands adjacent to those tributaries. The decision provided two standards for determining jurisdiction of water bodies that are not TNWs.

1. If the non-TNW is a relatively permanent water (RPW) or is a wetland directly connected to a RPW.
2. If the water body has *significant nexus* to a TNW. The significant nexus definition is based on the purpose of the CWA ("restore and maintain the chemical, physical, and biological integrity of the Nation's waters").

Guidance issued by the EPA and USACE on the Rapanos decision requires application of these two standards and use of substantially more documentation to support a jurisdictional determination for a water body.

Applicants must obtain a permit from the USACE for all discharges of dredged or fill material into waters of the United States, including adjacent wetlands, before proceeding with a proposed activity. USACE may issue either an individual permit evaluated on a case-by-case basis or a general permit evaluated at a program level for a series of related activities. General permits are preauthorized and are issued to cover multiple instances of similar activities expected to cause only minimal adverse environmental effects. The nationwide permits are a type of general permit issued to cover particular fill activities. Each nationwide permit specifies particular conditions that must be met for the nationwide permit to apply to a particular project.

Compliance with CWA Section 404 requires compliance with several other environmental laws and regulations. USACE cannot issue an individual permit or verify the use of a general permit until the requirements of NEPA, ESA, and the National Historic Preservation Act have been met. In addition, the USACE cannot issue or verify any permit until a water quality certification or a waiver of certification has been issued pursuant to CWA Section 401.

Permits for Stormwater Discharge (Section 402)

CWA Section 402 regulates construction-related stormwater discharges to surface waters through the NPDES program, administered by EPA. In California, the State Water Board is authorized by EPA to oversee the NPDES program through the RWQCBs (see the related discussion under "Porter-Cologne Water Quality Control Act" in Section 3.2, *Water Quality and Groundwater Resources*). The biological study area is located within the jurisdiction of the Central Valley RWQCB.

NPDES permits are required for projects that disturb more than 1 acre of land. The NPDES permitting process requires the applicant to file a public notice of intent (NOI) to discharge stormwater, and to prepare and implement a SWPPP. The SWPPP includes a site map and a description of proposed construction activities. In addition, it describes the BMPs that would be implemented to prevent soil erosion and discharge of other construction-related pollutants (e.g., petroleum products, solvents, paints, cement) that could contaminate nearby water resources.

Permittees are required to conduct annual monitoring and reporting to ensure that BMPs are correctly implemented and effective in controlling the discharge of stormwater-related pollutants.

Water Quality Certification (Section 401)

Under CWA Section 401, applicants for a Federal license or permit to conduct activities that may result in the discharge of a pollutant into waters of the United States must obtain certification from the state in which the discharge would originate or, if appropriate, from the interstate water pollution control agency with jurisdiction over affected waters at the point where the discharge would originate. Therefore, all projects that have a Federal component and may affect state water quality (including projects that require Federal agency approval, such as issuance of a Section 404 permit) must also comply with CWA Section 401.

Engineer Technical Letter (ETL) 1110-2-571 10 April 2009

In 2009, USACE published new Guidelines for Landscape Planting and Vegetation Management at Levees, Floodwalls, Embankment Dams, and Appurtenant Structures for the control of vegetation on levees (ETL 1110-2-571 10 April 2009). These guidelines recommend that a vegetation-free zone be established.

The vegetation-free zone is a three-dimensional corridor surrounding all levees, floodwalls, embankment dams, and critical appurtenant structures in all flood damage reduction systems. The vegetation-free zone applies to all vegetation except perennial, non-irrigated grass. Grass species are permitted. The only grasses permitted are perennial grasses whose primary function is to reliably protect against erosion. The species selected for the project shall be appropriate to local climate, conditions, and surrounding or adjacent land uses. Preference should be given to native species.

The primary purpose of a vegetation-free zone is to provide a reliable corridor of access to, or along, levees, floodwalls, embankment dams, and appurtenant structures. This corridor must be free of obstructions to assure adequate access by personnel and equipment for surveillance, inspection, maintenance, monitoring, and flood-fighting. In the case of flood-fighting, this access corridor must also provide the unobstructed space needed for the construction of temporary flood-control structures. Access is typically by four-wheel-drive vehicle, but for some purposes, such as maintenance and flood-fighting, access is required for larger equipment, such as tractors, bulldozers, dump trucks, and helicopters. Accessibility is essential to the reliability of flood damage reduction systems.

The vegetation-free zone must be wide enough and tall enough to accommodate all likely access requirements. The minimum width of the corridor shall be the width of the levee, floodwall, or embankment dam, including all critical appurtenant structures, plus 15 feet on each side, measured from the outer edge of the outermost critical structure. In the case of a landside planting berm, the 15 feet is measured from the point at which the top surface of the planting berm meets the levee section. The minimum height of the corridor shall be 8 feet from any point on the ground.

No vegetation, other than approved grasses, may penetrate the vegetation-free zone, with two exceptions.

- Tree trunks are measured to their centerline, so one half of the tree trunk may be within the vegetation-free zone.

- Newly planted trees, whose crowns can be expected to grow, or be pruned, clear of the vegetation-free zone within 10 years may be within the vegetation-free zone (U.S. Army Corps of Engineers 2009).

State

The following state policies related to vegetation and wetlands may apply to implementation of the proposed project.

California Environmental Quality Act

CEQA is the regulatory framework by which California public agencies identify and mitigate significant environmental effects. A project normally has a significant environmental effect on biological resources if it substantially affects a rare or endangered species or the habitat of that species; substantially interferes with the movement of resident or migratory fish or wildlife; or substantially diminishes habitat for fish, wildlife, or plants. The State CEQA Guidelines define rare, threatened, and endangered species as those listed under the ESA and the California Endangered Species Act (CESA) and any other species that meet the criteria of the resource agencies or local agencies (e.g., DFG-designated species of special concern). The guidelines state that the lead agency preparing an EIR must consult with and receive written findings from DFG concerning project effects on species listed as endangered or threatened. The effects of a proposed project on these resources are important in determining whether the project has significant environmental effects under CEQA.

California Endangered Species Act

California implemented the CESA in 1984. The act prohibits the take of listed endangered and threatened species. Section 2090 of CESA requires state agencies to comply with endangered species protection and recovery and to promote conservation of these species. DFG administers the act and authorizes take through Section 2081 agreements (except for species designated as fully protected).

California Native Plant Protection Act

The California Native Plant Protection Act of 1977 (CNPPA) prohibits importation of rare and endangered plants into California, take of rare and endangered plants, and sale of rare and endangered plants. The CESA defers to the CNPPA, which ensures that state-listed plant species are protected when state agencies are involved in projects subject to CEQA. In this case, plants listed as rare under the CNPPA are not protected under CESA but rather under CEQA.

California Fish and Game Code (Section 1602)

Section 1602 of the California Fish and Game Code requires project proponents to notify DFG before implementing any project that would divert, obstruct, or change the natural flow, bed, channel, or bank of any river, stream, or lake. Preliminary notification and project review generally occur during the environmental process. Any project modifications proposed by DFG to address effects on biological resources (e.g., rivers, fish, wildlife) and protect those resources are formalized in a streambed alteration agreement that becomes part of the plans, specifications, and bid documents for the project.

Local

Sutter County, Butte County, City of Yuba City, City of Live Oak, City of Biggs, and City of Gridley each have adopted policies related to vegetation and wetlands; these are detailed in Appendix A.

3.8.2.2 Environmental Setting

The following considerations are relevant to vegetation and wetland conditions in the proposed project area.

Biological Study Area

The biological study area for the proposed project consists of the most expansive construction footprint for the three FRWLP alternatives plus a 100-foot-wide buffer on either side of the levee to account for indirect effects. The biological study area is located in the Sacramento Valley subregion of the California Floristic Province (Baldwin et al. 2012:43). The biological study area is bounded by residential and commercial development, agriculture, recreation areas, dredge tailings, and riparian habitat.

Field Surveys

The field surveys pertaining to vegetation and wetlands that have been conducted for the proposed project are land cover mapping, special status–wildlife habitat identification, and a reconnaissance-level biological resource assessment. On November 9, 10, and 11, 2010, Galloway Consulting biologist Trish Ladd and ICF International geographic information systems (GIS) analysts Eric Link and Matt Ewalt mapped land cover types and identified special status–wildlife habitat in the biological study area (Ladd pers. comm. 2010). In July 2011, ICF International wildlife biologist Erin Hitchcock and botanist Jessica Hughes conducted a reconnaissance-level biological resource assessment of the biological study area to field-check current land cover conditions in the biological study area and update the 2010 mapping data as needed. The 2010 and 2011 field surveys were conducted using a combination of walking and driving through the biological study area and aerial photograph interpretation. A delineation of wetlands and other waters was conducted by HDR Engineering in June, July and August of 2012 of all areas that may potentially be directly impacted by construction of the proposed Project, encompassing the footprint of the three proposed alternative construction designs. Potential borrow site locations will be surveyed in Fall/Winter 2012 and will be provided to USACE as an appendix to the October 2012 delineation report if potentially jurisdictional features are present. Arborist surveys were started by ICF in 2012 and are still in-progress. Partial survey results have been used in this draft and final survey results will be used in permit applications and the Final EIS/EIR. No protocol-level floristic surveys have been conducted for the project; however, elderberry shrub surveys of the biological study area was conducted for the project in 2011 and 2012. Section 3.9, *Wildlife*, contains detailed information regarding the survey methodology and results.

Land Cover Types

The information pertaining to land cover types in the biological study area was derived primarily from the collaborative mapping done in November 2010 by ICF International GIS staff and Galloway Consulting and updated as needed based on the results of the 2011 reconnaissance-level biological assessment conducted by ICF International biologists. The reconnaissance-level mapping of areas of open water was honed during a delineation of potential wetlands and other waters of the United States conducted by HDR Engineering in the summer of 2012.

Land cover types in the biological study area are depicted in Plate 3.8-1 and fall into categories: wildlands, open water, agricultural lands, and developed/disturbed areas. The approximate acreages of the land cover types in the biological study area are listed in Table 3.8-1, and a description of each type is provided below.

Table 3.8-1. Acreages of Land Cover Types in the Biological Study Area

Land Cover Type	Acreage
Wildlands	
Riparian forest	241.23
Riparian scrub-shrub	21.45
Oak woodland	0.35
Open water	59.32
Agricultural lands	
Orchards	1,212.89
Field and row crops	147.65
Developed/disturbed areas	
Developed	404.68
Ruderal	903.24

Wildlands

Riparian Forest

Riparian forest occurs along the Feather River and its tributaries and forms a fringe around ponds. Riparian forests support an overstory dominated by mature native and nonnative trees. The dominant overstory species are valley oak (*Quercus lobata*), Fremont cottonwood (*Populus fremontii* ssp. *fremontii*), or Goodding's black willow (*Salix gooddingii*). Other trees commonly observed in the riparian forest are box elder (*Acer negundo* var. *californicum*), arroyo willow (*S. lasiolepis*), Oregon ash (*Fraxinus latifolia*), and western sycamore (*Platanus racemosa*). The shrub layer of most of the riparian forest in the biological study area is extremely dense, and species commonly observed are Himalayan blackberry (*Rubus armeniacus*), poison oak (*Toxicodendron diversilobum*), button bush (*Cephalanthus occidentalis*), wild rose (*Rosa* spp.) and blue elderberry (*Sambucus nigra* ssp. *caerulea*). Blue elderberry is the host plant for the valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), federally listed as threatened. Many of the trees and shrubs in the riparian forest are covered in California grape (*Vitis californica*). The herbaceous understory of riparian forest contains a mixture of native and introduced species. Representative species observed were horsetails (*Equisetum* spp.), mugwort (*Artemisia douglasiania*), and curly dock (*Rumex crispus*). Several patches of the invasive giant reed (*Arundo donax*) occur along the edges of riparian areas. Some areas of riparian forest are considered wetlands and are discussed below under *Open Water*.

Riparian Scrub-Shrub

Riparian scrub-shrub in the biological study area consists of areas that are dominated by shrubs such as willows (*Salix* spp.), blue elderberry, coyote brush (*Baccharis pilularis*), Himalayan blackberry, and button bush. The herbaceous understory of this land cover type is comparable to riparian forest.

Oak Woodland

Two small patches of oak woodland are located south of Almond Avenue and Laurel Avenue in the biological study area. The oak woodlands are dominated by valley oak and have an understory that contains annual grasses mixed with native and nonnative forbs. Representative understory species are wild oat (*Avena* spp.), soft chess (*Bromus hordeaceus*), ripgut brome (*B. diandrus*), field hedge parsley (*Torilis arvensis*), and the invasive yellow starthistle (*Centaurea solstitialis*).

Open Water

For the purposes of this EIS/EIR, the open-water land cover type includes both agricultural and natural water bodies: irrigation ditches, open water, seasonal wetlands, riparian forest wetlands, streams, and tailing ponds. These water bodies were identified during a delineation of potential wetlands and other waters of the United States that was conducted by HDR Engineering in summer 2012 (see *Potential Wetlands and Other Waters of the United States,* below). Potential borrow site locations will be surveyed in Fall/Winter 2012 and will be provided to USACE as an appendix to the October 2012 delineation report if potentially jurisdictional features are present. The approximate acreage of each water body category within this land cover type is provided in Table 3.8-2.

Table 3.8-2. Approximate Acreages of Potential Jurisdictional Wetlands and Waters of the United States in the Biological Study Area*

Potential Jurisdictional Wetlands	Acres	Potential Jurisdictional Other Waters	Acres
Seasonal wetlands	20.27		
		Open water	11.96
Riparian forest	12.10	Irrigation ditch	0.19
Tailings ponds	14.66	Streams/Rivers	0.14

*Some jurisdictional feature classifications and acreage may overlap land cover type classifications. This table may be modified after the delineation of the borrow sites has been completed if potentially jurisdictional features are present.

Agricultural Lands

Most of the biological study area consists of agricultural lands (i.e., orchards and field and row crops).

Orchards

Orchards are the dominant land cover type and occur throughout the biological study area. The majority of the orchards are walnuts, plums, or peaches that are actively maintained (e.g., irrigated, pruned). The age of the orchards ranges from small, immature trees in protective sheaths to mature, established trees. The density of herbaceous vegetation in the areas between tree rows is highly variable and depends on the type and frequency of maintenance (e.g., mowing, herbicide application). Where present, the herbaceous vegetation is dominated by nonnative, weedy species.

Field and Row Crops

Most of the field and row crops are located in the southern portion of the biological study area (south of Barry Road). Field and row crops include both active and fallow fields that exhibit indicators of tillage. Common field and row crops in the biological study area are sweet corn, alfalfa, wheat, and tomatoes. Active field and row crops are maintained with irrigation and herbicide application. Alfalfa hay is harvested several times during the growing season. The margins of field and row crops typically support weed species.

Developed/Disturbed Areas

Developed

Developed areas in the biological study area consist of urban areas (residential and commercial development), ranchettes, rural neighborhoods, agricultural outbuildings, farm equipment storage areas, pumping stations, and a plant nursery.

Ruderal

Most of the areas mapped as ruderal occur as swaths on both sides of the centerline of the levee where the native soil has been substantially altered. The largest ruderal areas are located between Vance Avenue and the north terminus of the biological study area. Ruderal areas reflect past and ongoing disturbance associated with agriculture, levee construction and maintenance, and excavation (e.g., dredge tailings). Scattered trees observed in ruderal areas are typically valley oak, Fremont cottonwood, and Goodding's black willow. Shrubs are scattered in ruderal areas, and species commonly observed are coyote brush, invasive tree tobacco (*Nicotiana glauca*), and Himalayan blackberry. Blue elderberry shrubs are also present in ruderal areas. The herbaceous layer of ruderal areas is dominated by annual grasses such as wild oat, soft chess, ripgut brome, and foxtail barley (*Hordeum murinum* ssp. *leporinum*). Numerous nonnative forbs such as yellow starthistle, prickly lettuce (*Lactuca serriola*), field hedge parsley, mustard (*Brassica* spp.), and rose clover (*Trifolium hirtum*) occur throughout ruderal areas. Native forbs observed in ruderal areas are Spanish lotus (*Lotus purshianus*), California poppy (*Eschscholzia californica*), annual fireweed (*Epilobium brachycarpum*), and western verbena (*Verbena lasiostachys*).

Sensitive Natural Communities

Sensitive natural communities are designated as such because of their high level of species diversity, high productivity, unusual nature, limited distribution, or declining status. Local, state, and Federal agencies consider these habitats important. The CNDDB maintains a current list of rare, natural communities throughout the state. Three sensitive natural communities recognized by the CNDDB have been reported in the 7.5-minute USGS quadrangles that overlap the biological study area: Great Valley cottonwood riparian forest, Great Valley mixed riparian forest, and northern hardpan vernal pool (California Department of Fish and Game 2012). The riparian forest in the biological study area could be considered either of these mapped CNDDB community types; therefore, it is a sensitive natural community. No vernal pools were observed in the biological study area during the 2010 and 2011 field surveys.

Potential Wetlands and Other Waters of the United States

The biological study area contains approximately 59.32 acres of features that are potential wetlands and other (non-wetland) waters of the United States. According to the Federal Register (FR), wetlands are defined as “those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions” (33 CFR §328.3[b]). In order for an area to be considered a wetland, it must exhibit positive indicators of all three Federal wetland criteria (hydrophytic vegetation, hydric soils, and wetland hydrology). For other water features such as rivers, streams, and ditches, the extent of potential USACE jurisdiction is determined by identification of the OHWM, which is defined as “that line on shore established by the fluctuations of water and indicated by physical character of the soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas” (33 CFR §328.3[e]). A preliminary delineation of wetlands and other waters was conducted during summer 2012. The types and acreages of the potential wetlands and other waters in the biological study area (pending verification by the USACE Sacramento District) are listed in Table 3.8-2.

Special-Status Plant Species

Special-status plant species are plants that are legally protected under CESA, ESA, or other regulations, and species considered sufficiently rare by the scientific community to qualify for such listing. For the purposes of this document, special-status plant species fall into the following categories.

- Species listed or proposed for listing as threatened or endangered under ESA (CFR, Title 50, Section 17.12 [listed plants] and various notices in the FR (proposed species).
- Species that are candidates for possible future listing as threatened or endangered under the ESA (76 FR 66370, October 26, 2011).
- Species listed or proposed for listing by the State of California as threatened or endangered under the CESA (CCR, Title 14, Section 670.5).
- Species that meet the definitions of rare or endangered under CEQA (State CEQA Guidelines Section 15380).
- Plants listed as rare under the CNPPA (California Fish and Game Code Section 1900 et seq.).
- Plants considered by DFG and CNPS to be “rare, threatened, or endangered in California” (Rare Plant Ranks 1B and 2; California Department of Fish and Game 2010; California Native Plant Society 2012).
- Plants identified by DFG and CNPS about which more information is needed to determine their status, and plants of limited distribution (Rare Plant Ranks 3 and 4, California Department of Fish and Game 2010; California Native Plant Society 2012), which may be included as special-status species on the basis of local significance or recent biological information.

Nine special-status plant species have been reported in the seven USGS quadrangles that overlap the biological study area (California Department of Fish and Game 2010; California Native Plant Society 2012; California Department of Fish and Game 2012; U.S. Fish and Wildlife Service 2012). Table 3.8-3 lists the scientific name, common name, status, distribution, habitat requirements, and known/potential presence in the biological study area. Two species, slender Orcutt grass (*Orcuttia tenuis*) and Greene’s tuctoria (*Tuctoria greenei*) are vernal pool species that lack potential habitat in the biological study area. No vernal pools were observed in the biological study area during the 2010 and 2011 field surveys.

Table 3.8-3. Special-Status Plants Identified during Prefield Investigation as Having Potential to Occur in the Biological Study Area

Common and Scientific Name	Legal Status[a] Federal/State/ Rare Plant Rank	Geographic Distribution/Floristic Province	Habitat Requirements	Reported Blooming Period	Potential for Occurrence in Biological Study Area
Ferris's milk-vetch *Astragalus tener* var. *ferrisiae*	–/–/1B.1	Historical range included the Central Valley from Butte County to Alameda County but currently occurs only in Butte, Glenn, Colusa, and Yolo Counties	Seasonally wet areas in meadows and seeps, subalkaline flats in valley and foothill grassland; 2–75 meters	Apr–May	Low potential to occur in ruderal areas outside the toe of the levee, but habitat conditions of poor quality and suitable microhabitat may not be present.
Recurved larkspur *Delphinium recurvatum*	–/–/1B.2	Central Valley from Colusa* to Kern Counties	Alkaline soils in valley and foothill grassland, saltbush scrub, cismontane woodland; 3–750 meters	Mar–Jun	Low potential to occur in oak woodland and ruderal areas outside the toe of the levee, but habitat conditions of poor quality and suitable microhabitat may not be present.
Ahart's dwarf rush *Juncus leiospermus* var. *ahartii*	–/–/1B.2	Eastern Sacramento Valley, northeastern San Joaquin Valley with occurrences in Butte, Calaveras, Placer, Sacramento, and Yuba Counties	Mesic areas in valley and foothill grassland, vernal pool margins; 30–229 meters	Mar–May	Low potential to occur in ruderal areas outside the toe of the levee, but habitat conditions of poor quality and suitable microhabitat may not be present.
Veiny monardella *Monardella douglasii* ssp. *venosa*	–/–/1B.1	Occurrences in the northern and central Sierra Nevada foothills; also historically known from the Sacramento Valley	Heavy clay soils in cismontane woodland, valley and foothill grassland; 60–410 meters	May–Jul	Low potential to occur in oak woodland and ruderal areas outside the toe of the levee, but habitat conditions of poor quality and suitable microhabitat may not be present.
Baker's navarretia *Navarretia leucocephala* ssp. *bakeri*	–/–/1B.1	Inner North Coast Ranges, western Sacramento Valley	Mesic areas in cismontane woodland, lower montane coniferous forest, meadows and seeps, valley and foothill grassland, vernal pools; 5–1,740 meters	Apr–Jul	Low potential to occur in oak woodland and ruderal areas outside the toe of the levee, but habitat conditions of poor quality and suitable microhabitat may not be present.

Common and Scientific Name	Legal Status[a] Federal/State/ Rare Plant Rank	Geographic Distribution/Floristic Province	Habitat Requirements	Reported Blooming Period	Potential for Occurrence in Biological Study Area
Slender Orcutt grass *Orcuttia tenuis*	T/E/1B.1	Sierra Nevada and Cascade Range foothills from Siskiyou to Sacramento Counties	Vernal pools; 35–1,760 meters	May–Sep	No potential habitat in the biological study area.
Hartweg's golden sunburst *Pseudobahia bahiifolia*	E/E/1B.1	Central Sierra Nevada foothills, eastern San Joaquin Valley	Clay soils in cismontane woodland, valley and foothill grassland; 15–150 meters	Mar–Apr	Low potential to occur in ruderal areas outside the toe of the levee, but habitat conditions of poor quality and suitable microhabitat may not be present.
Sanford's arrowhead *Sagittaria sanfordii*	–/–/1B.2	Scattered locations in Central Valley and Coast Ranges from Del Norte to Fresno Counties	Freshwater marshes, sloughs, canals, and other slow-moving water habitats; below 2,132 feet	May–Oct	Low potential to occur in ponds, inundated floodplain, and irrigation canals.
Greene's tuctoria *Tuctoria greenei*	E/R/1B.1	Scattered distribution along eastern Central Valley and foothills from Shasta to Tulare Counties	Dry vernal pools; 30–1,070 meters	May–Jul (uncommonly Sep)	No potential habitat in the biological study area.

[a] Status explanations:

Federal
E = listed as endangered under the Federal Endangered Species Act.
T = listed as threatened under the Federal Endangered Species Act.
– = no listing.

State
E = listed as endangered under the California Endangered Species Act.
– = no listing.

California Rare Plant Rank[2]
1B = List 1B species: rare, threatened, or endangered in California and elsewhere.
0.1 = seriously endangered in California.
0.2 = fairly endangered in California.
* = presumed extirpated from that County.

[b] Floristic provinces as defined in Baldwin et al. 2012.

[2] In March, 2010, DFG changed the name of "CNPS List" or "CNPS Ranks" to "California Rare Plant Rank" (or CRPR). This was done to reduce confusion over the fact that CNPS and DFG jointly manage the Rare Plant Status Review groups (300+ botanical experts from government, academia, nongovernmental organizations, and the private sector) and that the rank assignments are the product of a collaborative effort and not solely a CNPS assignment.

Six species were determined to have low potential for occurrence because the potential habitat (i.e., oak woodland, ruderal areas outside the toe of the levee) constitutes a relatively small portion of the biological study area and has been lowered in quality by past and ongoing disturbance (agricultural activities, dredging). Additionally, suitable microhabitat requirements (subalkaline flats, heavy clay soils, acidic clay soils) for these species may not be met. Sanford's arrowhead was determined to have low potential to occur along the edges of irrigation canals, inundated areas of the river's floodplain within riparian forest, and ponds on the land side of the levee that support a fringe of riparian forest.

3.8.3 Environmental Consequences

This section describes the environmental consequences relating to vegetation and wetlands for the proposed project. It describes the methods used to determine the effects of the action and lists the thresholds used to conclude whether an effect would be significant. The effects that would result from implementation of the action, findings with or without mitigation, and applicable mitigation measures are presented in a table under each alternative.

3.8.3.1 Assessment Methods

This evaluation of vegetation and wetlands is based on professional standards and information cited throughout the section. The key effects were identified and evaluated based on the environmental characteristics of the project area and the magnitude, intensity, and duration of activities related to the construction and operation of this project.

3.8.3.2 Determination of Effects

For this analysis, an effect pertaining to vegetation and wetlands was analyzed under NEPA and CEQA if it would result in any of the following environmental effects, which are based on NEPA standards, State CEQA Guidelines Appendix G (14 CCR 15000 et seq.), and standards of professional practice.

- A substantial adverse effect, either directly or through habitat modification, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations or by DFG, NMFS, or USFWS.
- A substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations or by DFG or USFWS.
- A substantial adverse effect on federally protected wetlands as defined by CWA Section 404 (including, but not limited to, marshes and vernal pools) through direct removal, filling, hydrological interruption, or other means.
- A conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.
- A conflict with the provisions of an adopted habitat conservation plan, natural communities conservation plan, or other approved local, regional, or state habitat conservation plan.

Effect Assumptions

The following assumptions were made regarding project effects on vegetation and wetlands in the biological study area.

- All project construction activities, including equipment staging and access, would take place only within the biological study area.
- As discussed in Chapters 1 and 2, the project is not intended to provide complete compliance with USACE's levee vegetation policy. Only that vegetation within the direct construction footprint would be removed by the project. While not proposed for removal by the FRWLP, vegetation would still be subject to USACE levee vegetation policy and may be removed as described under the No Action Alternative.
- There would be effects related to the routine operation or maintenance activities under the proposed project.
- All jurisdictional and riparian features would be avoided during borrow activities in Reach 36 through the northern extent of the project footprint.
- Discharge of fill into waters of the United States associated with the project would require a CWA Section 404 permit from the USACE Sacramento District, and CWA Section 401 certification from the Central Valley RWQCB, and may require a Rivers and Harbors Act Section 10 permit,. Before construction begins, SBFCA would obtain all necessary permits pertaining to affected waters of the United States. The permitting process would also require compensation for construction-, operation-, and maintenance-related effects.
- Grading would require a CWA Section 402 permit and preparation of a SWPPP.
- Grading or other construction activities within the bed, bank, or channel of the Feather River or its tributaries would require a streambed alteration agreement from DFG.
- Loss of agricultural and annual grassland vegetation would not be considered an adverse effect from a botanical standpoint because these habitats are common and not considered sensitive community types. They also are reestablished more easily after disturbance than riparian or wetland communities. The loss of agricultural and annual grassland habitats could be adverse for wildlife, however, and this effect is discussed in Section 3.9, *Wildlife*. Similarly, any adverse effects from these losses could affect farm lands, and are discussed in Section 3.11, *Agriculture, Land Use, and Socioeconomics*.

Effect Mechanisms

Vegetation and wetland resources could be directly and indirectly affected by the proposed project. The following types of activities could cause varying degrees of effects on these resources.

- Some degree of vegetation removal in levee measures at the onset of construction (clearing and grubbing).
- Grading and fill placement during construction of levee alternatives.
- Temporary stockpiling and sidecasting of soil, construction materials, and other construction wastes.
- Soil compaction, dust, and water runoff from the construction site into adjacent areas.

- Introduction or spread of invasive plant species into adjacent open space areas.
- Runoff of herbicides, fertilizers, diesel fuel, gasoline, oil, raw concrete, or other toxic materials used for levee alternatives, operations, and maintenance into sensitive biological resource areas (e.g., riparian habitat).

3.8.4 Effects and Mitigation Measures

Effects and mitigation measure requirements concerning vegetation and wetlands are summarized in Table 3.8-4.

Table 3.8-4. Summary of Effects for Vegetation and Wetlands

Effect	Finding	Mitigation Measure	With Mitigation
Alternatives 1, 2, and 3			
Effect VEG-1: Disturbance or Removal of Riparian Trees	Significant	VEG-MM-1: Compensate for the Loss of Woody Riparian Trees VEG-MM-2: Install Exclusion Fencing and/or K-rails along the Perimeter of the Construction Work Area and Implement General Measures to Avoid Effects on Sensitive Natural Communities and Special-Status Species VEG-MM-3: Conduct Mandatory Contractor/Worker Awareness Training for Construction Personnel VEG-MM-4: Retain a Biological Monitor	Significant and unavoidable (short term) and less than significant (long term after establishment of compensatory vegetation)
Effect VEG-2: Loss of Wetlands and Other Waters of the United States as a Result of Project Construction	Significant	VEG-MM-2: Install Exclusion Fencing and/or K-rails along the Perimeter of the Construction Work Area and Implement General Measures to Avoid Effects on Sensitive Natural Communities and Special-Status Species VEG-MM-3: Conduct Mandatory Contractor/Worker Awareness Training for Construction Personnel VEG-MM-4: Retain a Biological Monitor VEG-MM-5: Compensate for the Loss of Wetlands and Other Waters	Less than significant
Effect VEG-3: Disturbance or Removal of Protected Trees as a Result of Project Construction	Significant	VEG-MM-2: Install Exclusion Fencing and/or K-rails along the Perimeter of the Construction Work Area and Implement General Measures to Avoid Effects on Sensitive Natural Communities and Special-Status Species VEG-MM-3: Conduct Mandatory Contractor/Worker Awareness Training for Construction Personnel VEG-MM-4: Retain a Biological Monitor VEG-MM-6: Conduct a Tree Survey VEG-MM-7: Compensate for Loss of Protected Trees	Less than significant

Effect	Finding	Mitigation Measure	With Mitigation
Effect VEG-4: Potential Loss of Special-Status Plant Populations Caused by Habitat Loss Resulting from Project Construction	Significant	VEG-MM-2: Install Exclusion Fencing and/or K-rails along the Perimeter of the Construction Work Area and Implement General Measures to Avoid Effects on Sensitive Natural Communities and Special-Status Species VEG-MM-3: Conduct Mandatory Contractor/Worker Awareness Training for Construction Personnel VEG-MM-4: Retain a Biological Monitor VEG-MM-8: Retain Qualified Botanists to Conduct Floristic Surveys for Special-Status Plants during Appropriate Identification Periods VEG-MM-9: Avoid or Compensate for Substantial Effects on Special-Status Plants	Significant and unavoidable
Effect VEG-5: Introduction or Spread of Invasive Plants as a Result of Project Construction	Less than significant	None required	Less than significant
Effect VEG-6: Conflict with Provisions of an Adopted HCP/NCCP or Other Approved Local, Regional, or State Habitat Conservation Plan	No effect	None required	No effect

3.8.4.1 No Action Alternative

The No Action Alternative represents the continuation of the existing deficiencies in levees along 41 miles of the west bank of the Feather River between the Sutter Bypass and Thermalito Afterbay. No levee improvements would be made to increase the level of protection. No construction-related effects on vegetation or wetlands would occur.

Because no levee improvements would be made under the No Action Alternative, the risk that the Feather River Levee could fail because of seepage or slope stability/geometry issues would continue. These effects could include significant loss of vegetation and habitat quality due to both the hydraulic forces of the flood itself and the clean-up efforts. However, given the uncertainty of the occurrence or magnitude of such an event, potential effects on vegetation and waters of the United States cannot be fully quantified based on available information.

Effect VEG-1: Disturbance or Removal of Riparian Trees

As presented in Chapter 2, implementation of the USACE levee vegetation policy under no action is characterized by two possible scenarios.

- Full application of the ETL, meaning prohibition and removal of woody vegetation within the levee prism or within 15 feet of the landside or waterside levee toes.
- Modified application of the ETL, assuming the continued existence into the future of the vegetation conditions at the time of the analysis. This may include future application of a variance (not as part of the FRWLP) or application of the CVFPP concepts for management of woody vegetation, meaning trimming and thinning to allow visibility and accessibility, selective

retention and removal based on engineering inspection and evaluation, and LCM. A SWIF may also be a component of future compliance.

There are approximately 7,600 trees total in the biological study area, including riparian trees, orchards, and nonnative or ornamental trees. Under the full ETL, the only plant species permitted in the vegetation-free zone would be nonirrigated perennial grasses, with preference given to native species that are appropriate to local climate, conditions, and surrounding or adjacent land uses.

Under the full ETL application scenario, the number of trees that would need to be removed for full compliance is approximately 2,000. Permanent loss of woody vegetation to comply with USACE levee vegetation policy would result in significant effects on riparian habitat. These effects are considered significant and unavoidable in the short term, although it is assumed compensation vegetation would be required and the long-term effect would be less than significant after establishment of compensatory vegetation.

Under the modified ETL application scenario, the number of trees that would be removed to comply with a variance or levee inspection criteria is unknown, but would be expected to be relatively low. However, over time, much of the woody vegetation may be lost due to the natural life-cycle of each tree if not replaced, but substantial loss would not be expected to occur within 50 years or considerably longer in the case of long-lived riparian trees such as oaks and cottonwoods. Therefore, these effects are considered less than significant.

3.8.4.2 Alternative 1

Implementation of Alternative 1 would potentially result in effects on vegetation and wetlands. These potential effects and related mitigation measure requirements are summarized in Table 3.8-5 and discussed below. The acreage of habitat loss under each alternative is provided in Table 3.8-6.

Table 3.8-5. Vegetation and Wetlands Effects and Mitigation Measures for Alternative 1

Effect	Finding	Mitigation Measure	With Mitigation
Effect VEG-1: Disturbance or Removal of Riparian Trees	Significant	VEG-MM-1: Compensate for the Loss of Woody Riparian Trees VEG-MM-2: Install Exclusion Fencing and/or K-rails along the Perimeter of the Construction Work Area and Implement General Measures to Avoid Effects on Sensitive Natural Communities and Special-Status Species VEG-MM-3: Conduct Mandatory Contractor/Worker Awareness Training for Construction Personnel VEG-MM-4: Retain a Biological Monitor	Significant and unavoidable (short term) Less than significant (long term after establishment of compensatory vegetation)

Effect	Finding	Mitigation Measure	With Mitigation
Effect VEG-2: Loss of Wetlands and Other Waters of the United States as a Result of Project Construction	Significant	VEG-MM-2: Install Exclusion Fencing and/or K-rails along the Perimeter of the Construction Work Area and Implement General Measures to Avoid Effects on Sensitive Natural Communities and Special-Status Species VEG-MM-3: Conduct Mandatory Contractor/Worker Awareness Training for Construction Personnel VEG-MM-4: Retain a Biological Monitor VEG-MM-5: Compensate for the Loss of Wetlands and Other Waters	Less than significant
Effect VEG-3: Disturbance or Removal of Protected Trees as a Result of Project Construction	Significant	VEG-MM-2: Install Exclusion Fencing and/or K-rails along the Perimeter of the Construction Work Area and Implement General Measures to Avoid Effects on Sensitive Natural Communities and Special-Status Species VEG-MM-3: Conduct Mandatory Contractor/Worker Awareness Training for Construction Personnel VEG-MM-4: Retain a Biological Monitor VEG-MM-6: Conduct a Tree Survey VEG-MM-7: Compensate for Loss of Protected Trees	Less than significant
Effect VEG-4: Potential Loss of Special-Status Plant Populations Caused by Habitat Loss Resulting from Project Construction	Significant	VEG-MM-2 Install Exclusion Fencing and/or K-rails along the Perimeter of the Construction Work Area and Implement General Measures to Avoid Effects on Sensitive Natural Communities and Special-Status Species VEG-MM-3: Conduct Mandatory Contractor/Worker Awareness Training for Construction Personnel VEG-MM-4: Retain a Biological Monitor VEG-MM-8: Retain Qualified Botanists to Conduct Floristic Surveys for Special-Status Plants during Appropriate Identification Periods VEG-MM-9: Avoid or Compensate for Substantial Effects on Special-Status Plants	Significant and unavoidable
Effect VEG-5: Introduction or Spread of Invasive Plants as a Result of Project Construction	Less than significant	None required	Less than significant
Effect VEG-6: Conflict with Provisions of an Adopted HCP/NCCP or Other Approved Local, Regional, or State Habitat Conservation Plan	No effect	None required	No effect

Table 3.8-6. Effects on Land Cover Types by Project Alternative*

Land Cover Types	Alternative 1 (acres)	Alternative 2 (acres)	Alternative 3 (acres)
Wildlands			
Riparian forest	18.17	25.87	20.63
Riparian scrub-shrub	.63	1.08	1.09
Oak woodland	0.00	.03	NA
Subtotal	18.80	26.98	21.72
Open-Water Categories			
Irrigation ditch	NA	NA	NA
Open water	24.36	28.72	9.02
Seasonal wetlands	NA	NA	NA
Riparian forest wetland	NA	NA	NA
Stream	NA	NA	NA
Tailing ponds	NA	NA	NA
Subtotal	24.36	28.72	9.02
Agricultural Lands			
Orchards	224.01	663.92	101.11
Field and row crops	17.42	92.61	2.95
Subtotal	241.43	756.53	104.06
Developed/Disturbed Areas			
Developed	222.15	257.46	188.11
Ruderal	522.82	548.42	498.45
Subtotal	744.97	805.88	686.56
Total	1029.56	1618.11	821.36

*These totals do not include borrow site acreages.

Effect VEG-1: Disturbance or Removal of Riparian Trees

Under Alternative 1, riparian trees on the levees would be removed for construction of the proposed cutoff wall and seepage berms.

Construction of Alternative 1 would remove a total of approximately 13.03 acres of riparian forest and 0.33 acre of riparian scrub-shrub (Table 3.8-6). Loss of riparian habitats on the existing levee would be permanent because riparian restoration would not be permitted on the levees or seepage berms to comply with the USACE levee vegetation policy. The policy requires that the crown, slopes, and areas within 15 feet of the waterside and landside levee toes remain free of all woody vegetation. While not proposed for removal by the FRWLP, vegetation would still be subject to USACE levee vegetation policy and may be removed as described under the No Action Alternative.

Riparian communities, including cottonwood riparian woodland and valley oak riparian woodland, are considered sensitive natural communities by the CNDDB (California Department of Fish and Game 2012). These woodlands would be regulated by DFG and USFWS (46 FR 7644) under no-net-loss policies for existing riparian habitat values.

Because the loss of riparian habitat as a result of the proposed project would be substantial, the disturbance and removal of riparian habitat would be considered a significant effect. Implementation of Mitigation Measures VEG-MM-1, VEG-MM-2, VEG-MM-3, and VEG-MM-4 would reduce this effect. Because of the length of time required for newly planted trees to reach mature size, this effect would be significant and unavoidable in the short term and less than significant in the long term after establishment of compensatory vegetation.

Mitigation Measure VEG-MM-1: Compensate for the Loss of Woody Riparian Trees

For direct effects on woody riparian trees that cannot be avoided, SBFCA will compensate for the loss of riparian habitat to ensure no net loss of habitat functions and values. Compensation ratios will be based on site-specific information and determined through coordination with the appropriate state and Federal agencies during the permitting process. Compensation will be provided based on the ratio determined (e.g., 2:1 = 2 acres restored/created/enhanced or credits purchased for every 1 acre removed). Compensation may be a combination of offsite restoration or mitigation credits. SBFCA will develop a restoration and monitoring plan that describes how riparian habitat will be enhanced or recreated and monitored over a minimum period of time, as determined by the appropriate state and Federal agencies.

If SBFCA identifies onsite areas (adjacent to the levees) that are outside the USACE vegetation-free zone and chooses to compensate onsite or in the project vicinity, a revegetation plan will be prepared. The revegetation plan will be developed prior to the removal of existing riparian vegetation and will be conducted onsite or in the project vicinity to the extent feasible; however, mitigation site selection will avoid areas where future levee alternatives or maintenance is likely. The revegetation plan will be prepared by a qualified restoration ecologist and reviewed by the appropriate agencies. The revegetation plan will specify the planting stock appropriate for each riparian land cover type and each mitigation site, ensuring the use of genetic stock from the project area. The plan will employ the most successful techniques available at the time of planting. Success criteria will be established as part of the plan and will include a minimum of 80% revegetation success at the end of 5 years, 70% revegetation success after 3 years, and 75% vegetative coverage after 5 years.

SBFCA will monitor and maintain the plantings as necessary for 5 years, including weed removal, irrigation, and plant protection. SBFCA will submit annual monitoring reports of survival to the regulatory agencies issuing permits related to habitat effects, including DFG, USACE, NMFS, and USFWS. Replanting will be necessary if success criteria are not met, and replacement plants subsequently will be monitored and maintained to meet the success criteria. The riparian habitat mitigation will be considered successful when the sapling trees established meet the success criteria, the habitat no longer requires active management, and vegetation is arranged in groups that, when mature, replicate the area, natural structure, and species composition of similar riparian habitats in the region.

Mitigation Measure VEG-MM-2: Install Exclusion Fencing and/or K-rails along the Perimeter of the Construction Work Area and Implement General Measures to Avoid Effects on Sensitive Natural Communities and Special-Status Species

To clearly demarcate the project boundary and prevent special-status species from moving through the project area, SBFCA or its contractors will install temporary exclusion fencing along the project boundaries (including access roads, staging areas, etc.) 1 week prior to the start of construction activities. SBFCA will ensure that the temporary fencing is continuously maintained until all construction activities are completed and that construction equipment is confined to the designated work areas, including any offsite mitigation areas and access thereto. The fence will be made of suitable material that will not allow any of the special-status animals with potential to occur in the project area to pass through or over, and the bottom will be buried to a depth of at least 4 inches such that these species cannot crawl under the fence.

A USFWS- and a DFG-approved biological monitor will be on site during installation of the fencing to survey and relocate animals outside the work area boundaries. Federally and state-listed species will be relocated only if authorized by the USFWS and DFG. The exclusion fencing will be removed only after construction of the project phase is completed.

Exclusionary construction fencing and explanatory signage will be placed around the perimeter of sensitive vegetation communities that could be affected by construction activities throughout the period during which such effects occur. Signage will explain the nature of the sensitive resource and warn that no effect on the community is allowed. The fencing will include a buffer zone of at least 20 feet between the resource and construction activities. All exclusionary fencing will be maintained in good condition throughout the construction period.

Mitigation Measure VEG-MM-3: Conduct Mandatory Contractor/Worker Awareness Training for Construction Personnel

Before any work occurs in the biological study area, including grading, a qualified biologist will conduct mandatory contractor/worker awareness training for construction personnel. The awareness training will be provided to all construction personnel to brief them on the need to avoid effects on sensitive biological resources (e.g., riparian habitat, special-status species, special-status wildlife habitat) and the penalties for not complying with permit requirements. The biologist will inform all construction personnel about the life history of special-status species with potential for occurrence onsite, the importance of maintaining habitat, and the terms and conditions of the BO or other authorizing document. Proof of this instruction will be submitted to USFWS, DFG, or other overseeing agency, as appropriate.

The training also will cover the restrictions and guidelines that must be followed by all construction personnel to reduce or avoid effects on special-status species during project construction. The crew foreman will be responsible for ensuring that crew members adhere to the guidelines and restrictions. Educational training will be conducted for new personnel as they are brought on the job during the construction period. General restrictions and guidelines for vegetation (and wildlife) that must be followed by construction personnel are listed below.

- Project-related vehicles will observe the posted speed limit on hard-surfaced roads and a 10-mile-per-hour speed limit on unpaved roads during travel in the project site.
- Project-related vehicles and construction equipment will restrict offroad travel to the designated construction area.
- All food-related trash will be disposed of in closed containers and removed from the biological study area at least once a week during the construction period. Construction personnel will not feed or otherwise attract fish or wildlife to the project site.
- No pets or firearms will be allowed on the project site.

- To prevent possible resource damage from hazardous materials such as motor oil or gasoline, construction personnel will not service vehicles or construction equipment outside designated staging areas.

Any worker who inadvertently injures or kills a special-status wildlife species (discussed in Section 3.9, *Wildlife*) or finds one dead, injured, or entrapped will immediately report the incident to the biological monitor. The monitor will immediately notify SBFCA, who will provide verbal notification to the USFWS Endangered Species Office and/or the local DFG warden or biologist within 3 working days. SBFCA will follow up with written notification to USFWS or DFG within 5 working days.

Mitigation Measure VEG-MM-4: Retain a Biological Monitor

SBFCA or its contractors will retain qualified biologists to monitor construction activities adjacent to sensitive biological resources (e.g., special-status species, riparian habitat, wetlands, elderberry shrubs). The biologists will assist the construction crew, as needed, to comply with all project implementation restrictions and guidelines. In addition, the biologists will be responsible for ensuring that SBFCA or its contractors maintain the construction barrier fencing adjacent to sensitive biological resources.

Effect VEG-2: Loss of Wetlands and Other Waters of the United States as a Result of Project Construction

Construction of Alternative 1 would result in the fill of features that may be waters of the United States, including irrigation ditches, open water, and seasonal wetlands. Placement of fill would occur in jurisdictional features that are within the footprint of the cutoff wall and seepage berms.

Construction of Alternative 1 would result in the loss of 0.01 acre of irrigation ditch, 0.07 acre of open water, and 0.01 acre of seasonal wetlands (Table 3.8-6). This extent of effect is pending completion and verification of a delineation of waters of the United States and waters of the state in the project area.

Waters of the United States are regulated by USACE and waters of the state in California are regulated by the RWQCB. Wetlands are considered sensitive communities. The project would have a substantial adverse effect on federally protected wetlands and other waters of the United States through direct removal, filling, and hydrologic interruption; therefore, this effect would be considered significant. Implementation of the environmental commitment to develop a SWPPP (Section 2.4.12, *Stormwater Pollution Prevention Plan*, of Chapter 2, *Alternatives*) and Mitigation Measures VEG-MM-2, VEG-MM-3, VEG-MM-4, and VEG-MM-5 would reduce this effect to a less-than-significant level.

Mitigation Measure VEG-MM-5: Compensate for the Loss of Wetlands and Other Waters

Compensation for the loss of wetlands will include restoring or enhancing in-kind wetland habitat and open-water habitat at a mitigation ratio that will be developed in coordination with regulatory agencies to ensure no net loss of habitat functions and values. Before the removal of existing emergent wetland vegetation or open-water habitat, SBFCA will prepare a restoration plan to compensate for the loss of wetland and open-water habitat and submit the plan to the appropriate regulatory agencies for review.

The restoration plan will be prepared by a qualified restoration ecologist. The restoration plan will specify the planting stock appropriate for each wetland land cover type and each mitigation site, ensuring the use of genetic stock from the project area. The plan will employ the most successful techniques available at the time of planting. Success criteria will be established as part of the plan. The restoration will be conducted onsite or in the vicinity to the extent feasible, but mitigation site selection will avoid areas where future maintenance would be likely.

If offsite mitigation is necessary, a location that does not currently support wetlands but is capable of supporting wetland habitats will be selected. An area that currently supports minimal habitat value would be desirable. SBFCA will implement the restoration plan, maintain plantings for a minimum of 5 years (including weed removal, irrigation, and plant protection), and conduct annual monitoring for 4 years, followed by monitoring every 2 years for the next 6 years. As feasible, existing native wetland vegetation from the affected sites will be harvested and maintained for replanting after construction.

Effect VEG-3: Disturbance or Removal of Protected Trees as a Result of Project Construction

Construction of Alternative 1 would result in the disturbance or removal of numerous trees that may be protected under local ordinances (e.g., Yuba City Ordinance 01-98). Many of these affected trees are in riparian habitat and are included in the discussion in Effect VEG-2 above. Other trees occur in non-riparian valley oak woodland. The trees are within the footprint of the cutoff walls, seepage berms, O&M corridors, and utility corridors; and they would be removed during construction. Additional trees would be removed in the borrow areas.

Additional indirect effects on protected trees could occur during construction as a result of damage to trees located adjacent to the project footprint. Activities conducted within the dripline of trees, such as trenching or grading, movement of construction vehicles and equipment, and spillage or dumping of fuel, oil, concrete, or other harmful substances, could result in damage to root systems and possible tree mortality.

The removal or harming of protected trees as a result of construction activities would conflict with local ordinances, and this would be a significant effect. Implementation of the environmental commitment to comply with each city tree ordinance as it pertains to the segment location for all project alternatives (Section 2.4.6, *Measures for Protected and Riparian Trees*, of Chapter 2, *Alternatives*) and Mitigation Measures VEG-MM-2, VEG-MM-3, VEG-MM-4, VEG-MM-6, and VEG-MM-7 would reduce this effect to a less-than-significant level.

Mitigation Measure VEG-MM-6: Conduct a Tree Survey

SBFCA will retain a certified arborist to conduct a tree survey in the project area to identify trees protected under city tree ordinances. The arborist will document the results of the tree survey in a report that includes the location, species, size (diameter at breast height), overall health, and dripline diameter of the trees. For all protected trees to be removed in the project area, SBFCA will implement Mitigation Measure VEG-MM-7.

Mitigation Measure VEG-MM-7: Compensate for Loss of Protected Trees

SBFCA will apply for a tree permit for the removal of any protected trees during construction. SBFCA will replace trees that must be removed with trees at or near the location of the effect or another location approved by the appropriate party (e.g., tree administrator, parks and recreation department). SBFCA also will replace any replacement trees that die within 3 years of the initial planting.

Replacement trees are required at a ratio of 1:1 (i.e., 1-inch diameter of replacement plant for every 1-inch diameter of tree removed). Effects on trees also may be mitigated through payment of an in-lieu fee. Mitigation will be subject to approval by the appropriate party and will take into account species affected, replacement species, location, health and vigor, habitat value, and other factors to determine fair compensation for tree loss.

Effect VEG-4: Potential Loss of Special Status–Plant Populations Caused by Habitat Loss Resulting from Project Construction

No known occurrences of special-status plants are in the Alternative 1 project area; however, blooming-period surveys of the project area have not been conducted for special-status plant species with potential to occur in the region. Because of the historical and ongoing disturbance of most of the project area, there is low potential for the presence of special-status plants, but if one or more of these species are present in the project area, project construction would result in their removal.

Nearly all improvement measures associated with Alternative 1 require clearing and grubbing of the project footprint prior to construction. If special-status plants are present within the project footprint, they would be removed.

Plants that may occur in the project area under this alternative include one federally and state–listed endangered species (Hartweg's golden sunburst) and seven species that are on the CNPS list for rare and endangered plants. Loss of CNPS-listed plant species may be considered significant under CEQA and regulated by DFG if the loss is substantial and could affect the long-term survival of the affected population. Because the presence and extent of any special-status plants in the project construction area are unknown, this would be a significant effect.

Depending on the plant (listed versus unlisted) and the extent of effect on the population, implementation of Mitigation Measures VEG-MM-2, VEG-MM-3, and VEG-MM-4 may avoid or reduce this future effect to a less-than-significant level. The final significance determination will need to be made after floristic surveys have been conducted (Mitigation Measure VEG-MM-8) and through consultation with the appropriate resource agency (USFWS and/or DFG). In addition, Mitigation Measure VEG-MM-9 requires the project proponent to avoid indirect or direct effects on special-status plants wherever feasible. Because the effectiveness of these measures to reduce this effect to a lesser level is not known at this time, this effect is considered significant and unavoidable.

Mitigation Measure VEG-MM-8: Retain Qualified Botanists to Conduct Floristic Surveys for Special-Status Plants during Appropriate Identification Periods

SBFCA will retain qualified botanists to survey the biological study area to document the presence of special-status plants before project implementation. The botanists will conduct a floristic survey that follows the DFG botanical survey guidelines (California Department of Fish and Game 2009). All plant species observed will be identified to the level necessary to determine whether they qualify as special-status plants or are plant species with unusual or significant range extensions. The guidelines also require that field surveys be conducted when special-status plants that could occur in the area are evident and identifiable, generally during the reported blooming period. To account for different special status–plant identification periods, one or more series of field surveys may be required in spring and summer.

If any special-status plants are identified during the surveys, the botanist will photograph and map locations of the plants, document the location and extent of the special status–plant population on a CNDDB Survey Form, and submit the completed Survey Form to the CNDDB. The amount of compensatory mitigation required will be based on the results of these surveys.

Mitigation Measure VEG-MM-9: Avoid or Compensate for Substantial Effects on Special-Status Plants

If one or more special-status plants are identified in the study area during preconstruction surveys, SBFCA will redesign or modify proposed project components of the project to avoid indirect or direct effects on special-status plants wherever feasible. If special-status plants can be avoided by redesigning projects, implementation of Mitigation Measures VEG-MM-2 (barrier fencing), VEG-MM-3 (awareness training), and VEG-MM-4 (biological monitor) would avoid significant effects on special-status plants.

If complete avoidance of special-status plants is not feasible, the effects of the project on special-status plants would be compensated for by offsite preservation at a ratio to be negotiated with the resource agencies. Suitable habitat for affected special status–plant species will be purchased in a conservation area, preserved, and managed in perpetuity. Detailed information will be provided to the agencies on the location and quality of the preservation area, the feasibility of protecting and managing the area in perpetuity, and the responsible parties. Other pertinent information also will be provided, to be determined through future coordination with the resource agencies.

Effect VEG-5: Introduction or Spread of Invasive Plants as a Result of Project Construction

Invasive plants are already present in the Alternative 1 project area. However, construction activities could introduce new invasive plants to the project area or contribute to the spread of existing invasive plants to uninfested areas outside the project area. Invasive plants or their seeds may be dispersed by construction equipment if appropriate prevention measures are not implemented. The introduction or spread of invasive plants as a result of the project could have a significant effect on sensitive natural communities within and outside the project area by displacing native flora. The implementation of the appropriate BMPs described in the environmental commitment to avoid or minimize the spread or introduction of invasive plant species (Section 2.4.7, *Invasive Plant Species Prevention Measures*, of Chapter 2, *Alternatives*) will ensure that the proposed project would not have a significant effect on sensitive natural communities from the introduction or spread of invasive plants. With implementation of the environmental commitment, this would be a less-than-significant effect. No additional mitigation is required.

Effect VEG-6: Conflict with Provisions of an Adopted HCP/NCCP or Other Approved Local, Regional, or State Habitat Conservation Plan

There are no adopted HCP/NCCPs applicable to the proposed project. There are two plans under development in the region: the Yuba-Sutter NCCP/HCP and the Butte Regional Conservation Plan. The proposed project is within the plan area of both of these conservation plans. Because neither of these plans has been adopted, the project would not conflict with provisions of these plans, and there would be no effect.

In conclusion, implementation of Alternative 1 would result in the smallest affected acreage of wildland land cover types, including habitats such as riparian forest that are sensitive natural communities and/or represent potential habitat for special-status species, compared to Alternatives 2 and 3 (Table 3.8-6). Alternative 1 would result in the same affected acreage of open water categories as Alternative 2 but less affected acreage than Alternative 3 (Table 3.8-6).

3.8.4.3 Alternative 2

Implementation of Alternative 2 would potentially result in effects on vegetation and wetlands. These potential effects and related mitigation measure requirements are summarized in Table 3.8-7 and discussed below.

Table 3.8-7. Vegetation and Wetlands Effects and Mitigation Measures for Alternative 2

Effect	Finding	Mitigation Measure	With Mitigation
Effect VEG-1: Disturbance or Removal of Riparian Trees	Significant	VEG-MM-1: Compensate for the Loss of Woody Riparian Trees VEG-MM-2: Install Exclusion Fencing and/or K-rails along the Perimeter of the Construction Work Area and Implement General Measures to Avoid Effects on Sensitive Natural Communities and Special-Status Species VEG-MM-3: Conduct Mandatory Contractor/Worker Awareness Training for Construction Personnel VEG-MM-4: Retain a Biological Monitor	Significant and unavoidable (short term) Less than significant (long term after establishment of compensatory vegetation)
Effect VEG-2: Loss of Wetlands and Other Waters of the United States as a Result of Project Construction	Significant	VEG-MM-2: Install Exclusion Fencing and/or K-rails along the Perimeter of the Construction Work Area and Implement General Measures to Avoid Effects on Sensitive Natural Communities and Special-Status Species VEG-MM-3: Conduct Mandatory Contractor/Worker Awareness Training for Construction Personnel VEG-MM-4: Retain a Biological Monitor VEG-MM-5: Compensate for the Loss of Wetlands and Other Waters	Less than significant

Effect	Finding	Mitigation Measure	With Mitigation
Effect VEG-3: Disturbance or Removal of Protected Trees as a Result of Project Construction	Significant	VEG-MM-2: Install Exclusion Fencing and/or K-rails along the Perimeter of the Construction Work Area and Implement General Measures to Avoid Effects on Sensitive Natural Communities and Special-Status Species VEG-MM-3: Conduct Mandatory Contractor/Worker Awareness Training for Construction Personnel VEG-MM-4: Retain a Biological Monitor VEG-MM-6: Conduct a Tree Survey VEG-MM-7: Compensate for Loss of Protected Trees	Less than significant
Effect VEG-4: Potential Loss of Special-Status Plant Populations Caused by Habitat Loss Resulting from Project Construction	Significant	VEG-MM-2 Install Exclusion Fencing and/or K-rails along the Perimeter of the Construction Work Area and Implement General Measures to Avoid Effects on Sensitive Natural Communities and Special-Status Species VEG-MM-3: Conduct Mandatory Contractor/Worker Awareness Training for Construction Personnel VEG-MM-4: Retain a Biological Monitor VEG-MM-8: Retain Qualified Botanists to Conduct Floristic Surveys for Special-Status Plants during Appropriate Identification Periods VEG-MM-9: Avoid or Compensate for Substantial Effects on Special-Status Plants	Significant and unavoidable
Effect VEG-5: Introduction or Spread of Invasive Plants as a Result of Project Construction	Less than significant	None required	Less than significant
Effect VEG-6: Conflict with Provisions of an Adopted HCP/NCCP or Other Approved Local, Regional, or State Habitat Conservation Plan	No effect	None required	No effect

The measures proposed for Alternative 2 would extend substantially beyond the current footprint of the Feather River West Levee. Implementation of Alternative 2 would result in the same types of effects (i.e., Effect VEG-1 through Effect VEG-6) on vegetation and wetland resources as Alternative 1. However, implementation of Alternative 2 would result in greater effects on certain land cover types (e.g., riparian forest, riparian scrub-shrub) that are sensitive natural communities and/or represent potential habitat for special-status species (Table 3.8-6). The mitigation measures to reduce these effects are identical to those described for Alternative 1.

3.8.4.4 Alternative 3

Implementation of Alternative 3 would potentially result in effects on wetlands and vegetation. These potential effects and related mitigation measure requirements are summarized in Table 3.8-8 and discussed below.

Table 3.8-8. Vegetation and Wetlands Effects and Mitigation Measures for Alternative 3

Effect	Finding	Mitigation Measure	With Mitigation
Effect VEG-1: Disturbance or Removal of Riparian Trees	Significant	VEG-MM-1: Compensate for the Loss of Woody Riparian Trees VEG-MM-2: Install Exclusion Fencing and/or K-rails along the Perimeter of the Construction Work Area and Implement General Measures to Avoid Effects on Sensitive Natural Communities and Special-Status Species VEG-MM-3: Conduct Mandatory Contractor/Worker Awareness Training for Construction Personnel VEG-MM-4: Retain a Biological Monitor	Significant and unavoidable (short term) Less than significant (long term after establishment of compensatory vegetation)
Effect VEG-2: Loss of Wetlands and Other Waters of the United States as a Result of Project Construction	Significant	VEG-MM-2: Install Exclusion Fencing and/or K-rails along the Perimeter of the Construction Work Area and Implement General Measures to Avoid Effects on Sensitive Natural Communities and Special-Status Species VEG-MM-3: Conduct Mandatory Contractor/Worker Awareness Training for Construction Personnel VEG-MM-4: Retain a Biological Monitor VEG-MM-5: Compensate for the Loss of Wetlands and Other Waters	Less than significant
Effect VEG-3: Disturbance or Removal of Protected Trees as a Result of Project Construction	Significant	VEG-MM-2: Install Exclusion Fencing and/or K-rails along the Perimeter of the Construction Work Area and Implement General Measures to Avoid Effects on Sensitive Natural Communities and Special-Status Species VEG-MM-3: Conduct Mandatory Contractor/Worker Awareness Training for Construction Personnel VEG-MM-4: Retain a Biological Monitor VEG-MM-6: Conduct a Tree Survey VEG-MM-7: Compensate for Loss of Protected Trees	Less than significant

Effect	Finding	Mitigation Measure	With Mitigation
Effect VEG-4: Potential Loss of Special-Status Plant Populations Caused by Habitat Loss Resulting from Project Construction	Significant	VEG-MM-2 Install Exclusion Fencing and/or K-rails along the Perimeter of the Construction Work Area and Implement General Measures to Avoid Effects on Sensitive Natural Communities and Special-Status Species VEG-MM-3: Conduct Mandatory Contractor/Worker Awareness Training for Construction Personnel VEG-MM-4: Retain a Biological Monitor VEG-MM-8: Retain Qualified Botanists to Conduct Floristic Surveys for Special-Status Plants during Appropriate Identification Periods VEG-MM-9: Avoid or Compensate for Substantial Effects on Special-Status Plants	Significant and unavoidable
Effect VEG-5: Introduction or Spread of Invasive Plants as a Result of Project Construction	Less than significant	None required	Less than significant
Effect VEG-6: Conflict with Provisions of an Adopted HCP/NCCP or Other Approved Local, Regional, or State Habitat Conservation Plan	No effect	None required	No effect

Implementation of Alternative 3, which is a blend of levee improvement measures from Alternatives 1 and 2, would result in the same types of effects (i.e., Effect VEG-1 through Effect VEG-6) on vegetation and wetland resources as Alternatives 1 and 2. Implementation of Alternative 3 would result in greater effects on oak woodland and the open water land cover type than Alternatives 1 and 2 (Table 3.8-6). Implementation of Alternative 3 would result in a higher affected acreage of riparian habitats than Alternative 1, but a smaller affected acreage than Alternative 2. The mitigation measures to reduce these effects are identical to those described for Alternatives 1 and 2.

3.9 Wildlife

3.9.1 Introduction

This section describes the regulatory and environmental setting for wildlife; effects on wildlife that would result from the No Action Alternative and Alternatives 1, 2, and 3; and mitigation measures that would reduce significant effects. Additional information on special-status wildlife is provided in Appendix F.

3.9.2 Affected Environment

This section describes the affected environment for wildlife in the project area. The key sources of data and information used in the preparation of this section are listed below.

- A California Natural Diversity Database (CNDDB) query for records pertaining to the affected area, which includes portions of the following USGS 7.5-minute quadrangles that overlap the affected area: Nicolaus, Yuba City, Sutter, Olivehurst, Biggs, Gridley, and Palermo (California Department of Fish and Game 2012a).
- A USFWS list of endangered, threatened, and proposed species for the aforementioned seven USGS quadrangles (U.S. Fish and Wildlife Service 2012).
- General plans for counties and cities in the affected area.
    - Butte County General Plan 2030 (Butte County 2010).
    - Sutter County General Plan, Public Draft (Sutter County 2010).
    - City of Yuba City General Plan (City of Yuba City 2004).
    - City of Biggs General Plan 1997–2015 (City of Biggs 1998).
    - City of Gridley 2030 General Plan (City of Gridley 2010).
    - City of Live Oak 2030 General Plan (City of Live Oak 2010).
- Draft HCPs/NCCPs being prepared for the affected area.
    - Butte County Regional HCP/NCCP (in preparation; status available at www.buttehcp.com).
    - Yuba-Sutter HCP/NCCP (in preparation; status available at www.yubasutterhcp.org).
- Existing SBFCA documents:
    - Biological Survey Memo for SBFCA Preliminary Environmental Planning Support for the Feather River West Levee Rehabilitation Early Implementation Project (Gallaway Consulting 2010).
    - Draft Sutter Basin Feasibility Study Environmental Without-Project Conditions Report (ICF International 2011).
    - Lower Feather River Hydrologic Unit Code (HUC)/Honcut Creek Watershed Existing Conditions Assessment (Foothill Associates 2010).

- Sutter Basin Feasibility Study—Restoration Opportunities, Measures, and Sponsors (ICF International 2010).

3.9.2.1 Regulatory Setting

This section summarizes key Federal and state regulatory information that applies to wildlife. Additional regulatory information appears in Appendix A.

Federal

NEPA and ESA apply to wildlife but were discussed previously in Section 3.8.2.1 of *Vegetation and Wetlands* and thus not repeated here, with the exception of additional information for Section 9 of the ESA. This and other Federal policies are discussed below that relate to wildlife and apply to implementation of the proposed project.

Endangered Species Act

The Federal Endangered Species Act (ESA) protects fish and wildlife species and their habitats that have been identified by NMFS or USFWS as threatened or endangered. *Endangered* refers to species, subspecies, or distinct population segments (DPSs) that are in danger of extinction through all or a significant portion of their range. *Threatened* refers to species, subspecies, or DPSs that are likely to become endangered in the near future.

ESA is administered by USFWS and NMFS. In general, NMFS is responsible for protection of ESA-listed marine species and anadromous fish, and USFWS is responsible for other listed species. Provisions of Sections 9 and 7 of ESA are relevant to this project and are summarized below.

Section 9: ESA Prohibitions

Section 9 of ESA prohibits the take of any fish or wildlife species listed under ESA as endangered. Take of threatened species also is prohibited under Section 9, unless otherwise authorized by Federal regulations.[1] *Take*, as defined by ESA, means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." *Harm* is defined as "any act that kills or injures the species, including significant habitat modification." In addition, Section 9 prohibits removing, digging up, cutting, and maliciously damaging or destroying federally listed plants on sites under Federal jurisdiction.

Section 7: ESA Authorization Process for Federal Actions

Section 7 of the ESA provides a means for authorizing take of threatened and endangered species by Federal agencies. Under Section 7, the Federal agency conducting, funding, or permitting an action (the lead Federal agency, such as USACE) must consult with NMFS or USFWS, as appropriate, to ensure that the proposed project would not jeopardize endangered or threatened species or destroy or adversely modify designated critical habitat. If a proposed project "may affect" a listed species or designated critical habitat, the lead agency is required to prepare a BA to evaluate the nature and severity of the expected effect. In response, NMFS or USFWS issues a BO, with a determination that the proposed project either:

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[1] In some cases, exceptions may be made for threatened species under ESA Section 4(d); in such cases, USFWS or NMFS issues a "4(d) rule," describing protections for the threatened species and specifying the circumstances under which take is allowed.

- may jeopardize the continued existence of one or more listed species (*jeopardy finding*) or result in the destruction or adverse modification of critical habitat (*adverse modification finding*), or
- would not jeopardize the continued existence of any listed species (*no jeopardy finding*) or result in adverse modification of critical habitat (*no adverse modification finding*).

The BO issued by NMFS or USFWS may stipulate discretionary *reasonable and prudent* conservation measures. If the project would not jeopardize a listed species, USFWS or NMFS issues an incidental take statement to authorize the proposed activity.

Critical Habitat

Critical habitat, as defined in ESA Section 3, is:

I. the specific area within the geographic area occupied by a species, at the time it is listed in accordance with ESA, on which are found those biological features
   i. essential to the conservation of the species, and
   ii. may require special management considerations or protection; and

II. specific areas outside the geographical area occupied by a species at the time it is listed, upon a determination that such areas are essential for the conservation of the species.

Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) protects migratory bird species from take. *Take*, under the MBTA, is defined as an action or an attempt to pursue, hunt, shoot, capture, collect, or kill (50 CFR 10.12). The definition differentiates between "intentional" take (take that is the purpose of the activity in question) and "unintentional" take (take that results from, but is not the purpose of, the activity in question).

Executive Order 13186 (signed January 10, 2001) directs each Federal agency taking actions that would have or likely would have a negative effect on migratory bird populations to work with USFWS to develop a memorandum of understanding (MOU) to promote the conservation of migratory bird populations. Protocols developed under the MOU must include the following agency responsibilities.

- Avoid and minimize, to the extent practicable, adverse effects on migratory bird resources when conducting Federal agency actions.
- Restore and enhance habitat of migratory birds, as practicable.
- Prevent or abate the pollution or detrimental alteration of the environment for the benefit of migratory birds, as practicable.

The executive order is designed to assist Federal agencies in their efforts to comply with the MBTA; it does not constitute any legal authorization to take migratory birds.

Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act requires consultation with USFWS and the state fish and wildlife agencies where the waters of any stream or other body of water are proposed, authorized, permitted, or licensed to be impounded, diverted, or otherwise controlled or modified under a Federal permit or license. Consultation is in progress for the purpose of preventing loss of and damage to wildlife resources, led by USFWS in coordination with NMFS and DFG. More complete text for this act is included in Appendix A.

State

CEQA and CESA apply to wildlife but were discussed in Section 3.8.2.1 of *Vegetation and Wetlands* and thus not repeated here. Other state policies related to wildlife that may apply to implementation of the proposed project are discussed below.

California Fish and Game Code

As discussed in Chapter 8, Section 1602 of the California Fish and Game Code requires project proponents to notify DFG before any project diverts, obstructs, or changes the natural flow, bed, channel, or bank of any river, stream, or lake. When an existing fish or wildlife resource may be substantially adversely affected, DFG is required to propose reasonable changes to the project to protect the resources. These modifications are formalized in a Streambed Alteration Agreement that becomes part of the plans, specifications, and bid documents for the project.

The California Fish and Game Code provides protection from take for a variety of species, referred to as fully protected species. Section 5050 lists protected amphibians and reptiles. Section 5515 prohibits take of fully protected fish species. Section 3511 prohibits take of fully protected bird species. Fully protected mammals are protected under Section 4700. The California Fish and Game Code defines *take* as “hunt, pursue, catch, capture, or kill or attempt to hunt, pursue, catch, capture, or kill.” Except for take related to scientific research, all take of fully protected species is prohibited.

Section 3503 prohibits the killing of birds or the destruction of bird nests. Section 3503.5 prohibits the killing of raptor species and the destruction of raptor nests. Many bird species could nest in the affected area or vicinity. The nests would be protected under these sections of the California Fish and Game Code.

Local

Sutter County, Butte County, City of Yuba City, City of Live Oak, City of Biggs, and City of Gridley have each adopted policies related to wildlife resources, as detailed in Appendix A.

3.9.2.2 Environmental Setting

The following considerations are relevant to wildlife conditions in the proposed project area.

Affected Area

The affected area generally includes the 40+ miles of the Feather River’s western levee from south of the Thermalito Afterbay to approximately 4 miles north of the Sutter Bypass. Along this linear area, the affected area spans the project footprint, which includes the maximum extent of all alternatives, plus a 100-foot buffer on either side to account for potential effects on the valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) (VELB).

Field Surveys

Field surveys to identify habitats for special-status (defined below) wildlife in the affected area and elderberry shrub (habitat for the VELB) surveys were conducted by ICF biologists on July 20–22, July 27, and August 31, 2011. An HDR biologist conducted a 2-day survey for raptor nests on May 29 and 30, 2012. An assessment of habitat for giant garter snake was conducted by ICF and HDR biologists on July 12, 2012. During the surveys, biologists took representative photos of the affected area and recorded all wildlife species observed. Species observed during the surveys are listed in Table 3.9-1.

Elderberry shrub surveys were conducted by ICF biologists in 2011 and 2012. Biologists located elderberry shrubs by driving and walking along the levee in the affected area. All elderberry shrubs (and shrub clusters) within 100 feet of the maximum extent of the alternative boundaries were mapped with a sub-meter accurate geographic positioning system (GPS) and recorded. When the bases of shrubs were accessible, stem counts, heights, and widths of shrubs were recorded, and shrubs were surveyed for VELB exit holes. Where dense poison oak, blackberry, and/or other vegetation surrounds elderberry shrubs, stem counts and exit hole surveys could not be conducted. Impact estimates for these elderberry shrubs will be determined in consultation with USFWS. Surveys will be conducted prior to construction for shrubs located within the refined construction impact area in accordance with the Conservation Guidelines for the VELB (U.S. Fish and Wildlife Service 1999a) and as directed by USFWS staff. Information recorded for each shrub included the number of stems with diameters between 1 and 3 inches, 3 and 5 inches, and greater than 5 inches; whether the shrub is located in riparian or nonriparian habitat; the approximate height and width of the elderberry shrub; and the presence of VELB exit holes. Borrow sites recently have been identified and have not been surveyed yet. Surveys of these sites are planned to occur in Fall/Winter 2012, and information will be added to the EIR/EIS when complete.

Table 3.9-1. Wildlife Species Observed in the Affected Area

Common Name	Scientific Name
Amphibians	
Bullfrog	*Rana catesbeiana*
Reptiles	
Western fence lizard	*Sceloporus occidentalis*
Birds	
Acorn woodpecker	*Melanerpes formicivorus*
American crow	*Corvus brachyrhynchos*
American goldfinch	*Carduelis tristis*
American kestrel	*Falco sparverius*
American white pelican	*Pelecanus erythrorhynchos*
Bald eagle	*Haliaeetus leucocephalus*
Barn swallow	*Hirundo rustica*
Belted kingfisher	*Megaceryle alcyon*
Black phoebe	*Sayornis nigricans*
Brewer's blackbird	*Euphagus cyanocephalus*
Bushtit	*Psaltriparus minimus*
California towhee	*Pipilo crissalis*
Canada goose	*Branta canadensis*
Cooper's hawk	*Accipiter cooperii*
Dark-eyed junco	*Junco hyemalis*

Common Name	Scientific Name
Double-crested cormorant	*Phalacrocorax auritus*
European starling	*Sturnus vulgaris*
Great blue heron	*Ardea herodias*
Great egret	*Ardea alba*
Green heron	*Butorides virescens*
Gull sp.	*Larus* sp.
Killdeer	*Charadrius vociferus*
Mallard	*Anas platyrhynchos*
Mourning dove	*Zenaida macroura*
Osprey	*Pandion haliaetus*
Red-tailed hawk	*Buteo jamaicensis*
Red-shoulder hawk	*Buteo lineatus*
Red-winged blackbird	*Agelaius phoeniceus*
Rock dove	*Columba livia*
Snowy egret	*Egretta thula*
Spotted towhee	*Pipilo erythrophthalmus*
Swainson's hawk	*Buteo swainsonii*
Turkey vulture	*Cathartes aura*
Western kingbird	*Tyrannus verticalis*
Western meadow lark	*Sturnella neglecta*
Western scrub jay	*Aphelocoma californica*
Yellow-billed magpie	*Pica nuttalli*
Yellow-rumped warbler	*Dendroica coronata*
Mammals	
Black-tailed deer	*Odocoileus hemionus columbianus*
Black-tailed jack rabbit	*Lepus californicus*
Coyote	*Canis latrans*
Desert cottontail	*Sylvilagus audubonii*
Northern river otter	*Lontra canadensis*

Wildlife Habitat—Land Cover Type Associations

This section describes the locations of land cover types identified in the affected area and the relationship between land cover types and the wildlife habitats and the species they support. There are eight land cover types in the affected area, as described in Section 3.8, *Vegetation and Wetlands*, and shown in Plate 3.8-1. These land cover types are riparian forest, riparian scrub-shrub, oak woodland, open water, orchards, field and row crops, developed, and ruderal areas. Table 3.8-1 in Section 3.8, *Vegetation and Wetlands*, lists the approximate acreages and percentages of the land cover types in the affected area. Wildlife habitats associated with land cover types in the affected area are discussed below. Land cover types of borrow sites are not included below because they have not been surveyed yet.

Riparian Forest

In the affected area, riparian forest is located primarily along the water side of the levee in association with the Feather River and its tributaries but also is located along the fringes of ponds and canals.

Riparian forest communities provide wildlife with dispersal and migration corridors, foraging areas, cover, and breeding habitat. Many species of birds, mammals, reptiles, and amphibians are known to use riparian communities and other woody vegetation communities located in proximity to watercourses. Riparian trees provide suitable nesting and roosting habitat for a variety of raptors, egrets, herons, songbirds, and bats. Birds known to nest in these communities include red-shouldered hawk (*Buteo lineatus*), red-tailed hawk (*Buteo jamaicensis*), Swainson's hawk (*Buteo swainsoni*), white-tailed kite (*Elanus leucurus*), Cooper's hawk (*Accipiter cooperii*), American kestrel (*Falco sparverius*), great blue heron (*Ardea herodias*), great egret (*Ardea alba*), Nuttall's woodpecker (*Picoides nuttallii*), western scrub jay (*Aphelocoma californica*), western yellow-billed cuckoo (*Coccyzus americanus*), California towhee (*Pipilo crissalis*), spotted towhee (*Pipilo maculates*), black phoebe (*Sayornis nigricans*), warbling vireo (*Vireo gilvus*), yellow-rumped warbler (*Dendroica coronata*), wrentit (*Chamaea fasciata*), and house wren (*Troglodytes aedon*). Riparian forest also provides foraging habitat for numerous species of migratory and wintering birds.

Bat species known to use riparian habitats for roosting include California myotis (*Myotis californicus*), Yuma myotis (*Myotis yumanensis*), hoary bat (*Lasiurus cinereus*), western mastiff bat (*Eumops perotis californicus*), western red bat (*Lasiurus blossevillii*), and pallid bat (*Antrozous pallidus*). Other mammal species known to use riparian forest include beaver (*Castor canadensis*), Virginia opossum (*Didelphis virginiana*), striped skunk (*Mephitis mephitis*), black-tailed deer (*Odocoileus hemionus columbianus*), raccoon (*Procyon lotor*), and muskrat (*Ondatra zibethicus*). Reptiles, including common garter snake (*Thamnophis sirtalis*), western fence lizard (*Sceloporus occidentalis*), and western pond turtle (*Emys marmorata*), and amphibians, including Pacific tree frog (*Hyla regilla*), western toad (*Bufo boreas*), and bullfrog (*Rana catesbeiana*), also are associated with this land cover type. Additionally, the VELB has potential to occur at elderberry shrubs that have stems 1 inch or greater in diameter.

Riparian Scrub-Shrub

Similar to riparian forest, riparian scrub-shrub in the affected area is located primarily along the water side of the levee in association with the Feather River and its tributaries, and along the fringes of ponds and some canals.

Because of its association with and/or proximity to riparian forest, wildlife use of riparian scrub-shrub is similar to riparian forest. However, because the vegetation in areas of scrub-shrub lack large, mature trees of riparian forests, smaller birds are more likely to use these areas for nesting. Many of the wildlife species listed above as occurring in riparian forest would occur in riparian scrub-shrub.

Oak Woodland

In the affected area, oak woodland occurs as scattered patches south of Almond, Laurel, and Sacramento Avenues. These areas provide nesting habitat for a variety of raptors and other migratory tree-nesting birds discussed under the riparian section above. Additionally, great-horned owl (*Bubo virginianus*), barn owl (*Tyto alba*), and yellow-billed magpie (*Pica nuttalli*) are known to use these habitats. Reptiles and mammals that occur in riparian woodland also may use oak woodlands for foraging and cover habitat. Because of the small, scattered nature of these areas, the diversity of species using these areas is much lower than that in riparian areas.

Open Water

Open water habitats in the affected area include the river, ponds, and canals. Small ditches that provide open water habitat for wildlife are also present in the affected area. Smaller agricultural canals associated with rice and other flooded crops are discussed under the agricultural lands discussion below.

In addition to providing habitat for fish (discussed in Section 3.10, *Fisheries and Aquatic Resources*), open water provides foraging, cover, and reproductive sites for a variety of wildlife species. Open water areas provide essential foraging habitat for a variety of birds, including wading birds such as great blue heron, great egret, and snowy egret (*Egretta thula*); waterfowl such as northern shoveler (*Anas clypeata*), northern pintail (*Anas acuta*), common goldeneye (*Bucephala clangula*), mallard (*Anas platyrhynchos*), common merganser (*Mergus merganser*), ruddy duck (*Oxyura jamaicensis*), gadwall (*Anas strepera*), and cinnamon teal (*Anas cyanoptera*); other water birds such as eared grebe (*Podiceps nigricollis*), double-crested cormorant (*Phalacrocorax auritus*), and American white pelicans (*Pelecanus erythrorhynchos*); and land birds such as bald eagle (*Haliaeetus leucocephalus*), bank swallow (*Riparia riparia*), and belted kingfisher (*Megaceryle alcyon*).

Reptiles and amphibians, including western pond turtle, common garter snake, western aquatic garter snakes (*Thamnophis couchii*), Pacific tree frog, western toad, and bullfrog, use open water areas for breeding, foraging, and cover. Canals and ditches that contain water through mid-fall, have suitable prey, and adequate cover and foraging habitat have the potential to support giant garter snake (*Thamnophis gigas*).

Mammals that use open water habitats for foraging include bats such as California myotis, Yuma myotis, hoary bat, and western red bat, that forage for insects over open water. Additionally, terrestrial mammals such as black-tailed deer, raccoon, striped skunk, and Virginia opossum use open water habitats as water sources. Aquatic and semi-aquatic mammals that occur in open water habitats include beaver, river otter (*Lutra canadensis*), mink (*Mustela vison*), and muskrat.

Orchard

Orchard is the dominant land cover type and is present throughout much of the affected area. Orchards have limited value for wildlife, although birds such as red-shouldered hawk, American crow (*Corvus brachyrhynchos*), yellow-billed magpie, mourning dove (*Zenaida macroura*), European starling (*Sturnus vulgaris*), and rock pigeon (*Columba livia*) may nest or forage in these areas.

Field and Row Crops

Row and field crops are located primarily in the southern portion of the affected area. Row and field crops provide foraging opportunities for a variety of raptors, including red-tailed hawk, Swainson's hawk, white-tailed kite, American kestrel, burrowing owl (*Athene cunicularia*), northern harrier (*Circus cyaneus*), great-horned owl, barn owl, and other migratory and resident birds such as sandhill crane (*Grus canadensis tabida*), Brewer's blackbird (*Euphagus cyanocephalus*), red-winged blackbird (*Agelaius phoeniceus*), tricolored blackbird (*Agelaius tricolor*), American crow, yellow-billed magpie, western meadowlark (*Sturnella neglecta*), mourning dove, and rock pigeon. Similar species are known to use irrigated pastures for foraging, and birds such as burrowing owl, northern harrier, and western meadowlark are known to nest in these areas.

Developed Lands

Developed areas in the affected area include urban areas (residential and commercial development), ranchettes, rural neighborhoods, agricultural outbuildings, farm equipment storage areas, pumping stations, and a plant nursery.

These areas provide limited habitat for wildlife but are often known to support common "urban-dwelling species" such as northern mockingbird (*Mimus polyglottos*), rock pigeon, mourning dove, house sparrow (*Passer domesticus*), house finch (*Carpodacus mexicanus*), western scrub jay, Botta's pocket gopher (*Thomomys bottae*), California ground squirrel (*Spermophilus beecheyi*), house mouse (*Mus musculus*), black rat (*Rattus rattus*), and coyote (*Canis latrans*). Semi-developed areas containing grass, trees, or water sources (small ponds and ditches) may support additional wildlife species.

Ruderal

Ruderal areas in the affected area include the levee slopes and disturbed areas adjacent to levee slopes. Various native and nonnative scattered trees, shrubs, grasses, and forbs are found in these areas as described in the vegetation and wetlands section. Similar to developed lands, these areas support mostly common wildlife species, although scattered elderberry shrubs, which may support VELB, were found in these areas.

Special-Status Wildlife Species

Special-status wildlife species are defined as animals that are legally protected under the ESA, CESA, or other regulations and species that are considered sufficiently rare by the scientific community to qualify for such listing. Special-status species are defined as follows.

- Species that are listed or proposed for listing as threatened or endangered under the ESA (50 CFR 17.11 for listed animals and various notices in the Federal Register (FR) for proposed species).
- Species that are candidates for possible future listing as threatened or endangered under the ESA (73 FR 75178, December 10, 2008).
- Species listed or proposed for listing by the State of California as threatened or endangered under the CESA (14 CCR 670.5).

- Species that meet the definitions of rare or endangered under CEQA (State CEQA Guidelines Section 15380).
- Animals listed as California species of special concern on DFG's Special Animals List (California Department of Fish and Game 2011).
- Animals that are fully protected in California under the California Fish and Game Code (Sections 3511 [birds], 4700 [mammals], and 5050 [reptiles and amphibians]).

Based on the USFWS (2012) species list and CNDDB (California Department of Fish and Game 2012) records search for the quadrangles overlapping the affected area (included above in Section 3.9.2), 23 special-status wildlife species were identified as having potential to occur in the affected area. Of these 23 species, four are known to occur in the affected area (western pond turtle, Swainson's hawk, western yellow-billed cuckoo, and bank swallow). Swainson's hawk was observed in the affected area during 2011 field surveys. Though not reported to occur in the affected area, 10 other special-status wildlife species have a moderate or high potential to occur in the affected area given their known range, reports of occurrence, and/or the presence of suitable habitat. These species include Antioch Dunes anthicid beetle (*Anthicus antiochensis*), Sacramento anthicid beetle (*A. sacramento*), Sacramento Valley tiger beetle (*Cicindela hirticollis abrupta*), VELB, giant garter snake, northern harrier, bald eagle, western burrowing owl, tricolored blackbird, and silver-haired bat. The remaining nine species have low or no potential to occur. Seven additional species were added as having at least a moderate potential to occur in the affected area based on species habitat requirements and professional judgment (white-tailed kite, loggerhead shrike, purple martin, yellow warbler, pallid bat, hoary bat, and western red bat). All wildlife species considered are listed in Table 3.9-2, which contains their regulatory status, distribution, habitat requirements, and a rationale for their potential to occur in the affected area. The 21 special-status wildlife species that are known to occur or have a high or moderate potential to occur in the affected area are discussed briefly below.

Table 3.9-2. Rare and Special-Status Wildlife Species Identified As Having Potential to Occur in FRWLP Affected Area

Common and Scientific Names	Status[a] Federal/ State/Other	Geographic Distribution	Habitat Requirements	Potential Occurrence in Affected Area
Invertebrates				
Antioch Dunes anthicid beetle *Anthicus antiochensis*	–/–/–	Population in Antioch Dunes believed extinct. Present in several localities along the Sacramento and Feather Rivers.	Loose sand on sand bars and sand dunes.	Moderate—suitable habitat may be present in the affected area; known locations within 2 miles south of the affected area.
Sacramento anthicid beetle *Anthicus sacramento*	–/–/–	Dune areas at mouth of Sacramento River; western tip of Grand Island, Sacramento County; upper Putah Creek and dunes near Rio Vista, Solano County; Ord Ferry Bridge, Butte County.	Found in sand slip-faces among willows; associated with riparian and other aquatic habitats.	Moderate—suitable habitat may be present in the affected area; known locations within 2 miles south of the affected area.
Sacramento Valley tiger beetle *Cicindela hirticollis abrupta*	–/–/–	Lower Sacramento Valley (i.e., Sacramento River, lower American River, and Cache Creek).	Found in sandy areas among willows in riverine and riparian habitats.	Moderate—suitable habitat may be present in the affected area; known locations within 2 miles south of the affected area.
Valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	T/–/–	Streamside habitats below 3,000 feet throughout the Central Valley.	Riparian and oak savanna habitats with elderberry shrubs; elderberries are the host plant.	High—suitable habitat present; species occurrences in affected area.
Conservancy fairy shrimp *Branchinecta conservatio*	E/–/–	Disjunct occurrences in Solano, Merced, Tehama, Ventura, Butte, and Glenn Counties.	Large, deep vernal pools in annual grasslands.	None—no suitable habitat present in affected area.
Vernal pool fairy shrimp *Branchinecta lynchi*	T/–/–	Central Valley, central and south Coast Ranges from Tehama County to Santa Barbara County. Isolated populations also in Riverside County.	Common in vernal pools; also found in sandstone rock outcrop pools.	None—no suitable habitat present in affected area.
Vernal pool tadpole shrimp *Lepidurus packardi*	E/–/–	Shasta County south to Merced County.	Vernal pools and ephemeral stock ponds.	None—no suitable habitat present in affected area.

Common and Scientific Names	Status[a] Federal/ State/Other	Geographic Distribution	Habitat Requirements	Potential Occurrence in Affected Area
Amphibians				
California tiger salamander *Ambystoma californiense*	T/T/–	Central Valley, including Sierra Nevada foothills, up to approximately 1,000 feet, and coastal region from Butte County south to northeastern San Luis Obispo County.	Small ponds, lakes, or vernal pools in grasslands and oak woodlands for larvae; rodent burrows, rock crevices, or fallen logs for cover for adults and for summer dormancy.	Low—limited suitable aquatic habitat and unsuitable surrounding upland habitat; no occurrences in affected area.
California red-legged frog *Rana draytonii*	T/SSC/–	Found along the coast and coastal mountain ranges of California from Marin County to San Diego County and in the Sierra Nevada from Tehama County to Fresno County.	Permanent and semi-permanent aquatic habitats, such as creeks and coldwater ponds, with emergent and submergent vegetation. May estivate in rodent burrows or cracks during dry periods.	None—considered extirpated from the valley floor (U.S. Fish and Wildlife Service 2002).
Western spadefoot *Spea hammondii*	–/SSC/–	Sierra Nevada foothills, Central Valley, Coast Ranges, coastal counties in southern California.	Shallow streams with riffles and seasonal wetlands, such as vernal pools in annual grasslands and oak woodlands.	Low—limited suitable aquatic habitat and unsuitable surrounding upland habitat; no occurrences in affected area.
Reptiles				
Western pond turtle *Emys marmorata*	–/SSC/–	Occurs from the Oregon border of Del Norte and Siskiyou Counties south along the coast to San Francisco Bay, inland through the Sacramento Valley, and on the western slope of Sierra Nevada.	Occupies ponds, marshes, rivers, streams, and irrigation canals with muddy or rocky bottoms and with watercress, cattails, water lilies, or other aquatic vegetation in woodlands, grasslands, and open forests.	High—suitable habitat present; one occurrence in the affected area.
Giant garter snake *Thamnophis gigas*	T/T/–	Central Valley from the vicinity of Burrel in Fresno County north to near Chico in Butte County; has been extirpated from areas south of Fresno.	Sloughs, canals, low gradient streams and freshwater marsh habitats where there is a prey base of small fish and amphibians; also found in irrigation ditches and rice fields; requires grassy banks and emergent vegetation for basking and areas of high ground protected from flooding during winter.	Moderate—suitable habitat present; no occurrences in affected area but numerous occurrence within 5 miles of affected area in water bodies potentially connected to canals and ditches in the affected area.

Common and Scientific Names	Status[a] Federal/ State/Other	Geographic Distribution	Habitat Requirements	Potential Occurrence in Affected Area
Birds				
Greater sandhill crane *Grus canadensis tabida*	–/T/–	Breeds in Siskiyou, Modoc, Lassen, Plumas, and Sierra Counties. Winters in the Central Valley, southern Imperial County, Lake Havasu National Wildlife Refuge, and the Colorado River Indian Reserve.	Summers in open terrain near shallow lakes or freshwater marshes. Winters in plains and valleys near bodies of fresh water.	Low—limited suitable wintering habitat; one occurrence within 5 miles of the affected area.
Swainson's hawk *Buteo swainsoni*	–/T/–	Lower Sacramento and San Joaquin Valleys, the Klamath Basin, and Butte Valley. Highest nesting densities occur near Davis and Woodland, Yolo County.	Nests in oaks or cottonwoods in or near riparian habitats. Forages in grasslands, irrigated pastures, and grain fields.	High—suitable nesting and foraging habitat; seven records in and immediately adjacent to the affected area.
Northern harrier *Circus cyaneus*	–/SSC/–	Occurs throughout lowland California. Has been recorded in fall at high elevations.	Nests and forages in grasslands, meadows, marshes, and seasonal and agricultural wetlands.	Moderate—suitable foraging habitat, limited suitable nesting habitat; one occurrence within 5 miles of the affected area.
White-tailed kite *Elanus leucurus*	–/FP/–	Lowland areas west of Sierra Nevada from the head of the Sacramento Valley south, including coastal valleys and foothills to western San Diego County at the Mexico border.	Low foothills or valley areas with valley or live oaks, riparian areas, and marshes near open grasslands for foraging.	Moderate—suitable nesting and foraging habitat; no occurrences in affected area.
Bald eagle *Haliaeetus leucocephalus*	–/E, FP/–	Nests in Siskiyou, Modoc, Trinity, Shasta, Lassen, Plumas, Butte, Tehama, Lake, and Mendocino Counties and in the Lake Tahoe Basin. Reintroduced into central coast. Winter range includes the rest of California, except the southeastern deserts, very high altitudes in the Sierra Nevada, and east of the Sierra Nevada south of Mono County.	In western North America, nests and roosts in coniferous forests within 1 mile of a lake, reservoir, stream, or the ocean.	High—suitable nesting and foraging habitat along Feather River; one occurrence within 0.5 mile of the affected area.

Common and Scientific Names	Status[a] Federal/ State/Other	Geographic Distribution	Habitat Requirements	Potential Occurrence in Affected Area
California black rail *Laterallus jamaicensis coturniculus*	–/T/–	Permanent resident in the San Francisco Bay and eastward through the Delta into Sacramento and San Joaquin Counties; small populations in Marin, Santa Cruz, San Luis Obispo, Orange, Riverside, and Imperial Counties.	Tidal salt marshes associated with heavy growth of pickleweed; also occurs in brackish marshes or freshwater marshes at low elevations.	Low—no suitable nesting and foraging habitat; no occurrences within 5 miles of the affected area.
Western yellow-billed cuckoo *Coccyzus americanus*	C/E/–	Nests along the upper Sacramento, lower Feather, south fork of the Kern, Amargosa, Santa Ana, and Colorado Rivers.	Wide, dense riparian forests with a thick understory of willows for nesting; sites with a dominant cottonwood overstory are preferred for foraging; may avoid valley-oak riparian habitats where scrub jays are abundant.	High—suitable nesting and foraging habitat; two occurrences in the affected area.
Western burrowing owl *Athene cunicularia hypugea*	–/SSC/–	Lowlands throughout California, including the Central Valley, northeastern plateau, southeastern deserts, and coastal areas. Rare along south coast.	Level, open, dry, heavily grazed or low-stature grassland or desert vegetation with available burrows.	Moderate—suitable foraging habitat; limited suitable nesting habitat; no occurrences in affected area.
Loggerhead shrike *Lanius ludovicianus*	–/SSC/–	Resident and winter visitor in lowlands and foothills throughout California. Rare on coastal slope north of Mendocino County, occurring only in winter.	Prefers open habitats with scattered shrubs, trees, posts, fences, utility lines, or other perches.	Moderate—suitable nesting and foraging habitat; no occurrences in the affected area.
Purple martin *Progne subis*	–/SSC/–	Coastal mountains south to San Luis Obispo County, west slope of the Sierra Nevada, and northern Sierra and Cascade ranges. Absent from the Central Valley except in Sacramento. Isolated, local populations in southern California.	Nests in abandoned woodpecker holes in oaks, cottonwoods, and other deciduous trees in a variety of wooded and riparian habitats. Also nests in vertical drainage holes under elevated freeways and highway bridges.	Moderate—suitable nesting and foraging habitat; no occurrences in the affected area.

Common and Scientific Names	Status[a] Federal/ State/Other	Geographic Distribution	Habitat Requirements	Potential Occurrence in Affected Area
Bank swallow *Riparia riparia*	–/T/–	Occurs along the Sacramento River from Tehama County to Sacramento County, along the Feather and lower American Rivers, in the Owens Valley, and in the plains east of the Cascade Range in Modoc, Lassen, and northern Siskiyou Counties. Small populations near the coast from San Francisco County to Monterey County.	Nests in bluffs or banks, usually adjacent to water, where the soil consists of sand or sandy loam.	High—suitable foraging habitat present; suitable nesting habitat may be present but unlikely; eight occurrences within and adjacent to the affected area.
Yellow warbler *Dendroica petechia*	–/SSC/–	Nests over all of California except the Central Valley, the Mojave Desert region, and high altitudes in the Sierra Nevada. Winters along the Colorado River and in parts of Imperial and Riverside Counties.	Nests in riparian areas dominated by willows, cottonwoods, sycamores, or alders or in mature chaparral; also may use oaks, conifers, and urban areas near stream courses.	Moderate—suitable nesting and foraging habitat; no occurrences in the affected area.
Tricolored blackbird *Agelaius tricolor*	–/SSC/–	Permanent resident in the Central Valley from Butte County to Kern County; breeds at scattered coastal locations from Marin County south to San Diego County and at scattered locations in Lake, Sonoma, and Solano Counties; rare nester in Siskiyou, Modoc, and Lassen Counties.	Nests in dense colonies in emergent marsh vegetation, such as tules and cattails, or upland sites with blackberries, nettles, thistles, and grain fields; habitat must be large enough to support 50 pairs; probably requires water at or near the nesting colony.	Moderate—suitable nesting and foraging habitat; no occurrences in the affected area.
Mammals				
Western red bat *Lasiurus blossevillii*	–/SSC/ WBWG: High priority	Scattered throughout much of California at lower elevations.	Found primarily in riparian and wooded habitats. Occurs at least seasonally in urban areas. Day roosts in trees in the foliage. Found in fruit orchards and sycamore riparian habitats in the Central Valley.	Moderate—suitable roosting and foraging habitat; no occurrences within 5 miles of the affected area probably because of the lack of bat surveys in the affected area.

Common and Scientific Names	Status[a] Federal/ State/Other	Geographic Distribution	Habitat Requirements	Potential Occurrence in Affected Area
Hoary bat *Lasiurus cinereus*	–/–/ WBWG: Moderate priority	Occurs throughout California from sea level to 13,200 feet.	Found primarily in forested habitats. Also found in riparian areas and in park and garden settings in urban areas. Day roosts in foliage of trees.	Moderate—suitable roosting and foraging habitat; no occurrences have been recorded within 5 miles of the affected area (probably due to the lack of bat surveys in the affected area).
Silver-haired bat *Lasionycteris noctivagans*	–/–/WBWG: Moderate priority	Found from the Oregon border south along the coast to San Francisco Bay and along the Sierra Nevada and Great Basin region to Inyo County. Also occurs in southern California from Ventura and San Bernardino Counties south to Mexico. Has been recorded in Sacramento, Stanislaus, Monterey, and Yolo Counties.	During spring and fall migrations, may be found anywhere in California. Summer habitats include coastal and montane coniferous forests, valley foothill woodlands, pinyon-juniper woodlands, and valley foothill and montane riparian habitats. Roosts in hollow trees, snags, buildings, rock crevices, caves, and under bark.	Moderate—suitable roosting and foraging habitat; two occurrences within 5 miles of the affected area.
Pallid bat *Antrozous pallidus*	–/SSC/ WBWG: High priority	Occurs throughout California, except the high Sierra, from Shasta to Kern County and the northwest coast, primarily at lower and mid elevations.	Occurs in a variety of habitats from desert to coniferous forest. Most closely associated with oak, yellow pine, redwood, and giant sequoia habitats in northern California and oak woodland, grassland, and desert scrub in southern California. Relies heavily on trees for roosts.	Moderate—suitable roosting and foraging habitat; no occurrences have been recorded within 5 miles of the affected area (probably due to the lack of bat surveys in the affected area).
Western mastiff bat *Eumops perotis californicus*	–/SSC/ WBWG: High priority	Occurs along the western Sierra primarily at low to mid-elevations and widely distributed throughout the southern coast ranges. Recent surveys have detected the species north to the Oregon border.	Found in a wide variety of habitats from desert scrub to montane conifer. Roosts and breeds in deep, narrow rock crevices, but also may use crevices in trees, buildings, and tunnels.	Low— uncommon in the Central Valley and roost sites primarily associated with crevices in cliff faces and boulders. No occurrences within 5 miles of the affected area.

Common and Scientific Names	Status[a] Federal/ State/Other	Geographic Distribution	Habitat Requirements	Potential Occurrence in Affected Area

[a] Status explanations:

Federal

E = listed as endangered under the Federal Endangered Species Act.

T = listed as threatened under the Federal Endangered Species Act.

C = candidate species for which USFWS has on file sufficient information on biological vulnerability and threat(s) to support issuance of a proposed rule to list, but issuance of the proposed rule is precluded.

– = no listing.

State

E = listed as endangered under the California Endangered Species Act.

T = listed as threatened under the California Endangered Species Act.

FP = fully protected under the California Fish and Game Code.

SSC = species of special concern in California.

– = no listing.

Other

WBWG = Western Bat Working Group 2007. Available: <http://www.wbwg.org/spp_matrix.html>.

Moderate priority = species status is unclear because of a lack of data; this designation indicates a level of concern that should warrant (1) closer evaluation and more research of the species and possible threats and (2) conservation actions benefiting the species.

High priority = species are imperiled or at high risk of imperilment.

Antioch Dunes Anthicid, Sacramento Anthicid, and Sacramento Valley Tiger Beetles

The Antioch Dunes anthicid beetle, Sacramento anthicid beetle, and Sacramento Valley tiger beetle are associated with sand dunes/bars and other sandy areas in riparian areas. The Antioch Dunes anthicid beetle actively scavenges on dead insects at night, burrowing into the sand and remaining inactive during the day. Sacramento anthicid beetles also scavenge dead insects. Adults of both species overwinter and emerge in the spring to lay eggs from which the larvae hatch, and the next generation of adults emerges in summer. Adults of Antioch Dunes and Sacramento anthicids are most commonly collected in June–July and June–August, respectively (California Department of Fish and Game 2012b).

There are CNDDB records from 1987 for occurrences of each anthicid beetle approximately 2 miles south of the southern extent of the project area. There are two CNDDB records from 1970 and 1984 for occurrences of Sacramento Valley tiger beetle 1–2 miles south of the southern extent of the affected area. No Sacramento Valley tiger beetles were found during intensive surveys in sandy areas in the floodplain of the Sacramento Valley during the period 2001–2004. This beetle may possibly be extirpated from the areas south of the affected area (California Department of Fish and Game 2012b). Suitable habitat for the three beetle species may be present in sandy riparian areas in the affected area.

Valley Elderberry Longhorn Beetle

VELB is found only in association with its host plant, elderberry, which is commonly found in riparian forests and adjacent uplands in the Central Valley and foothills (U.S. Fish and Wildlife Service 1999a). Elderberries often grow vegetatively from rhizomes, resulting in shrubs that frequently have common root systems with multiple main stems (Talley et al. 2006) and multiple root crowns. Adult VELBs feed on elderberry foliage and are present from March through early June, during which time the adults mate. Females lay their eggs in bark crevices or at the junction of stem/trunk or leaf petiole/stem. After hatching, the larva burrows into the stem to feed and develop into pupa and adult. After transforming into an adult, it chews an exit hole and emerges. The life cycle of VELB ranges from 1 to 2 years (Barr 1991:4–5).

The closest VELB occurrence in the CNDDB (California Department of Fish and Game 2012a) is approximately 0.5 mile from the affected area. Numerous other occurrences are located within 10 miles of the affected area. Suitable habitat for the beetle is located at numerous places in the affected area. A total of 190 shrubs/shrub clusters were mapped in the affected area (Plate 3.9-1). Because of the high density of California grape (*Vitis californica*) and Himalayan blackberry (*Rubus armeniacus*) along portions of the Feather River riparian corridor, the stems of 79 shrubs/shrub clusters could not be observed and stem counts (and exit hole inspections) of these shrubs could not be conducted. Another 13 shrubs that are outside of but within 100 feet of the maximum extent of the alternative boundaries were mapped, but stem counts/exit hole inspections could not be conducted because of a lack of property access.

Western Pond Turtle

Aquatic habitats used by western pond turtles include ponds, lakes, marshes, rivers, streams, and irrigation ditches with a muddy or rocky bottom in grassland, woodland, and open forest areas (Stebbins 2003:250). Western pond turtles spend a considerable amount of time basking on rocks, logs, emergent vegetation, mud or sand banks, or human-generated debris (Jennings et al. 1992:11).

Western pond turtles move to upland areas adjacent to watercourses to deposit eggs and overwinter (Jennings and Hayes 1994:98). Turtles have been observed overwintering several hundred meters from aquatic habitat. In the southern portion of the range and along the central coast, western pond turtles are active year-round. In the remainder of their range, these turtles typically become active in March and return to overwintering sites by October or November (Jennings et al. 1992:11).

There is one record of an occurrence of western pond turtle at the south end of the affected area. There are no additional records of occurrences within 5 miles of the affected area (California Department of Fish and Game 2012a). Irrigation and drainage canals and ponds in and adjacent to the affected area provide suitable aquatic habitat for western pond turtle. Riparian forest and some ruderal habitat adjacent to aquatic habitat provide suitable hibernacula and nesting habitat.

Giant Garter Snake

Giant garter snakes inhabit agricultural wetlands and other waterways, including irrigation and drainage canals, ricelands, marshes, sloughs, ponds, small lakes, and low-gradient streams, as well as adjacent upland areas. They do not occur in larger rivers and wetlands with sand, gravel, or rock substrates. Giant garter snake requires permanent water during its active season (early spring through mid-fall) to maintain dense populations of food organisms. The snake also requires herbaceous, emergent vegetation for protective cover and foraging habitat and open areas and grassy banks for basking. In addition, higher elevation upland habitats for cover and refuge from floodwaters are needed during the winter when the snake is inactive. Riparian woodland generally is considered unsuitable habitat because of the lack of basking sites, excessive shade, and lack of prey. Giant garter snakes begin to search for mates soon after emergence from overwintering sites. The breeding season extends from March through May and resumes briefly in September (U.S. Fish and Wildlife Service 1999b:12, 13, 22).

There are no records of occurrences of giant garter snake in the affected area; however, there are 20 records of occurrences within 5 miles of the affected area. The information for some of these records is suppressed, but the closest available occurrence is approximately 2 miles from the affected area (California Department of Fish and Game 2012a).

Potentially suitable aquatic habitat in the affected area consists primarily of irrigation and drainage canals. Ponds in the affected area may provide suitable aquatic habitat, but most do not have connectivity to other water features except the Feather River (which is not considered suitable habitat). There is limited suitable upland habitat (some ruderal areas) in the affected area and adjacent to the affected area. Consequently, giant garter snakes (if present) are expected primarily to be associated with aquatic features.

Swainson's Hawk

Swainson's hawks forage in grasslands, grazed pastures, alfalfa and other hay crops, and certain grain and row croplands. Vineyards, orchards, rice, and cotton crops are generally unsuitable for foraging because of the density of the vegetation (California Department of Fish and Game 1992:41). The majority of Swainson's hawks winter in South America, although some winter in the United States. Swainson's hawk arrives in California in early March to establish nesting territories and breed (California Department of Fish and Game 1994). They usually nest in large, mature trees. Most nest sites (87%) in the Central Valley are found in riparian habitats (Estep 1989:35), primarily because trees are more available there. Swainson's hawks also nest in mature roadside trees and in isolated trees in agricultural fields or pastures. The breeding season is from March through August (Estep 1989:12, 35).

Swainson's hawks were flying through the affected area during the 2011 field surveys. There are 12 records of Swainson's hawk nests in the affected area and within 0.5 mile of the affected area (California Department of Fish and Game 2012a). The majority of these records are for observations of nesting between 2001 and 2004. Ten of the reported nests are located south of Olivehurst. There are numerous additional records of occurrences within 5 miles of the affected area. The affected area and adjacent areas contain numerous suitable nest trees for Swainson's hawks. Field and row crops and ruderal areas provide suitable foraging habitat for Swainson's hawks in the affected area.

Northern Harrier

Northern harrier is a year-round resident throughout the Central Valley and is often associated with open grassland habitats and agricultural fields. Nests are found on the ground in tall, dense herbaceous vegetation (MacWhirter and Bildstein 1996). Northern harrier nests from April to September, with peak activity in June and July. The breeding population has been reduced, particularly along the southern coast, because of the destruction of wetland habitat, native grassland, and moist meadows and from the burning and plowing of nesting areas during early stages of breeding (Zeiner et al. 1990a:124).

There is one record of an occurrence of a nesting northern harrier within 5 miles of the affected area (California Department of Fish and Game 2012a). Northern harriers could forage in field and row crops and may nest in ruderal areas in the affected area.

White-Tailed Kite

White-tailed kites generally inhabit low-elevation grassland, savannah, oak woodland, wetland, agricultural, and riparian habitats. Some large shrubs or trees are required for nesting and for communal roosting sites. Nest trees range from small, isolated shrubs and trees to trees in relatively large stands (Dunk 1995:6, 8). White-tailed kites make nests of loosely piled sticks and twigs, lined with grass and straw, near the top of dense oaks, willows, and other tree stands. The breeding season lasts from February through October and peaks between May and August. They forage in undisturbed, open grassland, meadows, farmland, and emergent wetlands (Zeiner et al. 1990a:120).

There are no records of nesting white-tailed kites within 5 miles of the affected area (California Department of Fish and Game 2012a). The project area and adjacent areas contain numerous suitable nest trees for white-tailed kites. Field and row crops provide suitable foraging habitat for white-tailed kites in the affected area. Because white-tailed kite is fully protected, removal of occupied nest trees during the breeding season and activities that may result in loss of white-tailed kites are prohibited.

Bald Eagle

Bald eagle is a permanent resident and uncommon winter migrant in California (Zeiner et al. 1990a:122). The species breeds at coastal areas, rivers, lakes, and reservoirs with forested shorelines or cliffs in northern California. Wintering bald eagles are associated with aquatic areas containing some open water for foraging. Bald eagles nest in trees in mature and old growth forests that have some habitat edge and are somewhat close (within 1.25 miles) to water with suitable foraging opportunities. Although nests can be closer, the average distance of bald eagle nests to human development and disturbance is more than 1,640 feet (Buehler 2000:6). The breeding season is February through July (Zeiner et al. 1990a:122).

A bald eagle and a bald eagle nest were observed during the May 29–30, 2012, raptor survey. The nest is located in the northern portion of the project area, approximately 800 feet from the project site. It appears that this nest was identified in 2010 and documented in the CNDDB (California Department of Fish and Game 2012a). The Feather River provides suitable foraging habitat, and the riparian forest along the river provides suitable nesting habitat for bald eagles.

Western Yellow-Billed Cuckoo

Western yellow-billed cuckoo occurs at isolated sites in the Sacramento Valley in northern California and along the Kern and Colorado River systems in southern California during the breeding season and winters primarily in South America. Western yellow-billed cuckoos arrive at breeding grounds starting in mid- to late May and depart for wintering grounds between late August and mid-September. Once initiated, the breeding cycle is extremely rapid and requires only 17 days from egg-laying to fledging of young. Birds generally prefer open woodland with clearings and low, dense, scrubby vegetation often associated with watercourses. Western yellow-billed cuckoos occupy various woodlands, riparian forests, and thickets along streams and marshes, and successional shrubland. The suggested minimum patch size to benefit the species is approximately 50–100 acres, with a minimum width of 300 feet (Riparian Habitat Joint Venture 2004). Western yellow-billed cuckoos feed primarily on large insects, including caterpillars, katydids, cicadas, grasshoppers, and crickets in open areas, woodlands, orchards, and areas adjacent to streams (Hughes 1999).

There are two records (from 1976 and 1987) for occurrences of western yellow-billed cuckoo in the affected area (California Department of Fish and Game 2012a). The riparian forest in and adjacent to the affected area provides suitable nesting habitat for yellow-billed cuckoo. This bird also may forage throughout the affected area.

Western Burrowing Owl

Western burrowing owls prefer open grasslands and shrublands with perches and burrows. They usually live and nest in the old burrows of California ground squirrels or other small mammals (Zeiner et al. 1990a:332) but also can nest in piles of wood or other debris. Burrows can be found on the sides of hills, along roadside embankments, on levees, along irrigation canals, near fence lines, and on or near other raised areas of land. The breeding season for burrowing owls extends from March through August (Zeiner et al. 1990a:332).

There is one record of an occurrence of a burrowing owl within 5 miles of the northern extent of the affected area (California Department of Fish and Game 2012a). Field and row crops and ruderal areas provide suitable foraging habitat for burrowing owls. They also may nest in burrows in ruderal areas and along the edges of agricultural areas in the affected area.

Loggerhead Shrike

Loggerhead shrikes occur in open habitats with scattered trees, shrubs, posts, fences, utility lines, or other types of perches. Nests are built in trees or shrubs with dense foliage and are usually hidden well. Loggerhead shrikes search for prey from perches and frequently impale their prey on thorns, sharp twigs, or barbed-wire. The nesting period for loggerhead shrikes is March through June (Zeiner et al. 1990a:546).

There are no CNDDB records of loggerhead shrike nests within 5 miles of the project area (California Department of Fish and Game 2012a). However, the affected area is within the range of this species and contains suitable trees for nesting and suitable foraging habitat (field and row crops).

Purple Martin

Purple martins occur in valley foothill and montane hardwood, valley foothill and montane hardwood-conifer, riparian, and conifer habitats. They nest in old woodpecker cavities and in human-made structures such as bridges and culverts. Their breeding season is from April to August (Zeiner et al. 1990a:434).

There are no CNDDB records of purple martin nests within 5 miles of the affected area (California Department of Fish and Game 2012a). However, the affected area is within the range of this species and contains suitable nesting habitat (tree cavities and weep holes in bridges) and foraging habitat.

Bank Swallow

Bank swallows nest in burrows in erodible soils on vertical or near-vertical banks and bluffs in lowland areas dominated by rivers, streams, lakes, and oceans. Bank swallows generally dig new burrows each year, especially if the bank or cliff face used for nesting the previous year collapsed from erosion or human activities and no old burrows remain. They breed from April through July and depart for wintering grounds in South America between mid-August and mid-September. Foraging habitats include lakes, ponds, rivers and streams, meadows, fields, pastures, and occasionally forest and woodlands. Bank swallow is an aerial feeder, taking flying or jumping insects from dawn to dusk (Garrison 1999).

There are eight records of occurrences of bank swallows in and adjacent to the affected area (California Department of Fish and Game 2012a). Although bank swallows are unlikely to nest in the majority of the affected area, they may nest close to it. Suitable foraging habitat is present in and adjacent to the affected area.

Yellow Warbler

Yellow warbler is a migrant and summer resident from late March through early October in California. It is largely extirpated as a breeder in the Sacramento Valley. Yellow warblers are found in riparian vegetation near streams and meadows. The breeding season is from April through late July (Shuford and Gardali 2008:332–334). Nests are generally placed 2–16 feet above the ground in young deciduous trees or in shrubs (Zeiner et al. 1990a:568). They will make several attempts at nesting throughout the season, but typically only produce one group of hatchlings per year (Shuford and Gardali 2008:336).

There are no records of occurrences of yellow warbler within 5 miles of the affected area (California Department of Fish and Game 2012a). The riparian forest in the affected area provides suitable nesting and foraging habitat for yellow warbler.

Tricolored Blackbird

Tricolored blackbird is a highly colonial species that is largely endemic to California. Tricolored blackbird breeding colony sites require open, accessible water; a protected nesting substrate, including either flooded, thorny, or spiny vegetation; and a suitable foraging space providing adequate insect prey within a few miles of the nesting colony. Tricolored blackbird breeding colonies occur in freshwater marshes dominated by tules (*Scirpus* spp.) and cattails (*Typha* spp.), in Himalayan blackberries (*Rubus armeniacus*), and in silage and grain fields (Beedy and Hamilton 1997:3–4). The breeding season is from late February to early August (Beedy and Hamilton 1999). Tricolored blackbird foraging habitats in all seasons include annual grasslands, dry seasonal pools, agricultural fields (such as large tracts of alfalfa with continuous mowing schedules, and recently tilled fields), cattle feedlots, and dairies. Tricolored blackbirds also forage occasionally in riparian scrub habitats and along marsh borders. Weed-free row crops and intensively managed vineyards and orchards do not serve as regular foraging sites. Most tricolored blackbirds forage within 3 miles of their colony sites but commute distances of up to 8 miles have been reported (Beedy and Hamilton 1997:5).

There are seven records of occurrences of tricolored blackbird breeding sites within 5 miles of the affected area (California Department of Fish and Game 2012a). Suitable breeding habitat for tricolored blackbirds may be present in or adjacent to the affected area. Tricolored blackbirds may forage in field and row crops in the affected area.

Western Red Bat

Western red bat occurs throughout much of California at lower elevations. It is found primarily in riparian and wooded habitats but also occurs seasonally in urban areas (Brown and Pierson 1996). Western red bats roost in the foliage of trees that often are located on the edge of habitats adjacent to streams, fields, or urban areas. This species breeds in August and September, and young are born in May through July (Zeiner et al. 1990b:60).

There are no CNDDB records of occurrences of western red bat within 5 miles of the affected area (California Department of Fish and Game 2012a), most likely because of a lack of survey data. Riparian forest and orchards in the affected area provide suitable roosting habitat for western red bat. Suitable foraging habitat is located throughout the affected area.

Hoary Bat

Hoary bats occur throughout California but are thought to have a patchy distribution in the southeastern deserts (Zeiner et al. 1990b:62). Hoary bats are found primarily in forested habitats, including riparian forests, and may occur in park and garden settings in urban areas. Day roost sites are in the foliage of coniferous and deciduous trees (Brown and Pierson 1996). Woodlands with medium to large trees with dense foliage provide suitable maternity roost sites (Zeiner et al. 1990b:62). Mating occurs in the fall, and after delayed fertilization, young are born May–June (Zeiner et al. 1990b:62; Brown and Pierson 1996).

There are no CNDDB records of occurrences of hoary bats within 5 miles of the affected area (California Department of Fish and Game 2012a), most likely because of a lack of survey data. Riparian forest in the affected area provides suitable roosting habitat, and suitable foraging habitat is located throughout the affected area.

Silver-Haired Bat

Silver-haired bats occur primarily in the northern portion of California and at higher elevations in the southern and coastal mountain ranges (Brown and Pierson 1996) but may occur anywhere in California during their spring and fall migrations. They are associated with coastal and montane coniferous forests, valley foothill woodlands, pinyon-juniper woodlands, and valley foothill and montane riparian habitats (Zeiner et al. 1990b:54). Silver-haired bats roost in trees almost exclusively in the summer, and maternity roosts typically are located in woodpecker hollows. Maternal colonies range from several to about 75 individuals (Brown and Pierson 1996). Mating occurs in the fall, and after delayed fertilization, young are born June–July (Zeiner et al. 1990b:54; Brown and Pierson 1996). Winter roost sites include hollow trees, rock crevices, mines, caves, and houses. They also have been found hibernating in leaf litter (Brown and Pierson 1996).

There is one record of an occurrence of silver-haired bat within 5 miles of the affected area (California Department of Fish and Game 2012a). Riparian forest in the affected area provides suitable roosting habitat, and suitable foraging habitat is located throughout the affected area.

Pallid Bat

Pallid bat is found throughout most of California at low to middle elevations (6,000 feet). Pallid bats are found in a variety of habitats, including desert, brushy terrain, coniferous forest, and non-coniferous woodlands. In central and northern California, the species is associated with oak, ponderosa pine, redwood, and giant sequoia habitats. Pallid bats forage among vegetation and above the ground surface, eating large ground-dwelling arthropods and large moths. Daytime roost sites include rock outcrops, mines, caves, hollow trees, buildings, and bridges. Night roosts are commonly under bridges but are also in caves and mines (Brown and Pierson 1996). Hibernation may occur during late November through March. Pallid bats breed from late October through February (Zeiner et al. 1990b:70), and one or two young are born in May or June (Brown and Pierson 1996).

There are no CNDDB records of occurrences for pallid bat within 5 miles of the affected area (California Department of Fish and Game 2012a). Riparian forest in the affected area provides suitable nesting and foraging habitat for this species.

3.9.3 Environmental Consequences

This section describes the environmental consequences relating to wildlife for the proposed project. It describes the methods used to determine the effects of the project and lists the thresholds used to conclude whether an effect would be significant. The effects that would result from implementation of the project, findings with or without mitigation, and applicable mitigation measures are presented in a table under each alternative.

3.9.3.1 Assessment Methods

This evaluation of wildlife is based on professional standards and information cited throughout the section. The key effects were identified and evaluated based on the environmental characteristics of the project area and the expected magnitude, intensity, and duration of activities related to the construction and operation of this project.

Potential direct effects (permanent and temporary) on wildlife habitat were quantified based on estimated habitat losses within proposed construction footprints and staging areas by alternative. Potential indirect effects of each project alternative were evaluated more qualitatively because they would occur farther from the project area or later in time, and are more difficult to evaluate quantitatively. As mentioned above, borrow sites recently were identified and have not been surveyed yet. Depending on the habitats present at these sites, additional wildlife species may be affected. Information collected during surveys will be needed to determine effects and appropriate mitigation measures.

Effect Mechanisms

The following project-related activities could affect wildlife resources in the affected area either directly or indirectly. Direct effects can be either temporary (return to baseline conditions within a year of disturbance) or permanent in duration. These effects were used to assess effects on wildlife resources.

Direct Effects

Direct effects on wildlife could be caused by the following actions.

- Vegetation clearing (including tree removal), grading, excavating/trenching, and paving activities during construction.
- Temporary stockpiling and sidecasting of soil, construction materials, or other construction wastes, and soil-bentonite mixing basins.
- Excavation of borrow material offsite.
- Soil compaction, dust, and water runoff from the construction site.
- Increased vehicle traffic.
- Short-term construction-related noise (from equipment) and visual disturbance.
- Degradation of water quality in drainages and other water bodies resulting from construction runoff containing petroleum products.

Indirect Effects

Indirect effects on wildlife could be caused by the following actions.

- Permanent alterations to light and noise levels.
- Alterations to hydrology.
- Damage through toxicity associated with herbicides and rodenticides.
- Introduction of invasive (nonnative) species.

3.9.3.2 Determination of Effects

For this analysis, an effect pertaining to wildlife was analyzed under NEPA and CEQA if it would result in any of the following environmental effects, which are based on NEPA standards, State CEQA Guidelines Appendix G (14 CCR 15000 et seq.), and standards of professional practice.

- Have a substantial significant effect, either directly or through habitat modification, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations or by DFG or USFWS.
- Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.
- Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.

- Conflict with the provisions of an adopted habitat conservation plan, natural communities conservation plan, or other approved local, regional, or state habitat conservation plan.
- Contribute to a substantial reduction or elimination of species diversity or abundance.

Qualitative relationships between environmental conditions during and after construction and the biology of the animal species affected are the basis of the effect assessment. Cause and effect relationships are identified for assessed species, including the relationship between environmental conditions and habitat, and the effects of changes in habitat on survival.

The effect analysis quantifies direct effects on wildlife based on habitat losses and other quantifiable habitat changes (noise, dust, hydrology, etc.) and is based on site-specific information. The mitigation measures described for potential effects on sensitive wildlife resources have not been developed through formal consultation or coordination with resource agencies (DFG, USFWS, NMFS, USACE) but are based on standard agency-approved guidelines and recommendations, and standards of professional practice when guidelines and recommendations are not available.

3.9.4 Effects and Mitigation Measures

Effects and mitigation measure requirements concerning wildlife resources are summarized in Table 3.9-3.

Table 3.9-3. Summary of Effects for Wildlife

Effect	Finding	Mitigation Measure	With Mitigation
Alternatives 1, 2, and 3			
Effect WILD-1: Potential Mortality of or Loss of Habitat for Antioch Dunes Anthicid, Sacramento Anthicid, and Sacramento Valley Tiger Beetle	Significant	WILD-MM-1: Conduct Focused Surveys for Habitat for Antioch Dunes Anthicid, Sacramento Anthicid, and Sacramento Valley Tiger Beetle and Implement Protective Measures	Less than significant
Effect WILD-2: Potential Mortality or Disturbance of VELB and its Habitat (Elderberry Shrubs)	Significant	WILD-MM-2: Implement Protective Measures and Compensate for Effects on VELB and its Habitat	Less than significant
Effect WILD-3: Potential Mortality or Disturbance of Western Pond Turtle	Significant	WILD-MM-3: Conduct Preconstruction Surveys for Western Pond Turtle and Monitor Construction Activities if Turtles are Observed	Less than significant
Effect WILD-4: Potential Disturbance or Mortality of and Loss of Suitable Habitat for Giant Garter Snake	Significant	WILD-MM-4: Avoid and Minimize Effects on Giant Garter Snake WILD-MM-5: Compensate for Loss of Suitable Giant Garter Snake Habitat	Less than significant
Effect WILD-5: Potential Loss or Disturbance of Nesting Swainson's Hawk and Loss of Nesting and Foraging Habitat	Significant	WILD-MM-6: Conduct Vegetation Removal Activities outside the Breeding Season for Birds WILD-MM-7: Conduct Focused Surveys for Nesting Swainson's Hawk prior to Construction and Implement Protective Measures during Construction WILD-MM-8: Compensate for the Loss of Foraging Habitat for Swainson's Hawk	Less than significant

Effect	Finding	Mitigation Measure	With Mitigation
Effect WILD-6: Potential Mortality or Disturbance of Nesting Special-Status and Non–Special Status Birds and Removal of Suitable Breeding Habitat	Significant	WILD-MM-6: Conduct Vegetation Removal Activities outside the Breeding Season for Birds WILD-MM-90: Conduct Nesting Surveys for Special-Status and Non–Special Status Birds and Implement Protective Measures during Construction	Less than significant
Effect WILD-7: Potential Loss or Disturbance of Western Burrowing Owl and Loss of Nesting and Foraging Habitat	Significant	WILD-6: Conduct Vegetation Removal Activities outside the Breeding Season for Birds WILD-MM-10: Conduct Surveys for Western Burrowing Owl prior to Construction and Implement Protective Measures if Found WILD-MM-11: Compensate for the Loss of Occupied Burrowing Owl Habitat	Less than significant
Effect WILD-8: Potential Injury, Mortality or Disturbance of Tree-Roosting Bats and Removal of Roosting Habitat	Significant	WILD-MM-6: Conduct Vegetation Removal Activities outside the Breeding Season for Birds WILD-MM-12: Conduct Preconstruction Surveys for Roosting Bats and Implement Avoidance and Protective Measures	Less than significant
Effect WILD-9: Disturbance to or Loss of Common Wildlife Species and Their Habitats	Less than significant	None required	Less than significant
Effect WILD-10: Potential Disruption of Wildlife Movement Corridors	Less than significant	None required	Less than significant
Effect WILD-11: Conflict with Provisions of an Adopted HCP/NCCP or other Approved Local, Regional, or State Habitat Conservation Plan	No effect	None required	No effect

3.9.4.1 No Action Alternative

The No Action Alternative represents the continuation of the existing deficiencies in levees along 44 miles of the west bank of the Feather River between the Sutter Bypass and Thermalito Afterbay. Current levee O&M activities would continue, but there would be no change in the geomorphic and flood control regimes relative to existing conditions. No construction-related effects on wildlife, such as displacement or loss of habitat, would occur.

Because no levee improvements would be made under the No Action Alternative, the risk that the levees along the west bank of the Feather River could fail because of seepage or slope stability/geometry issues would continue. A catastrophic levee failure would result in flooding and inundation that could significantly affect wildlife and their upland or wetland habitats, resulting in mortality of individuals, physical displacement, and temporary loss or permanent alterations of habitat. In addition, cleanup and repair activities could result in physical displacement for extended periods of time and significant effects on habitat. A major flood event along the Feather River corridor could result in damage to the riparian forest between the river and the levees. Given the importance of this riparian corridor for numerous special-status species and for the Pacific flyway (a major travel route for migratory birds in North America) in general, loss or fragmentation of this habitat would be a significant effect, and it could take decades for a mature riparian forest to reestablish itself in the affected areas. Given the uncertainty of the occurrence or magnitude of such an event, potential effects on wildlife and their habitats cannot be quantified based on available information.

3.9.4.2 Alternative 1

Alternative 1 addresses deficiencies in the levee primarily using cutoff walls such that increases in the overall footprint of the levee are minimized. Implementation of Alternative 1 would potentially result in effects on wildlife resources. These potential effects and related mitigation measure requirements are summarized in Table 3.9-4 and discussed below. A summary of effects on land cover and habitats for special-status wildlife for Alternative 1 is shown in Table 3.9-5.

Table 3.9-4. Wildlife Effects and Mitigation Measures for Alternative 1

Effect	Finding	Mitigation Measure	With Mitigation
Effect WILD-1: Potential Mortality of or Loss of Habitat for Antioch Dunes Anthicid, Sacramento Anthicid, and Sacramento Valley Tiger Beetle	Significant	WILD-MM-1: Conduct Focused Surveys for Habitat for Antioch Dunes Anthicid, Sacramento Anthicid, and Sacramento Valley Tiger Beetle and Implement Protective Measures	Less than significant
Effect WILD-2: Potential Mortality or Disturbance of VELB and its Habitat (Elderberry Shrubs)	Significant	WILD-MM-2: Implement Protective Measures and Compensate for Effects on VELB and its Habitat	Less than significant
Effect WILD-3: Potential Mortality or Disturbance of Western Pond Turtle	Significant	WILD-MM-3: Conduct Preconstruction Surveys for Western Pond Turtle and Monitor Construction Activities if Turtles are Observed	Less than significant
Effect WILD-4: Potential Disturbance or Mortality of and Loss of Suitable Habitat for Giant Garter Snake	Significant	WILD-MM-4: Avoid and Minimize Effects on Giant Garter Snake WILD-MM-5: Compensate for Loss of Suitable Giant Garter Snake Habitat	Less than significant
Effect WILD-5: Potential Loss or Disturbance of Nesting Swainson's Hawk and Loss of Nesting and Foraging Habitat	Significant	WILD-MM-6: Conduct Vegetation Removal Activities outside the Breeding Season for Birds WILD-MM-7: Conduct Focused Surveys for Nesting Swainson's Hawk prior to Construction and Implement Protective Measures during Construction WILD-MM-8: Compensate for the Loss of Foraging Habitat for Swainson's Hawk	Less than significant
Effect WILD-6: Potential Mortality or Disturbance of Nesting Special-Status and Non–Special Status Birds and Removal of Suitable Breeding Habitat	Significant	WILD-MM-6: Conduct Vegetation Removal Activities outside the Breeding Season for Birds WILD-MM-90: Conduct Nesting Surveys for Special-Status and Non–Special Status Birds and Implement Protective Measures during Construction	Less than significant

Effect	Finding	Mitigation Measure	With Mitigation
Effect WILD-7: Potential Loss or Disturbance of Western Burrowing Owl and Loss of Nesting and Foraging Habitat	Significant	WILD-6: Conduct Vegetation Removal Activities outside the Breeding Season for Birds WILD-MM-10: Conduct Surveys for Western Burrowing Owl prior to Construction and Implement Protective Measures if Found WILD-MM-11: Compensate for the Loss of Occupied Burrowing Owl Habitat	Less than significant
Effect WILD-8: Potential Injury, Mortality or Disturbance of Tree-Roosting Bats and Removal of Roosting Habitat	Significant	WILD-MM-6: Conduct Vegetation Removal Activities outside the Breeding Season for Birds WILD-MM-12: Conduct Preconstruction Surveys for Roosting Bats and Implement Avoidance and Protective Measures	Less than significant
Effect WILD-9: Disturbance to or Loss of Common Wildlife Species and Their Habitats	Less than significant	None required	Less than significant
Effect WILD-10: Potential Disruption of Wildlife Movement Corridors	Less than significant	None required	Less than significant
Effect WILD-11: Conflict with Provisions of an Adopted HCP/NCCP or other Approved Local, Regional, or State Habitat Conservation Plan	No effect	None required	No effect

Table 3.9-5. Effects on Special-Status Species Habitat for Alternative 1

Special-Status Species	Habitat	Permanent/Temporary (acres)
Antioch Dunes anthicid, Sacramento anthicid, and Sacramento Valley tiger beetle	Sandy riparian areas	0/0
Valley elderberry longhorn beetle	Elderberry shrubs	90/72*
Giant garter snake and western pond turtle aquatic habitat	Drainage ditch, freshwater emergent, irrigation ditch, open water	0.96/0
Giant garter snake upland habitat	Ruderal within 200 feet of aquatic habitat	4.17/0
Swainson's hawk, white-tailed kite, bald eagle, western yellow-billed cuckoo, purple martin, yellow warbler, and other birds nesting and foraging habitat	Riparian forest	13.03/0.47
Swainson's hawk, white-tailed kite, northern harrier, burrowing owl, and tricolored blackbird foraging habitat	Field and row crops and ruderal	568.37/10.65
Bank swallow	Bluffs and banks of streams/ levees adjacent to water	0/0
Bat roosting habitat	Riparian forest and orchard	265.62/27.89

*For valley elderberry longhorn beetle, effects are given in numbers of shrubs, not acres.

The following mitigation measures described in Section 3.8, *Vegetation and Wetlands,* would apply to the wildlife resources discussed below and would be implemented to avoid and minimize affects on special-status wildlife.

Mitigation Measure VEG-MM-2: Install Exclusion Fencing and/or K-rails along the Perimeter of the Construction Work Area and Implement General Measures to Avoid Effects on Sensitive Natural Communities and Special-Status Species

Mitigation Measure VEG-MM-3: Conduct Mandatory Contractor/Worker Awareness Training for Construction Personnel

Mitigation Measure VEG-MM-4: Retain a Biological Monitor

For brevity, these measures are not repeated for each species or group of species discussed below.

Effect WILD-1: Potential Mortality of or Loss of Habitat for Antioch Dunes Anthicid, Sacramento Anthicid, and Sacramento Valley Tiger Beetle

Construction activities that remove or disturb sandy riparian areas could result in the mortality of larvae or adults of Antioch Dunes anthicid, Sacramento anthicid, and Sacramento Valley tiger beetle. Beetles could be crushed by construction equipment or personnel, and suitable habitat could be modified or removed during ground-disturbing activities. Because these beetle species are rare and are only known from few locations in the project vicinity, loss of individuals and modification or removal of habitat would be considered significant effects. Implementation of the following mitigation measures would reduce these effects to less than significant.

Mitigation Measure WILD-MM-1: Conduct Focused Surveys for Habitat for Antioch Dunes Anthicid, Sacramento Anthicid, and Sacramento Valley Tiger Beetle and Implement Protective Measures

Wildlife biologists will conduct surveys for suitable habitat for Antioch Dunes anthicid, Sacramento anthicid, and Sacramento Valley tiger beetle. The biologists will map these areas using a GPS unit. If possible, these areas will be avoided during construction. If avoidance is not possible, a qualified entomologist will survey the suitable habitat areas for the presence of these three beetle species to determine their presence. If recommended by the entomologist and supported by the wildlife agencies, the beetles may be relocated to suitable habitat prior to the start of construction in the habitat to be affected.

Effect WILD-2: Potential Mortality or Disturbance of VELB and its Habitat (Elderberry Shrubs)

Elderberry shrubs, which provide habitat for the VELB, would be removed or disturbed by activities associated with construction of Alternative 1 (Table 3.9-5). Removal or disturbance of elderberry shrubs could result in the mortality or disturbance of VELB. Noise and dust generated during construction also may directly affect adult VELB or exposed larvae or eggs (Talley and Holyoak 2009:10). Soil disturbance adjacent to shrubs may affect the roots and subsequent health of elderberry shrubs. Shrubs located farther from the construction area and those sheltered by surrounding vegetation are expected to have fewer construction-related effects than shrubs that are closer to the construction area and in more open areas. The removal or disturbance of

162 elderberry shrubs would be considered a significant effect on VELB. Implementation of the following mitigation measures would reduce this effect to a less-than-significant level.

Mitigation Measure WILD-MM-2: Implement Protective Measures and Compensate for Effects on VELB and its Habitat

Complete avoidance of effects on VELB is assumed when a 100-foot buffer around elderberry shrubs is established and maintained during construction (U.S. Fish and Wildlife Service 1999a). Elderberry shrubs in the construction area that cannot be protected will be transplanted between November 1 and February 14 in accordance with to USFWS-approved procedures outlined in the Conservation Guidelines for the Valley Elderberry Longhorn Beetle (U.S. Fish and Wildlife Service 1999a). Removal of elderberry shrubs requires consultation with USFWS under Section 7 or 10 and compensation, as outlined in USFWS's guidelines. Elderberry shrubs within 100 feet of the construction area that will not be removed will be protected with orange construction barrier fencing. The width of the buffer from the dripline of elderberry shrubs will be determined through consultation with USFWS. No construction activities will be permitted in the buffer zone other than those activities necessary to erect the fencing. Signs will be posted along fencing for the duration of construction and will contain the following information.

This area is habitat of the valley elderberry longhorn beetle, a threatened species, and must not be disturbed. This species is protected by the Endangered Species Act of 1973, as amended. Violators are subject to prosecution, fines, and imprisonment.

Buffer area fences around elderberry shrubs will be inspected weekly by a qualified biologist during ground-disturbing activities and monthly after ground-disturbing activities until project construction is complete or until the fences are removed, as approved by the biological monitor and the resident engineer. The biological monitor will be responsible for ensuring that the contractor maintains the buffer area fences around elderberry shrubs throughout construction. Biological inspection reports will be provided to the project lead and USFWS.

SBFCA will ensure that the project site will be watered down as necessary to prevent dust from becoming airborne and accumulating on elderberry shrubs in and adjacent to the project site.

Effect WILD-3: Potential Mortality or Disturbance of Western Pond Turtle

Aquatic and upland (overwintering, nesting) habitat for western pond turtle may be removed or temporarily disturbed by construction activities. Western pond turtles may be killed, injured, or disturbed by activities that remove suitable aquatic or upland habitat. Construction activities (such as grading and movement of heavy equipment) could result in the destruction of pond turtle nests containing eggs or young individuals if affected areas are being used for egg deposition. Declines in populations of western pond turtles throughout the species range have been documented (Jennings and Hayes 1994). Loss of individuals in the project area could diminish the local population and lower reproductive potential, which could contribute to the further decline of this species. The loss of upland nesting sites or eggs also would decrease the local population. This effect would be significant, but implementation of the following mitigation measure would reduce this effect to a less-than-significant level.

Mitigation Measure WILD-MM-3: Conduct Preconstruction Surveys for Western Pond Turtle and Monitor Construction Activities if Turtles are Observed

One week before and within 24 hours of beginning work in suitable aquatic habitat, a qualified biologist (one who is familiar with different species of turtles) will conduct surveys for western pond turtle. The surveys should be timed to coincide with the time of day and year when turtles are most likely to be active (during the cooler part of the day between 8 a.m. and 12 p.m. during spring and summer). Prior to conducting the surveys, the biologist should locate the microhabitats for turtle basking (logs, rocks, brush thickets) and determine a location to quietly observe turtles. Each survey should include a 30-minute wait time after arriving on site to allow startled turtles to return to open basking areas. The survey should consist of a minimum 15-minute observation time per area where turtles could be observed. If western pond turtles are observed during either survey, a biological monitor should be present during construction activities in the aquatic habitat where the turtle was observed and will capture and remove, if possible, any entrapped turtle. The biological monitor also will be mindful of suitable nesting and overwintering areas in proximity to suitable aquatic habitat and periodically inspect these areas for nests and turtles. The biological monitor's DFG scientific collecting permit will include capture and relocation of turtles.

Effect WILD-4: Potential Disturbance or Mortality of and Loss of Suitable Habitat for Giant Garter Snake

Construction of Alternative 1 would result in temporary and permanent losses of suitable aquatic and upland habitat for giant garter snake. Construction activities in suitable habitat could result in the injury, mortality, or disturbance of giant garter snakes, which requires consultation with USFWS under Section 7 and compensation, as outlined in the Programmatic Formal Consultation for U.S. Army Corps of Engineers 404 Permitted Projects with Relatively Small Effects on the Giant Garter Snake within Butte, Colusa, Glenn, Fresno, Merced, Sacramento, San Joaquin, Solano, Stanislaus, Sutter, and Yolo Counties, California (Programmatic Consultation) (U.S. Fish and Wildlife Service 1997). Loss of habitat and potential injury or mortality of snakes are considered significant effects because the project could reduce the local population size of a federally and state-listed species. This effect would be significant, but implementation of the following mitigation measure would reduce this effect to a less-than-significant level.

Mitigation Measure WILD-MM-4: Avoid and Minimize Effects on Giant Garter Snake

The following measures will be implemented to avoid, minimize, and compensate for effects on giant garter snake and its habitat.

- To the maximum extent possible, all construction activity in giant garter snake aquatic and upland habitat within 200 feet of aquatic habitat will be conducted during the snake's active period (between May 1 and October 1). During this timeframe, potential for injury and mortality are lessened because snakes are actively moving and avoiding danger. Giant garter snakes are more vulnerable to danger during their inactive period because they are occupying underground burrows or crevices and are more susceptible to direct effects, especially during excavation. Small irrigation ditches on the landside of the levee that need to be moved outward from the existing levee will be completely dried, removed, and relocated during the May 1–October 1 timeframe.

- For work that cannot be conducted between May 1 and October 1, additional protective measures will be determined during consultation with USFWS.
- To reduce the likelihood of snakes entering the construction area, SBFCA will install exclusion fencing and orange barrier fencing along the edge of the construction area that is within 200 feet of suitable habitat. The exclusion and barrier fencing will be installed during the active period for giant garter snakes (May 1 to October 1) to reduce the potential for injury and mortality during this activity. The barrier fencing will consist of 3- to 4-foot-tall erosion fencing buried at least 6–8 inches below ground level. The barrier fencing will ensure that giant garter snakes are excluded from the construction area and that suitable upland and aquatic habitat is protected throughout construction.
- A USFWS-approved biologist will conduct a preconstruction survey in suitable habitat no more than 24 hours before construction. Prior to construction activities each morning, construction personnel will inspect exclusion and orange barrier fencing to ensure they are both in good working order. If any snakes are observed in the construction area during this inspection or at any other time during construction, the USFWS-approved biologist will be contacted to survey the site for snakes. The project area will be re-inspected and surveyed whenever a lapse in construction activity of 2 weeks or more has occurred. If a snake (believed to be a giant garter snake) is encountered during construction, activities will cease until appropriate corrective measures have been completed or it has been determined that the snake will not be harmed.
- Vegetation clearing within 200 feet of the banks of suitable giant garter snake aquatic habitat will be limited to the minimum area necessary. Avoided giant garter snake habitat within or adjacent to the project area will be flagged and designated as an environmentally sensitive area, to be avoided by all construction personnel.
- The movement of heavy equipment within 200 feet of the banks of potential giant garter snake aquatic habitat will be confined to designated haul routes to minimize habitat disturbance.

Mitigation Measure WILD-MM-5: Compensate for Loss of Suitable Giant Garter Snake Habitat

Compensation for effects on giant garter snake aquatic and upland habitat would follow the guidance in the Programmatic Consultation. To compensate for the direct and indirect effects on habitat for giant garter snake, SBFCA will acquire a fee title or conservation easement for an offsite location. If an offsite location is not logistically feasible, alternative options will be investigated, such as purchasing mitigation credits at a USFWS- and DFG-approved conservation bank (if available), or contributing to an in-lieu species fund. Final acreage effects based on the 65% project design will be submitted to the USFWS and DFG to assess the final required mitigation.

Effect WILD-5: Potential Loss or Disturbance of Nesting Swainson's Hawk and Loss of Nesting and Foraging Habitat

Construction is anticipated to occur between April 15 and November 30, which is during the breeding season of Swainson's hawks (March through August). Construction activities and removal of trees could result in the loss or disturbance of Swainson's hawk during the nesting season. Removal of nests or suitable nesting habitat and construction disturbance during the breeding season could result in the incidental loss of fertile eggs or nestlings or otherwise lead to nest abandonment. Removal of active nest trees or anticipated disturbance that may result in nest abandonment would require an incidental take permit from DFG. Effects on potential nesting habitat (riparian forest) and foraging habitat (row/field crops and ruderal grassland) for Swainson's hawk are shown in Table 3.9-5. Because the availability of foraging habitat has been closely tied to the breeding success of this species, projects that would significantly modify suitable Swainson's hawk foraging habitat are considered to have potential to significantly affect this species (California Department of Fish and Game 1994). Loss of Swainson's hawk eggs or nests, any activities resulting in nest abandonment, and loss of nesting and foraging habitat would be considered significant effects. Implementation of Mitigation Measure VEG-MM-1, Compensate for the Loss of Woody Riparian Habitat, would compensate for the loss of potential nesting habitat for Swainson's hawk. Implementation of the following mitigation measures would reduce these effects to a less-than-significant level.

Mitigation Measure WILD-MM-6: Conduct Vegetation Removal Activities outside the Breeding Season for Birds

To the maximum extent feasible, SBFCA will schedule vegetation (trees, shrubs, ruderal areas) removal/trimming during the nonbreeding season of birds (September 1–January 31). If vegetation removal cannot be removed in accordance with this timeframe, preconstruction surveys for nesting birds and additional protective measures will be implemented (see Mitigation Measure WILD-MM-9). SBFCA will not remove trees with active Swainson's hawk nests and will make every effort to avoid removal of trees with active raptors. Because white-tailed kite is fully protected, removal of trees with active nests and activities that may result in loss of white-tailed kites are prohibited.

Mitigation Measure WILD-MM-7: Conduct Focused Surveys for Nesting Swainson's Hawk Prior to Construction and Implement Protective Measures during Construction

During the spring prior to construction, focused surveys for Swainson's hawk will be conducted in the project area and in a buffer area up to 0.5 mile around the project area. The size of the buffer area surveyed will be based on the type of habitat present and line of sight from the construction area to surrounding suitable breeding habitat. Buffer areas containing unsuitable nesting habitat and/or with an obstructed line of sight to the project area will not be surveyed. Biologists will focus on suitable nest trees within and immediately adjacent to the project area that have the highest likelihood for disturbance. The number of surveys needed to determine the status of nesting will be dependent on the conditions during the surveys and behavior of the hawks. If needed, biologists will coordinate with DFG regarding the extent and number of surveys. Surveys would generally be conducted between February and July. Survey methods and results will be reported to DFG.

If active nests are found, SBFCA will maintain a 0.25-mile buffer or other distance determined appropriate through consultation with DFG, between construction activities and the active nest(s) until it has been determined that young have fledged. In addition, a qualified biologist (experienced with raptor behavior) will be present on site (daily) during construction activities occurring during the breeding season to watch for any signs of stress. If nesting birds are observed to exhibit agitated behavior indicating that they are experiencing stress, construction activities will cease until the qualified biologist, in consultation with DFG, determines that young have fledged.

Mitigation Measure WILD-MM-8: Compensate for the Loss of Foraging Habitat for Swainson's Hawk

Removal of suitable foraging habitat for Swainson's hawks will be mitigated by providing offsite habitat management lands as described in DFG's Staff Report Regarding Mitigation for Impacts to Swainson's Hawks in the Central Valley of California (California Department of Fish and Game 1994). The final acreage of off-site management lands to be provided will depend on the distance between the project area and the nearest active nest site. The mitigation ratio varies from 0.5:1 to 1:1 of habitat preserved for each acre lost. If acceptable to DFG, SBFCA also may be able to purchase mitigation credits for Swainson's hawk foraging habitat from a DFG-approved mitigation or conservation bank. Information on the nearest nest will be collected during Swainson's hawk surveys conducted under Mitigation Measure WILD-MM-7, discussed above, to determine the appropriate mitigation ratio. If no active nests are found during this survey, a search of the CNDDB will be conducted, and DFG will be contacted to determine the nearest active nest.

Effect WILD-6: Potential Mortality or Disturbance of Nesting Special-Status and Non–Special Status Birds and Removal of Suitable Breeding Habitat

Special-status birds that may nest in the riparian forest in and adjacent to the affected area include white-tailed kite, bald eagle, western yellow-billed cuckoo, purple martin, and yellow warbler. Bank swallow may nest adjacent to the affected area in the banks of the Feather River. Northern harrier may nest in ruderal areas in the affected area. Loggerhead shrike may nest in shrubs and trees in more open portions of the affected area. Tricolored blackbirds may nest in blackberry brambles or field crops. Numerous non–special status birds also may nest in these areas. Because construction is anticipated to occur between April 15 and November 30, effects on nesting birds may occur. Vegetation removal and other construction activities during the breeding season (generally February 1 through August 31) could result in the mortality or disturbance of nesting birds in and adjacent to the construction area. The removal of riparian forest, ruderal areas, and field crops would reduce the amount of available nesting habitat for special-status and non–special status birds.

Removal of nest trees during the breeding season or anticipated disturbance that may result in nest abandonment and subsequent loss of eggs or young of bald eagle, western yellow-billed cuckoo, or bank swallow would require an incidental take permit from DFG. Because white-tailed kite is fully protected, removal of trees with active nests and activities that may result in loss of white-tailed kites are prohibited. Removal of nests or suitable nesting habitat (trees, shrubs, ruderal areas, field crops) and construction disturbance during the breeding season could result in the incidental loss of fertile eggs or nestlings or otherwise lead to nest abandonment. Such losses could affect the local population of special-status and non–special status species and would be considered a significant effect. Implementation of Mitigation Measure WILD-MM-6, and the mitigation measure below, would reduce this effect to a less-than-significant level.

Mitigation Measure WILD-MM-9: Conduct Nesting Surveys for Special-Status and Non–Special Status Birds and Implement Protective Measures during Construction

SBFCA will retain qualified wildlife biologists with knowledge of the relevant species to conduct nesting surveys before the start of construction. A minimum of three separate surveys will be conducted between February 1 and June 1. Surveys will include a search of all suitable nesting habitat (trees, shrubs, ruderal areas, field crops) in the construction area. In addition, a 500-foot area around the project area will be surveyed for nesting raptors, and a 50-foot buffer area will be surveyed for other nesting birds. If no active nests are detected during these surveys, no additional measures are required.

If active nests are found in the survey area, no-disturbance buffers will be established around the nest sites to avoid disturbance or destruction of the nest site until the end of the breeding season (approximately September 1) or until a qualified wildlife biologist determines that the young have fledged and moved out of the project area (this date varies by species). The extent of the buffers will be determined by the biologists in coordination with USFWS and DFG and will depend on the level of noise or construction disturbance, line-of-sight between the nest and the disturbance, ambient levels of noise and other disturbances, and other topographical or artificial barriers. Suitable buffer distances may vary between species. Larger buffer areas or other protective measures may be required for state-listed species (bald eagle, western yellow-billed cuckoo, or bank swallow) to ensure that mortality does not occur if SBFCA does not obtain an incidental take permit for these species.

Effect WILD-7: Potential Loss or Disturbance of Western Burrowing Owl and Loss of Nesting and Foraging Habitat

Construction is anticipated to occur during the breeding season of western burrowing owl (March through August). Burrowing owls also could be present year-round. Construction activities and removal of nesting habitat (burrows in ruderal areas and on the edges of agricultural areas) could result in the loss or disturbance of western burrowing owl. Removal of occupied burrows and construction disturbance during the breeding season could result in the incidental loss of fertile eggs or nestlings or otherwise lead to nest abandonment. Permanent or temporary loss of foraging or burrow habitat for this species also would result from construction activities. Nesting burrowing owls are protected under the Federal MBTA and California Fish and Game Code Sections 3503 and 3503.5. Loss of active breeding or wintering burrows or disturbance of breeding burrows resulting in mortality of young and displacement of adults would be considered a significant effect. Implementation of Mitigation Measure WILD-MM-6 and the mitigation measures below would reduce this effect to a less-than-significant level.

Mitigation Measure WILD-MM-10: Conduct Surveys for Western Burrowing Owl Prior to Construction and Implement Protective Measures if Found

DFG recommends burrowing owl surveys whenever burrowing owl habitat is present on or within 500 feet of a project site. Breeding season and non-breeding season surveys will be conducted in accordance with DFG's 2012 Staff Report on Burrowing Owl Mitigation (2012 Staff Report) (California Department of Fish and Game 2012c). Breeding season will have four surveys: 1) one survey between February 15 and April 15 and 2) a minimum of three surveys at least three weeks apart between April 15 and July 15, with at least one survey after June 15. Non-breeding season surveys will consist of four surveys spread evenly throughout the non-breeding season (September 1 to January 31).

A survey report will be prepared at the conclusion of surveys for submission to DFG. The report will include, but is not limited to, a description of the proposed project or proposed activity, proposed project start and end dates, and a description of disturbances or other activities occurring onsite or nearby (see Appendix D of the 2012 Staff Report).

If burrowing owls are found during any of the surveys, compensatory mitigation best practices as described below will be used. Because ample lead time is necessary for putting compensation in place, these efforts should begin as soon as possible after presence of burrowing owls is determined.

Regardless of results from the surveys described above, an initial take avoidance (preconstruction) surveys will be conducted no less than 14 days prior to and 24 hours before initiating ground disturbing activities. SBFCA will retain a qualified biologist to conduct preconstruction surveys for active burrows according to methodology in the 2012 Staff Report. Burrowing owls may re-colonize a site after only a few days. As such, subsequent take avoidance surveys will be conducted if a few days pass between project activities. If no burrowing owls are found, no further mitigation is required. If burrowing owls are found, SBFCA will use avoidance, minimization measures, monitoring, and reporting of such measures as described in the 2012 Staff Report (Mitigation Methods) and summarized below.

- Do not disturb occupied burrows during the breeding season (February 1–August 31).
- Establish a 250-foot-wide buffer where no construction will occur around occupied burrows unless a qualified biologist determines through non-invasive methods that egg laying and incubation have not begun or that juveniles are foraging independently and are capable of independent survival.
- Avoid affecting burrows occupied during the non-breeding season by migratory or non-migratory resident burrowing owls.
- Avoid destruction of unoccupied burrows and place visible markers near burrows to ensure they are not collapsed.
- Develop and use a worker awareness program to increase the onsite worker recognition of and commitment to burrowing owl protection.
- Conduct additional take avoidance surveys as described above.
- Conduct ongoing surveillance of the project site for burrowing owls during project activities.
- Minimize effects on burrowing owls and their habitat by using buffer zones, visual screens, and other measures during project activities. Recommended buffer distances in the 2012 Staff Report will be used or site-specific buffers and visual screens will be determined through information collected during site-specific monitoring and consultation with the DFG.

Mitigation Measure WILD-MM-11: Compensate for the Loss of Occupied Burrowing Owl Habitat

If burrowing owls have been documented to occupy burrows at the project site in the last 3 years, current scientific literature supports the conclusion that the site should be considered occupied and mitigation is required. The current scientific literature also provides the following best practices. If these best practices cannot be used, SBFCA may consult with the DFG to develop effective mitigation alternatives.

1. Where habitat will be temporarily disturbed, restore the disturbed area to pre-project conditions, including soil decompaction and revegetation. Permanent habitat protection may be warranted if there is potential that temporary effects may render a nesting site

(nesting burrow and satellite burrows) unsustainable or unavailable, depending on the time frame, resulting in reduced survival or abandonment. For the latter potential effect, see the permanent effect measures below.

2. Mitigate for permanent effects on nesting, occupied and satellite burrows and/or burrowing owl habitat such that the habitat acreage, number of affected burrows, and burrowing owls are replaced based on site-specific conditions and an analysis of the factors influencing burrowing owls and burrowing owl population persistence in a particular area.
3. Mitigate for permanent effects on nesting, occupied, and satellite burrows and burrowing owl habitat with (a) permanent conservation of similar vegetation communities (grassland, scrublands, desert, urban, and agriculture) to provide for burrowing owl nesting, foraging, wintering, and dispersal during breeding and non-breeding seasons comparable to or better than that of the affected area, and (b) sufficiently large acreage and presence of fossorial (digging) mammals. The mitigation habitat lands may require enhanced or expanded burrows for breeding, shelter and dispersal opportunity, and removal or control of population stressors. If the mitigation lands are adjacent to the affected burrow site, ensure the nearest neighbor artificial or natural burrow clusters are at least within 690 feet.
4. Permanently protect mitigation land through a conservation easement deeded to a nonprofit conservation organization or public agency with a conservation mission for conserving burrowing owl habitat and prohibiting activities incompatible with burrowing owl use. If the project is within the service area of a DFG-approved burrowing owl conservation bank, the project proponent may purchase available burrowing owl conservation bank credits.
5. Develop and use a mitigation land management plan to address long-term ecological sustainability and maintenance of the burrowing-owl site (see Appendix D of the 2012 Staff Report). The plan will include a monitor and reporting on the mitigation site.
6. Fund the maintenance and management of mitigation land through the establishment of a long-term funding mechanism such as an endowment.
7. Do not alter or destroy habitat until mitigation lands have been legally secured, and the endowment or other long-term funding mechanism is in place or security is provided.
8. Mitigation lands should be on, adjacent, or near the affected site, if possible, and habitat should support an existing burrowing owl population.
9. When insufficient habitat is on, adjacent, or near project sites where burrowing owls will be excluded, mitigation lands with burrowing owl habitat should be away from the project site. The selection of mitigation lands should then focus on consolidating and enlarging conservation areas outside of urban and planned growth areas within foraging distance of other conserved lands. If mitigation lands are not available adjacent to other conserved lands, increase the mitigation land acreage requirement to ensure a selected site is of sufficient size. Offsite mitigation may not adequately offset the biological and habitat values affected on a one-to-one basis. Consult with the DFG when determining offsite mitigation acreages.
10. Evaluate and select suitable mitigation lands based on a comparison of the habitat attributes of the affected and conserved lands, including but not limited to type and structure of habitat being affected or conserved; burrowing owl density in affected and conserved

habitat; and significance of affected or conserved habitat to the species range wide. Mitigate for the highest quality affected burrowing owl habitat first and foremost when identifying mitigation lands, even if a mitigation site is outside of a lead agency's jurisdictional boundary, particularly if the lead agency is a city or special district.

11. Select mitigation lands while taking into account potential human and wildlife conflicts or incompatibility, including human foot and vehicle traffic, predation by cats, loose dogs, urban-adapted wildlife, and incompatible species management.
12. When a burrowing owl population appears to be highly adapted to heavily altered habitats such as golf courses, airports, athletic fields, and business complexes, permanently protecting the land, augmenting the site with artificial burrows, and enhancing and maintaining those areas may help sustain of the on-site burrowing owl population. Maintenance includes the following: reduce vegetation height by grazing or hand mowing, remove trees and shrubs, and prevent excessive human disturbance such as walking, jogging, off-road activities, dog-walking, unleashed pets, and feral animals that chase and prey upon owls (4, 5 and 6 above apply to this mitigation approach).
13. If no other feasible mitigation options are available and a lead agency is willing to establish and oversee a Burrowing Owl Mitigation and Conservation Fund that funds, on a competitive basis, acquisition and permanent habitat conservation, the project proponent may participate in the lead agency's program.

Effect WILD-8: Potential Injury, Mortality or Disturbance of Tree-Roosting Bats and Removal of Roosting Habitat

Construction is anticipated to occur during the maternity season of bats (April 1 through September 15) and beginning of the hibernation period (November 1). The proposed project would result in the loss of trees, which provide suitable roosting habitat (cavities, crevices, furrowed bark, and foliage) for special-status bats (western red bat and pallid bat) and bats for which conservation actions are warranted (hoary bat and silver-haired bat) (Western Bat Working Group 2007). Tree removal/trimming and noise or other construction activities could result in the injury, mortality, or disturbance of roosting bats, if present in cavities, crevices, furrowed bark, or foliage of trees. Because no work on bridges or other structures in the affected area is expected, effects on bats that may roost on these structures (pallid bat or maternity colonies of non–special status bats) are not anticipated. Mortality of tree-roosting bats during the maternity season or hibernation period that results from tree removal/trimming or other disturbances could affect the local populations of these species and would be considered a significant effect. Implementation of Mitigation Measure WILD-MM-6 and the following mitigation measure would lessen effects on western red bat, pallid bat, and other bat species.

Mitigation Measure WILD-MM-12: Conduct Preconstruction Surveys for Roosting Bats and Implement Avoidance and Protective Measures

If tree removal/trimming cannot be conducted between September 15 and October 30, qualified biologists will examine trees to be removed or trimmed for suitable bat roosting habitat before removal/trimming. High-quality habitat features (large tree cavities, basal hollows, loose or peeling bark, larger snags, palm trees with intact thatch, etc.) will be identified and the area around these features searched for bats and bat sign (guano, culled insect parts, staining, etc.). Riparian woodland, orchards, and stands of mature broadleaf trees should be considered potential habitat for solitary foliage–roosting bat species. If suitable habitat and/or bat sign is detected, biologists will conduct evening visual emergence surveys of the source habitat feature, from a half hour before sunset to 1–2 hours after sunset for a minimum of two nights within the season that construction will be taking place. Night vision goggles and/or full-spectrum acoustic detectors should be used during emergence surveys to assist in species identification. All emergence surveys will be conducted during favorable weather conditions (calm nights with temperatures conducive to bat activity and no precipitation predicted). Additional passive monitoring using full spectrum bat detectors may be needed if identification of bat species is required. Survey methods should be discussed with DFG prior to the start of surveys.

Avoidance and minimization measures may be necessary if sensitive bats species are detected during surveys and/or acoustic monitoring and will be determined in coordination with DFG. These measures may include those following.

- Tree removal will be avoided between April 1 and September 15 (the maternity period) to avoid effects on pregnant females and active maternity roosts (whether colonial or solitary).
- All tree removal will be conducted between September 15 and October 30, which corresponds to a time period when bats have not yet entered torpor or would be caring for nonvolant young.
- Trees will be removed in pieces rather than felling an entire tree.
- If a maternity roost is located, whether solitary or colonial, that roost will remain undisturbed until September 15 or a qualified biologist has determined the roost is no longer active.
- If avoidance of nonmaternity roost trees is not possible, and tree removal or trimming must occur between October 30 and August 31, qualified biologists will monitor tree trimming/removal. Prior to removal/trimming, each tree will be shaken gently and several minutes should pass before felling trees or limbs to allow bats time to arouse and leave the tree. The biologists should search downed vegetation for dead and injured bats. The presence of dead or injured bats that are species of special concern will be reported to DFG.

Effect WILD-9: Disturbance to or Loss of Common Wildlife Species and Their Habitats

The affected area contains both natural and human-influenced habitats that support common invertebrates, amphibians, reptiles, and terrestrial and aquatic mammals (most birds are protected under the MBTA). These non–special status species also could be directly and indirectly affected by project construction. Although they are not afforded the same levels of protection and do not have the same agency consultation requirements under applicable laws, regulations, and policies described in the regulatory section, common species generally would receive some protection from measures prescribed for special-status animals. The resulting effect is considered less than significant, and no mitigation is required.

Effect WILD-10: Potential Disruption of Wildlife Movement Corridors

Terrestrial wildlife species may use the Feather River or the levee as a movement corridor. Additionally, smaller, more localized movement corridors may be present in the 41-mile project area. During construction of levee improvements, movement through the project site would be temporarily impeded by the placement of physical barriers (fencing) used to protect resources within or near the construction footprint. Additionally, animals may avoid movement through the project area or along the Feather River because of the extensive amount of noise and human activity associated with construction. Upon completion of levee improvements, the affected area would have a different footprint but generally would be available as a movement corridor. No permanent barriers would be installed as part of the proposed project. This effect is considered less than significant, and no mitigation is required.

Effect WILD-11: Conflict with Provisions of an Adopted HCP/NCCP or other Approved Local, Regional, or State Habitat Conservation Plan

There are no adopted HCP/NCCPs applicable to the proposed project. There are two plans under development in the region: the Yuba-Sutter NCCP/HCP and the Butte Regional Conservation Plan. The proposed project is located in the plan area of both of these conservation plans. Because neither of these plans has been adopted, the proposed project will not conflict with provisions of these plans, and there would be no effect.

Summary of Mitigation Requirements

A summary of the timing of mitigation requirements is provided in Table 3.9-6.

Table 3.9-6. Timing of Mitigation Requirements

Species	Requirement	Timing
Anthicid beetles and tiger beetle		
Valley elderberry longhorn beetle	1) Transplant elderberry shrubs	November 1–February 15
	2) Install orange barrier fencing around shrubs to be protected.	Prior to the start of any construction activities
	3) Compensate for impacts by purchasing mitigation credits or planting elderberries and associated natives onsite.	Mitigation credits must be purchased prior to groundbreaking. Timing of onsite mitigation would be determined in coordination with USFWS.
Western pond turtle	Preconstruction survey	One week before and within 24 hours of beginning work during the cooler part of the day (8 a.m. and 12 p.m. during spring and summer)
Giant garter snake	1) Construction activity in giant garter snake aquatic and upland habitat within 200 feet of aquatic habitat	Between May 1 and October 1
	2) Install exclusion fencing and orange barrier fencing along the edge of the construction area that is within 200 feet of suitable habitat	Install on or after May 1
	3) Preconstruction survey	Within 24 hours of the start of construction in or within 200 feet of suitable habitat
Nesting birds	1) Vegetation removal/trimming	September 1–January 31
	2) Preconstruction Surveys (3)	February 1–June 1
Swainson's hawk	Preconstruction surveys	February through July
Burrowing owl	Breeding and wintering surveys (8)	Four surveys between February 15 and April 15 and four surveys spread evenly between September 1 and January 31
	Preconstruction surveys (2)	Preconstruction surveys no less than 14 days before and 24 hours before ground disturbance
Bats	1) Tree removal	September 15–October 30
	2) Disturbance of maternity colony	No disturbance until September 15
	3) Monitor tree removal	October 30–August 31

3.9.4.3 Alternative 2

Alternative 2 includes levee improvements used for Alternative 1 (with the exception of clay ditch lining) as well as other measures, including stability berms and relief wells. The measures used for Alternative 2 would extend substantially beyond the current footprint of the Feather River west levee. Implementation of this alternative would potentially result in effects on wildlife resources that are similar or greater than those described for Alternative 1. The magnitude of habitat losses would be greater for some species because the footprint of Alternative 2 is larger. Table 3.9-7 summarizes wildlife effects and mitigation measure requirements for Alternative 2; see Alternative 1 for the text describing the these effects and mitigation measures. Table 3.9-8 provides a summary of the effects on special-status species habitat for Alternative 2.

Table 3.9-7. Wildlife Effects and Mitigation Measures for Alternative 2

Effect	Finding	Mitigation Measure	With Mitigation
Effect WILD-1: Potential Mortality of or Loss of Habitat for Antioch Dunes Anthicid, Sacramento Anthicid, and Sacramento Valley Tiger Beetle	Significant	WILD-MM-1: Conduct Focused Surveys for Habitat for Antioch Dunes Anthicid, Sacramento Anthicid, and Sacramento Valley Tiger Beetle and Implement Protective Measures	Less than significant
Effect WILD-2: Potential Mortality or Disturbance of VELB and its Habitat (Elderberry Shrubs)	Significant	WILD-MM-2: Implement Protective Measures and Compensate for Effects on VELB and its Habitat	Less than significant
Effect WILD-3: Potential Mortality or Disturbance of Western Pond Turtle	Significant	WILD-MM-3: Conduct Preconstruction Surveys for Western Pond Turtle and Monitor Construction Activities if Turtles are Observed	Less than significant
Effect WILD-4: Potential Disturbance or Mortality of and Loss of Suitable Habitat for Giant Garter Snake	Significant	WILD-MM-4: Avoid and Minimize Effects on Giant Garter Snake WILD-MM-5: Compensate for Loss of Suitable Giant Garter Snake Habitat	Less than significant
Effect WILD-5: Potential Loss or Disturbance of Nesting Swainson's Hawk and Loss of Nesting and Foraging Habitat	Significant	WILD-MM-6: Conduct Vegetation Removal Activities outside the Breeding Season for Birds WILD-MM-7: Conduct Focused Surveys for Nesting Swainson's Hawk prior to Construction and Implement Protective Measures during Construction WILD-MM-8: Compensate for the Loss of Foraging Habitat for Swainson's Hawk	Less than significant
Effect WILD-6: Potential Mortality or Disturbance of Nesting Special-Status and Non–Special Status Birds and Removal of Suitable Breeding Habitat	Significant	WILD-MM-6: Conduct Vegetation Removal Activities outside the Breeding Season for Birds WILD-MM-90: Conduct Nesting Surveys for Special-Status and Non–Special Status Birds and Implement Protective Measures during Construction	Less than significant

Effect	Finding	Mitigation Measure	With Mitigation
Effect WILD-7: Potential Loss or Disturbance of Western Burrowing Owl and Loss of Nesting and Foraging Habitat	Significant	WILD-6: Conduct Vegetation Removal Activities outside the Breeding Season for Birds WILD-MM-10: Conduct Surveys for Western Burrowing Owl prior to Construction and Implement Protective Measures if Found WILD-MM-11: Compensate for the Loss of Occupied Burrowing Owl Habitat	Less than significant
Effect WILD-8: Potential Injury, Mortality or Disturbance of Tree-Roosting Bats and Removal of Roosting Habitat	Significant	WILD-MM-6: Conduct Vegetation Removal Activities outside the Breeding Season for Birds WILD-MM-12: Conduct Preconstruction Surveys for Roosting Bats and Implement Avoidance and Protective Measures	Less than significant
Effect WILD-9: Disturbance to or Loss of Common Wildlife Species and Their Habitats	Less than significant	None required	Less than significant
Effect WILD-10: Potential Disruption of Wildlife Movement Corridors	Less than significant	None required	Less than significant
Effect WILD-11: Conflict with Provisions of an Adopted HCP/NCCP or other Approved Local, Regional, or State Habitat Conservation Plan	No effect	None required	No effect

Table 3.9-8. Effects on Special-Status Species Habitat for Alternative 2

Special-Status Species	Habitat	Permanent/Temporary (acres)
Antioch Dunes anthicid, Sacramento anthicid, and Sacramento Valley tiger beetle	Sandy riparian areas	0/0
Valley elderberry longhorn beetle	Elderberry shrubs	89/72*
Giant garter snake and western pond turtle aquatic habitat	Drainage ditch, freshwater emergent, irrigation ditch, open water	0.96/0
Giant garter snake upland habitat	Ruderal within 200 feet of aquatic habitat	4.17/0
Swainson’s hawk, white-tailed kite, bald eagle, western yellow-billed cuckoo, purple martin, yellow warbler, and other birds nesting and foraging habitat	Riparian forest	16.95/0.61
Swainson’s hawk, white-tailed kite, northern harrier, burrowing owl, and tricolored blackbird foraging habitat	Field and row crops and ruderal	674.53/8.88
Bank swallow	Bluffs and banks of streams/ levees adjacent to water	0/0
Bat roosting habitat	Riparian forest and orchard	706.66/29.97

*For valley elderberry longhorn beetle, effects are given in numbers of shrubs, not acres.

3.9.4.4 Alternative 3

Alternative 3 is a blend of levee improvement measures from Alternatives 1 and 2. Implementation of this alternative would potentially result in effects on wildlife resources similar to those described for Alternative 1. The magnitude of the majority of permanent habitat losses would be less than Alternatives 1 and 2; however, temporary losses of habitat would be greater for some land cover types than Alternatives 1 and 2. Table 3.9-9 summarizes wildlife effects and mitigation measure requirements for Alternative 3; see Alternative 1 for the text describing these effects and mitigation measures. Table 3.9-10 summarizes the effects on special-status species habitat for Alternative 3.

Table 3.9-9. Wildlife Effects and Mitigation Measures for Alternative 3

Effect	Finding	Mitigation Measure	With Mitigation
Effect WILD-1: Potential Mortality of or Loss of Habitat for Antioch Dunes Anthicid, Sacramento Anthicid, and Sacramento Valley Tiger Beetle	Significant	WILD-MM-1: Conduct Focused Surveys for Habitat for Antioch Dunes Anthicid, Sacramento Anthicid, and Sacramento Valley Tiger Beetle and Implement Protective Measures	Less than significant
Effect WILD-2: Potential Mortality or Disturbance of VELB and its Habitat (Elderberry Shrubs)	Significant	WILD-MM-2: Implement Protective Measures and Compensate for Effects on VELB and its Habitat	Less than significant
Effect WILD-3: Potential Mortality or Disturbance of Western Pond Turtle	Significant	WILD-MM-3: Conduct Preconstruction Surveys for Western Pond Turtle and Monitor Construction Activities if Turtles are Observed	Less than significant
Effect WILD-4: Potential Disturbance or Mortality of and Loss of Suitable Habitat for Giant Garter Snake	Significant	WILD-MM-4: Avoid and Minimize Effects on Giant Garter Snake WILD-MM-5: Compensate for Loss of Suitable Giant Garter Snake Habitat	Less than significant
Effect WILD-5: Potential Loss or Disturbance of Nesting Swainson's Hawk and Loss of Nesting and Foraging Habitat	Significant	WILD-MM-6: Conduct Vegetation Removal Activities outside the Breeding Season for Birds WILD-MM-7: Conduct Focused Surveys for Nesting Swainson's Hawk prior to Construction and Implement Protective Measures during Construction WILD-MM-8: Compensate for the Loss of Foraging Habitat for Swainson's Hawk	Less than significant
Effect WILD-6: Potential Mortality or Disturbance of Nesting Special-Status and Non–Special Status Birds and Removal of Suitable Breeding Habitat	Significant	WILD-MM-6: Conduct Vegetation Removal Activities outside the Breeding Season for Birds WILD-MM-90: Conduct Nesting Surveys for Special-Status and Non–Special Status Birds and Implement Protective Measures during Construction	Less than significant

Effect	Finding	Mitigation Measure	With Mitigation
Effect WILD-7: Potential Loss or Disturbance of Western Burrowing Owl and Loss of Nesting and Foraging Habitat	Significant	WILD-6: Conduct Vegetation Removal Activities outside the Breeding Season for Birds WILD-MM-10: Conduct Surveys for Western Burrowing Owl prior to Construction and Implement Protective Measures if Found WILD-MM-11: Compensate for the Loss of Occupied Burrowing Owl Habitat	Less than significant
Effect WILD-8: Potential Injury, Mortality or Disturbance of Tree-Roosting Bats and Removal of Roosting Habitat	Significant	WILD-MM-6: Conduct Vegetation Removal Activities outside the Breeding Season for Birds WILD-MM-12: Conduct Preconstruction Surveys for Roosting Bats and Implement Avoidance and Protective Measures	Less than significant
Effect WILD-9: Disturbance to or Loss of Common Wildlife Species and Their Habitats	Less than significant	None required	Less than significant
Effect WILD-10: Potential Disruption of Wildlife Movement Corridors	Less than significant	None required	Less than significant
Effect WILD-11: Conflict with Provisions of an Adopted HCP/NCCP or other Approved Local, Regional, or State Habitat Conservation Plan	No effect	None required	No effect

Table 3.9-10. Effects on Special-Status Species Habitat for Alternative 3

Special-Status Species	Habitat	Permanent/Temporary (acres)
Antioch Dunes anthicid, Sacramento anthicid, and Sacramento Valley tiger beetle	Sandy riparian areas	0/0
Valley elderberry longhorn beetle	Elderberry shrubs	82/83*
Giant garter snake and western pond turtle aquatic habitat	Drainage ditch, freshwater emergent, irrigation ditch, open water	1.31/0.01
Giant garter snake upland habitat	Ruderal within 200 feet of aquatic habitat	4.08/0.24
Swainson's hawk, white-tailed kite, bald eagle, western yellow-billed cuckoo, purple martin, yellow warbler, and other birds nesting and foraging habitat	Riparian forest	15.44/7.95
Swainson's hawk, white-tailed kite, northern harrier, burrowing owl, and tricolored blackbird foraging habitat	Field and row crops and ruderal	533.09/104.21
Bank swallow	Bluffs and banks of streams/ levees adjacent to water	0/0
Bat roosting habitat	Riparian forest and orchard	113.21/14.39

*For valley elderberry longhorn beetle, effects are given in numbers of shrubs, not acres.

3.10 Fish and Aquatic Resources

3.10.1 Introduction

This section describes the regulatory and environmental setting for fish and aquatic resources; effects on fish and aquatic resources that would result from the No Action Alternative and Alternatives 1, 2, and 3; and mitigation measures that would reduce significant effects.

3.10.2 Affected Environment

This section describes the affected environment for fish and aquatics in the project area. Following are the key sources of data and information used in the preparation of this section.

- USFWS list of endangered, threatened, and proposed species for Nicolaus, Yuba City, Sutter, Olivehurst, Biggs, Gridley, and Palermo (U.S. Fish and Wildlife Service 2012).
- Published and unpublished reports.
- ICF International file information.

3.10.2.1 Regulatory Setting

This section summarizes key Federal and state regulatory information that applies to fish and aquatic resources. Additional regulatory information appears in Appendix A.

Federal

The following Federal policies related to fish and aquatics may apply to implementation of the proposed project.

Endangered Species Act

The Federal Endangered Species Act (ESA) protects fish and wildlife species and their habitats that have been identified by NMFS or USFWS as threatened or endangered. *Endangered* refers to species, subspecies, or distinct population segments (DPSs) that are in danger of extinction through all or a significant portion of their range. *Threatened* refers to species, subspecies, or DPSs that are likely to become endangered in the near future.

ESA is administered by USFWS and NMFS. In general, NMFS is responsible for protection of ESA-listed marine species and anadromous fish, and USFWS is responsible for other listed species. Provisions of Sections 9 and 7 of ESA are relevant to this project and are summarized below.

Section 9: ESA Prohibitions

Section 9 of the ESA prohibits the take of any fish or wildlife species listed under ESA as endangered. Take of threatened species also is prohibited under Section 9, unless otherwise authorized by

Federal regulations.[1] *Take*, as defined by the ESA, means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." *Harm* is defined as "any act that kills or injures the species, including significant habitat modification." In addition, Section 9 prohibits removing, digging up, cutting, and maliciously damaging or destroying federally listed plants on sites under Federal jurisdiction.

Section 7: ESA Authorization Process for Federal Actions

Section 7 of the ESA provides a means for authorizing take of threatened and endangered species by Federal agencies. Under Section 7, the Federal agency conducting, funding, or permitting an action (the lead Federal agency, such as USACE) must consult with NMFS or USFWS, as appropriate, to ensure that the proposed project would not jeopardize endangered or threatened species or destroy or adversely modify designated critical habitat. If a proposed project "may affect" a listed species or designated critical habitat, the lead agency is required to prepare a BA to evaluate the nature and severity of the expected effect. In response, NMFS or USFWS issues a BO, with a determination that the proposed project either:

- may jeopardize the continued existence of one or more listed species (jeopardy finding) or result in the destruction or adverse modification of critical habitat (adverse modification finding), or
- would not jeopardize the continued existence of any listed species (no jeopardy finding) or result in adverse modification of critical habitat (no adverse modification finding).

The BO issued by NMFS or USFWS may stipulate discretionary "reasonable and prudent" conservation measures. If the project would not jeopardize a listed species, USFWS or NMFS issues an incidental take statement to authorize the proposed activity.

USACE and NMFS are in coordination to determine the ESA compliance documentation appropriate for the FRWLP.

Critical Habitat

Critical habitat, as defined in ESA Section 3, is:

I. the specific area within the geographic area occupied by a species, at the time it is listed in accordance with ESA, on which are found those biological features
   i. essential to the conservation of the species, and
   ii. may require special management considerations or protection; and
II. specific areas outside the geographical area occupied by a species at the time it is listed, upon a determination that such areas are essential for the conservation of the species.

Floodplain connectivity is recognized as contributing to critical habitat. Aquatic habitats in the study area have been designated as critical habitat for the following species (also see discussion on 3.10-7 under *Special-Status Species*).

- Central Valley spring-run Chinook salmon.

[1] In some cases, exceptions may be made for threatened species under ESA Section 4(d); in such cases, USFWS or NMFS issues a 4(d) rule describing protections for the threatened species and specifying the circumstances under which take is allowed.

- Central Valley steelhead.
- Green sturgeon.

Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act requires consultation with USFWS, NMFS, and the state fish and wildlife agencies where the waters of any stream or other body of water are proposed, authorized, permitted, or licensed to be impounded, diverted, or otherwise controlled or modified under a Federal permit or license. Consultation is in progress for the purpose of preventing loss of and damage to wildlife resources, led by USFWS in coordination with NMFS and DFG. More complete text for this act is included in Appendix A, as well as a discussion in Chapter 5.

Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) establishes a management system for national marine and estuarine fishery resources. This legislation requires that all Federal agencies consult with NMFS regarding all actions or proposed actions permitted, funded, or undertaken that may adversely affect essential fish habitat (EFH). EFH is defined as “waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” The legislation states that migratory routes to and from anadromous fish spawning grounds are considered EFH. The phrase *adversely affect* refers to the creation of any effect that reduces the quality or quantity of essential fish habitat. Federal activities that occur outside of an essential fish habitat but that may, nonetheless, have an effect on essential fish habitat waters and substrate must also be considered in the consultation process.

Under the Magnuson-Stevens Act, effects on habitat managed under the Pacific Salmon Fishery Management Plan must also be considered. The Magnuson-Stevens Act states that consultation regarding essential fish habitat should be consolidated, where appropriate, with the interagency consultation, coordination, and environmental review procedures required by other Federal statutes, such as NEPA, Fish and Wildlife Coordination Act, CWA, and ESA. EFH consultation requirements can be satisfied through concurrent environmental compliance if the lead agency provides NMFS with timely notification of actions that may adversely affect EFH and if the notification meets requirements for essential fish habitat assessments.

USACE and NMFS are in coordination to determine the EFH compliance documentation appropriate for the FRWLP.

State

The following state policies related to fish and aquatics may apply to implementation of the proposed project.

California Endangered Species Act

The CESA, which is administered by DFG, protects wildlife and plants listed by the California Fish and Game Commission as threatened and endangered under the act. CESA prohibits all persons from taking species that are state-listed as threatened or endangered except under certain circumstances; the CESA definition of *take* is any action or attempt to “hunt, pursue, catch, capture, or kill.”

CESA Section 2081 provides a means by which agencies or individuals may obtain authorization for incidental take of state-listed species, except for certain species designated as fully protected under the California Fish and Game Code. Take must be incidental to, and not the purpose of, an otherwise lawful activity. Requirements for a Section 2081 permit are similar to those used in the ESA Section 7 process. They include identification of effects on listed species, development of mitigation measures that minimize and fully mitigate effects, development of a monitoring plan, and assurance of funding to implement mitigation and monitoring.

California Fish and Game Code Section 1600: Streambed Alteration Agreements

DFG has jurisdictional authority over wetland resources associated with rivers, streams, and lakes under Sections 1600–1607. DFG has the authority to regulate all work under the jurisdiction of the State of California that would substantially divert, obstruct, or change the natural flow of a river, stream, or lake; substantially change the bed, channel, or bank of a river, stream, or lake; or use material from a streambed.

In practice, DFG marks its jurisdictional limit at the top of the stream or lake bank, or the outer edge of the riparian vegetation where present, and sometimes extends its jurisdiction to the edge of the 100-year floodplain. Because riparian habitats do not always support wetland hydrology or hydric soils, wetland boundaries, as defined by CWA Section 404, sometimes include only portions of the riparian habitat adjacent to a river, stream, or lake. Therefore, jurisdictional boundaries under Section 1600 may encompass a greater area than those regulated under CWA Section 404.

DFG enters into a streambed alteration agreement with an applicant and can impose conditions on the agreement to ensure that no net loss of wetland values or acreage would be incurred. The streambed or lakebed alteration agreement is not a permit, but a mutual agreement between DFG and the applicant.

Local

Sutter and Butte Counties have each adopted policies related to fish and wildlife resources, as detailed in Appendix A.

3.10.2.2 Environmental Setting

The following considerations are relevant to fish and aquatic resources in the project area.

Study Area

The study area generally includes more than 40 miles of the Feather River's western bank from south of the Thermalito Afterbay to the Sutter Bypass. The study area spans the project footprint, which includes the maximum extent of all alternatives.

Fish Species in the Study Area

The various water bodies in the study area provide spawning, rearing, and migratory habitat for a diverse assemblage of native and nonnative fish species (Table 3.10-1). Native species present in these streams can be separated into anadromous (species that spawn in fresh water after migrating as adults from marine habitat) and resident species. Native anadromous species include two runs of Chinook salmon (*Oncorhynchus tshawytscha*), steelhead (*O. mykiss*), green and white sturgeon (*Acipenser medirostris* and *A. transmontanus*), Pacific lamprey (*Entosphenus tridentata*), and river lamprey (*Lampetra ayresi*). Native resident species include Sacramento pikeminnow (*Ptychocheilus grandis*), Sacramento splittail (*Pogonichthys macrolepidotus*), Sacramento sucker (*Catostomus* *occidentalis*), hardhead (*Mylopharodon conocephalus*), California roach (*Hesperoleucas symmetricus*), and rainbow trout (*O. mykiss*). Nonnative anadromous species include striped bass (*Morone saxatilis*) and American shad (*Alosa sapidissima*). Nonnative resident species include largemouth bass (*Micropterus salmoides*), smallmouth bass (*M. dolomieu*), white and black crappie (*Pomoxis annularis* and *P. nigromaculatus*), channel catfish (*Ictalurus punctatus*), white catfish (*Ameiurus catus*), brown bullhead (*Ictalurus nebulosus*), bluegill (*Lepomis macrochirus*), green sunfish (*L. cyanellus*), and golden shiner (*Notemigonus crysaleucas*).

Table 3.10-1. Representative Central Valley Fish Assemblage Likely to Be Present in the Feather River Study Area

Common Name—Origin	Scientific Name
Pacific lamprey—native	*Entosphenus tridentata*
River lamprey—native	*Lampetra ayresi*
Chinook salmon (spring-, fall-/late fall–runs)—native	*Oncorhynchus tshawytscha*
Steelhead/rainbow trout—native	*Oncorhynchus mykiss*
White sturgeon—native	*Acipenser transmontanus*
Green sturgeon—native	*Acipenser medirostris*
Wakasagi—nonnative	*Hypomesus nipponensis*
Sacramento sucker—native	*Catostomus occidentalis*
Sacramento pikeminnow—native	*Ptychocheilus grandis*
Sacramento splittail—native	*Pogonichthys macrolepidotus*
Sacramento blackfish—native	*Orthodon microlepidotus*
Hardhead—native	*Mylopharodon conocephalus*
Speckled dace—native	*Rhinichthys osculus*
California roach—native	*Hesperoleucas symmetricus*
Hitch—native	*Lavina exilicauda*
Golden shiner—nonnative	*Notemigonus crysoleucas*
Fathead minnow—nonnative	*Pimephales promelas*
Goldfish—nonnative	*Carassius auratus*
Common carp—nonnative	*Cyprinus carpio*
Threadfin shad—nonnative	*Dorosoma petenense*
American shad—nonnative	*Alosa sapidissima*
Black bullhead—nonnative	*Ictalurus melas*
Brown bullhead—nonnative	*Ictalurus nebulosus*
White catfish—nonnative	*Ictalurus catus*
Channel catfish—nonnative	*Ictalurus punctatus*
Mosquitofish—nonnative	*Gambusia affinis/G. holbrooki*
Inland silverside—nonnative	*Menidia beryllina*
Threespine stickleback—native	*Gasterosteus aculaetus*
Striped bass—nonnative	*Morone saxatilis*
Bluegill—nonnative	*Lepomis macrochirus*
Green sunfish—nonnative	*Lepomis cyanellus*
Redear sunfish—nonnative	*Lepomis microlophus*
Warmouth—nonnative	*Lepomis gulosus*

Common Name—Origin	Scientific Name
White crappie—nonnative	*Pomoxis annularis*
Black crappie—nonnative	*Pomoxis nigromaculatus*
Largemouth bass—nonnative	*Micropterus salmoides*
Redeye bass—nonnative	*Micropterus coosae*
Spotted bass—nonnative	*Micropterus punctulatus*
Smallmouth bass—nonnative	*Micropterus dolomieui*
Bigscale logperch—nonnative	*Percina macrolepida*
Prickly sculpin—native	*Cottus asper*
Riffle sculpin—native	*Cottus gulosus*
Tule perch—native	*Hysterocarpus traski*
Sources: Moyle 2002; California Department of Water Resources 2007; Seesholtz et al. 2004.	

Special-Status Fish Species

Special-status fish species that occur or have the potential to occur in or near the study area, as well as their status in the study area, are presented in Table 3.10-2. Critical habitat for spring-run Chinook salmon and Central Valley steelhead falls within the study area in the Feather River. In addition, the Feather River is designated critical habitat for green sturgeon (74 FR 52345 October 9, 2009). While the Feather River is not designated critical habitat for winter-run Chinook salmon, effects on this species were considered as they have the potential to occur in the study area for at least part of their life-cycle.

Table 3.10-2. Special-Status Fish Species with Potential to Occur in the Study Area

Common and Scientific Name	Status[a] Federal/State	California Distribution	Habitats	Occurrence in the Study Area
Sacramento splittail *Pogonichthys macrolepidotus*	–/SSC	Occurs throughout the year in low-salinity waters and freshwater areas of the Sacramento–San Joaquin Delta, Yolo Bypass, Suisun Marsh, Napa River, and Petaluma River (Moyle 2002).	Spawning takes place among submerged and flooded vegetation in sloughs and the lower reaches of rivers.	High
Central Valley steelhead *Oncorhynchus mykiss*	T/–	Sacramento River and tributary Central Valley rivers	Occurs in well-oxygenated, cool, riverine habitat with water temperatures from 7.8 to 18°C (Moyle 2002). Habitat types are riffles, runs, and pools.	High—spawning during migration
Sacramento River winter-run Chinook salmon *Oncorhynchus tshawytscha*	E/E	Mainstem Sacramento River below Keswick Dam (Moyle 2002)	Occurs in well-oxygenated, cool, riverine habitat with water temperatures from 8.0 to 12.5°C. Habitat types are riffles, runs, and pools (Moyle 2002).	Low–Medium—juveniles may occur in study area during rearing and emigration (see text on page 3.10-10)
Central Valley spring-run Chinook salmon *Oncorhynchus tshawytscha*	T/T	Upper Sacramento River and Feather River	Has the same general habitat requirements as winter-run Chinook salmon. Coldwater pools are needed for holding adults (Moyle 2002).	High—spawning during migration
Central Valley fall-/late fall–run Chinook salmon *Oncorhynchus tshawytscha*	SC/SSC	Sacramento and San Joaquin Rivers and tributary Central Valley rivers	Occurs in well-oxygenated, cool, riverine habitat with water temperatures from 8.0 to 12.5°C. Habitat types are riffles, runs, and pools (Moyle 2002).	High—spawning during migration
Green sturgeon (southern DPS) *Acipenser medirostris*	T/SSC	Sacramento, Klamath, and Trinity Rivers (Moyle 2002)	Spawns in large river systems with well-oxygenated water, with temperatures from 8.0 to 14°C.	Low
River lamprey *Lampetra ayresi*	–/SSC	Sacramento, San Joaquin, and Napa Rivers; tributaries of San Francisco Bay (Moyle 2002; Moyle et al. 1995)	Adults live in the ocean and migrate into fresh water to spawn.	High—spawning during migration

Common and Scientific Name	Status[a] Federal/State	California Distribution	Habitats	Occurrence in the Study Area
Hardhead *Mylopharodon conocephalus*	–/SSC	Tributary streams in the San Joaquin drainage; large tributary streams in the Sacramento River and the mainstem	Reside in low to mid-elevation streams and prefer clear, deep pools and runs with slow velocities. Also occur in reservoirs.	High

[a] Species Definitions

Federal

E = endangered under the Federal Endangered Species Act.
T = threatened under the Federal Endangered Species Act.
SC = species of concern.
– = no listing.

State

E = endangered under the California Endangered Species Act.
T = threatened under the California Endangered Species Act.
SSC = species of special concern.
– = no listing.

Chinook Salmon

Chinook salmon are anadromous fish, meaning that adults live in marine environments and return to their natal freshwater streams to spawn. Juveniles rear in freshwater for a period of up to 1 year until smoltification (a physiological preparation for survival in marine environs) and subsequent ocean residence.

Four distinct runs of Chinook salmon occur in the Feather River system: winter-run, spring-run, fall-run, and late fall–run. The runs are named after the season of adult migration, with each run having a distinct combination of adult migration, spawning, juvenile residency, and smolt migration periods. In general, fall- and late fall–run Chinook salmon spawn soon after entering their natal streams, while spring-run Chinook salmon typically hold in their natal streams for up to several months before spawning.

Winter-Run

The Sacramento River winter-run Chinook salmon is listed as an endangered species under the ESA and CESA. Critical habitat for winter-run Chinook salmon includes the Sacramento River from Keswick Dam (RM 302) to Chipps Island (RM 0) in the Delta, and all waters of the San Francisco estuary to the Golden Gate Bridge north of the San Francisco/Oakland Bay Bridge (58 FR 33212). Critical habitat includes the water column, bottom, and adjacent riparian zone of the designated stream reaches (limited to streambank and nearshore areas used as cover and foraging habitat by juveniles) and the water column, foraging habitat, and food resources used by juvenile and adult winter-run Chinook salmon in the estuary.

Historically, winter-run Chinook salmon spawned in cold tributary streams upstream of present-day Shasta Reservoir, including the Little Sacramento, Pit, McCloud, and Fall Rivers and Battle Creek. Presently, winter-run Chinook salmon persist in the Sacramento River below Keswick Dam and are sustained by coldwater releases from Shasta Reservoir.

Adult winter-run Chinook salmon immigration (upstream migration) through the Delta and into the Sacramento River occurs from December through July (Table 3.10-3), with a peak in March. Winter-run Chinook salmon spawn primarily in the Sacramento River between Keswick Dam (RM 302) and Red Bluff Diversion Dam (RM 242) from mid-April to mid-August, with peak spawning occurring in May and June (National Marine Fisheries Service 2009).

Juvenile emigration (downstream migration) past the Red Bluff Diversion Dam (RM 242) may begin as early as mid-July and extend through March, with a peak in September (National Marine Fisheries Service 2009) (Table 3.10-3). The primary period of juvenile emigration through the lower Sacramento River into the Delta is November through early May, with a peak occurring between January and April (National Marine Fisheries Service 1997). Although winter-run Chinook salmon do not spawn in the Feather River, juveniles emigrating down the Sacramento River are reported to enter and rear in non-natal tributaries (Maslin et al. 1999) and thus may enter the Feather River during their downstream emigration period (November through March) (Table 3.10-3).

Spring-Run

The Central Valley spring-run Chinook salmon evolutionarily significant unit (ESU), which includes populations spawning in the Sacramento River and its tributaries, including the Feather River, as well as the Feather River Hatchery spring-run Chinook program. They are listed as threatened under

ESA and CESA. Critical habitat is designated for spring-run Chinook salmon in the Feather River (70 FR 52598 September 2, 2005).

Spring-run Chinook salmon historically occurred from the upper tributaries of the Sacramento River to the upper tributaries of the San Joaquin River. However, they have been extirpated from the San Joaquin River system. The only streams in the Central Valley with remaining wild spring-run Chinook salmon populations are the Sacramento River and its tributaries, including the Yuba River, Mill Creek, Deer Creek, and Butte Creek.

Spring-run Chinook salmon enter the Sacramento River from late March through September (Reynolds et al. 1993), but peak abundance of immigrating adults in the Delta and lower Sacramento River occurs from April through June (Table 3.10-3). From the Sacramento River, adult Central Valley spring-run Chinook salmon enter native tributaries primarily between mid-April and mid-June (National Marine Fisheries Service 2006). Based on run-time observations of spring-run Chinook salmon in the Feather River, adults are likely to be present in the project area during the upstream migration period between February and July. During this period, adults are assumed to migrate actively through the project area to summer holding habitat in the Low Flow Channel below Oroville Dam. Adult spring-run Chinook salmon remain in deepwater habitats downstream of spawning areas during summer until their eggs fully develop and become ready for spawning. This is the primary characteristic that distinguishes spring-run Chinook salmon from the other runs.

Results from Feather River Chinook salmon emigration studies indicate that most juvenile Chinook salmon (both spring- and fall-run) emigrate soon after emergence at sizes less than 50 mm in length (Seesholtz et al. 2004). Emigration typically begins in mid-November, peaks between January and March, and continues through June (Table 3.10-3) (Seesholtz et al. 2004). Therefore, rearing and emigrating juveniles are likely present in the project area from mid-November through June, with the greatest abundance of individuals in January, February, and March. Little information is available on Chinook salmon emigration in the lowermost portion of the lower Feather River, but most juveniles probably have emigrated from the river by mid-May in response to physiological cues and rising water temperatures.

Fall- and Late Fall–Run

Central Valley fall-run and late fall–run Chinook salmon are commercially and recreationally important. These ESUs are Federal species of concern. Because the fall-run Chinook salmon is currently the largest run of Chinook salmon in the Sacramento River system, it continues to support commercial and recreational fisheries of significant economic importance.

All Central Valley streams that had adequate flows in the fall, even if they were intermittent during the summer, probably supported fall-run Chinook salmon. Unlike spring-run Chinook salmon that migrated to higher-elevation streams, fall-run Chinook salmon likely were limited to streams of the valley floor and lower foothill reaches because of their egg-laden and generally deteriorated physical condition.

In general, adult fall-run Chinook salmon migrate into the Sacramento River and its tributaries from July through December, with immigration peaking from mid-October through November (Table 3.10-3). Fall-run Chinook salmon spawn in numerous tributaries of the Sacramento River, including the lower American River, lower Yuba River, Feather River, and tributaries of the upper Sacramento River. Spawning generally occurs from October through December, with fry emergence typically beginning in late December and January (Table 3.10-3). Fall-run Chinook salmon emigrate as post-emergent fry, juveniles, and smolts after rearing in their natal streams for up to 6 months. Consequently, fall-run emigrants may be present in the lower Sacramento River from December through June (Reynolds et al. 1993) (Table 3.10-3) and remain in the Delta for variable lengths of time before ocean entry.

Adult immigration of late fall–run Chinook salmon into the Sacramento River generally begins in October, peaks in December, and ends in April (Moyle et al. 1995) (Table 3.10-3). Primary spawning areas for late fall–run Chinook salmon are located in tributaries of the upper Sacramento River (e.g., Battle Creek, Cottonwood Creek, Clear Creek, Mill Creek), although late fall–run Chinook salmon are believed to return to the Feather and Yuba Rivers as well (Moyle et al. 1995). Spawning occurs generally from January through April (Moyle et al. 1995). Juveniles emigrate through the lower Feather River primarily from October through April (Table 3.10-3).

Central Valley Steelhead

Central Valley steelhead is listed as threatened under the ESA. The Feather River Hatchery produces steelhead that are included as part of the listed steelhead population (74 FR 834 January 5, 2006). Critical habitat is designated for steelhead in the Feather River (70 FR 52614 September 2, 2005). Steelhead, an anadromous variant of rainbow trout, is closely related to Pacific salmon. The species was once abundant in California coastal and Central Valley drainages. However, population numbers have declined significantly in recent years, especially in the tributaries of the Sacramento River. Steelhead typically migrate to marine waters after spending 1 year or more in fresh water. In the marine environment, they typically mature for 1 to 3 years before returning to their natal streams to spawn as 3- or 4-year-olds. Unlike Pacific salmon, steelhead are capable of spawning more than once before they die. Immigration of adult steelhead in the Sacramento River occurs in nearly all months but peaks in late September and October (Moyle 2002). The steelhead spawning season typically stretches from December through April (Table 3.10-3). After several months, fry emerge from the gravel and begin to feed. Juveniles rear in fresh water from 1 to 4 years (usually 2 years), then migrate to the ocean as smolts in the spring (March through June).

Sacramento Splittail

Sacramento splittail is a California species of special concern. Sacramento splittail is an endemic California minnow that once was widely distributed in lakes and rivers throughout the Central Valley, including the Sacramento River upstream to Redding and the American River as far east as Folsom (Moyle 2002). Present distribution includes Suisun Bay, the Napa and Petaluma Rivers (Sommer et al. 1997), the Sacramento River as far north as the Red Bluff Diversion Dam, portions of the Delta, and the San Joaquin River upstream of its confluence with the Tuolumne River (Moyle 2002). In the Feather River, Sacramento splittail were found as far upstream as Oroville (Moyle et al. 2003).

Adult splittail usually reach sexual maturity in their second year. They then migrate upstream in late fall to early winter before spawning. Spawning occurs from mid-winter through July in water temperatures between 48°F and 68°F (Wang 1986) at times of high winter or spring runoff (Moyle et al. 1995). Eggs acquire adhesive properties following exposure to water and adhere to vegetation or other benthic substrates (Wang 1986). Fertilized eggs generally hatch in 3 to 5 days, and larvae begin feeding on plankton soon thereafter. Juvenile splittail inhabit shallow areas with abundant vegetation that are devoid of strong currents (Wang 1986) as they travel downstream from the spawning grounds to the Delta.

Mature splittail generally are found in the shallows of sloughs in edgewater habitat by emergent vegetation. They feed primarily on benthic invertebrates and aquatic insect larvae (Moyle 2002). Although they are tolerant of brackish water (Moyle 2002), splittail tend to move from areas of relatively high salinity to those characterized by fresh water (Moyle et al. 1995).

There have been incidental observations of splittail in the Feather River, but no detailed studies to determine population numbers. It is thought that splittail use the lower Feather River from February through May for spawning, egg incubation, and initial rearing during years when shallow flooded vegetation is inundated. Spawning splittail are infrequently observed in the lower Feather River from the confluence with the Sacramento River up to Honcut Creek. The majority of spawning activity in the lower Feather River is thought to occur below the Yuba River confluence and occurs in greatest abundance in the Sutter Bypass during high-flow events (California Department of Water Resources 2007).

Hardhead

Hardhead are a California species of concern. Hardhead are found in undisturbed, low- to mid-elevation streams with summer water temperatures greater than 68°F (20°C). They are common in the Sacramento River and lower mainstems of the American and Feather Rivers. Adults typically move upstream into tributaries to spawn primarily in April and May (Moyle 2002). Spawning behavior is not well-documented, but it is thought that fertilized eggs are deposited on beds of gravel in riffles, runs, or the heads of pools. While little is known about the early life history of hardhead, it is thought that young hardhead use shallow stream edges and/or backwater habitat with aquatic vegetation along perimeters of shallow pools as cover, and once they grow larger, move into deeper habitats (Moyle 2002).

Hardhead are resident year-round; therefore, all life stages are present in the Feather River. Hardhead frequently are observed in the Feather River from the Fish Barrier Dam downstream to the confluence with the Sacramento River (Moyle 2002).

Green Sturgeon

NMFS has divided sturgeon into two DPSs: the southern DPS and northern DPS. The northern DPS comprises sturgeon from the Eel River northward; the southern DPS comprises populations below the Eel, specifically the Sacramento River population (71 FR 17757). The southern DPS, which occurs in the study area, is federally listed as threatened (71 FR 17757, April 7, 2006). NMFS designated critical habitat for green sturgeon in the Feather River, which includes the project area (74 FR 52300 October 2009).

Green sturgeon are known to occur in the lower reaches of large rivers, including the Klamath, Eel, and Smith Rivers, from the Delta northward (Moyle 2002). Green sturgeon also have been found in saltwater from Ensenada, Mexico, to the Bering Sea and Japan (Miller and Lea 1972). Adults of this species tend to be associated with marine environments more than the more common white sturgeon, although spawning populations have been identified in the Sacramento and Klamath Rivers (Beak Consultants 1993). Spawning has been confirmed in only three rivers, the Rogue River in Oregon, and the Klamath and Sacramento Rivers in California (National Marine Fisheries Service 2008). Green sturgeon may spawn in the Feather River during high-flow years (California Department of Fish and Game 2002), but sightings to confirm this have not been documented. Historical use of the Feather River, prior to construction of Oroville Dam, is unknown. Historical and current records confirm the presence of adult green sturgeon in the Feather River (Beamesderfer et al. 2004; Seesholtz pers. comm.). In 2008, one adult was detected by a fixed telemetry monitor at Star Bend in May, and another adult was sighted in early June at Shanghai Bend (Seesholtz pers. comm.). In 2006, a dozen sturgeon, of which four were green sturgeon, were observed near the Thermalito Outlet on the Feather River (Seesholtz pers. comm.).

River Lamprey

River lamprey is a state species of special concern. River lamprey are relatively small (averaging 6.7 inches long) and highly predaceous (Moyle 2002). They are anadromous and will attack fish in both fresh and saltwater (Moyle 2002). A great deal of what is known about the species is based on populations in British Columbia. River lamprey adults are likely to occur in the project area during upstream movements to spawning areas in September through May (Table 3.10-3). It is unlikely that spawning would occur in the immediate project area based on reported spawning preferences (gravelly riffles in small tributaries). Adults excavate a saucer-shaped depression in sand or gravel riffles and deposit eggs. After spawning, the adults perish. Juvenile river lampreys, called ammocoetes, remain in backwaters for several years where they feed on algae and microorganisms (Moyle et al. 1986). The metamorphosis from juvenile to adult begins in July and is complete by the following April. From May through July, following completion of metamorphosis, river lamprey aggregate in the Delta before entering the ocean.

River lamprey is distributed in streams and rivers along the eastern Pacific Ocean from Juneau, Alaska, to San Francisco Bay. They may be most abundant in the Sacramento and San Joaquin River systems, although they are observed only rarely (Moyle et al. 1986).

Table 3.10-3. Life Stage Timing and Distribution of Selected Species Potentially Affected by the Feather River West Levee Project

Species/Life Stage	Distribution	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Spring-Run Chinook Salmon													
Adult migration	San Francisco Bay to Feather River and Tributaries												
Adult spawning	Upper Sacramento River, lower Yuba and Feather Rivers												
Juvenile movement	Feather River and Tributaries to San Francisco Bay												
Winter-Run Chinook Salmon													
Adult migration and holding	San Francisco Bay to upper Sacramento River												
Juvenile rearing (natal stream)	Upper Sacramento River to San Francisco Bay												
Juvenile movement and rearing	Feather River to San Francisco Bay												
Late Fall–Run Chinook Salmon													
Adult migration	San Francisco Bay to Upper Sacramento River and Tributaries												

Species/Life Stage	Distribution	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Adult spawning	Feather River	■	■	■	■								
Juvenile movement and rearing	Upper Sacramento River and Tributaries	■	■	■	■						■	■	■
Fall-Run Chinook Salmon													
Adult migration and holding	San Francisco Bay to Upper Sacramento River and Tributaries							■	■	■	■	■	■
Adult spawning	Feather River										■	■	■
Juvenile movement and rearing	Upper Sacramento River and Tributaries to San Francisco Bay	■	■	■	■	■	■						■
Steelhead													
Adult migration	San Francisco Bay to Upper Sacramento River and Feather River	■	■	■									■
Adult spawning	Upper Sacramento River, lower Yuba and Feather Rivers	■	■	■	■								■
Juvenile and smolt movement	Upper Sacramento River and Feather River to San Francisco Bay			■	■	■	■						
Green Sturgeon													
Adult migration and holding	San Francisco Bay to Upper Sacramento River		■	■	■	■	■						
Juvenile rearing (natal stream to estuary)	Upper Sacramento River to San Francisco Bay	■	■	■	■	■	■	■	■	■	■	■	■
Juvenile movement and rearing	Upper Sacramento River to San Francisco Bay					■	■	■	■				
Splittail													
Adult migration and holding	San Francisco Bay to Upper Sacramento River					■	■	■	■				
Juvenile rearing	Upper Sacramento River to San Francisco Bay					■	■	■	■				
Juvenile movement and rearing	Upper Sacramento River to San Francisco Bay					■	■	■	■				
Hardhead													
Adult spawning	Feather River				■	■							
Juvenile rearing	Feather River	■	■	■	■	■	■	■	■	■	■	■	■
River Lamprey													
Adult migration and spawning	Pacific Ocean to Feather River	■	■	■	■	■				■	■	■	■
Metamorphosis and movement	Feather River to Delta		■	■	■	■				■	■	■	

Species/Life Stage	Distribution	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Sources: Wang and Brown 1993; U.S. Fish and Wildlife Service 1996; McEwan 2001; Moyle 2002; Hallock 1989; Beamesderfer et al. 2006; California Department of Water Resources 2007.													
Note: Primary occurrence included in the assessment of project effects.													

Factors that Affect Abundance of Fish Species

Information relating abundance with environmental conditions is most available for listed species, especially Chinook salmon. The following section focuses on factors that potentially have affected the abundance of listed species in the Central Valley. Although not all species are discussed, factors affecting the listed species are assumed to affect the abundance of other native and nonnative species in similar fashion.

Aquatic Habitat

All of the information included below was taken from Foothill Associates (2010) Lower Feather River HUC/Honcut Creek Watershed Existing Conditions Assessment.

Between the Thermalito Afterbay Outlet and Verona (where the Feather River meets the Sacramento River), about 10% of the river is riprapped. Although the majority of the river is controlled by levees, only about 5% of the levees are directly adjacent to the active channel. Levees severely constrict the floodplain along the upper portion of this reach. Much of the reach has been mined for gravel, resulting in many pits, multiple channel areas, and somewhat jumbled floodplain topography.

Historically, seasonal flooding covered basins throughout the Central Valley and provided important spawning and rearing habitat for many fish species, including Sacramento splittail and juvenile Chinook salmon. Levee construction has reduced the overall amount of seasonal flooding and shallow-water habitat in the Feather River system. In winter, however, some agricultural fields are allowed to flood during high flows (e.g., Butte Basin, Sutter Bypass) and are used by splittail for spawning and rearing, and by Chinook salmon for rearing.

Floodplain Habitat

Recognition is growing that naturally functioning floodplains provide many benefits, including direct economic benefits, ecosystem services, and habitat for a wide diversity of species (Bayley 1991; Tockner and Stanford 2002, as cited in Ahearn et al. 2006). Floodplains provide freshwater habitat for the migration, reproduction, and rearing of native fishes (Moyle et al. 2003; Crain et al. 2004) and mitigate flood damage to human settlements (Sommer et al. 2001a).

Floodplains are highly productive habitats that flood during high flows in the winter and spring. Floodplains are important habitats for young fish, especially Chinook salmon and splittail (Moyle et al. 2005). Chinook salmon, which spawn in freshwater rivers and streams upstream of the Delta, use inundated floodplain habitats (when available) for rearing. Chinook salmon growth has been shown to be faster in floodplain habitat than in river systems (Sommer et al. 2001b). Sacramento splittail, which spawn in inundated floodplains, produce the highest numbers of young when flows are high and floodplain habitat is inundated (Moyle 2002).

Some floodplain habitat on the Feather River has been converted to agricultural land for irrigated crops and orchards (California Department of Water Resources 2007). Floodplain habitat is still present on the Feather River and provides habitat for Chinook salmon and splittail when inundated during high winter and spring flows.

Nearshore and Shaded Riverine Aquatic Habitat

Nearshore areas support large and diverse fish and wildlife populations. These areas are important to fish for rearing and migration because they create attachment sites for aquatic insects (a food source for fish) and provide fish with shelter from predators. For example, juvenile Chinook salmon and steelhead rely on nearshore habitats as fry, smolt, or yearlings and to some extent as adults. In addition, vegetated nearshore habitat can provide spawning areas for some fish species, such as splittail, black bass, and sunfish.

Shaded riverine aquatic (SRA) cover provides important riverine fish habitat along the water bodies in the study area. SRA cover is defined as the nearshore aquatic habitat occurring at the interface between a river and adjacent woody riparian habitat (U.S. Fish and Wildlife Service 1992). The principal attributes of this cover type are: (1) an adjacent bank composed of natural, eroding substrates supporting riparian vegetation that either overhangs or protrudes into the water; and (2) water that contains variable amounts of woody debris, such as leaves, logs, branches, and roots, and has variable depths, velocities, and currents. The quantity and quality of SRA cover for fish are primary determinants of habitat availability and suitability in streams. The occurrence of many aquatic species, including juvenile salmonids, depends on the size, density, and continuity of suitable nearshore cover.

Riparian vegetation is a component of nearshore and SRA cover and directly influences the quality of fish habitat. Its presence has an effect on cover, food, instream habitat complexity, streambank stability, and temperature regulation. Instream woody material (IWM) usually originates from riparian trees and provides habitat complexity in aquatic environments, an essential component of fish habitat. The roots of riparian vegetation at the land-water interface and on adjacent berms provide streambank stability and cover for rearing fish (Meehan and Bjorn 1991).

Riparian vegetation also provides shade and an insulating canopy that moderates water temperatures in both summer and winter. While the influence of shade on regulating river temperatures decreases as rivers become larger, the moderating effects of shade on nearshore water temperatures may be important to some fish species, including juvenile salmonids, during the growing season.

Riparian vegetation also influences the food chain of a stream, providing organic detritus and terrestrial insects. Terrestrial organisms falling from overhanging branches contribute to the food base of the aquatic community. Salmonids in particular are primarily insectivores and feed mainly on drifting food organisms. Areas of riparian floodplain on the Feather River have been converted to irrigated crops and orchards (California Department of Water Resources 2007). However, there are areas of riparian vegetation on the Feather River that provide large woody debris and organic detritus and terrestrial insects for fish.

Spawning Habitat

Spawning habitat area may limit the production of juveniles and subsequent adult abundance of some species. Spawning habitat area for fall- and late fall–run Chinook salmon, which compose more than 90% of the Chinook salmon returning to the Central Valley streams, has been identified as limiting their population abundance. Existing spawning habitat area has not been identified as a limiting factor for the less-abundant winter-run and spring-run Chinook salmon (National Marine Fisheries Service 1996; U.S. Fish and Wildlife Service 1996), although habitat may be limiting in some streams (e.g., Butte Creek) during years of high adult abundance.

A lack of sufficient seasonally flooded vegetation may limit splittail spawning success (Young and Cech 1996; Sommer et al. 1997). Splittail spawn over flooded vegetation and debris on floodplains inundated by high flows from February to early July in the Sacramento River and San Joaquin River systems. The onset of spawning appears to be associated with rising water levels, increasing water temperature, and day length (Moyle 2002). The Sutter and Yolo Bypasses along the Sacramento River are important spawning habitat areas during high flow.

The Feather River provides both warmwater and coldwater spawning habitat for native and sport fish. The upper section of the lower Feather River is managed for coldwater fish (salmonids), and the downstream extent of the lower Feather River is suitable for warmwater spawning. Approximately two thirds of the natural Chinook salmon spawning occurs between the Fish Barrier Dam and the Thermalito Afterbay Outlet (RM 67–59), and one third of the spawning occurs between the Thermalito Afterbay Outlet and Honcut Creek (RM 59–44). Most natural steelhead spawning occurs in the low-flow channel near Hatchery Ditch, a side channel located between RM 66 and RM 67. Some steelhead spawning also occurs below Thermalito Afterbay Outlet (California Department of Water Resources 2007).

Rearing Habitat

Rearing habitat area may limit the production of juveniles and subsequent adult abundance of some species. USFWS (1996) indicates rearing habitat area in Central Valley streams and rivers limits the abundance of juvenile fall-run and late fall–run Chinook salmon and juvenile steelhead. Rearing habitat for salmonids is defined by environmental conditions such as water temperature, DO, turbidity, substrate, water velocity, water depth, and cover (Jackson 1992; Bjornn and Reiser 1991; Healey 1991). Chinook salmon also rear along the shallow vegetated edges of Delta channels (Grimaldo et al. 2000).

Environmental conditions and interactions among individuals, predators, competitors, and food sources determine habitat quantity and quality and the productivity of the stream (Bjornn and Reiser 1991). Everest and Chapman (1972) found juvenile Chinook salmon and steelhead of the same size using similar in-channel rearing area.

Rearing area varies with flow. High flow increases the area available to juvenile Chinook salmon because they extensively use submerged terrestrial vegetation on the channel edge and the floodplain. Deeper inundation provides more overhead cover and protection from avian and terrestrial predators than shallow water. In broad, low-gradient rivers, change in flow can greatly increase or decrease the lateral area available to juvenile Chinook salmon, particularly in riffles and shallow glides (Jackson 1992).

Rearing habitat has not been identified as a limiting factor in splittail population abundance, but as with spawning, a lack of sufficient seasonally flooded vegetation may be limiting population abundance and distribution (Young and Cech 1996). Rearing habitat for splittail encompasses the Delta, Suisun Bay, Suisun Marsh, the lower Napa River, the lower Petaluma River, and other parts of San Francisco Bay (Moyle 2002). In Suisun Marsh, splittail concentrate in the dead-end sloughs that have small streams feeding into them (Daniels and Moyle 1983; Moyle 2002). As splittail grow, salinity tolerance increases (Young and Cech 1996). Splittail are able to tolerate salinity concentrations as high as 29 ppt and as low as 0 ppt (Moyle 2002).

Rearing habitat for all fish species discussed above is available in the Feather River (California Department of Water Resources 2007).

Migration Habitat

The Feather River and the Delta provide a migration pathway between freshwater and ocean habitats for adult and juvenile steelhead and all runs of Chinook salmon.

Migration habitat conditions include streamflows that provide suitable water velocities and depths that provide successful passage. Flow in the Feather River and in the Delta provides the necessary depth, velocity, and water temperature; however, flow and environmental conditions in the Central Valley are not always at optimal levels (e.g., see discussion below for water temperature).

Adult splittail gradually move upstream during the winter and spring months to spawn. Year-class success of splittail is positively correlated with wet years, high Delta outflow, and floodplain inundation (Sommer et al. 1997; Moyle 2002). Low flow impedes access to floodplain areas that support rearing and spawning.

Water Temperature

Fish species have different responses to water temperature conditions depending on their physiological adaptations. Salmonids in general have evolved under conditions in which water temperatures need to be relatively cool. Splittail can tolerate warmer temperatures. In addition to species-specific thresholds, different life stages have different water temperature requirements. Eggs and larval fish are the most sensitive to warm water temperature.

Unsuitable water temperatures for adult salmonids such as Chinook salmon and steelhead during upstream migration lead to delayed migration and the potential for lower reproduction rates. Elevated summer water temperatures in holding areas cause mortality of spring-run Chinook salmon (U.S. Fish and Wildlife Service 1996). Warm water temperature and low dissolved oxygen (DO) concentrations also increase egg and fry mortality. USFWS (1996) cited elevated water temperatures as limiting factors for fall- and late fall–run Chinook salmon.

Juvenile salmonid survival, growth, and vulnerability to disease are affected by water temperature. In addition, water temperature affects prey species abundance and predator occurrence and activity. Juvenile salmonids alter their behavior depending on water temperature, including movement to take advantage of local water temperature refugia (e.g., movement into stratified pools, shaded habitat, subsurface flow) and improve feeding efficiency (e.g., movement into riffles).

Water temperature in Central Valley rivers frequently exceeds the tolerance of Chinook salmon and steelhead life stages. For example, adult fall-run Chinook salmon have been observed to stop their upstream migration when water temperatures exceed 66°F (Hallock et al. 1970). For Chinook salmon eggs and larvae, survival during incubation is assumed to decline with increasing temperature between 54°F and 61°F (Myrick and Cech 2001). For juvenile Chinook salmon, survival is assumed to decline as temperature warms from 64°F to 75°F (Myrick and Cech 2001; Rich 1987). Relative to rearing, Chinook salmon require cooler temperatures to complete the parr-smolt transformation and maximize their saltwater survival. Successful smolt transformation is assumed to deteriorate at temperatures ranging from 63°F to 73°F (Baker et al. 1995).

For steelhead, successful adult migration and holding are assumed to deteriorate as water temperature warms between 52°F and 70°F. Adult steelhead appear to be much more sensitive to thermal extremes than are juveniles (National Marine Fisheries Service 1996; McCullough 1999). Conditions supporting steelhead spawning and incubation are assumed to deteriorate as temperature warms between 52°F and 59°F (Myrick and Cech 2001). Juvenile rearing success is assumed to deteriorate at water temperatures ranging from 63°F to 77°F (Raleigh et al. 1984; Myrick and Cech 2001). Relative to rearing, smolt transformation requires cooler temperatures, and successful transformation occurs at temperatures ranging from 43°F to 50°F. Juvenile steelhead, however, have been captured at Chipps Island in June and July at water temperatures exceeding 68°F (Nobriga and Cadrett 2001). Juvenile Chinook salmon also have been observed to migrate at water temperatures warmer than expected based on laboratory experimental results (Baker et al. 1995).

Splittail populations are adapted to water temperature conditions in the Delta. Splittail may withstand temperatures as warm as 91°F but prefer temperatures between 66°F and 75°F (Young and Cech 1996).

Water temperatures in the lower Feather River below the Thermalito Afterbay Outlet in the spring, summer, and fall can be increased by releases from Thermalito Afterbay. The amount of water temperature increase in the lower Feather River below the Thermalito Afterbay Outlet is affected by ambient air temperatures, the proportion of flows released from the afterbay in comparison to flows in the low-flow channel, and the duration of residence time of water in the afterbay (California Department of Water Resources 2007). Water temperatures may be too warm for pre-spawning adult salmonids and rearing salmonids.

Entrainment

All fish species are entrained to varying degrees by the State Water Project (SWP) and Central Valley Project (CVP) Delta export facilities and many other smaller diversions in Central Valley rivers. Entrainment of juvenile fish by unscreened or poorly screened diversions is one factor in degradation of rearing and migrating habitat (National Marine Fisheries Service 2009). Fish entrainment and subsequent mortality are highly variable among species and may be a function of the size of the diversion, the location of the diversion, the behavior of the fish (Swanson et al. 2004, 2005), and other factors, such as fish screens, the presence of predatory species, and water temperature. Diversions that divert relatively little water from the total channel and with low approach velocities are assumed to minimize stress and protect fish from entrainment.

Young-of-year splittail are entrained between April and August when fish are moving downstream into the estuary (Moyle 2002). Juvenile Chinook salmon are entrained in all months but primarily from November through June when juveniles are migrating downstream.

Contaminants

In the Sacramento and San Joaquin River basins, industrial and municipal discharge and agricultural runoff transport contaminants into rivers and streams that ultimately flow into the Delta. Principal pollutants in the Delta are agricultural chemicals and their derivatives (Herbold et al. 1992). Organophosphate insecticides, such as carbofuran, chlorpyrifos, and diazinon, are present throughout the Central Valley and dispersed in agricultural and urban runoff. The “first-flush” storm event or the “dormant spray” storm event is of most concern because of the higher concentration of contaminants in the runoff. In particular, diazinon and chlorpyrifos are applied to control wood-boring insects in dormant stone fruit orchards from December to February (Zamora et al. 2003). These contaminants enter rivers in winter runoff and enter the estuary in concentrations that can be toxic to invertebrates (CALFED Bay-Delta Program 2000). Unlike severe bioaccumulators such as organochlorine pesticides, organophosphate pesticides typically are metabolized by most invertebrates. However, some organophosphate pesticides do bioaccumulate, and some do not bioaccumulate. In particular, diazinon has a solubility of 68.9 mg/L (at 68°F) but should not bioaccumulate in aquatic organisms (Zamora et al. 2003). Chlorpyrifos, on the other hand, is more persistent in the environment and tends to be hydrophobic to the water column. Chlorpyrifos has a lower solubility than diazinon (1.12 mg/L at 75°F) and has a significant potential to bioaccumulate in aquatic organisms (Zamora et al. 2003). Because some organophosphates may accumulate in living organisms, they may become toxic to fish species, especially those life stages that remain in the system year-round and spend considerable time there during the early stages of development, such as Chinook salmon, steelhead, splittail, and green sturgeon.

Mercury contamination from historical mining activities is extensive on both sides of the Central Valley and occurs primarily from widely scattered hydraulic mining debris along eastside tributaries and active and abandoned mines and associated debris piles on the west side. These sources continue to deposit significant amounts of mercury into the Bay-Delta system. The Cosumnes River, Yolo Bypass, and Sacramento River are the primary ongoing sources of mercury contamination in the Bay-Delta. Mercury occurs in several forms, including pure elemental mercury and toxic methylmercury. Mercury is mobile in aquatic systems as aqueous mercury or when attached to suspended particulate matter. Methylmercury is a significant water quality concern because small amounts can bioaccumulate in fish to levels that are toxic to humans and wildlife. In the Delta, mercury concentrations in bluegill, Sacramento sucker, and largemouth bass have been found to exceed the human health standard of 0.5 part per million (ppm) by two to six times (Slotten 1991).

Other contaminants of particular concern in the Bay-Delta system include high concentrations of trace elements such as selenium, copper, cadmium, and chromium; however, their effects on higher trophic levels are poorly understood, in part as a result of the complex distribution of high concentrations in both time and space (Herbold et al. 1992). In general, it appears that the highest concentrations occur in areas where human activity adjacent to the bay is the highest. Although these trace elements occur naturally, concentrations of these trace elements have been found to be high enough to adversely affect the growth and reproduction of aquatic animals in laboratory experiments (Herbold et al. 1992).

In the Feather River, historical gold mining practices, as well as the development of municipal and industrial land uses in the upper watershed and along the lower Feather River, continue to be the primary sources for most of the metals found in the river. Pesticides used to control mosquitoes and herbicides are applied for routine and ongoing maintenance of recreational and other facilities (California Department of Water Resources 2007).

Predation

Nonnative species cause substantial predation mortality on native species. Although the predation contribution to mortality is uncertain, the estimated mortality suggests that striped bass and other predatory fish, primarily nonnative, pose a threat to juvenile Chinook salmon moving downstream, especially where the stream channel has been altered from natural conditions. Turbulence from water passing over dams and other structures may disorient juvenile Chinook salmon and steelhead, increasing their vulnerability to predators. Predators such as striped bass, largemouth bass, and catfish also prey on splittail (U.S. Fish and Wildlife Service 1996).

On the Feather River, water temperatures are a limiting factor in determining species composition, and predator species in the low-flow channel are low (Seesholtz et al. 2003). In the high-flow channel below the Thermalito Afterbay Outlet, predatory species are more numerous and probably contribute to predation on juvenile salmonids (California Department of Water Resources 2005).

Food

Food availability and type affect survival of fish species. Introduction of nonnative food organisms may have an effect on special-status fish species' survival. Nonnative zooplankton species are more difficult for small striped bass to capture, increasing the likelihood of larval starvation (Moyle 2002). Splittail feed on opossum shrimp, which in turn feed on native copepods that have shown reduced abundance, potentially because of the introduction of nonnative zooplankton and the Asiatic clam (*Potamorcorbula amurensis)*. In addition, flow affects the abundance of food in rivers, the Delta, and Suisun Bay. In general, higher flows result in higher productivity, including a higher input of nutrients from channel margins and floodplain inundation, and higher production when low salinity occurs in the shallows of Suisun Bay. Higher productivity increases the availability of prey organisms for fish species.

In the Feather River, macroinvertebrate diversity was consistent with expectations for large rivers in the Sacramento–San Joaquin River watershed. Plankton was not limiting downstream of Oroville Dam, and the macroinvertebrate community in the sampling stations included taxa that are important prey species for fish in the river (California Department of Water Resources 2005).

3.10.3 Environmental Consequences

This section describes the environmental consequences relating to fish for the proposed project. It describes the methods used to determine the effects of the action and lists the thresholds used to conclude whether an effect would be significant. The effects that would result from implementation of the action, findings with or without mitigation, and applicable mitigation measures are presented in a table under each alternative.

3.10.3.1 Assessment Methods

To prepare for the analysis of the potential effects of the proposed project on fish species, fish biologists reviewed existing resource information related to the study area to evaluate whether sensitive habitats and special-status fish species are known from or could occur in the study area. The information reviewed included the following sources.

- USFWS list of endangered, threatened, and proposed species for the Nicolaus, Yuba City, Sutter, Olivehurst, Biggs, Gridley, Palermo quads (U.S. Fish and Wildlife Service 2012).
- Published and unpublished documents and reports pertaining to the study area.

Construction activities near or in water can cause a range of short- and long-term effects on fish and aquatic resources. Short-term effects are those associated with construction-related activities that typically are limited to the immediate project area and duration of construction. The assessment methods for evaluating potential short-term, construction-related effects in the project area considered construction timing; physical habitat disturbance; potential for physical injury, hazardous spills, turbidity, sedimentation, and erosion resulting from short-term changes in habitat conditions; and the lifestage periodicity and habitat use by species of primary management concern. Long-term effects are those that result in adverse changes to habitat variables that reduce the suitability of fish habitat over a long time period.

Overall, potential effects on fish and aquatic resources were qualitatively assessed by identifying key effect mechanisms associated with construction activities, including the proximity to the Feather River, and evaluating the risk of those effects to harm fish or aquatic resources. Effects assessment methods rely on an understanding of potential effect mechanisms, general construction activities and timing, and a detailed understanding of species habitat use and life history characteristics. The potential effect mechanisms associated with construction activities that could occur under the project alternatives and evaluated as part of this effects assessment are described below.

Erosion, Sedimentation, and Turbidity

Ground-disturbing activities, such as grading and excavation, and vegetation removal can result in large areas of exposed soils that are susceptible to erosion. Increased erosion could increase sedimentation and siltation, resulting in increased turbidity in the Feather River, adjacent to the project footprint area. Construction-related increases in sedimentation and siltation above background condition potentially could affect listed anadromous fish and their habitat by reducing egg and alevin (juveniles still relying on the yolk sac for energy) survival, interfering with feeding activities, causing breakdown of social organization, and reducing primary and secondary productivity. The magnitude of potential effects on fish would depend on the timing and extent of sediment loading and flow in the stream before, during, and immediately following construction. Therefore, the effects assessment considers each of the aforementioned factors to evaluate qualitatively whether the project alternatives would change conditions in the Feather River as a result of increased erosion, sedimentation, and turbidity.

Hazardous Materials and Chemical Spills

Use and storage of hazardous materials and chemicals (e.g., diesel fuel, lubricants, uncured concrete) near waterways potentially could impair water quality if chemicals or other construction materials are spilled or enter waterways. In general, construction-related chemical spills could affect fish by increasing physiological stress, reducing biodiversity, altering primary and secondary production, and possibly causing direct mortality (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998). Therefore, the effects assessment qualitatively evaluates the potential for hazardous materials and chemical spills to alter aquatic habitat conditions in the Feather River.

Habitat Modification

Long-term effects of levee repair and bank protection projects on aquatic habitat include loss or degradation of SRA cover, including physical alteration of bank slope, substrate, and instream and overhead cover. Therefore, the potential for significant effects on fisheries resources was based on an assessment of the degree to which the project would affect these key habitat attributes in nearshore and seasonal inundation areas of the Feather River. Analyzing seasonal inundation areas involves understanding the relationships between the characteristics that define the floodplain, such as topography, vegetative cover, water surface elevation, depth, duration, and frequency of hydrologic events. Analysis of effects on woody vegetation relative to OHWM is the primary method for determining effects on critical habitat. OHWM is described in Section 3-8, *Vegetation and Wetlands*.

Hydrostatic Pressure Waves, Noise, and Vibration

In-water construction activities would not occur associated with any of the action alternatives evaluated in this EIS/EIR. Therefore, the potential for hydrostatic pressure waves, noise, and vibration to affect fish is relatively small. However, installation of sheet piles along proposed levee segments would involve equipment and activities that could produce subsurface pressure waves that could reach the Feather River and potentially affect fish and aquatic resources. These waves could result in underwater noise and vibration, thereby temporarily altering in-river conditions compared to background conditions.

Of particular concern is the noise associated with pile driving that can cause sharp and dramatic hydrostatic pressure waves and vibration that can adversely affect all life stages of fish over relatively long distances (Washington et al. 1992). Hydrostatic pressure waves potentially could rupture the swim bladders and other internal organs of all life stages of fish in the immediate construction area (Bonneville Power Administration 2002; Jones & Stokes Associates 2001; Washington et al. 1992). Additionally, noise and vibration generated by pile driving activities potentially could have sublethal effects on individual fish by inciting movement into lower quality habitats (Bonneville Power Administration 2002). There is evidence that lethal effects can occur from pile driving, but accurately analyzing and addressing these effects, as well as sublethal effects (e.g., injury, temporary hearing threshold shifts, stress, behavioral disturbance), is complicated by several factors. Sound levels and particle motion produced from pile driving can vary depending on pile type, pile size, substrate composition, and type of equipment used. Also, the effects of underwater noise vary among species as a function of species morphology and species physiology. Further, Oriard (1985) and Jones & Stokes Associates (2001) noted that the effects of energy resulting from blasting in rock adjacent to waterways differs depending on the composition and slope of the bank and specifically is reduced relative to in-water blasting. Presumably, pile driving activities on land result in similar reductions in energy transfer to waterways, and thus would result in lesser effects than in-river pile driving activities. Therefore, the effects assessment qualitatively evaluates whether the project alternatives would be anticipated to change conditions in the Feather River as a result of hydrostatic pressure waves and increased noise and vibration caused by construction along the levee footprint.

Predation Risk

Proposed construction activities may increase river turbidity, reduce habitat suitability, and cause disorientation, which in turn, could affect normal fish behavior. Deviation from normal behavior, associated with increased turbidity, reportedly increases the risk of predation (DeVore et al. 1980; Birtwell et al. 1984). However, it also has been reported that increased turbidity potentially could decrease predation on fish. In a study conducted in the Fraser River, it was found that juvenile Pacific salmon were less likely to encounter and be consumed by piscivorous (fish-eating) fish predators in turbid waters relative to clear waters (Gregory and Levings 1998). The effects assessment qualitatively evaluates whether the project alternatives would alter habitat conditions in the Feather River that potentially could increase the risk of predation.

3.10.3.2 Determination of Effects

The purpose of this assessment is to determine whether the proposed project effects on fish and aquatic resources are significant. Criteria defining significant effects under CEQA are provided in Mandatory Findings of Significance in Section 15065(a)(1) of the State CEQA Guidelines. This section of the State CEQA Guidelines related to fish and wildlife resources states that a project may have a significant effect on the environment if:

> …the project has the potential to substantially degrade the quality of the environment; substantially reduce the habitat of a fish or wildlife species; cause a fish or wildlife population to drop below self-sustaining levels; threaten to eliminate a plant or animal community; substantially reduce the number or restrict the range of an endangered, rare, or threatened species…

Consistent with this guidance, effects on fish and aquatic habitat are broadly defined as significant for this analysis if the project would contribute to any of the following effects in the study area.

- Degradation in the quantity or suitability of aquatic habitat of sufficient magnitude and/or duration to reduce the population levels of species of primary management concern.
- Loss of existing riparian habitat, especially that occurring below OHWM.
- Increase in predation of substantial magnitude and/or frequency to reduce the population levels of fish species in the Feather River.
- Interference with the movement of any resident or migratory fish species.
- Substantial long- or short-term loss of habitat quality or quantity.
- Substantial adverse effects on rare or endangered species, candidate species, other special-status species, or habitat of the species.

To further characterize effects on specific habitat parameters, qualitative thresholds (Table 3.10-4) were used to assess how individual effect mechanisms may contribute to the overall project effect.

Table 3.10-4. Construction-Related Impact Indicators

Impact Mechanism	Indicator Value
Shaded riverine aquatic habitat quantity and quality	Loss of existing shaded riverine aquatic habitat value, acreage, and riverside length resulting in habitat modification or degradation in the form of a reduction in physical habitat availability or habitat constituent element suitability for a species to substantially affect this species, relative to the basis of comparison.
Erosion, sedimentation, and turbidity	Increase in erosion, sedimentation, and turbidity resulting in habitat modification or degradation in the form of a reduction in physical habitat availability or habitat constituent element suitability for a species to substantially affect this species, relative to the basis of comparison.
Potential hazardous materials and chemical spills	Potential hazardous materials and chemical spills resulting in habitat modification or degradation in the form of a reduction in physical habitat availability or habitat constituent element suitability for a species to substantially affect this species, relative to the basis of comparison.
Hydrostatic pressure waves, noise, and vibration	Hydrostatic pressure waves, noise, and vibration resulting in habitat modification or degradation in the form of a reduction in physical habitat availability or habitat constituent element suitability for a species to substantially affect this species, relative to the basis of comparison.
Predation risk	Increase in predation of a species to substantially affect this species, relative to the basis of comparison.

3.10.4 Effects and Mitigation Measures

Effects and mitigation measure requirements concerning fish and aquatic resources are summarized in Table 3.10-5.

Table 3.10-5. Summary of Effects on Fish and Aquatic Resources

Effect	Finding	Mitigation Measure	With Mitigation
Alternatives 1, 2, and 3			
Effect FISH-1: Loss or Degradation of Riparian and SRA Cover (including Critical Habitat)	Less than significant	None required	Less than significant
Effect FISH-2: Construction-Related Erosion Resulting in Substantially Increased Sedimentation and Turbidity	Less than significant	None required	Less than significant
Effect FISH-3: Adverse Effects on Fish Health and Survival Associated with Potential Discharge of Contaminants during Construction Activities	Less than significant	None required	Less than significant
Effect FISH-4: Adverse Effects Caused by Construction Equipment Noise and Vibration	Less than Significant	None required	Less than Significant

3.10.4.1 No Action Alternative

The No Action Alternative represents the continuation of the existing deficiencies along the portion of the Feather River in the FRWLP area. Current levee operations and maintenance activities would continue, and there would be no change in the geomorphic and flood control regimes relative to existing conditions.

No construction-related release of contaminants would occur, and no noise and disturbance effects on special-status fish species or construction-related loss of habitat for special-status fish species would occur.

Because no levee improvements would be made under the No Action Alternative, the risk that the Feather River west levee could fail because of under-seepage, slope stability, or geometry issues would continue. Failure of the Feather River west levee, depending on the magnitude of the event, could cause catastrophic flooding.

A catastrophic levee failure could result in the displacement of fish into flooded areas and the potential for stranding and mortality. In addition, adverse water quality effects could result from the release of hazardous materials during a flood event, which could lead to stress and direct mortality of fish that could adversely affect migration, spawning, and rearing habitat of fish species in the Feather River and adjacent water bodies. Emergency clean-up and earth-moving activities also could result in an increase in sediment and turbidity and the release of hazardous materials into the Feather River and adjacent waterways that could adversely affect migration, spawning, or rearing habitat or result in direct mortality of special- status fish species. Depending on the magnitude of the flood, emergency clean-up activities could last for days, weeks, or even months. If a flood occurred in late winter, clean-up activities could last into the spring, a critical time for migration, movement, and rearing of spring-run Chinook salmon, steelhead, and green sturgeon. Given the unpredictable nature of emergency clean-up activities, is it likely that implementation of BMPs and measures to reduce effects on fish would not be possible. All of these effects would be considered significant. Furthermore, if levees along the Feather River were to collapse, important SRA habitat would be lost. Restoration of this critical habitat could require decades. All of these effects would be considered significant; however, given the uncertainty of the occurrence or magnitude of such an event, potential effects on fish cannot be quantified based on available information.

As presented in Chapter 2, removal of vegetation on the land side and waterside of the levees could occur at varying levels depending on which No Action scenario is implemented. Estimates of the total acres of riparian vegetation losses are presented in Section 3.8, *Vegetation and Wetlands*.

Effect FISH-1: Loss or Degradation of Riparian and SRA Cover (including Critical Habitat)

Loss of riparian and SRA cover resulting from removal of riparian vegetation and IWM along the shoreline of a river can adversely affect aquatic organisms and their habitat. Riparian vegetation serves important functions in stream ecosystems by providing shade, sediment storage, nutrient inputs, channel and streambank stability, habitat diversity, and cover and shelter for fish (Murphy and Meehan 1991). Shoreline areas are particularly important to juvenile salmonids and other native fishes that depend on such habitat for shelter from fast currents, protection from predators, and favorable feeding and growth conditions relative to open-water habitat. Riparian vegetation also acts to moderate stream temperatures. The effect of riparian vegetation on stream temperatures is greatest on small streams and decreases with increasing stream size. Because of the large size of the Feather River relative to its existing shoreline canopy, the effect of riparian vegetation in moderating water temperatures is minor compared with the effects of reservoir operations, discharge, and meteorological conditions (National Marine Fisheries Service 2006).

Although existing SRA cover values are relatively low along much of the existing levee, moderate- to high-quality SRA cover is present in some areas where dense riparian vegetation and IWM occurs below OHWM. The vegetation loss associated with full application of the USACE levee vegetation policy would be about 1,164 trees on the waterside of the levee, of the approximately 2,000 total trees that are non-compliant. These trees would be considered a loss of riparian habitat and the effect would be considered significant and unavoidable at least in the short term, but may be mitigated to a less-than-significant level over the long term with compensatory habitat. Under modified application of the USACE levee vegetation policy, the effect would be considered less than significant because there would not be a substantial temporal loss and because much of the existing riparian and SRA cover below the OHWM within the project area would remain intact.

3.10.4.2 Alternative 1

Implementation of Alternative 1 would potentially result in effects on fish and aquatic resources. These potential effects and related mitigation measure requirements are summarized in Table 3.10-6 and discussed below.

Table 3.10-6. Fish and Aquatic Resources Effects and Mitigation Measures for Alternative 1

Effect	Finding	Mitigation Measure	With Mitigation
Effect FISH-1: Loss or Degradation of Riparian and SRA Cover (including (Critical Habitat)	Less than significant	None required	Less than significant
Effect FISH-2: Construction-Related Erosion Resulting in Substantially Increased Sedimentation and Turbidity	Less than significant	None required	Less than significant
Effect FISH-3: Adverse Effects on Fish Health and Survival Associated with Potential Discharge of Contaminants during Construction Activities	Less than significant	None required	Less than significant
Effect FISH-4: Adverse Effects Caused by Construction Equipment Noise and Vibration	Less than Significant	None required	Less than Significant

Effect FISH-1: Loss or Degradation of Riparian and SRA Cover (including Critical Habitat)

Alternative 1 construction activities are assumed to be limited to removal of riparian vegetation only within the construction footprint, and no additional removal would be required in application of the USACE levee vegetation policy. An estimate of the total acreage of riparian vegetation to be removed under Alternative 1 is provided in Section 3.8, *Vegetation and Wetlands*, Table 3.8-6.

As discussed under the No Action Alternative, the removal of riparian vegetation and IWM adversely affects the quantity and quality of shoreline habitat available to juvenile salmonids and other native fishes. However, there are no construction activities proposed in-river or below OHWM; all activities that would result in physical disturbance and removal of vegetation on the waterside slope of the levee would be limited to areas above OHWM. Therefore, no physical modification of critical habitat for ESA-listed fish species would be expected because all proposed construction activities would occur above the OHWM of the Feather River. However, there would be effects on floodplain riparian habitat that may affect listed fish species. For the purposes of NEPA and CEQA, the effect on fisheries resources would be less than significant.

Effect FISH-2: Construction-Related Erosion Resulting in Sedimentation and Turbidity

Construction of cutoff walls, seepage berms, and slope reconstruction of levee sections; depression infill; and ditch lining—and associated clearing and grubbing of vegetation—has the potential to cause soil erosion and contribute sediment to the Feather River. Depending on the level of exposure, suspended sediment can cause lethal, sublethal, and behavioral effects in fish (Newcombe and

Jensen 1996). For salmonids, elevated suspended sediment (turbidity) has been linked to a number of behavioral and physiological responses (gill flaring, coughing, avoidance, and increase in blood sugar levels) that indicate some level of stress (Bisson and Bilby 1982; Sigler et al. 1984; Berg and Northcote 1985; Servizi and Martens 1992). Most of these studies observed chronic turbidity levels rather than the brief spikes that are likely under the proposed project. Although turbidity may cause stress, Gregory and Northcote (1993) have shown that moderate levels of turbidity (35 to 150 nephelometric turbidity units [NTUs]) accelerate foraging rates among juvenile Chinook salmon, likely because of reduced vulnerability to predators (camouflaging effect). The effects would be most acute directly below the construction work area and would decrease with distance downstream as suspended sediment settles out of the water column. Juvenile salmonids tend to avoid highly turbid waters (Bisson and Bilby 1982) and fish near the project area may move laterally or downstream to avoid suspended sediments (Lloyd 1987; Servizi and Martens 1992).

Increases in turbidity and suspended sediment during construction can affect adult and juvenile salmonids by displacing them from preferred habitat. Migrating adults have been reported to avoid high silt loads or cease migration when avoidance is not possible (Cordone and Kelley 1961, as cited by Bjornn and Reiser 1991). Bell (1986) cited a study in which adult salmon did not move in streams where the sediment concentration exceeded 4,000 mg/L (as a result of a landslide). Juveniles tend to avoid streams that are chronically turbid (Lloyd 1987) or move laterally or downstream to avoid turbidity plumes (Sigler et al. 1984). Juvenile coho salmon have been reported to avoid turbidities exceeding 70 NTU (Bisson and Bilby 1982) and cease territorial behavior when exposed to a pulse of turbidity of 60 NTU (Berg 1982). Displacement of juveniles from preferred habitat may reduce growth and survival of juveniles by affecting feeding success or increasing their susceptibility to predation.

Laboratory studies have demonstrated that chronic or prolonged exposure to high turbidity and suspended sediment levels can lead to reduced growth rates. For example, Sigler and coauthors (1984) found that juvenile coho salmon and steelhead trout exhibited reduced growth rates and higher emigration rates in turbid water (25–50 NTU) compared to clear water. Reduced growth rates generally have been attributed to an inability of fish to effectively feed in turbid water (Waters 1995). Chronic exposure to high turbidity and suspended sediment also may affect growth and survival by impairing respiratory function, reducing tolerance to disease and contaminants, and causing physiological stress (Waters 1995). High suspended-sediment concentrations also can indirectly affect feeding and growth by burying stream substrates and degrading the quality of the substrate for aquatic invertebrates, an important food source for juvenile salmonids and other fishes.

Based on observations during levee repair activities at project sites on the Sacramento River, construction activities are expected to result in periodic turbidity levels that exceed 25–75 NTUs (National Marine Fisheries Service 2006). These areas likely would be defined by turbidity plumes that may extend along the shoreline up to 1,000 feet downstream from construction activities. The magnitude and duration of exposure would be well below levels associated with injury or reduced growth of juvenile salmonids but would be expected to temporarily disrupt normal feeding, sheltering, and migratory behavior. Some individuals may respond by moving away from protective cover, increasing their susceptibility to predation. Other species may be affected in similar ways, although their tolerance levels vary depending on the species and life stage. For example, NMFS (2008) noted that short-term increases in suspended sediments or turbidity were unlikely to affect the foraging success of green sturgeon because this species uses olfactory cues as opposed to vision to locate prey. The most sensitive species to turbidity, sedimentation, and other physical disturbances are those that spawn in the project area.

Increased turbidity and sediment loading also can result in longer-term effects due to the siltation of gravel streambeds (decreasing their suitability as spawning habitat), filling of pool habitat, and reduction in benthic macroinvertebrate prey organisms. The removal of deposited material from affected habitats is dependent on subsequent flow conditions, physical attributes of the watercourse such as gradient and streambed composition, and the characteristics of the deposited sediment. Full recovery of streambed conditions has been reported to occur between 6 weeks and 2 years after construction. Anderson and coauthors (1996) stated,

> …based on all of the information available, it is anticipated that minor accumulations of surficially deposited sediments downstream of instream construction would normally be removed by the stream during normal, high flow events such as large spate or spring freshet. Larger accumulations of surficial sediments, especially coarse-grained sand slugs (not likely at any of the proposed crossing sites), may require larger flood events, but in most cases should be removed within a year in areas which experience a spring freshet.

In addition, increased turbidity and sedimentation downstream of the construction areas may negatively affect benthic invertebrates through alteration of water quality and substrate conditions. Benthic macroinvertebrates in the area isolated by cofferdams and areas immediately downstream are expected to recover rapidly following construction. Organisms that occur in the drift such as mayflies, caddisflies, and midge larvae are usually the first colonizers . Full recovery of benthic invertebrate communities usually requires 6 months to a year after construction (Tsui and McCart 1981; Young and Mackie 1991; Vinikour and Schubert 1987). Because no instream work would occur, and juvenile salmonids have the ability to use other food resources (e.g., terrestrial insects) during the summer months, few if any measurable effects on the growth or survival of juvenile salmonids are anticipated.

With implementation of the environmental commitment to implement a SWPPP, and standard erosion and sediment control BMPs (see Section 2.4, *Environmental Commitments*), these effects are expected to be less than significant.

Effect FISH-3: Adverse Effects on Fish Health and Survival Associated with Potential Discharge of Contaminants during Construction Activities

Releases of contaminants such as bentonite, gasoline, diesel fuel, lubricants, hydraulic fluid, and others contained in construction equipment, potentially could result in acute negative effects on fish, invertebrates, and instream habitat (National Marine Fisheries Service 2006). In addition, long-term effects could result if a spill were not properly remediated. The only potential sources of contaminants in the project would be the construction equipment itself (lubricating oils and fuel). The worst-case scenario for a hazardous materials release from construction equipment likely would be 100 gallons (estimated maximum size of fuel tanks, hydraulic fluid reservoirs, etc.). These substances can kill aquatic organisms through exposure to lethal concentrations or exposure to non-lethal levels that cause physiological stress and increased susceptibility to other sources of mortality such as predation. Petroleum products also tend to form oily films on the water surface that can reduce DO levels available to aquatic organisms. Adverse effects related to contaminant spills and leaks are potentially significant but would be adequately mitigated by implementing a SWPPP and a spill prevention, control, and countermeasure plan (see Section 2.4, *Environmental Commitments*) as part of the environmental commitments for the project.

There is also a slight risk of the release of bentonite into the Feather River during jet grouting or deep soil mixing used to construct slurry cut off walls. Bentonite is a naturally occurring, inert, nontoxic material that meets National Sanitation Foundation/American National Standards Institute (NSF/ANSI) Drinking Water Additives Standards 60 and 61. Therefore, any inadvertent release of drilling fluid containing only water and bentonite would not have toxicity effects on ESA-listed fish. However, bentonite released into streams still could clog the gills of fish and cause suffocation and fill interstitial spaces, reducing the suitability of spawning gravels. It could smother vegetation and macroinvertebrate habitats and interfere with filter-feeding of invertebrates. The implementation of a spill prevention, control, and countermeasure plan as part of the environmental commitments of the project is anticipated to minimize the potential for hazardous spills or chemical inputs to the Feather River. The spill prevention, control, and countermeasure plan also would identify appropriate measures for immediately cleaning up all spills regardless of size, and provide for staging and storage areas for equipment, materials, fuels, lubricants, solvents, and other possible contaminants away from watercourses and their watersheds. Release of bentonite is not anticipated, and implementation of the spill prevention, control, and countermeasure plan would reduce the extent of potential effects to a less-than-significant level.

Effect FISH-4: Adverse Effects Caused by Construction Equipment Noise and Vibration

Construction activities (e.g., excavation, driving sheet pile, grading) near the Feather River may result in noise and vibrations that potentially could alter fish behavior (Feist et al. 1992). In general, exposure to high sound levels "can damage the inner ear sensory cells, produce hearing loss, elicit stress responses, and alter the behavior of fishes" (Popper et al. 2003). Vibrations and sound pressure waves generated from driving sheet pile through the crown of levees that travels through the soil to create underwater noise is expected to attenuate quickly because pile driving would occur on land adjacent to the river and not within the watercourse itself. Therefore, the level of underwater noise from the upland sheet pile driving under Alternative 1 is anticipated to result in a less-than-significant effect on fish species of primary management concern.

3.10.4.3 Alternative 2

Implementation of Alternative 2 would potentially result in effects on fish and aquatic resources. These potential effects and related mitigation measure requirements are summarized in Table 3.10-7 and discussed below.

Table 3.10-7. Fish and Aquatic Resources Effects and Mitigation Measures for Alternative 2

Effect	Finding	Mitigation Measure	With Mitigation
Effect FISH-1: Loss or Degradation of Riparian and SRA Cover (including Critical Habitat)	Less than significant	None required	Less than significant
Effect FISH-2: Construction-Related Erosion Resulting in Substantially Increased Sedimentation and Turbidity	Less than significant	None required	Less than significant
Effect FISH-3: Adverse Effects on Fish Health and Survival Associated with Potential Discharge of Contaminants during Construction Activities	Less than significant	None required	Less than significant
Effect FISH-4: Adverse Effects Caused by Construction Equipment Noise and Vibration	Less than Significant	None required	Less than Significant

Effect FISH-1: Loss or Degradation of Riparian and SRA Cover (including Critical Habitat)

Compared to Alternative 1, implementation of Alternative 2 is expected to result in potentially greater removal of riparian vegetation. Alternative 2 construction activities are assumed to result in removal of all riparian vegetation within the construction footprint. An estimate of the total acreage of riparian vegetation to be removed is presented in Section 3.8, *Vegetation and Wetlands*, Table 3.8-6.

Similar to Alternative 1, there are no construction activities proposed in-river or below OHWM; all activities that would result in physical disturbance and removal of vegetation on the waterside slope of the levee would be limited to areas above OHWM. Therefore, no physical modification of critical habitat for ESA-listed fish species would be expected because all proposed construction activities would occur above the OHWM of the Feather River. However, there would be effects on floodplain riparian habitat that may affect listed fish species. For the purposes of NEPA and CEQA, the effect on fisheries resources would be less than significant.

Effect FISH-2: Construction-Related Erosion Resulting in Sedimentation and Turbidity

As described above under Alternative 1, temporary disturbance of fish and degradation of habitat may occur during construction activities. Effects on fish and habitat would be greater under this alternative because more levee construction and disturbance are expected to occur. Construction activities occurring along the levee footprint could cause increased sedimentation and turbidity during spawning periods, resulting in significant and adverse effects on these special-status species. However, with implementation of the environmental commitment to implement a SWPPP, described above under Alternative 1, and standard erosion and sediment control BMPs, as part of the project, these effects are expected to be less than significant.

Effect FISH-3: Adverse Effects on Fish Health and Survival Associated with Potential Discharge of Contaminants during Construction Activities

As discussed under Alternative 1, accidental spills or leakage of contaminants such as bentonite, gasoline, lubricants, and other petroleum-based products could kill or injure fish in the project area. Effects on fish could be greater under this alternative because of the potentially greater extent and duration of construction activities on the waterside slope of the levee. Adverse effects related to contaminant spills and leaks are potentially significant but would be adequately mitigated by implementing a spill prevention, control, and countermeasure plan and a SWPPP, described above under Alternative 1, as part of the environmental commitments for the project. Therefore, potential effects associated with contaminant spills are expected to be less than significant.

Effect FISH-4: Adverse Effects Caused by Construction Equipment Noise and Vibration

As described above under Alternative 1, temporary disturbance of fish and degradation of habitat may occur during construction activities. Effects on fish and habitat would be greater under this alternative because levee construction and disturbance are expected to occur. However, as described under Alternative 1, because construction would occur only on land near the Feather River and not in the water, potential effects associated with noise and vibration would be less than significant.

3.10.4.4 Alternative 3

Like Alternatives 1 and 2, Alternative 3 includes construction of cutoff walls along the entire construction footprint from Reaches 2 through 41. In addition, Alternative 3 includes a limited number of seepage berms, relief wells, slope flattening and depression infilling, ditch lining and levee reconstruction actions. Approximately 9,500 feet of canal would be kept in place and monitored with a Flood Safety Plan. Implementation of the Flood Safety Plan would occur as described in Section 2.3. This alternative would result in approximately the same amount of disturbance as Alternative 1.

Implementation of Alternative 3 would potentially result in effects on fish and aquatic resources. These potential effects and related mitigation measure requirements are summarized in Table 3.10-8 and discussed below.

Table 3.10-8. Fish and Aquatic Resources Effects and Mitigation Measures for Alternative 3

Effect	Finding	Mitigation Measure	With Mitigation
Effect FISH-1: Loss or Degradation of Riparian and SRA Cover (including Critical Habitat)	Less than significant	None required	Less than significant
Effect FISH-2: Construction-Related Erosion Resulting in Substantially Increased Sedimentation and Turbidity	Less than significant	None required	Less than significant
Effect FISH-3: Adverse Effects on Fish Health and Survival Associated with Potential Discharge of Contaminants during Construction Activities	Less than significant	None required	Less than significant
Effect FISH-4: Adverse Effects Caused by Construction Equipment Noise and Vibration	Less than Significant	None required	Less than Significant

Effect FISH-1: Loss or Degradation of Riparian and SRA Cover (including Critical Habitat)

The amount of riparian vegetation removed along the shoreline under Alternative 3 is expected to be similar to that under Alternative 1. An estimate of the total acreage of riparian vegetation to be removed is presented in Section 3.8, *Vegetation and Wetlands*, Table 3.8-6.

Similar to Alternative 1, there are no construction activities proposed in-river or below OHWM; all activities that would result in physical disturbance and removal of vegetation on the waterside slope of the levee would be limited to areas above OHWM. Therefore, no physical modification of critical habitat for ESA-listed fish species would be expected because all proposed construction activities would occur above the OHWM of the Feather River. However, there would be effects on floodplain riparian habitat that may affect listed fish species. For the purposes of NEPA and CEQA, the effect on fisheries resources would be less than significant.

Effect FISH-2: Construction-Related Erosion Resulting in Sedimentation and Turbidity

Temporary disturbance of fish and degradation of habitat may occur during construction activities for Alternative 3 and is anticipated to be the same as under Alternative 1. Construction activities occurring along the levee footprint could cause increased sedimentation and turbidity during spawning periods that would result in significant and adverse effects on special-status species. However, with implementation of the project environmental commitment to implement a SWPPP, described above, and standard erosion and sediment control BMPs, these effects are expected to be less than significant.

Effect FISH-3: Adverse Effects on Fish Health and Survival Associated with Potential Discharge of Contaminants during Construction Activities

As discussed under Alternative 1, accidental spills or leakage of contaminants such as bentonite, gasoline, lubricants, and other petroleum-based products could kill or injure fish in the project area. Effects on fish under Alternative 3 would be the same as described under Alternative 1. Adverse effects related to contaminant spills and leaks are potentially significant but would be adequately mitigated by implementing a spill prevention, control, and countermeasure plan and a SWPPP, described above, as part of the environmental commitments for the project. Therefore, potential effects associated with contaminant spills are expected to be less than significant.

Effect FISH-4: Adverse Effects Caused by Construction Equipment Noise and Vibration

Temporary disturbance of fish and degradation of habitat may occur during construction activities. Effects on fish and habitat under Alternative 3 would be similar to those under Alternative 1. Therefore, the level of underwater noise from the upland sheet pile driving under Alternative 3 is anticipated to result in a less-than-significant effect on fish.

3.11 Agriculture, Land Use, and Socioeconomics

3.11.1 Introduction

This section describes the regulatory and environmental setting for agriculture, land use, and socioeconomics; effects on agriculture, land use, and socioeconomics that would result from the No Action Alternative and Alternatives 1, 2, and 3; and mitigation measures that would reduce significant effects.

3.11.1 Affected Environment

This section describes the affected environment for agriculture, land use, and socioeconomics in the project area. Following are the key sources of data and information used in the preparation of this section.

- Butte County General Plan 2030 (Butte County 2010).
- Sutter County General Plan, Public Draft (Sutter County 2010a).
- Sutter County General Plan Draft Environmental Impact Report (Sutter County 2010b).
- City of Yuba City General Plan (City of Yuba City 2004).
- City of Live Oak 2030 General Plan (City of Live Oak 2010).

3.11.1.1 Regulatory Setting

This section summarizes key Federal and state regulatory information that applies to agriculture, land use, and socioeconomics. Additional regulatory information appears in Appendix A.

Federal

The following Federal policies related to agriculture and land use may apply to implementation of the proposed project. Socioeconomic issues are generally handled at the state and local level; therefore, this section contains no Federal regulations related to socioeconomics.

Farmland Protection Policy Act

The National Agricultural Land Study conducted in 1980–1981 found that each year millions of acres of farmland were being converted to other uses in the United States. In addition, a 1981 Congressional report acknowledged the need for Congress to carry out programs and policies to protect farmland. Congress passed the Agriculture and Food Act of 1981, which contained the Farmland Protection Policy Act (FPPA). The FPPA requires Federal agencies to identify the amount of farmland converted by Federal programs to nonagricultural use, assess the potential effects of a proposed project on prime and unique farmland, and consider alternative actions that would lessen such effects. Projects are subject to FPPA requirements if they may, directly or indirectly, irreversibly convert farmland to nonagricultural use and are implemented by a Federal agency or with assistance from a Federal agency. The Natural Resources Conservation Service (NRCS) is the Federal agency responsible for ensuring compliance with these laws and policies.

The purpose of the FPPA is to minimize the contribution of Federal programs to the irreversible conversion of farmland to nonagricultural uses and ensure that Federal programs are administered in a manner compatible with Federal, state, local, and private farmland protection programs and policies. Lands subject to the FPPA do not have to be currently used for crops, but do include prime farmland, unique farmland, and lands of statewide or local importance. These lands can be forest land, pastureland, cropland, or other land, but not water or urban built-up land.

During preparation of this EIS/EIR, ICF (as proxy for USACE) coordinated with NRCS on Form NRCS-CPA-106 to determine a Farmland Conversion Impact Rating and to ensure that all important farmland in the project area subject to conversion has been properly identified and considered in the analysis. The Oroville regional NRCS office oversaw the scoring of the Butte County portion of the project and the Yuba City regional NRCS office oversaw the scoring of the Sutter County portion of the project. The forms are located at the end of this chapter (Figure 3.11-1).

State

The following state policies related to agriculture, land use, and socioeconomics may apply to implementation of the proposed project.

Farmland Mapping and Monitoring Program

California established the Farmland Mapping and Monitoring Program (FMMP) in 1982 to continue the Important Farmland Inventory efforts begun by the NRCS in 1975. The FMMP is a non-regulatory program intended to aid in assessing the location, quality, and quantity of agricultural lands and conversion of such lands over time. The FMMP provides consistent and impartial data for the analysis of agricultural land uses and land use changes in California. Under the FMMP, the first Important Farmland Maps were produced in 1984, covering 38 of the state's 58 counties; current maps, released every 2 years, cover almost 98% of the state's privately held land (California Department of Conservation 2011). The FMMP rates agricultural land according to soil quality and irrigation status within the designations discussed below.

Prime Farmland

Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor, and without intolerable soil erosion.

Unique Farmland

Unique farmland is land other than prime farmland that is used for the production of specific high-value food and fiber crops, such as citrus, tree nuts, olives, cranberries, fruits, and vegetables.

Farmland of Statewide Importance

Farmland of statewide importance is land of statewide or local importance identified by state or local agencies for agricultural use, but not of national significance.

Farmland of Local Importance

Farmland of local importance is land identified as important to the local agricultural economy by each county's board of supervisors and a local advisory committee.

Williamson Act

The California Land Conservation Act of 1965, commonly referred to as the Williamson Act, is a state policy administered at the local government level. The Williamson Act is intended to preserve agricultural and open space lands through contracts with private landowners. By entering into a Williamson Act contract, the landowner foregoes the possibility of converting agricultural land to non-agricultural use for a rolling period of 10 years in return for lower property taxes. Local governments receive an annual subvention of forgone property tax revenues from the state via the Open Space Subvention Act of 1971.

The Williamson Act was amended in August 1998 to establish Farmland Security Zones. In return for a 20-year contract commitment, property owners are granted greater tax reductions. Neither Sutter County nor Butte County currently participates in the Farmland Security Zone program.

Of California's 58 counties, 53 have adopted the Williamson Act program, including Sutter and Butte Counties. The Environmental Setting section below discusses the location of Williamson Act lands within the project area.

Senate Bill 5

Circumstances regarding flood risk may influence community development and population growth. One such circumstance is the imposition of development restrictions if target levels of flood protection are not in place. Specifically, as required by California SB 5 (signed by then-Governor Schwarzenegger in October 2007), the CVFPB must adopt a CVFPP by July 1, 2012. The CVFPP will require a 200-year level of flood protection for urban and urbanizing areas by 2025. No new development will be permitted if this level of protection is not met. As an interim measure, no new development will be permitted if adequate progress is not being made toward this goal by 2015

Local

Portions of the project area fall under the jurisdiction of the Sutter County, Butte County, and Yuba City general plans. In addition, part of the project area lies outside the Live Oak City limit but within its Sphere of Influence. Each of these municipalities has adopted goals and policies related to agriculture, land use, and socioeconomics, detailed in Appendix A, which may apply to implementation of the proposed project.

3.11.1.2 Environmental Setting

The following considerations are relevant to agricultural, land use, and socioeconomic conditions in the proposed project area.

The proposed project would take place within a narrow strip of Sutter and Butte Counties, including a small area on the eastern edge of Yuba City, approximately 41 miles long and 600 feet wide, along and encompassing the Feather River West Levee. For purposes of agricultural and land use evaluations, the project area consists primarily of the area directly subjected to the proposed project activities, as well as overall issues of agricultural productivity and land use patterns within the two counties and Yuba City. For purposes of evaluating socioeconomic effects, relevant countywide economic data is also considered.

Study Area Farmland Mapping and Monitoring Program Classifications

The FMMP designates the vast majority of Sutter County land as important farmland. According to the most recent mapping, the county has approximately 162,673 acres of prime farmland, 105,395 acres of farmland of statewide importance, 17,752 acres of unique farmland, and 53,538 acres of grazing land (California Department of Conservation, Division of Land Resource Protection 2011). Within the Sutter County portion of the project area, much of the land along the west bank of the Feather River is classified as prime farmland, with farmland of statewide importance located immediately south of Yuba City and near Live Oak (Plate 3.11-1).

Only about one-third of Butte County is designated by the FMMP as important farmland; however, this land is almost exclusively located in the flat, western half of the county. According to the most recent mapping, Butte County has approximately 193,290 acres of prime farmland; 21,792 acres of farmland of statewide importance; 22,190 acres of unique farmland; and 403,078 acres of grazing land (California Department of Conservation, Division of Land Resource Protection 2010). Within the Butte County portion of the project area, prime farmland, located along the western edge of the Feather River between Reaches 25 and 40 (Plate 3.11-1), is the most common. A small area of unique farmland lies south of Thermalito Afterbay.

Sutter County Agriculture

Sutter County is largely rural, with agriculture being the dominant land use. More than 86% of land within the county is used for agriculture (Sutter County 2011a). As of 2010, food and agricultural production accounted for approximately 20% of the total economic output of all industries in the county (Sutter County 2010a).

Agricultural Production

Agriculture in Sutter County is either intensive (i.e., field crops, seed crops, vegetable crops, fruit and nut crops, nursery stock, and apiary products) or extensive (i.e., animal-related forms of agriculture). The dominant crops produced in the county are rice and other field crops, dried plums, English walnuts, almonds and other fruits and nuts, seed crops, tomatoes and other vegetable crops, nursery products, and apiary and livestock products. The top 10 crops for Sutter County in 2010, by value, were milling rice, English walnuts, dried plums, clingstone peaches, processing tomatoes, almonds, orchard biomass, seed rice, nursery products, and vegetable and vinecrop seed (U.S. Department of Agriculture, National Agricultural Statistics Service 2011). A list of the harvested acreages for these crops is provided in Table 3.11-1.

For the 2010 crop year, compared with other California counties, Sutter County ranked first in dried plum production and orchard biomass production, second in rice production, vegetable and vinecrop seed production, and honeydew melon production, fourth in peach production, and fifth in alfalfa seed production (U.S. Department of Agriculture, National Agricultural Statistics Service 2011).

Orchards, with their associated fruit and nut crops, predominate within the Sutter County portion of the project area, both from Reaches 2 through 11 and north of Yuba City, from Reach 18 north to the county line (Reach 25). Along these project reaches, agricultural lands not planted to orchard crops are currently in use for field crops.

Table 3.11-1. Sutter County Primary Crop Harvested Acreage, 2010

Crop	Crop Type	Harvested Acres	Crop Values
Almonds	Fruit and nut	4,453	$17,374,000
Peaches	Fruit and nut	7,120	$32,284,100
Dried plums	Fruit and nut	18,577	$48,830,000
Walnuts (English)	Fruit and nut	21,999	$71,760,700
Kiwifruit	Fruit and nut	104	$993,000
Lima beans	Field	1,965	$1,774,000
Miscellaneous beans	Field	4,765	$3,178,500
Corn, field grain	Field	4,317	$3,940,600
Hay (alfalfa)	Field	5,759	$4,360,000
Pasture (irrigated)	Field	10,500	$1,470,000
Pasture (range, dry)	Field	64,500	$645,000
Rice	Field	115,449	$202,945,800
Safflower	Field	1,938	$629,500
Wheat	Field	12,490	$5,967,000
Straw	Field	6,696	$359,200
Wild Rice	Field	550	$481,300
Melons (honeydew)	Vegetable	2,639	$7,678,500
Tomatoes (processing)	Vegetable	7,331	$22,390,000
Beans	Seed	614	$601,100
Rice	Seed	5,542	$14,952,800
Safflower	Seed	1,038	$191,000
Sunflower	Seed	7,740	$8,703,900

Source: Sutter County 2011b.

Williamson Act Lands

As of 2009, the most recent data available, a total of 64,573 acres of Williamson Act lands were located throughout Sutter County (Sutter County 2011b:24). No parcels within the Sutter County portion of the project area are currently under Williamson Act protection (Plate 3.11-2).

City of Yuba City Agriculture

Within the Yuba City Planning Area, agriculture is the most common open space land use and is vital to the city's economy (City of Yuba City 2004). However, very little agricultural land lies within the city limits. Orchards are the primary agricultural use within the Yuba City Planning Area.

As of 2002, the Yuba City Planning Area had 913 acres of prime farmland, 4,432 acres of farmland of statewide importance, 273 acres of unique farmland, no farmland of local importance, and 264 acres of grazing land (City of Yuba City 2004). Of this, no undeveloped acres of prime farmland, unique farmland, or grazing land fall within the project area. One agricultural area, planted to orchard crops, lies east of Reach 17 and within the city limit.

City of Live Oak Agriculture

Live Oak is located in a part of the Sacramento Valley with some of the richest soils in the state. Orchards occupy a large portion of the Live Oak SOI, and crops such as plums, peaches, apricots, almonds, walnuts, citrus, and alfalfa are grown in the area (City of Live Oak 2010). Farmland surrounds the town and is considered a vital component of the character, economy, history, and culture of Live Oak. As of 2006, important farmland within the city SOI was largely farmland of statewide importance, with small areas of prime farmland located to the southeast of the city (California Department of Conservation, Division of Land Resource Protection 2011). Within the Live Oak SOI portion of the project area, agricultural uses consist almost entirely of orchards.

Butte County Agriculture

Butte County is mostly rural, and agriculture is the most common land use in the county, totaling nearly 60% of all land use. Most of this agricultural land falls within the western portion of the county.

Agricultural Production

The main crops produced in Butte County include fruits and nuts as well as field, seed, and vegetable crops; livestock, apiary, and nursery products are also produced. The three most land-intensive crops in the county are rice, almonds, and English walnuts, accounting for more than one-third of the agricultural land (Butte County 2011). Table 3.11-2 lists the harvested acreage of Butte County's primary crops. The county's top 10 crops by value in 2010 were milling rice, English walnuts, almonds, dried plums, miscellaneous nursery products, seed rice, cattle and calves, unspecified fruits and nuts, clingstone peaches, and kiwi fruit (U.S. Department of Agriculture, National Agricultural Statistics Service 2011.

For the 2010 crop year, compared with other California counties, Butte County ranked second in dried plum production, English walnut production, and kiwi fruit production, third in rice production, and fifth in olive production (U.S. Department of Agriculture, National Agricultural Statistics Service 2011). Agricultural lands along the Butte County project reaches are dedicated almost exclusively to orchard crops.

Table 3.11-2. Butte County Primary Crop Harvested Acreages, 2010

Crop	Crop Type	Harvested Acres	Crop Values
Almonds	Fruit and nut	39,262	$113,781,000
Olives (oil)	Fruit and nut	2,055	$4,904,000
Peaches (clingstone)	Fruit and nut	2,288	$9,690,000
Dried plums	Fruit and nut	10,790	$42,556,000
Walnuts (English)	Fruit and nut	33,330	$173,392,000
Kiwi fruit	Fruit and nut	710	$8,177,000
Beans, dry	Field	950	$1,970,000
Hay (alfalfa)	Field	1,080	$809,000
Pasture (irrigated)	Field	16,500	$2,030,000
Pasture (other)	Field	245,000	$3,553,000
Rice	Field	93,800	$182,248,000
Wheat	Field	3,964	$1,591,000
Rice	Seed	4,327	$10,865,000

Source: Butte County 2011.

Williamson Act Lands

Butte County has Williamson Act tracts scattered throughout its western half. As of 2009, the most recent data available, Williamson Act contracts protected 217,151 acres of the county's agricultural land (California Department of Conservation, Division of Land Resources Protection 2010). Within the Butte County portion of the project area, the Williamson Act lands consist primarily of prime farmland (California Department of Conservation, Division of Land Resource Protection 2011).

3.11.1.3 Sutter County Land Use

Sutter County, whose southern boundary is located about 10 miles north of Sacramento, is the southernmost of the two project area counties. The Feather River serves as much of the county's eastern boundary; the Sacramento River and the Butte Sink area of Colusa County form the county's western boundary. Butte County adjoins Sutter County to the north and Sacramento, Yolo, and Placer Counties lie to the south. Sutter County covers approximately 607 square miles, 592 of which are unincorporated (Sutter County 2011a). The population of unincorporated Sutter County as of January 2010 was 21,408 (California Department of Finance 2011).

The county's overall land use pattern is rural in nature and dominated by expansive agricultural areas, significant natural and recreational resources (including the Sutter Buttes, the Feather River Wildlife Refuge, Gray Lodge Wildlife Area, and Bobelaine Audubon Sanctuary), and relatively low population density. Two incorporated cities, Yuba City and Live Oak, fall within the Sutter County portion of the project area and are discussed separately below.

Eighty-six percent of Sutter County's lands are dedicated to agriculture. Uses include field and row crops, orchards, rice, livestock grazing, dry farming, and timber (Sutter County 2010a). Agricultural lands are primarily limited to the unincorporated areas of the county, although approximately 598 acres and 98 acres of agricultural uses lie within the city limits of Yuba City and Live Oak, respectively (Sutter County 2010b:4-10). Sutter County's second-largest land use is open space, comprising nearly 12% of the county's area. Existing Sutter County land uses are described in Table 3.11-3 and shown in Plate 3.11-3 (Sutter County 2010b:4-7).

Table 3.11-3. Existing Land Uses in Sutter County

Land Use	Acres	Percentage of County Land
Agricultural	328,208	86.6%
Residential	1,971	1.0%
Public and Airport	472	0.1%
Commercial	424	0.1%
Industrial	749	0.2%
Open Space, Parks, and Golf Course	44,919	11.9%
Transportation and Utilities	1,809	0.5%
Vacant	323	0.1%
Total	378,875	100%

Source: Sutter County 2010b:4-7.

With the exception of urbanized Yuba City, agriculture and its accessory uses dominates the land use pattern of the Sutter County project reaches. As the proposed project would primarily affect lands west of the Feather River, this discussion focuses on those areas, with some exceptions. South of Yuba City, most of the project area lands are designated either AG-20 (agriculture, 20-acre minimum) or AG-80 (agriculture, 80-acre minimum) by Sutter County; lands east of the project area (within the Feather River floodway) are primarily designated OS (open space), with a floodplain overlay. In keeping with these designations, agricultural uses predominate west of the Feather River from Reaches 2 through 11, consisting mainly of orchards interspersed with parcels devoted to field crops. A variety of farm structures, including residences, barns, shop buildings, and other agricultural accessory uses, are scattered throughout the project area reaches. Abbott Lake lies immediately east of Reach 7, and Boyd's Boat Launch is located east of Reach 9. From the northernmost section of Reach 11 through Reach 17, the project area follows the eastern edge of Yuba City, with the exception of Reaches 14 and 15, which pass east of the city limit through lands designated open space by Sutter County. Near the northern part of Yuba City, the project area crosses the Union Pacific Railroad line, re-entering unincorporated Sutter County near the transition from Reach 17 to 18, and continues northward, east of Live Oak, to the county line through lands designated AG-20, an area of agricultural uses similar in character to those south of Yuba City. As with the southern Sutter County project area, lands immediately east of the project reaches are designated open space with a floodplain overlay. Reach 25 is the northernmost portion of the project area within Sutter County.

3.11.1.4 City of Yuba City Land Use

Yuba City, the Sutter County seat and the most densely populated portion of the project area, lies 42 miles north of Sacramento. Its boundaries encompass approximately 14 square miles (9,355 acres) of land. Portions of the city abut the west bank of the Feather River. As of January 2010, Yuba City's population was 64,929 (California Department of Finance 2011). The majority of Sutter County's population lives in Yuba City, which contains a broad range of residential, commercial, office, industrial, open space, and public facility uses (Plate 3.11-3).

Residential uses are the principal land use in the city, encompassing nearly 56% of the city's incorporated area, followed by commercial and office uses, public uses, and industrial uses (Table 3.11-4) (Sutter County 2010b:4-10). Within the city limits, approximately 598 acres of agriculture border the urbanized area to the west, north, and south, and 383 acres of open space exist, most of which serve as a buffer between the city and the Feather River to the east (City of Yuba City 2004).

Lands along the Yuba City portion of the project area consist primarily of urban uses. Single family residential neighborhoods and the southern boundary of Yuba City coincide with the northernmost portion of Reach 11, and single-family residential areas also border Reaches 12 and 13. Industrial and light industrial uses adjoin the northern section of Reach 13. Reaches 14 and 15 lie outside the city limit, along the east side of the Sutter County Airport facilities. North of the airport and south of the SR 20 bridge, areas of multi-family residential, office, and commercial uses border the western edge of Reach 16; part of the Feather River Levee Bike Trail also lies within this portion of the project area. Junctures with both the Twin Cities Memorial Bridge and the SR 20 (Colusa Avenue) bridge also distinguish Reach 16. North of the SR 20 bridge, Reaches 16 and 17 border a variety of light industrial and commercial uses. Lands east of Reaches 16 and 17 include some agricultural uses and carry AH (agricultural holding district) and F (flood district) designations.

Table 3.11-4. Existing Land Uses in the City of Yuba City

Land Use	Acres	Percentage of City Land
Agriculture	598	7%
Open space	383	4%
Public uses	900	10%
Residential	5,020	56%
Commercial and office	1,100	12%
Industrial	800	9%
Other uses	164	2%
Total	8,965	100%

Source: Sutter County 2010b:4-10.

3.11.1.5 City of Live Oak Land Use

The city of Live Oak lies about 1 mile west of the project area and 10 miles north of Yuba City; however, the Live Oak SOI extends north to the Sutter–Butte County line, south to Paseo Road, and east to the Feather River, encompassing portions of project Reaches 22 through 25. Live Oak occupies approximately 2 square miles (1,165 acres), with a population of 8,428 as of January 2010 (California Department of Finance 2011).

Land uses in Live Oak include residential, commercial, industrial, public, and agricultural uses. Approximately 70% of Live Oak's land use is residential in nature (Sutter County 2010b:4-10). Single-family housing accounts for 80% of the city's housing stock (City of Live Oak 2010:IN-13). The second most common land use is public uses, followed by agricultural, transportation and utilities, commercial, and industrial (Sutter County 2010b:4-10). Parks, schools, churches, and government offices are scattered throughout the city, while commercial and industrial uses are primarily concentrated near SR 99, which bisects the city. In addition, Live Oak contains approximately 98 acres of small agricultural parcels (Sutter County 2010b:4-10). Table 3.11-5 and Plate 3.11-3 outline the land uses in the city.

Although the project area does not enter the Live Oak city limit, Reaches 22 through 25 pass east of Live Oak, within Sutter County jurisdiction but also within the city's SOI. Agricultural uses in this area consist almost entirely of orchards, with scattered residences and related agricultural facilities; the area carries a designation of AG-20 (Agriculture, 20-acre minimum).

Table 3.11-5. Existing Land Uses in the City of Live Oak

Land Use Designation	Acres
Single-Family Residential	485
Multi-Family Residential	21
Rural Residential	471
Duplex	12
Mobile Home	11
Office	2
Commercial	25
Industrial	35
Open Land	125
Civic/Public	151
Vacant	72
Railroad	44
Park	6
Agriculture	2,766
Total	**4,228**

Source: City of Live Oak 2010:4.1-4.

3.11.1.6 Butte County Land Use

The northern reaches of the proposed project traverse southern Butte County, home to Thermalito Afterbay (a part of the Oroville Dam project), the northern edge of the project area. Butte County's southernmost boundary lies about 52 miles north of Sacramento, and its northernmost boundary is less than 150 miles from the California–Oregon border. The Feather River emerges from Thermalito Afterbay and runs south through the center of the southern portion of Butte County and into Sutter County. The county has a total area of 1,677 square miles, of which 1,639 square miles are land and 38 square miles are water. The population of unincorporated Butte County as of January 2010 was 83,809 (California Department of Finance 2011).

Agricultural and public uses occupy most of Butte County. Nearly 60% of Butte County lands are devoted to agriculture (Butte County 2010:41). The county's second most common land use is public/quasi-public, which includes parcels owned by Federal, state, and county agencies; publicly owned parcels; parcels owned by special districts; and parcels that accommodate civic and institutional uses, such as churches and hospitals, and utilities. Public and quasi-public uses account for approximately 178,400 acres, roughly 17% of land in the unincorporated county (Butte County 2010:45). Slightly more than 10% of unincorporated Butte County consists of residential uses (Butte County 2010). Existing land uses for Butte County are outlined in Table 3.11-6 and in Plate 3.11-3 (Butte County 2010:41).

Butte County has five incorporated cities, as well as numerous unincorporated communities: Oroville, the county seat; Chico; Paradise; Gridley; and Biggs. Other than the unincorporated community of East Gridley, these cities and communities are outside the area expected to experience the proposed project's land use and agricultural effects and are therefore not discussed further.

Table 3.11-6. Existing Land Uses in Butte County

Land Use	Acres	Percentage of County Land
Agriculture	599,040	58.11%
Public/quasi-public	178,400	17.3%
Residential—single-family	117,210	11.4%
Vacant	93,800	9%
Undefined	26,820	2.6%
Residential—multi-family	9,700	0.9%
Commercial and office	4,140	0.4%
Industrial	1,400	0.14%
Tribal lands	400	0.038%
Total	1,030,910	99.89%

Source: Butte County 2010:42.
Note: This table includes the acreages of land uses as they exist on the ground, as recorded by the Butte County Assessor.

Project Reaches 25 through 41 are within the boundaries of Butte County, and are characterized by agricultural and open space uses. Agricultural uses in this area consist primarily of orchards, with associated residences and agricultural facilities. Lands between Reaches 25 and 40 carry either an AG-40 or a P-Q designation, including the community of East Gridley, located immediately south of East Gridley Road within Reach 30. East Gridley contains a variety of uses, including residential, commercial, and school facilities. North of East Gridley, from Reach 31 to Reach 40, agricultural uses again predominate. The final project Reach, 41, is located at the southern edge of Thermalito Afterbay and falls within a Resource Conservation Zone.

3.11.1.7 Sutter County Socioeconomics

Sutter County is one of northern California's major agricultural counties (California Employment Development Department 2010a), and its traditional job base is agriculture. Agriculture and agriculture-related support industries have been and continue to be the county's top "competitive edge" private industries (California Economic Development Partnership 2009a).

As residential growth increased, so did the number of service and retail industries in the county (Sutter County 2010a:5-1). Government, health care, and construction have become some of the county's largest employment sectors (Bureau of Economic Analysis 2010a; California Economic Development Partnership 2009a). The fastest growing job markets between 2001 and 2007 included mining, administrative and waste services, utilities, and information (Table 3.11-7) (California Economic Development Partnership 2009a). The projected fastest growing job sectors in the county are home health and home care aides, truck and heavy equipment mechanics and drivers, and retail workers (California Economic Development Partnership 2009a). The county plans to diversify its economic base and create a regulatory climate conducive to new businesses and business growth (Sutter County 2010a:5-2). Sutter County has a labor force of 41,800, and its unemployment rate is 21.5% (California Employment Development Department 2010a).

Table 3.11-7. Total Full-Time and Part-Time Employment in Sutter County between 2001 and 2008

Employment by Industry	2001	2002	2003	2004	2005	2006	2007	2008
Total employment	40,171	40,109	41,098	41,561	41,972	43,067	44,561	44,316
Farm employment	4,000	4,099	4,146	3,735	2,947	2,602	2,873	2,655
Nonfarm employment	36,171	36,010	36,952	37,826	39,025	40,465	41,688	41,661
Private employment	31,774	31,648	32,625	33,424	34,639	35,885	37,005	36,888
Forestry, fishing, and related activities	1,465	1,408	1,507	1,407	1,625	1,613	1,607	1,482
Mining	93	99	116	96	108	129	167	251
Utilities	49	100	98	88	85	73	70	99
Construction	2,673	2,559	2,649	2,753	2,990	3,056	3,039	2,761
Manufacturing	2,379	1,785	1,844	1,813	1,820	1,804	1,900	1,908
Wholesale trade	1,178	1,366	1,170	1,298	1,252	1,340	1,458	1,338
Retail trade	5,696	5,931	6,130	6,094	6,326	6,711	6,797	6,561
Transportation and warehousing	1,428	1,356	1,324	1,267	1,330	1,427	1,683	1,714
Information	278	259	281	309	305	319	357	353
Finance and insurance	1,347	1,208	1,204	1,272	1,241	1,288	1,452	1,528
Real estate and rental and leasing	1,821	1,877	1,978	2,184	2,333	2,320	2,247	2,450
Professional, scientific, and technical services	(D)	1,547	1,644	1,760	1,839	1,793	1,845	1,922
Management of companies and enterprises	(D)	327	(D)	262	246	241	236	234
Administrative and waste services	1,710	1,663	2,131	2,229	2,468	2,766	2,722	2,544
Educational services	476	613	669	652	452	470	478	482
Health care and social assistance	3,660	3,941	4,021	4,237	4,455	4,660	4,847	5,010
Arts, entertainment, and recreation	671	676	(D)	715	696	725	757	811
Accommodation and food services	2,281	2,397	2,331	2,344	2,417	2,573	2,665	2,730
Other services, except public administration	2,631	2,536	2,540	2,644	2,651	2,577	2,678	2,710
Government and government enterprises	4,397	4,362	4,327	4,402	4,386	4,580	4,683	4,773
Federal, civilian	176	174	176	173	174	173	174	177
Military	151	152	154	154	147	147	146	151
State and local	4,070	4,036	3,997	4,075	4,065	4,260	4,363	4,445
State government	246	79	80	80	87	91	93	87
Local government	3,824	3,957	3,917	3,995	3,978	4,169	4,270	4,358

Source: Bureau of Economic Analysis 2010b.

Notes:

Estimates for 2001–2006 based on 2002 North American Industry Classification System (NAICS). Estimates for 2007 forward based on 2007 NAICS.

(D) = Not shown to avoid disclosure of confidential information but included in totals.

In 2008, total personal income in Sutter County was $3,067,966, and the per capita personal income was $33,301 (Bureau of Economic Analysis 2010a). For comparison, in 2009, total personal income in California was $1,564,388,897,000, and the per capita personal income was $42,325 (California Employment Development Department 2010b). As of 2010, food and agricultural production accounted for approximately 20% of the total economic output of all industries in Sutter County (Sutter County 2010b).

3.11.1.8 Butte County Socioeconomics

Agriculture is a major employment sector in Butte County (Butte County 2010:117). According to the Butte County General Plan 2030, in 2008 the estimated gross value of agricultural production countywide was approximately $580 million. Trends indicate that agriculture will maintain a strong position within Butte County's economy. The 2008 production value is an increase of almost $73 million over the 2007 production value.

Construction, health care, education, and government are other major employment sectors (Bureau of Economic Analysis 2010c; California Economic Development Partnership 2009b). Between 2001 and 2007, construction, retail, and education services were the fastest growing sectors in Butte County (California Economic Development Partnership 2009b) (Table 3.11-8). Occupational projections by the California Economic Development Partnership (2009b) indicate that the fastest growing occupations in the county are those involving pharmaceutical workers, home health care providers, and medical assistants. The county has a total labor force of 104,700, and its unemployment rate is 13.8% (California Employment Development Department 2010b).

Table 3.11-8. Total Full-Time and Part-Time Employment in Butte County between 2001 and 2008

Employment by Industry	2001	2002	2003	2004	2005	2006	2007	2008
Farm employment	3,909	4,092	3,785	3,491	3,166	2,974	3,181	3,270
Nonfarm employment	97,098	97,568	97,961	100,373	103,130	103,880	104,666	105,250
Private employment	81,406	81,539	81,925	84,672	87,092	87,696	88,344	89,098
Forestry, fishing, and related activities	1,406	1,384	1,360	(D)	1,446	1,264	1,356	1,366
Mining	116	92	95	(D)	80	117	130	157
Utilities	408	381	372	372	358	429	537	523
Construction	5,501	5,560	5,940	6,798	7,564	7,575	7,059	6,587
Manufacturing	5,300	4,646	4,635	4,790	4,855	4,831	5,016	4,995
Wholesale trade	1,976	2,046	2,180	2,520	2,425	2,441	2,558	2,417
Retail trade	12,868	13,359	13,231	13,178	13,606	13,750	13,514	13,171
Transportation and warehousing	2,435	2,514	2,063	2,195	2,205	2,220	2,187	2,196
Information	1,748	1,580	1,673	1,756	1,601	1,564	1,547	1,558
Finance and insurance	3,693	3,883	3,911	3,840	3,980	4,091	4,485	4,918
Real estate and rental and leasing	4,073	4,138	4,485	4,445	4,861	4,884	4,880	5,229
Professional, scientific, and technical services	4,831	4,777	5,025	5,329	5,538	5,558	5,737	5,818
Management of companies and enterprises	451	629	568	470	465	414	413	335
Administrative and waste services	5,730	5,842	4,928	4,879	4,828	4,724	4,493	4,542
Educational services	664	645	670	744	843	931	959	1,004
Health care and social assistance	13,265	13,227	14,094	14,501	14,683	14,889	15,206	15,772
Arts, entertainment, and recreation	2,005	2,045	1,985	2,079	2,111	2,120	2,241	2,332
Accommodation and food services	6,854	6,720	6,464	6,753	7,119	7,465	7,591	7,643
Other services, except public administration	8,082	8,071	8,246	8,543	8,524	8,429	8,435	8,535
Government and government enterprises	15,692	16,029	16,036	15,701	16,038	16,184	16,322	16,152
Federal, civilian	539	536	561	555	559	542	535	541
Military	390	391	396	387	369	365	361	361
State and local	14,763	15,102	15,079	14,759	15,110	15,277	15,426	15,250
State government	3,581	3,636	3,377	3,302	3,374	3,454	3,516	3,492
Local government	11,182	11,466	11,702	11,457	11,736	11,823	11,910	11,758

Source: Bureau of Economic Analysis 2010d.

Notes:

Estimates for 2001–2006 based on 2002 NAICS. Estimates for 2007 forward based on 2007 NAICS.

(D) = Not shown to avoid disclosure of confidential information but included in totals.

In 2008, total personal income in Butte County was $7,100,740, and the per capita personal income in Butte County was $32,349 (Bureau of Economic Analysis 2010c).

3.11.2 Environmental Consequences

This section describes the environmental consequences relating to agriculture, land use, and socioeconomics for the proposed project. It describes the methods used to determine the effects of the project and lists the thresholds used to conclude whether an effect would be significant. The effects that would result from implementation of the project, findings with or without mitigation, and applicable mitigation measures are presented in a table under each alternative.

3.11.2.1 Assessment Methods

This qualitative evaluation of agriculture, land use, and socioeconomics is based on professional standards and information cited throughout the section. The key effects were identified and evaluated based on the environmental characteristics of the project area and the magnitude, intensity, and duration of activities related to the construction and operation of the project.

The agriculture and land use evaluations are based on a review of the regulatory setting and environmental setting above, including review of the proposed project's compliance with Federal, state and local land use plans and regulations, and existing project area conditions. Key effects were identified and evaluated based on the environmental characteristics of the project area and the magnitude, intensity, and duration of activities related to the construction and operation of the proposed project.

Effects on socioeconomic conditions were evaluated qualitatively based on a review of the employment and project information outlined above and the criterion listed in Section 3.11.2.2, *Determination of Effects*. The proposed project was also evaluated for consistency with relevant socioeconomic plans and policies at the Federal, state, and local level, as applicable.

3.11.2.2 Determination of Effects

For this analysis, an effect pertaining to agriculture, land use, or socioeconomics was analyzed under NEPA and CEQA if it would result in any of the following environmental effects, which are based on NEPA standards, State CEQA Guidelines Appendix G (14 CCR 15000 et seq.), and standards of professional practice.

Agriculture

For the purposes of this analysis, effects on agriculture are considered significant if implementation of the proposed project would result in any of the following.

- Irretrievable conversion of a substantial acreage of prime farmland, unique farmland, or farmland of statewide importance.
- Conflicts with existing zoning for agricultural use, or a Williamson Act contract.
- Changes to the existing environment which, because of their location or nature, could result in substantial loss of crop production in the project area.

Land Use

For the purposes of this analysis, effects on land use are considered significant if implementation of the proposed project would result in any of the following.

- Physically divide an established community.
- Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project adopted for the purpose of avoiding or mitigating an environmental effect.
- Conflict with any applicable habitat conservation plan or natural community conservation plan.

Implementation of the project would not physically divide an established community, as the affected rural areas do not constitute established communities and the structures that would be removed within Yuba City are located the edge of the city along the Feather River. Consequently, the first criterion above does not apply to the project and is not considered further in this analysis. Section 3.12, *Population, Housing, and Environmental Justice*, addresses the potential displacement of residents and businesses due to implementation of the proposed project.

Implementation of the project would not conflict with any applicable habitat conservation plan or natural community conservation plan, as both the Yuba-Sutter Natural Community Conservation Plan and Habitat Conservation Plan (Yuba-Sutter NCCP/HCP) and the Butte Regional Conservation Plan (BRCP) are currently in development but have not yet been adopted. Consequently, the third criterion above does not apply to the proposed project and is not considered further in this analysis.

Socioeconomics

For the purposes of this analysis, socioeconomic effects are considered significant if implementation of the proposed project would result in the following conditions.

- A substantial change in employment.
- Conflict with any applicable socioeconomic plan or policy.

3.11.3 Effects and Mitigation Measures

Effects and mitigation measure requirements concerning agriculture, land use, and socioeconomics are summarized in Table 3.11-9.

Table 3.11-9. Summary of Effects for Agriculture, Land Use, and Socioeconomics

Effect	Finding	Mitigation Measures	With Mitigation
Alternatives 1, 2, and 3			
Effect AG-1: Temporary Conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance to Accommodate Construction Activities	Less than significant	None required	Less than significant
Effect AG-2: Irretrievable Conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance	Less than significant	None required	Less than significant
Effect AG-3: Conflict with Existing Zoning for Agricultural Use	Less than significant	None required	Less than significant
Effect AG-4: Conflict with Williamson Act Contract	Less than significant	None required	Less than significant
Effect AG-5: Loss of Agricultural Production	Less than significant	None required	Less than significant
Effect LU-1: Conflict with Applicable Land Use Plan, Policy, or Regulation	Less than significant	None required	Less than significant
Effect SOC-1: Employment Effects during Construction	Beneficial	None required	Beneficial
Effect SOC-2: Conflict with Applicable Socioeconomic Plan or Policy	Less than significant	None required	Less than significant

3.11.3.1 No Action Alternative

The No Action Alternative represents the continuation of the existing deficiencies along the portion of the Feather River in the FRWLP area. Current levee operations and maintenance activities would continue, but there would be no change in the geomorphic and flood control regimes relative to existing conditions.

Agriculture

No construction-related effects to agriculture would occur under the No Action Alternative. However, because no levee improvements would be made under the No Action Alternative, the risk of levee failure and flooding along the Feather River West Levee would continue. Plates 2-13 through 2-19 show the areas subject to inundation from a potential 200-year flood event.

A flood event could have severe consequences for agriculture in the project area. Flooding could cause inundation, erosion, or sedimentation from high flows, destruction, or damage to agricultural equipment, outbuildings, and processing facilities, all of which could lead to reduced agricultural productivity. This damage could cause depression of the agricultural economy and cause abandonment of or prolonged delay in cultivation of productive lands, which could ultimately result in a change in the use of these lands that may be difficult to reverse. Clean-up and repair would likely take months or years after a large flood event, during which time the affected parcels would be temporarily unable to support agricultural uses. Additionally, the cost of cleanup and repair after flooding could be too great to make restoring agricultural operations practicable. As the effects of levee failure on agriculture in the project area are unpredictable, a precise determination of significance cannot be made.

Land Use

No construction-related effects to land use would take place under the No Action Alternative, as no construction would occur. However, because no levee improvements would be made under the No Action Alternative, the risk of levee failure and flooding along the Feather River West Levee would continue. Plates 2-13 through 2-19 show the areas subject to inundation from a potential 200-year flood event.

A flood event could have severe consequences for land use in the project area. Flooding may substantially change the land uses in urban areas, both temporarily and permanently, and result in the physical division of established communities. A period of months or years would be required for clean-up and repair after a large flood event, during which time the affected parcels would be temporarily unable to support their designated land uses. Damages sustained by residential, commercial, civic, and industrial uses in areas inundated by flooding could be so great as to render the properties permanently unusable. Additionally, the cost of cleanup and repair after flooding could be too great to make restoring the current land use worthwhile, resulting in permanent changes to land use in the project area and potential division of established communities. As the effects of levee failure on project area land uses are unpredictable, a precise determination of significance cannot be made.

Socioeconomics

Under the No Action Alternative, none of the proposed project improvements would be implemented. Consequently, no socioeconomic effects associated with levee construction would occur because there would be no construction workforce utilized and, therefore, no increase in employment or change in local economic conditions. In addition, no changes to agricultural income related to project construction would take place. However, because no levee improvements would be made under the No Action Alternative, the risk of levee failure and flooding along the Feather River West Levee would continue. Plates 2-13 through 2-19 show the areas subject to inundation from a potential 200-year flood event. A flood event could have severe consequences for agriculture and land use in the project area, thereby affecting the project area's economic productivity. Flooding could cause inundation, erosion, or sedimentation from high flows, destruction, or damage to agricultural equipment, outbuildings, and processing facilities, all of which could lead to reduced agricultural productivity. Similar damage could occur to commercial and industrial uses in the project area. This damage could cause depression of the local economy. However, as the effects of levee failure on the economy are unpredictable, a precise determination of significance cannot be made.

3.11.3.2 Alternative 1

Implementation of Alternative 1 would potentially result in effects on agriculture, land use, and socioeconomics. These potential effects and related mitigation measure requirements are summarized in Table 3.11-10 and discussed below.

Table 3.11-10. Agriculture, Land Use, and Socioeconomic Effects and Mitigation Measures for Alternative 1

Effect	Finding	Mitigation Measure	With Mitigation
Effect AG-1: Temporary Conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance to Accommodate Construction Activities	Less than significant	None required	Less than significant
Effect AG-2: Irretrievable Conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance	Less than significant	None required	Less than significant
Effect AG-3: Conflict with Existing Zoning for Agricultural Use	Less than significant	None required	Less than significant
Effect AG-4: Conflict with Williamson Act Contract	Less than significant	None required	Less than significant
Effect AG-5: Loss of Agricultural Production	Less than significant	None required	Less than significant
Effect LU-1: Conflict with Applicable Land Use Plan, Policy, or Regulation	Less than significant	None required	Less than significant
Effect SOC-1: Employment Effects during Construction	Beneficial	None required	Beneficial
Effect SOC-2: Conflict with Applicable Socioeconomic Plan or Policy	Less than significant	None required	Less than significant

Effect AG-1: Temporary Conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance to Accommodate Construction Activities

During construction of Alternative 1, temporary staging areas to house construction materials and equipment would be necessary. Temporary earthen access ramps would also be built to facilitate construction activities and allow equipment to access the levees. Due to these construction requirements, implementation of Alternative 1 would temporarily convert up to 18.7 acres of prime farmland and 4.99 acres of farmland of statewide importance from agricultural use within Sutter County, as well as up to 11.77 acres of prime farmland within Butte County. However, all of this farmland in both Sutter County and Butte County would be returned to its original use after completion of project construction. The temporary conversion of this farmland constitutes a less-than-significant effect. No mitigation is required.

Effect AG-2: Irretrievable Conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance

To accommodate the flood control facilities and improvements proposed under Alternative 1, 181.72 acres of prime farmland, 2.79 acres of unique farmland, and 36.37 acres of farmland of statewide importance in Sutter County and 82.49 acres of prime farmland and 3.08 acres of unique farmland in Butte County would be permanently converted to non-agricultural use. This acreage represents 0.11% of the prime farmland, 0.02% of the unique farmland, and 0.03% of the farmland of statewide importance acreage in Sutter County and 0.04% of the prime farmland and 0.01% of the unique farmland acreage in Butte County. The conversion of agricultural land under Alternative 1 would occur only in a narrow corridor adjacent to the existing levee, the remainder of the affected parcel feasible and economically viable for continued farming. Furthermore, the proposed improvements to the flood control system would benefit hundreds of thousands of acres of valuable agricultural land in Sutter and Butte Counties, including prime farmland, unique farmland, and farmland of local importance, by providing increased protection from future flood damage. Consequently, the conversion of this farmland constitutes a less than significant effect. No mitigation is required.

Effect AG-3: Conflict with Existing Zoning for Agricultural Use

With the exception of the portions of the project area within and immediately adjacent to Yuba City along the Feather River, and Reach 41 immediately south of Thermalito Afterbay, lands along the project reaches are zoned for agricultural use. Flood protection measures and facilities are not specifically identified within any of the local zoning ordinances, but would constitute a public facility, which the local jurisdictions recognize as consistent with all zoning districts. Implementation of Alternative 1 would therefore not conflict with existing agricultural zoning. No mitigation is required.

Effect AG-4: Conflict with a Williamson Act Contract

Public agencies may acquire Williamson Act contracted land for a variety of public improvements, including water resource management, provided that there is no other non-contracted land reasonably feasible for the purpose, and that the lower cost of contracted land is not a primary factor in its decision.

No lands in the Sutter County portion of the project area are currently under Williamson Act contract; however, within Butte County, approximately 87.91 acres of contracted lands fall within the footprint of Alternative 1. Of these 87.91 acres, 83.02 acres would be permanently converted to flood protection uses and 4.89 acres would be returned to agricultural use following project construction. Implementation of Alternative 1 would therefore conflict with Williamson Act contracts on 83.02 acres of land within Butte County. The 83.02 acres of Williamson Act lands that would be removed from contracts under Alternative 1 represent 0.04% of Butte County's contracted Williamson Act lands. Furthermore, the nature of the proposed project precludes consideration of lands in other areas. This constitutes a less-than-significant effect. No mitigation is required.

Effect AG-5: Loss of Agricultural Production

As discussed above for Effect AG-2, implementation of Alternative 1 would involve the permanent conversion of up to 401.24 acres of agricultural land within Sutter County and up to 186.22 acres of agricultural land within Butte County. This loss would primarily consist of orchard and field crop land. The loss of a total of 587.46 acres of productive agricultural land, with associated annual losses in agricultural production, would represent approximately 0.06% of the total agricultural land under production in Sutter and Butte Counties, a less than significant effect. No mitigation is required.

Effect LU-1: Conflict with Applicable Land Use Plan, Policy, or Regulation

Construction of Alternative 1 would be generally consistent with the policies of the Sutter County , City of Yuba City , City of Live Oak , and Butte County general plans. These policy documents support the implementation of flood control operations where appropriate. Flood control activities are typically considered public uses, which are largely consistent with the land use policies and regulations governing the project area. The consistency of Alternative 1 with the relevant land use plans, policies and regulations would constitute a less-than-significant effect. No mitigation is required.

Effect SOC-1: Employment Effects during Construction

Construction activities associated with implementation of Alternative 1 would temporarily increase employment and personal income in the local area. Preliminary cost estimates indicate that total construction-related expenditures associated with Alternative 1 would be approximately $321,535,000 (HDR et al. 2011). This is an estimate of direct costs only, and does not include indirect or induced changes in employment and personal income resulting from project construction. Project construction would benefit the local economy by temporarily increasing employment and personal income. Although the increase in employment is not considered substantial when compared to total employment in the region, this effect on employment would be beneficial.

Effect SOC-2: Conflict with Applicable Land Use Plan, Policy, or Regulation

Construction of Alternative 1 would be generally consistent with the socioeconomic policies of the , City of Yuba City , City of Live Oak , and Butte County general plans. The consistency of Alternative 1 with the relevant socioeconomic plans, policies and regulations would constitute a less-than-significant effect. No mitigation is required.

3.11.3.3 Alternative 2

Implementation of Alternative 2 would potentially result in effects on agriculture, land use, and socioeconomics. These potential effects and related mitigation measure requirements are summarized in Table 3.11-11 and discussed below.

Table 3.11-11. Agriculture, Land Use, and Socioeconomic Effects and Mitigation Measures for Alternative 2

Effect	Finding	Mitigation Measures	With Mitigation
Effect AG-1: Temporary Conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance to Accommodate Construction Activities	Less than significant	None required	Less than significant
Effect AG-2: Irretrievable Conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance	Less than significant	None required	Less than significant
Effect AG-3: Conflict with Existing Zoning for Agricultural Use	Less than significant	None required	Less than significant
Effect AG-4: Conflict with Williamson Act Contract	Less than significant	None required	Less than significant
Effect AG-5: Loss of Agricultural Production	Less than significant	None required	Less than significant
Effect LU-1: Conflict with Applicable Land Use Plan, Policy, or Regulation	Less than significant	None required	Less than significant
Effect SOC-1: Employment Effects during Construction	Beneficial	None required	Beneficial
Effect SOC-2: Conflict with Applicable Socioeconomic Plan or Policy	Less than significant	None required	Less than significant

Effect AG-1: Temporary Conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance to Accommodate Construction Activities

During construction of Alternative 2, temporary staging areas to house construction materials and equipment would be necessary. Temporary earthen access ramps would also be built to facilitate construction activities and allow equipment to access the levees. Due to these construction requirements, implementation of Alternative 2 would temporarily convert 18.8 acres of prime farmland and 5.24 acres of farmland of statewide importance from agricultural use within Sutter County, as well as 12.11 acres of prime farmland within Butte County. However, all of this farmland would be returned to its original use after completion of project construction. The temporary conversion of this farmland constitutes a less-than-significant effect. No mitigation is required.

Effect AG-2: Irretrievable Conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance

To accommodate the flood control facilities and improvements proposed under Alternative 2, 555.24 acres of prime farmland, 2.79 acres of unique farmland, and 117.87 acres of farmland of statewide importance in Sutter County and 166.78 acres of prime farmland, plus 3.19 acres of unique farmland in Butte County would be permanently converted to non-agricultural use. This acreage represents 0.34% of the prime farmland, 0.02% of the unique farmland, and 0.1% of the farmland of statewide importance acreage in Sutter County and 0.09% of the prime farmland and 0.01% of the unique farmland acreage in Butte County. The conversion of agricultural land under Alternative 2 would occur only in a narrow corridor adjacent to the existing levee, the remainder of the affected parcel feasible and economically viable for continued farming. Furthermore, the proposed improvements to the flood control system would benefit hundreds of thousands of acres of valuable agricultural land in Sutter and Butte Counties, including prime farmland, unique farmland, and farmland of local importance, by providing increased protection from future flood damage. Consequently, the conversion of this farmland constitutes a less-than-significant effect. No mitigation is required.

Effect AG-3: Conflict with Existing Zoning for Agricultural Use

With the exception of the portions of the project area within and immediately adjacent to Yuba City along the Feather River, and Reach 41 immediately south of Thermalito Afterbay, lands along the project reaches are zoned for agricultural use. Flood protection measures and facilities are not specifically identified within any of the local zoning ordinances, but would constitute a public facility, which the local jurisdictions recognize as consistent with all zoning districts. Implementation of Alternative 2 would therefore not conflict with existing agricultural zoning. No mitigation is required.

Effect AG-4: Conflict with a Williamson Act Contract

Public agencies may acquire Williamson Act contracted land for a variety of public improvements, including water resource management, provided that there is no other noncontracted land reasonably feasible for the purpose, and that the lower cost of contracted land is not a primary factor in its decision.

No lands in the Sutter County portion of the project area are currently under Williamson Act contract; however, within Butte County, 138.89 acres of contracted lands fall within the footprint of Alternative 2. Of these 138.89 acres, 133.99 acres would be permanently converted to flood protection uses and 4.9 acres would be returned to agricultural use following project construction. Implementation of Alternative 2 would therefore conflict with Williamson Act contracts on 133.99 acres of land within Butte County. The 133.99 acres of Williamson Act lands that would be removed from contracts under Alternative 2 represent 0.06% of Butte County's contracted Williamson Act lands. Furthermore, the nature of the proposed project precludes consideration of lands in other areas. This constitutes a less-than-significant effect. No mitigation is required.

Effect AG-5: Loss of Agricultural Production

As discussed above for Effect AG-2, implementation of Alternative 2 would involve the permanent conversion of up to 856.26 acres of agricultural land within Sutter County and up to 270.62 acres of agricultural land within Butte County. This loss would primarily consist of orchard and field crop land. The loss of a total of 1,126.88 acres of productive agricultural land, with associated annual losses in agricultural production, would represent approximately 0.1% of the total agricultural land under production in Sutter and Butte Counties, a less-than-significant effect. No mitigation is required.

Effect LU-1: Conflict with Applicable Land Use Plan, Policy, or Regulation

Effect LU-1, Conflict with Applicable Land Use Plan, Policy, or Regulation, would be the same for Alternative 2 as discussed above for Alternative 1. Flood control activities are typically considered public uses, which are largely consistent with the land use policies and regulations governing the project area. The consistency of Alternative 2 with the relevant land use plans, policies and regulations would constitute a less-than-significant effect. No mitigation is required.

Effect SOC-1: Employment Effects during Construction

Construction activities associated with implementation of Alternative 2 would temporarily increase employment and personal income in the local area. Preliminary cost estimates anticipate that total construction-related expenditures associated with Alternative 2 would be approximately $527,373,000 (HDR et al. 2011). This is an estimate of direct costs only, and does not include indirect/induced changes in employment and personal income resulting from project construction. Project construction would benefit the local economy by temporarily increasing employment and personal income. Although the increase in employment is not considered substantial when compared to total employment in the region, this effect on employment would be beneficial.

Effect SOC-2: Conflict with Applicable Land Use Plan, Policy, or Regulation

Construction of Alternative 2 would be generally consistent with the socioeconomic policies of the , City of Yuba City , City of Live Oak , and Butte County general plans. The consistency of Alternative 2 with the relevant socioeconomic plans, policies and regulations would constitute a less-than-significant effect. No mitigation is required.

3.11.3.4 Alternative 3

Implementation of Alternative 3 would potentially result in effects on agriculture, land use, and socioeconomics. These potential effects and related mitigation measure requirements are summarized in Table 3.11-12 and discussed below.

Table 3.11-12. Agriculture, Land Use, and Socioeconomic Effects, and Mitigation Measures for Alternative 3

Effect	Finding	Mitigation Measure	With Mitigation
Effect AG-1: Temporary Conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance to Accommodate Construction Activities	Less than significant	None required	Less than significant
Effect AG-2: Irretrievable Conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance	Less than significant	None required	Less than significant
Effect AG-3: Conflict with Existing Zoning for Agricultural Use	Less than significant	None required	Less than significant
Effect AG-4: Conflict with Williamson Act Contract	Less than significant	None required	Less than significant
Effect AG-5: Loss of Agricultural Production	Less than significant	None required	Less than significant
Effect LU-1: Conflict with Applicable Land Use Plan, Policy, or Regulation	Less than significant	None required	Less than significant
Effect SOC-1: Employment Effects during Construction	Beneficial	None required	Beneficial
Effect SOC-2: Conflict with Applicable Socioeconomic Plan or Policy	Less than significant	None required	Less than significant

Effect AG-1: Temporary Conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance to Accommodate Construction Activities

During construction of Alternative 3, temporary staging areas to house construction materials and equipment would be necessary. Temporary earthen access ramps would also be built to facilitate construction activities and allow equipment to access the levees. Due to these construction requirements, implementation of Alternative 3 would temporarily convert 5.57 acres of prime farmland and 0.57 acre of farmland of statewide importance from agricultural use within Sutter County, as well as 8.2 acres of prime farmland and 0.25 acre of unique farmland within Butte County. However, all of this farmland would be returned to its original use after completion of project construction. The temporary conversion of this farmland constitutes a less-than-significant effect. No mitigation is required.

Effect AG-2: Irretrievable Conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance

To accommodate the flood control facilities and improvements proposed under Alternative 3, 85.03 acres of prime farmland, 4.37 acres of unique farmland, and 13.83 acres of farmland of statewide importance in Sutter County and 41.38 acres of prime farmland as well as 4.65 acres of unique farmland in Butte County would be permanently converted to non-agricultural use. This acreage represents 0.05% of the prime farmland, 0.02% of the unique farmland, and 0.01% of the farmland of statewide importance acreage in Sutter County and 0.02% of the prime farmland and 0.02% of the unique farmland acreage in Butte County. The conversion of agricultural land under Alternative 3 would occur only in a narrow corridor adjacent to the existing levee, leaving the remainder of the affected parcel feasible and economically viable for continued farming.

In accordance with the FPPA, ICF (as proxy for USACE) coordinated with NRCS on Form NRCS-CPA-106 (“Farmland Conversion Impact Rating for Corridor Type Projects”) to determine a Farmland Conversion Impact Rating for Alternative 3. Projects are scored on a scale of 260 points, and under the FPPA, projects receiving a total score of less than 160 need not be given further consideration for protection and no alternative sites need to be evaluated. The Oroville regional NRCS office oversaw the scoring of the Butte County portion of the project and the Yuba City regional NRCS office oversaw the scoring of the Sutter County portion of the project. The completed forms are located at the end of this chapter (Figure 3.11-1). The total score for the Butte County portion of Alternative 3 is 124 points, and the total score for the Sutter County portion of Alternative 3 is 118 points. A score for Alternative 3 as a whole was determined as shown in Table 3.11-13 below, and totals 136 points. This score is below the threshold of 160, so under the FPPA, no further consideration for protection of agricultural land needs to be undertaken, and no alternative sites need to be evaluated.

In addition, the proposed improvements to the flood control system would benefit hundreds of thousands of acres of valuable agricultural land in Sutter and Butte Counties, including prime farmland, unique farmland, and farmland of local importance, by providing increased protection from future flood damage. Consequently, the conversion of this farmland constitutes a less-than-significant effect. No mitigation is required.

Table 3.11-13. Combined Farmland Conversion Impact Rating for Alternative 3

Category	Score
Land Evaluation (Relative Value of Farmland)[a]	**74**
Corridor Assessment	
1. Area in Nonurban Use	14
2. Perimeter in Nonurban Use	10
3. Percent of Corridor Being Farmed	0
4. Protection Provided by State and Local Government	20
5. Size of Present Farm Unit Compared to Average	10
6. Creation of Nonfarmable Farmland	0
7. Availability of Farm Support Services	5
8. On-Farm Investments	3
9. Effects of Conversion on Farm Support Services	0
10. Compatibility with Existing Agricultural Use	0
Total Corridor Assessment Points	**62**
Total Points (Land Evaluation plus Corridor Assessment)	**136**

[a] NRCS provided separate “Land Evaluation” scores for the portions of Alternative 3 in Sutter County and in Butte County. A combined “Land Evaluation” score for Alternative 3 was determined using a weighted average for the separate county scores. 71% of the project area is located in Sutter County and 29% of the project area is located in Butte County, so Sutter County’s “Land Evaluation” score (79 points) makes up 71% of the combined “Land Evaluation” score and Butte County’s score (60 points) makes up 29% for an average of 74 points.

Effect AG-3: Conflict with Existing Zoning for Agricultural Use

With the exception of the portions of the project area within and immediately adjacent to Yuba City along the Feather River, and Reach 41 immediately south of Thermalito Afterbay, lands along the project reaches are zoned for agricultural use. Flood protection measures and facilities are not specifically identified within any of the local zoning ordinances, but would constitute a public facility, which the local jurisdictions recognize as consistent with all zoning districts. Implementation of Alternative 3 would therefore not conflict with existing agricultural zoning. No mitigation is required.

Effect AG-4: Conflict with a Williamson Act Contract

Public agencies may acquire Williamson Act contracted land for a variety of public improvements, including water resource management, provided that there is no other noncontracted land reasonably feasible for the purpose, and that the lower cost of contracted land is not a primary factor in its decision.

No lands in the Sutter County portion of the project area are currently under Williamson Act contract; however, within Butte County, approximately 81.32 acres of contracted lands fall within the footprint of Alternative 3. Of these 81.32 acres, 67.65 acres would be permanently converted to flood protection uses and 13.67 acres would be returned to agricultural use following project construction. Implementation of Alternative 3 would therefore conflict with Williamson Act contracts on 67.65 acres of land within Butte County. The 67.65 acres of Williamson Act lands that would be removed from contracts under Alternative 3 represent 0.03% of Butte County's contracted Williamson Act lands. Furthermore, the nature of the proposed project precludes consideration of lands in other areas. This constitutes a less-than-significant effect. No mitigation is required.

Effect AG-5: Loss of Agricultural Production

As discussed above for Effect AG-2, implementation of Alternative 3 would involve the permanent conversion of up to 283.69 acres of agricultural land within Sutter County and up to 146.69 acres of agricultural land within Butte County. This loss would primarily consist of orchard and field crop land. The loss of a total of 430.38 acres of productive agricultural land, with associated annual losses in agricultural production, would represent less than 0.05% of the total agricultural land under production in Sutter and Butte Counties, a less-than-significant effect. No mitigation is required.

Effect LU-1: Conflict with Applicable Land Use Plan, Policy, or Regulation

Effect LU-1, Conflict with Applicable Land Use Plan, Policy, or Regulation, would be the same for Alternative 3 as discussed above for Alternative 1. Flood control activities are typically considered public uses, which are largely consistent with the land use policies and regulations governing the project area. The consistency of Alternative 3 with the relevant land use plans, policies and regulations would constitute a less-than-significant effect. No mitigation is required.

Effect SOC-1: Employment Effects during Construction

Construction activities associated with implementation of Alternative 3 would temporarily increase employment and personal income in the local area. Preliminary cost estimates anticipate that total construction-related expenditures associated with Alternative 3 would be approximately

$288,847,000 (HDR et al. 2011). This is an estimate of direct costs only, and does not include indirect/induced changes in employment and personal income resulting from project construction. Project construction would benefit the local economy by temporarily increasing employment and personal income. Although the increase in employment is not considered substantial when compared to total employment in the region, this effect on employment would be beneficial.

Effect SOC-2: Conflict with Applicable Land Use Plan, Policy, or Regulation

Construction of Alternative 3 would be generally consistent with the socioeconomic policies of the Sutter County, City of Yuba City, City of Live Oak, and Butte County general plans. The consistency of Alternative 3 with the relevant socioeconomic plans, policies and regulations would constitute a less-than-significant effect. No mitigation is required.

U.S. DEPARTMENT OF AGRICULTURE
Natural Resources Conservation Service

NRCS-CPA-106
(Rev. 1-91)

FARMLAND CONVERSION IMPACT RATING FOR CORRIDOR TYPE PROJECTS

PART I *(To be completed by Federal Agency)*	3. Date of Land Evaluation Request **11/1/12** — 4. Sheet 1 of **1**
1. Name of Project **Feather River West Levee Project**	5. Federal Agency Involved **US Army Corps of Engineers**
2. Type of Project **Levee Improvements**	6. County and State **Sutter County, CA**
PART II *(To be completed by NRCS)*	1. Date Request Received by NRCS **11/1/12** — 2. Person Completing Form **Gabe Garbarino**
3. Does the corridor contain prime, unique statewide or local important farmland? (If no, the FPPA does not apply - Do not complete additional parts of this form). YES ☑ NO ☐	4. Acres Irrigated **231,713** — Average Farm Size **285**
5. Major Crop(s) **Rice, walnuts, prunes** — 6. Farmable Land in Government Jurisdiction Acres: **274,439** % **71.2**	7. Amount of Farmland As Defined in FPPA Acres: **292,256** % **75.8**
8. Name Of Land Evaluation System Used **CA Revised Storie Index** — 9. Name of Local Site Assessment System **None**	10. Date Land Evaluation Returned by NRCS **11/15/12**

PART III *(To be completed by Federal Agency)*	Maximum Points	Alternative Corridor For Segment ______ Corridor A	Corridor B	Corridor C	Corridor D
A. Total Acres To Be Converted Directly		170.30			
B. Total Acres To Be Converted Indirectly, Or To Receive Services		0			
C. Total Acres In Corridor		676.65			
PART IV *(To be completed by NRCS)* **Land Evaluation Information**					
A. Total Acres Prime And Unique Farmland		122.4			
B. Total Acres Statewide And Local Important Farmland		22.8			
C. Percentage Of Farmland in County Or Local Govt. Unit To Be Converted		.04			
D. Percentage Of Farmland in Govt. Jurisdiction With Same Or Higher Relative Value		Not available			
PART V *(To be completed by NRCS)* **Land Evaluation Information Criterion Relative value of Farmland to Be Serviced or Converted (Scale of 0 - 100 Points)**		79			
PART VI *(To be completed by Federal Agency)* **Corridor Assessment Criteria (These criteria are explained in 7 CFR 658.5(c))**	**Maximum Points**				
1. Area in Nonurban Use	15	13			
2. Perimeter in Nonurban Use	10	9			
3. Percent Of Corridor Being Farmed	20	0			
4. Protection Provided By State And Local Government	20	0			
5. Size of Present Farm Unit Compared To Average	10	10			
6. Creation Of Nonfarmable Farmland	25	0			
7. Availablility Of Farm Support Services	5	5			
8. On-Farm Investments	20	2			
9. Effects Of Conversion On Farm Support Services	25	0			
10. Compatibility With Existing Agricultural Use	10	0			
TOTAL CORRIDOR ASSESSMENT POINTS	160	39	0	0	0
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland (From Part V)	100	79	0	0	0
Total Corridor Assessment (From Part VI above or a local site assessment)	160	39	0	0	0
TOTAL POINTS *(Total of above 2 lines)*	260	118	0	0	0

1. Corridor Selected:	2. Total Acres of Farmlands to be Converted by Project:	3. Date Of Selection:	4. Was A Local Site Assessment Used?
Corridor A (Alt 3)	168.5	12/3/12	YES ☐ NO ☑

5. Reason For Selection:

Corridor A (Alternative 3) was selected because it is the preferred alternative and scored under the threshold of 160 on this form.

Signature of Person Completing this Part: [signature] DATE **12/3/12**

NOTE: Complete a form for each segment with more than one Alternate Corridor

Figure 3-11

U.S. DEPARTMENT OF AGRICULTURE
Natural Resources Conservation Service

NRCS-CPA-106
(Rev. 1-91)

FARMLAND CONVERSION IMPACT RATING FOR CORRIDOR TYPE PROJECTS

PART I *(To be completed by Federal Agency)*	3. Date of Land Evaluation Request 11/1/12	4. Sheet 1 of 1
1. Name of Project Feather River West Levee Project	5. Federal Agency Involved US Army Corps of Engineers	
2. Type of Project Levee Improvements	6. County and State Butte County, CA	
PART II *(To be completed by NRCS)*	1. Date Request Received by NRCS 11/6/12	2. Person Completing Form Dan Taverner
3. Does the corridor contain prime, unique statewide or local important farmland? (If no, the FPPA does not apply - Do not complete additional parts of this form). YES ☑ NO ☐		4. Acres Irrigated 222713 / Average Farm Size 183
5. Major Crop(s) Rice, almonds, walnuts	6. Farmable Land in Government Jurisdiction Acres: 242,058 % 21.2	7. Amount of Farmland As Defined in FPPA Acres: 242,058 % 23.1
8. Name Of Land Evaluation System Used California Revised Storie Index	9. Name of Local Site Assessment System None	10. Date Land Evaluation Returned by NRCS 11/6/12

PART III *(To be completed by Federal Agency)*	Maximum Points	Corridor A	Corridor B	Corridor C	Corridor D
		Alternative Corridor For Segment Afterbay outlet to Butte County line			
A. Total Acres To Be Converted Directly		74			
B. Total Acres To Be Converted Indirectly, Or To Receive Services		0			
C. Total Acres In Corridor		102.87			
PART IV *(To be completed by NRCS) Land Evaluation Information*					
A. Total Acres Prime And Unique Farmland		74			
B. Total Acres Statewide And Local Important Farmland		0			
C. Percentage Of Farmland in County Or Local Govt. Unit To Be Converted		0.706			
D. Percentage Of Farmland in Govt. Jurisdiction With Same Or Higher Relative Value		not available			
PART V *(To be completed by NRCS) Land Evaluation Information Criterion Relative value of Farmland to Be Serviced or Converted (Scale of 0 - 100 Points)*		60			
PART VI *(To be completed by Federal Agency) Corridor Assessment Criteria (These criteria are explained in 7 CFR 658.5(c))*	Maximum Points				
1. Area in Nonurban Use	15	15			
2. Perimeter in Nonurban Use	10	10			
3. Percent Of Corridor Being Farmed	20	0			
4. Protection Provided By State And Local Government	20	20			
5. Size of Present Farm Unit Compared To Average	10	10			
6. Creation Of Nonfarmable Farmland	25	0			
7. Availablility Of Farm Support Services	5	5			
8. On-Farm Investments	20	4			
9. Effects Of Conversion On Farm Support Services	25	0			
10. Compatibility With Existing Agricultural Use	10	0			
TOTAL CORRIDOR ASSESSMENT POINTS	160	64	0	0	0
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland (From Part V)	100	60	0	0	0
Total Corridor Assessment (From Part VI above or a local site assessment)	160	64	0	0	0
TOTAL POINTS *(Total of above 2 lines)*	260	124	0	0	0

1. Corridor Selected:	2. Total Acres of Farmlands to be Converted by Project:	3. Date Of Selection:	4. Was A Local Site Assessment Used?
Corridor A (Alt 3)	74	12/3/12	YES ☐ NO ☑

5. Reason For Selection:

Corridor A (Alternative 3) was selected because it is the preferred alternative and scored under the threshold of 160 on this form.

Signature of Person Completing this Part: [signature] DATE 12/3/12

NOTE: Complete a form for each segment with more than one Alternate Corridor

Figure 3-11. Continued

3.12 Population, Housing, and Environmental Justice

3.12.1 Introduction

This section describes the regulatory and environmental setting for population, housing, and environmental justice; effects on population, housing, and environmental justice that would result from the No Action Alternative and Alternatives 1, 2, and 3; and mitigation measures that would reduce significant effects.

3.12.2 Affected Environment

This section describes the affected environment for population, housing, and environmental justice in the project area. Following are the key sources of data and information used in the preparation of this section.

- Butte County General Plan 2030, Housing Element (Butte County 2010).
- City/County Population and Housing Estimates (California Department of Finance 2010).
- City of Biggs General Plan, Housing Element 2009-20014 (Pacific Municipal Consultants 2010).
- City of Gridley General Plan, Housing Plan (City of Gridley 2010).
- City of Live Oak General Plan, 2008-2013 Housing Element (City of Live Oak 2010).
- City of Yuba City 2008 Housing Element Update (Stuart and Graham 2009).
- Sutter County General Plan, 2008–2013 Housing Element (Sutter County 2010).
- American FactFinder (U.S. Census Bureau 2010).

3.12.2.1 Regulatory Setting

This section summarizes key Federal and state regulatory information that applies to population, housing, and environmental justice. Additional regulatory information appears in Appendix A.

Federal

The following Federal policies related to population, housing, and environmental justice may apply to implementation of the proposed project.

Uniform Relocation Assistance and Real Property Acquisition Policies Act

Federal, state, and local government agencies and other agencies receiving Federal financial assistance for public programs and projects that require the acquisition of real property must comply with the policies and provisions set forth in the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended in 1987 (42 USC 4601 et seq.) (Uniform Act), and implementing regulation, Title 49 CFR Part 24. Relocation advisory services, moving cost reimbursement, replacement housing, and reimbursement for related expenses and rights of appeal are provided for in the Uniform Act.

Executive Order 12898: Environmental Justice

Federal EO 12898, Environmental Justice, requires that, to the greatest extent practicable and permitted by law,

> …each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations.

EO 12898 charges each cabinet department to "make achieving environmental justice part of its mission," with the EPA responsible for implementation of EO 12898. The CEQ has oversight of the Federal government's compliance with Executive Order 12898 and NEPA.

For purposes of this analysis, the definitions of minority and low-income populations provided in the CEQ's Guidance for Agencies on Key Terms in Executive Order 12898 (Council on Environmental Quality 1997) are used.

- Minority individuals are defined as members of the following population groups.
  - American Indian or Alaskan Native.
  - Asian or Pacific Islander.
  - Black.
  - Hispanic.
- Minority populations are identified by the following.
  - Where the minority population percentage of the affected area is meaningfully greater than the minority population percentage of the general population.
  - Where the minority population percentage of the affected area exceeds 50% (Council on Environmental Quality 1997).
- Low-income populations are identified based upon poverty thresholds provided by the U.S. Census Bureau (Council on Environmental Quality 1997:25), and identified as one of the following.
  - The population percentage below the poverty level is meaningfully greater than that of the population percentage in the general population.
  - The population percentage below the poverty level in the affected area exceeds 50%.
- Significant concentrations of minority or low-income individuals are sometimes referred to as environmental justice populations.

State

The following state policies related to population, housing, and environmental justice may apply to implementation of the proposed project.

California Relocation Act

The State of California's Government Code Section 7260, et seq., brings the California Relocation Act into conformity with the Federal Uniform Act. In the acquisition of real property by a public agency, both the Federal and state acts seek to (1) ensure consistent and fair treatment of owners of real property, (2) encourage and expedite acquisition by agreement to avoid litigation and relieve congestion in the courts, and (3) promote confidence in public land acquisition.

The Relocation Assistance and Real Property Acquisition Guidelines were established by 25 CCR 1.6. The guidelines were developed to assist public entities with developing regulations and procedures for implementing 42 USC 61—the Uniform Act, for Federal and federally assisted programs. The guidelines are designed to ensure that uniform, fair, and equitable treatment is given to people displaced from their homes, businesses, or farms as a result of the actions of a public entity. Under the Uniform Act, persons required to relocate temporarily are not considered "displaced," but must be reimbursed for all reasonable out-of-pocket expenses. In accordance with these guidelines, people would not suffer disproportionate injury as a result of action taken for the benefit of the public as a whole. Additionally, public entities must ensure consistent and fair treatment of owners of such property, and encourage and expedite acquisitions by agreement with displaced owners of property to avoid litigation.

Property acquisition and relocation services, compensation for living expenses for temporarily relocated residents, and negotiations regarding any compensation for temporary loss of business would be accomplished in accordance with the Uniform Act (see discussion above) and California Government Code Section 7267, et seq.

CEQA

Unlike Federal guidelines, CEQA does not require consideration of environmental justice.

General Plans

State law requires each city and county to adopt a general plan for its future growth. This plan must include a housing element that identifies housing needs for all economic segments and provide opportunities for housing development to meet those needs. At the state level, the Housing and Community Development Department estimates the relative share of California's projected population growth that would occur in each county presented by the Department of Finance's demographic research unit.

Each city and county must update its general plan housing element on a regular basis (usually every 5 years). Among other things, the housing element must incorporate policies and identify potential sites that would accommodate the city's and county's share of the regional housing need. Prior to adopting a general plan update for housing, the city or county must submit the draft to the Housing and Community Development Department for its review. The Housing and Community Development Department would take action to advise the local jurisdiction whether its housing element complies with provisions of California Housing Element Law. County and city housing elements in the planning area are described below.

Local

Sutter County, Butte County, City of Yuba City, City of Live Oak, City of Biggs, and City of Gridley each have adopted goals and policies to promote housing that is affordable, safe, sanitary, efficient, and available at equal opportunity, detailed in Appendix A.

3.12.2.2 Environmental Setting

The following considerations are relevant to population, housing, and environmental justice conditions in the proposed project area.

Affected Area

The population, housing, and environmental justice affected area has been defined to include the 2010 U.S. Census of Population and Housing census tracts near the proposed project (U.S. Census 2010), and comprises the corridor along the Feather River west levee approximately 500 feet toward the land side and 100 feet toward the water side that stretches from the Thermalito Afterbay south for 41 miles. The corridor is shown on Plates 1-3a and 1-3b. The population, housing, and environmental justice affected area is intended to encompass an area where the potential population, housing, and environmental effects, if any, of construction and operation of the proposed project would be reasonably foreseeable. The affected area consists of 18 census tracts adjacent to the proposed project area and are located within Butte County and Sutter County.

Population

Butte County

The California Department of Finance provides population data estimates and projections for cities and counties throughout California. Between April 2000 and January 2010, the overall population of Butte County increased by 9.2%, growing from 203,171 to 221,768. For that same timeframe, the incorporated City of Gridley saw an increase of 19.3%, with the estimated population rising from 5,408 to 6,454. During that time, the City of Biggs saw a 0.9% decrease in population, going from 1,793 to 1,787. For comparison, the state's population rose 14.1% during the same period, from 33,873,086 to 38,648,090 (California Department of Finance 2010.) Although the county population has been increasing steadily, the population of the unincorporated portion of the county has been declining as people move to urban areas and cities' annex areas to accommodate this growth (Butte County 2010:32). According to the U.S. Census Bureau (2010), Butte County had a population density of approximately 134 persons per square mile, compared with the state average of 239 persons per square mile.

Sutter County

The California Department of Finance provides population data estimates and projections for cities and counties throughout California. Between April 2000 and January 2010, the overall population of Sutter County increased by 25.6%, growing from 78,930 to 99,154. For that same timeframe, the incorporated cities of Live Oak and Yuba City saw increases of 41.1% and 77.8%, respectively, with their estimated populations rising from 6,229 to 8,791 and 36,758 to 65,372. In contrast, the state's population rose more slowly at 14.1% during that time, as noted above (California Department of Finance 2010).

Sutter County is primarily rural, with extensive agricultural areas and a low population density (Sutter County 2010:4-16). Nearly two-thirds of the county's residents live in the incorporated cities of Live Oak and Yuba City (California Department of Finance 2010). According to the U.S. Census Bureau (2010), Sutter County had a population density of approximately 157 persons per square mile, compared with the state average of 239 persons per square mile.

Table 3.12-1 presents the latest race and ethnicity data from the U.S. Census Bureau (2010) for Butte County and Sutter County and affected census tracts in the affected area.

Table 3.12-1. Census 2010 Race and Ethnicity for Butte and Sutter Counties and the Affected Area

	Total Population for Which Data Were Compiled	White Alone	Black or African American Alone	American Indian and Alaskan Native Alone	Native Hawaiian and Other Pacific Islanders Alone	Asian Alone	Some Other Race Alone	Two or More Races Alone	Hispanic Ethnicity	Non-Hispanic Ethnicity
Butte County	220,000	180,096 (81.9%)	3,415 (1.6%)	4,395 (2.0%)	452 (0.2%)	9,057 (4.1%)	12,141 (5.5%)	10,444 (4.7%)	31,116 (14.1%)	188,884 (85.9%)
Affected Area [a]	*15,717*	*11,886* *75.6%*	*139* *0.9%*	*594* *3.8%*	*39* *0.2%*	*813* *5.2%*	*1,467* *9.3%*	*779* *5.0%*	*3,224* *(20.5%)*	*12,493* *(79.5%)*
CT 33	4,852	3,723 (76.7%)	59 (1.2%)	253 (5.2%)	7 (0.1%)	131 (2.7%)	396 (8.2%)	283 (5.8%)	785 (16.2%)	4,067 (83.8%)
CT 34	2,956	2,157 (73.0%)	8 (0.3%)	48 (1.6%)	0 (0.0%)	92 (3.1%)	518 (17.5%)	133 (4.5%)	1,091 (36.9%)	1,865 (63.1%)
CT 36	3,404	2,724 (80.0%)	30 (0.9%)	94 (2.8%)	2 (0.1%)	50 (1.5%)	369 (10.8%)	135 (4.0%)	847 (24.9%)	2,557 (75.1%)
CT 37	4,505	3,282 (72.9%)	42 (0.9%)	199 (4.4%)	30 (0.7%)	540 (12.0%)	184 (4.1%)	228 (5.1%)	501 (11.1%)	4,004 (88.9%)
Sutter County	94,737	57,749 (61.0%)	1,919 (2.0%)	1,365 (1.4%)	281 (0.3%)	13,663 (14.4%)	14,463 (15.3%)	5,297 (5.6%)	27,251 (28.8%)	67,486 (71.2%)
Affected Area [a]	*62,676*	*39,065* *(62.3%)*	*1,375* *(2.2%)*	*892* *(1.4%)*	*208* *(0.3%)*	*6,551* *(10.5%)*	*10,910* *(17.4%)*	*3,675* *(5.9%)*	*20,744* *(33.1%)*	*41,932* *(66.9%)*
CT 501.01	6,438	3,937 (61.2%)	285 (4.4%)	89 (1.4%)	32 (0.5%)	667 (10.4%)	969 (15.1%)	459 (7.1%)	1,831 (28.4%)	4,607 (71.6%)
CT 501.02	4,559	3,065 (67.2%)	130 (2.9%)	99 (2.2%)	22 (0.5%)	157 (3.4%)	788 (17.3%)	298 (6.5%)	1,549 (34.0%)	3,010 (66.0%)
CT 502.01	3,249	1,924 (59.2%)	60 (1.8%)	56 (1.7%)	11 (0.3%)	275 (8.5%)	702 (21.6%)	221 (6.8%)	1,410 (43.4%)	1,839 (56.6%)
CT 502.02	4,037	2,348 (58.2%)	102 (2.5%)	85 (2.1%)	14 (0.3%)	91 (2.3%)	1,148 (28.4%)	249 (6.2%)	2,102 (52.1%)	1,935 (47.9%)
CT 503.01	2,403	1,701 (70.8%)	33 (1.4%)	23 (1.0%)	13 (0.5%)	173 (7.2%)	307 (12.8%)	153 (6.4%)	561 (23.3%)	1,842 (76.7%)
CT 503.02	6,071	3,241 (53.4%)	111 (1.8%)	97 (1.6%)	10 (0.2%)	357 (5.9%)	1,880 (31.0%)	375 (6.2%)	3,396 (55.9%)	2,675 (44.1%)

	Total Population for Which Data Were Compiled	White Alone	Black or African American Alone	American Indian and Alaskan Native Alone	Native Hawaiian and Other Pacific Islanders Alone	Asian Alone	Some Other Race Alone	Two or More Races Alone	Hispanic Ethnicity	Non-Hispanic Ethnicity
CT 504.01	4,783	2,982 (62.3%)	87 (1.8%)	67 (1.4%)	14 (0.3%)	708 (14.8%)	604 (12.6%)	321 (6.7%)	1,149 (24.0%)	3,634 (76.0%)
CT 504.02	3,970	2,555 (64.4%)	95 (2.4%)	21 (0.5%)	28 (0.7%)	646 (16.3%)	390 (9.8%)	235 (5.9%)	805 (20.3%)	3,165 (79.7%)
CT 504.03	3,585	2,258 (63.0%)	114 (3.2%)	39 (1.1%)	19 (0.5%)	400 (11.2%)	501 (14.0%)	254 (7.1%)	937 (26.1%)	2,648 (73.9%)
CT 506.01	6,029	4,034 (66.9%)	98 (1.6%)	85 (1.4%)	13 (0.2%)	1,065 (17.7%)	481 (8.0%)	253 (4.2%)	973 (16.1%)	5,056 (83.9%)
CT 506.03	4,528	3,249 (71.8%)	93 (2.1%)	41 (0.9%)	7 (0.2%)	660 (14.6%)	272 (6.0%)	206 (4.5%)	561 (12.4%)	3,967 (87.6%)
CT 507.01	4,358	2,604 (59.8%)	25 (0.6%)	64 (1.5%)	13 (0.3%)	436 (10.0%)	1,025 (23.5%)	191 (4.4%)	1,896 (43.5%)	2,462 (56.5%)
CT 507.02	6,205	3,540 (57.1%)	118 (1.9%)	99 (1.6%)	11 (0.2%)	690 (11.1%)	1,389 (22.4%)	358 (5.8%)	2,732 (44.0%)	3,473 (56.0%)
CT 510	2,461	1,627 (66.1%)	24 (1.0%)	27 (1.1%)	1 (0.0%)	226 (9.2%)	454 (18.4%)	102 (4.1%)	842 (34.2%)	1,619 (65.8%)
Total Butte and Sutter Counties	*314,737*	*237,845 (75.6%)*	*5,334 (1.7%)*	*5,760 (1.8%)*	*733 (0.2%)*	*22,720 (7.2%)*	*26,604 (8.5%)*	*15,741 (5.0%)*	*58,367 (18.5%)*	*256,370 (81.5%)*
Total Affected Area[a]	*78,393*	*50,951 (65.0%)*	*1,514 (1.9%)*	*1,486 (1.9%)*	*247 (0.3%)*	*7,364 (9.4%)*	*12,377 (15.8%)*	*4,454 (5.7%)*	*23,968 (30.6%)*	*50,358 (64.2%)*

Source: U.S. Census Bureau 2010.

CT = Census Tract.

[a] The affected area consists of four census tracts in Butte County, and 14 census tracts in Sutter County, for a total of 18 census tracts.

Housing

Butte County

The number of housing units in Butte County continues to grow. The California Department of Finance (2010) estimates that Butte County had a total of 96,623 housing units in January 2010, up 1.3% from the 85,523 housing units in January 2000. The county's vacancy rate was 6.44% in 2010.

Housing stock also continued to grow in the cities of Biggs and Gridley. The California Department of Finance estimates that Biggs had 634 housing units and Gridley had 2,449 housing units in January 2010. These figures are up 3.4% and 24.1%, respectively, from the 613 and 1,973 total housing units in Biggs and Gridley in January 2000. The vacancy rate in Biggs was 6.62%, while the vacancy rate in Gridley was 6.17%, in 2010 (California Department of Finance 2010).

Sutter County

As the population of Sutter County grew, the county's housing stock grew as well. The California Department of Finance (2010) estimates that Sutter County had a total of 33,772 housing units in January 2010. This is up 19.3% from the 28,319 housing units in January 2000. The county's vacancy rate was 4.47% in 2010.

The California Department of Finance also estimates that housing stock grew in the cities of Live Oak and Yuba City. Live Oak had 2,427 housing units in January 2010. Yuba City had 22,706 housing units in January 2010. These figures are up 33.5% and 63.2%, respectively, from the 1,818 and 13,912 total housing units in Live Oak and Yuba City in January 2000. The vacancy rate in Live Oak was 4.99%, while the vacancy rate in Yuba City was 4.12% in 2010 (California Department of Finance 2010).

To supplement the summary of California Department of Finance estimates above, Table 3.12-2 presents the latest housing data from the U.S. Census Bureau (2010) for Butte and Sutter Counties and the affected area.

Table 3.12-2. Housing Data for Butte and Sutter Counties and the Affected Area (2010)

	Total Households	Average Household Size	Housing Units			Occupied Housing Units	
			Total	Occupied	Vacant	Owner Occupied	Renter Occupied
Butte County	87,618	2.46	95,835	87,618	8,217	50,991	36,627
Affected Area[a]	*5,625*	*2.86*[b]	*6,211*	*5,625*	*586*	*3,933*	*1,191*
CT 33	1,786	2.78	2,015	1,786	229	1,366	420
CT 34	1,023	2.89	1,133	1,023	110	585	438
CT 36	1,166	2.98	1,284	1,166	118	833	333
CT 37	1,650	2.80	1,779	1,650	129	1,149	501
Sutter County	31,437	2.99	33,858	31,437	2,421	19,212	12,225
Affected Area[a]	*21,038*	*2.98*[b]	*22,754*	*21,038*	*1,716*	*12,170*	*8,868*
CT 501.01	2,308	2.74	2,487	2,308	179	1,073	1,235
CT 501.02	1,779	2.51	1,974	1,779	195	581	1,198
CT 502.01	1,140	2.76	1,265	1,140	125	322	818
CT 502.02	1,405	2.74	1,578	1,405	173	382	1,023
CT 503.01	940	2.56	1,018	940	78	535	405
CT 503.02	1,820	3.27	2,004	1,820	184	721	1,099
CT 504.01	1,562	3.08	1,660	1,562	98	1,004	558
CT 504.02	1,285	3.08	1,363	1,285	78	959	326
CT 504.03	1,009	3.75	1,076	1,009	67	838	171
CT 506.01	2,040	3.07	2,170	2,040	130	1,648	392
CT 506.03	1,852	2.52	1,950	1,852	98	1,529	323
CT 507.01	1,342	3.29	1,438	1,342	96	927	415
CT 507.02	1,748	3.29	1,882	1,748	134	1,142	606
CT 510	808	3.10	889	808	81	509	299
Total Butte and Sutter Counties	*119,055*	*2.72*[c]	*129,693*	*119,055*	*10,638*	*70,203*	*48,852*
Total Affected Area[a]	*26,663*	*2.92*[d]	*28,965*	*26,663*	*2,302*	*16,103*	*10,059*

Source: U.S. Census Bureau 2010.

CT = Census Tract.

[a] The affected area consists of four census tracts in Butte County, and 14 census tracts in Sutter County, for a total of 18 census tracts.

[b] This number was obtained by averaging the average household size of the census tracts in the respective county planning area.

[c] This number was obtained by averaging the average household size for Butte and Sutter Counties.

[d] This number was obtained by averaging the average household size for Butte and Sutter Counties.

Income and Poverty Level

Income and poverty data from the American Community Survey (ACS) for Butte and Sutter Counties and the affected area are summarized in Table 3.12-3. For Census 2010, the ACS eliminated the decennial census long form on which it had collected income and poverty data in previous decennial census years, with income and poverty data as part of the decennial census. Now, income and poverty data are collected only through the ACS, which collects information throughout the decade and publishes statistics yearly, rather than once every 10 years. At the time of writing, the most recent ACS data for the population, housing, and environmental justice affected area were the ACS 5-year estimates from 2006–2010.

Butte County

As shown in Table 3.12-3, per capita income in the Butte County portion of the affected area is $3,812 lower than in Butte County overall, which amounts to approximately 20% lower income in the Butte County affected area than in Butte County as a whole. In addition, the poverty rate in the Butte County affected area is 0.17% higher than in Butte County in its entirety.

Sutter County

Per capita income in the Sutter County portion of the affected area is $705 lower than in Sutter County overall (Table 3.12-3), which amounts to approximately 3% lower income in the Sutter County affected area than in Sutter County. In addition, the poverty rate in the Sutter County affected area is 4.07% higher than in Sutter County as a whole.

Table 3.12-3. Income and Poverty Data for Butte and Sutter Counties and the Affected Area (2006–2010)

Census Tract	Per Capita Income ($)[a]	Population for Whom Poverty Is Determined: Total[a]	Population for Whom Poverty Status Is Determined: Income below Poverty Level[a]
Butte County	23,404	213,501	39,290 (18.40%)
Affected Area[b]	19,592[c]	15,673	2,910 (18.57%)
CT 33	21,138	4,653	534 (11.48%)
CT 34	17,908	2,913	643 (22.07%)
CT 36	19,776	3,651	543 (14.87%)
CT 37	19,544	4,456	1,190 (26.71%)
Sutter County	22,344	92,477	13,194 (14.27%)
Affected Area[b]	21,639[c]	48,638	8,920 (18.34%)
CT 501.01	20,542	5,647	963 (17.05%)
CT 501.02	15,393	4,711	1,446 (30.69%)
CT 502.01	15,074	3,569	1,192 (33.40%)
CT 502.02	13,914	3,693	1,091 (29.54%)
CT 503.01	28,767	2,649	181 (6.83%)
CT 503.02	14,842	6,215	1,548 (24.91%)
CT 504.01	25,700	4,808	370 (7.70%)
CT 504.02	26,491	3,434	315 (9.17%)
CT 504.03	23,523	2,851	87 (3.05%)
CT 506.01	26,659	5,816	531 (9.13%)
CT 506.03	31,433	4,519	234 (5.18%)
CT 507.01	19,884	4,389	1,129 (25.72%)
CT 507.02	17,661	5,447	946 (17.37%)
CT 510	23,065	2,622	235 (8.96%)

Census Tract	Per Capita Income ($)[a]	Population for Whom Poverty Is Determined: Total[a]	Population for Whom Poverty Status Is Determined: Income below Poverty Level[a]
Butte and Sutter Counties	22,874[d]	305,978	52,484 (17.15%)
Affected Area[a]	20,615[e]	64,311	11,830 (18.39%)

Source: U.S. Census Bureau 2010.

[a] Data are based on a sample and are subject to sampling variability. The degree of uncertainty for an estimate arising from sampling variability is represented through the use of a margin of error. The value shown here is the 90% margin of error. The margin of error can be interpreted roughly as providing a 90% probability that the interval defined by the estimate minus the margin of error and the estimate plus the margin of error (the lower and upper confidence bounds) contains the true value.

[b] The affected area consists of four census tracts in Butte County, and 14 census tracts in Sutter County, for a total of 18 census tracts.

[c] This number was obtained by averaging the per capita income of the census tracts in the respective county affected area.

[d] This number was obtained by averaging the per capita income of Butte and Sutter Counties.

[e] This number was obtained by averaging the per capita income of the affected area in Butte and Sutter Counties.

3.12.3 Environmental Consequences

This section describes the environmental consequences relating to population, housing, and environmental justice for the proposed project. It describes the methods used to determine the effects of the project and lists the thresholds used to conclude whether an effect would be significant. The effects that would result from implementation of the project, findings with or without mitigation, and applicable mitigation measures are presented in a table under each alternative.

3.12.3.1 Assessment Methods

This evaluation of population, housing, and environmental justice is based on professional standards and information cited throughout the section. The key effects were identified and evaluated based on the environmental characteristics of the project area and the magnitude, intensity, and duration of activities related to the construction of this project.

Effects on population, housing, and environmental justice were evaluated qualitatively based on the criteria listed under Section 3.12.3.2, *Determination of Effects*.

The data that are pertinent to the analysis of population, housing, and environmental justice include race, housing, and income characteristics such as the following.

- Percent of minority population (Black or African American, American Indian and Alaskan Native, Asian, Native Hawaiian and Other Pacific Islander, and Hispanic).
- Total housing units.
- Vacant housing units.
- Per capita income.
- Percent of population below the U.S. Census poverty level.

Proposed project population, housing, and environmental justice effects were analyzed by comparing 2010 U.S. Census and ACS data for the affected area (four census tracts in Butte County and 14 census tracts in Sutter County) with data for Butte and Sutter Counties and by determining the percent of housing units displaced by each project alternative. In addition, geospatial analysis was used to determine the number of homes that would be affected by each project alternative. Affected census tracts in the affected area for which data were obtained were determined by using geospatial analysis and professional judgment. Census Tracts 502.01, 503.01, 504.01, and 506.01 are not intersected by the project boundary, but they were included in the affected area because of their proximity to small, adjacent census tracts that were intersected by the project boundary. This was done in case the proposed project affects these census tracts indirectly. For example, if residents currently residing in the small census tracts affected by the project boundary require relocation, they could be relocated to the census tract immediately adjacent to the affected census tract.

3.12.3.2 Determination of Effects

For this analysis, an effect pertaining to population and housing was analyzed under NEPA and CEQA if it would result in any of the following environmental effects, which are based on NEPA standards, State CEQA Guidelines Appendix G (14 CCR 15000 et seq.), and standards of professional practice. As noted above, only NEPA requires environmental justice analysis through Executive Order 12898.

- Displace people or existing housing.
- Result in a disproportionately high and adverse human health or environmental effect on minority populations and low-income populations.

3.12.4 Effects and Mitigation Measures

Effects and mitigation measure requirements concerning population, housing, and environmental justice are summarized in Table 3.12-4.

Table 3.12-4. Summary of Effects for Population, Housing, and Environmental Justice

Effect	Finding	Mitigation Measure	With Mitigation
Alternatives 1, 2, and 3			
Effect POP-1: Displacement of Existing Housing Units	Significant	POP-MM-1: Property Acquisition Compensation and Resident Relocation Plan	Less than significant
Effect EJ-1: Result in a Disproportionately High and Adverse Human Health or Environmental Effect on Minority Populations and Low-Income Populations from Construction Activities	Less than significant	None required	Less than significant

3.12.4.1 No Action Alternative

The No Action Alternative represents the continuation of the existing deficiencies along the portion of the Feather River in the FRWLP area. Current levee operations and maintenance activities would continue, but there would be no change in the geomorphic and flood control regimes relative to existing conditions.

Under the No Action Alternative, no displacement of housing units or people due to construction or operations and maintenance would occur. However, assuming that no levee repair or strengthening would occur under the No Action Alternative means that the levee would remain or become more susceptible to failure as a result of identified deficiencies. These conditions could cause portions of the levee system to fail, triggering widespread flooding, extensive damage to the affected area's existing residential structures, and potential loss of life and property. The magnitude of the flood damage would depend on the location of the levee breach, severity of the storm, and river flows at the time of a potential levee failure.

During the recovery period after a flood event, area residents would require temporary housing, and displacement of many or all occupants would occur while levees, buildings, and other infrastructure were repaired. According to the U.S. Census, there were 26,663 total households in the affected area as of 2010 (Table 3.12-2) (U.S. Census Bureau 2010) that could be affected by a flood event; it is possible that the number of households that could be affected by a flood event has increased since 2010. As of 2010, there were 2,302 vacant housing units in the affected area (Table 3.12-2). Therefore, the potential number of displaced residents resulting in demand for temporary quarters likely would exceed the available supply of vacant buildings surrounding the affected area. Thus, many displaced residents may be forced to relocate to areas a considerable distance from their communities in the affected area.

Because the magnitude of the flood damage would depend on the location of the levee breach, severity of the storm, and river flows at the time of a potential levee failure, a precise determination of significance cannot be made.

3.12.4.2 Alternative 1

Implementation of Alternative 1 would potentially result in effects on population, housing, and environmental justice. These potential effects and related mitigation measure requirements are summarized in Table 3.12-5 and discussed below.

Table 3.12-5. Population, Housing, and Environmental Justice Effects and Mitigation Measures for Alternative 1

Effect	Finding	Mitigation Measure	With Mitigation
Effect POP-1: Displacement of Existing Housing Units	Significant	POP-MM-1: Property Acquisition Compensation and Resident Relocation Plan	Less than significant
Effect EJ-1: Result in a Disproportionately High and Adverse Human Health or Environmental Effect on Minority Populations and Low-Income Populations from Construction Activities	Less than significant	None required	Less than significant

Effect POP-1: Displacement of Existing Housing Units

Implementation of Alternative 1 would require the permanent acquisition of five existing residences to accommodate the expanded footprint of the flood control system: two residences in Butte County (one each in Census Tracts 33 and 34) and three in Sutter County (two in Census Tract 502.02 and one in Census Tract 507.01). In some cases, project construction may result in temporary disruption of utilities (water, telephone, electricity, gas, and sanitary sewer), loss of vehicle or pedestrian access for durations too lengthy for convenient day-to-day living, and/or construction-related noise. During some periods of time, construction activities may be directly adjacent to homes. If these circumstances occur, residents may voluntarily relocate during disruptive construction activities.

The displacement of any residences is considered a significant effect, so the permanent acquisition of five residences and the potential for temporary displacement of residents under Alternative 1 would be significant. However, with implementation of Mitigation Measure POP-MM-1: Property Acquisition Compensation and Resident Relocation Plan, this effect would be reduced to a less-than-significant level.

Mitigation Measure POP-MM-1: Property Acquisition Compensation and Resident Relocation Plan

Permanent acquisition, relocation, and compensation services will be conducted in compliance with Federal and state relocation laws, which are the Uniform Act of 1970 (42 USC 4601 et seq.) and implementing regulation, 49 CFR Part 24; and California Government Code Section 7267 et seq. These laws require that appropriate compensation be provided to displaced landowners and tenants, and that residents may be relocated to comparable replacement housing. A review of Census Tract information for the affected residences shows that there are adequate vacant residences (see Table 3.12-2) within the same Census Tracts for resident relocations.

In cases where project construction is temporarily disruptive to nearby residents, SBFCA will provide assistance for residents to relocate temporarily during construction activities and provide compensation to residents for reasonable rent and living expenses incurred as a result of relocation. SBFCA will develop a Temporary Resident Relocation Plan to guide temporary relocation services and compensation. The Temporary Resident Relocation Plan will, at a minimum, serve the following functions.

- Outline the process for providing notice of relocation.
- Provide guidelines for relocation services and compensation.
- Ensure that 24-hour security for vacated homes is provided.
- Provide for temporary occasional access of vacated homes by residents (for long-duration construction periods).
- Ensure all compensation and relocation activities are conducted in compliance with Federal and state relocation laws, which are identified above.
- Ensure that the Temporary Resident Relocation Plan in no way offsets, eliminates, or reduces rights to compensation and relocation assistance resulting from required property rights.
- Ensure that the properties are returned to the property owners in an undamaged, clean condition, unaffected by residual dust or debris, in a manner consistent with the condition of the property prior to commencement of construction.
- Provide for cleaning or restoration of affected property improvements.

Effect EJ-1: Result in a Disproportionately High and Adverse Human Health or Environmental Effect on Minority Populations and Low-Income Populations from Construction Activities

Income and poverty data for Butte and Sutter Counties are summarized in Table 3.12-3. As shown in Table 3.12-3, the per capita income in Census Tract 34 is $1,684 less than the average per capita income in the Butte County affected area. In addition, the percentage of the population below the poverty level in Census Tract 34 is 3.5% greater than the percentage of the population below the poverty level in the Butte County affected area. The per capita income in Census Tract 502.02 is $7,725 less than the average per capita income in the Sutter County affected area, and the percentage of the population below the poverty line is 11.2% more than the average percentage of the population below the poverty line in the Sutter County affected area. This represents a substantial difference in income between Census Tract 502.02 and the Sutter County affected area. Per capita income in Census Tract 502.02 is approximately 36% less than in the Sutter County affected area, and the percentage of the population below the poverty line is greater than 10% more in Census Tract 502.02 than in the Sutter County affected area.

Two homes would be acquired in Census Tract 502.02, while only one home would be acquired in each of Census Tracts 33, 34, and 507.01. The majority of the population of Census Tract 502.02 is of Hispanic ethnicity; per capita income in Census Tract 502.02 is approximately 36% less than in the Sutter County affected area; and the percentage of the population below the poverty line is greater than 10% more in Census Tract 502.02 than in the Sutter County affected area. However, because the number of homes acquired in the other census tracts is comparable to those in Census Tract 502.02 (one versus two homes acquired, respectively), home acquisitions associated with Alternative 1 would not result in a disproportionately high and adverse environmental effect on minority populations and low-income populations from project operation. For the same reason, significant and unavoidable effects associated with Alternative 1 for other resources (specifically Section 3.5, *Air Quality,* and Section 3.7, *Noise*) would not result in a disproportionately high and adverse human health or environmental effect on minority populations and low-income populations. Therefore, this effect is less than significant.

Implementation of Alternative 1 would require the acquisition of 24 residences in Census Tract 502.02. This represents approximately 80% of the total homes acquired in the Sutter County affected area. As described above for Effect EJ-1, the majority of the population of Census Tract 502.02 is of Hispanic ethnicity (52.1%). In addition, per capita income in Census Tract 502.02 is approximately 36% less than in the Sutter County affected area, and the percentage of the population below the poverty line is greater than 10% more in Census Tract 502.02 than in the Sutter County affected area. This represents a disproportionately high and adverse effect on a minority and low-income population from implementation of Alternative 1, considering that only one or two homes would be acquired in other census tracts. This effect is considered less than significant for Alternative 1.

3.12.4.3 Alternative 2

Implementation of Alternative 2 would potentially result in effects on population, housing, and environmental justice. These potential effects and related mitigation measure requirements are summarized in Table 3.12-6 and discussed below.

Table 3.12-6. Population, Housing, and Environmental Justice Effects and Mitigation Measures for Alternative 2

Effect	Finding	Mitigation Measure	With Mitigation
Effect POP-1: Displacement of Existing Housing Units	Significant	POP-MM-1: Property Acquisition Compensation and Resident Relocation Plan	Less than significant
Effect EJ-1: Result in a Disproportionately High and Adverse Human Health or Environmental Effect on Minority Populations and Low-Income Populations from Construction Activities	Less than significant	None required	Less than significant

Effect POP-1: Displacement of Existing Housing Units

This effect would be similar to Effect POP-1 described under Alternative 1. Implementation of Alternative 2 would require the permanent acquisition of 17 residences to accommodate the expanded footprint of the flood control system: 5 in Butte County (Census Tract 36) and 12 in Sutter County (2 in Census Tract 510, 6 in Census Tract 504.03, 2 in Census Tract 502.02, 1 in Census Tract 507.02, and 1 in Census Tract 507.01). Temporary relocation of residents may also be necessary.

The displacement of any residences is considered a significant effect, so the permanent acquisition of 17 residences and the potential for temporary displacement of residences under Alternative 2 would be significant. However, with implementation of Mitigation Measure POP-MM-1, this effect would be reduced to a less-than-significant level.

Effect EJ-1: Result in a Disproportionately High and Adverse Human Health or Environmental Effect on Minority Populations and Low-Income Populations from Construction Activities

As described for Effect POP-1, implementation of Alternative 2 would require the acquisition of 17 existing residences.

In Sutter County, six homes would be acquired in Census Tract 504.03, two homes would be acquired in Census Tract 502.02, two homes would be acquired in Census Tract 510 and one home would be acquired in both Census Tracts 507.02, and 507.01. The majority of the population of Census Tract 504.03 is of non-minority descent. Because the number of homes acquired in the other census tracts is less than those in Census Tract 504.03 (six versus one or two homes respectively), home acquisitions associated with Alternative 2 would not result in a disproportionately high and adverse environmental effect on minority populations and low-income populations from project operation. For the same reason, significant and unavoidable effects associated with Alternative 2 for other resources (specifically Section 3.5, *Air Quality,* and Section 3.7, *Noise*) would not result in a disproportionately high and adverse human health or environmental effect on minority populations and low-income populations. Therefore, this effect is less than significant.

3.12.4.4 Alternative 3

Implementation of Alternative 3 would potentially result in effects on population, housing, and environmental justice. These potential effects and related mitigation measure requirements are summarized in Table 3.12-7 and discussed below.

Table 3.12-7. Population, Housing, and Environmental Justice Effects and Mitigation Measures for Alternative 3

Effect	Finding	Mitigation Measure	With Mitigation
POP-1: Displacement of Existing Housing Units	Significant	POP-MM-1: Property Acquisition Compensation and Resident Relocation Plan	Less than significant
EJ-1: Result in a Disproportionately High and Adverse Human Health or Environmental Effect on Minority Populations and Low-Income Populations from Construction Activities	Less than significant	None required	Less than significant

Effect POP-1: Displacement of Existing Housing Units

This effect would be the same as Effect POP-1 described under Alternative 1. Implementation of Alternative 3 would require the permanent acquisition of five existing residences to accommodate the expanded footprint of the flood control system: two residences in Butte County (one each in Census Tracts 33 and 34) and three in Sutter County (two in Census Tract 502.02 and one in Census Tract 507.01). Temporary relocation of residents may also be necessary.

The displacement of any residences is considered a significant effect, so the permanent acquisition of five residences and the potential for temporary displacement of residences under Alternative 3 would be significant. However, with implementation of Mitigation Measure POP-MM-1, this effect would be reduced to a less-than-significant level.

Effect EJ-1: Result in a Disproportionately High and Adverse Human Health or Environmental Effect on Minority Populations and Low-Income Populations from Construction Activities

Two homes would be acquired in Census Tract 502.02, while only one home would be acquired in each of Census Tracts 33, 34, and 507.01. As described for the analysis of Alternative 2 for Effect EJ-1, the majority of the population of Census Tract 502.02 is of Hispanic ethnicity; per capita income in Census Tract 502.02 is approximately 36% less than in the Sutter County affected area; and the percentage of the population below the poverty line is greater than 10% more in Census Tract 502.02 than in the Sutter County affected area. However, because the number of homes acquired in the other census tracts is comparable to those in Census Tract 502.02 (one versus two homes acquired, respectively), home acquisitions associated with Alternative 3 would not result in a disproportionately high and adverse environmental effect on minority populations and low-income populations from project operation. For the same reason, significant and unavoidable effects associated with Alternative 3 for other resources (specifically Section 3.5, *Air Quality,* and Section 3.7, *Noise*) would not result in a disproportionately high and adverse human health or environmental effect on minority populations and low-income populations. Therefore, this effect is less than significant.

3.13 Visual Resources

3.13.1 Introduction

This section describes the regulatory and environmental setting for visual resources; effects on visual resources that would result from the No Action Alternative and Alternatives 1, 2, and 3; and mitigation measures that would reduce significant effects.

3.13.2 Affected Environment

This section describes the affected environment for visual resources in the project area. Following are the key sources of data and information used in the preparation of this section.

- Sacramento, Delevan, Colusa, and Sutter National Wildlife Refuges Final Comprehensive Conservation Plan (U.S. Fish and Wildlife Service 2009).
- Sutter County General Plan (Sutter County 2011).
- City of Yuba City General Plan (City of Yuba 2004).
- Butte County General Plan 2030 (Butte County 2010).
- City of Live Oak 2030 General Plan (City of Live Oak 2010).
- Visual Resources Assessment Procedure for the U.S. Army Corps of Engineers (Smardon et al. 1988).

3.13.2.1 Regulatory Setting

This section discusses regulatory information that applies to visual resources. Additional regulatory information appears in Appendix A.

Federal and State

There are no Federal or state policies related to visual resources that apply to the implementation of the proposed project. Notably, there are no roadways in or near the project area that are designated in Federal or state plans as scenic highways worthy of protection for maintaining and enhancing scenic viewsheds. Accordingly, there would be no effects on a state scenic highway and this is not analyzed further.

Local

Sutter County, Butte County, City of Yuba City, and the City of Live Oak have each adopted general plan goals and policies aimed toward protecting visual resources; these are provided in Appendix A. It should be noted that visual resources tend to be associated with land use, cultural resources, and biological resources; accordingly, the regulatory information presented in Appendix A is more inclusive to recognize these relationships.

3.13.2.2 Environmental Setting

The following considerations are relevant to visual resources conditions in the proposed project area.

Concepts and Terminology

Identifying a project area's visual resources and conditions involves three steps:

1. Objective identification of the visual features (visual resources) of the landscape.
2. Assessment of the character and quality of those resources relative to overall regional visual character.
3. Determination of the importance to people, or sensitivity, of views of visual resources in the landscape.

Because evaluating visual effects is inherently subjective, Federal and professional standards and methods of visual assessment have been used to determine potential effects on aesthetic values of the project area (see Section 3.13.3, *Environmental Consequences*). The aesthetic value of an area is a measure of its visual character and quality, combined with the viewer response to the area (Federal Highway Administration 1988:26–27, 37–43, 63–72). Scenic quality can best be described as the overall impression that an individual viewer retains after driving through, walking through, or flying over an area (U.S. Bureau of Land Management 1980:2–3). Viewer response is a combination of viewer exposure and viewer sensitivity. Viewer exposure is a function of the number of viewers, number of views seen, distance of the viewers, and viewing duration. Viewer sensitivity relates to the extent of the public's concern for a particular viewshed. These terms and criteria are described in detail below.

Visual Character

Natural and artificial landscape features contribute to the visual character of an area or view. Visual character is influenced by geologic, hydrologic, botanical, wildlife, recreational, and urban features. Urban features include those associated with landscape settlements and development, including roads, utilities, structures, earthworks, and the results of other human activities. The perception of visual character can vary significantly seasonally, even hourly, as weather, light, shadow, and elements that compose the viewshed change. The basic components used to describe visual character for most visual assessments are the elements of form, line, color, and texture of the landscape features (USDA Forest Service 1995:28–34, 1-2–1-15; Federal Highway Administration 1988:37–43). The appearance of the landscape is described in terms of the dominance of each of these components.

Visual Quality

Visual quality is evaluated using the well-established approach to visual analysis adopted by the Federal Highway Administration, employing the concepts of vividness, intactness, and unity (Federal Highway Administration 1988:46–59; Jones et al. 1975;682–713).

- *Vividness* is the visual power of landscape components or how memorable they are as they combine in striking and distinctive visual patterns.

- *Intactness* is the visual integrity of the natural and human-built landscape and its freedom from encroaching elements; this factor can be present in well-kept urban and rural landscapes, and in natural settings.
- *Unity* is the visual coherence and compositional harmony of the landscape considered as a whole; it frequently attests to the careful design of individual components in the landscape.

Visual quality is evaluated based on the relative degree of vividness, intactness, and unity, as modified by the visual sensitivity of the viewers. High-quality views are exceptionally vivid and relatively intact and exhibit a high degree of visual unity. Low-quality views lack vividness, are not visually intact, and possess a low degree of visual unity.

Viewer Exposure and Sensitivity

The measure of the quality of a view must be tempered by the overall sensitivity of the viewer. Viewer sensitivity or concern is based on the visibility of resources in the landscape, proximity of viewers to the visual resource, elevation of viewers relative to the visual resource, frequency and duration of views, number of viewers, and type and expectations of individuals and viewer groups.

The importance of a view is related in part to the position of the viewer relative to the resource; therefore, visibility and visual dominance of landscape elements depend on their placement within the viewshed. A viewshed is defined as all of the surface area visible from a particular location (e.g., an overlook) or sequence of locations (e.g., a roadway or trail) (Federal Highway Administration 1988:26–27). To identify the importance of views of a resource, a viewshed must be broken into distance zones of foreground, middleground, and background. Generally, the closer a resource is to the viewer, the more dominant the resource and the greater its importance to the viewer. Although distance zones in a viewshed may vary between different geographic regions or types of terrain, the standard foreground zone is 0.25 to 0.5 mile from the viewer, the middleground zone is from the foreground zone to 3 to 5 miles from the viewer, and the background zone is from the middleground to infinity (Jones et. al. 1975:688).

Visual sensitivity depends on the number and type of viewers and the frequency and duration of views. Visual sensitivity also is modified by viewer activity, awareness, and visual expectations in relation to the number of viewers and viewing duration. For example, visual sensitivity is generally higher for views seen by people who are driving for pleasure; people engaging in recreational activities such as hiking, biking, or camping; and homeowners. Sensitivity tends to be lower for views seen by people driving to and from work or as part of their work (USDA Forest Service 1995:3-3–3-13; Federal Highway Administration 1988:63–72; U.S. Soil Conservation Service 1978:3, 9, 12). Commuters and nonrecreational travelers typically have fleeting views and tend to focus on traffic, not on surrounding scenery; therefore, they generally are considered to have low visual sensitivity. Residential viewers typically have extended viewing periods and are concerned about changes in the views from their homes; therefore, they generally are considered to have high visual sensitivity. Viewers using recreation trails and areas, scenic highways, and scenic overlooks usually are assessed as having high visual sensitivity.

Judgments of visual quality and viewer response must be made based on a regional frame of reference (U.S. Soil Conservation Service 1978:3). The same landform or visual resource appearing in different geographic areas could have a different degree of visual quality and sensitivity in each setting. For example, a small hill may be a significant visual element on a flat landscape but have very little significance in mountainous terrain.

Visual Character of the Region

This section discusses the existing conditions related to aesthetics in the project area. The project area is located in the region of California's Sacramento Valley (valley), with its northern extent beginning at the Thermalito Afterbay (approximately 2.5 miles north of Biggs), stretching approximately 41 miles south to approximately 4 miles north of where the Feather River enters the Sutter Bypass. Yuba City is the largest city in the project area and is connected by SR 99 to the smaller cities of Gridley and Live Oak. The city of Biggs in Butte County and the smaller communities of Peachton, Fagan, Sunset, Encinal, Sanders, Tierra Buena, and Nicolaus in Sutter County are located nearby, on local roadways off SR 99.

Agricultural land, planted predominantly with row crops and orchards, stretches for miles in the region. A patchwork of fields surrounds the suburban outskirts of cities and communities, separating developed areas. When haze is at a minimum, these fields offer expansive views that extend over agricultural fields and recent development in the foreground to the middleground and background. The Sutter Buttes can be seen vividly rising up from the flat valley floor in the background, based on the viewer's location in the landscape. Views of the Coast Range to the west are common. Background views to the Sierra Nevada foothills to the east are more rare because of atmospheric haze.

While much of the valley is still in agricultural production, agricultural land has been and continues to be converted to suburban land uses. This trend is evident around the outskirts of Yuba City, Gridley, and Live Oak. Smaller, agrarian communities have not experienced a great deal of new development or growth over the past decade. Development in the region is typified by a growing core of residential, commercial, and some industrial land uses, with agricultural fields surrounding the city outskirts. Older residential and commercial areas in the region are often distinct, with a wide variety of architectural styles, development layouts, and visual interest. Newer residential and commercial development, however, tends to be homogenous in nature, with similar architectural styles, building materials, plan layouts, and commercial entities; and development often lacks a distinctive character from one city to the next. Waterways and bypasses, both natural and human-made, aid in limiting development but lead to development spreading outward where vast acreage of agricultural land remains. This growth is slowly changing the visual character from rural to suburban.

Overall, a mix of developed and natural landscapes characterizes the project area. The landscape pattern is influenced by development expanding from older core areas along the major roadways. The waterways in the project area have different visual characteristics at a finer scale. Viewers in the region include residents, local business employees, roadway users, and recreational users. Areas that may be affected by the project alternatives are shown in Plate 1-3.

Visual Character and Quality of the Project Vicinity

To illustrate visual character, Plate 3.13-1 plots the locations of the representative photographs shown in the identified plates. For visual quality, Table 3.13-1 (see end of this section, page 3.13-23) details the rating of each reach under existing conditions and anticipated rating based on the project alternatives. Visual quality ratings are assigned for vividness, intactness, and unity on a scale of 0 to 7, with 7 being the highest quality.

In the project area, the Feather River has a wider floodplain with gravel bars and riparian vegetation to the north, and past mining activities located to the east and west. South of the mining areas, the width of the floodplain varies (Plate 3.13-2, Photo 5). In wider areas, there is an elevated floodplain used for agricultural production, which is often defined by bends in the river (Plate 3.13-2, Photo 17). In narrower areas, the river supports a dense riparian vegetation corridor. The character of the river remains much the same until it enters the Sutter Bypass, where it closely follows Garden Highway on the east, with only a narrow band of riparian vegetation on either side, and a wide swath of agricultural fields between the river and the west levee. The Oroville Wildlife Management Area is supported by the northern portion of the Feather River, and Lake of the Woods State Wildlife Area is supported by the southern portion of the river.

As they flow toward the south, waterways in this region meander through agricultural fields and orchards, passing by several rural communities. Except where the Feather River passes through Yuba City, lands adjacent to project levee exteriors are predominantly agricultural fields and orchards, with the occasional rural residence or commercial facility located close to the levee (Plate 3.13-2, Photo 2 and 4). Where the Feather River passes through Yuba City, the land uses are primarily commercial, industrial, and residential. Public roadways, typically found adjacent to levees in this region, provide most of the views toward the project area. Foreground views near the river often consist of the waterway, levees, vegetation, surrounding agriculture, orchards, communities, docking areas, local roadways, and related infrastructure. Middleground and background views throughout the region may be limited by vegetation, levees, and infrastructure or may extend over the landscape to include views of the Sutter Buttes, Sierra Nevada, Coast Ranges, and a collage of agricultural fields and orchards (Plate 3.13-2, Photo 18).

Reaches

For purposes of discussion in this chapter, and to aid in understanding the numerous reaches in the project, the reaches have been divided into two categories based on, and defined by, similar existing visual characteristics, visual qualities, and associated viewer groups: rural reaches and urban reaches.

Rural Reaches

Rural reaches include portions of the project area where the adjacent land use is primarily large blocks of land used for agriculture. These agricultural fields are routinely leveled, disked, and planted in row crops or orchards. Consistency in the visual character is found by the common element of agriculture in the foreground and middleground. Along these rural reaches, a few individual rural residential home sites, often with secondary structures such as barns, are scattered throughout the project area. A small residential community is located south of E. Gridley Road and west of the Feather River levee in Reach 30.

Rural reaches comprise Reaches 2 through 11 (up to station 820+00) and Reaches 18 (beginning at station 1150+00) to 41. The numerous roadways in the rural reaches are generally two lanes with no curb, gutter, sidewalk, or street lights. These roads typically are not highly traveled and are used primarily for access to rural home sites or by vehicles or agricultural equipment used in farming operations.

While the character of these rural reaches is primarily agricultural, they do contain public recreation opportunities, as shown in Plate 3.14-1, *Existing Recreation Facilities near the Project Area*, including the Feather River Wildlife Areas (Nelson Slough Unit, O'Connor Lakes Unit, Abbot Lake Unit, and Morse Road Unit), Bobelaine Audubon Sanctuary, Boyd's Boat Ramp, Live Oak Park and Recreation Area, City of Gridley Boat Ramp, and the Oroville Wildlife Area. These public areas provide visual and recreational opportunities to appreciate the river and its surrounding environment. Aside from those public areas, the rural reaches are defined by agricultural uses that stretch for miles.

As shown in Table 3.13-1 (page 3.13-23), the overall visual quality of the rural reaches is moderate (3.5–4.3). Vividness (V=3.5–4), intactness (I=3.5–4.5), and unity (U=3.5–4.5) are moderate to moderately high because the vast amount of agricultural fields and orchards coupled with the mature vegetation along the river corridor provide a more unique and pleasing visual experience.

Photographs illustrating the visual character of the rural reaches are contained in Plate 3.13-2, Photos 1 through 7 and 12 through 17.

Urban Reaches

Urban reaches are those areas in the project area where the adjacent land uses have a higher density of residential, commercial, and industrial uses. The only urban reach in the project area is Yuba City, which includes Reach 11 (starting at station 820+00) through Reach 18 (ending at station 1150+00). Adjacent development in the project area for these reaches is composed of residential subdivisions; commercial and industrial uses; park, recreation, and open space land uses; and the Sutter County Airport. Along these reaches are significant roadways, such as SR 20 (Colusa Avenue), the Twin Cities Memorial Bridge, Shanghai Bend Road, 2nd Street, and Live Oak Boulevard.

As shown in Table 3.13-1 (page 3.13-23), the overall visual quality of the urban reaches is moderately low to moderate (3.2–3.8). Vividness (V=2.5–3.5), intactness (I=3.5–4), and unity (U=3.5–4) are moderately low to moderate. This is because the contrasting built elements of Yuba City that combine with the Feather River corridor lack a coherent and harmonious visual pattern. The urbanization associated with Yuba City does not provide visual order; rather, it encroaches into the Feather River corridor.

Photos 8 through 11 in Plate 3.13-2 illustrate the visual character of the urban reaches.

Viewer Groups and Viewer Responses

The primary viewer groups in the project area include people living or conducting business near levees; travelers using highways and smaller local roads; and recreational users (including boaters and beachgoers along the Feather River; anglers using canals, creeks, and rivers; trail users; equestrians; bicyclists; and joggers).

Residents

Suburban and rural residences are located directly adjacent to levees or are separated from them by local streets or similar corridors. Suburban residences are mostly oriented inward toward the developments, and only residences on the outer edge of the developments have views of the levee, vegetation, and trees. At various locations the orientation of rural residences allows inhabitants to have direct views over agricultural fields toward the levee. Both suburban and rural residents are likely to have a high sense of ownership over the adjacent waterways, the surrounding open space, the recreational opportunities, and the inherent scenic quality. Residents are considered to have high sensitivity to changes in the viewshed because of their potential exposure to such views, proximity to the project area, and sense of ownership.

Businesses

Viewers from industrial, commercial, government, and educational facilities have semi-permanent views from their respective facilities. Situated in different locations throughout the project area, views from these facilities range from those limited by the levee to sweeping views that extend out to the background. Employees and users of these facilities are likely to be occupied with their work activities and tasks at hand. People using these facilities often travel to and from work and spend leisure time on the waterways and levee. Because of their limited viewing times, their focus on tasks at hand, and the current use of the levee, this viewer group is considered to have moderate sensitivity to changes in views.

Roadway Users

Roadway users' views differ based on the roadway they are traveling and elevation of that roadway. The majority of views are mostly limited to the foreground by suburban, commercial, and industrial development, vegetation, and the levee itself. Views to the middleground and background are present, but are limited to areas where structures that otherwise would conceal background views from the roadway are set back. However, if the roadway is elevated, as on portions of SR 20 and bridges crossing over the waterways, most views of the surrounding mountain ranges (Vaca Mountains, Coast Ranges, and Sierra Nevada), waterways (e.g., Feather River, Sutter Bypass when flooded), and open space areas (e.g., agriculture) are only partially obstructed by the rooflines and mature vegetation in the area. Roads on the levee associated with the project area are not open to the public and, therefore, would not provide public views of the project area.

Travelers use roadways at varying speeds. Normal highway and roadway speeds differ based on speed limits and the traveler's familiarity with the route and roadway conditions (e.g., presence or absence of rain). Single views typically are of short duration, except on straighter stretches where views last slightly longer. Viewers who frequently travel these routes generally possess moderate visual sensitivity to their surroundings. The passing landscape becomes familiar to these viewers, and their attention typically is focused on the roadway, roadway signs, and surrounding traffic, not on the passing views. Viewers who travel local routes for their scenic quality generally possess a higher visual sensitivity to their surroundings because they are likely to respond to the natural environment with a high regard and as a holistic visual experience. Furthermore, scenic stretches of roadway passing through the project area offer sweeping views of the surrounding area that are of interest to motorists, especially when traveling on the bridges or levee tops. For these reasons, viewer sensitivity is moderate among most roadway travelers.

Recreational Users

As described in Section 3.14, *Recreation*, there are numerous public access points to the Feather River in the project area. These destination spots provide passive and active recreation opportunities in the project area, and are adjacent to or within the footprint of the areas that would be directly affected by project alternatives. These destination spots are shown on Plate 3.14-1 and include the Feather River Wildlife Areas (Nelson Slough Unit, O'Connor Lakes Unit, Abbot Lake Unit, Shanghai Bend Unit, and Morse Road Unit), Bobelaine Audubon Sanctuary, Boyd's Boat Ramp, Peach Bowl Little League Field, Yuba City Boat Ramp, Live Oak Park and Recreation Area, City of Gridley Boat Ramp, and the Oroville Wildlife Area. These public amenities draw recreational viewer groups and provide visual opportunities to appreciate the river and surrounding environment.

Recreational users view the project area from parks, waterways, roadways, trails, and the levee itself. Recreational uses consist of boating and fishing; hunting in the bypasses; birding; and walking, running, jogging, and bicycling along trails, levee crowns, and local roads. Users of the waterways are likely to seek out natural areas within the corridor, such as sand and gravel bars and beaches, in addition to using the waterways as a resource. Waterway users have differing views based on their location in the landscape and are accustomed to variations in the level of land uses and activities occurring in the project area. The amount of vegetation present along the waterway creates a softened, natural edge that can be enjoyed by all recreational users. Local recreational users have a high sense of ownership over the waterways and corridors they use, and these areas are greatly valued throughout the project area.

Viewer sensitivity is high among recreational users in the project area because they are more likely to value the natural environment, appreciate the visual experience, have an enhanced sense of ownership, and be more sensitive to changes in views.

3.13.3 Environmental Consequences

This section describes the environmental consequences relating to visual resources for the proposed project. It describes the methods used to determine the effects of the project and lists the thresholds used to conclude whether an effect would be significant. The effects that would result from implementation of the project, findings with or without mitigation, and applicable mitigation measures are presented in a table under each alternative.

3.13.3.1 Assessment Methods

This evaluation of visual resources is based on professional standards and information cited throughout the section. The key effects were identified and evaluated based on the environmental characteristics of the project area and the magnitude, intensity, and duration of activities related to the construction and operation of this project.

The Visual Quality Rating Summary, provided in Table 3.13-1 (at the end of this section), was used to determine project effects. Vividness, intactness, and unity were evaluated to determine the existing visual quality of each reach and the proposed visual quality for all three alternatives. The Visual Quality Rating Summary also includes a brief description of affected viewers by reach.

3.13.3.2 Determination of Effects

For this analysis, an effect pertaining to visual resources was identified under NEPA and CEQA if it would result in any of the following environmental effects, which are based on NEPA standards, State CEQA Guidelines Appendix G (14 CCR 15000 et seq.), and standards of professional practice.

- Cause a substantial, demonstrable negative aesthetic effect on a scenic vista or view open to the public.
- Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway.
- Substantially degrade the existing visual character or quality of the site and its surroundings.
- Create a new source of substantial light or glare that would adversely affect day or nighttime public views.

Professional Standards

According to professional standards, a project may be considered to have an adverse (i.e., significant) effect if it would substantially:

- Conflict with local guidelines or goals related to visual quality.
- Alter the existing natural viewsheds, including changes in natural terrain.
- Alter the existing visual quality of the region or eliminate visual resources.
- Increase light and glare in the project vicinity.
- Result in backscatter light into the nighttime sky.
- Result in a reduction of sunlight or introduction of shadows in community areas.
- Obstruct or permanently reduce visually important features.
- Result in long-term (persisting for 2 years or more) adverse visual changes or contrasts to the existing landscape as viewed from areas with high visual sensitivity.

3.13.4 Effects and Mitigation Measures

Effects and mitigation measure requirements concerning visual resources are summarized in Table 3.13-2.

Table 3.13-2. Summary of Effects for Visual Resources

Effect	Finding	Mitigation Measures	With Mitigation
Alternatives 1 and 3			
Effect VIS-1: Result in Temporary Visual Effects from Construction	Less than significant	None required	Less than significant
Effect VIS-2: Adversely Affect a Scenic Vista	Less than significant	None required	Less than significant
Effect VIS-3: Substantially Degrade the Existing Visual Character or Quality of the Site and Its Surroundings	Less than significant	None required	Less than significant
Effect VIS-4: Create a New Source of Substantial Light or Glare That Would Adversely Affect Day and Nighttime Public Views	Less than significant	None required	Less than significant
Alternative 2			
Effect VIS-1: Result in Temporary Visual Effects from Construction All reaches	Significant and unavoidable	None available	Significant and unavoidable
Effect VIS-2: Adversely Affect a Scenic Vista Reaches 6, 12–15, 17, 24, 25–28, 34, 39; 2, 4, 16, 20, 22, 31–33, 35, 37, 38	Less than significant	None required	Less than significant
Reaches 3, 5, 7–11, 18, 19, 21, 23, 30, 36, 40, 41	Significant and unavoidable	None available	Significant and unavoidable

Effect	Finding	Mitigation Measures	With Mitigation
Effect VIS-3: Substantially Degrade the Existing Visual Character or Quality of the Site and Its Surroundings Reaches 6, 12–15, 17, 24–29, 34, 39; 2, 4, 16, 20, 22, 31–33, 35, 37, 38	Less than significant	None required	Less than significant
Reaches 3, 5, 7–11, 18, 19, 21, 23, 30, 36, 40, 41	Significant and unavoidable	None available	Significant and unavoidable
Effect VIS-4: Create a New Source of Substantial Light or Glare That Would Adversely Affect Day and Nighttime Public Views All reaches	Less than significant	None required	Less than significant

3.13.4.1 No Action Alternative

The No Action Alternative represents the continuation of the existing deficiencies along the portion of the Feather River in the FRWLP area. Current levee operations and maintenance activities would continue, but there would be no change in the geomorphic and flood control regimes relative to existing conditions. No levee improvements would be made to decrease flood risk. No construction-related effects relating to visual resources such as vegetation removal, displacement of agricultural land or development, or construction of a new levee, cutoff wall, and landside seepage and stability berms would occur.

As stated in Section 2.6.4, *Levee Vegetation Policy and No Action,* because of the existence of multiple future vegetation removal scenarios, the visual resources analysis examined the worst-case scenario—full application of the USACE levee vegetation policy. Full application of the policy is prohibition and removal of woody vegetation within the levee prism or within 15 feet of the landside or waterside levee toes. The degree of visual change in character and diminishment in visual quality from loss of the trees would be significant and unavoidable.

Without implementation of the proposed project alternatives, visual resources are expected to remain similar to existing conditions, aside from vegetation removal for USACE levee vegetation policy compliance. The visual character could change in the event of a levee failure. Catastrophic flooding has the potential to destroy vegetation, infrastructure, and development. However, current policy is to protect eroding sites during emergencies. Erosion on banks often has the potential to create small earthslides that take vegetation with them. However, this is part of a naturally functioning river system, and vegetation more often than not would recolonize such sites over time. These events often create areas of visual interest, but at erosion sites that are roughly 500 feet or larger, the loss of bank and vegetation due to erosion would be highly visible. Such a large site is likely to fall under emergency repair and would be repaired or revetted.

Without levee improvements, there is the continued risk of levee failure. Under-seepage and loss of levee foundation soils would be expected to continue. A catastrophic levee failure would result in collapse of levee slopes and loss of soil. This would result in flooding and inundation that could significantly damage existing facilities and infrastructure and uproot and kill vegetation to an unknown extent. Should such an event occur, natural processes and vegetative succession would restore the visual environment to a certain degree over time. However, permanent scarring or visual remnants of damaged infrastructure could remain on the landscape. Such an event would cause a change in the existing visual character and potentially could lay waste to miles of land. Scenic vistas would be significantly altered for an extended period of time, or irreparably damaged, because views across this landscape would be so changed.

The necessary cleanup after such an event would introduce considerable heavy equipment and associated vehicles, including bulldozers, excavators, water trucks, and haul trucks, into the viewshed. The visual effect of these activities would not be significant because of the temporary nature of such activities.

Given the extent of catastrophic levee failure and the number of people affected, views of a barren or destroyed landscape could invoke deep emotional responses in viewers. Such views would reduce the visual enjoyment of areas that were once well regarded. The potential effects cannot be quantified based on available information but can be equated to such failures in recent history.

Furthermore, if lesser events such as a levee breach were to occur, emergency construction and repair activities would be implemented without the use of BMPs and could result in similar adverse effects, described under the alternatives below.

3.13.4.2 Alternative 1

Implementation of Alternative 1 would potentially result in effects on visual resources. These potential effects and related mitigation measure requirements are summarized in Table 3.13-3 and discussed below.

As stated in Chapter 2, *Alternatives*, and described in Section 3.8, *Vegetation and Wetlands*, for all three alternatives , existing trees and encroachments would be removed along the levee prism to the extent necessary to facilitate construction of the project. These areas are identified within the temporary and permanent effect boundaries on Plate 3.8-1 and would be void of vegetation except for erosion-controlling grasses. These areas are termed vegetation free zones (VFZ) in this section.

Table 3.13-3. Visual Resources Effects and Mitigation Measures for Alternative 1

Effect	Reach	Finding	Mitigation Measures	With Mitigation
Effect VIS-1: Result in Temporary Visual Effects from Construction	All reaches	Less than significant	None required	Less than significant
Effect VIS-2: Adversely Affect a Scenic Vista	All reaches	Less than significant	None required	Less than significant
Effect VIS-3: Substantially Degrade the Existing Visual Character or Quality of the Site and Its Surroundings	All reaches	Less than significant	None required	Less than significant
Effect VIS-4: Create a New Source of Substantial Light or Glare That Would Adversely Affect Day and Nighttime Public Views	All reaches	Less than significant	None required	Less than significant

Effect VIS-1: Result in Temporary Visual Effects from Construction

Construction in both rural and urban reaches would occur during more than one construction season (typically April 15 to November 30, subject to conditions). It is anticipated that construction would start in 2013 and continue through 2015. Construction is anticipated to occur in single 10-hour shifts, 6 days a week. An exception to this schedule is the cutoff wall construction, which is anticipated to occur in two 10-hour shifts (essentially 24-hour construction), 6 days a week. This would adversely affect residential viewers close to 20-hour construction activities.

High-powered lighting would be required for construction operations past sunset, visible to nearby residents who may be inside their homes or outside in their yards during the spring and summer months. However, Environmental Commitment *2.4.8 Construction near Residences*, would ensure that high-power lighting is not used near sensitive residential viewers. In general, construction operations at the levee and borrow sites, construction traffic, haul trucks, and staging areas would be visible in the foreground and middleground to residents, businesses, roadway users, and recreationists.

Construction of the project would require clearing, grubbing, and stripping the construction site, and constructing temporary facilities such as staging areas and slurry mixing areas. The project would introduce heavy equipment, including long-reach track hoes, dump trucks, loaders, bulldozers, excavators, rough terrain forklifts, compactors, and water trucks. Construction has the potential to create dust and would introduce heavy equipment and associated vehicles into foreground views from the rural and urban residences, businesses in the rural and urban reaches, and those traveling along the nearby roadways. Dust control would be implemented during construction to reduce the potential for dust that would attract attention from visual receptors and reduce the availability of foreground and middleground views. Viewers are accustomed to seeing heavy machinery associated with agricultural operations, but viewers would not be accustomed to seeing intense construction activities because levee construction of this scale is not common in the project area.

In the rural reaches, construction would consist of a cutoff wall along all reaches and a landside seepage berm. The cutoff wall would be constructed along the centerline of the existing levee footprint to varying depths. While the visual effects associated with the construction of a cutoff wall would be minimal, the seepage berm would result in the removal of agricultural land planted in orchards. Furthermore, the seepage berm would result in expanding the levee footprint in near view of two rural residences, one located at the terminus of Ashford Avenue and the second at the terminus of O’Connor Avenue. Views from both properties would be affected by this new landform void of woody vegetation. However, Environmental Commitment *2.4.1.5 Use of Native Wildflower Species in Erosion Control Grassland Seed Mix*, would improve the aesthetics of the seepage berm and other surfaces treated with erosion control measures by providing seasonal interest through wildflower displays.

To construct the seepage berm, material must be generated from borrow sites and hauled to the construction sites. This has the potential to create large landscape scars at borrow sites. However, Environmental Commitment *2.4.10 Soil Borrow Site Reclamation Plan*, would improve the aesthetics of borrow sites by reclaiming and restoring borrow sites in a manner that returns the land to agricultural uses or creates natural habitat, recreational, developed, and/or mixed uses. At the construction sites, heavy equipment such as bulldozers, front-end loaders, haul trucks, motor-graders, sheepsfoot rollers, and water trucks would be visible during the construction period. Haul trucks would be seen transporting borrow material to the construction site. This activity, which is not consistent with agricultural operations, would attract attention and be visually out of character, disrupting the visual quality of the project area.

In the urban reaches, construction would consist primarily of cutoff walls.

In Reaches 6, 12, 14, 25, 29, and 39, construction would include replacement or relocation of underground features such as storm drains, sewer and irrigation pipelines. Once constructed, the ground surface would be restored and reseeded and appear consistent with existing, pre-disturbance conditions.

Visual changes resulting from construction are considered short-term and temporary. Equipment would work in one area for a short period of time (typically a matter of days or less for any individual property and receptor group) and then move to a new location along the alignment, and each reach would typically include work only for a single construction season. Therefore, temporary visual effects during construction of Alternative 1 would be considered less than significant.

Effect VIS-2: Adversely Affect a Scenic Vista

The river and numerous roadways throughout the project area offer scenic vistas of contrasting landscape features. Development associated with Yuba City and the expansive agricultural fields are softened by the riparian corridors that line the river. Vistas from the river would be affected by vegetation removal (VFZ); however, removal of vegetation could create new vistas.

In Reaches 6, 12, 14, 25, 29, and 39, all project features would be located underground and would not be visible to the public. Therefore, effects on scenic vistas would be less than significant for these reaches.

In Reaches 2, 4, 11, 13, 15, 17–21, 24, 26–28, and 32–38, the cutoff wall would be contained within the levee's existing footprint. In Reaches 26–28, the landside slope of the levee would also need to be reconstructed. The cutoff wall and reconstructed slopes would not result in a noticeable change in the appearance of the levee, and these changes would not affect sensitive viewers. Vegetation in the VFZ would be cleared and these areas would be revegetated with grasses, but a limited number of sensitive viewers have visual access to these reaches. The overall visual quality in these reaches would not change.

In Reaches 3, 5, 7–10, 16, 22, 23, 30, 31, 40, and 41, vegetation removal in the VFZ would be the most dominant visual change. In addition, the new seepage berm in Reach 5 would introduce a large mass into foreground views in place of agricultural orchards now viewed from two residential properties. These changes would be considerable because of the physical modification being made to the levee but would result in a minor reduction in the overall visual quality because there are limited sensitive viewers with visual access to those reaches. However, Environmental Commitment *2.4.9 Use of Native Wildflower Species in Erosion Control Grassland Seed Mix*, would improve the aesthetics of the seepage berm and other surfaces treated with erosion control measures by providing seasonal interest through wildflower displays in all reaches. Therefore, effects on scenic vistas would be less than significant for these reaches.

While final soil borrow sites have not been selected, it is unlikely that scenic vistas would be adversely affected because the activity would take place below the surrounding land surface and therefore would not obstruct views; and because borrow sites would be restored to pre-borrow or similar land use, as identified in Environmental Commitment *2.4.10 Soil Borrow Site Reclamation Plan*.

Ongoing maintenance would be similar to existing levee maintenance and would not result in significant effects.

Effect VIS-3: Substantially Degrade the Existing Visual Character or Quality of the Site and Its Surroundings

In Reaches 6, 12, 14, 25, 29, and 39, all project features would be located underground and would not be visible to the public. Therefore, effects on the existing visual character and quality of the site would be less than significant for these reaches.

In Reaches 2, 4, 11, 13, 15, 17–21, 24, 26–28, and 32–38, the cutoff wall would be contained within the levee's existing footprint. In Reaches 26–28, the landside slope of the levee also would need to be reconstructed. The cutoff wall and reconstructed slopes would not result in a noticeable change in the appearance of the levee, and these changes would not affect sensitive viewers. Vegetation in the VFZ would be cleared, and these areas would be revegetated with grasses, but a limited number of sensitive viewers have visual access to these reaches. The overall visual quality in these reaches would not change. Therefore, effects would be less than significant for these reaches.

In Reaches 3, 5, 7–10, 16, 22, 23, 30, 31, 40, and 41, vegetation removal in the VFZ would be the most dominant visual change. In addition, while a cutoff wall within the existing levee footprint would not alter or degrade the existing visual character or quality of the site and its surroundings, this alternative would introduce a seepage berm into the viewshed of all viewer groups in and near Reach 5. Roadway users traveling along O'Connor Avenue and Ashford Avenue and two residences would have views of this new land form. All vegetation in the VFZ would be cleared, and these areas would be revegetated with grasses. After the project is constructed, these viewers would see a large berm with only grass as vegetation where agricultural fields or woody vegetation once existed, resulting in a change in visual character and reduction in quality.

In Reach 22, a portion of the levee would need to be completely reconstructed but would not greatly alter the permanent visual character because there is already a levee at this location; vegetation removal in this area, however, would be substantial.

Removal of vegetation in the VFZ and construction of the landside seepage berm constitute a significant visual change and would alter the viewshed from one that is vegetated with row crops, orchards, grasses, large trees, and shrubs to one that is vegetated only with grasses. However, Environmental Commitment *2.4.9 Use of Native Wildflower Species in Erosion Control Grassland Seed Mix*, would improve the aesthetics of the seepage berm and other surfaces treated with erosion control measures by providing seasonal interest through wildflower displays in all reaches. These changes in views would be perceived by residents, businesses, roadway users, and recreational viewer groups. However, a limited number of viewers are present, as identified in Table 3.13-1 (page 3.13-23). The changes in these reaches would be substantial because of the type of physical changes being made to the levee and vegetated areas, but a limited number of sensitive viewers have visual access to those reaches. Therefore, effects would be less than significant for these reaches.

While final soil borrow sites have not been selected, it is unlikely that scenic character and quality would be substantially degraded because borrow sites would be restored to pre-borrow or similar land use, essentially retaining existing character and quality, as identified in Environmental Commitment *2.4.10 Soil Borrow Site Reclamation Plan*.

Ongoing maintenance would be similar to existing levee maintenance and would not result in significant effects.

Effect VIS-4: Create a New Source of Substantial Light or Glare That Would Adversely Affect Day or Nighttime Public Views

The project would not introduce any permanent sources of illumination or reflective surfaces and therefore would result in no change in nighttime light or daytime glare.

3.13.4.3 Alternative 2

Implementation of Alternative 2 would potentially result in effects on visual resources. These potential effects and related mitigation measure requirements are summarized in Table 3.13-4 and discussed below.

Table 3.13-4. Visual Resources Effects and Mitigation Measures for Alternative 2

Effect	Reach	Finding	Mitigation Measure	With Mitigation
Effect VIS-1: Result in Temporary Visual Effects from Construction	All reaches	Significant and unavoidable	None available	Significant and unavoidable
Effect VIS-2: Adversely Affect a Scenic Vista	6, 12–15, 17, 24, 25–28, 34, 39	Less than significant	None required	Less than significant
	2, 4, 16, 20, 22, 31–33, 35, 37, 38	Less than significant	None required	Less than significant
	3, 5, 7–11, 18, 19, 21, 23, 30, 36, 40, 41	Significant and unavoidable	None available	Significant and unavoidable
Effect VIS-3: Substantially Degrade the Existing Visual Character or Quality of the Site and Its Surroundings	6, 12–15, 17, 24–29, 34, 39	Less than significant	None required	Less than significant
	2, 4, 16, 20, 22, 31–33, 35, 37, 38	Less than significant	None required	Less than significant
	3, 5, 7–11, 18, 19, 21, 23, 30, 36, 40, 41	Significant and unavoidable	None available	Significant and unavoidable
Effect VIS-4: Create a New Source of Substantial Light or Glare That Would Adversely Affect Day and Nighttime Public Views	All reaches	Less than significant	None required	Less than significant

Effect VIS-1: Result in Temporary Visual Effects from Construction

This effect under Alternative 2 is similar to the effect under Alternative 1, except as discussed below.

Alternative 2 would include construction of seepage and stability berms along the landside toe of the levee and cutoff walls along certain portions of the project. Similar to Alternative 1, all existing vegetation would be removed in the VFZ within the direct footprint necessary to construct the project.

This alternative, compared to Alternatives 1 and 3, would require the greatest amount of construction, over the largest area, and would result in the largest expansion of the overall levee footprint. Similar to Alternative 1, the construction of cutoff walls along certain reaches is proposed under Alternative 2. There would be fewer cutoff walls under Alternative 2 than under Alternative 1. Construction of the seepage and stability berms would displace more agricultural fields, residences, and small businesses than under Alternatives 1 and 3. Thus, Alternative 2 would result in greater effects than Alternatives 1 and 3.

In the rural reaches, a considerable amount of agricultural land would be converted to expansive seepage and stability berms located adjacent to the existing levee. There would be significant loss of residential and secondary structures, and businesses (Reaches 3, 8, 9, 10, 11, 18, 19, 20, 22, 23, 30, 31, 32, 33, 35, 36, 37, 38, and 40). Garden Highway would be realigned in Reach 10.

In the urban reaches, this alternative would result in the loss of numerous residential, commercial, and industrial structures. In addition, this alternative would require the realignment of urban roadways to accommodate the proposed improvements. The effects of this alternative would be significant in the urban reaches because of the adjacent higher density of residential, commercial, retail, and industrial land uses.

Construction of the landside seepage and stability berms would have significant effects because of the size of the berms, the amount of vegetation removal, and earthmoving activities during construction. However, Environmental Commitment *2.4.9 Use of Native Wildflower Species in Erosion Control Grassland Seed Mix*, would improve the aesthetics of the seepage and stability berms and other surfaces treated with erosion control measures by providing seasonal interest through wildflower displays in all reaches. Cutoff walls, where applicable, would be installed during construction of the adjacent seepage and stability berms and, thus, would not appear to be a visually separate feature during construction but a part of the overall construction activities. The introduction of seepage and stability berms would result in the removal of agricultural land, demolition of structures and roadways, and the introduction of expansive manipulated landforms of low visual quality. Construction of the seepage and stability berms would be visible to nearby residents, businesses, roadway users, and recreationists.

Alternative 2 would require more soil borrow and likely more borrow sites than Alternatives 1 or 3. This has the potential to create large landscape scars at borrow sites. However, Environmental Commitment *2.4.10 Soil Borrow Site Reclamation Plan*, would improve the aesthetics of borrow sites by reclaiming and restoring borrow sites in a manner that returns the land to agricultural uses or creates natural habitat, recreational, developed, and/or mixed uses. In addition, construction activities at the soil borrow sites and the increased presence of haul trucks would be visible to all nearby viewer groups, causing greater disruption in the visual character of the area than under the other alternatives.

Similar to Alternative 1, while construction would be temporary (equipment would work in one area for a period of time and then move to a new location along the alignment), visual effects would be significant because of the proximity to highly sensitive residential viewers, roadway users, and recreationists. In addition, the disturbance area and duration of the work would be considerably greater for Alternative 2 than for Alternatives 1 and 3, and would result in more substantial significant effects on visual resources from construction, especially to residences which are considered highly sensitive viewers. The magnitude of this effect is considered significant and unavoidable. Because these effects are inherent to the nature of the construction, no feasible mitigation is available.

Effect VIS-2: Adversely Affect a Scenic Vista

The river and numerous roadways throughout the project area offer scenic vistas of contrasting landscape features. Development associated with Yuba City and the expansive agricultural fields are softened by the riparian corridors that line the river. Vistas from the river would be affected by vegetation removal (VFZ); however, removal of vegetation could create new vistas. Vistas in the urban reaches would be adversely affected under Alternative 2 much more so than under Alternatives 1 and 3. Alternative 2 proposes cutoff walls and seepage and stability berms in the urban reaches, while Alternative 1 proposes only cutoff walls.

In Reaches 6, 12, 14, 25, 29, and 39, all project features would be located underground and would not be visible to the public. Therefore, effects on scenic vistas would be less than significant for these reaches.

In Reaches 13, 17, 24, 26–28, and 34, the cutoff wall would be contained within the levee's existing footprint. In Reaches 24 and 26–28, the canal would be filled, but it is not immediately visible to sensitive viewers. The cutoff wall and reconstructed slopes would not result in a noticeable change in the appearance of the levee, and these changes would not affect sensitive viewers. Vegetation in the VFZ would be cleared and these areas would be revegetated with grasses, but a limited number of sensitive viewers have visual access to these reaches. The overall visual quality in these reaches would not change. Therefore, effects on scenic vistas would be less than significant for these reaches.

In Reaches 2, 4, 16, 20, 22, 31, 33, 35, 37, and 38, vegetation removal in the VFZ and the proposed seepage and stability berms would introduce a large mass into foreground views in place of agricultural orchards now viewed from two residential properties. In Reach 22 the canal would be filled and no longer be present, but it is not immediately visible to sensitive viewers. In Reaches 22 and 38, a portion of the levee would need to be completely reconstructed. These are considerable physical changes to the levee but would result in a minor reduction in the overall visual quality because a limited number of sensitive viewers have visual access to those reaches, as identified in Table 3.13-1 (page 3.13-23). Therefore, these effects on scenic vistas are considered less than significant for these reaches.

In Reaches 3, 5, 7–11, 18, 19, 21, 23, 30, 36, 40, and 41, the project would have an significant effect on the existing scenic vistas because views from nearby rural roadways, as seen by residents, recreational users, and roadway users, would be substantially altered by the removal of agricultural land and structures and the introduction of expansive seepage and stability berms void of all vegetation other than grasses. Views would be interrupted by these new landforms instead of being multi-directional views of the surrounding landscape. Relatively flat land would be elevated and angled as a result of the seepage and stability berms. This would introduce a large mass into foreground views in place of agricultural orchards or urban development as viewed from sensitive viewer groups. Levee vegetation, row crops, and orchards would be replaced with native grasses associated with erosion control. Seepage and stability berms in Reaches 11 and 18 would result in the loss of residences and businesses, realignment of existing roadways, and removal of vegetation in the VFZ that would visually alter the character and adversely affect the scenic vistas. However, Environmental Commitment *2.4.9 Use of Native Wildflower Species in Erosion Control Grassland Seed Mix*, would improve the aesthetics of the seepage and stability berms and other surfaces treated with erosion control measures by providing seasonal interest through wildflower displays in all reaches. The magnitude of the loss of agricultural land, vegetation to be cleared from the VFZ, and introduction of new berms, combined with the loss of structures would have a substantial effect on the visual character and result in a substantial reduction in the overall visual quality, including scenic vistas. Therefore, these effects are considered significant and unavoidable with no mitigation available due to the nature of the effects.

While final soil borrow sites have not been selected, it is unlikely that scenic vistas would be significantly affected because the activity would take place below the surrounding land surface and therefore would not obstruct views; and because borrow sites would be restored to pre-borrow or similar land use, as identified in Environmental Commitment *2.4.10 Soil Borrow Site Reclamation Plan*. For Alternative 2 soil borrow needs would be greater e than Alternatives 1 and 3 and would potentially involve more sites, greater volumes per site, and greater duration of activities per site.

Ongoing maintenance would be similar to existing levee maintenance and would not result in significant effects.

Effect VIS-3: Substantially Degrade the Existing Visual Character or Quality of the Site and Its Surroundings

As discussed under Effects VIS-1 and VIS-2, Alternative 2 would introduce seepage and stability berms into the viewshed of all viewer groups. Similar to Alternative 1, all vegetation would be removed in the VFZ to the extent necessary within the direct construction footprint. While vegetation beyond the VFZ would be allowed to remain, the lack of woody vegetation would heighten the visibility of the stability and seepage berms. Alternative 2 proposes cutoff walls and seepage and stability berms in the urban reaches, while Alternative 1 proposes only cutoff walls. Accordingly, Alternative 2 would result in the most substantial change in visual character and reduction in visual quality compared to Alternatives 1 and 3. Environmental Commitment *2.4.9 Use of Native Wildflower Species in Erosion Control Grassland Seed Mix*, would improve the aesthetics of the seepage berms and other surfaces treated with erosion control measures by providing seasonal interest through wildflower displays in all reaches.

In Reaches 6, 12, 14, 25, 29, and 39, all project features would be located underground and would not be visible to the public. Therefore, effects on the existing visual character and quality of the site would be less than significant for these reaches.

In Reaches 13,17, 24, 26–28, and 34, the cutoff wall would be contained within the levee's existing footprint. In Reaches 24 and 26–28, the canal would be filled and no longer be present, but it is not immediately visible to sensitive viewers. The cutoff wall and reconstructed slopes would not result in a noticeable change in the appearance of the levee, and these changes would not affect sensitive viewers. Vegetation in the VFZ would be cleared and these areas would be revegetated with grasses, but a limited number of sensitive viewers have visual access to these reaches. The overall visual quality in these reaches would not change. Therefore, effects on the existing visual character and quality would be less than significant for these reaches.

In Reaches 2, 4, 16, 20, 22, 31, 33, 35, 37, and 38, vegetation removal in the VFZ and the proposed seepage and stability berms would introduce a large mass into foreground views in place of agricultural orchards now viewed from two residential properties. In Reaches 22 and 38, a portion of the levee would need to be completely reconstructed. These changes would be substantial because of the type of physical changes being made to the levee but would result in a minor reduction in the overall visual quality because a limited number of sensitive viewers have visual access to those reaches, as identified in Table 3.13-1 (page 3.13-23). Therefore, effects on the existing visual character and quality would be less than significant for these reaches.

In Reaches 3, 5, 7–11, 18, 19, 21, 23, 30, 36, 40, and 41, the project would have an significant effect on the existing visual character and degrade the overall visual quality of the project area because views from nearby rural roadways, as seen by residents, recreational users, and roadway users would be substantially altered by the removal of agricultural land and structures and the introduction of expansive seepage and stability berms void of all vegetation other than grasses. Views would be interrupted by these new landforms instead of being multi-directional views of the surrounding landscape. Relatively flat land would be elevated and angled as a result of the seepage and stability berms. This would introduce a large mass into foreground views in place of agricultural orchards or urban development as viewed from sensitive viewer groups. Levee vegetation, row crops, and orchards would be replaced with native grasses associated with erosion control. Seepage and stability berms would be introduced in Reaches 11 and 18 that would result in the loss of residences and businesses, realignment of existing roadways, and removal of vegetation in the VFZ that would visually alter and adversely affect the existing visual character. The magnitude of the loss of agricultural land, vegetation to be cleared from the VFZ, and introduction of new berms coupled with the loss of structures would have a substantial effect on the visual character and result in a substantial reduction in the overall visual quality. Accordingly, these effects are considered significant and unavoidable with no mitigation available due to the nature of the effects.

While final soil borrow sites have not been selected, it is unlikely that scenic character and quality would be substantially degraded because borrow sites would be restored to pre-borrow or similar land use, as identified in Environmental Commitment *2.4.10 Soil Borrow Site Reclamation Plan.* Such reclamation would restore existing visual character and quality, considering soil borrow needs are greater for this alternative than Alternatives 1 and 3 and would potentially involve more sites, greater volumes per site, and greater duration of activities per site.

Ongoing maintenance would be similar to existing levee maintenance and would not result in significant effects.

Effect VIS-4: Create a New Source of Substantial Light or Glare That Would Adversely Affect Day or Nighttime Public Views

The project would not introduce any permanent sources of illumination or reflective surfaces and therefore would result in no change in nighttime light or daytime glare.

3.13.4.4 Alternative 3

Implementation of Alternative 3 would potentially result in effects on visual resources. These potential effects and related mitigation measure requirements are summarized in Table 3.13-5 and discussed below.

Table 3.13-5. Visual Resources Effects and Mitigation Measures for Alternative 3

Effect	Reach	Finding	Mitigation Measure	With Mitigation
Effect VIS-1: Result in Temporary Visual Effects from Construction	All reaches	Less than significant	None required	Less than significant
Effect VIS-2: Adversely Affect a Scenic Vista	All reaches	Less than significant	None required	Less than significant
Effect VIS-3: Substantially Degrade the Existing Visual Character or Quality of the Site and Its Surroundings	All reaches	Less than significant	None required	Less than significant
Effect VIS-4: Create a New Source of Substantial Light or Glare That Would Adversely Affect Day and Nighttime Public Views	All reaches	Less than significant	None required	Less than significant

Effect VIS-1: Result in Temporary Visual Effects from Construction

Under Alternative 3, this effect is similar to that under Alternative 1, with the most substantial difference being that there would be more seepage berms, but considerably fewer than in Alternative 2. Visual changes resulting from construction are considered short-term and temporary. Equipment would work in one area for a short period of time (typically a matter of days or less for any individual property and receptor group) and then move to a new location along the alignment, and each reach would typically include work only for a single construction season. Therefore, temporary visual effects during construction of Alternative 3 would be considered less than significant.

Effect VIS-2: Adversely Affect a Scenic Vista

As described under Alternatives 1 and 2, the project area is filled with scenic vistas that offer unique views of the contrasting landscape features.

In Reaches 11, 13, 14, 17–21, 24, 26–28, 32, 34, and 36, the cutoff wall would be contained within the levee's existing footprint. In Reaches 26–28, the landside slope of the levee would need to be reconstructed and the canal portion would be armored. The cutoff wall and reconstructed slopes would not result in a noticeable change in the appearance of the levee, and these changes would not affect sensitive viewers. Vegetation in the VFZ would be cleared and these areas would be revegetated with grasses, but a limited number of sensitive viewers have visual access to these reaches. The overall visual quality in these reaches would not change. Therefore, effects on scenic vistas would be less than significant for these reaches.

In Reaches 6, 12, 14, 25, 29, and 39, all project features would be located underground and would not be visible to the public. Therefore, effects on scenic vistas would be less than significant for these reaches.

In Reaches 2–5, 7–10, 16, 22, 23, 30, 31, 33, 35, 37, 38, 40, and 41, vistas would be adversely affected by displaced agricultural fields, the footprint of the seepage berms, and the landside utility and operation and maintenance corridor. Views would be interrupted by the seepage berm landforms instead of being multi-directional views of the surrounding landscape. As with all alternatives, the cutoff walls, which would be contained within the levee's existing footprint, would have no significant effect on a scenic vista. As under Alternatives 1 and 2, the removal of woody vegetation in the VFZ would be limited to that within the construction footprint.

Construction of seepage berms in the rural reaches would result in the loss of agricultural land. The proposed seepage berm in Reach 5 would be close to two residences (one at O'Connor Avenue and the other at the end of Ashford Avenue) and would be in the middleground of their views. Seepage berms that would be constructed in Reach 33 would result in the loss of vegetation but no residences. Two seepage berms would be installed in Reach 35 and would result in the loss of agricultural land (orchards). Furthermore, the seepage berms in Reach 35 have the potential to visually affect an existing business because of the proximity of these improvements. In Reaches 22 and 30, a portion of the levee would need to be completely reconstructed. The levee also would be strengthened in these reaches by constructing cutoff walls, which would have no visual effect once construction is complete.

These changes would be considerable because of the type of physical changes being made to the levee but would result in a minor reduction in the overall visual quality because a limited number of sensitive viewers have visual access to those reaches, as identified in Table 3.13-1 (page 3.13-23). However, Environmental Commitment *2.4.1.5 Use of Native Wildflower Species in Erosion Control Grassland Seed Mix*, would improve the aesthetics of the seepage berms and other surfaces treated with erosion control measures by providing seasonal interest through wildflower displays in all reaches. Accordingly, effects on scenic vistas would be less than significant for these reaches.

While final soil borrow sites have not been selected, it is unlikely that scenic vistas would be affected because the activity would take place below the surrounding land surface and would not obstruct views; and because borrow sites would be restored to pre-borrow or similar land use, as identified in Environmental Commitment *2.4.10 Soil Borrow Site Reclamation Plan*. For Alternative 2, soil borrow needs are greater than Alternative 1 but less than Alternative 3.

Ongoing maintenance would be similar to existing levee maintenance and would not result in significant effects.

Effect VIS-3: Substantially Degrade the Existing Visual Character or Quality of the Site and Its Surroundings

As discussed under Effect VIS-1 and VIS-2, a cutoff wall within the existing levee footprint would not alter or degrade the existing visual character or quality of the site and its surroundings.

In Reaches 6, 12, 14, 25, 29, and 39, all project features would be located underground and would not be visible to the public. Therefore, effects on the existing visual character and quality of the site would be less than significant for these reaches.

In Reaches 11, 13, 17–21, 24, 26–28, 32, 34, and 36, the cutoff wall would be contained within the levee's existing footprint. In Reaches 26–28, the landside slope of the levee would need to be reconstructed, and the canal portion would be armored. The cutoff wall and reconstructed slopes would not result in a noticeable change in the appearance of the levee, and these changes would not affect sensitive viewers. Vegetation in the VFZ would be cleared, and these areas would be revegetated with grasses, but a limited number of sensitive viewers have visual access to these reaches. The overall visual quality in these reaches would not change. Therefore, effects would be less than significant for these reaches.

In Reaches 2–5, 7–10, 16, 22, 23, 30, 31, 33, 35, 37, 38, 40, and 41, existing visual character or quality of the site and its surroundings would be adversely affected by displaced agricultural fields, the footprint of the seepage berms, and the landside utility and operation and maintenance corridor. Views would be interrupted by the seepage berm landforms instead of being multi-directional views of the surrounding landscape. As with all alternatives, the cutoff walls, which would be contained within the levee's existing footprint, would have no significant effect on the existing visual character and quality of the site.

Construction of seepage berms in the rural reaches would result in the loss of agricultural land. The proposed seepage berm located in Reach 5 would be close to two residences (one at O'Connor Avenue and the other at the end of Ashford Avenue) and would be in the middleground of their views. Seepage berms would be constructed in Reach 33. These new seepage berms would result in the loss of vegetation but no residences. Two seepage berms would be installed in Reach 35 and would result in the loss of agricultural land (orchards). Furthermore, the seepage berms in Reach 35 have the potential to visually affect an existing business because of the proximity of these improvements. In Reaches 22 and 30, a portion of the levee would need to be completely reconstructed. The levee also would be strengthened in these reaches by constructing cutoff walls, which would have no visual effect once construction is complete. These changes would be considerable because of the type of physical changes being made to the levee but would result in a minor reduction in the overall visual quality because a limited number of sensitive viewers have visual access to those reaches, as identified in Table 3.13-1 (page 3.13-23). However, Environmental Commitment *2.4.9 Use Native Wildflower Species in Erosion Control Grassland Seed Mix*, would improve the aesthetics of the seepage berms and other surfaces treated with erosion control measures by providing seasonal interest through wildflower displays in all reaches. Accordingly, effects would be less than significant for these reaches.

While final soil borrow sites have not been selected, it is unlikely that scenic character and quality would be substantially degraded because borrow sites would be restored to pre-borrow or similar land use, as identified in Environmental Commitment, *2.4.10 Develop a Soil Borrow Site Reclamation Plan,* essentially retaining existing character and quality, considering soil borrow needs are greater for this alternative than Alternative 1 but less than for Alternative 2.

Ongoing maintenance would be similar to existing levee maintenance and would not result in significant effects.

Effect VIS-4: Create a New Source of Substantial Light or Glare That Would Adversely Affect Day or Nighttime Public Views

The project would not introduce any permanent sources of illumination or reflective surfaces and therefore would result in no change in nighttime light or daytime glare.

Table 3.13-1. Visual Quality Rating Summary

Reach	Alternative	Vividness	Intactness	Unity	Visual Quality	Change	Viewers
Reach 1	This Reach is not included within the project.					–	
Reach 2	Existing	3.5	4	4	3.8	–	Roadway users traveling along Laurel Ave. Residents. Recreational users at Bobelaine Audubon Sanctuary.
	Alt 1	3.5	4	4	3.8	0.0	
	Alt 2	3	3.5	3.5	3.3	0.5	
	Alt 3	3	3.5	3.5	3.3	0.5	
Reach 3	Existing	3.5	4	4	3.8	–	Roadway users traveling along Oak Ave. and Cypress Ave. Residents. Recreational users at Bobelaine Audubon Sanctuary and Feather River Wildlife Area.
	Alt 1	3.25	3.75	3.75	3.6	0.3	
	Alt 2	2.25	3.75	2.75	2.9	0.9	
	Alt 3	3.25	3.75	3.75	3.6	0.3	
Reach 4	Existing	3.5	4	4	3.8	–	Roadway users traveling along Central Street and Wilkie Ave. Residents. Recreational users at Feather River Wildlife Area.
	Alt 1	3.5	4	4	3.8	0.0	
	Alt 2	3	3.5	3.5	3.3	0.5	
	Alt 3	3	4	4	3.7	0.2	
Reach 5	Existing	3.5	4	4	3.8	–	Roadway users traveling along Wilkie Ave., Lyon Ave., Oconnor Ave., Peck Ave., and Ashford Ave. Residents. Recreational users at Feather River Wildlife Area.
	Alt 1	3.5	3.5	3.5	3.5	0.3	
	Alt 2	3	3	3	3.0	0.8	
	Alt 3	3.5	3.5	3.5	3.5	0.3	
Reach 6	Existing	3.5	4	4	3.8	–	Roadway users traveling along Star Bend Rd., Shannon Rd., and Garden Hwy. Residents. Recreational users at Feather River Wildlife Area.
	Alt 1	3.5	4	4	3.8	0	
	Alt 2	3.5	4	4	3.8	0	
	Alt 3	3.5	4	4	3.8	0	
Reach 7	Existing	3.5	4	4	3.8	–	Roadway users traveling along Star Bend Rd. and Garden Hwy. Residents. Recreational users at Feather River Wildlife Area.
	Alt 1	3.25	3.75	3.75	3.6	0.3	
	Alt 2	2.75	2.75	2.75	2.8	1.1	
	Alt 3	3.25	3.75	3.75	3.6	0.3	
Reach 8	Existing	3.5	4	4	3.8	–	Roadway users traveling along Garden Hwy. Business. Recreational users at Feather River Wildlife Area.
	Alt 1	3.25	3.75	3.75	3.6	0.3	
	Alt 2	2.75	3.25	3.25	3.1	0.8	
	Alt 3	3.25	3.75	3.75	3.6	0.3	
Reach 9	Existing	3.5	4	4	3.8	–	Roadway users traveling along Garden Hwy. Residents. Businesses. Recreational users at Boyd's Pump Boat Ramp.
	Alt 1	3.25	3.75	3.75	3.6	0.3	
	Alt 2	2.75	3.25	3.25	3.1	0.8	
	Alt 3	3.25	3.75	3.75	3.6	0.3	
Reach 10	Existing	3.5	4	4	3.8	–	Roadway users traveling along Garden Hwy., Oswald Rd., and Barry Rd. Residents.
	Alt 1	3.25	3.75	3.75	3.6	0.3	
	Alt 2	2.75	2.75	2.75	2.8	1.1	
	Alt 3	3.25	3.75	3.75	3.6	0.3	
Reach 11	Existing	3.5	4	4	3.8	–	Roadway users traveling along Garden Hwy. Residents. Recreational users at Feather River Wildlife Area.
	Alt 1	3.5	4	4	3.8	0.0	
	Alt 2	2.5	2.5	2.5	2.5	1.3	
	Alt 3	3.5	4	4	3.8	0.0	

Reach	Alternative	Vividness	Intactness	Unity	Visual Quality	Change	Viewers
Reach 12	Existing	2.5	3.5	3.5	3.2	–	Roadway users traveling along Shanghai Bend Rd., Montana Ct., and Dakota Ct. Residents. Recreational users at Feather River Wildlife Area.
	Alt 1	2.5	3.5	3.5	3.2	0.0	
	Alt 2	2.5	3.5	3.5	3.2	0.0	
	Alt 3	2.5	3.5	3.5	3.2	0.0	
Reach 13	Existing	2.5	3.5	3.5	3.2	–	Residents. Recreational users at Yuba Sutter Dog Park and Feather River Wildlife Area . Businesses. Airport users.
	Alt 1	2.5	3.5	3.5	3.2	0.0	
	Alt 2	2.5	3.5	3.5	3.2	0.0	
	Alt 3	2.5	3.5	3.5	3.2	0.0	
Reach 14	Existing	2.5	3.5	3.5	3.2	–	Roadway users traveling along 2nd St. Airport users. Residents. Businesses. Recreational users at Yuba City Boat Ramp.
	Alt 1	2.5	3.5	3.5	3.2	0.0	
	Alt 2	2.5	3.5	3.5	3.2	0.0	
	Alt 3	2.5	3.5	3.5	3.2	0.0	
Reach 15	Existing	2.5	3.5	3.5	3.2	–	Roadway users traveling along 2nd St. Airport users. Recreational users at Yuba City Boat Ramp and Peach Bowl Little League Field.
	Alt 1	2.5	3.5	3.5	3.2	0.0	
	Alt 2	2.5	3.5	3.5	3.2	0.0	
	Alt 3	2.5	3.5	3.5	3.2	0.0	
Reach 16	Existing	2.5	3.5	3.5	3.2	–	Roadway users traveling along 2nd St. Airport users. Residents. Businesses. Recreational users at Yuba City Boat Ramp.
	Alt 1	2.25	3.25	3.25	2.9	0.3	
	Alt 2	2.25	3.25	3.25	2.9	0.3	
	Alt 3	2.25	3.25	3.25	2.9	0.3	
Reach 17	Existing	2.5	3.5	3.5	3.2	–	Roadway users traveling along Live Oak Blvd. Businesses.
	Alt 1	2.5	3.5	3.5	3.2	0.0	
	Alt 2	2.5	3.5	3.5	3.2	0.0	
	Alt 3	2.5	3.5	3.5	3.2	0.0	
Reach 18	Existing	4	4.5	4.5	4.3	–	Roadway users traveling along Live Oak Blvd., Rednall Rd., and Levee Rd. Residents.
	Alt 1	4	4.5	4.5	4.3	0.0	
	Alt 2	3	3	3	3.0	1.3	
	Alt 3	4	4.5	4.5	4.3	0.0	
Reach 19	Existing	4	4.5	4.5	4.3	–	Roadway users traveling along Live Oak Blvd., Levee Rd., and Morse Rd. Residents. Businesses. Recreational users at Feather River Wildlife Area.
	Alt 1	4	4.5	4.5	4.3	0.0	
	Alt 2	3	3	3	3.0	1.3	
	Alt 3	4	4.5	4.5	4.3	0.0	
Reach 20	Existing	4	4.5	4.5	4.3	–	Roadway users traveling along Koch Lane. Residents. Recreational users at Feather River Wildlife Area.
	Alt 1	4	4.5	4.5	4.3	0.0	
	Alt 2	3.5	4	4	3.8	0.5	
	Alt 3	4	4.5	4.5	4.3	0.0	
Reach 21	Existing	4	4.5	4.5	4.3	–	Roadway users traveling along Hermanson St., Bridgeford Ave., and Kent Ave. Residents.
	Alt 1	4	4.5	4.5	4.3	0.0	
	Alt 2	3	3	3	3.0	1.3	
	Alt 3	4	4.5	4.5	4.3	0.0	
Reach 22	Existing	4	4.5	4.5	4.3	–	Roadway uses traveling along Paseo Ave. and Bishop Ave. Residents.
	Alt 1	3.75	4.25	4.25	4.1	0.3	
	Alt 2	3.75	4.25	4.25	4.1	0.3	
	Alt 3	3.75	4.25	4.25	4.1	0.3	

Reach	Alternative	Vividness	Intactness	Unity	Visual Quality	Change	Viewers
Reach 23	Existing	4	4.5	4.5	4.3	–	Roadway uses traveling along Archer Ave., Pennington Ave., and Gooley Rd. Residents. Recreational users at Live Oak Riverfront Park Boat Launch Facility.
	Alt 1	3.75	4.25	4.25	4.1	0.3	
	Alt 2	3.25	3.75	3.75	3.6	0.8	
	Alt 3	3.75	4.25	4.25	4.1	0.3	
Reach 24	Existing	4	4.5	4.5	4.3	–	Roadway users traveling along Campbell Rd. Resident.
	Alt 1	4	4.5	4.5	4.3	0.0	
	Alt 2	4	4.5	4.5	4.3	0.0	
	Alt 3	4	4.5	4.5	4.3	0.0	
Reach 25	Existing	4	4.5	4.5	4.3	–	Roadway users traveling along Rivera Rd., Levee Rd., and Metteer Rd. Residents.
	Alt 1	4	4.5	4.5	4.3	0.0	
	Alt 2	4	4.5	4.5	4.3	0.0	
	Alt 3	4	4.5	4.5	4.3	0.0	
Reach 26	Existing	4	4.5	4.5	4.3	–	Roadway uses traveling along Levee Rd. and Chandon Ave. Residents.
	Alt 1	4	4.5	4.5	4.3	0.0	
	Alt 2	4	4.5	4.5	4.3	0.0	
	Alt 3	4	4.5	4.5	4.3	0.0	
Reach 27	Existing	4	4.5	4.5	4.3	–	Roadway users traveling along Levee Rd.
	Alt 1	4	4.5	4.5	4.3	0.0	
	Alt 2	4	4.5	4.5	4.3	0.0	
	Alt 3	4	4.5	4.5	4.3	0.0	
Reach 28	Existing	4	4.5	4.5	4.3	–	Roadway users traveling along Levee Rd., Campbell Rd., and E. Evans Reimer Rd. Residents.
	Alt 1	4	4.5	4.5	4.3	0.0	
	Alt 2	4	4.5	4.5	4.3	0.0	
	Alt 3	4	4.5	4.5	4.3	0.0	
Reach 29	Existing	4	4.5	4.5	4.3	–	Roadway users traveling along Levee Rd., E. Evans Reimer Rd., and Alexander Ave. Residents.
	Alt 1	4	4.5	4.5	4.3	0.0	
	Alt 2	4	4.5	4.5	4.3	0.0	
	Alt 3	4	4.5	4.5	4.3	0.0	
Reach 30	Existing	4	4.5	4.5	4.3	–	Roadway users traveling along Richards Ave., Briarcliff Ln., Booth Dr., and E. Gridley Rd. Residents. Recreational users at City of Gridley Boat Ramp.
	Alt 1	3.75	4.25	4.25	4.1	0.3	
	Alt 2	2.75	2.75	2.75	2.8	1.6	
	Alt 3	3.75	4.25	4.25	4.1	0.3	
Reach 31	Existing	4	4.5	4.5	4.3	–	Roadway users traveling along E. Gridley Rd. and Ord Ranch Rd.
	Alt 1	3.75	4.25	4.25	4.1	0.3	
	Alt 2	3.75	4.25	4.25	4.1	0.3	
	Alt 3	3.75	4.25	4.25	4.1	0.3	
Reach 32	Existing	4	4.5	4.5	4.3	–	Roadway users traveling along Ord Ranch Rd.
	Alt 1	4	4.5	4.5	4.3	0.0	
	Alt 2	3.5	4	4	3.8	0.5	
	Alt 3	4	4.5	4.5	4.3	0.0	
Reach 33	Existing	3.5	3.5	3.5	3.5	–	Roadway users traveling along Ord Ranch Rd., Steadman Rd., and Almond Ave. Residents.
	Alt 1	3.5	3.5	3.5	3.5	0.0	
	Alt 2	3	3	3	3.0	0.5	

Reach	Alternative	Vividness	Intactness	Unity	Visual Quality	Change	Viewers
	Alt 3	3	3	3	3.0	0.5	Recreational users within Oroville WMA.
Reach 34	Existing	3.5	3.5	3.5	3.5	–	Roadway users traveling along Ord Ranch Rd., Palm Ave., Hixson Ave., and Cherry Ave. Business. Recreational users within Oro Oroville WMA.
	Alt 1	3.5	3.5	3.5	3.5	0.0	
	Alt 2	3.5	3.5	3.5	3.5	0.0	
	Alt 3	3.5	3.5	3.5	3.5	0.0	
Reach 35	Existing	4	4	4	4.0	–	Roadway users traveling along Hixson Ave., Cherry Ave., and Walnut Ave. Business. Recreational users within Oroville WMA.
	Alt 1	4	4	4	4.0	0.0	
	Alt 2	3.5	3.5	3.5	3.5	0.5	
	Alt 3	3.5	3.5	3.5	3.5	0.5	
Reach 36	Existing	4	4	4	4.0	–	Roadway users traveling along Hixson Ave. and Larkin Rd. Resident. Business. Recreational users within Oroville WMA.
	Alt 1	4	4	4	4.0	0.0	
	Alt 2	3	3	3	3.0	1.0	
	Alt 3	4	4	4	4.0	0.0	
Reach 37	Existing	3.5	3.5	3.5	3.5	–	Roadway users traveling along Hixson Ave. and Vance Ave. Resident. Business. Recreational users within Oroville WMA.
	Alt 1	3.5	3.5	3.5	3.5	0.0	
	Alt 2	3	3	3	3.0	0.5	
	Alt 3	3	3	3	3.0	0.5	
Reach 38	Existing	3.5	3.5	3.5	3.5	–	Roadway users traveling along Vance Ave. Resident. Recreational users within Oroville WMA.
	Alt 1	3.5	3.5	3.5	3.5	0.0	
	Alt 2	3	3	3	3.0	0.5	
	Alt 3	3	3	3	3.0	0.5	
Reach 39	Existing	3.5	3.5	3.5	3.5	–	Roadway users traveling along Vance Ave. Resident. Recreational users within Oroville WMA.
	Alt 1	3.5	3.5	3.5	3.5	0.0	
	Alt 2	3.5	3.5	3.5	3.5	0.0	
	Alt 3						
Reach 40	Existing	3.5	4	4	3.8	–	Roadway users traveling along Vance Ave. and Larkin Rd. Recreational users within Oroville WMA.
	Alt 1	3.25	3.75	3.75	3.6	0.3	
	Alt 2	2.25	2.75	2.75	2.6	1.3	
	Alt 3	3	3.5	3.5	3.3	0.5	
Reach 41	Existing	4	4	4	4.0	–	Roadway users traveling along Vance Rd. and Larking Rd. Recreational users within Oroville WMA.
	Alt 1	3.75	3.75	3.75	3.8	0.3	
	Alt 2	2.75	2.75	2.75	2.8	1.3	
	Alt 3	3.75	3.75	3.75	3.8	0.3	

WMA = Wildlife Management Area.

Ratings: Very Low = 0–1.49
Low = 1.5–2.49
Moderately Low = 2.5–3.49
Moderate = 3.5–4.49
Moderately High = 4.5–5.49
High = 5.5–6.49
Very High = 6.5–7

3.14 Recreation

3.14.1 Introduction

This section describes the regulatory and environmental setting for recreation; effects on recreation that would result from the No Action Alternative and Alternatives 1, 2, and 3; and mitigation measures that would reduce significant effects.

3.14.2 Affected Environment

This section describes the affected environment for recreation in the project area. The key sources of data and information used in the preparation of this section are as follows.

- State Panel to Review Yuba City's Willow Island Project (Appeal Democrat 2010).
- Butte County 2007 Future Bike Routes within Butte County (Butte County 2007).
- Butte County Countywide Bikeway Master Plan (Butte County 1998).
- Butte County General Plan 2030 (Butte County 2010).
- Feather River Wildlife Area (California Department of Fish and Game 2012a).
- Oroville Wildlife Area (California Department of Fish and Game 2012b).
- California Department of Fish and Game Feather River Wildlife Area Management Plan (California Department of Fish and Game 1991).
- California Department of Fish and Game Oroville Wildlife Area Management Plan (California Department of Fish and Game 1974).
- California Department of Transportation Highway Design Manual (California Department of Transportation 2006).
- California State Parks Central Valley Vision (California State Parks 2006).
- California State Parks Central Valley Vision Draft Implementation Plan (California State Parks 2008).
- City of Gridley Bicycle Plan (City of Gridley 2003).
- City of Gridley 2030 General Plan (City of Gridley 2010).
- City of Live Oak Draft General Plan, Parks and Recreation Element (City of Live Oak 2010).
- City of Yuba City Feather River Parkway Strategic Plan (City of Yuba City 2002).
- City of Yuba City General Plan (City of Yuba City 2004).
- Feather River Air Quality Management District Yuba-Sutter Bikeway Master Plan (Feather River Air Quality Management District 1995).
- GreenInfo Network (California's Protected Areas Database 2012).
- Sacramento Audubon Society Bobelaine Audubon Sanctuary (Sacramento Audubon Society 2012).

- Sutter County General Plan, Recreation (Sutter County 1996).
- Sutter County General Plan (Sutter County 2011).
- U.S. Army Corps of Engineers Recreation Facility and Customer Service Standards, EM 1110-1-400 (U.S. Army Corps of Engineers 2005).
- U.S. Bureau of Reclamation Recreation Facility Design Guidelines (U.S. Bureau of Reclamation 2002).
- Campgrounds, Marinas, and Recreation Vehicles (City of Yuba City 2012).
- Off the Leash Dog Park – Yuba Sutter Dog Park (Yuba Sutter Dog Park 2012).

Throughout this section, bike trails are referred to as Class I, II, or III. These trail classifications are Caltrans design standard designations (California Department of Transportation 2006: 1000-1-1000-2). Class I bike paths provide completely separated facilities designed for the exclusive use of bicycles and pedestrians with minimal crossflows by motorists. Caltrans standards call for Class I bikeways to have a minimum of 8 feet of pavement with 2-foot graded shoulders on either side, for a total right-of-way of 12 feet. Class I bikeways also must be at least 5 feet from the edge of a paved roadway. Class II trails provide a restricted right-of-way designated for the exclusive or semi-exclusive use of bicycles with through travel by motor vehicles or pedestrians prohibited, but with vehicle parking and crossflows by pedestrians and motorists permitted. Caltrans standards generally require a 4-foot bike lane with a 6-inch white stripe separating the roadway from the bike lane. Class III trails provide a right-of-way designated by signs or permanent markings and shared with pedestrians and motorists. Roadways designated as Class III bike routes should have sufficient width to accommodate motorists, bicyclists, and pedestrians. Other than a street sign, there are no special markings required for a Class III bike route.

3.14.2.1 Regulatory Setting

This section summarizes key Federal and state regulatory information that applies to recreation. Additional regulatory information appears in Appendix A.

Federal

Federal policies or regulations related to recreation resources include the 2004 Engineering Manual 1110-1-400 (EM) prepared by USACE and the Recreation Facility Design Guidelines (RFDG) prepared by U.S. Department of the Interior (DOI). These regulations apply to the development of, improvements to, and ongoing maintenance of new and existing recreation facilities and resources in the planning area. Federal plans prepared by USACE and DOI could affect the development of recreation facilities and resources in the planning area.

U.S. Army Corps of Engineers

USACE prepared Engineering Manual 1110-1-400 to achieve a nationwide standard for park and recreation facilities managed by USACE. The manual provides guiding principles for ensuring consideration of the design, use, accessibility, sustainability, and cost of facilities; the health, safety, recreation needs, and welfare of the intended users; and the long-term harmony of the facility with the environment and maintenance requirements. The manual was updated most recently in 2004.

State

The following state policies related to recreation may apply to implementation of the proposed project.

Feather River Wildlife Area Management Plan

In the Feather River Wildlife Area Management Plan, DFG identifies preservation and enhancement of habitat, recreation, and education as the three purposes for acquisition of property (California Department of Fish and Game 1991:1). The document describes the expansion of, improvements to, and ongoing maintenance of the wildlife area (California Department of Fish and Game 1991:9). Two goals are defined in the document relating to recreation. These goals are as follows.

> **Goal 4)** Provide for public use of the area. Appropriate uses of the area are hunting, fishing, trapping, birdwatching, hiking, nature study, picnicking, and boating.
>
> **Goal 5)** Provide for public education facilities concerning the value of habitat and wildlife. This may include the construction of buildings, signs, trails, etc., which increases the public's appreciation for the area. An adequate road and trail system now exists on the area and new construction should be held to a minimum.

Oroville Wildlife Area Management Plan

The document describes the purpose, current uses, potential uses, and long range plan for the Oroville Wildlife Area. The primary purpose of the wildlife area is to preserve and enhance the fish and wildlife resources for use and enjoyment by the public (California Department of Fish and Game 1974:1).

Local

Butte County, Sutter County, City of Yuba City, City of Live Oak, City of Biggs, and City of Gridley each have adopted policies and goals promoting recreation via trail, bikeway, open space, and park facilities, detailed in Appendix A.

3.14.2.2 Environmental Setting

The following considerations are relevant to recreation conditions in the proposed project area. The FRWLP has been divided into 41 reaches. Of these, the FRWLP identifies flood management measures for 34 reaches. Recreation facilities and resources are located in, or adjacent to, 22 of the project reaches with project alternatives identified.

The Feather River and its adjacent levees are a popular recreation venue for local residents and visitors. While recreation opportunities vary among locations along the river, recreationists are attracted to water-based recreation as well as land-based recreation on the levees and facilities surrounding the river. Water-based recreation activities include boating, fishing, kayaking, canoeing, floating, tubing, water skiing, and swimming. Land-based activities include bicycling, walking, hiking, hunting, bird-watching, wildlife viewing, enjoying nature trails, photography, picnicking, and more. Access to the right (west) bank of the Feather River is provided by state wildlife areas, local parks, and a wildlife sanctuary. Many parts of the shoreline, especially north of Yuba City, are inaccessible to recreationists.

Boating is a common activity along the Feather River. Motorized boat use—water skiing, use of personal watercraft, and cruising along the river—is especially popular in various locations.

Kayaking and canoeing is occasionally favored in portions of the river. Boat ramps are distributed approximately every 7 miles along the Feather River between Thermalito Afterbay and the Sutter Bypass.

Fishing is another popular recreation activity throughout portions of the corridor. Anglers fish from boats and the shore throughout the reaches of the river.

Yuba City is the only community immediately adjacent to the right (west) bank of the Feather River within the corridor. Three other communities are within 3 miles of the levee: Biggs, Gridley, and Live Oak. All four communities have policies or plans involving recreation interfacing with the Feather River levee and have recreation resources which could be affected by modifications to the Feather River levee.

Formal Recreation Facilities

Recreation facilities and resources in, adjacent to, or within view of the project area are described below from north to south. See Plate 3.14-1 for locations of these recreation facilities and resources.

Oroville Wildlife Area

The OWA is managed by the California Department of Fish and Game. The OWA is 11,869 acres in size and is primarily riparian woodland along the Feather River and Thermalito Afterbay (California Department of Fish and Game 2012b). Hunting, fishing, swimming, picnicking, hiking, horseback riding, birding, biking, boating, camping and other activities are allowed in the OWA (California Department of Fish and Game 1974:2). In addition to these activities, dog training is allowed from July 1 through March 15 in designated areas, and there is an onsite shooting range (California Department of Fish and Game 2012b). The OWA is accessible by vehicle travel, boating, biking, horseback riding, and walking from public roads or trails. There are approximately 10.5 miles of levee on the west side of the Feather River within the OWA. About 5.5 miles of this levee are within the FRWLP. The OWA is located within the FRWLP Reaches 33 through 41.

City of Gridley Boat Ramp

The City of Gridley Boat Ramp is managed by the City of Gridley. The City of Gridley Boat Ramp is located within view of the FRWLP Reach 30 on the east side of the Feather River outside of the project area. The boat ramp is next to the City’s water treatment plant and provides opportunities for boating and day use (City of Gridley 2010:18).

Live Oak Park and Recreation Area

The Live Oak Park and Recreation Area is managed by Sutter County. The campground, RV park, and boat ramp at the facility allow for camping and boating in addition to swimming, picnicking, and day use (City of Live Oak 2010:2). The Live Oak Park and Recreation Area is located within the FRWLP Reach 23.

Feather River Wildlife Area

The Feather River Wildlife Area (FRWA) is comprised of eight separate wildlife area management units. Five wildlife area units are located on the west side of the Feather River and are within the project area. These five areas from north to south are: Morse Road Unit, Shanghai Bend Unit, Abbott Lake Unit, O’ Connor Lakes Unit, and Nelson Slough Unit. These five unites total 1,724 acres

(California's Protected Areas Database 2012). Three units are located on the east side of the Feather River and are visible from and have views to the project area. These three areas from north to south are: Marysville Unit, Star Bend Unit, and Lake of the Woods Unit. Morse Road Unit is a 62-acre management unit located within project Reach 19. Marysville Unit is located across from project Reaches 16 and 17. Shanghai Bend Unit is a 98-acre management unit located within project Reaches 11 through 13. Abbott Lake Unit is a 409-acre management unit located within project Reaches 7 and 8. Star Bend Unit is located across from project Reaches 6 and 7. O'Connor Lake Unit is a 467-acre management unit located within project Reaches 5 and 6. Lake of the Woods Unit is located across from project Reaches 3 through 5. Nelson Bend Unit is a 688-acre management unit located within project Reach 2 (California's Protected Areas Database 2012).

The FRWA is accessible by vehicular travel, boating, biking, and walking from public roads or trails. Hunting, fishing, trapping, birdwatching, hiking, nature study, picnicking, and boating are allowed in the FRWA (California Department of Fish and Game 1991:2). Hunting is restricted to certain seasons for authorized species. No permits, passes, or reservations are required to use the wildlife area for other allowed uses. There is a Class I Bike Trail on top of the Feather River Levee in the Shanghai Bend Unit and hunting is not allowed in the Shanghai Bend Unit (California Department of Fish and Game 2012a).

Park and Recreation Facilities within Yuba City

There are five park and recreation facilities in Yuba City within the project area. From north to south these are: Feather River Parkway Bike Trail, Willow Island Park, Veterans Park, Yuba City Boat Ramp, Peach Bowl Little League Fields, and Yuba Sutter Dog Park (City of Yuba City 2004:6-4). The recreation facilities within Yuba City are integrated with the urban fabric and are accessible in numerous ways providing places for fishing, swimming, picnicking, walking, biking, wildlife viewing, boating, baseball, and other activities.

Feather River Parkway Bike Trail

Feather River Parkway Bike Trail is 5 miles long between Northgate Drive and Shanghai Bend Road located within the FRWLP Reaches 12 through 17. The trail is heavily used (McIntire pers. comm.). The trail will connect to Yuba City's Class I and Class II bike trail network at Northgate Drive, B Street, and Shanghai Bend Road in the future (Feather River Air Quality Management District 1995: 16).

Willow Island Park

Willow Island Park is 172 acres in size and is located within project Reaches 16 and 17. Construction on the first phase of Willow Island Park is expected to begin in 2012. The first phase of Willow Island Park includes pedestrian and bicycle trails, a picnic area, and a parking lot, with more amenities planned for future phases. Willow Island Park is expected to be a heavily used park once completed (McIntire pers. comm.).

Veterans Park

Veterans Park is a passive use park with a World War I memorial located adjacent to project Reach 16. Veterans Park is managed by Yuba City and has minimal use by the public (McIntire pers. comm.).

Yuba City Boat Ramp

Yuba City Boat Ramp is located within project Reaches 15 and 16 and has RV campsites, barbeques, picnic tables, showers, bathrooms, boat launching facilities, and a small marina (City of Yuba City 2012). Yuba City Boat Ramp is owned and managed by Sutter County and is heavily used by the public (McIntire pers. comm.).

Peach Bowl Little League Field

Peach Bowl Little League Field comprises three baseball diamonds located adjacent to project Reach 15. Peach Bowl Little League Field is managed by Peach Bowl, a nonprofit volunteer little league organization. The ball diamonds are heavily used (McIntire pers. comm.).

Yuba Sutter Dog Park

Yuba Sutter Dog Park is 5 acres in size and has an off-leash area for dogs, benches, drinking water, and shade trees (Yuba Sutter Dog Park 2012). Yuba Sutter Dog Park is located on land owned by Caltrans and is operated by Off the Leash Dog Park, a nonprofit volunteer group. The dog park is heavily used (McIntire pers. comm.). Yuba Sutter Dog Park is adjacent to the FRWLP Reach 13.

Boyd's Pump Boat Ramp

The Boyd's Pump Boat Ramp, just south of Yuba City, is a public boat launching facility on the Feather River managed by Sutter County. The facility has a parking area and boat ramp that provides an opportunity for motorized and nonmotorized boat launching. This facility is located within the FRWLP Reach 9.

Bobelaine Audubon Sanctuary

The Bobelaine Audubon Sanctuary is a 430-acre wildlife sanctuary owned by the National Audubon Society and managed by volunteers of the Sacramento Audubon Society. Bobelaine is a rare remnant of the riparian forests that once projected 2 to 5 miles on either side of the rivers in the Great Central Valley of California. The sanctuary is registered as a "State Ecological Reserve" and is protected by the California Department of Fish and Game and the National Audubon Society. It is also listed as part of an "Important Bird Area" by the National Audubon Society. Hiking, walking, and wildlife viewing are all allowed recreational uses within the preserve (Sacramento Audubon Society 2012). Bobelaine Audubon Sanctuary is located within the FRWLP Reaches 2 and 3.

3.14.3 Environmental Consequences

This section describes the environmental consequences relating to recreation for the proposed project. It describes the methods used to determine the effects of the project and lists the thresholds used to conclude whether an effect would be significant. The effects that would result from implementation of the project, findings with or without mitigation, and applicable mitigation measures are presented in a table under each alternative.

3.14.3.1 Assessment Methods

This evaluation of recreation is based on professional standards and information cited throughout the section. The key effects were identified and evaluated based on the environmental characteristics of the project area and the magnitude, intensity, and duration of activities related to the construction and operation of this project.

Effects on recreation related to the FRWLP were evaluated qualitatively. Generally, construction activities could result in short-term loss of recreation opportunities by disrupting use of recreation areas, resources, or recreational boating corridors. A long-term effect could occur if a recreation opportunity is eliminated or the quality of that opportunity is severely reduced as a result of permanent project-related structures or operations. Long-term beneficial effects could occur if new or enhanced recreation opportunities are created through implementation of the project.

3.14.3.2 Determination of Effects

For this analysis, an effect pertaining to recreation was analyzed under NEPA and CEQA if it would result in any of the following environmental effects, which are based on NEPA standards, State CEQA Guidelines Appendix G (14 CCR 15000 et seq.), and standards of professional practice.

- Increase the use of existing neighborhood and regional parks or other recreation facilities such that substantial physical deterioration of the facility would occur or be accelerated.
- Include recreation facilities or require the construction or expansion of recreation facilities that might have an adverse physical effect on the environment.
- Restrict or reduce the availability or quality of existing recreation opportunities in the project vicinity.
- Implement operational or construction-related activities related to the placement of project facilities that would cause a substantial long-term disruption of any institutionally recognized recreation activities.
- Result in increased risk to recreationists in or adjacent to the project vicinity.

The proposed alternatives do not include the construction of recreation facilities unless required as a form of mitigation associated with a project alternative.

3.14.4 Effects and Mitigation Measures

There is a substantial variety of type and intensity of recreation occurring at sites along the Feather River within the project area. Effects and mitigation measure requirements concerning recreation are summarized in Table 3.14-1.

Table 3.14-1. Summary of Effects for Recreation

Effect	Finding	Mitigation Measures	With Mitigation
Alternatives 1, 2, and 3			
Effect REC-1: Temporary Changes in Recreation Opportunities during Construction	Less than significant	None required	Less than significant
Effect REC-2: Long-Term or Permanent Loss of Recreation Opportunities in the Levee Corridor	Less than significant	None required	Less than significant

3.14.4.1 No Action Alternative

The No Action Alternative represents the continuation of the existing deficiencies in the Feather River West Levee along the 44 miles south of Thermalito Afterbay. Current levee operations and maintenance activities would continue, but there would be no change in the geomorphic and flood control regimes relative to existing conditions. This means that the project area levee system would remain or become more susceptible to levee failure. The magnitude of the flood damage and inundation would depend on the location of a levee breach, severity of the storm, and flows of the river at the time of a potential levee failure.

During a 100-year flood event scenario, inundation levels would range from 1 foot to 15 feet and could flood approximately 44,919 acres of open space, golf courses, and parks. A potential flood event of this or similar magnitude could significantly damage existing facilities, infrastructure, and the environment and setting of the various open spaces, parks, and recreation facilities. It is possible that after a flood event, recreation facilities may never be fully restored to their former condition, permanently reducing the quality and/or quantity of recreation opportunities in the area. In addition, scenic vistas for existing and future recreation facilities could be damaged irreparably or for an extended period of time, which would reduce the enjoyment derived by recreationists. Given the uncertainty of the occurrence or magnitude of such an event, potential effects on recreation cannot be quantified based on available information.

3.14.4.2 Alternative 1

Alternative 1 addresses deficiencies in the levee primarily using cutoff walls with seepage berms and slope flattening in select locations, such that increases in the overall footprint of the levee are minimized. Implementation of Alternative 1 would potentially result in effects on recreation. These potential effects and related mitigation measure requirements are summarized in Table 3.14-2 and discussed below.

Table 3.14-2. Recreation Effects and Mitigation Measures for Alternative 1

Effect	Finding	Mitigation Measures	With Mitigation
Effect REC-1: Temporary Changes in Recreation Opportunities during Construction	Less than significant	None required	Less than significant
Effect REC-2: Long-Term or Permanent Loss of Recreation Opportunities in the Levee Corridor	Less than significant	None required	Less than significant

Cutoff walls would be installed in the OWA, Live Oak Park and Recreation Area, FRWA (all five units in the FRWLP area), Feather River Parkway Bike Trail, Willow Island Park, Yuba City Boat Ramp, Peach Bowl Little League Fields, Yuba Sutter Dog Park, Boyd's Pump Boat Ramp, and Bobelaine Audubon Sanctuary. Levee slopes would be flattened on the waterside of the levee next to Feather River Parkway Bike Trail, Willow Island Park, Veteran's Park, and Yuba City Boat Ramp. An undrained seepage berm would be installed at the FRWA O' Connor Lakes Unit.

The FRWLP does not include new recreation facilities or expansion of existing facilities at this time. As stated in Chapter 2, *Alternatives*, the Sutter Basin Project feasibility study has been drafted to determine the extent of Federal interest in exploring opportunities to increase recreation as part of the FRWLP to reduce flood risk. Appropriation of funding for increasing recreation facilities, if a project were to be authorized as part of the FRWLP, is highly uncertain.

Effect REC-1: Temporary Changes in Recreation Opportunities during Construction

During construction, the levee crown and adjacent construction and staging areas would be closed to public access. Recreationists wishing to use the various parks, wildlife areas, trails, and other recreation facilities would not have access to the recreation facilities or be able to participate in recreation activities when the levee crown and adjacent construction and staging areas are closed to public access. Construction of seepage berms may displace the current access and staging areas to some park and recreation facilities including the O'Connor Lakes Unit of the FRWA. Construction would occur primarily between April 15 and November 30 over the course of more than one construction season, beginning with the northernmost reaches.

During construction of Alternative 1, the FRWLP would affect 0.5 acres, or 0.004% of the OWA. Construction is expected to affect the OWA during 2013 and 2014. The area affected is about 5.5 miles of the total 10.5 miles of levee on the west side of the Feather River within the OWA. The entire OWA would not be closed by the FRWLP, but the southerly half of the OWA closest to the Feather River levee would be. During construction, access to the Live Oak Park and Recreation Area would be blocked from Pennington Road and this facility would be closed. Construction is expected to affect the Live Oak Park and Recreation Area during 2013 and 2014. During construction, access to the management units of the FRWA on the west side of the Feather River from the landside of the levees would be blocked, but these management units could be accessed by boat. A 0.02-acre area, or 0.02% of the Shanghai Bend Unit of the FRWA, would be affected during construction. Construction is expected to affect the Shanghai Bend Unit of the FRWA during 2013 through 2015. Access to the Feather River Parkway Bike Trail, Willow Island Park, Yuba City Boat Ramp, Boyd's Pump Boat Ramp, and Bobelaine Audubon Sanctuary would be blocked and these facilities would likely be closed during construction. Construction is expected to affect these facilities during 2013 through 2015. A 0.31-acre area, or 0.07% of the Bobelaine Audubon Sanctuary, would be affected during construction. Construction is expected to affect Bobelaine Audubon Sanctuary during 2014 through 2015. Veteran's Park, Peach Bowl Little League Fields, and Yuba Sutter Dog Park would not have primary access points blocked by levee construction. These facilities would likely remain open with proper safety measures and signage.

Even if the recreation areas themselves are not closed, proximity to construction equipment and activities (noise, visual effects, and smells) may degrade recreational experiences and likely disturb wildlife species normally inhabiting or present in wildlife and open space areas. This effect is temporary and highly localized; however, there are alternative locations for fishing, hunting, wildlife viewing, boating, and bicycling within 3 miles of the project area at other locations in Butte and Sutter Counties. Depending upon how many reaches would be under construction at one time, the distance recreationists would need to travel to a similar facility would vary. Levee access is restricted and controlled for the vast majority of the project area and the levee is not a major access corridor. With implementation of the environmental commitment requiring notification of construction area closure to ensure public safety and provide closure notice in advance of construction activities (described in Chapter 2, *Alternatives*), this effect would be less than significant. No mitigation is required.

Effect REC-2: Long-Term or Permanent Loss of Recreation Opportunities in the Levee Corridor

Alternative 1 proposes seepage berms as a measure to reduce flood risk. In Alternative 1, a seepage berm is proposed along the levee next to the O'Connor Lakes Unit of the FRWA.

Seepage berms typically extend outward from the landside levee toe 300 to 400 feet and are one-third the height of the levee. Most recreation facilities along the Feather River levee are oriented towards the water, but are most often reached from the landside of the levee. Access to recreation facilities and resources would need to be replaced at each location to avoid effects on recreation.

In Alternative 1, 5.56 acres of the OWA (0.05%), 8.20 acres of the FRWA (0.5% of the FRWA on the west side of the Feather River), 0.03 acres of Veterans Park, and 4.10 acres (1.0%) of the Bobelaine Audubon Sanctuary would be displaced by the larger levee footprint. See Plate 3.14-2. The area of the recreation resources displaced by the larger levee footprint does not contain developed recreation facilities or infrastructure. The recreation opportunities within the area lost to the proposed project, such as hunting, hiking, and wildlife viewing, are not unique to the area of loss, but are allowed and supported by the remainder of the OWA and several nearby recreation facilities.

Following construction, recreational opportunities at OWA, facilities in Yuba City, existing recreation facilities and resources on the waterside of the levee would not be inundated longer or with a different frequency than they currently are. Once construction is completed, affected formal park facilities would be replaced onsite to the greatest degree possible; if not possible, SBFCA would work with the local agency and determine an appropriate location for recreation facility replacement. With implementation of the environmental commitment requiring reconstruction of affected formal park facilities and preservation of boat launch access during and following construction activities (described in Chapter 2, *Alternatives*), this effect would be less than significant. No mitigation is required.

In Alternative 1, the expanded project footprint would require some land acquisition. At this time the levee footprint of Alternative 1 would not be expanded in locations where there are landside or waterside parks or recreation resources, nor would the expanded levee footprint require permanent removal of park and recreation resources. If the project were to damage or require removal of park or recreation facilities within the project area, it would be considered a significant effect, given the dearth of formal recreational facilities in the planning area. SBFCA has made a commitment requiring reconstruction of affected formal park facilities and preservation of boat launch access during and following construction activities (see the environmental commitment to rebuild affected formal park facilities described in Chapter 2, *Alternatives*). With implementation of this environmental commitment, any affected park facilities would be rebuilt after construction of the project, and there would be no permanent loss of recreation opportunities.

Alternative 1 would not influence increases in population, change in land use, or change in transportation and access such that permanent, long-term recreation use would change in the project area to a degree that parks and recreation facilities would be subject to additional physical deterioration; the recreational characteristics of the river corridor and adjacent lands would be unchanged in terms of use, access, and facilities after construction of the FRWLP. Similarly, the FRWLP does not include or induce the construction or expansion of recreation facilities. There would be no change in permanent access since levee access is restricted and controlled for the vast majority of the project area. This effect would be less than significant. No mitigation is required.

3.14.4.3 Alternative 2

Alternative 2 addresses levee deficiencies primarily using seepage berms and stability berms, which would result in an expansion of the overall levee footprint. Cutoff walls, slope flattening, relief wells, fill of canals and pits, and drainage relief trenches would be implemented at select locations. Implementation of Alternative 2 would potentially result in effects on recreation. These potential effects and related mitigation measure requirements are summarized in Table 3.14-3 and discussed below.

Table 3.14-3. Recreation Effects and Mitigation Measures for Alternative 2

Effect	Finding	Mitigation Measures	With Mitigation
Effect REC-1: Temporary Changes in Recreational Opportunities during Construction	Less than significant	None required	Less than significant
Effect REC-2: Long-Term or Permanent Loss of Recreation Opportunities in the Levee Corridor	Less than significant	None required	Less than significant

Seepage berms would be installed in the OWA, Live Oak Park and Recreation Area, FRWA (all five units in the FRWLP area), Boyd's Pump Boat Ramp, and Bobelaine Audubon Sanctuary. Stability berms would be installed in the OWA, FRWA (Morse Road Unit, Shanghai Bend Unit, and Abbott Lake Unit), and Bobelaine Audubon Sanctuary. Cutoff walls would be installed in the FRWA (Shanghai Bend Unit, Abbott Lake Unit, and Nelson Slough Unit), Feather River Parkway Bike Trail, Willow Island Park, Yuba City Boat Ramp, Peach Bowl Little League Fields, Yuba Sutter Dog Park, Boyd's Pump Boat Ramp, and Bobelaine Audubon Sanctuary. Levee slopes would be flattened on the waterside of the levee next to Feather River Parkway Bike Trail, Willow Island Park, Veteran's Park, and Yuba City Boat Ramp. Relief wells would be installed near or in the Feather River Parkway Bike Trail, Willow Island Park, Yuba City Boat Ramp, Peach Bowl Little League Fields, and Yuba Sutter Dog Park. Fill of canals and pits would occur and drainage relief trenches would be installed in the OWA.

Effect REC-1: Temporary Changes in Recreational Opportunities during Construction

This effect would be similar to that described above under Alternative 1; however, in Alternative 2, access to several more park and recreation facilities would be affected by the installation of landside seepage and stability berms.

During construction of Alternative 2, the FRWLP would affect 0.47 acres, or 0.004% of the OWA. The area affected is 5.5 miles of the total 10.5 miles of levee on the west side of the Feather River within the OWA. A 0.02-acre area, or 0.02% of the Shanghai Bend Unit of the FRWA, would be affected during construction.

Seepage and stability berm installation would affect access and staging areas at more locations of the Feather River Wildlife Area than in Alternative 1, and access to OWA, Live Oak Park and Recreation Area, Boyd's Pump Boat Ramp, and Bobelaine Audubon Sanctuary may take longer to restore for recreational use in Alternative 2. With implementation of the environmental commitment requiring notification of construction area closure to ensure public safety and provide closure notice in advance of construction activities (described in Chapter 2, *Alternatives*), this effect would be less than significant. No mitigation is required.

Effect REC-2: Long-Term or Permanent Loss of Recreation Opportunities in the Levee Corridor

In Alternative 2, 20.13 acres of the OWA (0.2%), 8.22 acres of the FRWA (0.5% of the FRWA on the west side of the Feather River), 0.03 acres of Veterans Park, and 5.54 acres (1.3%) of the Bobelaine Audubon Sanctuary would be displaced by the larger levee footprint. See Plate 3.14-2. The area of the recreation resources displaced by the larger levee footprint does not contain developed recreation facilities or infrastructure. The recreation opportunities within the area lost to the project such as hunting, hiking, and wildlife viewing, are not unique to the area of loss, but are allowed and supported by the remainder of the OWA and several nearby recreation facilities. For other recreation parks and facilities in the project area, this effect would be the same as described above under Alternative 1.

Seepage and stability berm installation in Alternative 2 could affect the long term access to portions of the OWA, Live Oak Park and Recreation Area, the management units of the FRWA on the west side of the Feather River, Boyd's Pump Boat Ramp, and Bobelaine Audubon Sanctuary. The new topography on the approach side of each of these facilities may require the construction of new roadway and trail access, utility, parking, staging, and other facility or infrastructure improvements. With implementation of the environmental commitment requiring reconstruction of affected formal park facilities and preservation of boat launch access during and following construction activities (described in Chapter 2, *Alternatives*), this effect would be less than significant. No mitigation is required.

3.14.4.4 Alternative 3

Alternative 3 addresses deficiencies in the levee by blending the flood management measures identified in Alternatives 1 and 2, and by primarily using cutoff walls and seepage berms. Stability berms, slope flattening, relief wells, and weir structures would be implemented at select locations. Implementation of Alternative 3 would potentially result in effects on recreation. These potential effects and related mitigation measure requirements are summarized in Table 3.14-4 and discussed below.

Table 3.14-4. Recreation Effects and Mitigation Measures for Alternative 3

Effect	Finding	Mitigation Measures	With Mitigation
Effect REC-1: Temporary Changes in Recreational Opportunities during Construction	Less than significant	None required	Less than significant
Effect REC-3: Long-Term or Permanent Loss of Recreation Opportunities in the Levee Corridor	Less than significant	None required	Less than significant

Cutoff walls would be installed in the OWA, Live Oak Park and Recreation Area, FRWA (all five units in the FRWLP area), Feather River Parkway Bike Trail, Willow Island Park, Yuba City Boat Ramp, Peach Bowl Little League Fields, Yuba Sutter Dog Park, Boyd's Pump Boat Ramp, and Bobelaine Audubon Sanctuary. Seepage berms would be installed in the OWA, FRWA (O'Connor Lakes Unit and Nelson Slough Unit), and Bobelaine Audubon Sanctuary. Stability berms would be installed in the OWA and Bobelaine Audubon Sanctuary. Levee slopes would be flattened on the waterside of the levee next to Feather River Parkway Bike Trail, Willow Island Park, Veteran's Park, and Yuba City Boat Ramp. Relief wells would be installed near or in the FRWA (Shanghai Bend Unit), Feather River

Parkway Bike Trail, and Yuba Sutter Dog Park. Weir structures would not be installed in park or recreation facilities.

Effect REC-1: Temporary Changes in Recreational Opportunities during Construction

This effect would be similar to that described above under Alternatives 1 and 2. In Alternative 3, access to park and recreation facilities would be affected to a greater extent than in Alternative 1 and to a lesser extent than in Alternative 2 during construction. In Alternative 3, access and staging areas affected by seepage and stability berm installation would include the OWA and the FRWA.

During construction of Alternative 3, the FRWLP would affect 0.27 acres, or 0.002% of the OWA. The area affected is 5.5 miles of the total 10.5 miles of levee on the west side of the Feather River within the OWA. A 0.02-acre area, or 0.02% of the Shanghai Bend Unit of the FRWA, would be affected during construction. A 0.28-acre area, or 0.07% of the Bobelaine Audubon Sanctuary, would be affected during construction.

With implementation of the environmental commitment requiring notification of construction area closure to ensure public safety and provide closure notice in advance of construction activities (described in Chapter 2, *Alternatives*), this effect would be less than significant. No mitigation is required.

Effect REC-2: Long-Term or Permanent Loss of Recreation Opportunities in the Levee Corridor

In Alternative 3, 20.97 acres (0.2%) of the OWA, 5.78 acres (0.3% of the FRWA on the west side of the Feather River), 0.01 acres of Veterans Park, and 2.11 acres (0.5%) of Bobelaine Audubon Sanctuary would be displaced by the larger levee footprint. See Plate 3.14-2. The area of recreation resources displaced by the larger levee footprint does not contain developed recreation facilities or infrastructure. The recreation opportunities within the area lost to the project such as hunting, hiking, and wildlife viewing, are not unique to the area of loss, but are allowed and supported by the remainder of the OWA and several nearby recreation facilities.

Seepage and stability berm installation in Alternative 3 could affect the long term access to portions of the OWA; O'Connor Lakes Unit and Nelson Slough Unit of the FRWA; and Bobelaine Audubon Sanctuary. The new topography on the approach side of each of these facilities may require the construction of new roadway and trail access, utility, parking, staging, and other facility or infrastructure improvements. With implementation of the environmental commitment requiring reconstruction of affected formal park facilities and preservation of boat launch access during and following construction activities (described in Chapter 2, *Alternatives*), this effect would be less than significant. No mitigation is required.

3.15 Utilities and Public Services

3.15.1 Introduction

This section describes the regulatory and environmental setting for utilities and public services; effects on utilities and public services that would result from the No Action Alternative and Alternatives 1, 2, and 3; and mitigation measures that would reduce significant effects. Additional information on utilities and public services is provided in Appendix G, *SBFCA, FRWLP Approach for Addressing Existing Levee Encroachments*.

3.15.2 Affected Environment

This section describes the affected environment for utilities and public services in the project area. Following are the key sources of data and information used in the preparation of this section.

- Sutter County General Plan Update Technical Background Report (Sutter County 2008).
- Sutter County General Plan (Sutter County 2011).
- Butte County General Plan 2030 (Butte County 2010).
- City of Yuba City General Plan (City of Yuba City 2004).
- SBFCA, Feather River West Levee Project, Approach for Addressing Existing Levee Encroachments Draft Memorandum, Wood Rodgers (2012); included in this document as Appendix G.
- SBFCA, Feather River West Levee Project, Project Description for CEQA/NEPA Analysis, Version 2.0, HDR and Wood Rodgers Design Team (2012).

3.15.2.1 Regulatory Setting

This section summarizes key regulatory information that applies to utilities and public services.

Federal

There are no applicable Federal policies related to utilities and public services.

State

California Public Utilities Commission

CPUC regulates privately owned telecommunications, electric, natural gas, water, railroad, rail transit, and passenger transportation companies in the state. CPUC is responsible for ensuring that California utility customers have safe, reliable utility service at reasonable rates, protecting utility customers from fraud, and promoting the health of California's economy. CPUC establishes service standards and safety rules and authorizes utility rate changes. CPUC enforces CEQA compliance for utility construction. CPUC also regulates the relocation of power lines by public utilities under its jurisdiction, such as The Pacific Gas and Electric Company (PG&E). CPUC works with other state and Federal agencies in promoting water quality, environmental protection, and safety.

California Integrated Waste Management Act

In 1989, AB 939, known as the Integrated Waste Management Act, was passed into law. Enactment of AB 939 established the California Integrated Waste Management Board and set forth aggressive solid waste diversion requirements. Under AB 939, every city and county in California is required to reduce the volume of waste sent to landfills by 50% through recycling, reuse, composting, and other means. AB 939 requires counties to prepare a countywide integrated waste management plan (CIWMP). An adequate CIWMP contains a summary plan that includes goals and objectives, a summary of waste management issues and problems identified in the incorporated and unincorporated areas of the county, a summary of waste management programs and infrastructure, existing and proposed solid waste facilities, and an overview of specific steps that would be taken to achieve the goals outlined in the components of the CIWMP.

Local

Butte County

The Butte County General Plan 2030 presents its policies regarding utilities and public services in the Public Facilities and Services element (Butte County 2010). Goals and policies that may influence the FRWLP include the following.

Goals

- **Goal PUB-2:** Provide adequate fire protection and emergency medical response services to serve existing and new development.
- **Goal PUB-9:** Provide safe, sanitary and environmentally acceptable solid waste management.
- **Goal PUB-12:** Manage wastewater treatment facilities at every scale to protect the public health and safety of Butte County residents and the natural environment.

Policies

- **Policy PUB-P9.3:** Innovative strategies shall be employed to ensure efficient and cost-effective solid waste and other discarded materials collection, disposal, transfer, and processing.

Sutter County

The Sutter County General Plan presents its policies regarding utilities and public services in the Infrastructure and Public Services elements (Sutter County 2011). Goals and policies that may influence the FRWLP include the following.

Goals

- **Goal I2:** Ensure efficient and safe collection, treatment, and disposal of wastewater, biosolids, and septage.
- **Goal I3**: Ensure stormwater runoff is collected and conveyed safely and efficiently.
- **Goal I4**: Ensure safe and efficient disposal of solid waste generated in Sutter County, while reducing the county's waste stream.
- **Goal I6**: Provide state-of-the-art telecommunication services for households, businesses, institutions, and public agencies throughout the county.

- **Goal PS 2**: Protect life and property from the risk of fire, and provide for coordinated emergency medical services.

Policies

- **Policy I1.10**: New individual wells shall meet county well construction and water quality standards.
- **Policy I2.10**: Groundwater Protection. Continue to regulate the siting, design, construction, and operation of wastewater disposal systems in accordance with County regulations to minimize contamination of groundwater supplies.
- **Policy I4.1**: Reduced Waste Stream. Implement, as appropriate, the reduction measures in the Climate Action Plan targeted to reduce the County's waste stream. Such measures may include reducing solid waste, diverting construction waste, and educating the public on solid waste reduction and recycling.
- **Policy I6.3**: Location. Ensure that the location and design of telecommunication facilities is functionally an aesthetically compatible with adjacent uses.

Yuba City

The City of Yuba City General Plan presents its policies regarding utilities and public services in the Public Utilities and Noise and Safety element (City of Yuba City 2004). Goals and policies that may influence the FRWLP include the following.

Guiding Policies

- **7.1-G-3:** Maintain existing levels of water service by preserving and improving infrastructure, replacing water mains as necessary, and improving water transmission facilities.
- **7.2-G-1:** Ensure that adequate wastewater treatment capacity is available to serve existing and future needs of the City.
- **7.3-G-1:** Meet the City's solid waste disposal needs, while maximizing opportunities for waste reduction and recycling.
- **9.4-G-3:** Maintain current police and fire response times and staffing ratios.

Implementing Policies

- **7.2-I-1:** Maintain existing levels of wastewater service by preserving and improving infrastructure, including replacing sewer mains as necessary.
- **7.3-I-6:** Comply with state requirements for proper handling and storage of solid waste and recyclables and diversion of solid waste from landfills.
- **9.4-I-4:** Require adequate access for emergency vehicles, including adequate street width and vertical clearance on new streets.

3.15.2.2 Environmental Setting

This section discusses the environmental setting related to utilities and public services in the project area, defined as the flood management footprint, which consists of the levee and berm itself and the landside and waterside operation and maintenance corridor (land 20 feet from the landside levee or berm toe and land 15 feet from the waterside levee toe). For the purposes of this analysis, the project area consists of the above and underground utilities and service systems that intersect and provide service to customers in and adjacent to the project area.

Electric Power Transmission and Natural Gas

PG&E provides Sutter and Butte counties with most of its electricity. The city of Gridley has its own electrical power company, Gridley Municipal Utilities Department, which distributes electricity purchased from the federal government to residents within the city limits. Electricity purchased from PG&E by local customers in Sutter and Butte counties is generated and transmitted to the county by a statewide network of power plants and transmission lines. Natural gas service is provided by PG&E to the urbanized areas of Yuba City. In parts of Sutter and Butte counties not served by PG&E's gas distribution network, including many of the counties' rural areas, residents and businesses make use of liquid propane gas (LPG) or other tanked or bottled gas for heating and cooking.

Water Service

Domestic

The domestic water service in the unincorporated areas of the project area is primarily through groundwater from privately owned wells. The Yuba City Utilities Department provides and distributes water service to Yuba City residents through pipes along roads in its service area. The Yuba City Utilities Department uses both surface water, diverted from the Feather River, and groundwater supplies for water service. Yuba City has three existing storage tanks located at the Yuba City water treatment facility for a total of 8 million gallons (MG) of storage. Located throughout the water distribution system are four additional tanks with a total volume of 9 MG.

Agricultural

Irrigation water for use within the project area is maintained and operated by several irrigation water companies and districts. The existing agricultural irrigation entities in the project area include the Garden Highway Mutual Water Company, Feather Water District, Tudor Mutual Water Company, Oswald Water District, Sutter Extension Water District, Butte Water District, and the Biggs–West Gridley Water District. The sources of irrigation water are diversions from the Feather River and private agricultural groundwater wells. During shortages of surface water, some of the irrigation districts and companies are able to supplement the surface water supplies with use of groundwater or through surface water purchases from other sources. When agricultural water supply is located within a reclamation district or stormwater management district, it is common practice for pumps to be placed in the drainage channels to reuse the tailwater from these channels.

Stormwater and Drainage

Stormwater management in the project area is a cooperative effort between a variety of agencies including Sutter and Butte counties, cities of Yuba City and Gridley, the local reclamation districts, and the state of California. The state and the local reclamation districts share responsibility for the levees that control flooding from the river. The counties and cities in the project area share responsibility with the reclamation districts for stormwater infrastructure inside the project area. The project lies within the following reclamation and drainage districts: Reclamation Districts 1, 9, and 777, Gilsizer Drainage District, Butte County Drainage District No. 1, and the Sacramento–San

Joaquin Drainage District. Stormwater drainage throughout much of the project area is collected through a system of ditches, culverts, and underground storm sewers, and ultimately flows to, or sometimes is pumped into, the Feather River, Sacramento River, or the Sutter Bypass.

Wastewater

There are two different methods of wastewater treatment and disposal currently used in the project area: municipal wastewater treatment plants (WWTPs)and individual on-site wastewater disposal systems, which are generally referred to as private septic systems. Larger urban areas require the organization and treatment capabilities provided by a municipal wastewater facility, whereas rural areas in the county employ individual on-site systems. Yuba City is the only municipality within the project area that operates and maintains a sanitary sewer collection system and wastewater treatment facility. The sewer collection systems convey the wastewater from the homes and businesses within Yuba City limits to the Yuba City WWTP. Yuba City's WWTP was expanded in 2005 to provide an average dry weather flow (ADWF) capacity of 10.5 million gallons per day (mgd). For the summer of 2007, the ADWF was approximately 5.5 mgd, and the current peak day wet weather flow rate is approximately 8.5 mgd. The WWTP discharges secondary, disinfected effluent to the Feather River.

Solid Waste Disposal

The nearest solid waste facilities to the project area is the Ostrom Landfill in Yuba County serving the Yuba Sutter Regional Waste Management Authority, a joint powers agreement between Sutter and Yuba counties; the cities of Live Oak, Marysville, Wheatland, and Yuba City; and the Neal Road Landfill in Butte County.

The Ostrom Road Landfill is located in Wheatland and is owned and operated by Norcal Waste Systems Ostrom Road LF Inc. The Ostrom Road Landfill is east of the project site, approximately 30 road miles from the southern end of the project at Reach 2, and approximately 35 road miles from the city of Gridley and Reach 31. The 225 acre Class II landfill is permitted to accept the following types of waste: solid waste; waste water treatment sludge; construction debris; food and green waste; some types of contaminated soils; and non-friable asbestos. The landfill can accept a maximum of 3,000 tons of waste a day and has a total maximum permitted capacity of 43,467,231 cubic yards. In 2007, the Ostrom Road Landfill was reported to have 39,223,000 cubic yards of remaining capacity (90% of total capacity) and it is estimated to have enough capacity to remain open until the year 2066 (CalRecycle 2012).

The Neal Road Recycling and Waste Facility is located 7 miles southeast of Chico directly north of the project, on 190 acres owned by Butte County. The Neal Road Facility is 25 miles north of the project at Reach 40. The Neal Road Facility is permitted with a total maximum permitted capacity of 25,271,900 cubic yards and permitted to accept municipal solid waste, inert industrial waste, demolition materials, special wastes containing nonfriable asbestos; and septage. In June 2011, the Neal Road Landfill was reported to have 20,396,081 cubic yards of remaining capacity (80% of total capacity) (Dugger 2012). According to the Butte County General Plan 2030 (2010), current projections suggest that the Neal Road Facility has capacity to last through 2034, based upon current waste volumes, and the county is undertaking efforts to investigate the possible expansion of the facility to serve future capacity needs.

Telecommunications

Telephone, cable television, and other telecommunications services are provided by a variety of private companies in the project area. Telecommunications are primarily provided by AT&T and Comcast for telephone, internet, and cable television. Cellular phone service providers in the area include T-Mobile, Verizon, Metro PCS, Virgin Mobile, and Net 10. Infrastructure necessary to provide these services including fiber optic lines, above and below ground services lines, and internet remote terminals are located strategically throughout Sutter and Butte counties.

Utility and Service System Encroachments

An inventory of existing utilities and encroachments within the project area was developed by MHM Engineers and is located in the appendix of the SBFCA, Feather River West Levee Project, Approach for Addressing Existing Levee Encroachments Draft Memorandum in Appendix G of this document. The inventory was completed through field reconnaissance of the project site, review of the CVFPB encroachment permit logs, USACE's Periodic Inspection Reports, and as-built documentation of various projects located along the project alignment. There are approximately 430 utility encroachments listed in the inventory. Typical utility encroachments include pressure pipelines (water supply pipelines from waterside pump stations and drainage pipelines from landside drainage pump stations), gravity drainage pipes, gas lines, telephone utilities, overhead utilities, fiber optic cables, and other types and variations.

The inventory is comprehensive and includes utilities that comply with the CVFPB and USACE utility placement standards within a levee operation and maintenance area, and would not be affected by the project; and utilities that do not comply with the CVFPB and USACE utility placement standards within a levee operation and maintenance area, or do comply with utility placement standards but would be affected by project construction. Of those utilities that fall into the latter distinction, these utilities would be addressed either by SBFCA or a local maintenance agency over time, by the levee project contractor during construction, or by SBFCA or the levee project contractor in advance of levee project construction.

Public Services

Fire Services

Fire protection and emergency services within the project area are provided by the Yuba City Fire Department, Sutter County Fire Department, and Butte County Fire Department. The Yuba City Fire Department currently staffs five engine companies in its five fire stations. Stations 1, 2, 3, and 4 are located within Yuba City's city limits. Station 7 in Tierra Buena also provides initial response service in the Yuba City Planning Area. The Sutter County Fire Department operates three fire stations near the project, the Oswald-Tudor Station located in Yuba City, the Sutter Station located in Sutter, and the Live Oak Station located in Live Oak. The Butte County Fire Department operates three stations in Gridley and one station in Biggs.

Police Services

Law enforcement services in the project area are provided by the Sutter County Sheriff's Department, the Butte County Sherriff's Department, and the Yuba City Police Department. The Yuba City Police Department currently operates a staff of 45 sworn peace officers and 26.5 civilian staff members augmented by 19 part-time reserve peace officers, 35 volunteers and 10 police cadets.

3.15.3 Environmental Consequences

This section describes the environmental consequences relating to utilities and public services for the FRWLP. It describes the methods used to determine the effects of the project and lists the thresholds used to conclude whether an effect would be significant. The effects that would result from implementation of the project, findings with or without mitigation, and applicable mitigation measures are presented in a table under each alternative.

3.15.3.1 Assessment Methods

This quantitative evaluation of utilities and public services is based on professional standards and information cited throughout the section. The key effects were identified and evaluated based on the environmental characteristics of the project area and the magnitude, intensity, and duration of activities related to the construction and operation of this project.

This evaluation of utilities and public services is based on information obtained from the following sources.

- Review of relevant documents and Web sites to obtain information regarding known utilities and public services in the project area.
- Analysis of geographic map research to determine locations of existing utilities and public services for project components.
- Telephone calls and e-mail correspondence to area utility and public service providers.

3.15.3.2 Determination of Effects

For this analysis, an effect pertaining to utilities and public services was analyzed under NEPA and CEQA if it would result in any of the following environmental effects, which are based on NEPA standards, state CEQA Guidelines Appendix G (14 CCR 15000 et seq.), and standards of professional practice.

- Require the construction or expansion of electrical or natural gas transmission or distribution facilities.
- Require the construction or expansion of a water conveyance or wastewater treatment facility or require new or expanded water supply entitlements.
- Require the construction of new or expanded stormwater drainage facilities.
- Cause the capacity of a solid waste landfill to be reached sooner than it would without the project.
- Require the construction or expansion of communications facilities (telephone, cell, cable, satellite dish).
- Significantly affect public utility facilities that are located underground or aboveground along the local roadways as a result of project construction activities.
- Create an increased need for new fire protection, police protection, or ambulance services or significantly affect existing emergency response times or facilities.
- Intersect with major infrastructure components, such as bridges or overpasses, requiring relocation of the components.

Effects Assumptions

The following assumptions are made as part of the analysis of effects on utilities and public services.

- Implementation of the proposed project is not expected to create additional demand for electricity or natural gas and would not require the construction or expansion of electrical or natural gas transmission lines or public utilities.
- Implementation of the proposed project would not require the construction or expansion of wastewater treatment facilities, nor would it require the relocation of major infrastructure.

3.15.4 Effects and Mitigation Measures

Effects and mitigation measure requirements concerning utilities and public services are summarized in Table 3.15-1.

Table 3.15-1. Summary of Effects for Utilities and Public Services

Effect	Finding	Mitigation Measures	With Mitigation
Alternatives 1, 2, and 3			
Effect UTL-1: Potential Temporary Disruption of Irrigation/Drainage Facilities and Agricultural and Domestic Water Supply	Significant	UTL-MM-1: Coordinate with Water Supply Users before and during All Water Supply Infrastructure Modifications and Implement Measures to Minimize Interruptions of Supply	Less than significant
Effect UTL-2: Damage of Public Utility Infrastructure and Disruption of Service	Significant	UTL-MM-2: Verify Utility Locations, Coordinate with Utility Providers, Prepare a Response Plan, and Conduct Worker Training	Less than significant
Effect UTL-3: Increase in Solid Waste Generation	Less than significant	None required	Less than significant
Effect UTL-4: Increase in Emergency Response Times	Less than significant	None required	Less than significant

3.15.4.1 No Action Alternative

The No Action Alternative represents the continuation of the existing deficiencies along the portion of the Feather River in the FRWLP area. Current levee operations and maintenance activities would continue, but no construction-related effects relating to utilities and public services such as electric power, natural gas, and communications transmission, water supply, wastewater, and solid waste service, and stormwater drainage would occur. Therefore, there would be no effect on utilities and public services attributable to the implementation of the No Action Alternative.

However, without levee improvements, there is the continued risk of levee failure. Under-seepage and loss of levee foundation soils would be expected to continue. A catastrophic levee failure would result in collapse of levee slopes and loss of soil. Furthermore, if a levee breach were to occur, emergency construction and repair activities would be implemented without the use of BMPs and could result in the immediate disruption or loss of public utilities. Varying levels of damage could be done to public service structures as well, causing delays in fire protection, police protection, and emergency medical assistance. A major flood event could stress the region's emergency response and hospital services, as the likelihood of injury resulting from a flood event is high, and evacuees may not have access to their regular medications. However, the potential for such an occurrence is uncertain, and the magnitude and duration of any related risks cannot be predicted. Because the effects of a levee failure are unpredictable, a precise determination of significance is not possible and cannot be made.

3.15.4.2 Alternative 1

Implementation of Alternative 1 would potentially result in effects on utilities and public services. These potential effects and related mitigation measure requirements are summarized in Table 3.15-2 and discussed below.

Table 3.15-2. Utilities and Public Services Effects and Mitigation Measures for Alternative 1

Effect	Finding	Mitigation Measures	With Mitigation
Effect UTL-1: Potential Temporary Disruption of Irrigation/Drainage Facilities and Agricultural and Domestic Water Supply	Significant	UTL-MM-1: Coordinate with Water Supply Users before and during All Water Supply Infrastructure Modifications and Implement Measures to Minimize Interruptions of Supply	Less than significant
Effect UTL-2: Damage of Public Utility Infrastructure and Disruption of Service	Significant	UTL-MM-2: Verify Utility Locations, Coordinate with Utility Providers, Prepare a Response Plan, and Conduct Worker Training	Less than significant
Effect UTL-3: Increase in Solid Waste Generation	Less than significant	None required	Less than significant
Effect UTL-4: Increase in Emergency Response Times	Less than significant	None required	Less than significant

Effect UTL-1: Potential Temporary Disruption of Irrigation/Drainage Facilities and Agricultural and Domestic Water Supply

As described in Utility and Service System Encroachments, implementation of Alternative 1 requires modifications to irrigation, drainage, and domestic water supply infrastructure. Water supply, and irrigation and drainage infrastructure in the project area include drainage canals like the Sutter Butte Main Canal; irrigation, water supply and drainage pipelines; waterside and landside pump stations, and agricultural wells. The water supply and drainage infrastructure in the footprint of the proposed flood management facilities would be removed and replaced in locations farther from the project footprint.

Repair, replacement, or relocation of infrastructure elements would provide water supply and drainage service equivalent to existing conditions. Construction of Alternative 1 could result in the need to temporarily take individual water supply and drainage infrastructure elements out of service for short periods. Because the potential for damage to water supply and drainage infrastructure could cause a delay in service, this potential construction effect is considered significant. Mitigation Measure UTL-MM-1 would reduce this potential effect to a less-than-significant level.

The timing of these replacements would be planned, to the extent feasible, to prevent disruptions of service.

Mitigation Measure UTL-MM-1: Coordinate with Water Supply Users before and during All Water Supply Infrastructure Modifications and Implement Measures to Minimize Interruptions of Supply

The project proponent will ensure the following measures are implemented to avoid and minimize potential for domestic and irrigation water supply interruptions during construction activities.

- Coordinate the timing of all modifications to domestic and irrigation water supply infrastructure with the affected infrastructure owners and water supply users.
- Include detailed scheduling of the phases of modifications or replacement of existing domestic and irrigation water supply infrastructure components in project design and in construction plans and specifications.
- Plan and complete modifications of irrigation infrastructure for the non-irrigation season to the extent feasible.
- Provide for alternative water supply, if necessary, when modification or replacement of irrigation infrastructure must be conducted during a period when it otherwise would be in normal use by an irrigator.
- Ensure either that users of irrigation water supply do not, as a result of physical interference associated with the project, experience a substantial interruption in irrigation supply when such supply is needed for normal, planned farming operations; or compensate users of irrigation water supply that experience a substantial decrease in an existing level of service (that meets the established standards for the project area) in kind for losses associated with the reduction in level of service.

Effect UTL-2: Damage of Public Utility Infrastructure and Disruption of Service

As documented in Appendix G, the project levee has numerous encroachments that would be affected by the project because they present a threat to stability of the levee system, do not currently comply with levee encroachment placement criteria provided by USACE and CVFPB, or would be disrupted or otherwise affected by project construction.

Given the number of encroachments the project must address and the variable nature of how each would be addressed, levee encroachments affected by the project are divided into two categories: those that only encroach on the levee right-of-way (ROW), which make up the operation and maintenance area consisting of the land 20 feet from the landside levee or berm toe and the land 15 feet from the waterside levee toe; and those that encroach on the levee prism itself. The categories can be further divided into three subcategories: structural encroachments, wet utility encroachments, and dry utility encroachments. Structural encroachments consist of homes, sheds, roadways, railroad tracks, and structures in general. Wet utility encroachments are defined as facilities for agricultural, drainage, water supply, sewage, and natural gas systems (e.g., agricultural pipelines and wells). Dry utilities are defined as facilities for electrical and telecommunication systems (e.g., fiber optic cables and aboveground electric poles).

In general, encroachments within the levee ROW would not be modified as part of the levee work, but by SBFCA or the local maintenance agency over time. Encroachments within the levee prism, structural encroachments and wet utility encroachments would be addressed by the levee construction contractor. Dry utility encroachments within the levee prism would be addressed in advance of the levee construction contactor's work to clear the way for levee construction.

Utility infrastructure could require significant actions to repair, relocate, or replace. Additionally, Alternative 1 construction could necessitate that existing utilities be taken off line or could cause accidental damage to identified and unidentified infrastructure. Because the potential exists for damage and service interruptions to existing utilities, the effect of this potential construction effect is considered significant. Mitigation Measure UTL-MM-2 would reduce this potential effect to a less-than-significant level.

Mitigation Measure UTL-MM-2: Verify Utility Locations, Coordinate with Utility Providers, Prepare a Response Plan, and Conduct Worker Training

The project proponent will ensure the following measures are implemented to avoid and minimize potential damage to utilities and service disruptions during construction. Implementing these measures will help ensure that existing utilities are not damaged and that service interruptions are minimized.

- Obtain utility excavation or encroachment permits as necessary before initiating any work with the potential to affect utility lines, and include all necessary permit terms in construction contract specifications.
- Before starting construction, coordinate with the CVFPB and utility providers in the area to locate existing lines and to implement orderly relocation of utilities that need to be removed or relocated. Avoid relocating utilities when possible. Provide notification of potential interruptions in services to the appropriate agencies.
- Before starting construction, verify utility locations through field surveys and the use of the Underground Service Alert services. Clearly mark any buried utility lines in the area of construction before any earthmoving activity.
- Before starting construction, prepare a response plan to address potential accidental damage to a utility line. The plan will identify chain-of-command rules for notifying authorities and appropriate actions and responsibilities to ensure the safety of the public and the workers. Contractors will conduct worker training to respond to these situations.
- Stage utility relocations to minimize service interruptions.

Effect UTL-3: Increase in Solid Waste Generation

During three years of construction, implementation of Alternative 1 may generate up to 819,097 cubic yards of solid waste that would require disposal. Sources of solid waste related to construction activities would include levee material, structural debris from removal of residences and agricultural structures, roadways, and utility infrastructure within the project footprint. The waste material resulting from the degradation of the existing levee could be disposed of onsite at the landside and waterside levee toes and used for new levee construction, if it is suitable material. Disposal of the soil material would occur if soil characteristics make it infeasible for reuse as levee material, or the soil is determined to have contaminants that would require appropriate disposal. Embankment fill material excavated to construct levee improvements would be evaluated for reuse after excavation and prior to disposal. Stripped and cleared vegetation resulting from project construction would be mulched and spread on the finished levee.

Solid waste requiring disposal as part Alternative 1 likely would be transported to the Ostrom Road Landfill outside of Wheatland or the Neal Road Landfill outside of Chico, depending on the reach location of project construction. However, the location of the landfill used for disposal of construction-related waste may be determined by the construction contractor at the time of construction activity based on capacity, type of waste, and other factors. Only those landfills determined to have the ability to accommodate the construction disposal needs of Alternative 1 would be used.

As of 2007, the remaining waste capacity for the Ostrom Road Landfill was 39,223,000 cubic yards, and in 2011 the Neal Road Landfill reported a remaining waste capacity of 20,396,081 cubic yards. Some of the disposed material may be deemed suitable by landfills for other beneficial uses. These materials would be stored only temporarily at the landfill and would not have an effect on its overcall capacity. The current landfill closure projections is 2066 at the Ostrom Road Landfill and 2034 at the Neal Road Landfill, which takes into account disposal growth rate, including both beneficial and non-beneficial soil materials. Assuming all of the estimated 819,097 cubic yards of waste material would require permanent disposal, Alternative 1 implementation would represent 2% of the Ostrom Road Landfill and 4% of the Neal Road Landfill remaining capacities. However, the option of beneficial reuse is likely to reduce the cubic yards of soil that require permanent disposal. These facts would make this effect less than significant. No mitigation is required.

Effect UTL-4: Increase in Emergency Response Times

Emergency access to the project vicinity could be affected by construction of the proposed project, and construction-related traffic could delay or obstruct the movement of emergency vehicles. However, execution of the environmental commitment to develop and implement a traffic control and road maintenance plan, described in Chapter 2, *Alternatives*, would minimize construction-related effects on emergency response times. This effect would be less than significant. No mitigation is required.

3.15.4.3 Alternative 2

Implementation of Alternative 2 would potentially result in effects on utilities and public services. These potential effects and related mitigation measure requirements are summarized in Table 3.15-3 and discussed below.

Table 3.15-3. Utilities and Public Resources Effects and Mitigation Measures for Alternative 2

Effect	Finding	Mitigation Measures	With Mitigation
Effect UTL-1: Potential Temporary Disruption of Irrigation/Drainage Facilities and Agricultural and Domestic Water Supply	Significant	UTL-MM-1: Coordinate with Water Supply Users before and during All Water Supply Infrastructure Modifications and Implement Measures to Minimize Interruptions of Supply	Less than significant
Effect UTL-2: Damage of Public Utility Infrastructure and Disruption of Service	Significant	UTL-MM-2: Verify Utility Locations, Coordinate with Utility Providers, Prepare a Response Plan, and Conduct Worker Training	Less than significant
Effect UTL-3: Increase in Solid Waste Generation	Less than significant	None required	Less than significant
Effect UTL-4: Increase in Emergency Response Times	Less than significant	None required	Less than significant

Effect UTL-1: Potential Temporary Disruption of Irrigation/Drainage Facilities and Agricultural and Domestic Water Supply

Effects associated with Effect UTL-1 under Alternative 2 are identical to those described above for Effect UTL-2 under Alternative 1. Implementation of Mitigation Measure UTL-MM-1, described above under Alternative 1 would reduce this potential effect to a less-than-significant level.

Effect UTL-2: Damage of Public Utility Infrastructure and Disruption of Service

Effects associated with Effect UTL-2 under Alternative 2 are identical to those described above for Effect UTL-2 under Alternative 1. Implementation of Mitigation Measure UTL-MM-2, described above under Alternative 1 would reduce this potential effect to a less-than-significant level.

Effect UTL-3: Increase in Solid Waste Generation

Implementation of Alternative 2 may generate up to 378,800 cubic yards of solid waste that would require disposal. Sources of solid waste related to construction activities would include levee material, structural debris from removal of residences and agricultural structures, roadways, and utility infrastructure within the project footprint. The waste material resulting from the degradation of the existing levee could be disposed of onsite at the landside and waterside levee toes and used for new levee construction, if it is suitable material. Disposal of the soil material would occur if soil characteristics make it infeasible for reuse as levee material, or the soil is determined to have contaminants that would require appropriate disposal. Embankment fill material excavated to construct levee improvements would be evaluated for reuse after excavation and prior to disposal. Stripped and cleared vegetation resulting from project construction would be mulched and spread on the finished levee.

Solid waste requiring disposal as part Alternative 2 likely would be transported to the Ostrom Road Landfill outside of Wheatland or the Neal Road Landfill outside of Chico, depending on the reach location of project construction. However, the location of the landfill used for disposal of construction-related waste may be determined by the construction contractor at the time of construction activity based on capacity, type of waste, and other factors. Only those landfills determined to have the ability to accommodate the construction disposal needs of Alternative 2 would be used.

As of 2007, the remaining waste capacity for the Ostrom Road Landfill was 39,223,000 cubic yards, and in 2011 the Neal Road Landfill reported a remaining waste capacity of 20,396,081 cubic yards. Some of the disposed material may be deemed suitable by landfills for other beneficial uses. These materials would be stored only temporarily at the landfill and would not have an effect on its overcall capacity. The current landfill closure projections is 2066 at the Ostrom Road Landfill and 2034 at the Neal Road Landfill, which takes into account disposal growth rate, including both beneficial and non-beneficial soil materials. Assuming all of the estimated 378,800 cubic yards of waste material would require permanent disposal, Alternative 2 implementation would represent less 1% of the Ostrom Road Landfill and 1% of the Neal Road Landfill remaining capacities. However, the option of beneficial reuse is likely to reduce the cubic yards of soil that require permanent disposal. These facts would make this effect less than significant. No mitigation is required.

Effect UTL-4: Increase in Emergency Response Times

Effects associated with Effect UTL-4 under Alternative 2 are identical to those described above for Effect UTL-4 under Alternative 1. This effect would be less than significant. No mitigation is required.

3.15.4.4 Alternative 3

Implementation of Alternative 3 would potentially result in effects on utilities and public services. These potential effects and related mitigation measure requirements are summarized in Table 3.15-4 and discussed below.

Table 3.15-4. Utilities and Public Resources Effects and Mitigation Measures for Alternative 3

Effect	Finding	Mitigation Measures	With Mitigation
Effect UTL-1: Potential Temporary Disruption of Irrigation/Drainage Facilities and Agricultural and Domestic Water Supply	Significant	UTL-MM-1: Coordinate with Water Supply Users before and during All Water Supply Infrastructure Modifications and Implement Measures to Minimize Interruptions of Supply	Less than significant
Effect UTL-2: Damage of Public Utility Infrastructure and Disruption of Service	Significant	UTL-MM-2: Verify Utility Locations, Coordinate with Utility Providers, Prepare a Response Plan, and Conduct Worker Training	Less than significant
Effect UTL-3: Increase in Solid Waste Generation	Less than significant	None required	Less than significant
Effect UTL-4: Increase in Emergency Response Times	Less than significant	None required	Less than significant

Effect UTL-1: Potential Temporary Disruption of Irrigation/Drainage Facilities and Agricultural and Domestic Water Supply

Effects associated with Effect UTL-1 under Alternative 3 are identical to those described above for Effect UTL-2 under Alternative 1. Implementation of Mitigation Measure UTL-MM-1, described above under Alternative 1 would reduce this potential effect to a less-than-significant level.

Effect UTL-2: Damage of Public Utility Infrastructure and Disruption of Service

Effects associated with Effect UTL-2 under Alternative 2 are identical to those described above for Effect UTL-2 under Alternative 1. Implementation of Mitigation Measure UTL-MM-2, described above under Alternative 1 would reduce this potential effect to a less-than-significant level.

Effect UTL-3: Increase in Solid Waste Generation

Implementation of Alternative 3 may generate up to 813,152 cubic yards of solid waste that would require disposal. Sources of solid waste related to construction activities would include levee material, structural debris from removal of residences and agricultural structures, roadways, and utility infrastructure within the project footprint. The waste material resulting from the degradation of the existing levee could be disposed of onsite at the landside and waterside levee toes and used for new levee construction, if it is suitable material. Disposal of the soil material would occur if soil characteristics make it infeasible for reuse as levee material, or the soil is determined to have contaminants that would require appropriate disposal. Embankment fill material excavated to construct levee improvements would be evaluated for reuse after excavation and prior to disposal. Stripped and cleared vegetation resulting from project construction would be mulched and spread on the finished levee.

Solid waste requiring disposal as part Alternative 3 likely would be transported to the Ostrom Road Landfill outside of Wheatland or the Neal Road Landfill outside of Chico, depending on the reach location of project construction. However, the location of the landfill used for disposal of construction-related waste may be determined by the construction contractor at the time of construction activity based on capacity, type of waste, and other factors. Only those landfills determined to have the ability to accommodate the construction disposal needs of Alternative 3 would be used.

As of 2007, the remaining waste capacity for the Ostrom Road Landfill was 39,223,000 cubic yards, and in 2011 the Neal Road Landfill reported a remaining waste capacity of 20,396,081 cubic yards. Some of the disposed material may be deemed suitable by landfills for other beneficial uses. These materials would be stored only temporarily at the landfill and would not have an effect on its overcall capacity. The current landfill closure projections is 2066 at the Ostrom Road Landfill and 2034 at the Neal Road Landfill, which takes into account disposal growth rate, including both beneficial and non-beneficial soil materials. Assuming all of the estimated 813,152 cubic yards of waste material would require permanent disposal, Alternative 3 implementation would represent 2% of the Ostrom Road Landfill and 4% of the Neal Road Landfill remaining capacities. However, the option of beneficial reuse is likely to reduce the cubic yards of soil that require permanent disposal. These facts would make this effect less than significant. No mitigation is required.

Effect UTL-4: Increase in Emergency Response Times

Effects associated with Effect UTL-4 under Alternative 3 are identical to those described above for Effect UTL-4 under Alternative 1. This effect would be less than significant. No mitigation is required.

3.16 Public Health and Environmental Hazards

3.16.1 Introduction

This section describes the regulatory and environmental setting for public health and environmental hazards; effects on public health and environmental hazards that would result from the No Action Alternative and Alternatives 1, 2, and 3; and mitigation measures that would reduce significant effects. Additional information on public health and hazards is provided in Appendix H.

3.16.2 Affected Environment

This section describes the affected environment for public health and environmental hazards in the project area. Following are the key sources of data and information used in the preparation of this section.

- Environmental Site Assessment (ESA), Sutter Basin Feasibility Study, Sutter and Butte Counties (U.S. Army Corps of Engineers 2012).
- Sutter County General Plan (Sutter County 2011).
- City of Yuba City General Plan (City of Yuba City 2004).
- City of Live Oak 2030 General Plan (City of Live Oak 2010).
- Butte County General Plan 2030 (Butte County 2010).
- City of Biggs General Plan 1997–2015 (City of Biggs 1998).
- City of Gridley 2030 General Plan (City of Gridley 2010).

3.16.2.1 Regulatory Setting

This section summarizes key Federal and state regulatory information that applies to public health and environmental hazards. Additional regulatory information appears in Appendix A.

Federal

The following Federal policies related to public health and environmental hazards may apply to implementation of the proposed project. Two key federal regulations pertaining to hazardous wastes are described below. Other applicable federal regulations are contained primarily in CFR Titles 29, 40, and 49.

Resource Conservation and Recovery Act

The Federal Resource Conservation and Recovery Act enables EPA to administer a regulatory program that extends from the manufacture of hazardous materials to their disposal, thus regulating the generation, transportation, treatment, storage, and disposal of hazardous waste at all facilities and sites in the nation.

Comprehensive Environmental Response, Compensation, and Liability Act

The Comprehensive Environmental Response, Compensation, and Liability Act (also known as Superfund) was passed to facilitate the cleanup of the nation's toxic waste sites. In 1986, the act was amended by the Superfund Amendment and Reauthorization Act Title III (community right-to-know laws). Title III states that past and present owners of land contaminated with hazardous substances can be held liable for the entire cost of the cleanup, even if the material was dumped illegally when the property was under different ownership.

State

The following State policies related to public health and environmental hazards may apply to implementation of the proposed project.

Hazardous Materials Release Response Plans and Inventory Act of 1985

The Hazardous Materials Release Response Plans and Inventory Act, also known as the Business Plan Act, requires businesses using hazardous materials to prepare a plan that describes their facilities, inventories, emergency response plans, and training programs. Hazardous materials are defined as unsafe raw or unused material that is part of a process or manufacturing step. They are not considered hazardous waste. Health concerns pertaining to the release of hazardous materials, however, are similar to those relating to hazardous waste.

Hazardous Waste Control Act

The Hazardous Waste Control Act created the state hazardous waste management program, which is similar to, but more stringent than, the Federal Resource Conservation and Recovery Act program. The act is implemented by regulations contained in Title 26 CCR, which describes the following elements required for the proper management of hazardous waste.

- Identification and classification.
- Generation and transportation.
- Design and permitting of recycling, treatment, storage, and disposal facilities.
- Treatment standards.
- Operation of facilities and staff training.
- Closure of facilities and liability requirements.

These regulations list more than 800 materials that may be hazardous and establish criteria for identifying, packaging, and disposing of such waste. Under the Hazardous Waste Control Act and Title 26, the generator of hazardous waste must complete a manifest that accompanies the waste from generator to transporter to the ultimate disposal location. Copies of the manifest must be filed with the California Department of Toxic Substances and Control.

Emergency Services Act

Under the Emergency Services Act, the state developed an emergency response plan to coordinate emergency services provided by Federal, state, and local agencies. Rapid response to incidents involving hazardous materials or hazardous waste is an important part of the plan, which is administered by the California Office of Emergency Services. The office coordinates the responses of other agencies, including EPA, California Highway Patrol, RWQCBs, air quality management districts, and county disaster response offices.

Local

Butte County, Sutter County, City of Yuba City, City of Live Oak, City of Biggs, and City of Gridley each have adopted goals and policies related to public health and environmental hazards, detailed in Appendix A.

3.16.2.2 Environmental Setting

The following considerations are relevant to environmental and public safety conditions in the proposed project area.

The project area is located in the north-central part of California, and its boundaries include the Sacramento River to the west and the Feather River to the east. Its southern boundary is just downstream of the confluence of the Sacramento River with the Sutter Bypass, and includes the urban areas of Yuba City, Live Oak, Gridley, and Biggs in the Sutter Bypass. As described in the Environmental Site Assessment prepared by USACE, levees surrounding the project area protect a substantial number of improvements including residential homes, commercial structures, farm houses and buildings, and semipublic structures (U.S. Army Corps of Engineers 2012). The Environmental Site Assessment looked at a limited portion of the current study area, focusing on the areas surrounding (up to 0.25 mile) existing flood control levees.

For ease of investigating, the Environmental Site Assessment divided the project area into seven sites, but only four are used in this analysis.

1. **Feather River North (Yuba).** This site roughly follows the Feather River from the Thermalito Afterbay to approximately Metteer Road or the Butte-Sutter county line. This section covers about 13.5 miles of the levee, and consists of Reaches 25–41.
2. **Feather River North (Sutter).** This section starts at the Butte-Sutter county line of the Feather River and goes south along the river to approximately Pease Road. This section is approximately 9.8 miles long, and consists of Reaches 18–25.
3. **Yuba City Levee.** This section of the project area starts at Pease Road on the Feather River and goes south through the Yuba City to the confines of the Feather River and the Yuba River. This section is approximately 12.5 miles long, and consists of Reaches 8–17.
4. **Feather River South.** Starting at Star Bend Road, this levee section goes south on Levee Road, which parallels SR 99. This section is approximately 9.3 miles long, and consists of Reaches 3–7.
5. **Sutter Bypass.** This section of the project area starts at the intersection of Feather River Levee Road and Sutter Bypass Levee Road and goes north along the Sutter Bypass for approximately 17.5 miles.

3.16.2.3 Hazardous Materials

Hazardous materials are chemicals and other substances defined as hazardous by Federal and state laws and regulations. In general, these materials are substances that, because of their quantity, concentration, or physical, chemical, or infectious characteristics, may have harmful effects on public health or the environment during their use or when released to the environment. Hazardous materials also include waste chemicals and spilled materials.

Potential Sources of Hazardous Materials

The project area consists of urban, suburban, and rural areas. Potential sources of hazardous materials and waste may exist in the urbanized as well as agricultural areas adjacent to the levees. The following hazardous materials may be present in the project area in a variety of common contexts.

- Pesticides, herbicides, and fertilizers associated with agricultural lands.
- Petroleum hydrocarbons.
- Underground storage tanks.
- Contaminated debris.
- Lead associated with paints and structures.
- Wastewater.
- Pits or ponds.
- Stormwater runoff structures.
- Transformers that may contain PCBs.

Known Sources of Hazardous Materials

The Department of Toxic Substances Control's (DTSC's) Envirostor database provides access to detailed information on hazardous waste permitted and corrective action facilities within California, as well as existing site cleanup information. According the Envirostor Database, the following known sources of hazardous materials are located adjacent to or along project levees, and consist of evaluation sites, voluntary cleanup, and permitted hazardous waste sites (U.S. Army Corps of Engineers 2012). Evaluation sites are typically (1) in the preliminary phase of a site investigation, or (2) were found to have no contamination. The sites located within the project area have been organized by study reaches in Table 3.16-1.

Table 3.16-1. Known Hazardous Materials Sources

Environmental Site Assessment Study Reaches	Project Reaches Covered	HTRW Sites Located
Feather River North (Yuba)	25–41	Four USTs One landfill Two reports on the HAZNET database
Feather River North (Sutter)	18–25	Seven USTs One waste discharge system Three reports on the HAZNET database One RCRA-SQG or small quantity generator
Yuba City Levee	8–17	33 USTs* One landfill Two ASTs Four RCRA-SQG or small quantity generators One pesticide producer One SuperFund site (Onstott Dusters, Inc.) Three sites on the SLIC database 58 reports on the HAZNET database 11 sites on the CDL database
Feather River South	3–7	One site on the CDL database

Source: Environmental Site Assessment Sutter Basin Feasibility Study 2012, except Onstott Dusters, Inc., which was obtained from the EPA website at http://ofmpub.epa.gov/.
* Five of which are on the LUST list.
AST = aboveground storage tank.
CDL = California digital library.
HTRW = hazardous, toxic, or radioactive waste.
LUST = leaking underground storage tank.
RCRA-SQG = Resource Conservation and Recovery Act small quantity generators.
UST = underground storage tank.
SLIC = spills, leaks, investigations, and cleanup.

3.16.2.4 Agricultural Lands

There are large tracts of agricultural lands throughout the counties in the project area. Agricultural lands are known to have various pesticides, herbicides, and fertilizers in their soils, and can pose a risk to local and regional water quality because these areas are largely considered floodplain for the Sacramento River. The river elevation fluctuates seasonally and the groundwater elevation is assumed to fluctuate with river levels. During periods of low flow, it is likely that groundwater flows from agricultural lands toward the river and that any contaminated water could be transported to the soils within and near the levees.

3.16.2.5 Wildland Fires

The large areas of undeveloped, agricultural, and forested land in the project area pose a serious risk for wildland fires. These areas are largely fallow agricultural lands or lands that are composed primarily of annual grasses that become dry during summer months, raising the risk of grassland fire. Areas of this type are found throughout the project area; however, wildland fire risk is greater in rural locations.

Various city and county agencies are responsible for controlling and responding to wildland fires. City fire departments are responsible for responding to fires in areas that are incorporated into cities and towns within the project area. Many unincorporated areas have formed fire districts that are primarily protected by county fire departments. Other entities involved in wildland fire protection are the California Department of Forestry and Fire Protection and the U.S. Forest Service. Some areas within the project area also have volunteer fire departments for fighting wildland fires. Refer to Section 3.15, *Utilities and Public Services*, for a detailed discussion.

3.16.2.6 Emergency Response

Emergency response and evacuation services for the project area are provided by various departments in the counties and cities nearest to the project area, including, but not limited to, sheriff, fire, and emergency services departments. Fire protection and emergency services provided within the project area are described in Section 3.15, *Utilities and Public Services*.

3.16.3 Environmental Consequences

This section describes the environmental consequences relating to environmental and public safety for the proposed project. It describes the methods used to determine the effects of the project and lists the thresholds used to conclude whether an effect would be significant. The effects that would result from implementation of the project, findings with or without mitigation, and applicable mitigation measures are presented in a table under each alternative.

3.16.3.1 Assessment Methods

This evaluation of public health and environmental hazards is based on professional standards and information cited throughout the section. The key effects were identified and evaluated based on the environmental characteristics of the project area and the magnitude, intensity, and duration of activities related to the construction and operation of this project.

The evaluation of potential effects on public health and environmental hazards addresses the potential for health and safety hazards during construction of the levee improvements. The analysis includes evaluation of the potential effects related to construction activities on workers, and general safety of, and hazards, to both workers and the public posed by construction, operations, and maintenance associated with implementation of the proposed project.

The Sacramento District of the USACE conducted an Environmental Site Assessment in June–July of 2009. The Environmental Site Assessment is meant to identify recognized environmental conditions, including presence or likely presence of any hazardous substance or petroleum products under conditions that indicate an existing release, a past release, or the material threat of a release into structures, the ground, groundwater, or surface waters of the property (U.S. Army Corps of Engineers 2012). Information was gathered for this report by conducting a pre-site visit search, and a site visit to verify listed Hazardous, Toxic, or Radioactive Waste (HTRW threats) and discover new ones. Results of the Environmental Site Assessment included:

- 51 registered underground storage tanks (USTs) and 3 aboveground storage tanks (ASTs).
- Five sources are listed as small and large generators of EPA-regulated hazardous waste.
- Five sites that had leaking USTs, two of which have or had affected public drinking water.

- Six known or potential hazardous substance sites under investigation or cleanup.
- Two waste discharge systems.
- Two landfills.
- 12 suspected drug labs.
- One pesticide-producing facility.

One additional site not included in the Environmental Site Assessment was a SuperFund site (Onstott Dusters, Inc.). For the majority of the sources, no records were found to indicate that these potential sources have actually caused major contamination, although investigations are still on-going. Several areas of concern were revealed during the investigation. Most of these areas of concern involve registered USTs, hazardous waste generators, minor tank leaks, UST removal and remediation, and accidental releases. During records research and field surveys, no known contamination due to HTRW was confirmed within the construction zone. In conclusion, no evidence was found to indicate that any other potential sources of contamination would interfere with any planned construction of the levees.

3.16.3.2 Determination of Effects

For this analysis, an effect pertaining to public health and environmental hazards was analyzed under NEPA and CEQA if it would result in any of the following environmental effects, which are based on NEPA standards, State CEQA Guidelines Appendix G (14 CCR 15000 et seq.), and standards of professional practice.

- Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials to the environment.
- Emit hazardous emissions or involve handling hazardous or acutely hazardous materials, substances, or waste within 0.25 mile of an existing or proposed school.
- Be located on a site that is on a list of hazardous materials sites compiled pursuant to California Government Code 65962.5, and as a result would create a significant hazard to the public or the environment.
- Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan.
- Place within a 100-year flood hazard area structures that would impede or redirect flood flows.
- Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam.
- Significantly affect drinking water quality.

3.16.4 Effects and Mitigation Measures

Effects and mitigation measure requirements concerning public health and environmental hazards are summarized in Table 3.16-2.

Table 3.16-2. Summary of Effects for Public Health and Environmental Hazards

Effect	Finding	Mitigation Measures	With Mitigation
Alternatives 1, 2, and 3			
Effect PH-1: Temporary Exposure to or Release of Hazardous Materials during Construction	Significant	Environmental Commitment: Stormwater Pollution Protection Plan	Less than significant
Effect PH-2: Exposure of the Environment to Hazardous Materials during Ground-Disturbing Activities	Significant	Environmental Commitment: Stormwater Pollution Protection Plan PH-MM-1: Complete Phase I and Phase II (if Necessary) Environmental Site Assessment Investigations and Implement Required Measures PH-MM-2: Employment of a Toxic Release Contingency Plan	Less than significant
Effect PH-3: Temporary Exposure to Safety Hazards from the Construction Site and Vehicles	Significant	PH-MM-3: Implementation of Construction Site Safety Measures PH-MM-4: Implementation of an Emergency Response Plan	Less than significant
Effect PH-4: Exposure of People or Structures to Increased Flood Risk	Beneficial	None required	Beneficial

3.16.4.1 No Action Alternative

The No Action Alternative represents the continuation of the existing deficiencies along the portion of the Feather River in the FRWLP area. Current levee operations and maintenance activities would continue, but there would be no change in the geomorphic and flood control regimes relative to existing conditions.

Under the No Action Alternative, no construction activities associated with the project would occur. Thus the proposed project would not result in accidental spills of hazardous materials, nor would there be any effect on emergency response, as there would be no interference with emergency response routes.

However, without levee improvements to the project area, the risk of levee failure would remain high. A levee failure within the FRWLP project area could result in flooding that would upset stored hazardous materials and spread agricultural pesticides, oil, gasoline, and other hazardous materials in floodwaters, creating hazardous conditions for the public and the environment. The timing, duration, magnitude, and location for such an occurrence cannot be predicted.

3.16.4.2 Alternative 1

Implementation of Alternative 1 would potentially result in effects on public health and environmental hazards. These potential effects and related mitigation measure requirements are summarized in Table 3.16-3 and discussed below.

Table 3.16-3. Public Health and Environmental Hazards Effects and Mitigation Measures for Alternative 1

Effect	Finding	Mitigation Measures	With Mitigation
Effect PH-1: Temporary Exposure to or Release of Hazardous Materials during Construction	Significant	Environmental Commitment: Stormwater Pollution Prevention Plan	Less than significant
Effect PH-2: Exposure of the Environment to Hazardous Materials during Ground-Disturbing Activities	Significant	Environmental Commitment: Stormwater Pollution Prevention Plan PH-MM-1: Complete Phase I and Phase II (if Necessary) Environmental Site Assessment Investigations and Implement Required Measures PH-MM-2: Employment of a Toxic Release Contingency Plan	Less than significant
Effect PH-3: Temporary Exposure to Safety Hazards from the Construction Site	Significant	PH-MM-3: Implementation of Construction Site Safety Measures PH-MM-4: Implementation of an Emergency Response Plan	Less than significant
Effect PH-4: Exposure of People or Structures to Increased Flood Risk	Beneficial	None required	Beneficial

Effect PH-1: Temporary Exposure to or Release of Hazardous Materials during Construction

Construction associated with Alternative 1 would involve hazardous materials, such as fuels and lubricants, from the operation of construction equipment and vehicles (e.g., excavators, compactors, haul trucks, and loaders). Fuels and lubricants have the potential to be released into the environment at construction sites and along haul routes, causing potential environmental and human exposure to these hazards. The implementation of a SWPPP would ensure that this effect would be less than significant. Refer to Chapter 2, *Alternatives,* (Section 2.4, *Environmental Commitments*) for a complete description of SWPPP measures. No mitigation is required.

Effect PH-2: Exposure of the Environment to Hazardous Materials during Ground-Disturbing Activities

Clearing and grading would likely be required to implement the proposed levee improvements. This ground disturbance may expose construction workers, the general public, or the environment to hazardous materials such as petroleum hydrocarbons, pesticides, herbicides, fertilizers, contaminated debris, or other hazardous contaminants that would otherwise remain buried in or near the levee. Implementation of a SWPPP would ensure that the risk of accidental exposures and releases into the environment would be minimal and that the effect would not be significant. If a release were to occur, the environmental commitment to prepare a SWPPP, Mitigation Measure PH-MM-1, and Mitigation Measure PH-MM-2 would be implemented to ensure that water quality would be returned to baseline conditions and that any threat to public health would be met with an effective response. Implementation of this environmental commitment and the mitigation measures will reduce this effect to a less-than-significant level.

While not a construction-related effect, slurry cutoffs walls implemented under the project could provide an incidental and indirect operational benefit of inhibiting groundwater contaminants from entering the Feather River.

Environmental Commitment: Stormwater Pollution Prevention Plan

Refer to Chapter 2, *Alternatives* (Section 2.4.12) for a detailed description of the SWPPP.

Mitigation Measure PH-MM-1: Complete Phase I and Phase II (if Necessary) Environmental Site Assessment Investigations and Implement Required Measures

SBFCA will conduct Phase I Environmental Site Assessments and, if necessary, Phase II Environmental Site Assessments or other appropriate testing. If necessary, before construction activities begin, the assessment will include an analysis of soil or groundwater samples for the potential contamination sites that were not covered by previous investigations..

Recommendations in Phase I and Phase II Environmental Site Assessments to address any contamination that is found will be implemented before initiating ground-disturbing activities. In addition, SBFCA will implement the following measures before ground-disturbing or demolition activities begin, in order to reduce health hazards associated with potential exposure to hazardous substances.

- Prepare a site plan that identifies any necessary remediation activities appropriate for proposed land uses, including excavation and removal of contaminated soils, and redistribution of clean fill material on the project site. The plan will include measures that ensure the safe transport, use, and disposal of contaminated soil and building debris removed from the site, as well as any other hazardous materials. In the event that contaminated groundwater is encountered during site excavation activities, the contractor will report the contamination to the appropriate regulatory agencies, dewater the excavated area, and treat the contaminated groundwater to remove contaminants before discharge into the sanitary sewer system. The contractor will be required to comply with the plan and applicable Federal, state, and local laws.
- Retain licensed contractors to remove all underground storage tanks.
- Notify the appropriate Federal, state, and local agencies if evidence of previously undiscovered soil or groundwater contamination is encountered during construction activities. Any contaminated areas will be cleaned up in accordance with the recommendations of the Environmental Health Division for Sutter, Butte, and Yuba Counties, Central Valley RWQCB, California Department of Toxic Substances Control, or other appropriate Federal, state or local regulatory agencies.

Prepare a worker health and safety plan before the start of construction activities that identifies, at a minimum, all contaminants that could be encountered during construction activity; all appropriate worker, public health, and environmental protection equipment and procedures to be used during project activities; emergency response procedures; the most direct route to the nearest hospitals; and a site safety officer. The plan will describe actions to be taken should hazardous materials be encountered onsite, including protocols for handling hazardous materials and preventing their spread, and emergency procedures to be taken in the event of a spill.

Mitigation Measure PH-MM-2: Employment of a Toxic Release Contingency Plan

The construction contractor will coordinate with regional and local planning agencies to incorporate a toxic release contingency plan, pursuant to California Government Code Section 8574.16, which requires that regional and local planning agencies incorporate such a measure within their planning. Implementation of this plan will ensure the effective and efficient use of resources in the areas of traffic and crowd control; firefighting; hazardous materials response and cleanup; radio and communications control; and provision of medical emergency services.

Effect PH-3: Temporary Exposure to Safety Hazards from the Construction Site

Construction associated with Alternative 1 would involve operation of vehicles and other mechanical equipment by construction workers that, if used improperly, could result in safety hazards at the construction site to workers and the public (e.g., pedestrians, bicyclists). Also, the staging of the equipment during hours of non-operation (e.g., weekends, holidays, and overnight) may pose a threat to public safety if the equipment is not properly secured. Implementation of Mitigation Measures PH-MM-3 and PH-MM-4 would reduce this effect to a less-than-significant level.

Mitigation Measure PH-MM-3: Implementation of Construction Site Safety Measures

The construction contractor will ensure that all workers are properly trained to operate equipment. Safety precautions will be followed at all times during construction to avoid accidents. The construction contractor will also require that all workers have valid drivers' licenses and insurance. Proper signage and detours will be provided to ensure public safety.

Mitigation Measure PH-MM-4: Implementation of an Emergency Response Plan

Development of an emergency response plan will ensure that any accidents that occur at the construction site will be responded to in the appropriate manner. The construction contractor will develop the emergency response plan, taking into consideration the location of nearby emergency response agencies as well as emergency response access routes and response times.

Effect PH-4: Exposure of People or Structures to Increased Flood Risk

All levees have the potential to fail, regardless of design. USACE has set forth guidelines for levee design. Alternative 1 would result in improved levees in the project area through implementation of levee improvement methods that meet engineering requirements set forth by both USACE and the CVFPB. This would be an improvement compared to existing flood protection. Therefore, this effect would be beneficial. No mitigation is necessary.

3.16.4.3 Alternative 2

Implementation of Alternative 2 would potentially result in effects on public health and environmental hazards. These potential effects and related mitigation measure requirements are summarized in Table 3.16-4 and discussed below.

Table 3.16-4. Public Health and Environmental Hazards Effects and Mitigation Measures for Alternative 2

Effect	Finding	Mitigation Measures	With Mitigation
Effect PH-1: Temporary Exposure to or Release of Hazardous Materials during Construction	Significant	Environmental Commitment: Stormwater Pollution Prevention Plan	Less than significant
Effect PH-2: Exposure of the Environment to Hazardous Materials during Ground-Disturbing Activities	Significant	Environmental Commitment: Stormwater Pollution Prevention Plan PH-MM-1: Complete Phase I and Phase II (if Necessary) Environmental Site Assessment Investigations and Implement Required Measures PH-MM-2: Employment of a Toxic Release Contingency Plan	Less than significant
Effect PH-3: Temporary Exposure to Safety Hazards from the Construction Site	Significant	PH-MM-3: Implementation of Construction Site Safety Measures PH-MM-4: Implementation of an Emergency Response Plan	Less than significant
Effect PH-4: Exposure of People or Structures to Increased Flood Risk	Beneficial	None required	Beneficial

Effect PH-1: Temporary Exposure to or Release of Hazardous Materials during Construction

Construction associated with Alternative 2 would involve hazardous materials, such as fuels and lubricants, from the operation of construction equipment and vehicles (e.g., excavators, compactors, haul trucks, and loaders). Fuels and lubricants have the potential to be released into the environment at construction sites and along haul routes, causing potential environmental and human exposure to these hazards. The implementation of a SWPPP would ensure that this effect would be less than significant. Refer to Chapter 2, *Alternative*s, (Section 2.4, *Environmental Commitments*). No mitigation is required.

Effect PH-2: Exposure of the Environment to Hazardous Materials during Ground-Disturbing Activities

Clearing and grading would likely be required to implement the proposed levee improvements. This ground disturbance may expose construction workers, the general public, or the environment to hazardous materials such as petroleum hydrocarbons, pesticides, herbicides, fertilizers, contaminated debris, or other hazardous contaminants that would otherwise remain buried in or near the levee. Implementation of a SWPPP would ensure that the risk of accidental exposures and releases into the environment would be minimal and that the effect would not be significant. If a release were to occur, the environmental commitment to prepare a SWPPP, Mitigation Measure PH-MM-1, and Mitigation Measure PH-MM-2 would be implemented to ensure that water quality would be returned to baseline conditions and that any threat to public health would be met with an effective response. Implementation of this environmental commitment and the mitigation measures will reduce this effect to a less-than-significant level.

While not a construction-related effect, slurry cutoffs walls implemented under the project could provide an incidental and indirect operational benefit of inhibiting groundwater contaminants from entering the Feather River.

Effect PH-3: Temporary Exposure to Safety Hazards from the Construction Site

Construction associated with Alternative 2 would involve operation of vehicles and other mechanical equipment by construction workers that, if used improperly, could result in safety hazards at the construction site to workers and the public (e.g., pedestrians, bicyclists). Also, the staging of the equipment during hours of non-operation (e.g., weekends, holidays, and overnight) may pose a threat to public safety if the equipment is not properly secured. Implementation of Mitigation Measures PH-MM-3 and PH-MM-4, as described in the discussion of Alternative 1, would reduce this effect to a less-than-significant level.

Effect PH-4: Exposure of People or Structures to Increased Flood Risk

All levees have the potential to fail, regardless of design. USACE has set forth guidelines for levee design. Alternative 2 would result in improved levees in the project area through implementation of levee improvement methods that meet engineering requirements set forth by both USACE and the CVFPB. This would be an improvement compared to the existing flood protection. Therefore, this effect would be beneficial. No mitigation is necessary.

3.16.4.4 Alternative 3

Implementation of Alternative 3 would potentially result in effects on public health and environmental hazards. These potential effects and related mitigation measure requirements are summarized in Table 3.16-5 and discussed below.

Table 3.16-5. Public Health and Environmental Hazards Effects and Mitigation Measures for Alternative 3

Effect	Finding	Mitigation Measures	With Mitigation
Effect PH-1: Temporary Exposure to or Release of Hazardous Materials during Construction	Significant	Environmental Commitment: Stormwater Pollution Prevention Plan	Less than significant
Effect PH-2: Exposure of the Environment to Hazardous Materials during Ground-Disturbing Activities	Significant	Environmental Commitment: Stormwater Pollution Prevention Plan PH-MM-1: Complete Phase I and Phase II (if Necessary) Environmental Site Assessment Investigations and Implement Required Measures PH-MM-2: Employment of a Toxic Release Contingency Plan	Less than Significant
Effect PH-3: Temporary Exposure to Safety Hazards from the Construction Site	Significant	PH-MM-3: Implementation of Construction Site Safety Measures PH-MM-4: Implementation of an Emergency Response Plan	Less than Significant
Effect PH-4: Exposure of People or Structures to Increased Flood Risk	Beneficial	None required	Beneficial

Effect PH-1: Temporary Exposure to or Release of Hazardous Materials during Construction

Construction associated with Alternative 3 would involve hazardous materials, such as fuels and lubricants, from the operation of construction equipment and vehicles (e.g., excavators, compactors, haul trucks, and loaders). Fuels and lubricants have the potential to be released into the environment at construction sites and along haul routes, causing potential environmental and human exposure to these hazards. The implementation of a SWPPP would ensure that this effect would be less than significant. Refer to Chapter 2, *Alternatives,* (Section 2.4, *Environmental Commitments*). No mitigation is required.

Effect PH-2: Exposure of the Environment to Hazardous Materials during Ground-Disturbing Activities

Clearing and grading would likely be required to implement the proposed levee improvements. This ground disturbance may expose construction workers, the general public, or the environment to hazardous materials such as petroleum hydrocarbons, pesticides, herbicides, fertilizers, contaminated debris, or other hazardous contaminants that would otherwise remain buried in or near the levee. Implementation of a SWPPP would ensure that the risk of accidental exposures and releases into the environment would be minimal and that the effect would not be significant. If a release were to occur, the environmental commitment to prepare a SWPPP, Mitigation Measure PH-MM-1, and Mitigation Measure PH-MM-2 would be implemented to ensure that water quality would be returned to baseline conditions and that any threat to public health would be met with an effective response. Implementation of this environmental commitment and the mitigation measures will reduce this effect to a less-than-significant level.

While not a construction-related effect, slurry cutoffs walls implemented under the project could provide an incidental and indirect operational benefit of inhibiting groundwater contaminants from entering the Feather River.

Effect PH-3: Temporary Exposure to Safety Hazards from the Construction Site

Construction associated with Alternative 3 would involve operation of vehicles and other mechanical equipment by construction workers that, if used improperly, could result in safety hazards at the construction site to workers and the public (e.g., pedestrians, bicyclists). Also, the staging of the equipment during hours of non-operation (e.g., weekends, holidays, and overnight) may pose a threat to public safety if the equipment is not properly secured. Implementation of Mitigation Measures PH-MM-3, and PH-MM-4, described in the discussion of Alternative 1, would reduce this effect to a less-than-significant level.

Effect PH-4: Exposure of People or Structures to Increased Flood Risk

All levees have the potential to fail, regardless of design. USACE has set forth guidelines for levee design. Alternative 3 would result in improved levees in the project area through implementation of levee improvement methods that meet engineering requirements set forth by both USACE and the CVFPB. This would be an improvement compared to the existing flood protection. Therefore, this effect would be beneficial. No mitigation is necessary.

3.17 Cultural Resources

3.17.1 Introduction

This section describes the regulatory and environmental setting for cultural resources; effects on cultural resources that would result from the No Action Alternative and Alternatives 1, 2, and 3; and mitigation measures that would reduce significant effects on cultural resources.

For the purposes of this section, *cultural resources* consist of historic and prehistoric archaeological sites, traditional cultural properties, and built environment resources.

Archaeological resources consist of the physical remains of past human activity, when such remains have been preserved in the ground but no longer take the form of a standing structure such as a house or building. Archaeological remains may occur in the same place as standing structures but are considered a distinct element (called a *component*) of the larger resource.

Traditional cultural properties consist of resources that are associated with the practices or beliefs of a living community and are (a) rooted in that community's history for at least 50 years and (b) important in maintaining the continuing cultural identity of the community (Parker and King 1998:1).

Built environment resources consist of standing structures, residences, and engineered works such as levees, bridges, ditches, and pumping plants. Where these resources form a landscape unified by a coherent historical or design theme, they may qualify as a rural historic landscape (U.S. Department of the Interior 1999:1). Typically, built environment resources must also be older than 50 years to qualify as cultural resources.

3.17.2 Affected Environment

The following summary describes the regulatory and environmental setting that is relevant to the analysis of effects on cultural resources.

3.17.2.1 Regulatory Setting

This section summarizes key Federal and state regulatory information that applies to cultural resources. Additional regulatory information appears in Appendix A.

Federal

National Environmental Policy Act

NEPA establishes the Federal policy of protecting important historic, cultural, and natural aspects of our national heritage during Federal project planning. All Federal or federally assisted projects requiring action pursuant to Section 102 of NEPA must take into account the effects on cultural resources (42 USC §4321–4347).

The CEQ Guidelines provide a standard for determining the significance of effects analyzed under NEPA. *Significance* as used in NEPA requires considering effects in terms of both context and intensity (40 CFR §1508.27).

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

Collectively, these considerations mean that NEPA analysis should identify the potential for a project to adversely (i.e., significantly) affect resources that are or may be eligible for listing on the NRHP.

Section 106 of the National Historic Preservation Act of 1966

The FRWLP requires permits to discharge fill to waters of the United States under Section 404 of the Clean Water Act (33 USC §1344) and authorization to modify federally regulated levees under Section 14 of the Rivers and Harbors Act (33 USC §408). Because these Federal permissions may result in effects on *historic properties*, or cultural resources listed on or eligible for listing in the NRHP (36 CFR Part 800.16[l][1]), they are undertakings that require compliance with Section 106 of the National Historic Preservation Act (NHPA) (16 USC §470f) (Section 106). Section 106 requires Federal agencies to consider the effects of their actions on historic properties.

The proposed FRWLP is a large, phased construction project. The Section 106 regulations specifically authorize phased management of cultural resources where the project area covers a large area or access is restricted (36 CFR Part 800.4[b][2]). This section of the regulations allows the agency to provide for a phased management process in a programmatic agreement (PA) or memorandum of agreement. USACE is working with SBFCA to develop a programmatic agreement that provides for a phased review process for Section 106. Under the draft PA, SBFCA will work with USACE to perform management activities required under Section 106 for discrete phases of the project according to the proposed construction schedule. For each discrete phase, SBFCA and USACE will complete the following steps.

- Prepare a map of the area of potential effects (APE) for the phase in consultation with the State Historic Preservation Officer (SHPO).
- Complete an inventory of the APE.
- Evaluate all cultural resources in the APE for eligibility for listing in the NRHP.
- Prepare a finding of effect for each resource.
- Resolve significant effects through treatment or avoidance.

The management activities prescribed in the Programmatic Agreement (PA) will be conducted in consultation with SHPO, the Native American community, and any other party that constitutes a stakeholder in the management of cultural resources for the project.

Native American Graves Protection and Repatriation Act

The Native American Graves Protection and Repatriation Act (NAGPRA) defines the ownership of Native American human remains and funerary materials excavated on lands owned or controlled by the Federal government. NAGPRA is applicable because the FRWLP may traverse Federal lands.

Archaeological Resources Protection Act

The Archaeological Resources Protection Act (ARPA) requires a permit for intentional excavation of archaeological materials on Federal lands (16 USC 470ee[a]). ARPA is applicable because the FRWLP may traverse Federal lands. The Federal agency that owns or controls the land may dispense permits for excavation as provided in the ARPA regulations (43 CFR §7.5). The permit may require notice to affected Indian tribes (43 CFR §7.7) and compliance with the terms and conditions provided in the ARPA regulations (43 CFR §7.9).

State

California Environmental Quality Act—Statute and Guidelines

CEQA requires the lead agency to consider the effects of a project on cultural resources. Two categories of cultural resources are specifically called out in the State CEQA Guidelines: *historical resources* (State CEQA Guidelines §15064.5[b]) and *unique archaeological sites* (State CEQA Guidelines §15064.5[c] and PRC §21083.2). Different legal rules apply to the two different categories of cultural resources, although the two categories sometimes overlap where a unique archaeological resource also qualifies as a historical resource. In such an instance, the more stringent rules for archaeological resources that are historical resources apply. Appendix A provides additional background on CEQA as it pertains to cultural resources; it also provides information on other California laws that set forth special rules for dealing with human remains that might be encountered during construction.

Local

Butte County, Sutter County, and the City of Yuba City each have adopted goals and policies related to cultural resources. These are detailed in Appendix A.

3.17.2.2 Environmental Setting

The prehistoric, ethnographic, and historic contexts for the FRWLP are described in Appendix I. These contexts provide an overview of the significance themes relevant to the analysis of effects on cultural resources.

3.17.3 Environmental Consequences

This section describes the environmental consequences relating to cultural resources for the proposed project. The section first provides an overview of the methods used to determine the effects of the proposed project and the thresholds used to conclude whether an effect would be significant. Descriptions of specific effects and mitigation measures follow.

3.17.3.1 Assessment Methods

This section summarizes the sources of information used to identify known (i.e., previously recorded) cultural resources as well as the potential for additional cultural resources to be identified in the project area. This section also describes the specific mechanisms for effects on cultural resources associated with the FRWLP. Together, data on the kinds of resources that occur in the footprint of the project alternatives and the effect mechanisms of these alternatives were used to describe the potential effects of the alternatives under consideration.

Data Sources

Records Search

Data sources for this effects analysis include a records search, query of the shipwreck database maintained by the California State Lands Commission (CSLC), Native American correspondence, and the environmental setting provided in Appendix I.

On June 22, 2011, ICF conducted a records search at the Northeastern Information Center (NEIC) of the California Historical Information System (CHRIS) at Chico State University in Chico, California. The NEIC maintains the State of California's official records of previous cultural resources studies and recorded cultural resources for Butte and Sutter Counties. The records search consulted the CHRIS base maps of previously recorded cultural resources for the project area, encompassing the levee and a 500-meter buffer around the approximate project footprint, including the land and water sides of the levee. Additional sources of information, including previously conducted cultural resources surveys and historical maps (U.S. Geological Survey [USGS] and General Land Office [GLO]), were selectively reviewed to determine areas that have a high potential for the presence of historical and prehistoric sites. An ICF archaeologist also reviewed the following registers and lists.

- NRHP and California Register of Historical Resources (CRHR).
- California Office of Historic Preservation Historic Property Directory (2010).
- California Inventory of Historic Resources (1976).
- California State Historic Landmarks (1996).
- California Points of Historical Interest (1992).

A total of 26 previously recorded cultural resources were identified within the project area that may be subject to effects and also have the potential to qualify as historical resources or historic properties. Of these, 17 consist of built environment resources and 9 are archaeological resources. These resources include resources that were identified through the record search as well as field inventory and historical research.

Projects that affect cultural resources that have not been evaluated or determined eligible for the NRHP or CRHR may still result in significant effects, where facts indicate the affected resources are likely to possess significance and integrity within the meaning of CEQA or the NRHP. For example, the California PRC provides that a lead agency may determine that a cultural resource likely qualifies as a historical resource when analyzing the significant effects of a project, even if the resource has not been determined eligible or evaluated per the significance criteria provided in the State CEQA Guidelines (PRC §21084.1). This section must be read in the context of the general requirement that all of the lead agency's conclusions must be supported by fact and inferences supported by fact (State CEQA Guidelines §15384). Section 21084.1 thus indicates that a lead agency should conservatively estimate whether or not affected cultural resources are likely to qualify as historical resources, even if technical work evaluating such resources has not been completed. Such evaluations should be supported by fact, but need not contain the same level of detail that can be provided in focused cultural resources surveys and evaluations.

The basis for the conclusion that potentially affected resources may be historic properties or historical resources is provided in Appendix I, Section I.4, *Identified Resources Affected by the Action Alternatives.* Completion of evaluation reports and associated technical work in coordination with SHPO is necessary to confirm these preliminary recommendations.

The records search indicated that 16 cultural resources surveys have been conducted within the records search corridor. These surveys have collectively covered approximately 25% of the records search area. Of the 16 studies, 7 were conducted more than 10 years ago. The majority of the surveys focused on the levee and its immediate vicinity (Appendix I, Table I-2).

Shipwreck Database

ICF also completed a query of the CSLC shipwreck database. The query results indicated that a historic-era shipwreck is located in the Feather River just west of Nicolaus and north of SR 99. The shipwreck is recorded as a steamship named *RK Page* that sunk in 1853 after a boiler explosion. It is not anticipated the project will affect this resource because most work is constrained to the levee and the landside and waterside areas in the immediate vicinity.

Contact with Interested Parties

ICF sent a letter to the Native American Heritage Commission (NAHC) on February 23, 2012. In this letter, ICF requested that the NAHC perform a query of the Sacred Lands File (a database of features important to Native Americans) and provide a list of Native American contacts for Sutter and Butte Counties. The NAHC responded by letter on March 22, 2012, indicating that the NAHC did not identify any resources in the database that occur within the project area. The NAHC also responded with a list of Native American individuals and organizations that may have concerns or information regarding cultural resources that may occur in the project area. As part of the consultation conducted under Section 106, USACE contacted Native American individuals and organizations. ICF, in cooperation with USACE, is participating in active consultation with Native American representatives to identify known cultural resources and areas of sensitivity for unknown cultural resources that may be affected by the project. As described in Appendix I, ICF contacted all parties identified in the NAHC list by letter on September 28, 2012. Both the Enterprise Rancheria and the Mooretown Rancheria responded by letter and requested the opportunity to review cultural resources finds and technical documents.

Contextual Information

The environmental setting included in Appendix I provides an overview of the prehistoric, ethnographic, and historic activities that generate cultural resources. These literature sources demonstrate intense human activity in the region for the past 10,000 years. Because these human activities generate physical remains such as prehistoric sites and historic structures and residences, the project area for the FRWLP is sensitive for additional cultural resources that have not been identified.

Field Methods (Survey)

ICF cultural resources staff conducted a pedestrian survey of the project area during spring and summer 2012. During the pedestrian survey, ICF visited previously identified resources and recorded previously unidentified resources. For identified resources, ICF either confirmed the boundaries and description of identified resources or gathered data to support updates to the site record. For previously unidentified resources, ICF recorded the boundaries and nature of the resource and collected data to support preparation of site or resource records using California Department of Parks and Recreation (DPR) forms. Evaluations of affected resources are in progress.

Test Excavation and Evaluation

Evaluation of identified resources is in progress using standard methods. For archaeological resources, test excavation may be used to identify archaeological resource boundaries and assess resource integrity to determine if the resource has data potential. For built environment resources, recordation and assessment per relevant significance themes are used to determine the integrity and significance of the resource.

Effect Mechanisms

FRWLP-related activities may affect cultural resources directly or indirectly. Direct effects on cultural resources may occur through any of the following actions.

- Ground-disturbing construction that damages historic or prehistoric archaeological sites and impairs the constituent deposits in the sites and their utility for answering archaeological research questions.
- Ground-disturbing construction that unearths and damages human remains.
- Direct demolition of built environment resources such as historic-era residences, structures, or buildings.
- Direct excavation or alteration of traditional cultural properties.
- Direct effects on individual resources that create significant effects on rural historic landscapes, where the individual resource is a constituent element of the rural historic landscape.

Indirect effects may occur under any of the following actions.

- Construction in the vicinity of a resource removes features of the surrounding setting, where the setting is an integral part of the resource.
- Construction in the vicinity introduces new physical features that are incongruent with the setting, where the setting is an integral part of the resource.

- Introduction of new sources of sound or activities in the vicinity that would be inconsistent with the setting, where the setting is an integral part of the resource.
- Increasing public access or traffic near a resource, where increased access or traffic would result in looting or inadvertent damage.
- Vibration associated with construction, where vibration may damage the integrity of a resource such as a residence or structure that is susceptible to vibration damage.

3.17.3.2 Determination of Effects

Effects on cultural resources are considered significant if the FRWLP would result in any of the following, under the respective laws that govern the FRWLP.

- Under CEQA, an effect is significant if it would demolish or materially alter the qualities that justify the resource for inclusion or eligibility for inclusion on the CRHR (State CEQA Guidelines §15064.5[b][2][A],[C]).
- Under CEQA, an effect is also significant if it would demolish or materially alter the qualities that justify the inclusion of the resource on a local register (State CEQA Guidelines §15064.5[b][2][B]) or its identification as a historical resource survey meeting the requirements of PRC §5024.1(g).
- CEQA also covers effects on unique archaeological sites. Effects on unique archaeological sites are significant if they would demolish or materially impair the characteristics that allow a site to qualify as a unique archaeological resource (PRC §21083.2[g]).
- CEQA protects interred human remains. Under CEQA, an effect is significant if it would disturb human remains, including remains interred outside of established cemeteries (State CEQA Guidelines, Appendix G checklist).
- Under Section 106, effects are significant if they would alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the NRHP in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association (36 CFR 800.5[a][1]). Significant effects under Section 106 only include effects on resources that are NRHP-eligible or NRHP-listed; effects on resources considered significant under state law are not significant effects under Section 106 if those resources do not qualify for listing in the NRHP.

3.17.3.3 Distinguishing Effects on Cultural Resources under CEQA and NEPA

It should be noted that while the NRHP emphasizes resources that are significant at a national level, and resources protected under state law are more inclusive of state or local significance themes, there is substantial overlap between the two. For example, National Register Bulletin 15, How to Apply the National Register Criteria for Evaluation, indicates that the NRHP may include properties that are significant at both the state and local levels (U.S. Department of the Interior 1990:i). The California Office of Historic Preservation mirrors the emphasis that NRHP-eligible resources may be significant at the local level (California Office of Historic Preservation 2012:2).

Resources that are significant at a national level are also eligible as historical resources under CEQA (California Office of Historic Preservation 2012:1). However, in some instances, resources may qualify as historical resources under CEQA that are not eligible for the NRHP. For example, the State CEQA Guidelines indicate that historical resources for the purposes of CEQA analysis will include resources listed on local registers (14 CCR Section 15064.5[a][2]). While historical resources that meet the significance criteria under CRHR regulations (CCR Sections 4851 and 4852) are typically also eligible for the NRHP, resources that only achieve significance under local registers may qualify as historical resources under CEQA without qualifying as historic properties. For this latter category of resources, significant effects would contribute to a significant effect under CEQA without resulting in a significant effect under NEPA or Section 106.

3.17.4 Effects and Mitigation Measures

Effects and mitigation measure requirements concerning cultural resources are summarized in Table 3.17-1.

Table 3.17-1. Summary of Effects for Cultural Resources

Effect	Finding	Mitigation Measures	With Mitigation
Alternatives 1, 2, and 3			
Effect CR-1: Effects on Identified Archaeological Sites Resulting from Construction of Levee Improvements and Ancillary Facilities	Significant	CR-MM-1: Perform Field Studies, Evaluate Identified Resources and Determine Effects, and Develop Treatment to Resolve Significant Effects	Significant and unavoidable
Effect CR-2: Potential to Disturb Unidentified Archaeological Sites	Significant	CR-MM-2: Implement a Cultural Resources Discovery Plan, Provide Related Training to Construction Workers, and Conduct Construction Monitoring	Significant and unavoidable
Effect CR-3: Potential to Disturb Human Remains	Significant	CR-MM-3: Monitor Culturally Sensitive Areas during Construction and Follow State and Federal Laws Governing Human Remains if Such Resources Are Discovered	Significant and unavoidable
Effect CR-4: Direct and Indirect Effects on Built Environment Resources Resulting from Construction Activities	Significant	CR-MM-4: Conduct Inventory of Built Environment Resources, Evaluate Identified Properties, Assess Effects, and Prepare Treatment to Resolve and Mitigate Significant Effects	Significant and unavoidable

3.17.4.1 No Action Alternative

Under the No Action Alternative, no levee improvements would be made to increase the level of protection, and it is presumed that no ground-disturbing activities associated with levee repair and alternatives would occur. Because no levee improvements would be made under the No Action Alternative, the risk that the Feather River West Levee could fail due to seepage or slope stability/geometry issues would continue. Failure of the Feather River West Levee, depending on the magnitude of the event, could cause catastrophic flooding in the Sutter Basin. If this levee failed, inundation of debris and mud from that failure could significantly damage or completely destroy any resource in its path. Furthermore, emergency efforts to contain and repair a failed levee could potentially cause the same effects described for the proposed alternatives—and possibly with greater significance. Although the levee would be damaged, the potential extent of damage to the resource is unknown. It is also unknown whether these events would transpire and affect other cultural resources; therefore, further analysis of effects on cultural resources would be speculative. Federal agencies responsible for levee repairs would be responsible for compliance with Section 106, and local governments would be responsible for carrying out Federal programs. Local agencies participating or implementing repairs would be responsible for compliance with CEQA.

3.17.4.2 Alternative 1

Implementation of Alternative 1 would potentially result in effects on cultural resources. These potential effects and related mitigation measure requirements are summarized in Table 3.17-2 and discussed below.

Table 3.17-2. Cultural Resources Effects and Mitigation Measures for Alternative 1

Effect	Finding	Mitigation Measures	With Mitigation
Effect CR-1: Effects on Identified Archaeological Sites Resulting from Construction of Levee Improvements and Ancillary Facilities	Significant	CR-MM-1: Perform Field Studies, Evaluate Identified Resources and Determine Effects, Develop Treatment to Resolve Significant Effects	Significant and unavoidable
Effect CR-2: Potential to Disturb Unidentified Archaeological Sites	Significant	CR-MM-2: Implement a Cultural Resources Discovery Plan, Provide Related Training to Construction Workers, and Conduct Construction Monitoring	Significant and unavoidable
Effect CR-3: Potential to Disturb Human Remains	Significant	CR-MM-3: Monitor Culturally Sensitive Areas during Construction and Follow State and Federal Laws Governing Human Remains if Such Resources Are Discovered	Significant and unavoidable
Effect CR-4: Direct and Indirect Effects on Built Environment Resources Resulting from Construction Activities	Significant	CR-MM-4: Conduct Inventory of Built Environment Resources, Evaluate Identified Properties, Assess Effects, and Prepare Treatment to Resolve and Mitigate Significant Effects	Significant and unavoidable

Effect CR-1: Effects on Identified Archaeological Sites Resulting from Construction of Levee Improvements and Ancillary Facilities

A range of archaeological resources have been identified that may be affected by this alternative (nine resources as indicated in Appendix I, Table I-4). Identified prehistoric resources contain midden (habitation debris), human burials, hearths (charred remains from cooking), and lithic debris (remains from manufacture of stone tools). Deposits with these constituents often have data potential for archaeological research, which strives to describe human adaptations and their changes over time and to construct meaningful explanations for these changes. Because material in these sites may be useful for this purpose, it is likely that many of these sites have significance within the meaning of 14 CCR §4852(b)(4) (data potential). Furthermore, because many of these resources are expansive (each in excess of 30 meters across), they are each likely to contain some portion of the deposit with sufficient integrity to yield meaningful data (14 CCR §4852[c]).

Additional research value may be associated with specific deposits that cannot be identified in advance. For these same reasons, these sites are likely to be eligible for inclusion in the NRHP because they may yield information pertinent to prehistoric archaeological research (30 CFR Part 60.4[d]). These sites thus are likely to qualify as historical resources and historic properties. Individual sites and their potential register eligibility are described in Appendix I, Section I.4, *Identified Resources Affected by the Action Alternatives.* Potential resource-specific treatments are identified in Appendix I, Table I-4.

Identified historic-era archaeological sites are associated with the themes of mining, transportation, and settlement. These themes are significant because they are associated with the historic-era economy and development of the region. For these reasons, it is likely that many of these sites have significance within the meaning of 14 CCR §4852(b)(1) (association with the broad patterns of history). In addition, because these sites contain physical remnants of the activities associated with these themes, they may be able to elucidate significant details regarding the settlement of the region and expansion of Euro-American populations into the Sacramento Valley. For this reason, these sites may have data potential within the meaning of 14 CCR §4852(b)(4). While these sites have not been revisited to assess their integrity, these resources are expansive (e.g., CA-BUT-465 is described as a landscape feature spanning several miles) and it is likely that some portion of the deposits remain with sufficient integrity to yield data (14 CCR §4852[c]). For these same reasons, these sites are likely to have significance and integrity for the NRHP as defined in 30 CFR §60.4, because these sites may yield information in historic research regarding the theme of settlement and resource extraction in California, a theme that is significant at the local, state, and national levels (30 CFR §60.4[a]). The NRHP may include resources that are significant at the state, local, and national levels (U.S. Department of the Interior 1990:i). These sites thus are likely to qualify as historical resources and historic properties.

Construction of levee improvements and ancillary activities such as borrow operations have the potential to directly disturb identified resources through ground-disturbing excavation or by placement of large, durable new features such as seepage berms or stability berms over these resources. Because direct disturbance through excavation would disrupt the associations that contain meaningful information, it would potentially materially impair these resources under CEQA (State CEQA Guidelines §15064.5[b][2][A],[C]). For the same reasons, this work could result in significant effects under Section 106 (36 CFR Part 800.5[a][1]). Mitigation Measure CR-MM-1 is available to reduce these effects. In addition, this mitigation addresses management steps necessary under Section 106 to resolve significant effects by attempting to avoid or minimize those effects or to recover consequential information where avoidance is not feasible. Because mitigation cannot guarantee that all effects would be avoided (even where such effects would be resolved under Section 106), these effects would remain significant and unavoidable for the purposes of CEQA.

Mitigation Measure CR-MM-1: Perform Field Studies, Evaluate Identified Resources and Determine Effects, and Develop Treatment to Resolve Significant Effects

Prior to the completion of the final environmental impact statement/final environmental impact report (FEIS/FEIR), SBFCA and USACE will complete the following mitigation and management steps to satisfy Section 106 (subject to revision based on coordination with SBFCA counsel).

- SBFCA and USACE will ensure that an inventory and evaluation report for cultural resources is completed within all areas of the right-of-way where effects on archaeological resources may occur.

- The work will be led or supervised by cultural resources specialists who meet the Secretary of the Interior's professional qualification standards provided in 36 CFR Part 61.
- Inventory methods will include pedestrian surveys and probabilistic subsurface sampling through excavation with augurs or hand excavating units where feasible.
- Identified resources and newly identified resources will be mapped and described on DPR forms. Mapping will be performed by recording data points with GPS hardware through which data can be imported and managed digitally. Mapping of previously identified resources will be limited to updates of existing records where necessary to describe the current boundaries of the resource.
- For all identified resources, SBFCA and USACE will perform an evaluation to determine if they qualify as historic properties per the criteria provided in 36 CFR Part 60.4.
- The recorded resources and the resource evaluations will be summarized in an inventory and evaluation report (unless testing is required to complete the evaluation, as described below).
- SBFCA and USACE will make a finding of effect; a significant effect will occur if the project would alter, directly or indirectly, the qualities that make a resource eligible for listing in the NRHP (36 CFR Part 800.5[a][1]).
- Where necessary, USACE and SBFCA will conduct test excavation to support the evaluation and finding of effect. Test excavation is typically performed to retrieve a suitable sample of material to determine the constituents and integrity of the resource. Test excavation will be conducted in consultation with SHPO and other relevant parties. Test excavation will follow a testing plan developed in consultation with SHPO, either for the specific resource or as part of the treatment methods developed pursuant to the programmatic agreement that USACE is preparing in consultation with SHPO.
- For all resources subject to significant effects, USACE and SBFCA will implement treatment in consultation with SHPO and other relevant parties such as Native American stakeholders and the public.

To satisfy the requirements of CEQA, SBFCA will also evaluate identified resources to determine if they are historical resources (State CEQA Guidelines §15064.5[a]), unique archaeological resources under CEQA (PRC §21083.2[g]), and/or eligible for local registers.

SBFCA will determine if the project will result in significant effects on historic properties, historical resources, or unique archaeological sites. A significant effect will be found if the project would result in one or more of the following.

- Demolish or materially alter the qualities that make the resource eligible for listing in the CRHR (State CEQA Guidelines §15064.5[b][2][A],[C]).
- Demolish or materially alter the qualities that justify the inclusion of the resource on a local register or its identification in a historical resources survey that meets the requirements of PRC §5024.1(g), unless SBFCA establishes by a preponderance of evidence that the resource is not historically or culturally significant (State CEQA Guidelines §15064.5[b][2][B]).
- Alter, directly or indirectly, the qualities that make a resource eligible for listing in the NRHP (36 CFR Part 800.5[a][1]).

- Demolish or materially impair the qualities that allow a resource to qualify as a unique archaeological site (PRC §21083.2).

For all resources qualifying as unique archaeological resources, historical resources, or historic properties that will be subject to significant effects, SBFCA will develop treatment methods. Such treatment will consist of the following, listed in the order of priority that SBFCA must follow under CEQA.

- Preservation in place will occur where feasible, through methods such as redesign of relevant facilities to avoid destruction or damage to eligible cultural resources, capping resources with fill, or deeding resources into conservation easements.
- Data recovery excavations will be conducted by qualified cultural resources specialists to retrieve the information that makes the resource eligible for CRHR or NRHP listing or that qualifies the site as a unique archaeological resource or a local register–eligible resource. If data recovery through excavation is the appropriate mitigation, a data recovery plan, which makes provisions for adequately recovering the scientifically consequential information from and about the resource, will be prepared and adopted prior to any excavation being undertaken. Such studies will be deposited with the relevant CHRIS center. The data recovery plan will specify the basis for the significance of the resource and methods for retrieving the consequential information from the site. After completion of excavation, SBFCA will synthesize the findings into a data recovery report describing the findings and will deposit the report at the relevant CHRIS center.

The treatment plan will identify treatment methods that are proposed by SBFCA and which measures are proposed by other public entities. The plan will also specify the basis for selecting a particular mitigation measure. Treatment need not be completed before the FEIS/FEIR is prepared, but the evaluation of effects and selection of treatment will be summarized in the FEIS/FEIR.

If preservation in place of archaeological sites that qualify as historical resources or unique archaeological resources is not feasible in light of costs, logistics, technological considerations, the location of the find, and the extent to which preservation of the find is consistent or inconsistent with the design and objectives of the FRWLP, SBFCA will include a discussion in the treatment plan describing why the selected mitigation serves the interests protected by CEQA better than preservation in place.

SBFCA currently estimates that data recovery may be necessary for all of the archaeological sites that may be affected by the project alternatives, because construction is constrained to existing levees and the vicinity; the durable nature of existing flood control works makes avoidance of cultural resources potentially infeasible. Data recovery thus serves the environmental protection goals of CEQA by ensuring that valuable information that would otherwise be lost will be retained to the extent feasible. Potential resource-specific treatments are identified in Appendix I, Table I-4.

Construction will also be monitored, and discoveries of human remains will be treated as prescribed under Mitigation Measures CR-MM-2 and CR-MM-3, below.

Effect CR-2: Potential to Disturb Unidentified Archaeological Sites

The footprint of the proposed alternatives is sensitive for buried and obscured archaeological sites that cannot always be identified in advance of construction. Because much of the right-of-way occurs within natural floodplains, archaeological sites in the right-of-way are subject to the geological processes associated with river systems and flooding. During prehistory, sites were formed over many millennia. When habitation ceased or flood events occurred, interrupting human occupation, these sites may have been obscured by the deposition of sediment. In addition, because of the intensity of farming activity in the historic era, surface manifestations for prehistoric sites may have been obscured by cultivation, leaving portions of the site below grade with no visible indication above ground. Geological processes may obscure historic-era sites as well.

Because these sites may contain important data useful in research, and may have integrity to convey this data, these sites may qualify as historic properties, historical resources, or unique archaeological resources. Disturbance of these resources through direct excavation would materially impair these resources under CEQA and result in significant effects under Section 106 by disrupting scientifically meaningful associations.

While probabilistic subsurface excavation is a standard tool that is available to identify such sites, the scale of the project area and the size of such sites in relation to the acreage affected by the project create conditions where identification of all buried and unknown sites may not be possible. For these reasons, these sites may remain undetected prior to construction. It is particularly worth noting that the construction of deep slurry cutoff walls may disturb deeply buried early Holocene or Pleistocene sites that exist far below grade where there is no feasible means to identify such resources prior to disturbance. Buried sites may contain human remains in addition to archaeological debris. While mitigation is available to minimize these effects under Mitigation Measure CR-MM-2, this mitigation would not ensure that these effects would be avoided. For this reason, this effect is significant and unavoidable.

Mitigation Measure CR-MM-2: Implement a Cultural Resources Discovery Plan, Provide Related Training to Construction Workers, and Conduct Construction Monitoring

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

- An archaeological monitor will be present to observe construction at geographic locations that are sensitive for unidentified cultural resources. Such locations will consist of construction areas near identified cultural resource(s) sites (within a 200-foot radius around the known boundaries of identified resources) and where ground-disturbing construction will occur within 1,500 feet of major water features.
- In the event of an archaeological resource discovery, work will cease in the immediate vicinity of the find, based on the direction of the archaeological monitor or the apparent distribution of cultural resources if no monitor is present. A qualified archaeologist will assess the significance of the find and make recommendations for further evaluation and treatment as necessary.
- Discovered resources will be mapped and described on DPR forms. Mapping will be performed by recording data points digitally with GPS hardware.

- SBFCA will evaluate identified resources to determine if they are unique archaeological sites or historical resources. In consultation with SHPO, USACE will evaluate identified resources to determine if they are historic properties. Test excavations will be performed where necessary to support evaluation. Evaluation and treatment will follow the standards and order of priority described above for Mitigation Measure CR-MM-1, with the exception of timing. Discoveries may occur after the FEIS/FEIR and thus need not be described in that document.
- If human remains are discovered as part of the deposit, SBFCA, USACE, and the contractors will coordinate with the county coroner and NAHC to make the determinations and perform the management steps prescribed in California Health and Safety Code Section 7050.5 and PRC §5097.98.
- If Native American human remains are discovered on Federal land, work in the immediate vicinity will cease, and SBFCA and USACE will contact the relevant representative of the Federal agency where the remains were discovered, as prescribed in 25 USC §3002(d) (NAGPRA). After notification from the relevant agency representative and treatment of the remains as required under NAGPRA, work may continue. Disposition of the remains will follow the ownership priority described in NAGPRA (25 USC §3002[a]).

SBFCA and USACE will develop a list of cultural resources staff who can respond to cultural resources discoveries and SBFCA and USACE will also develop training materials for construction workers regarding management direction following discoveries. The staff list and training materials will be provided to the supervisory field staff. SBFCA and USACE, or their archaeological consultant, will conduct training for construction workers that provides an overview of cultural resources identification and this mitigation measure.

Effect CR-3: Potential to Disturb Human Remains

The project area is located in an area of moderate to high sensitivity for archaeological cultural remains, including burials. Some of the identified archeological resources contain burials, and the remaining right-of-way is sensitive for additional archaeological sites. Ground-disturbing work necessary to construct proposed levee improvements may inadvertently damage and disturb these resources before they can be discovered. In particular, slurry cutoff walls may disturb these resources at depths where the resource cannot be identified, even during monitoring. Slurry cutoff wall construction occurs through use of a bentonite mixture that obscures artifacts and cultural material, making identification infeasible or at least unlikely during monitoring of these features in particular. Mitigation Measure CR-MM-3 would reduce the severity of this effect, but it cannot guarantee the effect would be avoided. For these reasons, this effect remains significant and unavoidable.

Mitigation Measure CR-MM-3: Monitor Culturally Sensitive Areas during Construction and Follow State and Federal Laws Governing Human Remains if Such Resources Are Discovered

SBFCA and USACE will retain a qualified archaeologist to monitor areas of sensitivity for previously unidentified archaeological resources and human remains, as required under Mitigation Measure CR-MM-2. The following actions will be taken.

- If human remains are discovered as part of the deposit or in isolation, work will cease in the immediate vicinity and within the radius necessary to avoid further disturbance. SBFCA, USACE, and the contractors will coordinate with the county coroner and NAHC to make the determinations and perform the management steps prescribed in California Health and Safety Code §7050.5 and PRC §5097.98. This coordination requires the following steps.

 - The county coroner will be notified so that he/she may determine if an investigation regarding the cause of death is required. If the coroner determines that the remains are of prehistoric Native American origin, the coroner will notify the NAHC.
 - Upon notification, the NAHC will identify the most likely descendant (MLD), and the MLD will be given the opportunity to reinter the remains with appropriate dignity. If the NAHC fails to identify the MLD or if the parties cannot reach agreement as to how to reinter the remains as described in PRC §5097.98(e), the landowner will reinter the remains at a location not subject to further disturbance. SBFCA and USACE will ensure the protections prescribed in PRC §5097.98(e) are performed, such as the use of conservation easements and recording of the location with the relevant county.

- If Native American human remains are discovered on Federal land, work in the immediate vicinity will cease, and SBFCA and USACE will contact the relevant representative of the Federal agency where the remains were discovered, as prescribed in 25 USC §3002(d) (NAGPRA). After notification from the relevant agency representative and treatment of the remains as required under NAGPRA, work may continue. Disposition of the remains will follow the ownership priority described in NAGPRA (25 USC §3002[a]).
- SBFCA and USACE will include an overview of the potential for encountering human remains and an overview of this mitigation measure in the training performed under Mitigation Measure CR-MM-2.

Effect CR-4: Direct and Indirect Effects on Built Environment Resources Resulting from Construction Activities

Identified built environment resources consist of structures associated with the historical themes of transportation, water conveyance, and commercial development. A total of 17 identified and potentially eligible built environment resources may be affected by this alternative (Appendix I, Table I-5).

Because these resources are associated with the historical settlement and development of the region, they may have significance under 14 CCR §4852(b)(1)(association with the broad patterns of California or local history). If these resources retain their setting and character-defining elements, they may have integrity under 14 CCR §4852(c). For these reasons, these resources may qualify as historical resources under CEQA. For similar reasons, these resources may qualify as historic properties under NRHP (36 CFR Part 60.4[a]). Because the settlement, development, and reclamation of the Sacramento Valley are significant at both the local and state levels, these resources may be NRHP-eligible if they retain integrity. Demolition of these structures may be required for the construction of new levee improvements such as seepage berms, stability berms, or wider levee prisms. In addition, even if demolition does not occur, these new features may not be consistent with the setting. Construction may also generate substantial vibration (e.g., soil compaction is typically required for seepage berm construction). Vibration may damage structures. For these reasons, construction may impair the ability of these resources to convey their significance, resulting in a significant effect under CEQA. For resources that qualify as historic properties, this effect would also be a significant effect under NEPA and Section 106. The basis for the conclusion that individual resources are register-eligible is provided in Appendix I, Section I.4, *Identified Resources Affected by the Action Alternatives.* Potentially affected built environment resources and potential resource-specific treatments are identified in Appendix I, Table I-5.

Although mitigation is available to reduce this effect, mitigation cannot guarantee these effects would be avoided entirely. Because mitigation cannot guarantee avoidance of these effects, this effect is significant and unavoidable.

An inventory for the right-of-way required for the project alternatives has not been completed. The presence of identified built environment resources and a review of aerial photographs indicate that the right-of-way is sensitive for additional unidentified built environment resources. Such resources may consist of individual structures and residences or landscape-scale features such as rural historic landscapes (U.S. Department of the Interior 1999). In addition, built environment features such as community gathering halls or traditional activity areas may consist of traditional cultural properties (Parker and King 1998). The right-of-way for the proposed alternatives is sensitive for these types of resources because of the intensity of activity in the historic (and prehistoric) era and because the rural setting makes it more likely that these resources may have remained intact. These resources may qualify as historical resources under CEQA or as historic properties under NRHP for their integrity, if they remain intact, and their association with important historic-era themes identified in this setting.

The construction of new levee improvements such as seepage berms, stability berms, or wider levee prisms may require demolition of built environment resources that would be identified through inventory and evaluation efforts. Even if demolition does not occur, these new features may not be consistent with the setting. For these reasons, construction may impair the ability of these resources to convey their significance. While mitigation is available to reduce these effects under Mitigation Measure CR-MM-4, this mitigation cannot guarantee all effects would be avoided. For these reasons, this effect remains significant and unavoidable.

Mitigation Measure CR-MM-4: Conduct Inventory of Built Environment Resources, Evaluate Identified Properties, Assess Effects, and Prepare Treatment to Resolve and Mitigate Significant Effects

Prior to completion of the FEIS/FEIR, SBFCA and USACE will ensure that an inventory and evaluation report is completed for all areas where effects on built environment resources may occur.

- The scope of the inventory will include the entire area where effects may occur. Such effects consist of direct disturbance, damage through vibration, and/or changes to the setting.
- The work will be led or supervised by architectural historians who meet the Secretary of the Interior's professional qualification standards provided in 36 CFR Part 61.
- Inventory methods and evaluation will include pedestrian surveys, photographic documentation, and historical research using primary and secondary sources, interviews, and oral histories.
- Identified resources will be mapped and described on forms provided by DPR. Mapping will be performed by recording data points digitally with GPS hardware.
- For all identified resources, SBFCA will determine if they are historical resources (State CEQA Guidelines §15064.5[a]), significant historical resources under CEQA (PRC §21084.1),

and/or eligible for local registers. USACE, in consultation with SHPO, will evaluate these resources to determine if they are historic properties (36 CFR Part 60.4).

- The recorded resources and the resource evaluations will be summarized in an inventory report. In the inventory report, SBFCA and USACE will also determine if individual resources qualifying as historical resources or historic properties will be subject to significant effects. SBFCA will make such a finding if the FRWLP would result in any of the following actions.
    - Demolish or materially alter the qualities that make the resource eligible for listing in the CRHR (State CEQA Guidelines §15064.5[b][2][A],[C]).
    - Demolish or materially alter the qualities that justify the inclusion of the resource on a local register or its identification in a historical resources survey meeting the requirements of PRC §5024.1(g), unless SBFCA establishes by a preponderance of evidence that the resource is not historically or culturally significant (State CEQA Guidelines §15064.5[b][2][B]).
    - Cause a substantial significant change in the significance of a historical resource (PRC §21084.1).
- USACE, in consultation with SHPO, will make a finding of effect to determine if the project will result in significant effects on NRHP-eligible resources. A finding of adverse (i.e., significant) effect will be made if the project would alter, directly or indirectly, the qualities that make a resource eligible for listing on the NRHP (36 CFR 800.5[a][1]).
- For all resources subject to significant effects (or adverse effects under NEPA), USACE and SBFCA will develop and implement treatment. Treatment will prioritize avoidance and preservation in place. SBFCA will have sole responsibility for mitigating effects on resources that only qualify as historical resources under CEQA without qualifying as historic properties under Section 106. Where avoidance is not feasible, standard treatment such as documentation through the Historic American Building Survey, Historic American Landscape Survey, or Historic American Engineering Record will be completed.
- SBFCA and USACE will complete the inventory, evaluation, and selection of treatment prior to certification of the FEIS/FEIR. In the FEIS/FEIR, SBFCA and USACE will summarize the list of eligible and affected resources, the selected treatment, and the basis for selection of treatment in the FEIS/FEIR. Preservation in place will be prioritized as treatment. Where preservation in place is not feasible, SBFCA and USACE will explain the need for other methods.
- For affected built environment resources that may be affected by the project alternatives, SBFCA currently estimates that documentation or relocation of existing resources rather than avoidance may be necessary because construction is constrained to existing levees and the vicinity; the durable nature of existing flood control works makes avoidance of cultural resources potentially infeasible. Documentation or relocation thus serves the environmental protection goals of CEQA by ensuring that valuable information that would otherwise be lost will be retained to the extent feasible. Potential resource-specific treatments are identified in Appendix I, Table I-5.

3.17.4.3 Alternative 2

Implementation of Alternative 2 would potentially result in effects on cultural resources. These potential effects and related mitigation measure requirements are summarized in Table 3.17-3 and discussed below.

Table 3.17-3. Cultural Resources Effects and Mitigation Measures for Alternative 2

Effect	Finding	Mitigation Measures	With Mitigation
Effect CR-1: Effects on Identified Archaeological Sites Resulting from Construction of Levee Improvements and Ancillary Facilities	Significant	CR-MM-1: Perform Field Studies, Evaluate Identified Resources and Determine Effects, Develop Treatment to Resolve Significant Effects	Significant and unavoidable
Effect CR-2: Potential to Disturb Unidentified Archaeological Sites	Significant	CR-MM-2: Implement a Cultural Resources Discovery Plan, Provide Related Training to Construction Workers, and Conduct Construction Monitoring	Significant and unavoidable
Effect CR-3: Potential to Disturb Human Remains	Significant	CR-MM-3: Monitor Culturally Sensitive Areas during Construction, Follow State and Federal Law Governing Human Remains if Such Resources Are Discovered	Significant and unavoidable
Effect CR-4: Direct and Indirect Effects on Built Environment Resources Resulting from Construction Activities	Significant	CR-MM-4: Conduct Inventory of Built Environment Resources, Evaluate Identified Properties, Assess Effects, and Prepare Treatment to Resolve and Mitigate Significant Effects	Significant and unavoidable

Effect CR-1: Effects on Identified Archaeological Sites Resulting from Construction of Levee Improvements and Ancillary Facilities

A range of archaeological resources have been identified that may be affected by this alternative (nine resources as indicated in Appendix I, Table I-4). This effect would be substantially similar to the effect described for Alternative 1, as identified archaeological resources likewise occur in the footprint of this alternative. Individual site descriptions and potential register eligibility are described in Appendix I, Section I.4, *Identified Resources Affected by the Action Alternatives.* Potential resource-specific treatments are identified in Appendix I, Table I-4. Because this proposed alternative represents a larger footprint than Alternative 1, it is likely that a greater number of resources would be identified through inventory efforts. However, the overall significance conclusion is the same as Alternative 1. Implementation of Mitigation Measure CR-MM-1 described under the Alternative 1 discussion is available to reduce this effect, but the effect would remain significant and unavoidable.

Effect CR-2: Potential to Disturb Unidentified Archaeological Sites

This effect would be substantially similar to the effect described for Alternative 1, as the right-of-way for this alternative is likewise sensitive for resources that have not yet been identified and which cannot feasibly be identified in advance of construction. Because Alternative 2 involves a larger footprint than Alternative 1, this alternative may affect more cultural resources than

Alternative 1. However, the overall significance conclusion is identical to that of Alternative 1. Implementation of Mitigation Measure CR-MM-2 described under the Alternative 1 discussion is available to reduce this effect, but the effect would remain significant and unavoidable.

Effect CR-3: Potential to Disturb Human Remains

This effect would be substantially similar to the effect described for Alternative 1, as the right-of-way is likewise sensitive for unidentified human remains. Because Alternative 2 involves a larger footprint than Alternative 1, the likelihood of disturbing buried human remains is greater under Alternative 2 than under Alternative 1. However, the overall significance conclusion is identical to that of Alternative 1. Implementation of Mitigation Measure CR-MM-3 described under the Alternative 1 discussion is available to reduce this effect, but the effect would remain significant and unavoidable.

Effect CR-4: Direct and Indirect Effects on Built Environment Resources Resulting from Construction Activities

A total of 16 identified and potentially eligible built environment resources may be affected by this alternative (Appendix I, Table I-5).This effect would be substantially similar to the effect described for Alternative 1, as identified and previously unrecorded built environment resources that are likely to qualify as historical resources or historic properties may likewise occur in the right-of-way and may be significantly affected by the construction of improvements. The basis for the conclusion that individual resources are register-eligible is provided in Appendix I, Section I.4, *Identified Resources Affected by the Action Alternatives.* Potentially affected built environment resources and potential resource-specific treatments are identified in Appendix I, Table I-5. Because this alternative involves a larger footprint than Alternative 1, it is likely that a greater number of resources would be identified through inventory efforts. However, the overall significance conclusion is identical to that of Alternative 1. Implementation of Mitigation Measure CR-MM-4 described under the Alternative 1 discussion is available to reduce this effect, but the effect would remain significant and unavoidable.

3.17.4.4 Alternative 3

Implementation of Alternative 3 would potentially result in effects on cultural resources. These potential effects and related mitigation measure requirements are summarized in Table 3.17-4 and discussed below.

Table 3.17-4. Cultural Resources Effects and Mitigation Measures for Alternative 3

Effect	Finding	Mitigation Measures	With Mitigation
Effect CR-1: Effects on Identified Archaeological Sites Resulting from Construction of Levee Improvements and Ancillary Facilities	Significant	CR-MM-1: Perform Field Studies, Evaluate Identified Resources and Determine Effects, and Develop Treatment to Resolve Significant Effects	Significant and unavoidable
Effect CR-2: Potential to Disturb Unidentified Archaeological Sites	Significant	CR-MM-2: Implement a Cultural Resources Discovery Plan, Provide Related Training to Construction Workers, and Conduct Construction Monitoring	Significant and unavoidable
Effect CR-3: Potential to Disturb Human Remains	Significant	CR-MM-3: Monitor Culturally Sensitive Areas during Construction, Follow State and Federal Law Governing Human Remains if Such Resources Are Discovered	Significant and unavoidable
Effect CR-4: Direct and Indirect Effects on Built Environment Resources Resulting from Construction Activities	Significant	CR-MM-4: Conduct Inventory of Built Environment Resources, Evaluate Identified Properties, Assess Effects, and Prepare Treatment to Resolve and Mitigate Significant Effects	Significant and unavoidable

Effect CR-1: Effects on Identified Archaeological Sites Resulting From Construction of Levee Improvements and Ancillary Facilities

A range of archaeological resources have been identified that may be affected by this alternative (nine resources as indicated in Appendix I, Table I-4). This effect would be substantially similar to the effect described for Alternative 1, as identified archaeological resources likewise occur in the footprint of this alternative. Individual site descriptions and potential register eligibility are described in Appendix I, Section I.4, *Identified Resources Affected by the Action Alternatives.* Potentially affected sites and resource-specific treatments are identified in Appendix I, Table I-4. Implementation of Mitigation Measure CR-MM-1 described under the Alternative 1 discussion above is available to reduce this effect, but the effect would remain significant and unavoidable.

Effect CR-2: Potential to Disturb Unidentified Archaeological Sites

This effect would be substantially similar to the effect described for Alternative 1, as the right-of-way for this alternative is likewise sensitive for resources that have not yet been identified and which cannot feasibly be identified in advance of construction. Implementation of Mitigation Measure CR-MM-2 described under the Alternative 1 discussion is available to reduce this effect, but the effect would remain significant and unavoidable.

Effect CR-3: Potential to Disturb Human Remains

This effect would be substantially similar to the effect described for Alternative 1, as the right-of-way is likewise sensitive for unidentified human remains. Implementation of Mitigation Measure CR-MM-3 described under the Alternative 1 discussion is available to reduce this effect, but the effect would remain significant and unavoidable.

Effect CR-4: Direct and Indirect Effects on Built Environment Resources Resulting from Construction Activities

A total of four identified and potentially eligible built environment resources may be affected by this alternative (Appendix I, Table I-5). This effect would be substantially similar to the effect described for Alternative 1, as identified and previously unrecorded built environment resources that are likely to qualify as historical resources or historic properties likewise may occur in the right-of-way and may be significantly affected by the construction of improvements. The basis for the conclusion that individual resources are register-eligible is provided in Appendix I, Section I.4, *Identified Resources Affected by the Action Alternatives.* Potentially affected built environment resources and potential resource-specific treatments are identified in Appendix I, Table I-5. Implementation of Mitigation Measure CR-MM-4 described under the Alternative 1 discussion above is available to reduce this effect, but the effect would remain significant and unavoidable.

Chapter 4
Growth-Inducing and Cumulative Effects

4.1 Growth-Inducing Effects

4.1.1 Introduction

NEPA and CEQA require that an EIS and EIR discuss how a project, if implemented, could induce growth. The following sections present an analysis of the potential growth-inducing effects of the FRWLP. They discuss regulatory background information, the methods used to analyze growth-inducing effects, and conclusions about those effects.

4.1.2 Affected Environment

4.1.2.1 Regulatory Setting

NEPA and CEQA Requirements

Under authority of NEPA, CEQ regulations require an EIS to consider the potential indirect effects of a proposed action. The indirect effects of an action include those that occur later in time or farther away in distance but are still reasonably foreseeable. They may include "growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate" (40 CFR Section 1508.8[b]).

In addition, Section 21100(b)(5) of CEQA requires an EIR to discuss how a proposed project, if implemented, may induce growth and the impacts of that induced growth (see also State CEQA Guidelines Section 15126). CEQA requires an EIR to discuss specifically "the ways in which the proposed project could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment" (State CEQA Guidelines Section 15126.2[d]).

Floodplain Development Regulations

EO 11988 (May 24, 1977) requires a Federal agency, when taking an action, to avoid short- and long-term adverse effects associated with the occupancy and modification of a floodplain, and it must avoid direct and indirect support of floodplain development whenever there is a reasonable and feasible alternative. If the only reasonable and feasible alternative is to site the proposed action in a floodplain, the agency must explain why and must minimize potential harm to or in the floodplain.

In February 1978, the Water Resources Council issued Floodplain Management Guidelines for Implementing EO 11988. These guidelines provide analysis of the EO, definitions of key terms, and an eight-step decision-making process for carrying out the EO's directives. The process contained in the Water Resources Council guidelines incorporates the basic requirements of the EO. The eight-step process is briefly outlined below, followed by discussion of how the FRWLP would apply the process to demonstrate compliance with EO 11988.

- **Step 1: Determine whether a proposed action is in the base floodplain.** (A base floodplain is defined as a 100-year floodplain [a 1% chance to flood] or, if the action falls under the definition of *critical*, discussed below, a 500-year floodplain[a 0.2% chance to flood]). The FRWLP is located primarily on and adjacent to the west levee along the Feather River in Butte and Sutter Counties. Not only is it not directly within the base 100-year floodplain, but it would ultimately improve the current level of protection to reach the goal of 200-year protection for more populated areas. The 100-year floodplain is waterward of the levee. Within the affected area, the top-of-levee elevation ranges from 87.0 to 139.7 feet (NAVD88) and the toe-of-levee ranges from 68.0 to 136.0 feet (NAVD88). The FEMA floodplain presently ranges from 51.5 to 53.3 feet (NAVD88). The proposed project is described in Chapter 2, *Alternatives*, including location, construction methods, and operation and maintenance activities.

  The Water Resources Council Floodplain Management Guidelines present the concept of a *critical action*. While they offer no precise definition, the guidelines (under Part II, Decision-Making Process, Step 1C) outline parameters and describe a critical action as "any activity for which even a slight chance of flooding is too great." This definition is intended to apply to Federal actions that would involve facilities or infrastructure sensitive to flooding (i.e., for which the consequences of flooding would be severe in terms of ability to provide essential community services or to protect life and welfare). The FRWLP would not be sensitive to or compromised by flooding because it is the levee project itself that would reduce the chance of flooding. Therefore, the FRWLP is not considered a critical action because the project purpose is to withstand flood conditions, reduce flood risk, and increase flood protection.

- **Step 2: Provide public review.** The NEPA/CEQA process provides for public disclosure; this EIS/EIR is one instrument for public review of the FRWLP. As discussed in Chapter 1, *Introduction*, USACE and SBFCA have established a proactive multimedia outreach program to publicize the project and allow for public review and disclosure. The approach to the outreach program has been to go beyond the guidelines and requirements of NEPA and CEQA for public noticing to ensure the community and other interested stakeholders are informed, engaged, and involved through an accessible, open, and transparent process. Thus far, the outreach program has included the following actions.

  - Four scoping meetings for the environmental document.
  - Publication of notices in local newspapers of major circulation.
  - Publication in the *Federal Register*.
  - Notification to the State Clearinghouse.
  - Posting NEPA notices on the USACE website.
  - Posting CEQA notices and project information on the SBFCA website (www.sutterbutteflood.org).
  - Periodic newsletters provided to the parcel owners in the flood improvement assessment district.
  - Presentation and discussion of the status of the project at various public meetings for elected boards.
  - Phone calls to public agencies.

As the proposed actions and EIS/EIR are further developed, the outreach program would continue in a broad sense through the methods listed above and would expand through more targeted specific outreach to residents and businesses who might be more directly affected by construction or operation of the proposed improvements.

To date, the results of the outreach program have been constructive and very supportive of the FRWLP. The tone and substance of the input have been consistent with the very favorable response for the voter-approved assessment to fund the local share of flood improvements. Comments received from the public have been considered in order to help refine the project description and the environmental analysis.

A more detailed accounting of the scoping process is provided in Appendix B, *Scoping Report.*

- **Step 3: Identify and evaluate reasonable and feasible alternatives to locating in the base floodplain.** Previously, Butte and Sutter Counties have not been mapped in the base floodplain, and land use planning decisions have been based on studies demonstrating protection from the base flood. Only recent studies (as described in Chapter 1, *Introduction*), based on evolving levee standards, now necessitate improvements to continue maintaining protection above the base floodplain. The proposed project (the FRWLP) is targeted specifically to provide such improvements and exceed the level of protection beyond the base flood to that of the 0.5% chance (200-year) flood event for more populated areas in, around, and north of Yuba City and 100-year for the area south of Yuba City.

  General engineering and environmental analyses have been performed for the FRWLP following an identification and screening process discussed in Chapter 2, *Alternatives*. Detailed analyses performed for the alternatives have found the proposed project to be the only practicable alternative that achieves the project objectives. Construction of the FRWLP would keep thousands of transportation, commercial, institutional, and residential structures and nearly 200,000 residents out of the base floodplain.

- **Step 4: Identify the effects of the proposed action.** This EIS/EIR analyzes the environmental effects potentially resulting from the FRWLP per NEPA/CEQA requirements. Review under the ESA, CWA, CAA, and other Federal and state environmental regulations is taking place in coordination with the EIS/EIR. Effects of the FRWLP are analyzed in Chapter 3, *Affected Environment and Environmental Consequences*. In brief, the FRWLP may have temporary construction-related effects on roadways, air quality from heavy equipment use, biological resources (due to temporary disruption of or construction near habitat), temporary construction-related effects on residents due to noise generation, changes in visual quality, and interruption in utility service and property access. The project also may necessitate property acquisition, either through temporary construction easements or permanent increases in the levee footprint. Growth inducement is also a potential effect, and is discussed in this chapter.

- **Step 5: Minimize threats to life and property and to natural and beneficial floodplain values.** Restore and preserve natural and beneficial floodplain values. The FRWLP would reduce flood risk for Butte and Sutter Counties and increase protection for life and property in the affected area. The existing levee system was designed and constructed to provide a minimum level of protection from the base flood and ensure that human life and structures are out of the floodplain. The FRWLP target is to maintain and increase the level of protection beyond that of the base flood to a minimum 200-year protection (0.5% chance) for more populated areas in, around, and north of Yuba City and 100-year protection for the area south of Yuba City.

- **Step 6: Reevaluate alternatives.** This EIS/EIR is part of a step-wise evaluation process to refine the alternatives through public review as well as through resource and regulatory agency input in consultation for compliance with the CWA, ESA, and other project authorizations. The alternatives have been evaluated at the planning level for initial screening (in Chapter 2, *Alternatives*) and for reevaluation through environmental analysis (Chapter 3 *Affected Environment and Environmental Consequences*). The alternatives also are continuously evaluated on a technical basis through independent review of the design documents (plans and specifications) at several levels of design development, including expert peer review by a board of senior consultants. The recommendations and design refinements resulting from these reviews have been incorporated into the project description (Chapter 2), resource analyses and findings (Chapter 3), and project-level analyses and mitigation measures (Chapter 3). This level of screening analysis has demonstrated that the proposed actions of the FRWLP are the most practicable alternatives.
- **Step 7: Issue findings and a public explanation.** To conclude the NEPA process, a ROD for the FRWLP will be publically issued following the Final EIS. To conclude the CEQA process, findings would be publicly issued following the Final EIR. A public workshop will be conducted during the draft document stage, and a public hearing will be held to decide on project adoption by SBFCA as an action under CEQA.
- **Step 8: Implement the action.** SBFCA intends to construct the FRWLP as soon as possible based on conclusion of the project approval processes, targeted to be initiated in the 2013 construction season.

The FRWLP would reduce the risk of flood loss and minimize the effect of floods on human health, safety, and welfare by improving flood management infrastructure and would increase protection for existing population centers. The FRWLP would further protect farmland, agricultural commodities, and agricultural infrastructure for this crucial agricultural region. The FRWLP would be a substantial step toward compliance with state law requiring 200-year protection for urban and urbanizing areas and would avoid development restrictions outlined under SB 5. Therefore, the FRWLP is not in conflict with EO 11988; the project would improve flood protection, and there is no reasonable and feasible alternative to the urban development already existing in the affected area. This EIS/EIR further complies with this EO by identifying the most reasonable and feasible flood improvement alternative and disclosing the potential effects of the FRWLP that may lead to growth or other direct and indirect effects. Additionally, Chapter 1, *Introduction*, and Chapter 2, *Alternatives*, explain why levee improvements are necessary for Butteand Sutter Counties, regardless of how they may affect future development and growth.

4.1.2.2 Environmental Setting

The information in this section provides context for the analysis and its structure and discusses the legal requirements for analyzing growth-inducing effects in CEQA and NEPA documents.

Growth Projections

Population is not static, and the population of California has been growing significantly. To provide statewide context for population change in the project region, California's population was estimated at 36 million people in 2005 and is expected to rise to nearly 44 million by 2025 (U.S. Bureau of the Census 2008). According to the California Department of Finance, "California's population is projected to reach almost 60 million people by 2050, adding over 25 million since the 2000 decennial census" (California Department of Finance 2007). The California Department of Finance provides population data estimates and projections for cities and counties throughout California. Population information for Butte and Sutter Counties is provided below.

Butte County

Between April 2000 and January 2010, the overall population of Butte County increased by 9.2%, growing from 203,171 to 221,768 people. Within that same timeframe, the incorporated city of Gridley saw an increase of 19.3%, with the estimated population rising from 5,408 to 6,454, and the city of Biggs saw a 0.9% decrease in population, going from 1,793 to 1,787. For comparison, the state's population rose 14.1% during the same period, from 33,873,086 to 38,648,090 (California Department of Finance 2010). Although the county population has been increasing steadily, the population of the unincorporated portion of the county has been declining as people move to urban areas and cities annex areas to accommodate this growth (Butte County 2010a: 32). Butte County had a population density of approximately 134 persons per square mile in 2010, compared with the state average of 239 persons per square mile (U.S. Census Bureau 2010).

The population of Butte County is expected to reach 281,442 by 2020 (California Department of Finance 2007). The city of Gridley is expected to reach 8,774 by 2020, assuming a growth rate of 2.86% per year (Redamonti pers. comm.). The city of Biggs is expected to reach a population of 2,136, based on a 1.5% growth rate per year (City of Biggs 1998:1-5).

By 2050, the total population of Butte County is expected to reach 441,596 (California Department of Finance 2007). Based on the Department of Finance's unofficial 2070 population estimates for Butte and Sutter Counties prepared for the Sutter Basin Project, Butte County is expected to reach a total population of 512,095. These projections are based on very preliminary analyses of migration and fertility trends, which could change. Also, it is important to note that 60-year projections are subject to an enormous amount of potential external changes that could render these values inaccurate (Schwarm pers. comm.). Despite the preliminary nature of these projections, the population in the affected area is expected to continue to increase, and it can be assumed that employment, income, and the demand for housing also would increase.

Sutter County

Between April 2000 and January 2010, the overall population of Sutter County increased by 25.6%, growing from 78,930 to 99,154. Within that same timeframe, the incorporated cities of Live Oak and Yuba City saw increases of 41.1% and 77.8%, respectively, with their estimated populations rising from 6,229 to 8,791 and 36,758 to 65,372. In contrast, the state's population rose more slowly (14.1%) during that time, as noted above (California Department of Finance 2010).

Nearly two-thirds of the county's residents live in the cities of Live Oak and Yuba City (California Department of Finance 2010). However, Sutter County is primarily rural, with extensive agricultural areas and a low population density (Sutter County 2010a:1-7). The county had a population density of approximately 157 persons per square mile in 2010, compared with the state average of 239 persons per square mile (U.S. Census Bureau 2010).

The population of Sutter County is expected to reach 141,159 by 2020 (California Department of Finance 2007), and the city of Yuba City is expected to reach 79,000, based on an average annual growth rate of 2.5% per year (City of Yuba City 2004:2-3). According to the county's general plan (Sutter County 2010a:4-2):

> For nearly 40 years, and, in particular, since 1990, most of the growth in Sutter County has taken place in its two cities, Yuba City and Live Oak. Yuba City annexations and new development in the incorporated cities has increased the share of the county's incorporated population from 40% in 1970 to 75% in 2007. As a result, fewer people resided in unincorporated areas of the county in 2007 than in 1970. This trend is assumed to continue during the time horizon of the 2006–2013 housing element.

By 2050, Sutter County is expected to more than triple in size (+255%). In 2050, the total population of Sutter County is expected to reach 282,894 (California Department of Finance 2007). Based on the California Department of Finance's unofficial 2070 population estimates for Butte and Sutter Counties for the Sutter Basin Project, Sutter County is expected to reach a total population of 341,216. As is described for Butte County above, based on these projections, the population in the affected area would continue to increase, and it can be assumed that employment, income, and the demand for housing also would increase.

Current and Planned Development

To accommodate current populations and growth, development has been planned in Butte and Sutter Counties in accordance with California law. The key development planning documents are the following general plans.

- Butte County General Plan 2030 (Butte County 2010a).
- City of Biggs General Plan 1997–2015 (City of Biggs 1998).
- City of Gridley General Plan (City of Gridley 2010).
- Sutter County 2030 General Plan (Sutter County 2010a).
- City of Yuba City General Plan (City of Yuba City 2004).
- City of Live Oak General Plan (City of Live Oak 2010).

To account for growth relative to flood-risk management, the local governments in the affected area have in place the following flood-risk management programs. This list is not a comprehensive inventory, but rather is meant to demonstrate the responsibility communities are showing for flood-risk management and to provide a representation of the types of programs currently being implemented.

Butte County

- Butte County Flood Mitigation Plan.
- Public education and awareness programs.
- Land use planning and development restrictions in floodplains.
- Emergency Preparedness and Evacuation Plan.
- FEMA Community Rating System (CRS) Program.

City of Biggs

- Development restrictions in flood-prone areas.
- Emergency response plan and emergency evacuations routes.

Sutter County

- Sutter County Floodplain Management Ordinance, which includes the following flood-risk management measures.
  - Standards of construction to prevent flood damage.
  - Development restrictions in floodways.
- FEMA Community Rating System (CRS) Program.
- Emergency Operations Plan.
- Emergency Action Plan.
- Public Outreach Strategy Team.

City of Yuba City

- Flood Damage Prevention Ordinance, which includes the following flood-risk management measures.
  - Standards of construction to prevent flood damage.
  - Development restrictions in floodways.
- FEMA Community Rating System Program: Class 7.
- Emergency Evacuation Plan.
- Floodplain development permit requirement.
- Public Outreach Program.

City of Live Oak

- Development restrictions in flood-prone areas.
- Emergency Response Plan and emergency evacuations routes.

4.1.3 Environmental Consequences

An action that removes an obstacle to growth is considered to be growth-inducing. As such, where flood risk may be seen as an obstacle to growth in an area, levee improvements that would reduce that risk may be considered to remove an obstacle to growth and thereby be indirectly growth-inducing.

Growth inducement may lead to environmental effects, such as increased demand for utilities and public services, increased traffic and noise, degradation of air or water quality, degradation or loss of plant or animal habitats, and conversion of agricultural and open space land to urban uses. Growth within a floodplain area increases the risk to people or property of flooding.

However, if the induced growth is consistent with or provided for by the adopted land use plans and growth management plans and policies for the area affected (e.g., city and county general plans, specific plans, transportation management plans), those plans may ensure that these effects are either less than significant or mitigated to a less-than-significant level. In some instances, significant and unavoidable effects would occur as a result of implementation of land use plans. All effects associated with this planned growth are the responsibility of the city or county in which the growth takes place. Local land use plans provide for land use development patterns and growth policies that encourage orderly urban development supported by adequate urban public services, such as water supply, roadway infrastructure, sewer services, and solid waste services.

4.1.3.1 Effects and Mitigation Measures

No Action Alternative

Under the No Action Alternative, SBFCA would not implement levee improvements. The levees protecting the city would continue to deteriorate and necessitate improvements to meet FEMA's and the state's minimum acceptable levels of flood protection. In addition, the associated risk to human health and safety and property and the adverse economic effect that serious flooding could cause would continue, and the risk of a catastrophic flood would remain high. Again, though no improvements would be implemented, regular operations and maintenance of the levee system would continue as prescribed and as presently executed by the local maintaining entities. Further detail on the No Action Alternative is provided in Chapter 2, *Alternatives*.

As described in Chapter 2, despite the likelihood of Federally or state-led implementation of repairs, for the purposes of evaluating effects under the No Action Alternative, the EIS/EIR assumes that the improvements would not be made. This assumption provides the most conservative approach for disclosure and comparison of potential effects. Therefore, the No Action Alternative assumes no levee repair or strengthening would be implemented, the purpose and objectives would not be met, and flood risk would continue.

Action Alternatives

The FRWLP would incrementally reduce localized flood risk for the levee reaches proposed for improvement. However, these reaches are only a portion of the total levee system protecting Butte and Sutter Counties, and the remaining unimproved levees in the system also would determine FEMA mapping and build-out decisions. The FRWLP, if implemented, would potentially remove approximately 6,300 acres from the current officially mapped FEMA floodplain; however, only roughly 25% of this acreage (about 1,500 acres) is within areas planned for growth under the adopted municipal general plans. Therefore, the project would facilitate general plan build-out for that area potentially removed from the FEMA floodplain.

Such build-out growth is part of the planned development of Butte and Sutter Counties. The counties and incorporated cities have general plans under which growth and increases in population could lead to effects on air and water quality, water supply, traffic, and noise conditions and increases in the demand for such public services as schools, fire, police, sewer, solid waste disposal, and electric and gas utilities. In addition, the expansion of such services could result in significant effects. The effects of this growth have been analyzed in the CEQA documents associated with these plans. Mitigation measures that would reduce or eliminate these effects are included. Ultimately, the effects associated with growth in Butte and Sutter Counties are the responsibility of cities and counties in which they occur, in combination with specific project proponents. The plans and programs listed under Section 4.1.2.2, *Environmental Setting*, as integral components of the general plans are in place to manage flood risk relative to development and population growth.

While growth in Butte and Sutter Counties is expected to occur in the future and is planned for in the development of infrastructure and municipal services, the FRWLP has limited influence on such growth because the area that would be potentially removed from the FEMA floodplain that is planned for development is very small (approximately 1,500 of the 185,675 acres of the affected area, or 0.8%). The FRWLP, therefore, has no significant effect on growth considering the magnitude of this change. It should be further noted that while the project does remove a potential obstacle to growth by reducing the area subject to FEMA floodplain designation, it does not directly facilitate growth (like developing new water supply, utilities, or other infrastructure would, for example).

4.2 Cumulative Effects

4.2.1 Introduction

The cumulative effects analysis determines the combined effect of the proposed project and other closely related, reasonably foreseeable, projects. This section introduces the methods used to evaluate cumulative effects, lists related projects and describes their relationship to the proposed project, identifies cumulative effects by resource area, and recommends mitigation for significant cumulative effects.

4.2.2 Approach to Cumulative Effect Analysis

4.2.2.1 Legal Requirements

NEPA regulations and State CEQA Guidelines require that the cumulative effects of a proposed project be addressed under NEPA when the cumulative effects are expected to be significant, and under CEQA when the project's incremental effect is cumulatively considerable (Guidelines 15130[a], 40 CFR 1508.25[a][2]). Cumulative effects are effects on the environment that result from the incremental effects of a proposed project when added to other past, present, and reasonably foreseeable future projects (Guidelines 15355[b], 40 CFR 1508.7). Such effects can result from individually minor but collectively significant actions taking place over time.

Section 15130 of the State CEQA Guidelines states that the discussion of cumulative impacts need not provide as much detail as the discussion of impacts attributable to the project alone. The level of detail should be guided by what is practical and reasonable.

4.2.2.2 Methods

According to the State CEQA Guidelines (Section 15130), an adequate discussion of significant cumulative impacts should contain the following elements.

- An analysis of related future projects or planned development that would affect resources in the project area similar to those affected by the proposed project.
- A summary of the expected environmental effects to be produced by those projects with specific reference to additional information stating where that information is available.
- A reasonable analysis of the cumulative impacts of the relevant projects. An EIR must examine reasonable, feasible options for mitigating or avoiding the project's contribution to any significant cumulative effects.

To identify the related projects, the State CEQA Guidelines (Section 15130[b]) recommend either the list or projection approach. This analysis uses the list approach, which entails listing past, present, and probable future projects producing related or cumulative effects, including, if necessary, those projects outside the control of SBFCA. NEPA does not provide specific guidance as to how to conduct a cumulative effect assessment; however, the list approach has been effective at disclosing cumulative effects under NEPA.

A list of past, current, and probable future projects was compiled for the cumulative setting. These projects include other flood protection projects affecting the Feather River and the Sacramento River system (including those requesting Section 408 approval) and projects affecting fish and wildlife that use the proposed project area. Regional plans were reviewed to characterize development trends and growth projections in Butte and Sutter Counties. These plans are considered with the proposed project to determine whether the combined effects of all of the projects would result in significant cumulative effects.

4.2.3 Projects Considered for the Cumulative Assessment

4.2.3.1 Flood Protection Projects

According to the CEQ regulations, when determining the scope of the action assessment, similar actions must be considered. Similar actions are defined as actions that, when viewed with other reasonably foreseeable or proposed agency actions, have similarities that provide a basis for evaluating their environmental consequences together, such as common timing or geography. An agency may wish to analyze these actions in the same environmental assessment. It should do so when the best way to assess adequately the combined effects of similar actions or reasonable alternatives to such actions is to treat them in a single environmental assessment (40 CFR §1508.25[a][3]) (Council on Environmental Quality 1997).

The following list of related or similar flood protection projects includes those that are under active consideration, have been proposed, or have some form of environmental documentation complete. In addition, these projects have the potential to affect the same resources and fall within the same geographic scope and therefore are to be considered cumulatively with the proposed project. In particular, the affected resources are biological resources (riparian habitat and wildlife disturbance), hydrology, and geomorphology. The geographic scope of consideration for effects on those resources is the Sacramento Valley region and Sacramento River system, respectively. These projects are described in Chapter 1, *Introduction*.

- Central Valley Flood Protection Act.
- Sacramento River Flood Control System Evaluation.
- Sacramento–San Joaquin Rivers Comprehensive Study.
- Sacramento River Bank Protection Project.
- Flood Control and Coastal Storm Emergency Act.
- Sutter Basin Project.
- Yuba Basin Project.
- American River Common Features Project.
- West Sacramento General Reevaluation Report.
- Lower Feather River Corridor Management Program.
- Three Rivers Levee Improvement Program.

- Natomas Levee Improvements Program.
- West Sacramento Levee Improvements Program.

4.2.3.2 Relevant Land Use Plans

Relevant land use plans were reviewed to assess past, present, and reasonably foreseeable development actions in the proposed project planning area that may affect the same resources as the FRWLP, or provide for the restoration, preservation, or enhancement of those resources.

- Butte County General Plan 2030 (Butte County 2010a).
- City of Biggs General Plan 1997–2015 (City of Biggs 1998).
- City of Gridley General Plan (City of Gridley 2010).
- Sutter County 2030 General Plan (Sutter County 2011).
- City of Yuba City General Plan (City of Yuba City 2004).
- City of Live Oak General Plan (City of Live Oak 2010).

4.2.3.3 Projects Affecting Fish and Wildlife That Use the Affected Area

The following programs and projects may affect the same species of fish or wildlife that may be affected by the proposed project.

CALFED Ecosystem Restoration Program

The goals of the CALFED Ecosystem Restoration Program are listed below.

- Recover 19 at-risk native species and contribute to the recovery of 25 additional species.
- Rehabilitate natural processes related to hydrology, stream channels, sediment, floodplains, and ecosystem water quality.
- Maintain and enhance fish populations critical to commercial, sport, and recreational fisheries.
- Protect and restore functional habitats, including aquatic, upland and riparian, to allow species to thrive.
- Reduce the negative effects of invasive species and prevent additional introductions that compete with and destroy native species.
- Improve and maintain water and sediment quality to better support ecosystem health and allow species to flourish.

The Ecosystem Restoration Program, which is divided into the Sacramento, San Joaquin, and Delta and Eastside Tributary regions, takes the following kinds of actions.

- Develops and implement habitat management and restoration actions, including restoration of river corridors and floodplains, reconstruction of channel-floodplain interactions, and restoration of Delta aquatic habitats.
- Restores habitat that would specifically benefit one or more at-risk species.
- Implements fish passage programs and conducts passage studies.
- Continues major fish screen projects and conducts studies to improve knowledge of their effects.

- Restores geomorphic processes in stream and riparian corridors.
- Implements actions to improve understanding of at-risk species.
- Develops an understanding of and technologies to reduce the effects of irrigation drainage on the San Joaquin River and reduce transport of contaminant (selenium) loads carried by the San Joaquin River to the Delta and the Bay.
- Implements actions to prevent, control, and reduce effects from nonnative invasive species.

Ecosystem Restoration Program actions contribute to cumulative benefits on fish and wildlife species, habitats, and ecological processes.

Bay Delta Conservation Plan

The BDCP provides for the recovery of endangered and sensitive species and their habitats in the Delta in a way that also provides for the protection and restoration of water supplies. The plan would identify and implement conservation strategies to improve the overall ecological health of the Delta; identify and implement more ecologically friendly ways to move fresh water through or around the Delta; address toxic pollutants, invasive species, and impairments to water quality; and provide a framework and funding to implement the plan over time.

Alternatives being evaluated include conveyance options using the through-Delta waterways, an isolated canal, or an isolated tunnel. The restoration options include various degrees of restoration in the Delta and Suisun Marsh. The final plan and the final EIS/EIR are expected to be completed in 2013. The BDCP could contribute to beneficial cumulative effects by increasing suitable habitat for fish and wildlife species.

4.2.4 Cumulative Effects by Resource

4.2.4.1 Flood Control and Geomorphic Conditions

The proposed project would not significantly contribute to cumulative effects on flood control and geomorphic conditions resulting from the various seepage control and erosion treatments. Because the west bank of the Feather River in the project area does not have any significant freeboard issues, levee raises have not been proposed. Levee raises can cause slight increases in upstream or downstream water surface elevations and a transfer of flood risk to downstream reaches. Additionally, levee setbacks may cause variable localized, upstream, and downstream outcomes, dependent on the modeling scenario, but levee setbacks are also not currently proposed in any of the project alternatives.

It is acknowledged there is speculation that strengthening certain levee segments and thereby reducing their likelihood of failure may make other levees more susceptible to failure (i.e., the weakest link in the chain may shift). However, there is no evidence that the proposed seepage control treatments would represent an unacceptable transfer of flood risk to adjacent or downstream levee districts. Furthermore, strengthening portions of the Federal project levee system protecting the planning area would not result in any adverse hydraulic effects on other subbasins protected as part of the SRFCP.

4.2.4.2 Water Quality and Groundwater Resources

There is potential for the project to have a cumulative water quality effect as a result of the additional sedimentation from areas where construction would take place. However, it is anticipated that this cumulative increase in sedimentation would be minimal and construction-related BMPs would minimize the sediment loading.

No other currently known projects are expected to have potential groundwater effects that would be cumulatively considerable.

4.2.4.3 Geology, Seismicity, Soils, and Mineral Resources

The FRWLP could result in both beneficial and significant effects on geology, seismicity, and soils. Other earth-moving activities in the affected area, such as development, could change the stability of soils, increase erosion and sedimentation, and expose structures to ground shaking and liquefaction. Soil stability is addressed through engineering design of structures, including levees, and ground-disturbing activities are required to stabilize soils on completion of construction or even between stages of construction. As such, no significant cumulative effects related to soil stability are anticipated. A cumulative increase in erosion and sedimentation could occur if other levee improvement projects on the Feather River take place at the same time. The potential for erosion and sedimentation resulting from the FRWLP and other projects is limited by minimization measures and implementation of a SWPPP. Any cumulative effect would be temporary and minimal and therefore less than significant. The levee improvement projects replace or upgrade existing flood control facilities (levees), and there would be no change in risks due to seismicity. However, there could be cumulative effects related to construction of structures that could be subject to seismic activity. The affected area is not located in an active seismic area (i.e., no active faults and in an area of relatively low risk of strong ground shaking for California), and therefore any cumulative increase in risk related to ground shaking would be less than significant.

There would be minimal effect on mineral resources and therefore no cumulative effects associated with the levee improvement projects.

4.2.4.4 Traffic, Transportation, and Navigation

Construction activities associated with the FRWLP have the potential to result in short-term disruptions to roadways, including closures, increase in emergency response time, and road hazards; effects on alternative transportation modes; disruption to navigation; and decreases in LOS for roads accessed or used for detours during construction. Combined with other projects in Butte and Sutter Counties and along the Feather River, there could be significant cumulative effects on transportation if the FRWLP and other projects are implemented at the same time. Specifically, cumulative effects would occur if projects required closings or detours on multiple major roadways at the same time, resulting in decreased access to roads in the planning area. Due to the temporary nature of the effects (limited to the construction period) and with implementation of the environmental commitment to use a traffic control and road maintenance plan to ensure minimal overlap in disturbances to traffic during project construction, these effects would be less than significant. No significant cumulative effects would occur.

4.2.4.5 Air Quality

The FRWLP would result in temporary construction-related emissions that would be partially mitigated by reducing vehicle and equipment emissions and implementing a fugitive dust plan. Regardless of the mitigation measures, the temporary construction emissions produced by the FRWLP would be significant and unavoidable on a project-level basis. Other projects occurring in the FRAQMD and BCAQMD jurisdictions at the same time as the FRWLP construction would result in cumulative effects that would be significant, particularly in regards to ROG, NO_X, and PM10 emissions. It is expected that projects generating these pollutants also would minimize emissions through dust control and vehicle emissions control. However, there still could be a significant and unavoidable cumulative effect.

4.2.4.6 Climate Change

Construction activity for the FRWLP, considered on a project-only basis, would cause a temporary and less-than-significant increase in greenhouse gas emissions. However, climate change is a worldwide cumulative effect that is caused by all emission sources throughout California and the world. Therefore, the local effects of climate change in central California will be caused by worldwide GHG emissions rather than local emissions. The State of California, through the AB 32 process, has identified global climate change as a significant and unavoidable issue. Therefore, even though the FRWLP emissions would be small and mitigated to the extent practical, this cumulative effect is significant and unavoidable.

4.2.4.7 Noise

Implementation of any of the project alternatives would result in temporary but significant effects related to construction noise and vibration at sensitive receptors in the affected area. Other projects in the vicinity of these receptors occurring at the same time could result in cumulative effects. However, because construction noise would be temporary and highly localized, implementation of project alternatives is not anticipated to make a cumulatively considerable contribution to noise effects in the affected area.

4.2.4.8 Vegetation and Wetlands

Cumulative effects from levee repair would result in permanent loss of vegetation and wetlands. Compensation of lost vegetation and wetlands would mitigate those effects with the goal of no net loss. Levee repairs on other reaches of the Feather River also may result in losses of vegetation and wetlands, and permanent loss could contribute to a significant cumulative effect. However, it is expected that each project would be required to mitigate for such loss thereby reducing any cumulative effect to a less-than-significant level.

4.2.4.9 Wildlife

Construction of the proposed project could result in the injury, mortality, or disturbance of special-status and common species during construction, which could affect local populations. Implementation of mitigation measures identified in this report would minimize or avoid injury, mortality, or disturbance of special-status and common species during construction, and avoid or reduce the project's contribution to cumulative effects on local populations.

The proposed project would result in the permanent and temporary losses of land cover types that provide suitable habitat for special-status and common wildlife species. The loss of these habitats would cumulatively contribute to effects from other projects that remove these habitats in the project region. The Feather River corridor provides important nesting, roosting, foraging, cover, and movement habitat for numerous wildlife species, including several listed and rare species. Additional levee improvement projects along the Feather River levee system would result in losses of riparian habitat as a result of construction and/or implementation of USACE's policy regarding levee vegetation (or other future agreed-upon policy). Coordination with USFWS, NMFS, DFG, and appropriate local agencies would be required for such projects to ensure appropriate compensation for effects on riparian habitat. Additionally, many of the listed species affected by the proposed project would be affected by other projects along the Feather River. Because these species are protected under state and Federal laws, other projects also would be required to minimize injury and mortality and compensate for loss of their habitats.

Creation/restoration of riparian forest would occur along the Feather River corridor, within or adjacent to the biological affected area, and would ensure no net loss of riparian forest. Because the greatest threat to most special-status species is the loss of habitat, the permanent loss of habitat from the proposed project together with habitat loss attributable to other projects in the region may be significant.

4.2.4.10 Fish and Aquatic Resources

The project would avoid or minimize losses of riparian vegetation, SRA cover, and seasonal floodplain habitat by restricting most construction activities to areas above the ordinary high water mark on the waterside levee slopes. Thus, the project is not expected to contribute to cumulative effects on aquatic habitat and fisheries resources. Although compensation objectives for this project and similar ongoing and future projects are avoidance or no net loss of existing habitat values, cumulative effects on aquatic habitat and fisheries resources remain significant because of the extensive historical losses of riparian vegetation, SRA cover, and seasonal floodplain habitat in the Central Valley.

4.2.4.11 Agriculture, Land Use, and Socioeconomics

The Sutter County General Plan Draft Environmental Impact Report (DEIR) notes that full buildout of the Sutter County General Plan would result in the loss of 3.3% (9,626 acres) of the important farmland in the county by 2030. This conversion of important farmland to non-agricultural use was determined to be a significant and unavoidable impact, with no feasible mitigation measures (Sutter County 2010b: 6.3-22 to 6.3-23). However, even with full buildout of the General Plan, nearly 87% of the county's acreage will still be designated for agriculture (Sutter County 2010b: 4-7). Conversion of agricultural land in Sutter County would be focused around existing urban centers in growth areas. The agricultural goals and policies of the Sutter County General Plan are designed to preserve agricultural lands to the greatest extent possible as well as to discourage the conversion of agricultural lands to urban uses, as agriculture is vital to the county's economy.

As described in the Butte County General Plan 2030 Draft Environmental Impact Report, full buildout of the Butte County 2030 General Plan would convert approximately 8.3% (4,700 acres) of important farmland to non-agricultural use, resulting in a significant and unavoidable impact (Butte County 2010b: 4.2-9 to 4.2-13). At full buildout condition, agriculture will still be Butte County's primary land use, given the large proportion of agricultural land in the county. The purpose of the

Butte County 2030 General Plan Agriculture Element is to protect farmland from urbanization and to enhance the county's agricultural industry (Butte County 2010b: 4.2-11).

Implementation of the FRWLP would permanently convert farmland to nonagricultural use in the direct footprint of the project. However, the FRWLP activities would convert less than one-tenth of a percent of the total important farmland in Sutter and Butte Counties, and the project's contribution toward and in addition to all other planned farmland conversion discussed and analyzed under the County General Plans would range from only 1% for Alternative 3 (149.27 acres plus 14,326 acres under the General Plans) to 6% for Alternative 2 (845.86 acres plus 14,326 acres under the General Plans). As noted in Section 3.11, the conversion of agricultural land to non-agricultural uses would occur only in a narrow corridor adjacent to the existing levee, leaving the remainder of each affected parcel feasible and economically viable for continued farming. Overall, the project is intended to preserve existing land use and socioeconomic conditions, especially for agriculture. Local land use policies and the collective regional perspective are aimed to maintain agriculture as a viable, sustainable, and thriving industry to drive the local economy. Municipal general plans call for the protection of agriculture and maintaining its compatibility with other land uses, and the FRWLP is consistent with those goals. Therefore, the FRWLP would contribute to the cumulative conversion of agricultural land to non-agricultural uses in Sutter and Butte counties, but at a less-than-significant level.

Potential FRWLP conflicts with zoning, land use plans, policies, or regulations would be the same under cumulative conditions as described in Section 3.11, Effect AG-3, *Conflict with Existing Zoning for Agricultural Use*, and Effect LU-1, *Conflict with Applicable Land Use Plan, Policy, or Regulation*. The FRWLP is not expected to contribute to cumulative land use regulatory compatibility impacts.

Construction activities associated with the FRWLP would contribute to a temporary, local increase in employment and personal income. However, implementation of the proposed FRWLP is not anticipated to significantly contribute to long-term cumulative changes in employment region-wide.

4.2.4.12 Population, Housing, and Environmental Justice

While the FRWLP would not displace a substantial number of people or existing housing units nor necessitate the construction of replacement housing elsewhere, other projects may displace housing in the same census tracts, which could result in a significant cumulative effect. However, acquisition of any residences for the FRWLP and other projects would comply with the policies and provisions set forth in the Uniform Act and implementing regulation, Title 49 CFR Part 24, and be in accordance with the California Government Code Section 7267, et seq. Therefore, implementation of the FRWLP considered cumulatively with other projects is not expected to result in a significant cumulative effect related to home acquisitions.

The FRWLP would potentially result in significant and unavoidable effects related to disproportionately high and adverse effects on minority populations and low-income populations from temporary construction activities for air quality, noise, and visual resources under Alternative 2. Construction activities for other projects that result in air quality, noise, and visual impacts in the affected area could also result in significant cumulative effects. The FRWLP could contribute to a cumulatively considerable effect.

The FRWLP alternatives would not result in disproportionately high and adverse effects on minority populations and low-income populations from acquisition of homes because plenty of vacant homes exist within the affected area to serve as replacement housing. Existing state and federal laws require relocation advisory services, replacement housing, and compensation for living expenses, which further offset effects associated with acquisition of homes. The Relocation Assistance and Real Property Acquisition Guidelines were designed to ensure that uniform, fair, and equitable treatment is given to people displaced from their homes as a result of the actions of a public entity. Although other projects could also require the acquisition of homes in the same census tracts, implementation of FRWLP, considered cumulatively with other projects, is not expected to result in a significant cumulative effect.

4.2.4.13 Visual Resources

The FRWLP would potentially result in significant and unavoidable visual effects in reaches with sensitive viewers for one or more project alternatives. The effect mechanisms are primarily vegetation removal and replacement of agricultural and developed land use with seepage berms. As other projects to achieve flood risk reduction in the region are implemented, these effects would be additive and could be cumulatively significant and unavoidable.

4.2.4.14 Recreation

The FRWLP would not result in any significant or beneficial effects on recreation and consequently would not contribute to any cumulative recreation effects in the planning area.

4.2.4.15 Utilities and Public Services

Construction of the project may damage drainage and irrigation systems and public utility infrastructure, resulting in temporary disruptions to service. Coordination with drainage and irrigation system users, consultation with service providers, and implementation of appropriate protection measures would minimize the possibility of any significant effects. Because utility and public service system effects would be isolated, temporary, and fully mitigated, the project would not result in a cumulatively considerable incremental contribution to a cumulatively significant effect.

4.2.4.16 Public Health and Environmental Hazards

The project has the potential to slightly increase risks to the public during construction through use of equipment and fuels, but the increased risk is temporary. These risks are minimized through implementation of the SWPPP and other BMPs described for Mitigation Measures PH-MM-1 through PH-MM-4 in Section 3.16, *Public Health and Environmental Hazards*. Because these are standard practice for construction projects, it is expected that the overall cumulative effect would not be adverse.

The FRWLP would improve flood protection for the planning area. The Sutter Basin Project is expected to propose flood management improvements that would further improve flood protection in the planning area, and other projects that reduce stress on the Sutter Basin levees could result in a beneficial cumulative effect in the planning area by reducing the overall public risk associated with levee failure.

4.2.4.17 Cultural Resources

Because individual cultural resources occur in discrete, relatively small, and geographically bounded areas, they typically are not subject to cumulative effects. Environmental resources like air quality and water quality that occur in more expansive locations (e.g., air basins and river systems) are more likely to be affected cumulatively because more than one project on the list could contribute to the degradation of the resource. However, the combined set of actions that form the cumulative context for the FRWLP, and its extent, are expected to result in significant and unavoidable effects on cultural resources and in an ongoing loss of such resources. Because the project alternatives each would result in significant and unavoidable effect on cultural resources, they would make a significant contribution to this cumulative effect. While mitigation is identified for the project alternatives, this mitigation does not reduce the contribution of the project alternatives to less than significant. For these reasons, this effect may be cumulatively significant and unavoidable.

Rural historic landscapes may span large enough areas to be subject to cumulative effects. Such landscapes typically contain multiple contributing elements associated with the historic themes that give the landscape significance. For example, reclaimed agricultural landscapes may have multiple elements, such as drainage systems, road systems, and landscape patterns (Dames and Moore 1996). Because these landscapes span large areas, individual projects each may contribute to a loss of the resource's integrity that ultimately results in a complete loss of the ability of the resource to convey its significance. The FRWLP would alter the features of the Feather River West Levee and also would require the use and operation of borrow sites. These improvements may result in the demolition of individual structures and residences that contribute to rural historic landscapes. Other projects that form the cumulative context may contribute to these effects through plan build-out, levee repair, or other actions requiring demolition of structures forming portions of rural historic landscapes also affected by the FRWLP. For these reasons, the FRWLP may contribute to cumulatively significant and unavoidable effects on rural historic landscapes.

Chapter 5

Compliance with Environmental Laws and Regulations

5.1 Federal Requirements

Many of the requirements of the Federal government are codified under the USC as described below. Where a more common name for a law or regulation is typically used, it is listed by that name with a reference to the corresponding USC section.

National Environmental Policy Act (42 USC 4321, et seq.)

Partial Compliance. This Draft EIS/EIR partly fulfills requirements of NEPA. After a public review period, the Final EIS/EIR will incorporate public comments, as appropriate.

River and Harbors Appropriation Act of 1899

Partial Compliance. Under Section 14 of the Rivers and Harbors Appropriation Act (33 USC 408, commonly referred to as Section 408), temporary or permanent alteration, occupation, or use of any public works, including levees, for any purpose is only allowable with the permission of the Secretary of the Army. Under the terms of 33 USC 408, any proposed levee modification requires a determination by the Secretary that the proposed alteration, permanent occupation, or use of a Federal project is not injurious to the public interest and will not impair the usefulness of the levee. The authority to make this determination and approve modifications to Federal works under 33 USC 408 has been delegated to the Chief of Engineers, USACE. The CVFPB is requesting Section 408 permission from USACE for the FRWLP on behalf of SBFCA. USACE is also reviewing the FRWLP for Section 10 of the Rivers and Harbors Appropriation Act for effects on navigability, coincident with review under Clean Water Act, Section 404 (discussed below).

Clean Water Act (33 USC 1251 et seq.)

Partial Compliance. USACE and SBFCA will ensure that the project complies with the CWA, including Sections 404, 401, and 402. Some placement of fill within jurisdictional wetlands and waters of the United States is required for the project, under USACE jurisdiction for Section 404. This is detailed in Section 3.8, *Vegetation and Wetlands.* SBFCA will submit an application to USACE for a Section 404 permit. A Section 401 State Water Quality Certification for activities associated with implementation of the proposed project is required as a condition of Section 404, and SBFCA will submit a 401 certification application to the RWQCB. The project would also require an NPDES permit, through the development of a SWPPP because the project would disturb more than 1 acre of ground. Water quality issues are discussed in Section 3.2, *Water Quality and Groundwater Resources*.

Clean Air Act (42 USC 1857, et seq.), as amended and recodified (42 USC 7401, et seq.)

Partial Compliance. The project construction falls under the jurisdiction of the BCAQMD and FRAQMD. The districts determine whether project emission levels significantly affect air quality, based on Federal standards established by EPA and ARB. The districts would first issue a permit to construct, followed by a permit to operate, which would be evaluated to determine whether all facilities have been constructed in accordance with the authority to construct permit. USACE and SBFCA have prepared a draft conformity analysis and are in coordination with the districts to determine that the project would have no significant effects on the future air quality of the area and is in compliance with this act. Air quality analysis is presented in Section 3.5, *Air Quality*.

Executive Order 11990, Protection of Wetlands

Partial Compliance. This order directs USACE to provide leadership and take action to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands in implementing Civil Works projects. The project has been designed to avoid and minimize effects on wetlands, and all wetland effects would be compensated. Permitting under CWA Section 404 for wetlands is in progress. Analysis of wetlands is presented in Section 3.8, *Vegetation and Wetlands*.

Endangered Species Act (16 USC 1531, et seq.)

Partial Compliance. Section 7 of the ESA requires Federal agencies, in consultation with USFWS and NMFS, to ensure that their actions do not jeopardize the continued existence of endangered or threatened species, or result in the destruction or significant modification of the critical habitat of these species.

To ensure that the proposed project is in full compliance, USACE is coordinating with USFWS and NMFS to determine consultation and documentation needs. Also, discussions of Federal listed species have been included in Section 3.9, *Wildlife*, and 3.10, *Fish and Aquatic Resources*, of this EIS/EIR.

Fish and Wildlife Coordination Act of 1958, as amended (16 USC 661, et seq.)

Partial Compliance. This act requires Federal agencies to consult with USFWS, NMFS, and DFG before undertaking projects that control or modify surface water. The consultation is intended to promote conservation of wildlife resources by preventing loss of or damage to fish and wildlife, and to provide for the development and improvement of these resources in connection with water projects. USFWS, NMFS, and DFG are authorized to conduct surveys and investigations to determine the potential damages and the measures required to prevent losses. Recommendations of USFWS, NMFS, and DFG are typically integrated into reports seeking permission to construct a project or to modify plans for previously authorized projects. This act requires USACE to incorporate justifiable means for the benefit of wildlife that should be adopted to obtain maximum overall project benefits. USFWS is developing a Coordination Act Report (CAR), with input from NMFS and DFG. USACE has and will continue to maintain coordination and communication with USFWS, NMFS, and DFG. The CAR will be considered in development of the Final EIS/EIR and the Record of Decision. Effects on wildlife and fish are described in Section 3.9, *Wildlife*, and 3.10, *Fish and Aquatic Resources*, of this EIS/EIR.

Migratory Bird Treaty Act of 1936, as amended (16 USC 703, et seq.)

Partial Compliance. The MBTA implements various treaties and conventions between the United States, Canada, Japan, Mexico, and Russia, providing protection for migratory birds as defined in 16 USC 715j. Most effects resulting from the proposed project are anticipated to be short-term direct disturbances to migratory birds, which would likely temporarily avoid the construction area. USACE is in communication with USFWS via ESA consultation and development of the CAR to ensure that the proposed project does not significantly affect migratory birds; coordination with DFG is also in progress. Effects on avian species are described in Section 3.9, *Wildlife*.

Magnuson-Stevens Fishery Conservation and Management Act

Partial Compliance. The Magnuson-Stevens Act establishes a management system for national marine and estuarine fishery resources. This legislation requires that all Federal agencies consult with NMFS regarding all actions or proposed actions permitted, funded, or undertaken that may adversely affect EFH. Under the Magnuson-Stevens Act, effects on habitat managed under the Pacific Salmon Fishery Management Plan must also be considered. The Magnuson-Stevens Act states that consultation regarding essential fish habitat should be consolidated, where appropriate, with the interagency consultation, coordination, and environmental review procedures required by other Federal statutes, such as NEPA, Fish and Wildlife Coordination Act, CWA, and ESA. USACE and NMFS are in coordination to determine the EFH compliance documentation appropriate for the FRWLP. Additional description of the act is found in Section 3.10, *Fish and Aquatic Resources*.

Farmland Protection Policy Act (7 USC 4201, et seq.)

Partial Compliance. The FPPA is regulated by NRCS. The purpose of this act is to minimize the extent to which Federal programs contribute to the unnecessary and irreversible conversion of farmland to nonagricultural uses, and to ensure that Federal programs are administered in a manner that, to the extent practicable, will be compatible with state, unit of local government, and private programs and policies to protect farmland. NRCS is authorized to review Federal projects to determine whether a project is regulated under the act and establish the farmland conversion impact rating for the project. Coordination with NRCS is in progress, as discussed in Section 3.11, *Agriculture, Land Use, and Socioeconomics*.

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

Full Compliance. The order requires all Federal agencies to identify and address, as appropriate, disproportionately high and significant human health or environmental effects of their programs, policies, and activities on minority and low-income populations. Anticipated effects from the proposed project were reviewed to determine whether low-income or minority neighborhoods would be disproportionately affected by the proposed project. No effects associated with environmental justice or social equity are anticipated as a result of the project, as discussed in Section 3.12, *Population, Housing, and Environmental Justice*.

National Historic Preservation Act of 1966, as amended (16 USC 470, et seq.)

Partial Compliance. The NHPA requires Federal agencies to take into account the effects of Federal undertakings on historic properties. Section 106 of the NHPA describes the process for identifying and evaluating historic properties; for assessing the effects of Federal actions on historic properties; and for consulting to avoid, reduce, or minimize significant effects. The term *historic properties* refers to cultural resources that meet specific criteria for eligibility for listing on the NRHP. This process does not require historic properties to be preserved but does ensure that the decisions of Federal agencies concerning the treatment of these places result from meaningful consideration of cultural and historic values and the options available to protect the properties.

Under these requirements, the APE of the selected project is inventoried and evaluated to identify historical, archeological, or traditional cultural properties that have been placed on the NRHP and those that the agency and SHPO agree are eligible for listing on the NRHP. If the project is determined to have an effect on such properties, the agency must consult with SHPO and the Advisory Council on Historic Preservation (ACHP) to develop alternatives or mitigation measures. Compliance with these and other provisions of the NHPA is required as a process separate from, but concurrent with, NEPA.

The evaluation of cultural resources presented in this EIS/EIR complies with the NHPA. Research (literature and archival research) and field surveys in the APE are summarized in Section 3.17, *Cultural Resources*. USACE has prepared a draft PA to provide guidelines for compliance with the Section 106 process when the effects on historic properties are unknown, under review by SHPO.

Ongoing coordination and communication will be maintained by USACE with signatories, concurring parties, and other key stakeholders as planned follow-on efforts are undertaken and the proposed project proceeds. By carrying out the terms of the PA, USACE will have fulfilled its responsibilities under Section 106 of the NHPA and ACHP regulations. This would constitute full compliance with this act.

Executive Order 11988, Floodplain Management

Full Compliance. This Executive Order requires USACE to provide leadership and take action to (1) avoid development in the base (1-in-100 annual event) floodplain (unless such development is the only practicable alternative); (2) reduce the hazards and risk associated with floods; (3) minimize the effect of floods on human safety, health, and welfare; and (4) restore and preserve the natural and beneficial values of the base floodplain.

To comply with this Executive Order, the policy of USACE is to formulate projects which, to the extent possible, avoid or minimize significant effects associated with use of the without-project flood plain, and avoid inducing development in the existing flood plain unless there is no practicable alternative. None of the remediation measures proposed as part of the FRWLP would induce development within the floodplain. The project would provide increased stability to existing levees in selected areas that have been determined to require reinforcement. This would decrease the risk of flooding and hazards associated with floods. It would not create development in the base floodplain but would preserve the natural and beneficial values associated with the present agricultural uses. A more complete discussion is provided in Chapter 4, *Growth Inducing and Cumulative Effects*.

Executive Order 13514, Federal Leadership in Environmental, Energy, and Economic Performance

Full Compliance. Executive Order 13514 requires Federal agencies to set a 2020 GHG emissions reduction target within 90 days; increase energy efficiency, reduce fleet petroleum consumption, conserve water, and reduce waste; support sustainable communities; and leverage Federal purchasing power to promote environmentally responsible products and technologies. USACE is requiring lower emission-producing equipment for use in construction and electric batch plants.

Wild and Scenic River Act (16 USC 1271, et seq.)

Full Compliance. The proposed project complies with this act as no river segments designated as wild and scenic exist in the project area.

5.2 State Requirements

Many of the requirements of the State of California are codified under the PRC as described below. Where a more common name for a law or regulation is typically used, it is listed by that name with a reference to the corresponding PRC section.

California Environmental Quality Act (PRC, Section 21000, et. seq.)

Partial compliance. The act requires disclosure of environmental effects, alternatives, potential mitigation, and environmental compliance of the proposed project. This document will be certified and a Notice of Determination will be filed upon finalization.

Porter-Cologne Water Quality Control Act

Partial Compliance. The State Water Resources Control Board reviews certain water activities throughout California with delegated authority to regional boards for water quality. The FRWLP is under the jurisdiction of the Central Valley RWQCB. The boards administer the requirements mandated by state law and Federal law responsibilities delegated to the state (including the Porter-Cologne Water Quality Control Act and elements of the Clean Water Act, respectively). RWQCB establishes water quality standards and reviews individual projects for compliance with the standards. SBFCA will submit a 401 certification application as described above under CWA Section 404. Water quality effects are described in Section 3.2, *Water Quality and Groundwater Resources*.

Surface Mining and Reclamation Act of 1975 (PRC, Section 2710, et seq.)

Partial Compliance. The State Mining and Geology Board oversees the implementation of relevant state laws and regulations. One of the laws within its jurisdiction is the Surface Mining and Reclamation Act of 1975 (SMARA). SMARA requires that an entity seeking to conduct a surface-mining operation obtain a permit from and submit a reclamation plan to the lead agency overseeing that operation. To be adequate, the reclamation plan must contain all categories of information specified in the SMARA. SMARA compliance is in progress for applicable soil borrow areas, led by SBFCA. Section 3.3 describes effects on mineral resources.

California Streets and Highways Code (Section 660)

Partial Compliance. Caltrans is responsible for ensuring the safety and integrity of the State of California's highway system. Under California law, any encroachment on a state route must be approved by Caltrans. SBFCA is leading coordination with Caltrans for any construction permitting. Effects on roadways are presented in Section 3.4, *Traffic, Transportation, and Navigation*.

California Clean Air Act of 1988

Partial Compliance. As discussed above under the Federal Clean Air Act, the BCAQMD and FRAQMD determine whether project emission sources and emission levels significantly affect air quality based on Federal standards established by EPA and state standards set by ARB. The project is in compliance with all provisions of Federal and state Clean Air Acts. USACE and SBFCA have prepared a draft conformity analysis and are in coordination with the districts to determine that the project would have no significant effects on the future air quality of the area and is in compliance with this act. Air quality analysis is presented in Section 3.5, *Air Quality*.

California Fish and Game Code (Section 1600, et seq.)

Partial Compliance. Under Sections 1600–1616 of the California Fish and Game Code, DFG regulates activities that would substantially divert, obstruct, or change the natural flow of a river, stream, or lake; substantially change the bed, channel, or bank of a river, stream, or lake; or use material from a streambed that falls under DFG jurisdiction. In practice, DFG marks its jurisdictional limit at the top of the stream or lake bank, or the outer edge of the riparian vegetation, where present, and sometimes defines its jurisdiction based on the levee crown within leveed river systems. Notification is required prior to any such activities and DFG will issue an agreement with any necessary mitigation to ensure protection of the state's fish and wildlife resources. SBFCA is coordinating a Streambed Alteration Agreement with DFG. Effects on riparian habitat are described in Section 3.8, *Vegetation and Wetlands*.

California Endangered Species Act of 1984

Partial Compliance. DFG administers this act, which requires non-Federal lead agencies to prepare documentation if a project may significantly affect one or more state-listed endangered species. Federal agencies are not subject to the state Endangered Species Act. SBFCA is leading coordination with DFG, and species effects are discussed in Sections 3.9, *Wildlife*, and 3.10, *Fish and Aquatic Resources*.

California Land Conservation Act of 1965 (Williamson Act)

The California Land Conservation Act of 1965, commonly referred to as the Williamson Act, is a state policy administered at the local government level. The Williamson Act is intended to preserve agricultural and open space lands through contracts with private landowners. By entering into a Williamson Act contract, the landowner foregoes the possibility of converting agricultural land to non-agricultural use for a rolling period of 10 years in return for lower property taxes. The Williamson Act was amended in August 1998 to establish Farmland Security Zones. In return for a 20-year contract commitment, property owners are granted greater tax reductions. Neither Sutter County nor Butte County currently participates in the Farmland Security Zone program. As discussed in Section 3.11, *Agriculture, Land Use, and Socioeconomics*, no lands under Williamson Act protection would be affected in Sutter County and no further action is required. SBFCA will be responsible for addressing any Williamson Act issues in Butte County and is in the process of determining any Williamson Act triggers.

PRC, Section 6301, et seq. (Administration and Control of Swamp, Overflowed, Tide, or Submerged Lands)

Full Compliance. In addition to such state-owned lands as parks and state highways, the State Lands Commission has exclusive jurisdiction over all ungranted tidelands and submerged lands owned by the state and the beds of navigable rivers, sloughs, and lakes (PRC, Section 6301). State ownership extends to lands lying below the ordinary high-water mark of tidal waterways and below the low-water mark of nontidal waterways (Civil Code, Section 830). The area between the ordinary high and low water on nontidal waterways is subject to a “public trust easement.” Projects such as bridges, transmission lines, and pipelines fall into this category. A proposed project cannot use these state lands unless a lease is first obtained from the State Lands Commission. The Commission also issues separate permits for dredging. For this proposed project, no state lands have been identified that require State Lands Commission review and approval.

5.3 Local Plans and Policies

This section discusses the degree to which individual project components comply with locally adopted plans and policies. Evaluating the level of compliance with locally adopted plans can be complicated due to the following: (1) the intentionally broad and unspecific goals articulated in local general plans; (2) the potential of a Federal project to influence the location, density, and rate of development in ways that differ from existing local plans and policies; and (3) the currency of local plans. The proposed project is located within the jurisdiction of the General Plans of Sutter and Butte Counties and Cities of Yuba City, Live Oak, and Gridley. A listing of potentially applicable local plans and policies is provided in Appendix A. As the applicant and non-Federal lead agency, SBFCA would ensure, to the extent practicable, that the project complies with the provisions of all relevant local plans.

Chapter 6
Consultation and Coordination

6.1 Introduction

This chapter contains a summary of the FRWLP consultation and coordination activities that have occurred in support of the FRWLP.

6.2 Public Scoping

In June 2011, four scoping meetings were held jointly for the FRWLP and the Sutter Basin Feasibility Study. Because the two projects are being studied in close coordination, a joint scoping process was conducted to explain the relationship between the two efforts and obtain public input in a manner that is convenient, efficient, and integrated. The meetings were held to educate the public about each of the two efforts and to garner input on the proposed scope of each, in accordance with NEPA and CEQA.

The meetings were held at two different times over the course of two days. On June 27, 2011, two meetings were held; one from 3:30 to 5:30 p.m. and another from 6:30 to 8:30 p.m. Both were at the Yuba City Veterans Memorial Community Center. On June 28, 2011, two meetings were held; one from 3:30 to 5:30 p.m. and another from 6:30 to 8:30 p.m. Both were at the Gridley Veterans Memorial Hall.

The meeting locations were chosen as they are central to the region. The meeting times were chosen to accommodate both the work day schedules of public agency representatives and the general public, including residents and business owners.

The meetings were open-house style workshops in which attendees could read and view the information about the two projects and interact with project staff including SBFCA, USACE, DWR, and engineering and environmental consultants.

For more detail on comments received, information available at the meetings, and a summary of key issues that were raised, see Appendix B.

A similar approach will be used when the public draft EIS/EIR is available for review.

6.3 Agency Consultation and Coordination

Beyond formal public scoping, USACE and SBFCA have been in communication with Federal, state, and local agencies in the course of project planning, design development, and preparation of the EIS/EIR. These communications have taken form via in-person meetings, telephone conversations, and written correspondence. The purpose of the communications has included consistency with other planning studies and projects in the region, pursuit of agency approvals, seeking information to be considered in the document, and exploring opportunities for partnership.

Beginning in June 2012, numerous meetings have been held between staff from USACE Sacramento District, USFWS, and SBFCA to discuss various issues including scope of service, Coordination Act Report, Section 7 consultation, potential mitigation, and compliance strategy. USACE has also sent numerous electronic mail messages to the USFWS transmitting important information including the USFWS Scope of Work, Civil Works project funding, and acreage impacts. An onsite field tour of the entire project area was also held in July 2012 that was attended by USFWS staff and other agency staff, including USACE, DFG, DWR, CVFPB, and SBFCA. Communication with Caltrans has also occurred during this time.

Agency communication will continue through approvals and monitoring of permit conditions.

6.4 Other Communication

Beyond agency coordination, USACE and SBFCA are in communication with Native Americans, environmental non-governmental organizations (NGOs), and other interested stakeholders. Correspondence was received from Mooretown Rancheria and Enterprise Rancheria in response to a written inquiry from USACE based on NAHC coordination (described in 3.17). A comprehensive mailing list that includes the 27,000 property owners of the 34,200 properties in the Sutter Basin will be utilized to share information regarding the project as it moves forward including a newsletter announcing the availability of the public draft EIS/EIR and upcoming public meetings.

SBFCA will be increasing outreach to all of these groups prior to release of the public draft EIS/EIR, to facilitate support for the project through an inclusive process.

Chapter 7
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Chapter 8
List of Preparers

This EIS/EIR was prepared by ICF International at the direction of USACE and SBFCA. The following individuals participated in the preparation of this document.

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8.2 U.S. Army Corps of Engineers

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8.4 Other Contributors

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Dave Peterson	PBI M.S. Civil Engineering 30 years experience	Coordinator for Sutter Basin Project
Andrea Clark	Downey Brand EnEnvironment Science , J.D 9 years experience	Legal Counsel on behalf of SBFCA
Chris Krivanec	HDR M.S. Civil (Geotechnical) Engineering 20 years experience	Project Description Review and Analytical Input
Jonathon Kors	Wood Rogers B.S. Civil Engineering 15 years experience	Project Description Review and Analytical Input
Daniel Jabbour	HDR B.S. Civil Engineering 13 years experience	Analytical Input
Dawn LoBaugh	HDR M.S. Environmental Sciences; 10 years experience	Wildlife Resource Specialist; authored USFWS Biological Assessment and provided agency coordination
Jeannette Owen	HDR B.S. Environmental Biology & Ecology; 17 years experience	Authored Environmental Consequences material of Vegetation and Wetlands section

Name	Education/Experience	Contribution/Role
Patty Hardesty	HDR B.S. Conservation Biology; 10 years experience	Conducted delineation of wetlands and other waters
Scott Tidball	HDR B.A. Environmental Studies; 1 year experience	Provided GIS expertise for wetlands and other waters delineation and USFWS Biological Assessment
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Chapter 9
Recipients

9.1 Government Departments and Agencies

9.1.1 Federal Agencies

Bureau of Indian Affairs, Pacific Regional Office, Sacramento, CA
Bureau of Land Management, Sacramento, CA
Bureau of Reclamation, Mid-Pacific Region, Sacramento, CA
Department of Agriculture, Animal and Plant Health and Inspection Service, Sacramento, CA
Department of Agriculture, Farm Service Agency, Washington, DC
Department of Agriculture, National Institute of Food and Agriculture, Washington, DC
Department of Agriculture, Natural Resources Conservation Service, Oroville, CA
Department of Agriculture, Natural Resources Conservation Service, Washington, DC
Department of Agriculture, Natural Resources Conservation Service, Yuba City, CA
Department of Defense, Navy, Washington, DC
Department of Defense, U.S. Marine Corps, Washington, DC
Department of Energy, Washington, DC
Department of Health and Human Services, Americans with Disabilities Act, Washington, DC
Department of Health and Human Services, Centers for Disease Control and Prevention, Atlanta, GA
Department of Health and Human Services, Office of the Secretary, Washington, DC
Department of Homeland Security, Washington, DC
Department of Housing and Urban Development, Region IX, San Francisco, CA
Department of the Interior, Washington, DC
Department of the Treasury, Washington, DC
Department of Veterans Affairs, Washington, DC
Environmental Protection Agency (via e-filing)
Environmental Protection Agency Region 9, San Francisco, CA
Federal Aviation Administration, Flight Standards District Office, Sacramento, CA
Federal Emergency Management Agency, Region IX, Oakland, CA
Federal Highway Administration, California Division, Sacramento, CA
Fish and Wildlife Service, Sacramento Fish and Wildlife Office – Sacramento, CA;
Fish and Wildlife Service, Sacramento River National Wildlife Refuge Complex-Willows, CA
General Services Administration, Washington, DC
Geological Survey, Menlo Park, CA
National Marine Fisheries Service, Central Valley Office-Sacramento, CA
National Marine Fisheries Service, Southwest Regional Office-Long Beach, CA
National Park Service, San Francisco, CA
National Science Foundation, Arlington, VA

9.1.2 Native American Contacts

Berry Creek Rancheria of Maidu Indians
Butte Tribal Council
Cachil DeHe Band of Wintun Indians (Colusa Rancheria)
Cortina Indian Rancheria of Wintun Indians
Enterprise Rancheria of Maidu Indians
Greenville Rancheria of Maidu Indians
KonKow Valley Band of Maidu
Maidu Cultural and Development Group
Maidu Nation
Maidu/Konkow
Mechoopda Indian Tribe of Chico Rancheria
Mooretown Rancheria of Maidu Indians
National Congress of American Indians
National Tribal Environmental council
Paskenta Band of Nomlaki Indians of California
Strawberry Valley Rancheria
Tsi-Akim Maidu
United Auburn Indian Community of the Auburn Rancheria

9.1.3 State Agencies

California Air Resources Board
California Department of Conservation
California Department of Fish and Game, North Central Region
California Department of Parks and Recreation, Northern Butte District
California Department of Transportation, District 3
California Department of Water Resources
California Environmental Protection Agency
California Farm Bureau Federation
California Natural Resources Agency
Central Valley Flood Protection Board
Central Valley Regional Water Quality Control Board
Environmental Council of the States
National Association of Attorneys General
National Conference of State Legislatures
Office of Historic Preservation
Office of Planning and Research
State Lands Commission, Environmental Management Division
The California Central Valley Flood Control Association
The Northern California Water Association

9.1.4 Elected Officials

Honorable Barbara Boxer, U.S. Senator
Honorable Dianne Feinstein, U.S. Senator
Honorable Wally Herger, U.S. Congressman, District 2
Honorable Doug Lamalfa, California State Senator, District 4
Honorable Jim Nielsen, California Assembly member, District 2

9.1.5 Regional, County, and City

Butte County Air Quality Management District
Butte County Board of Supervisors
Butte County Clerk/Recorder
Butte County Department of Development Services
Butte County Library—Main Branch, Oroville, CA
Butte Environmental Council
City of Biggs Branch Library
City of Biggs City Council
City of Biggs Planning Department
City of Gridley City Council
City of Gridley Planning Department
City of Live Oak City Council
City of Live Oak Planning Department
City of Marysville City Council
City of Marysville Planning Department
City of Yuba City City Council
City of Yuba City Community Development
Feather River Air Quality Management District
Gridley Branch Library
Levee District 1
Levee District 3
Levee District 9
Maintenance Area 16
Maintenance Area 7
Sacramento Area Flood Control Agency
Sutter Butte Flood Control Agency
Sutter Butte Flood Control Agency Board of Directors
Sutter County Board of Supervisors
Sutter County Clerk/Recorder
Sutter County Library—Main Branch, Yuba City, CA
Sutter County Planning Services
Sutter County Public Works Department
Sutter County RCD

Three Rivers Levee Improvement Authority
West Sacramento Area Flood Control Agency
Yuba County Planning Department
Yuba-Sutter Farm Bureau

9.2 Other Interested Parties

Alliance for Nuclear Accountability
American Bird Conservancy
American Federation of Labor and Congress of Industrial Organizations
American Lung Association
American Recreation Coalition
American Rivers
Center for Biological Diversity
Clean Water Action
Ducks Unlimited
Earth Justice
Edison Electric Institute
Environment America
Environmental Defense Fund
Environmental Defense Institute
Family Water Alliance
Friends of the Earth
GRACE
Institute for Science and International Security
League of Women Voters
Local Media Representatives
National Audubon Society
National Wildlife Federation
Natural Resources Defense Council
Pacific Gas & Electric Company
Partners in Flight
Responsible Environmental Action League
Sacramento River Preservation Trust
Sacramento Valley Landowners Association
Sierra Club
The Nature Conservancy
The Partnership Project
The Wilderness Society
Trout Unlimited

9.3 Members of the Public

All members of the general public who requested a copy of the Draft EIS/EIR will be mailed either an electronic version (on CD) or a hard copy of the document. Additionally, those who submitted comments during the scoping process and provided complete mailing addresses and those who may be affected by the proposed project will also receive a copy of the Draft EIS/EIR.

Chapter 10
Index

Plates

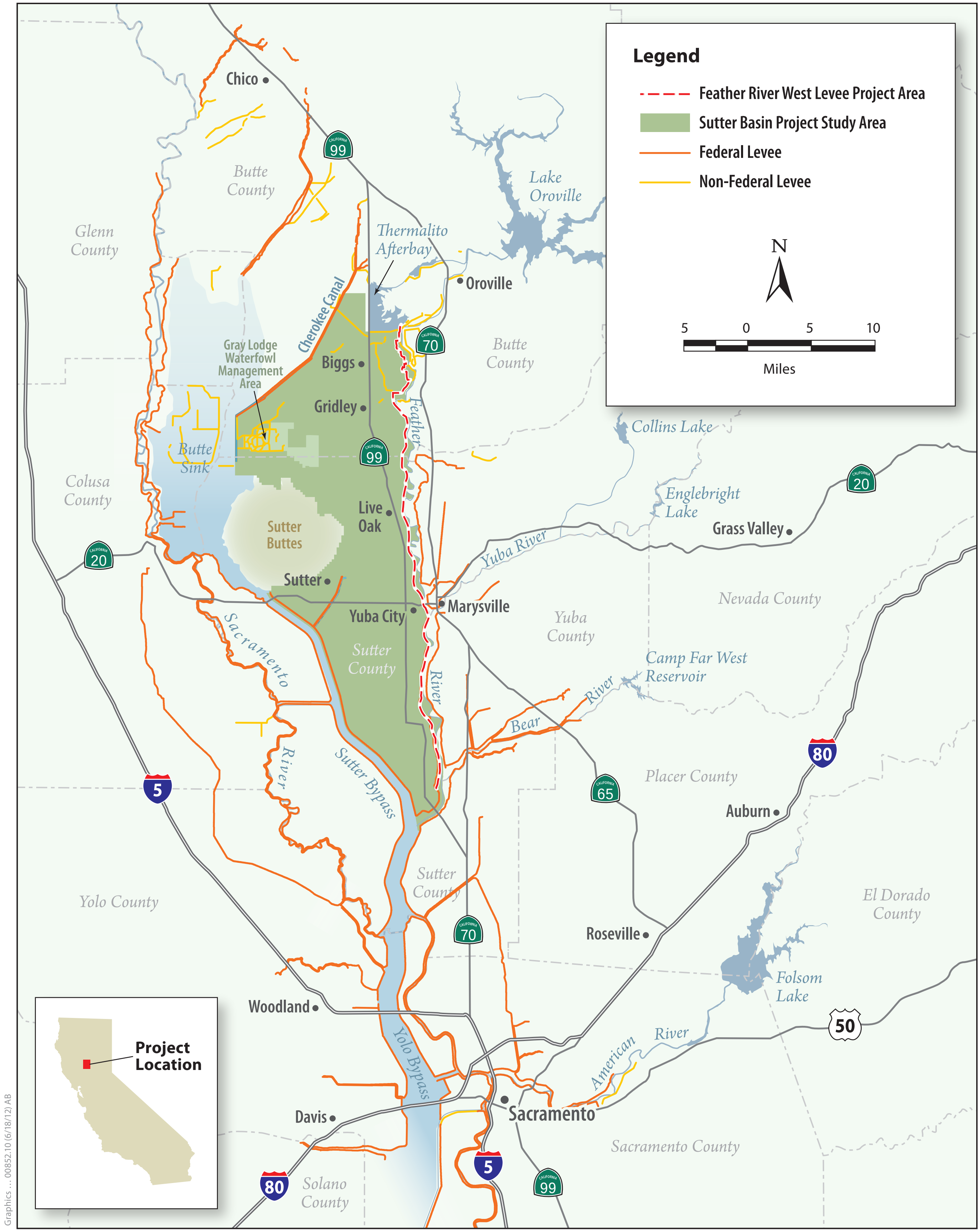


Plate 1-1
Regional Setting

State Plan of Flood Control

Lead Agency: DWR
Location: Central Valley
Goal: Guide flood management expenditures under Propositions 84 & 1E
Timeline: Complete Plan by 2014

Sacramento – San Joaquin River Basins Comprehensive Study/Central Valley Integrated Flood Management Study

Lead Agency: USACE and DWR
Location: Central Valley
Goal: Flood damage reduction and ecosystem restoration
Phase: Comp study was completed in 2002; CVIFMS is expected to be complete by 2015

Sutter Basin Project

Lead Agency: USACE and SBFCA
Location: Sutter and Butte counties
Goal: Increase flood protection for communities in Sutter and Butte counties
Phase (Timeline): Feasibility Study and EIS (2011)

Mid-Valley Project

Lead Agency: USACE and State of California
Location: Knights Landing
Goal: Flood risk reduction for Knights Landing
Timeline: Construction by 2016

Natomas Levee Improvement Program

Lead Agency: SAFCA
Location: Natomas Area, Sacramento
Goal: Achieve 200-year flood protection for the Natomas Basin
Timeline: Construction of 100 yr. protection by 2011, 200 yr. protection by 2012

West Sacramento Levee Improvements Project

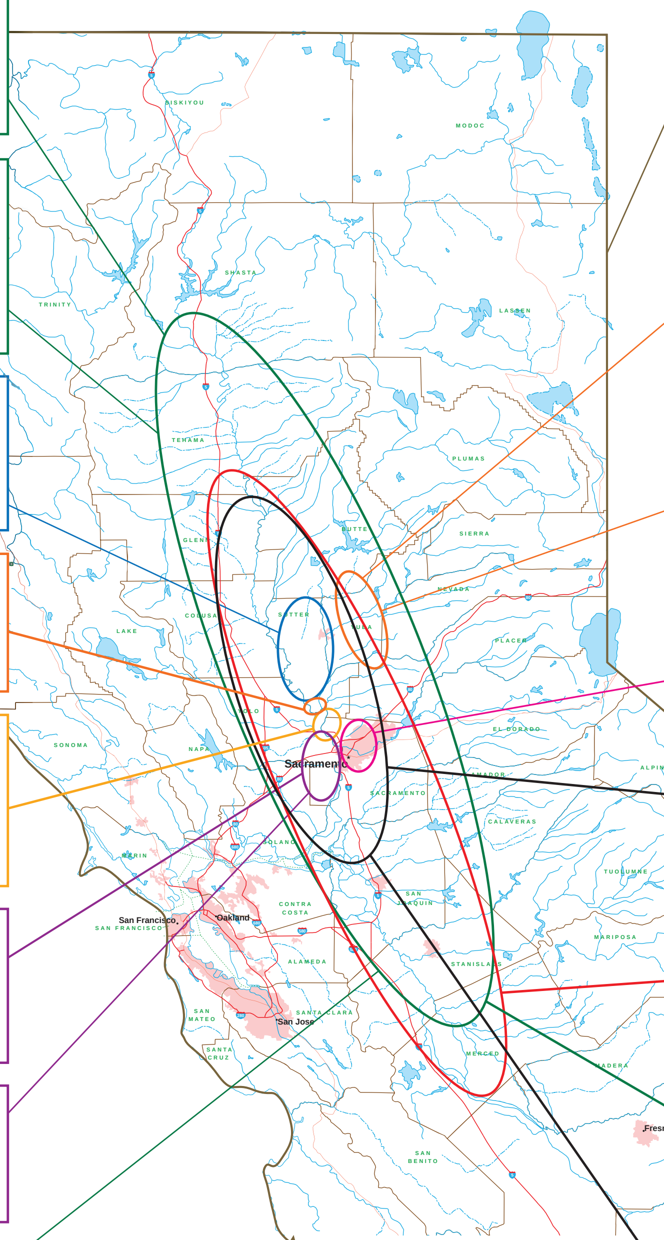
Lead Agency: USACE and WSAFCA
Location: West Sacramento
Goal: Achieve 200-year flood protection for the City of West Sacramento
Phase (Timeline): EIS/EIR (2010)

West Sacramento Project

Lead Agency: WSAFCA, USACE and DWR
Location: West Sacramento
Goal: Comprehensive analysis of the City's levee system
Phase (Timeline): GRR (2012)

Central Valley Flood Protection Plan

Lead Agency: DWR
Location: Central Valley and Sacramento-San Joaquin Delta
Goal: Develop strategies for comprehensive system-wide flood improvements
Timeline: Complete plan by 2012; complete protection measures by 2025



FloodSAFE

Lead Agency: DWR
Location: State-wide, but primarily Central Valley
Definition: Multi-faceted program to improve public safety through integrated flood management.
Timeline: Complete foundational objectives by 2025

Yuba Basin Project

Lead Agency: USACE, DWR, and YCWA
Location: Yuba, Feather, Bear rivers Watershed
Goal: Increase flood protection for communities of Linda, Olivehurst, Arboga, Marysville, and unincorporated areas of Yuba County
Phase (Timeline): GRR (2010)

Three Rivers Levee Improvement Authority Projects

Lead Agency: Three Rivers Levee Improvement Authority
Location: Southern Yuba County
Goal: Increase flood protection for communities in southern Yuba County
Phase (Timeline): Construction of 200-year protection by 2010

American River Common Features Project

Lead Agency: USACE, DWR, and SAFCA
Location: Sacramento metropolitan area
Goal: Reduce flood risks for the City of Sacramento
Phase (Timeline): GRR (2010)

Sacramento River Bank Protection Project

Lead Agency: USACE and DWR
Location: SRFCP
Goals: Federal program to correct levee erosion issues
Phase (Timeline): Ongoing Phase II EIS (2011)

PL 84-99 Rehabilitation Assistance of Flood Control Works

Lead Agency: USACE and DWR
Location: Central Valley and Sacramento-San Joaquin Delta
Goals: Federal program to provide emergency levee repairs
Timeline: Ongoing

Levee Collaborative

Lead Agency: USACE and DWR
Location: Central Valley
Goals: Develop short- and long-term plans to achieve system-wide compliance with USACE standards for the State Flood System in the Central Valley
Timeline: Ongoing

Sacramento River Flood Control System Evaluation

Lead Agency: USACE
Location: SRFCP
Goals: Repairing, raising, and strengthening urban levees
Timeline: Ongoing

ACRONYMS

WSAFCA - West Sacramento Area Flood Control Agency
USACE - U.S. Army Corps of Engineers
SBFCA - Sutter-Butte Flood Control Agency
DWR - Department of Water Resources
SAFCA - Sacramento Area Flood Control Agency
SRFCP - Sacramento River Flood Control Project
YCWA - Yuba County Water Agency

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Plate 1-2
Major Flood Risk Reduction Efforts in the Sacramento Valley

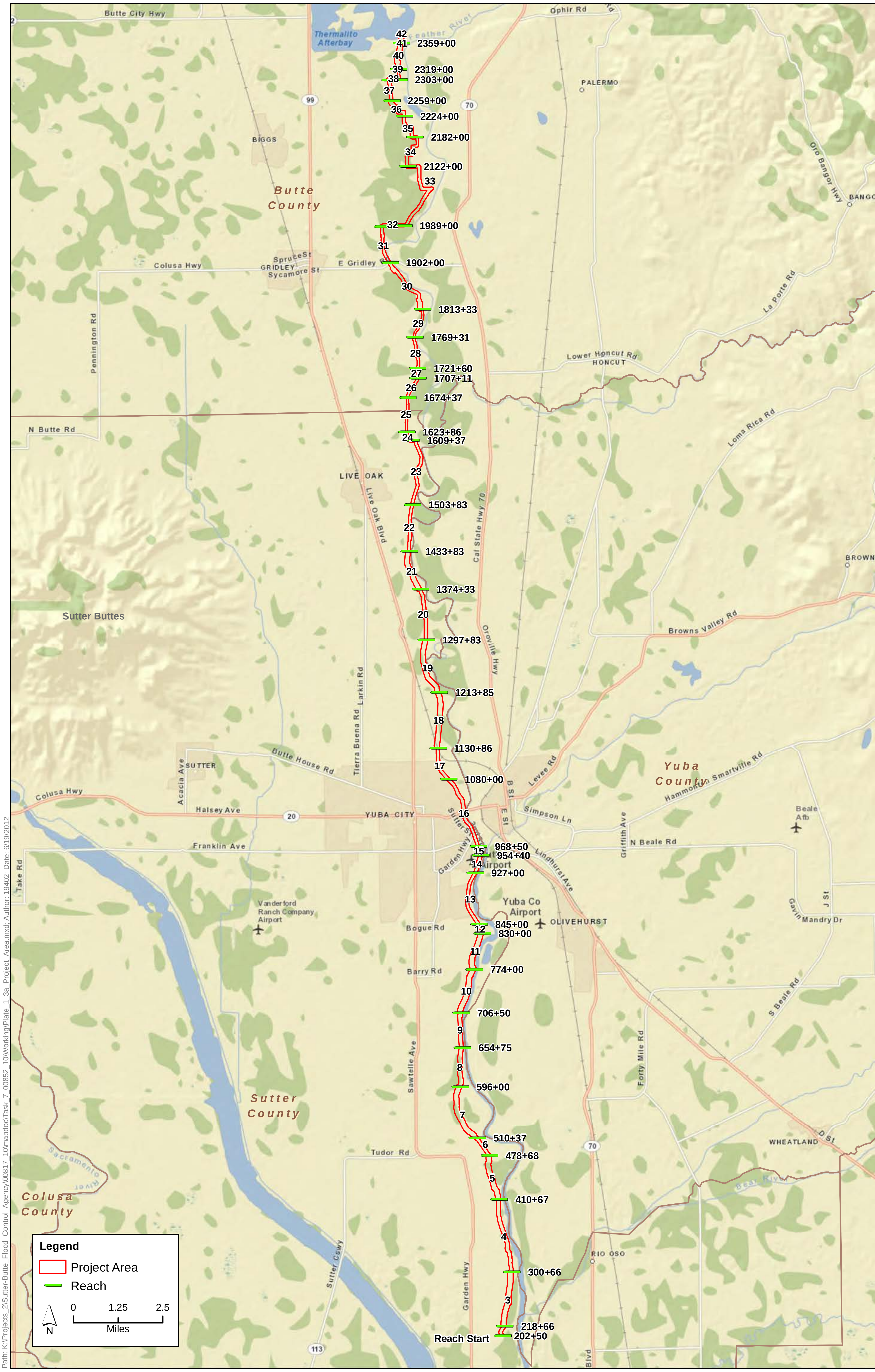

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Plate 1-3a
Project Area

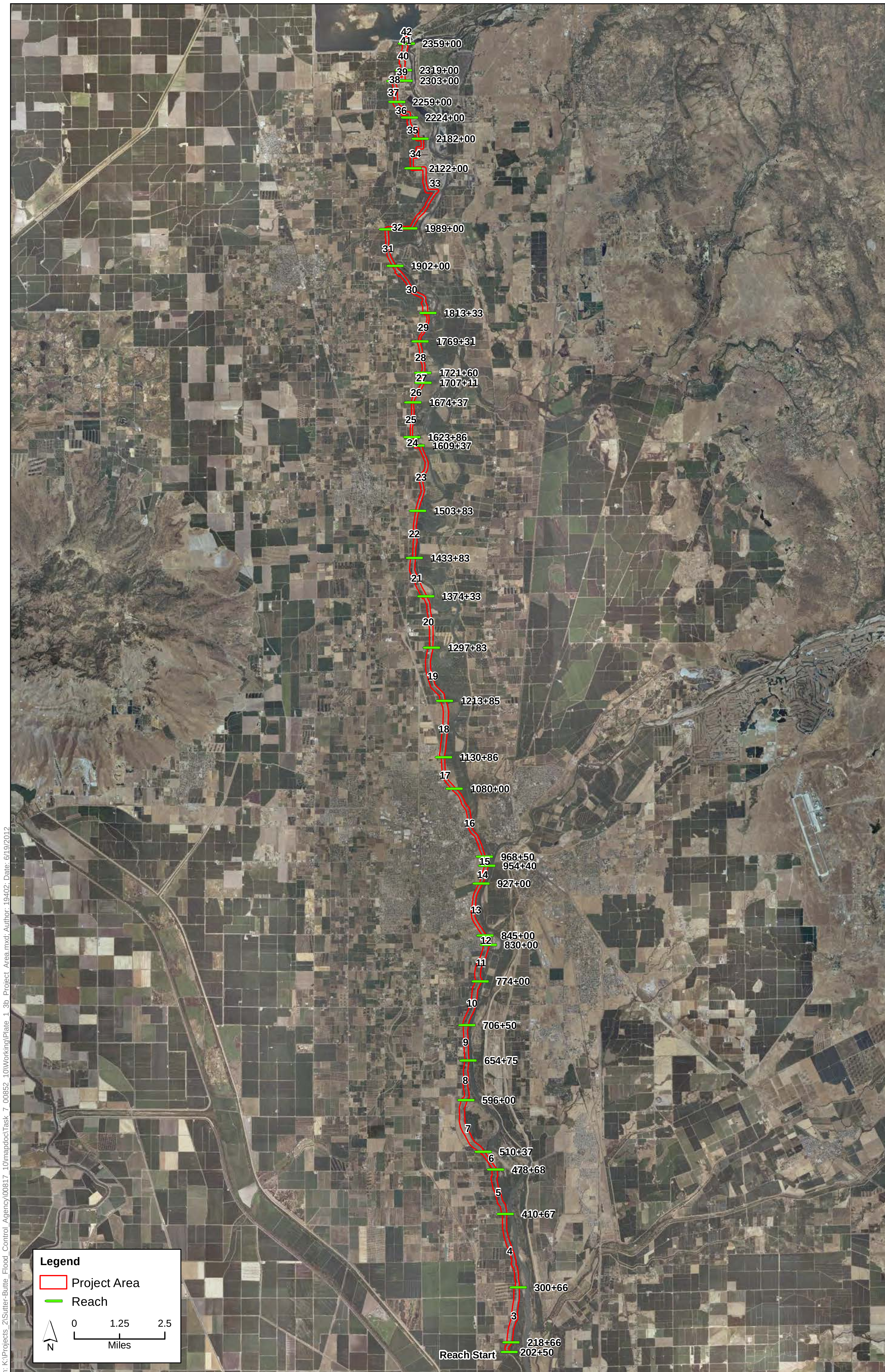

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Plate 1-3b
Project Area

Reach 4. Feather River west levee looking northeast from water side of levee crown. Note mature vegetation on waterside slope. River is off the photo to the right.

Reach 4. Feather River west levee looking northwest from landside of levee crow. Note the Sutter Buttes visible on the horizon and orchards in foreground.

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Plate 1-4
Representative Photos of the Project Area

Reach 7. Feather River west levee looking northeast from landside slope. Note the Sutter Buttes to the left along the horizon and the agricultural fields in the foreground.

Reach 8. Feather River west levee looking northeast from waterside slope. Note the mature vegetation along the bank, and the Feather River in the middleground barely visible beyond the near vegetation.

Plate 1-5
Representative Photos of the Project Area

Reach 9. Feather River west levee looking south from the levee crown at Boyd's Pump. Note the boat launching facilities.

Reach 11. Feather River west levee looking south from the crown. Note the river channel at left and the mature vegetation along the bank.

Graphics … 00852.10 (6/26/12) AB

Plate 1-6
Representative Photos of the Project Area

Reach 13. Feather River west levee looking south along the landside slope at the intersection of Shanghai Bend Road. Note the paved public access trail and the residences to the west. The river is at left off the photo.

Reach 14. Feather River west levee looking west from the landside slope at the Sutter County Airport.

Graphics … 00852.10 (6/26/12) AB

Plate 1-7
Representative Photos of the Project Area

Reach 18. Feather River west levee looking north from the levee crown. Note the utility poles at the landside toe of the levee at left with orchards beyond.

Reach 19. Feather River west levee looking west from the land side of the levee crown. Note the Sutter Buttes in the background and orchards in the foreground.

Graphics … 00852.10 (6/26/12) AB

Plate 1-8
Representative Photos of the Project Area

Reach 23. Feather River west levee looking south from the levee crown. Note the residence on the landside toe and the mature vegetation on both the land and watersides of the levee.

Reach 26. Feather River west levee looking north from land side of the crown. Note the irrigation canal, utility poles, and orchards to the left. Also note the decreased levee prism in this reach.

Graphics … 00852.10 (6/26/12) AB

Plate 1-9
Representative Photos of the Project Area

Reach 32. Feather River West levee looking north from the water side of the levee crown. Note orchards on both water side and land side of the levee.

Reach 33. Feather River west levee looking north. Note the orchards on the land side to the left and the aggregate deposits in the floodplain to the right.

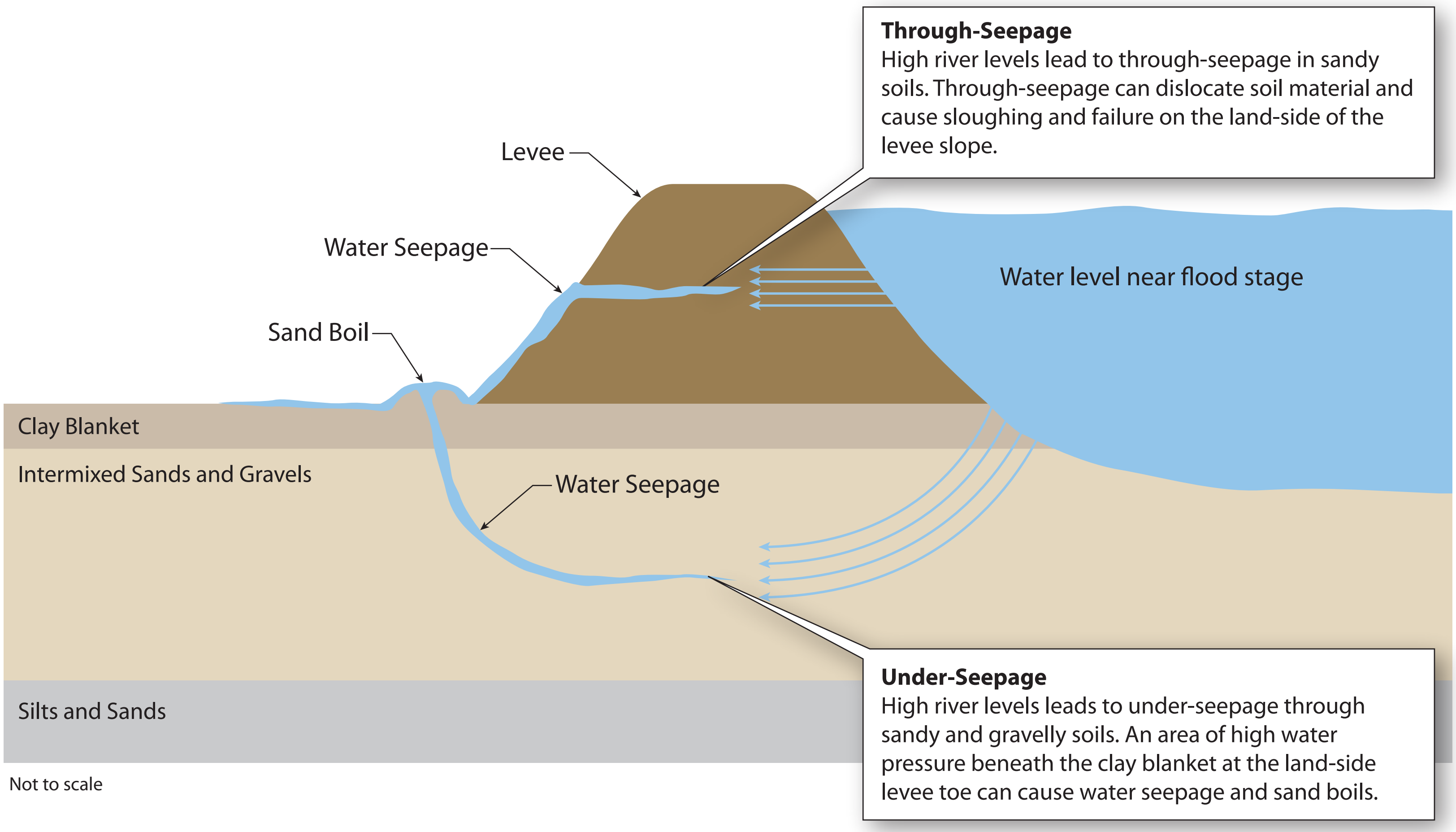
Graphics … 00852.10 (6/26/12) AB

Plate 1-10
Representative Photos of the Project Area

Levee seepage is when water moves away from the river channel, either below or through the levee and surrounding land surface (see diagram below). Two main factors contribute to seepage:

- high water pressure within the river (such as during periods when the river is near flood-stage), and
- pervious earth material within and underlying the levee.

The combination of high water pressure and pervious material can be evident in sand boils and water seepage on the land-side of the levee. Under severe conditions, the clay blanket on the land side may be ruptured and the increased flow of the under-seeping water undermines the levee, causing the levee to breach or collapse.

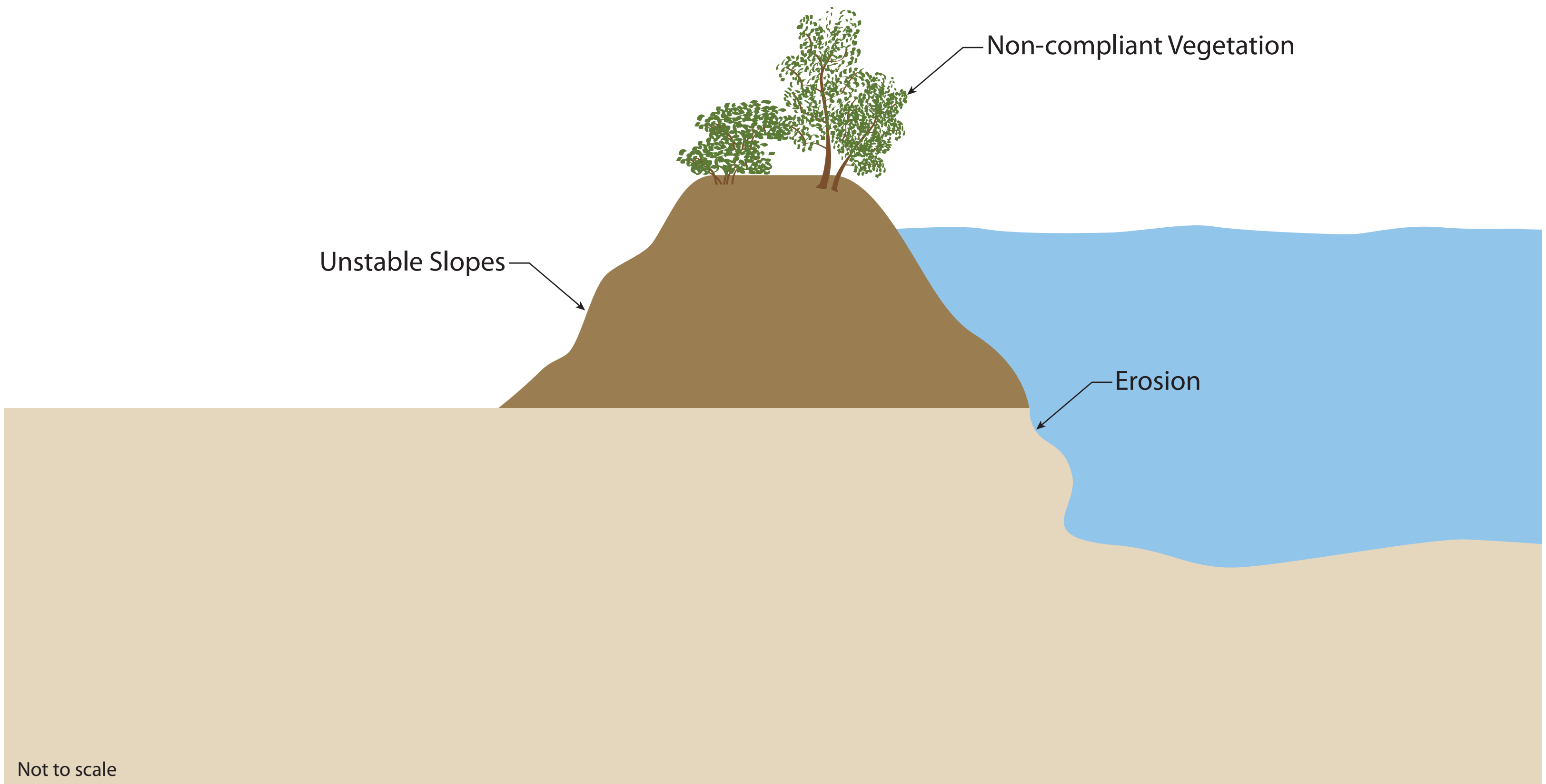


Graphics . . . 00852.10 (6/26/12) AB

Plate 1-11
Levee Seepage

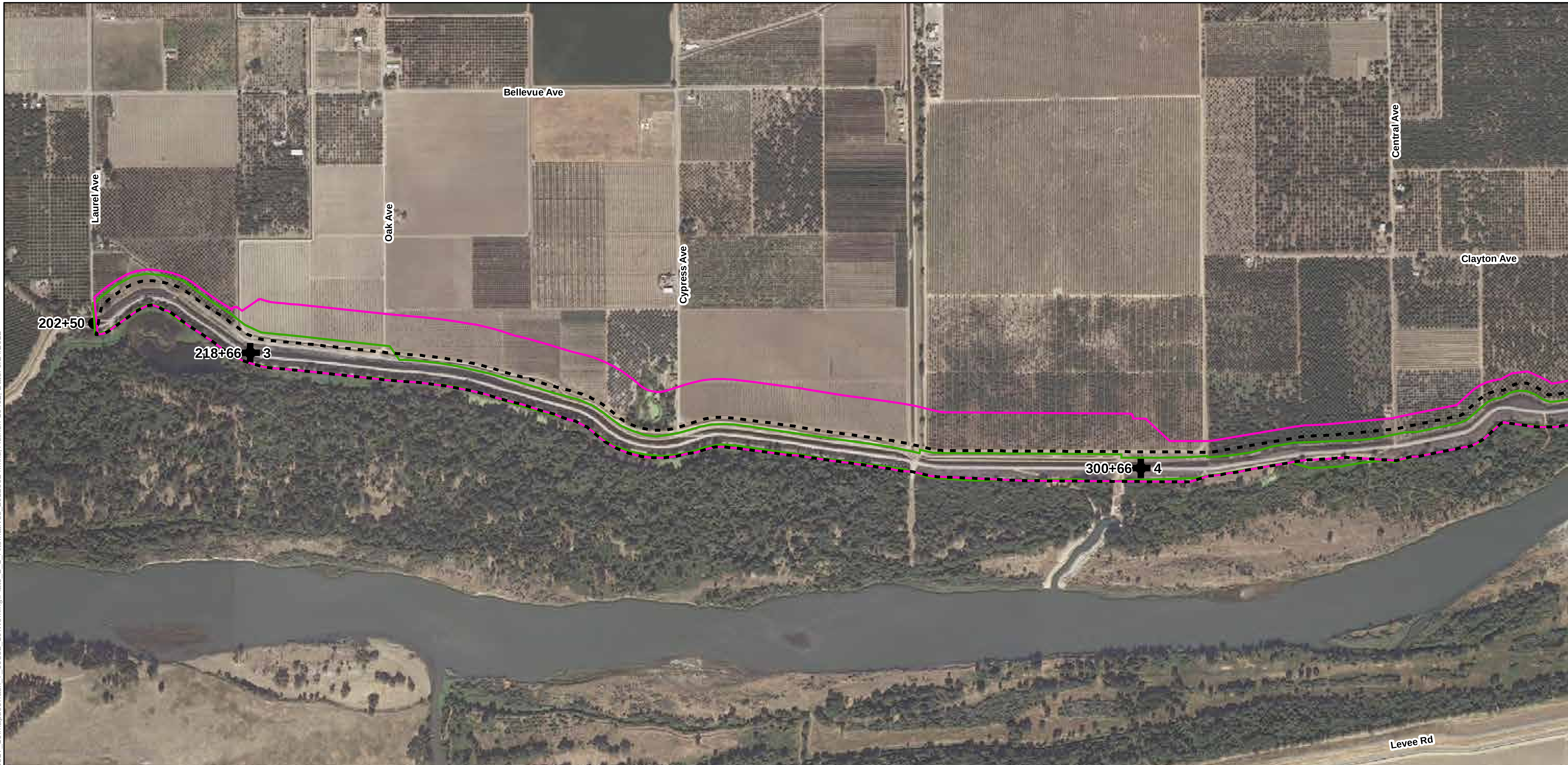
Typical Levee Deficiencies

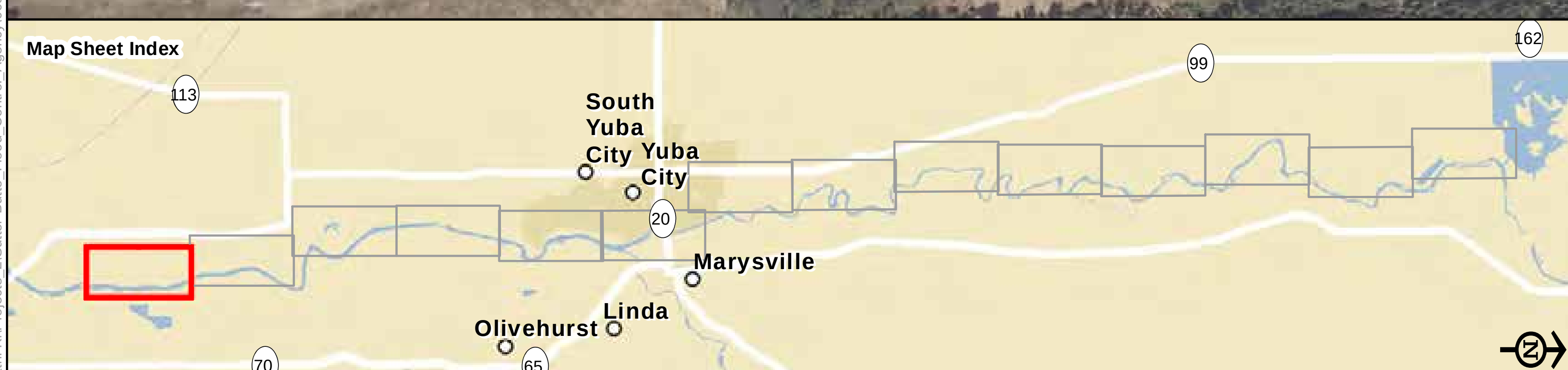
- Unstable Slopes - irregular or overly steepened slopes compromise the levee structure
- Erosion - water flow, wakes, and waves damage the levee by removing soil
- Vegetation and other Encroachments - this can hinder levee monitoring and maintenance, and raise water surface elevation



Graphics . . . 00852.10 (6/26/12) AB

Plate 1-12
Other Typical Levee Deficiencies





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- Alternative 2
- Alternative 3

Plate 2-1
Alternatives 1-3

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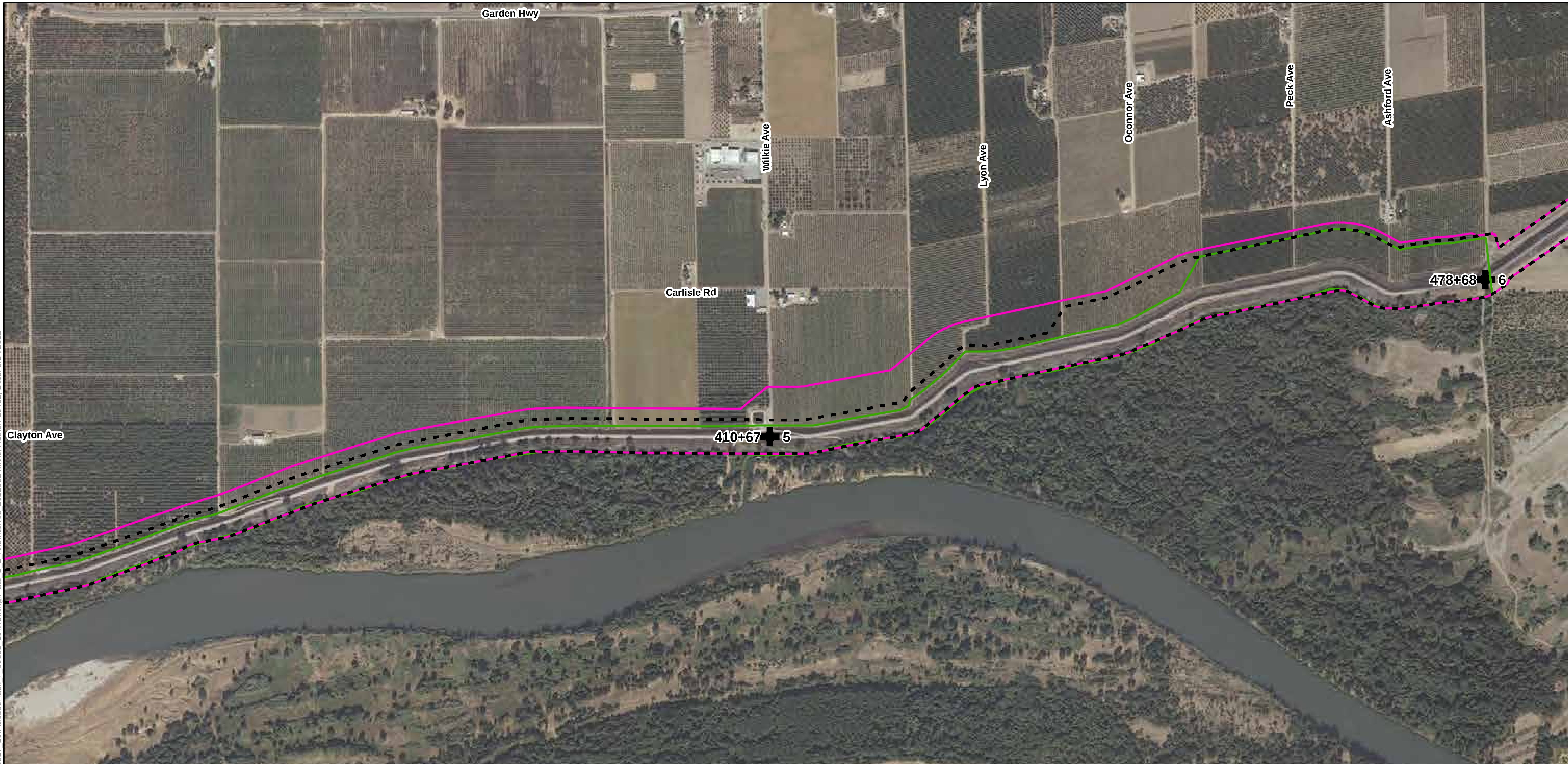

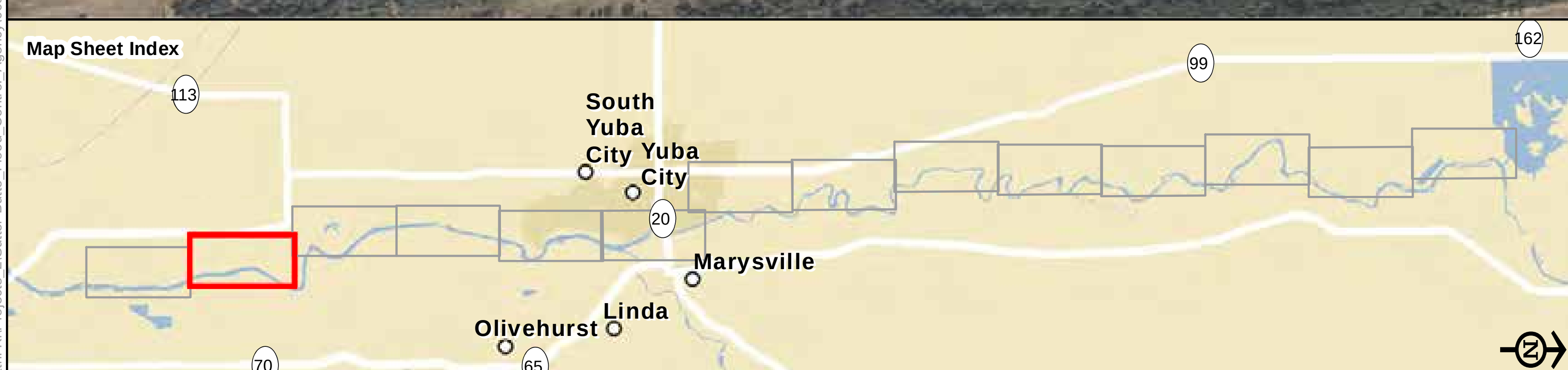

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Plate 2-1
Alternatives 1-3

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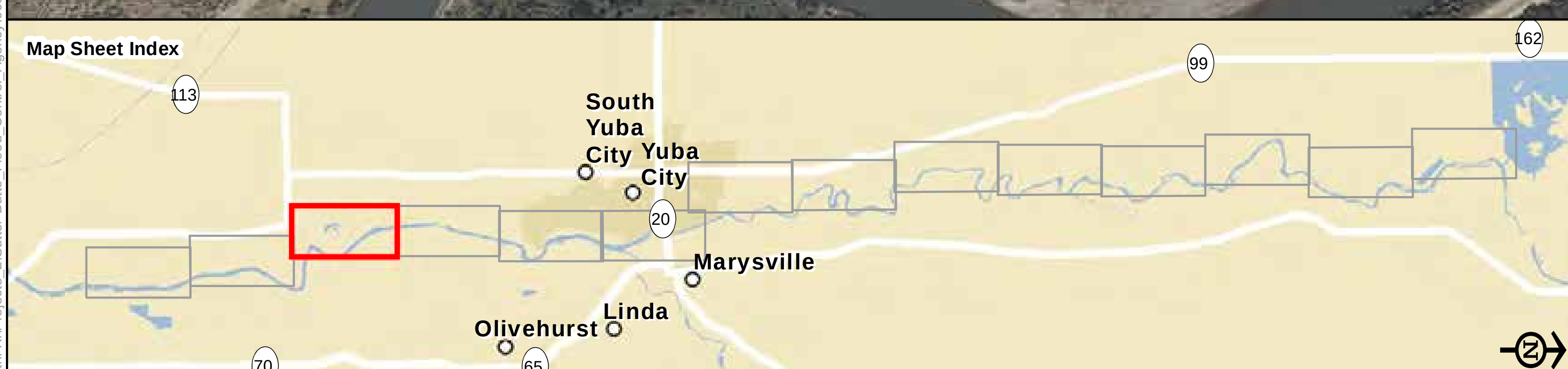

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Plate 2-1
Alternatives 1-3

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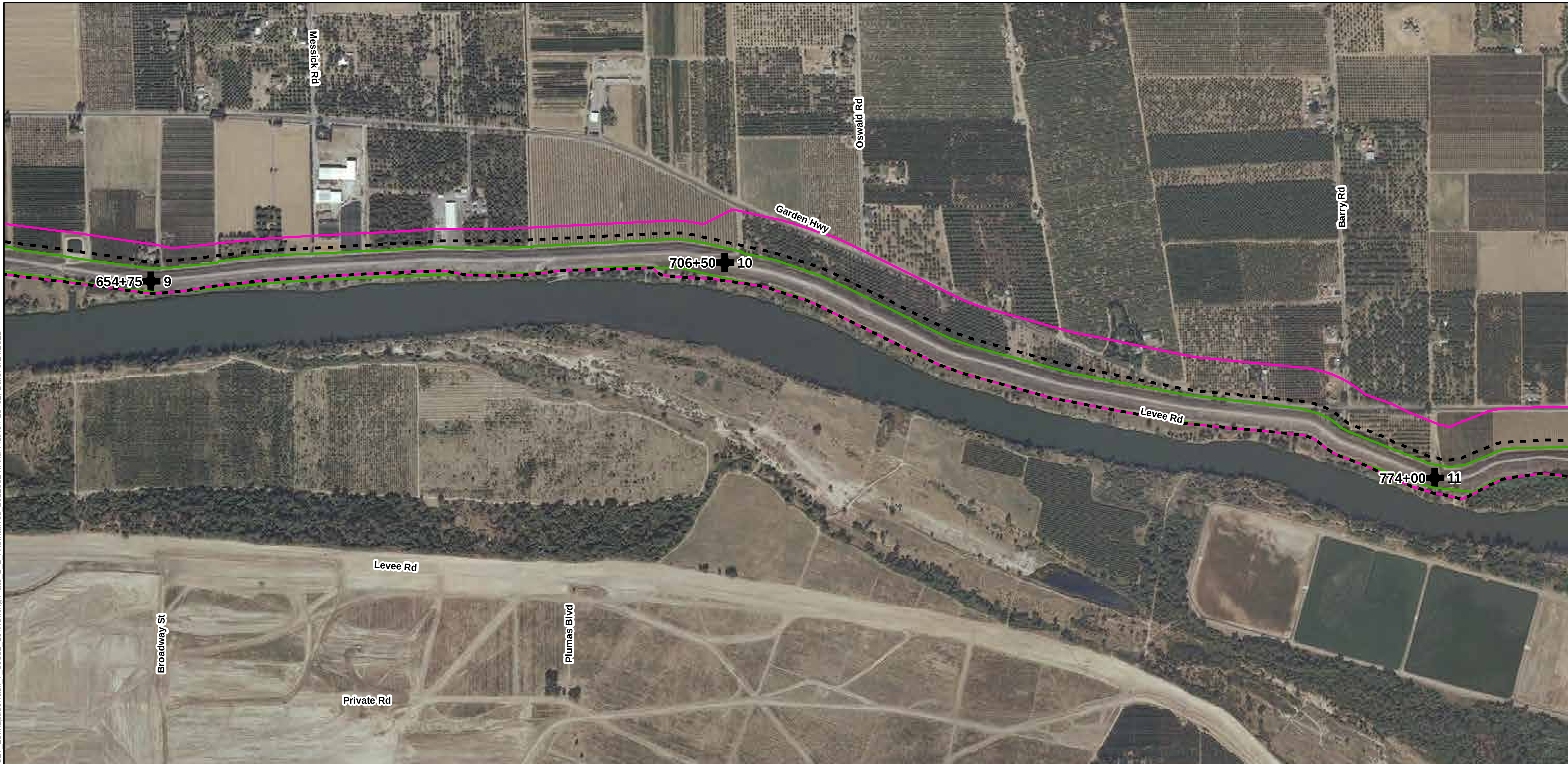

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Plate 2-1
Alternatives 1-3

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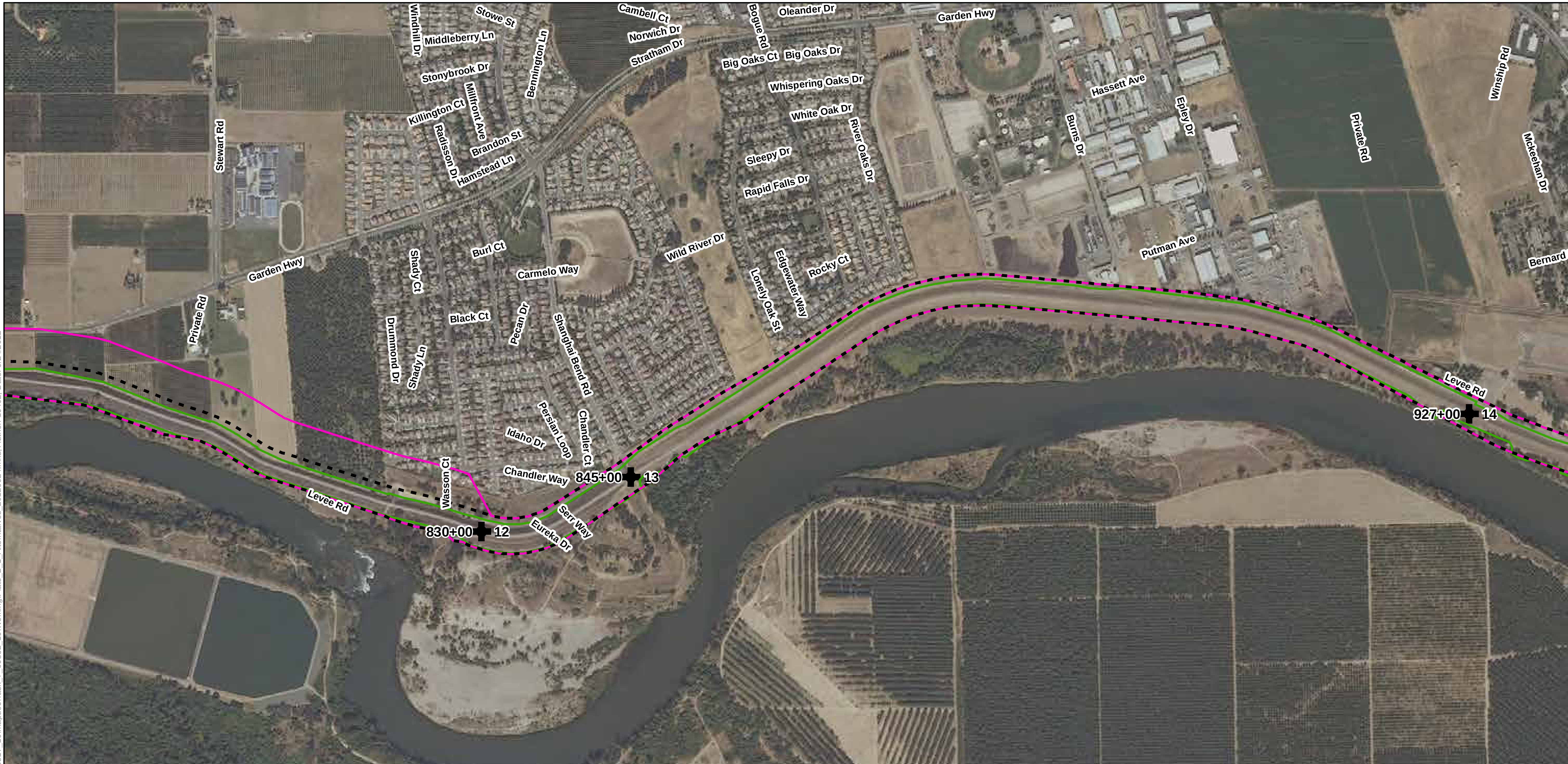

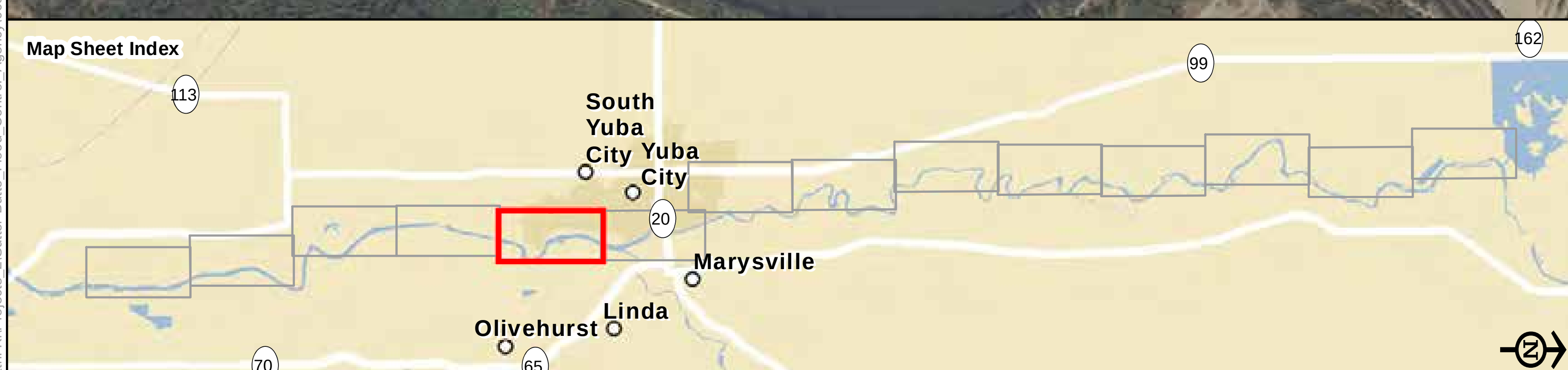

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Plate 2-1
Alternatives 1-3

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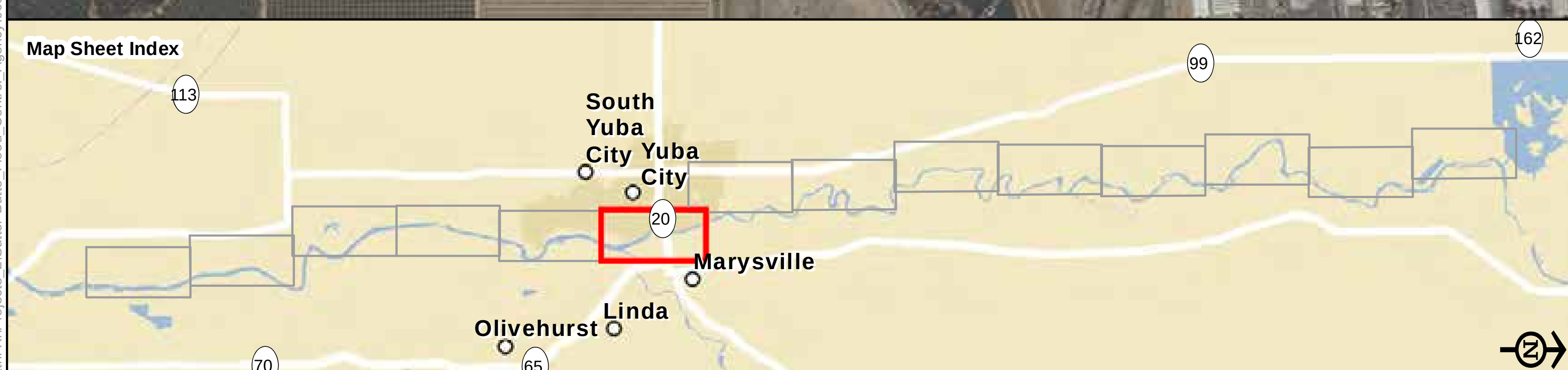

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Plate 2-1
Alternatives 1-3

Sheet 6

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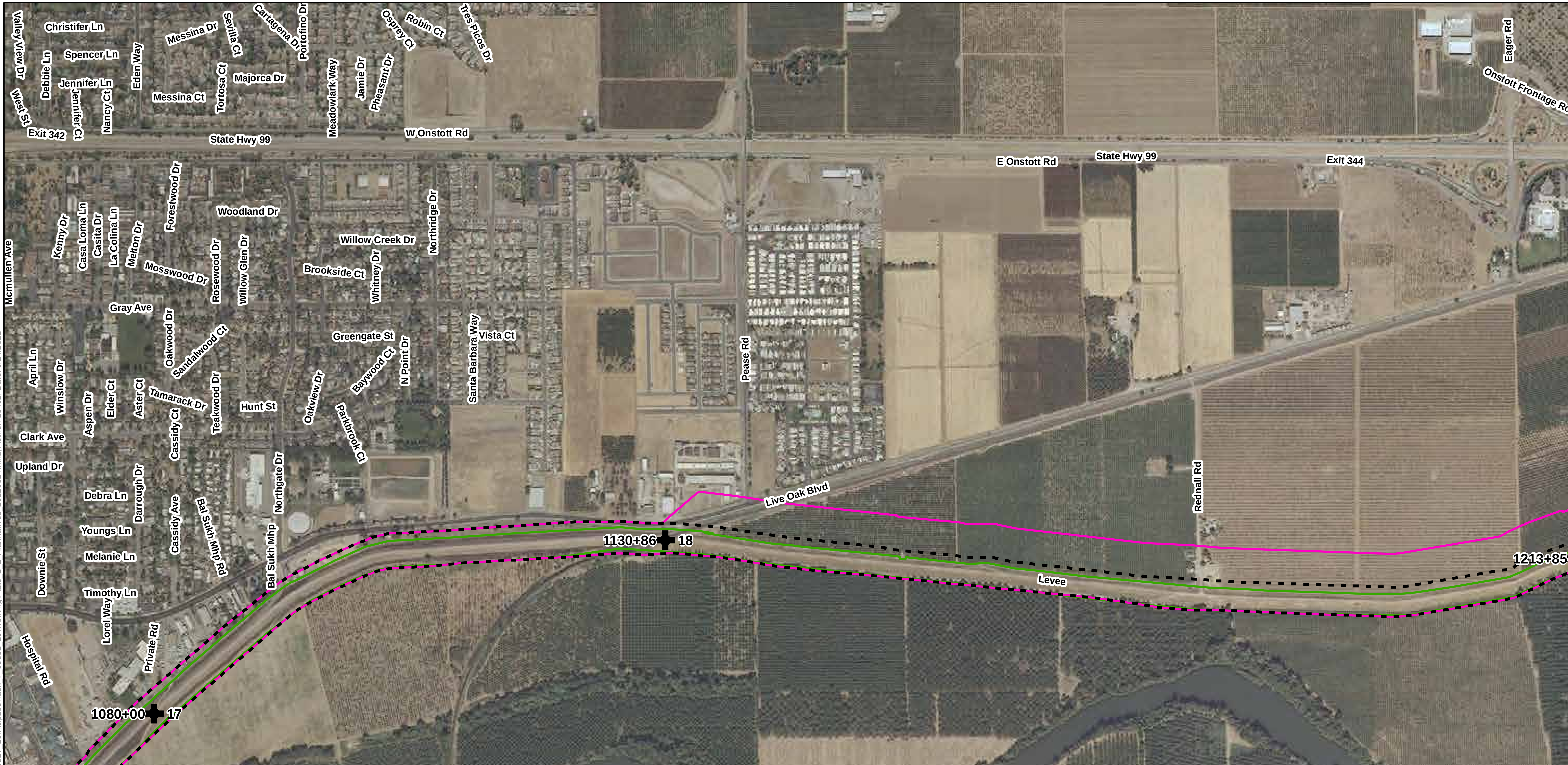

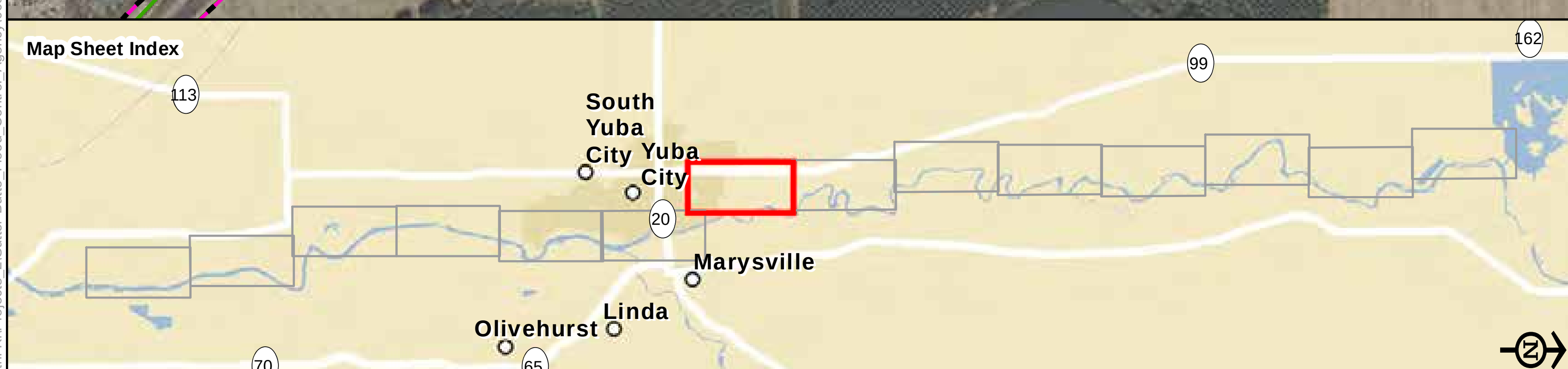

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Plate 2-1
Alternatives 1-3

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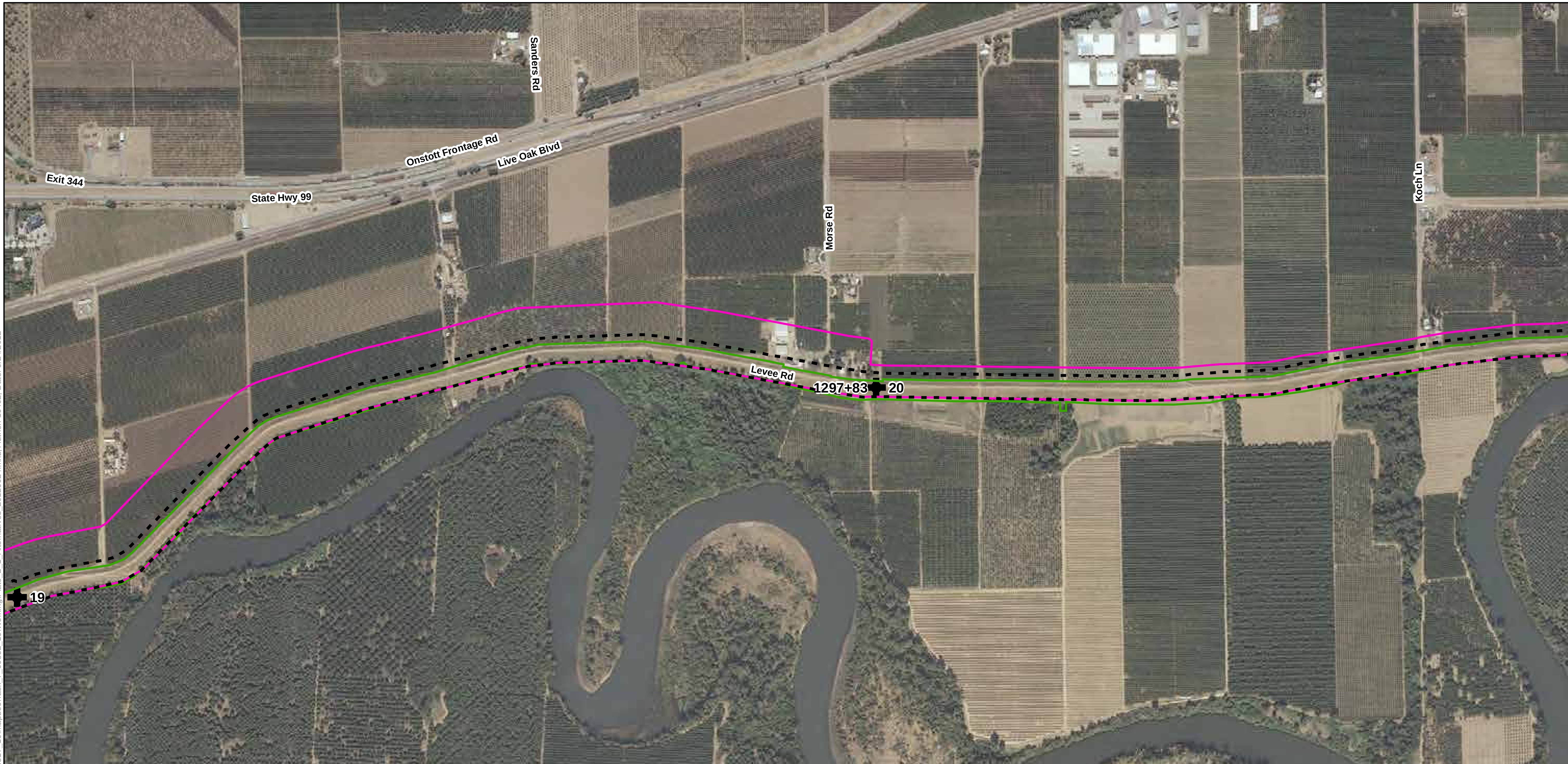

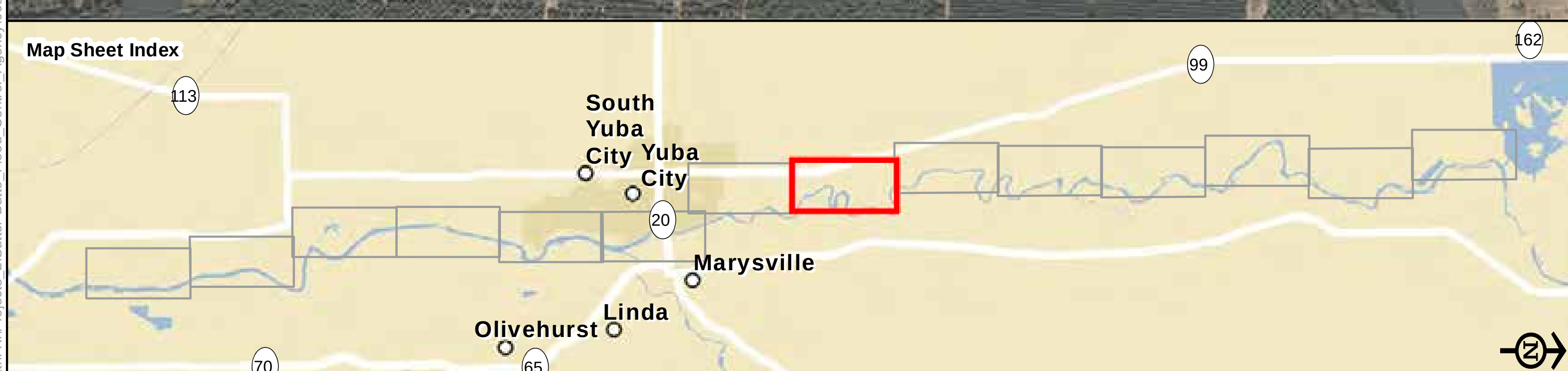

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Plate 2-1
Alternatives 1-3

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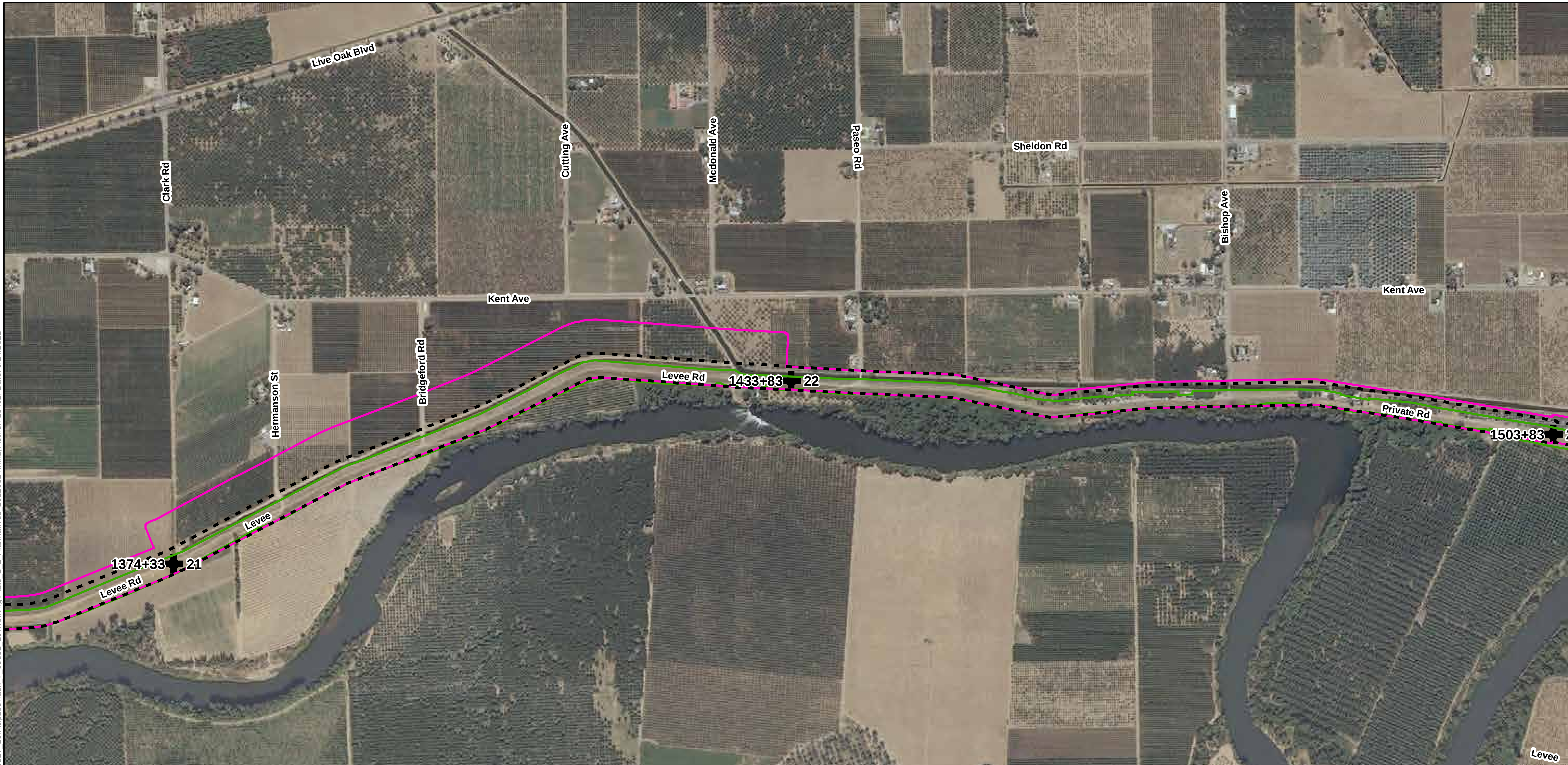

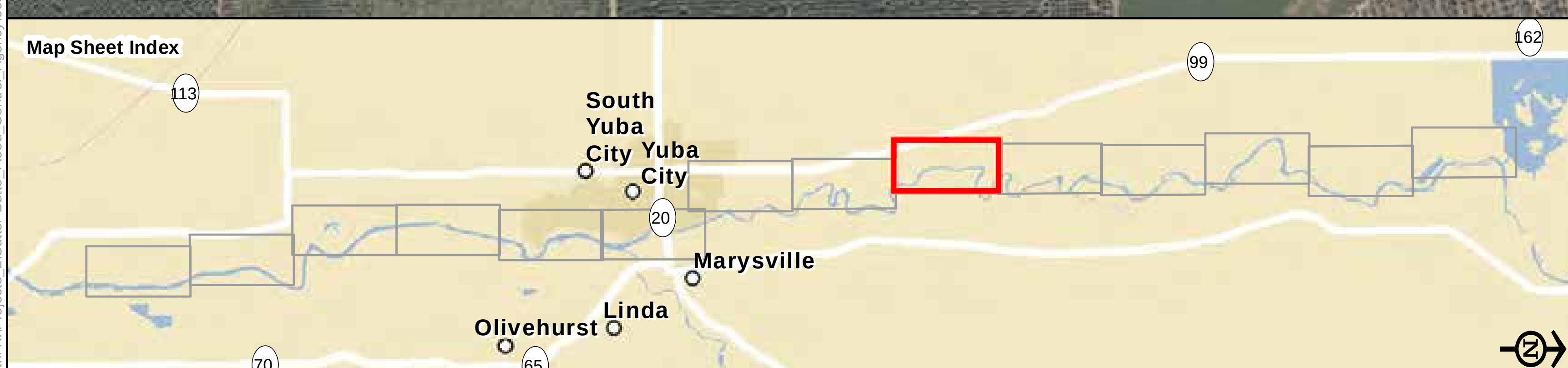

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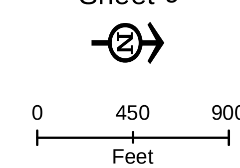
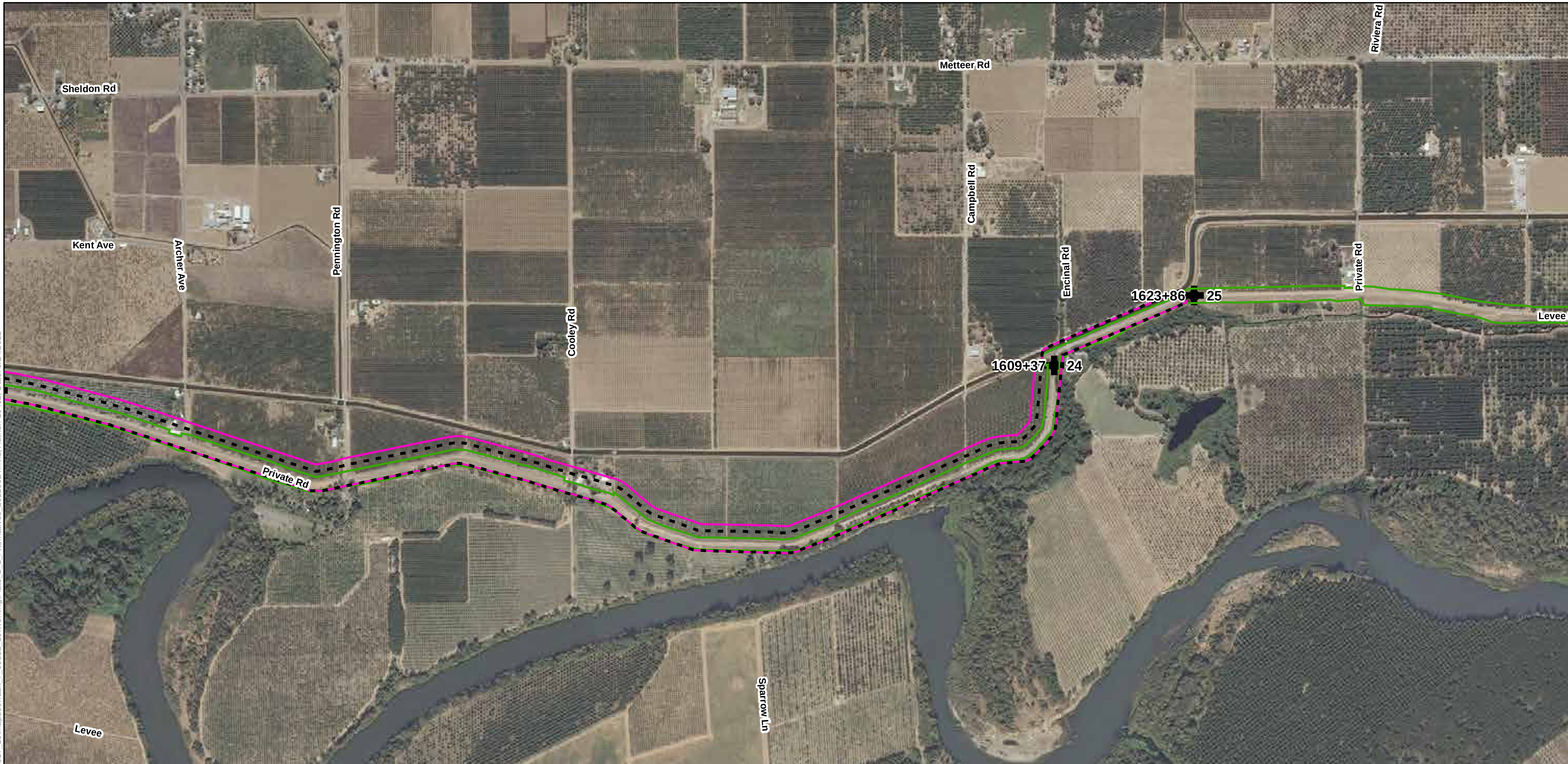
Plate 2-1
Alternatives 1-3

Sheet 9





Legend

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Plate 2-1
Alternatives 1-3

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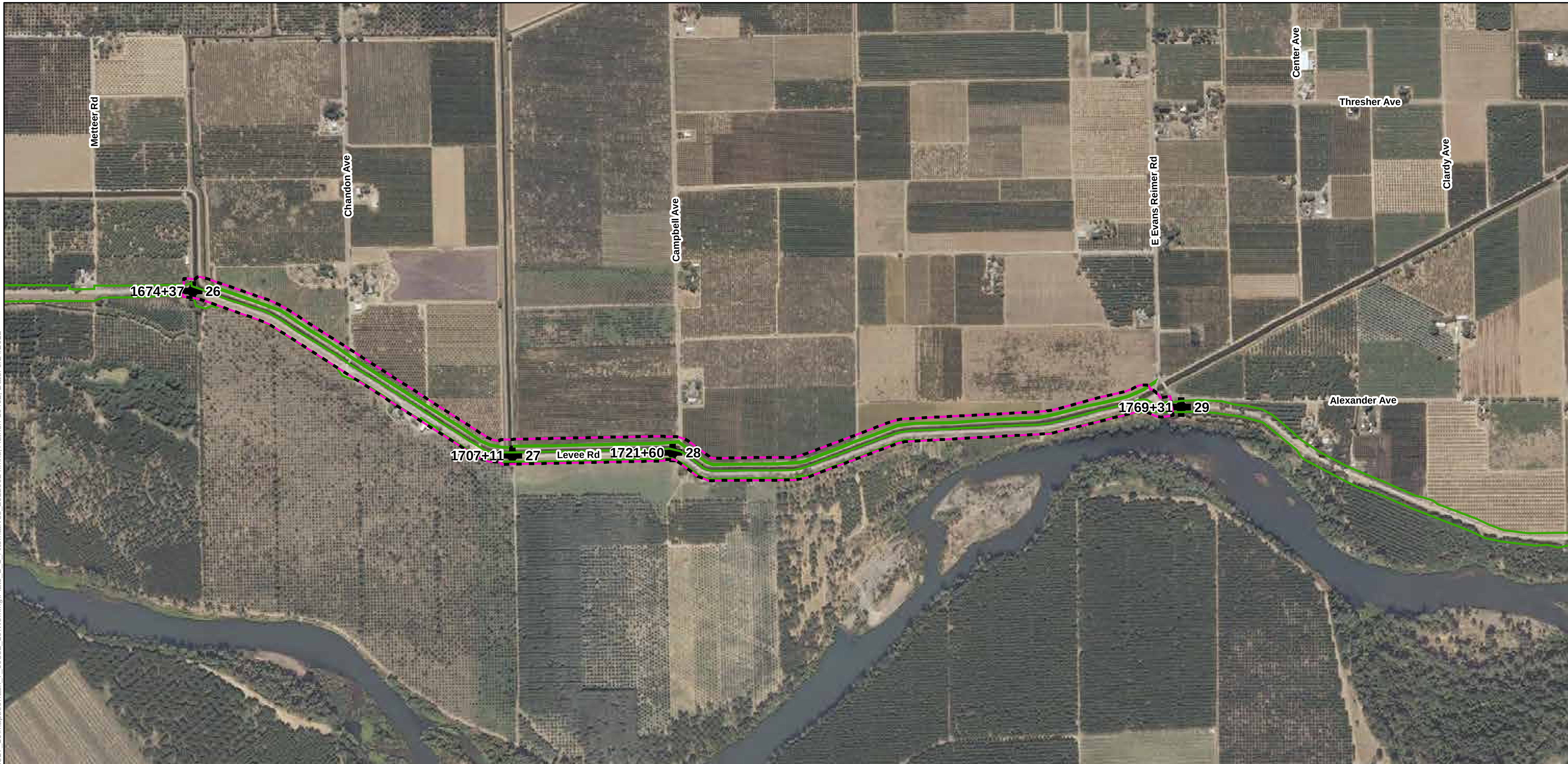

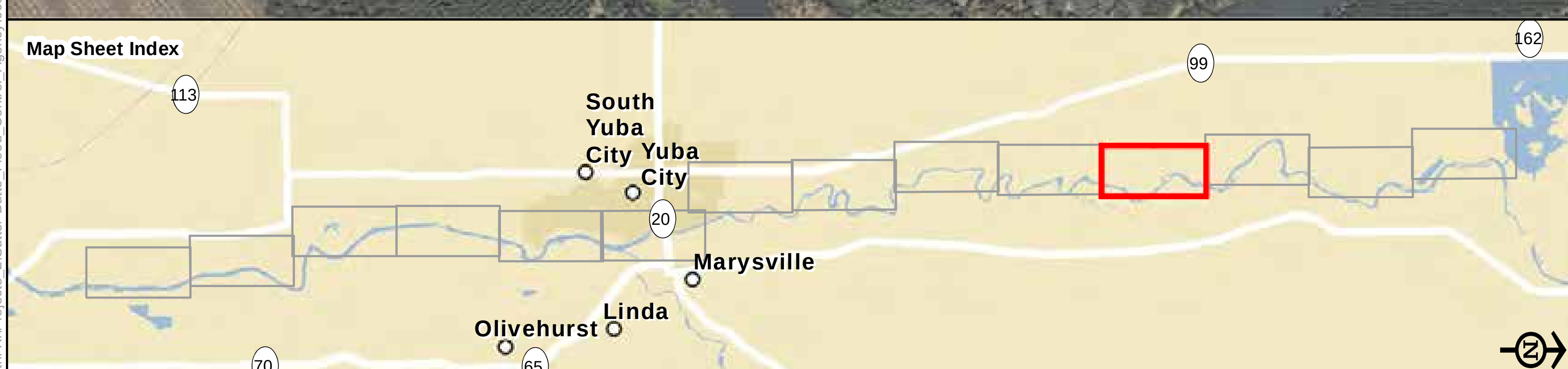

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Plate 2-1
Alternatives 1-3

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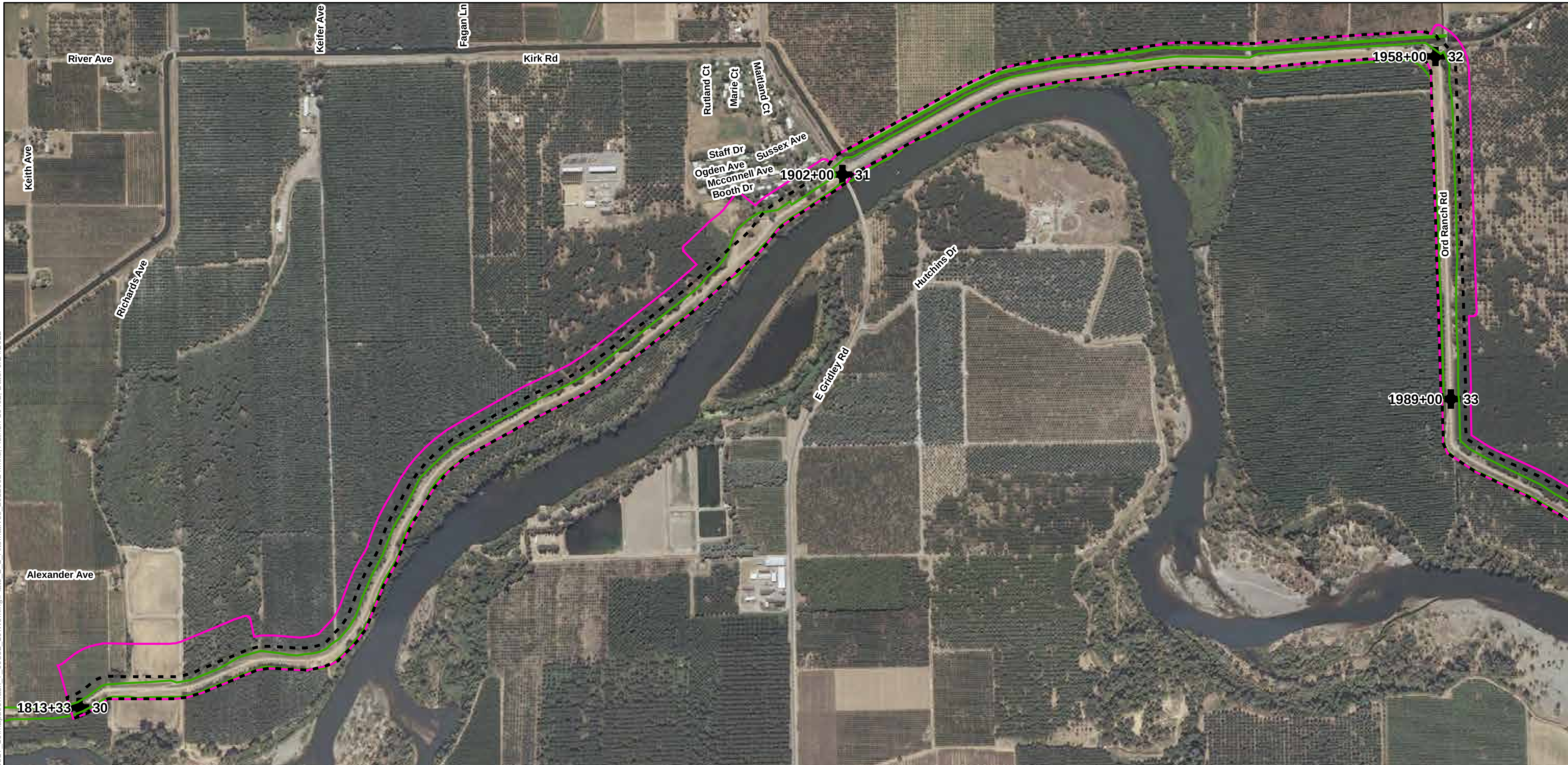

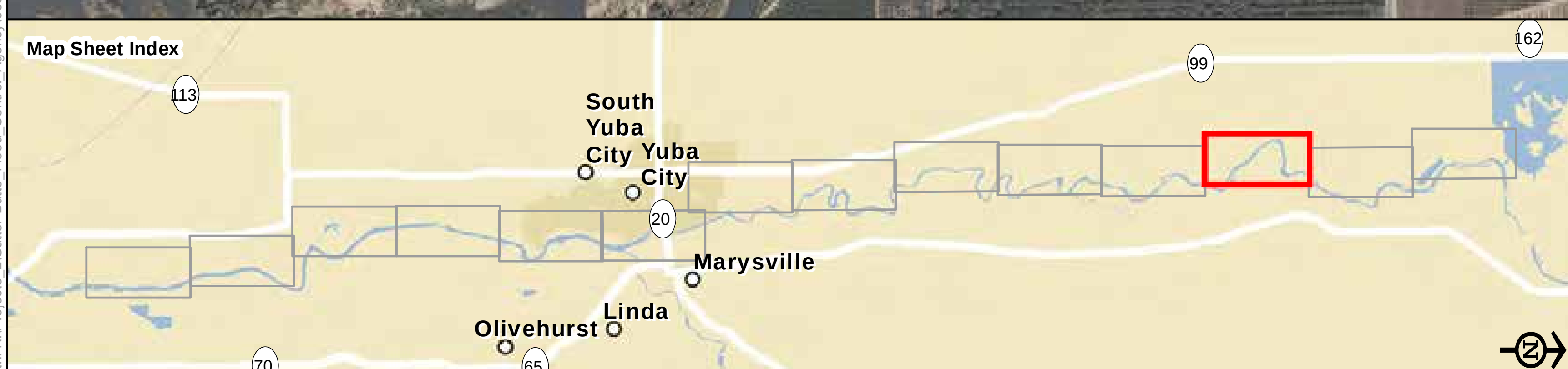

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Plate 2-1
Alternatives 1-3

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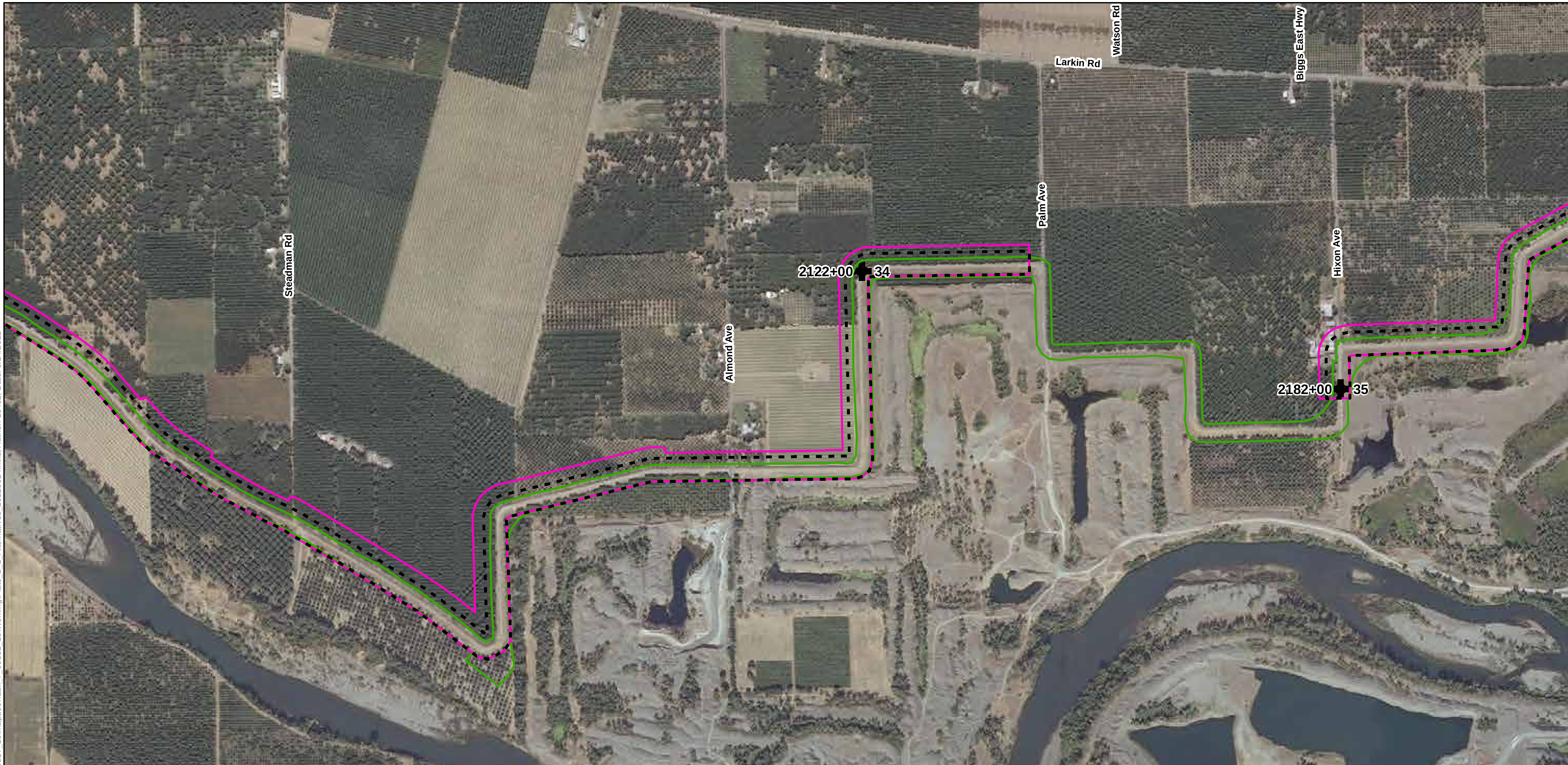

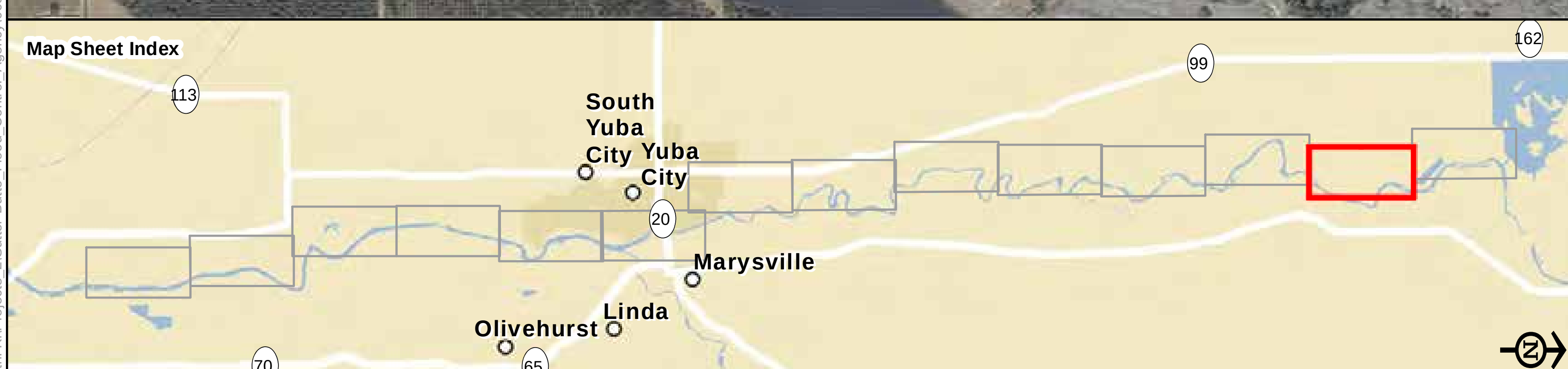

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Plate 2-1
Alternatives 1-3

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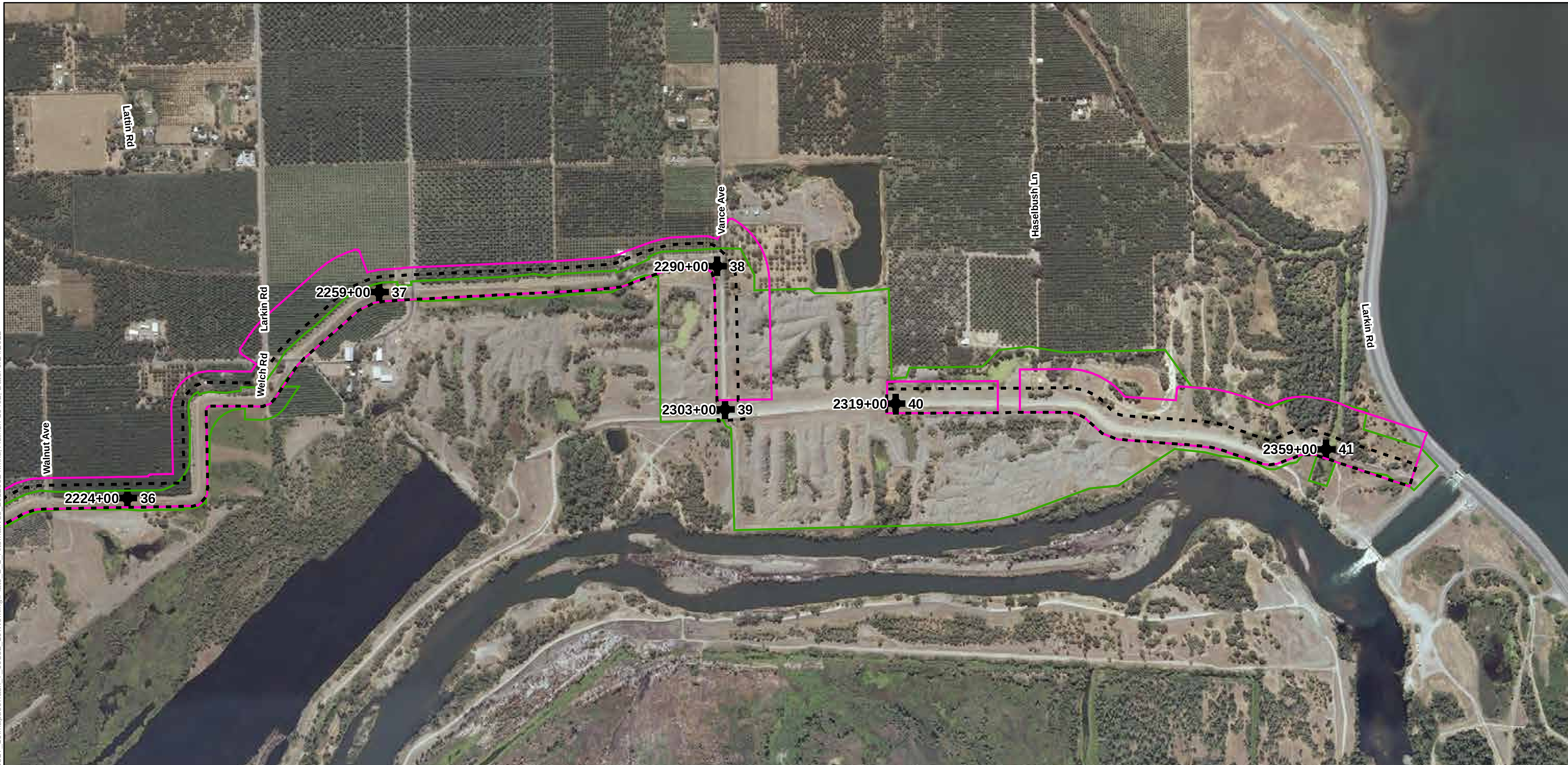

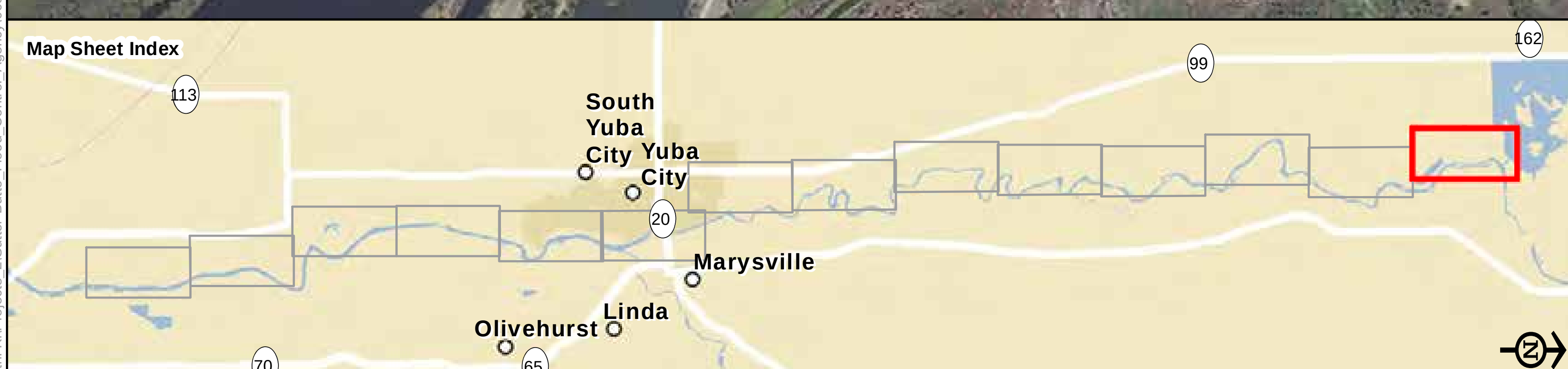

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Plate 2-1
Alternatives 1-3

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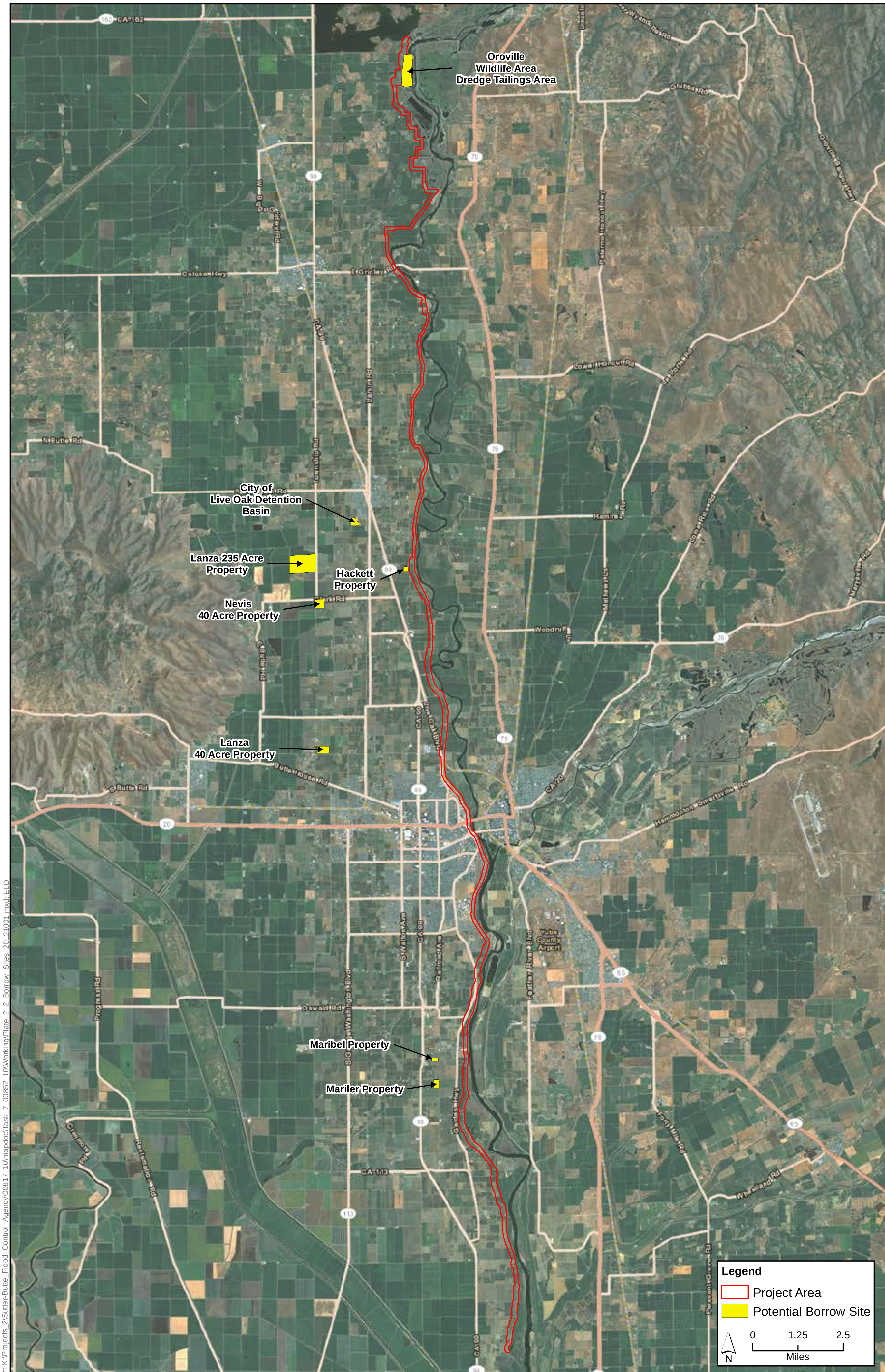


Plate 2-2
Potential FRWLP Borrow Sites

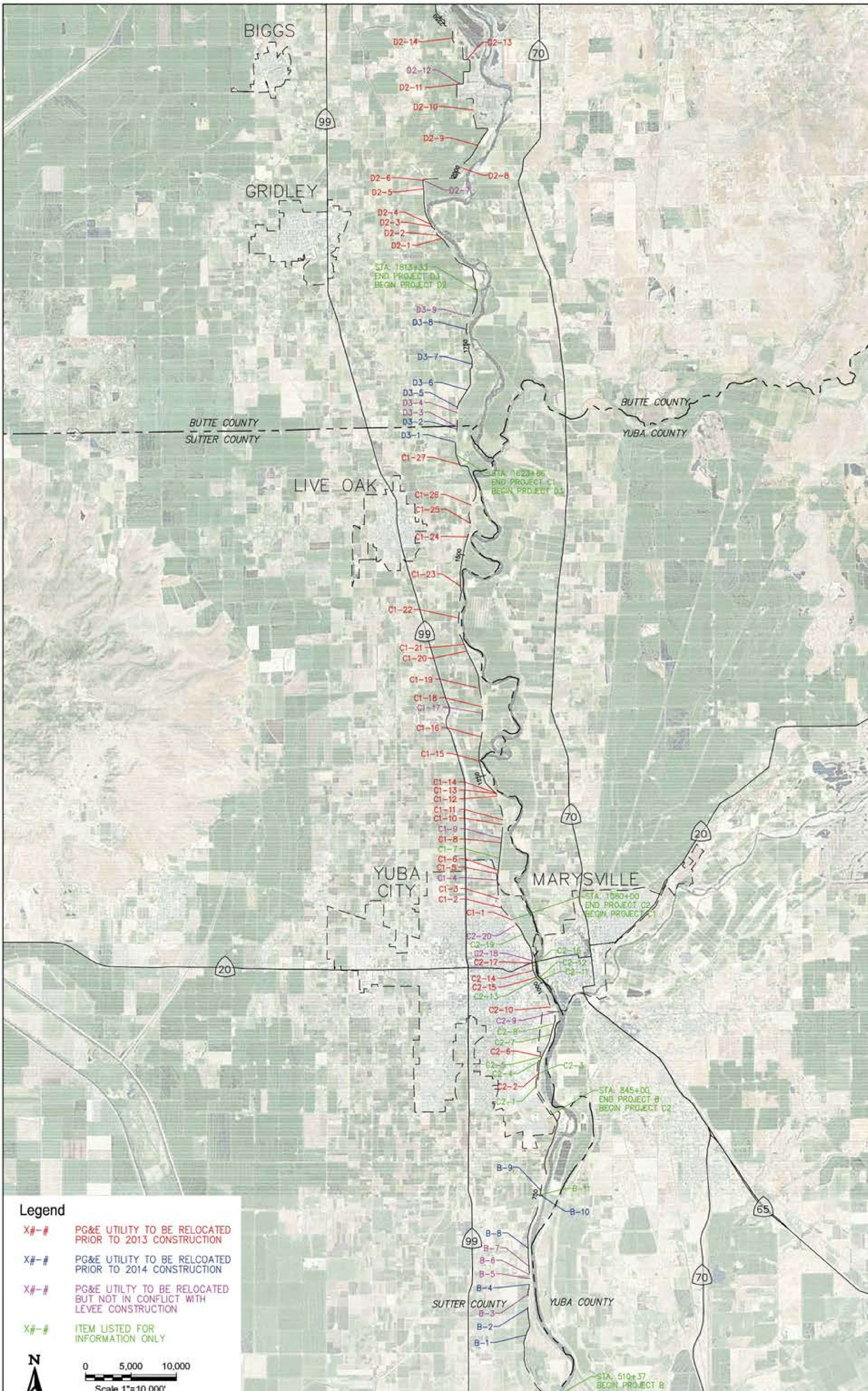


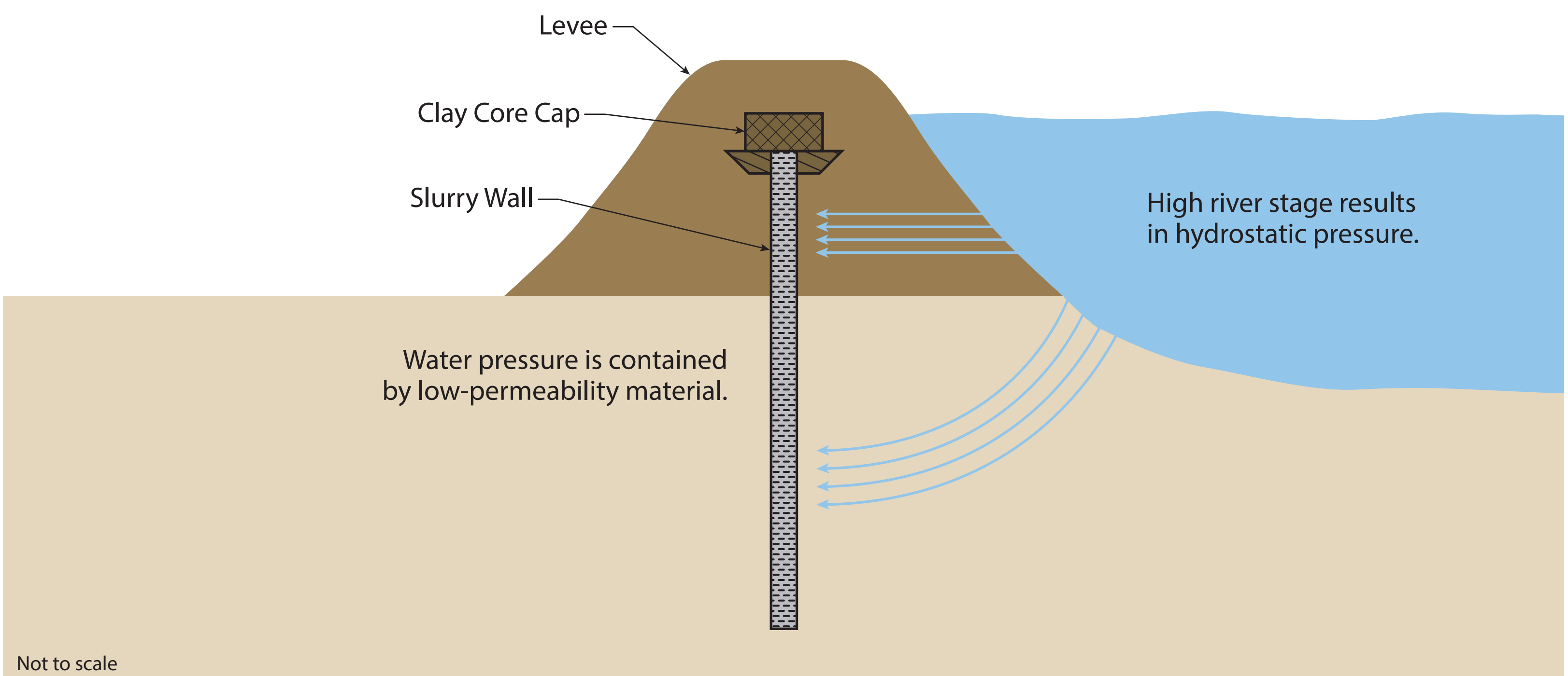
Plate 2-3
PG&E Project Relocations

Concept

Through-seepage is controlled by a low-permeability wall conctructed within the levee cross section.

Details

- Constructed via conventional slot trench, deep soil mixing or jet grouting method.
- Wall is approximately 3′ wide and up to 140′ deep.
- Wall is often capped with a clay core.



Graphics . . . 00852.10 (8/3/12) AB

Plate 2-4
Slurry Cutoff Wall

Graphics … 00852.10 (8/3/12) AB

Plate 2-5
Deep Soil Mixing

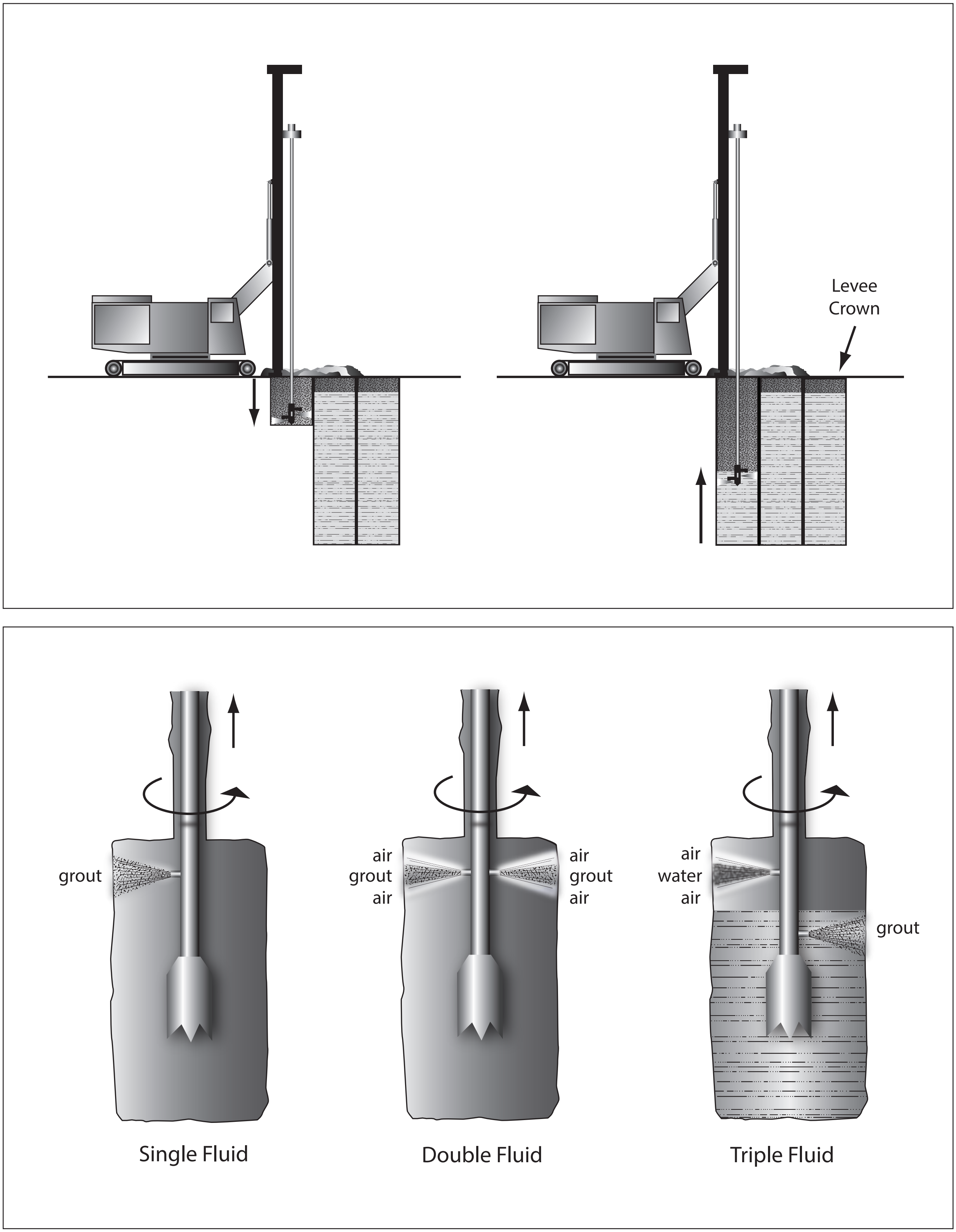


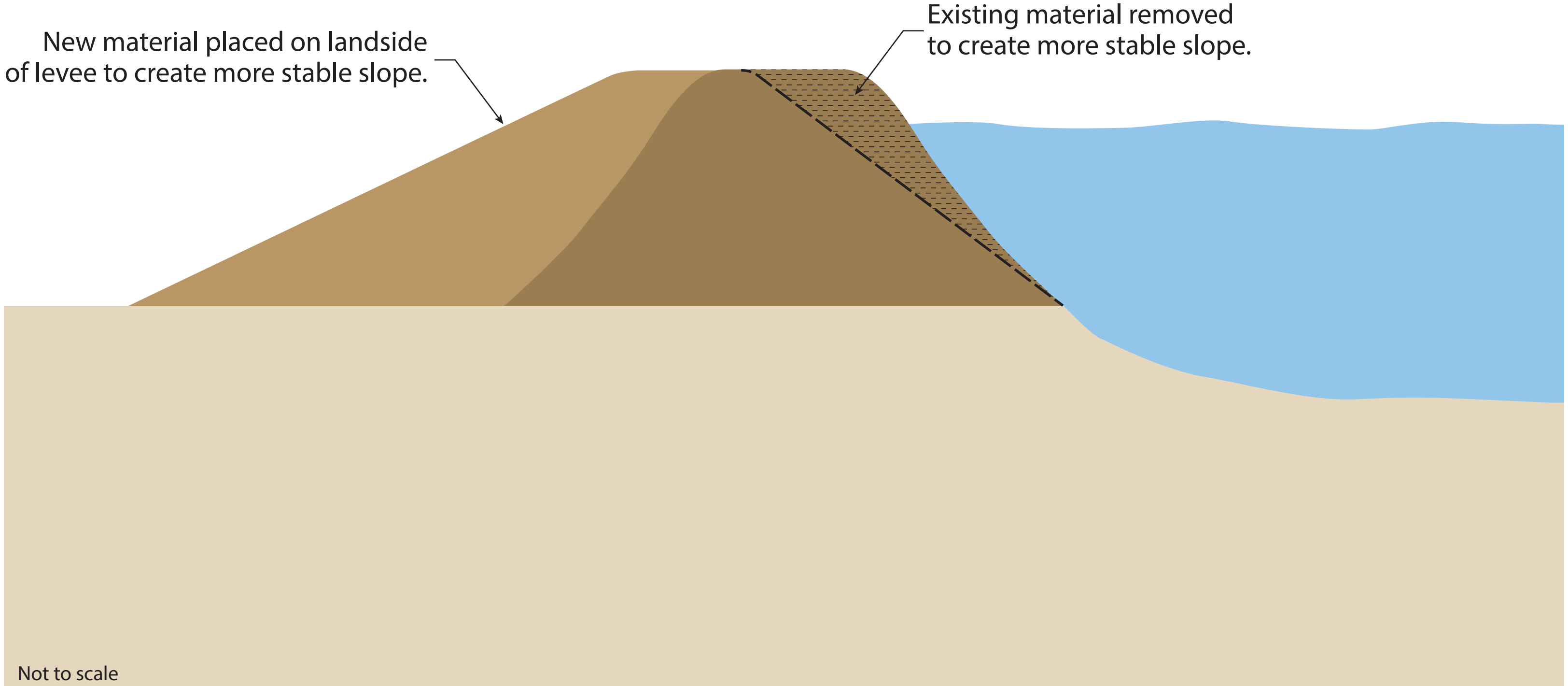
Plate 2-6
Jet Grouting Diagrams

Concept

Flatter slopes are more stable and less susceptible to erosion.

Details

- Slopes are repaired by reforming material on the landside (and waterside if necessary) to create flatter slopes.
- New material will meet current standards.



Graphics . . . 00852.10 (8/3/12) AB

Plate 2-7
Slope Flattening

Concept

Provides additional support to levee to increase strength.

Details

- Berm height is generally 2/3 the height of levee, extending for a distance determined by the structural needs of the levee.
- An optional drainage layer may underlie the berm.

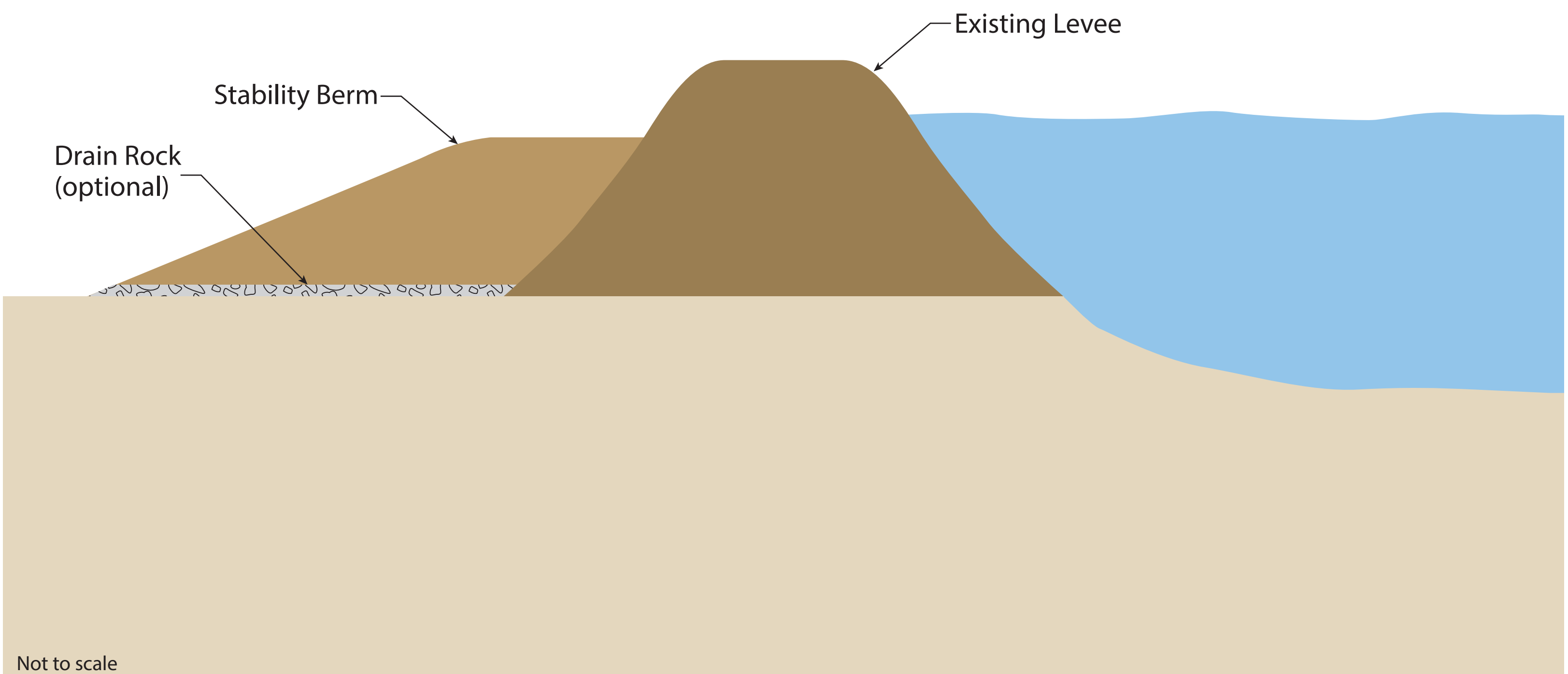


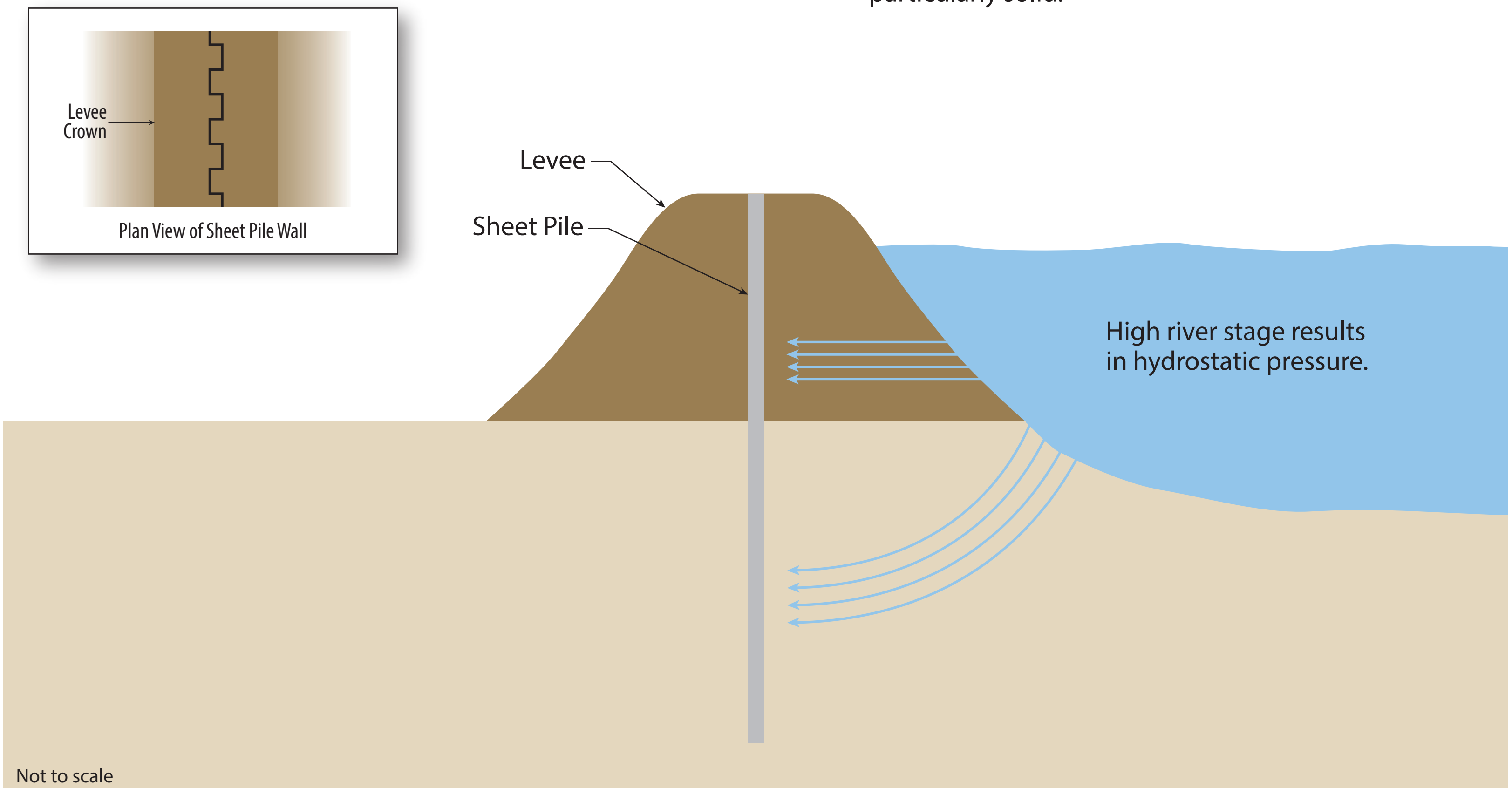
Plate 2-8
Stability Berm

Concept

Steel panels are driven into the levee core to provide a seepage barrier.

Details

- Interlocking steel sheet piles are driven into the ground by a pile driving head attached to a crane.
- Pre-drilling of soil may be necessary if earth is particularly solid.



Graphics . . . 00852.10 (8/3/12) AB

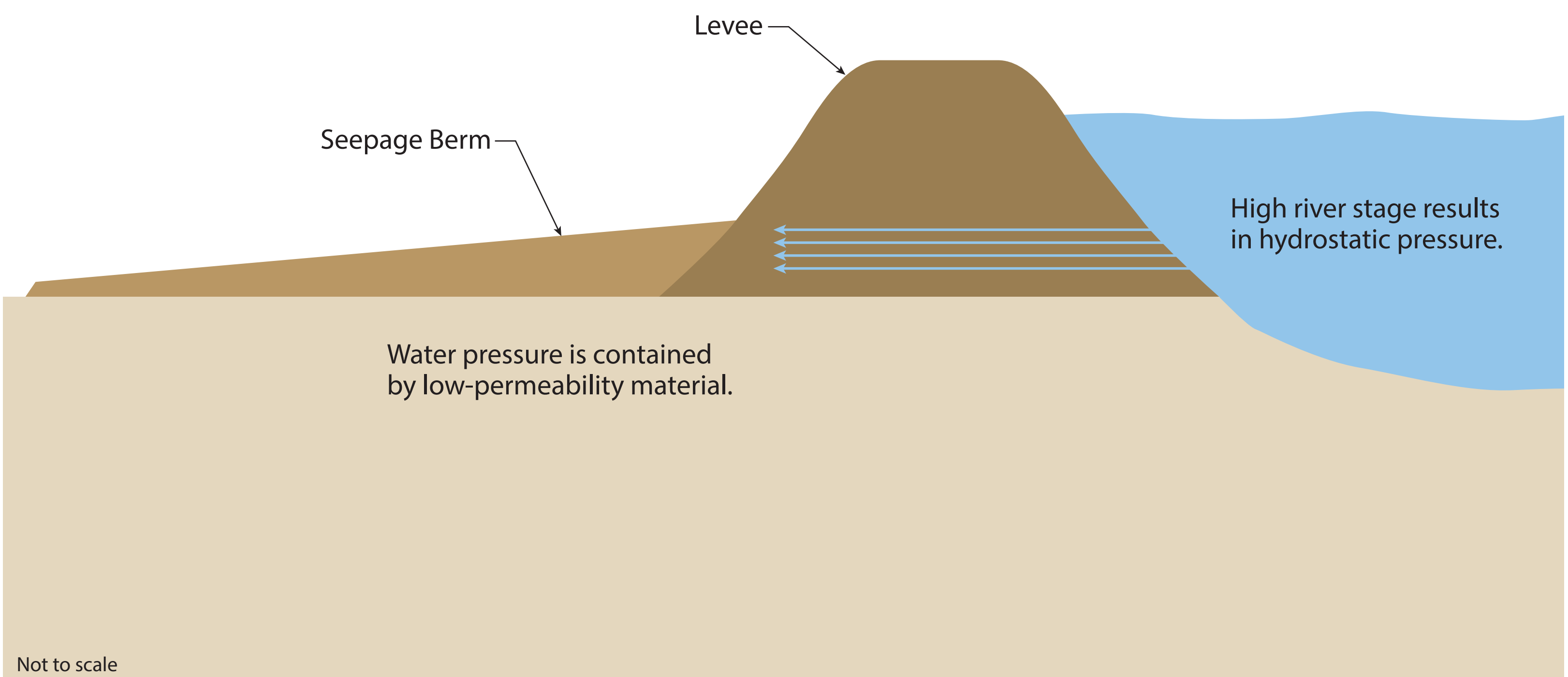
Plate 2-9
Sheet Pile Wall

Concept

Water pressure is contained and dispersed by a thickened soil layer.

Details

- Berm is typically one-third the height of the levee.
- Berm may extend 300′ from the levee.
- Landside toe of berm may include optional relief trench.



Graphics . . . 00852.10 (8/3/12) AB

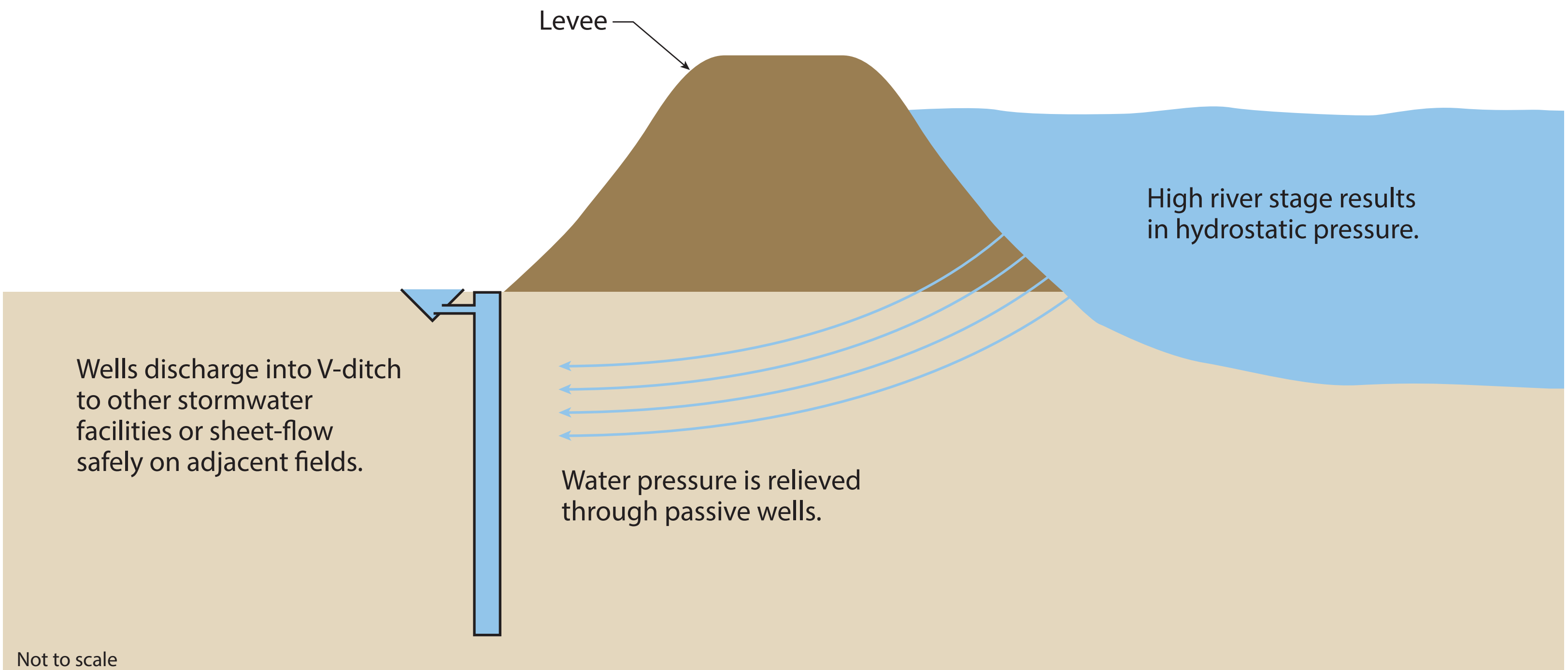
Plate 2-10
Seepage Berm

Concept

Water pressure is relieved via passive wells, which direct water discharge into a collection system.

Details

- Wells are drilled near levee toe, approximately 80′ deep.
- Well spacing is approximately 50′-100′.



Graphics … 00852.10 (8/3/12) AB

Plate 2-11
Relief Well

Concept

Water-side erosion is prevented by placement of rock.

Details

- Rock is typically 8″-18″ in diameter, placed in a 30″ layer.
- Rock could be covered by soil and/or vegetation.

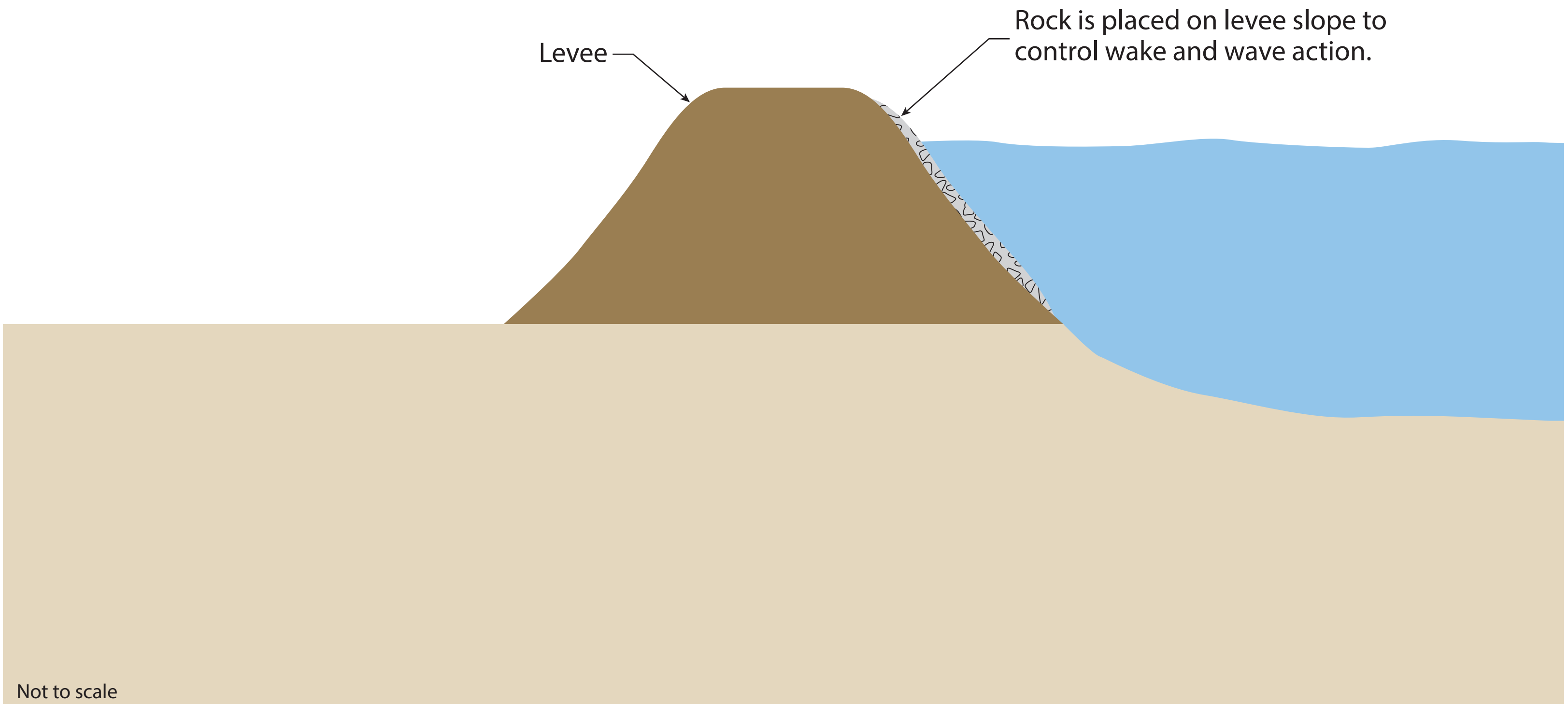


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Plate 2-12
Rock Slope Protection

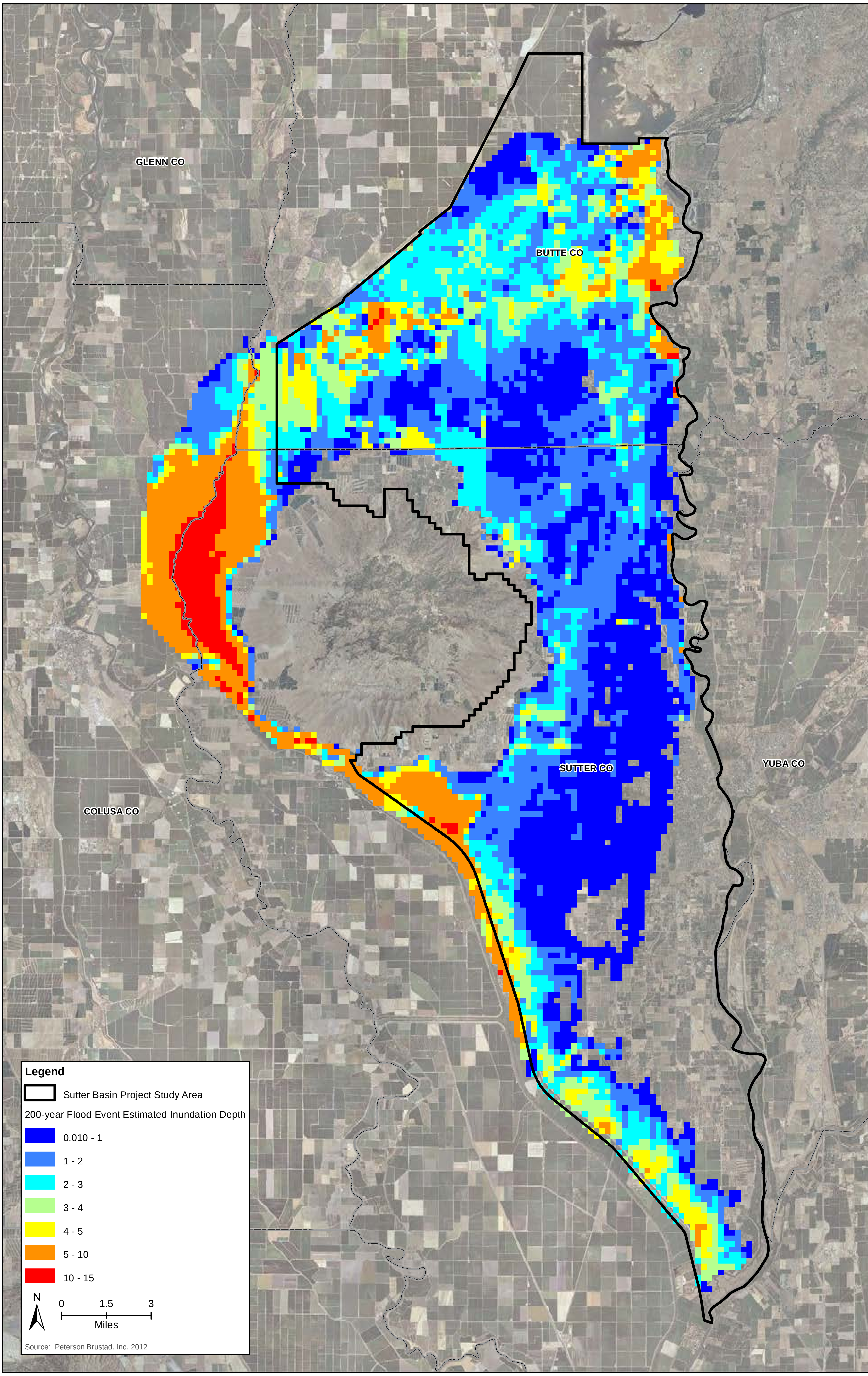

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Plate 2-13
200-year Flood Event Estimated Inundation Depth - Segment 1

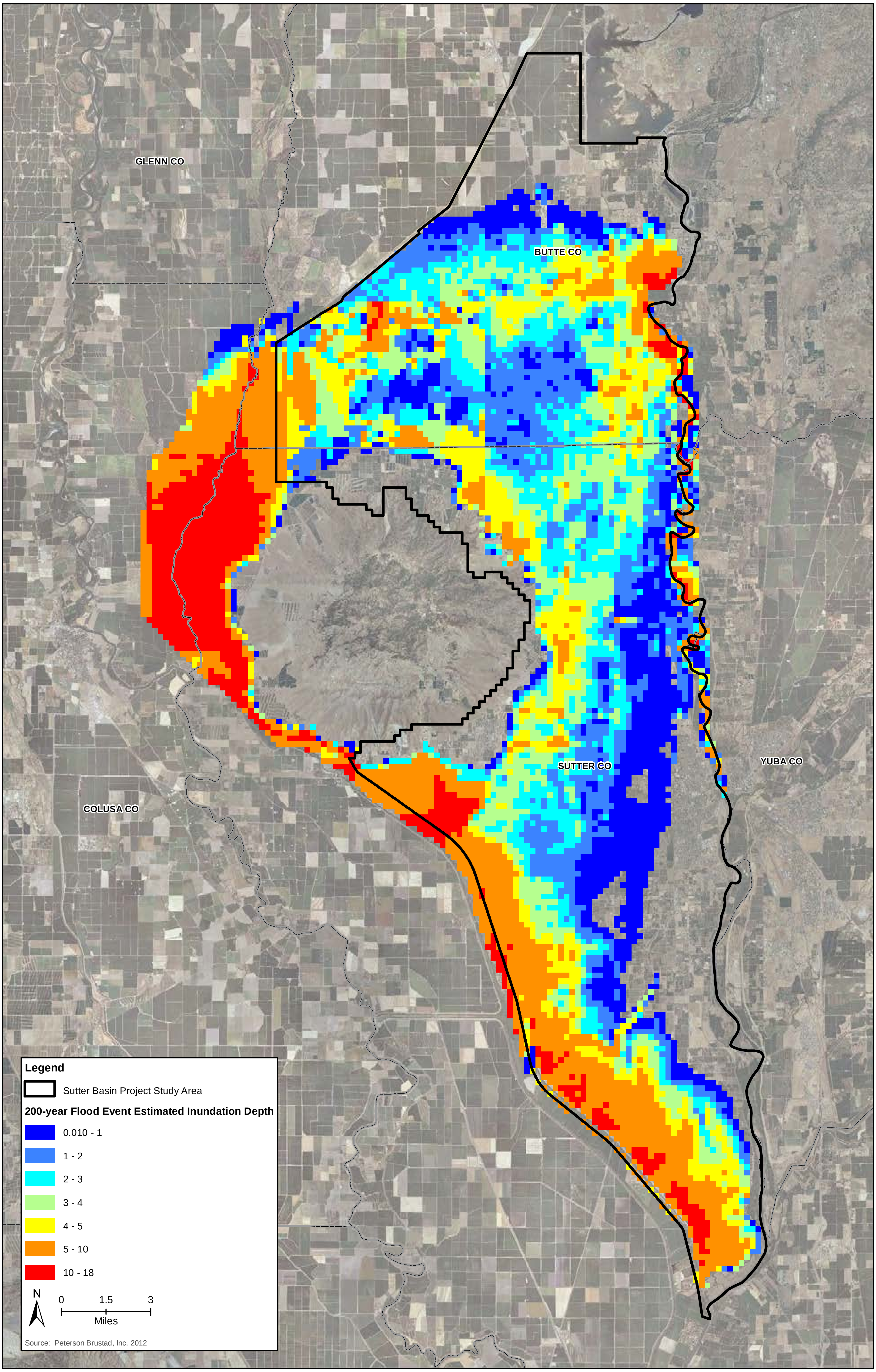

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Plate 2-14
200-year Flood Event Estimated Inundation Depth - Segment 2

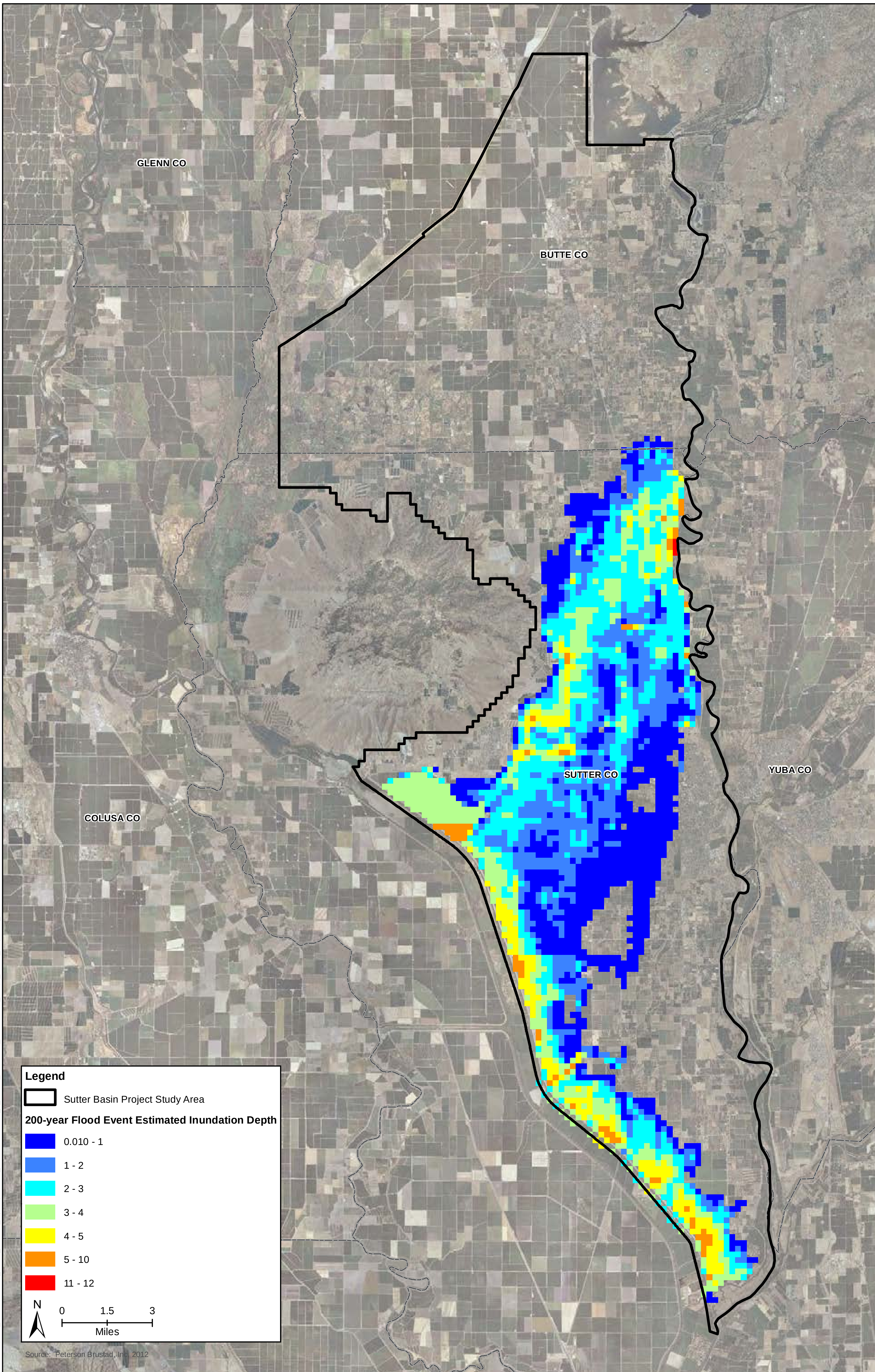

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Plate 2-15
200-year Flood Event Estimated Inundation Depth - Segment 3

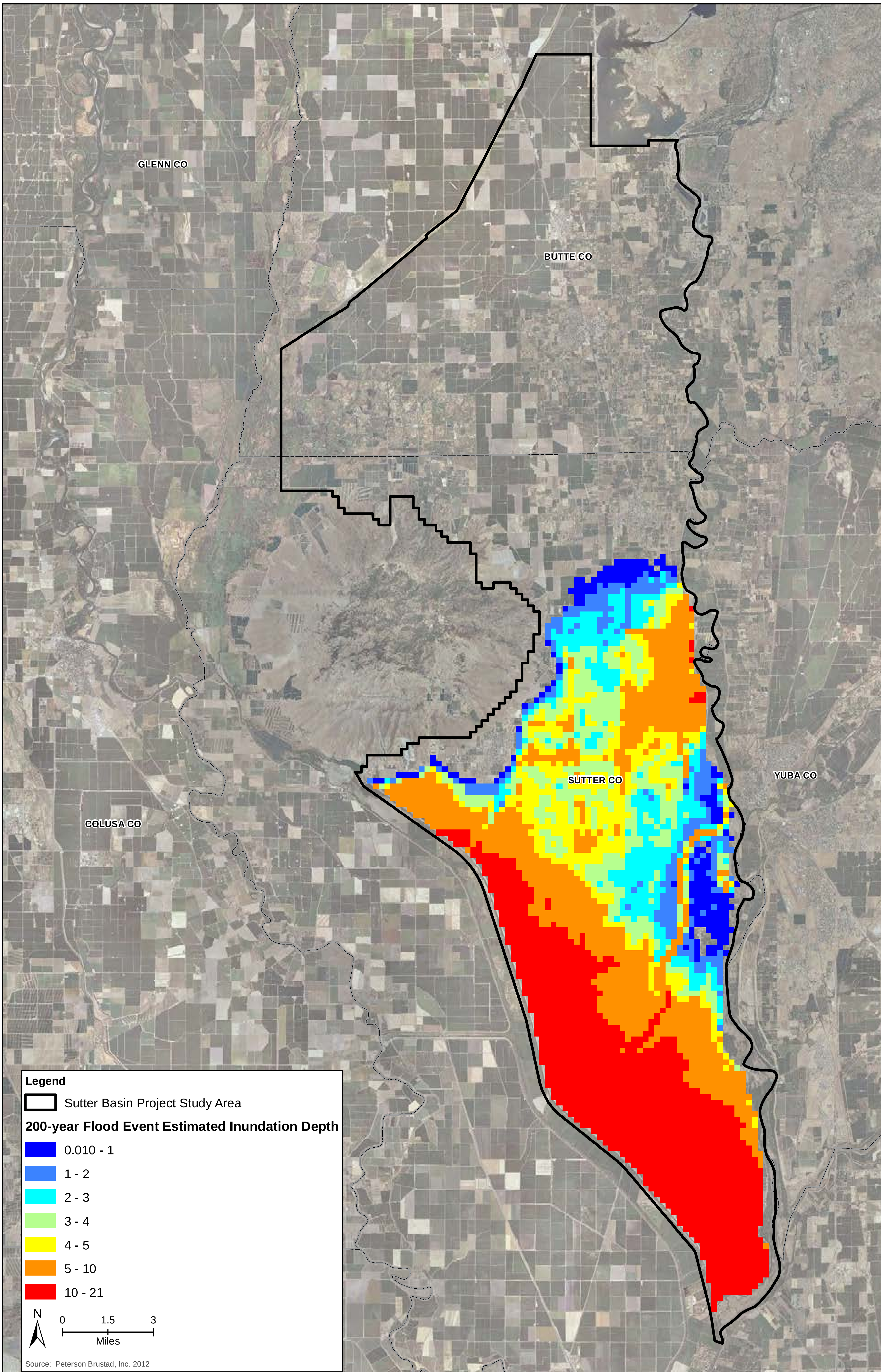

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Plate 2-16
200-year Flood Event Estimated Inundation Depth - Segment 4

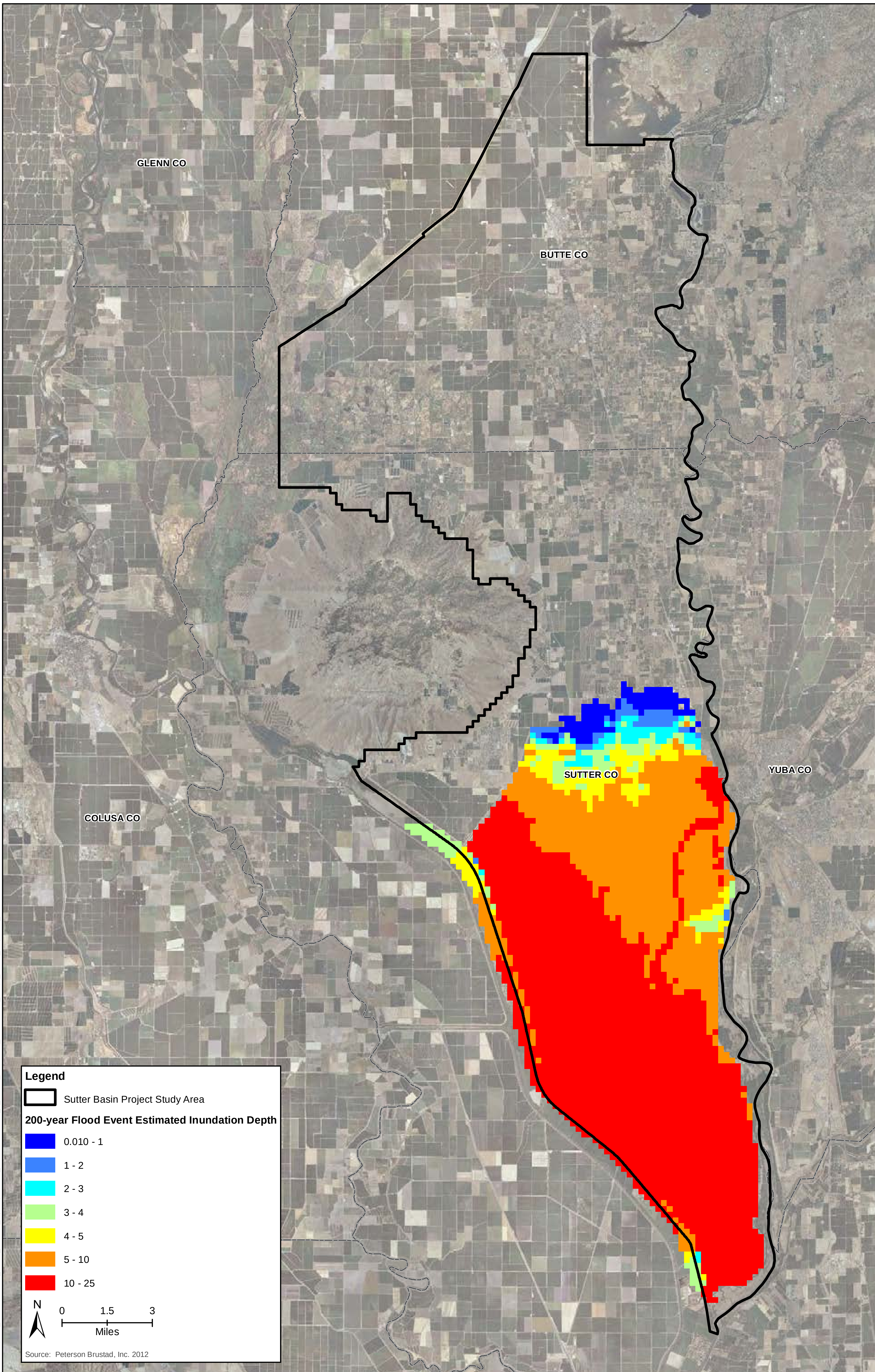

Plate 2-17
200-year Flood Event Estimated Inundation Depth - Segment 5

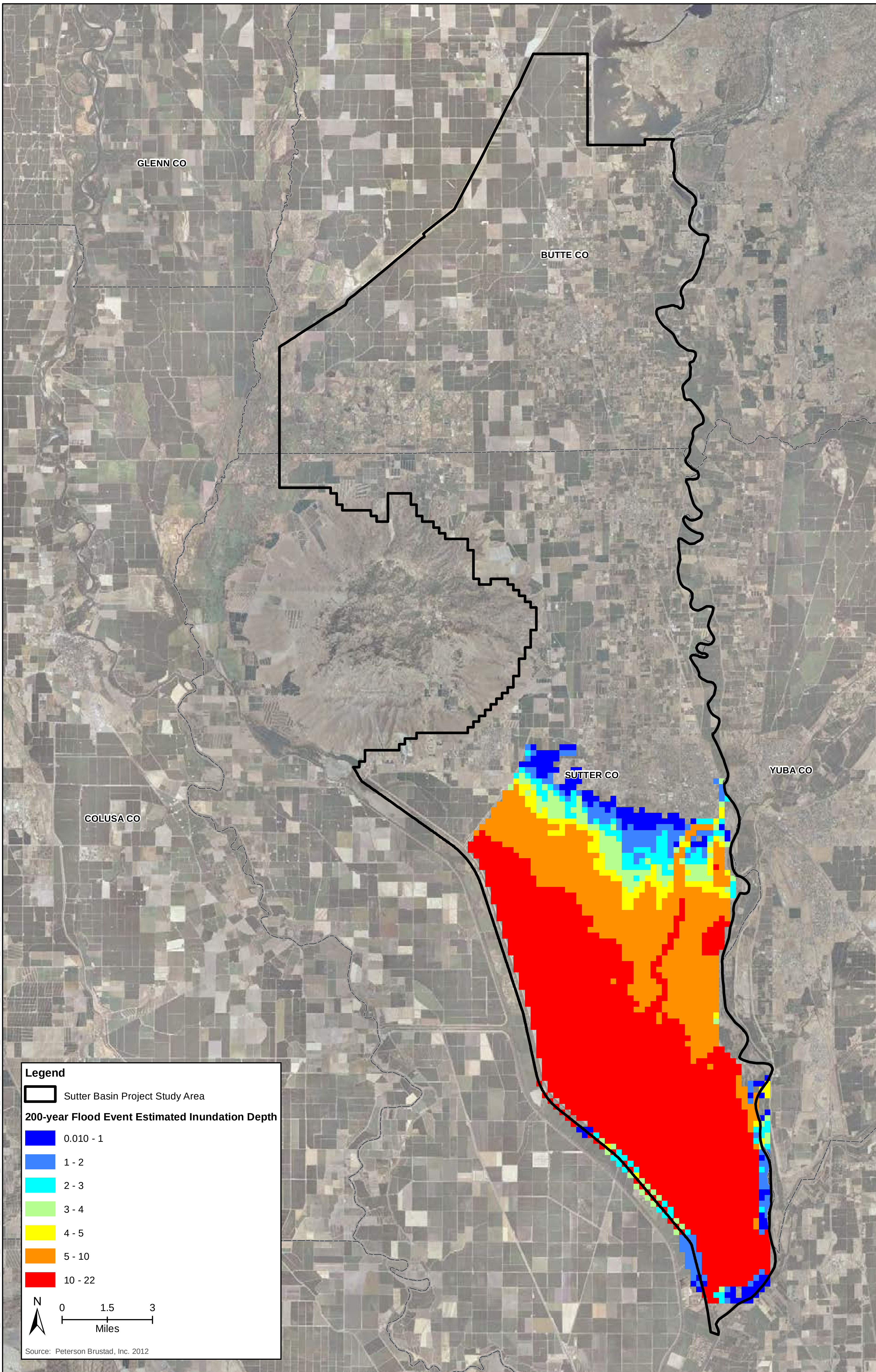

Plate 2-18
200-year Flood Event Estimated Inundation Depth - Segment 6

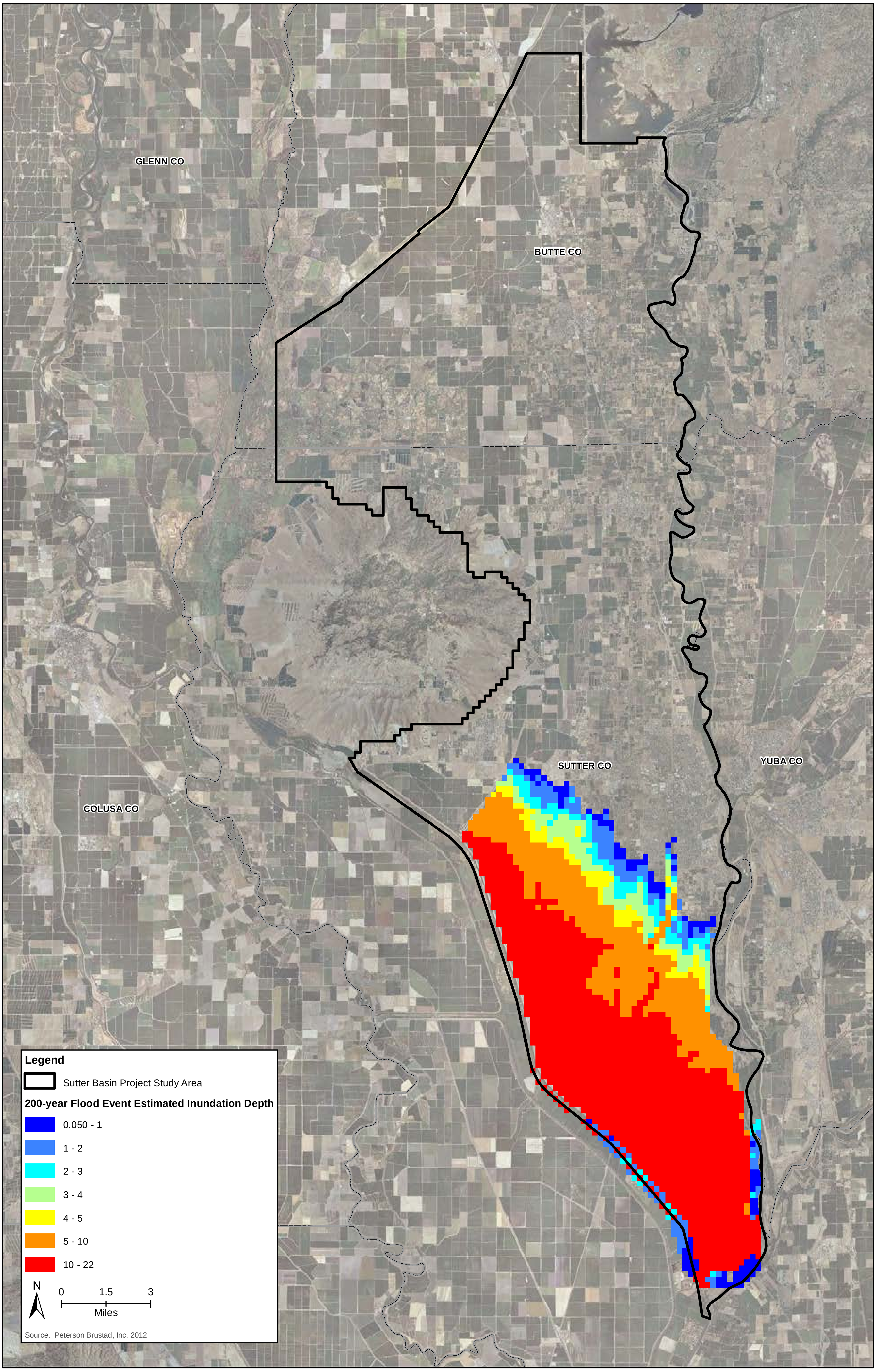

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Plate 2-19
200-year Flood Event Estimated Inundation Depth - Segment 7

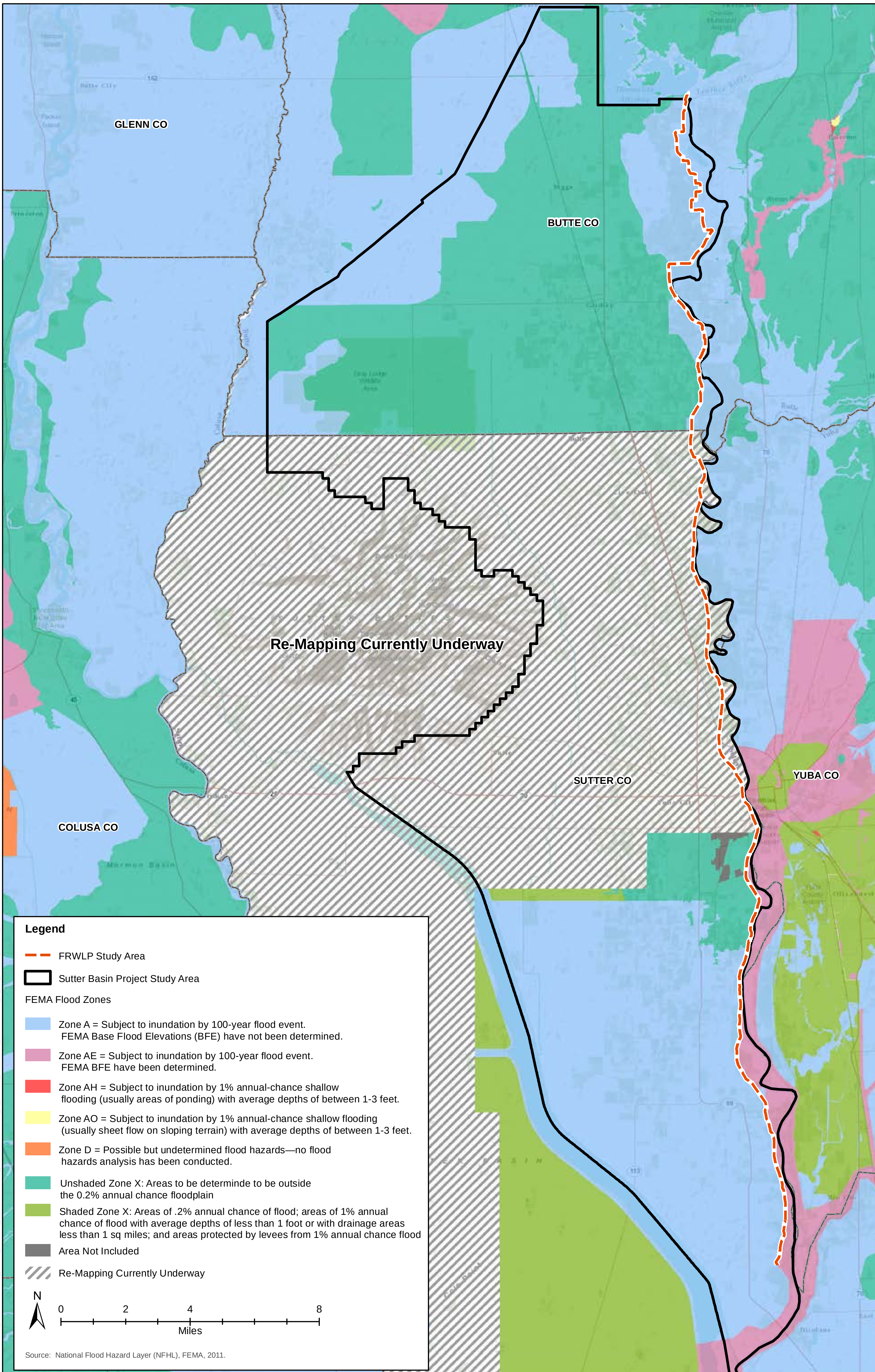

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Plate 2-20
FEMA Zones

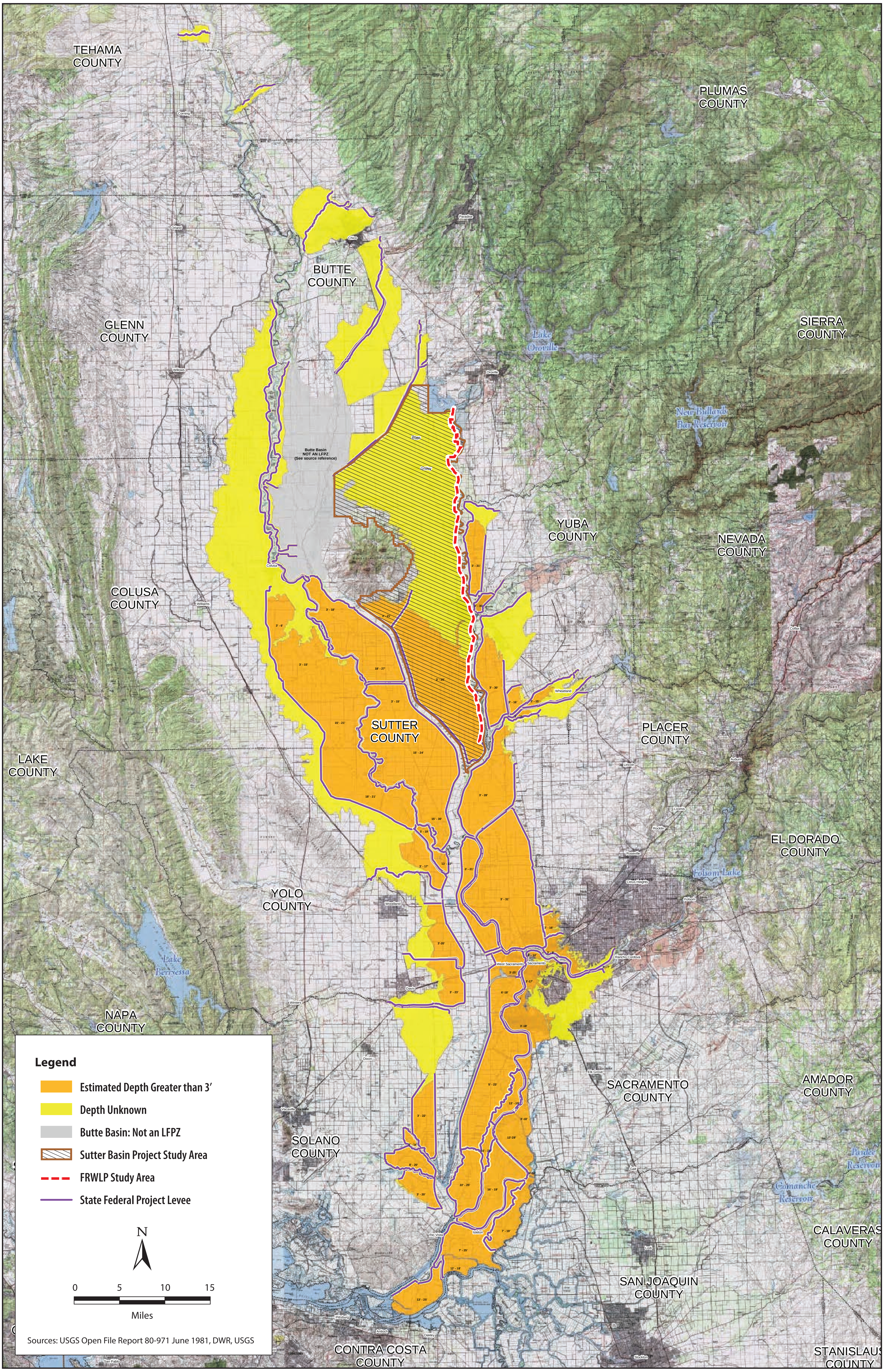
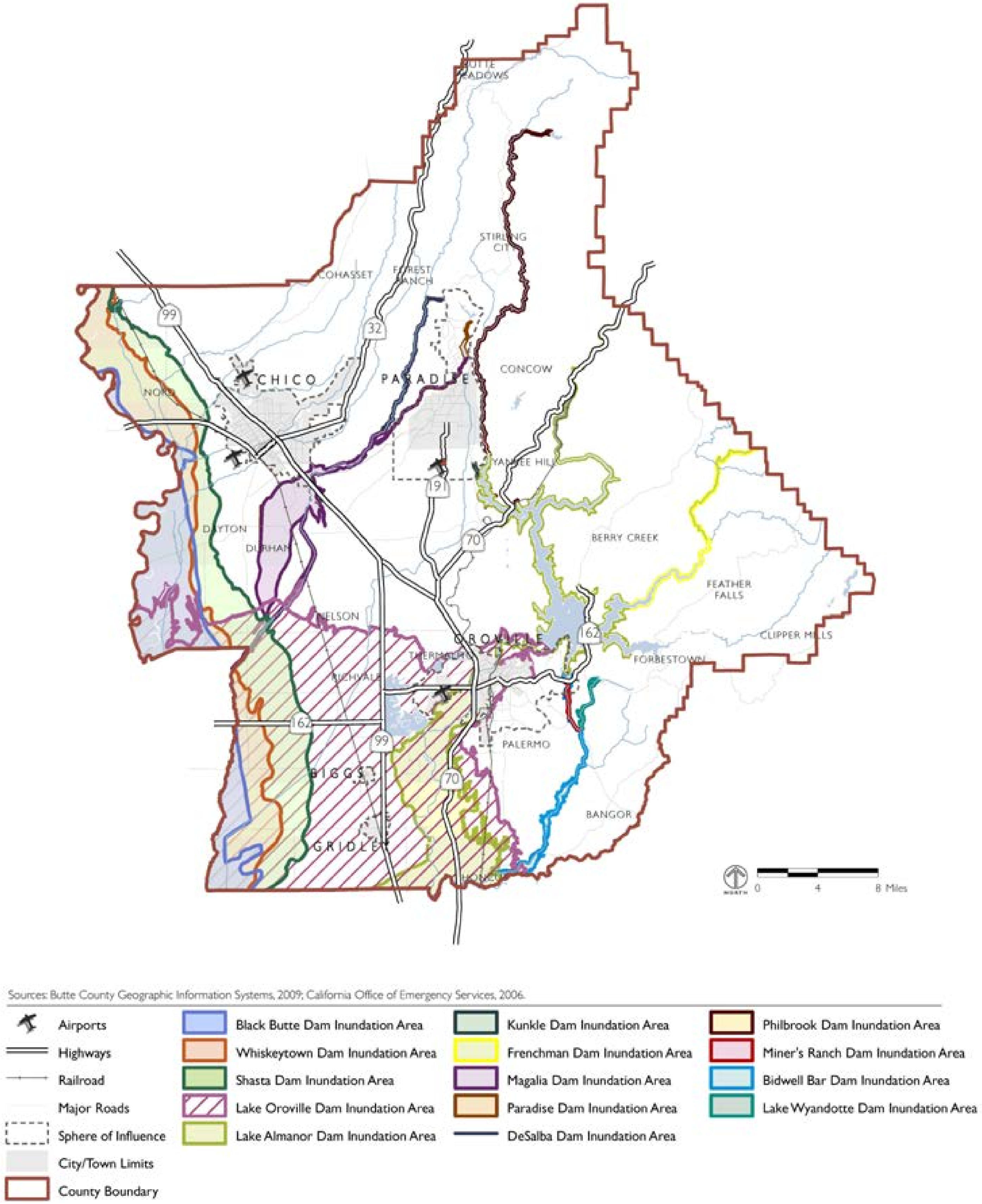
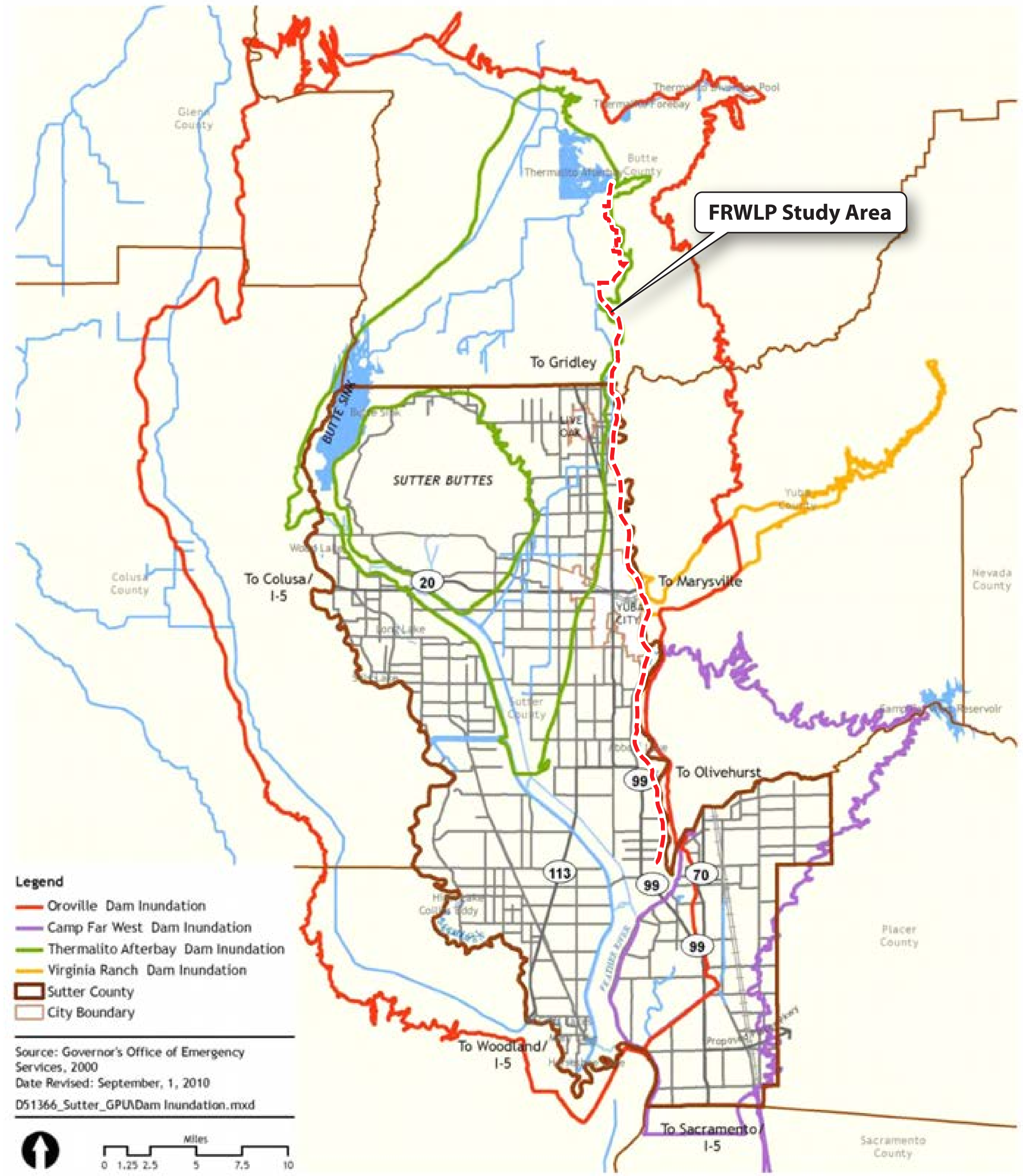


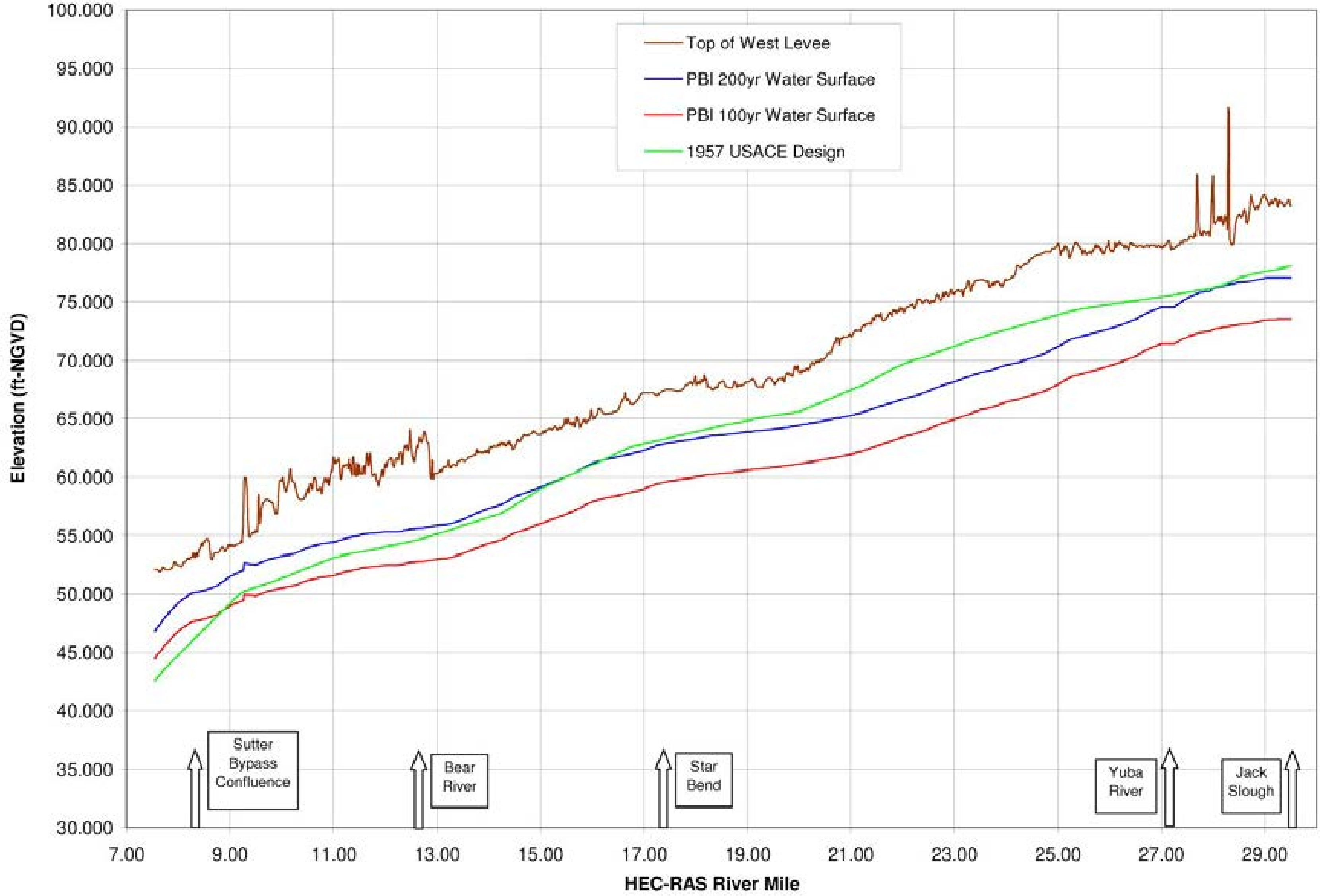
Plate 3.1-1
Levee Flood Protection Zones





Graphics ... 00852.10 (6/19/12) AB

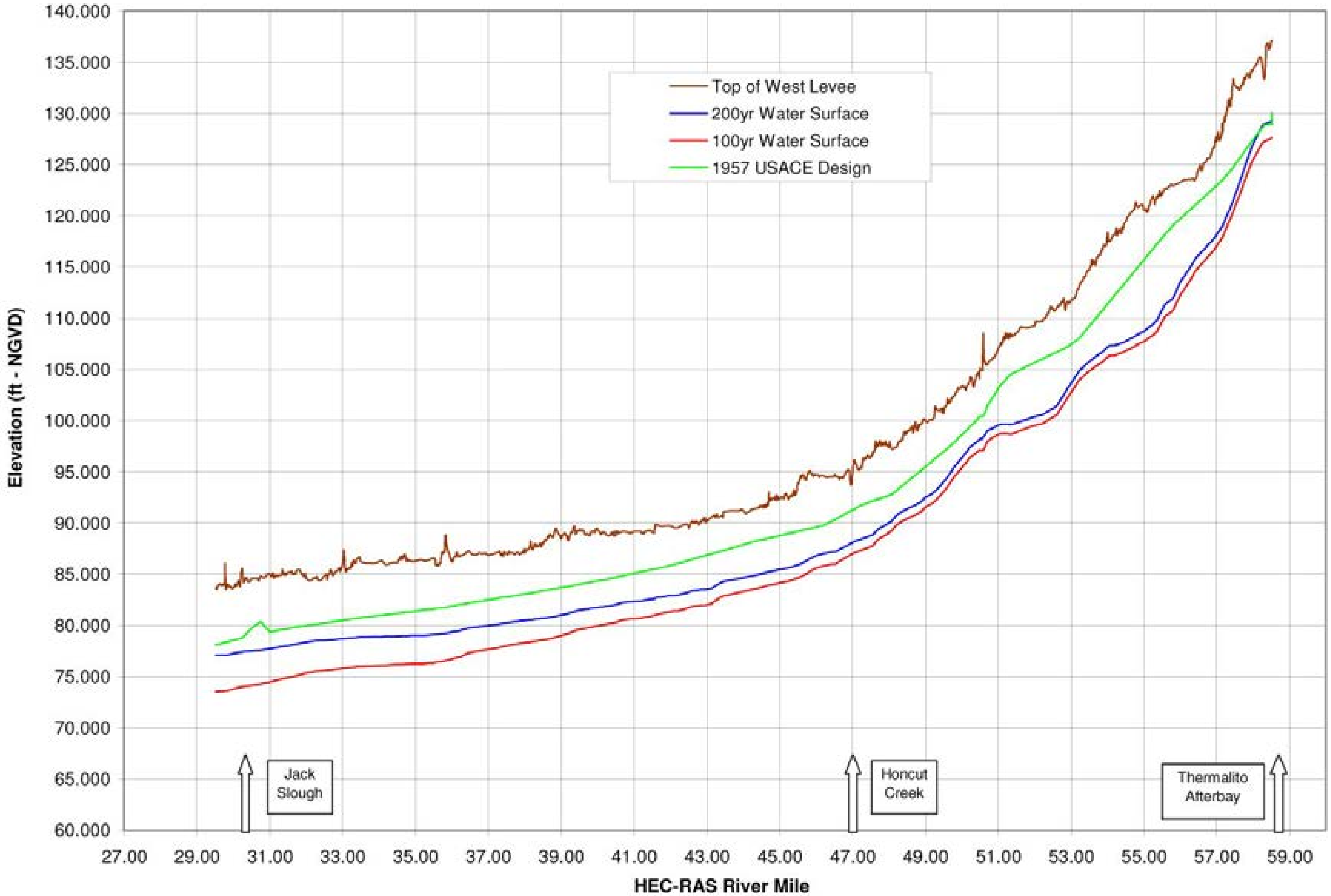
Plate 3.1-2
Dam Inundation Areas



Graphics ... 00852.10 (10/1/12)

Source: Peterson Brustad, Inc. 2010. Sutter Butte Flood Control Agency's Early Implementation Program Project Report for the Feather River West Levee Rehabilitation Project. Figure 9

Figure 3.1-3
Lower Feather River Freeboard Profile



Source: Peterson Brustad, Inc. 2010. Sutter Butte Flood Control Agency's Early Implementation Program Project Report for the Feather River West Levee Rehabilitation Project. Figure 8

Graphics ... 00852.10 (10/1/12)

Plate 3.1-4
Upper Feather River Freeboard Profile

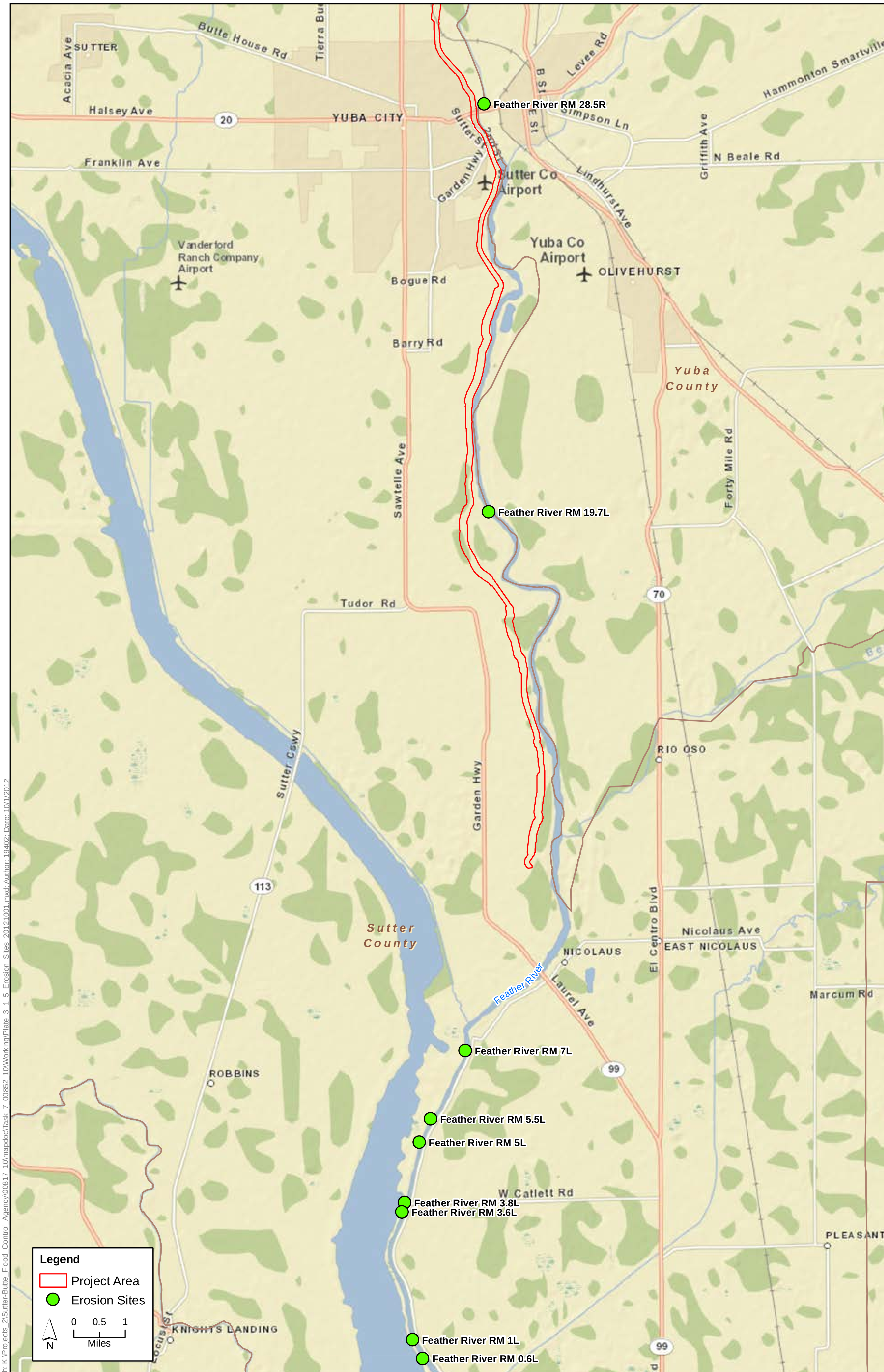


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Plate 3.1-5
Erosion Sites

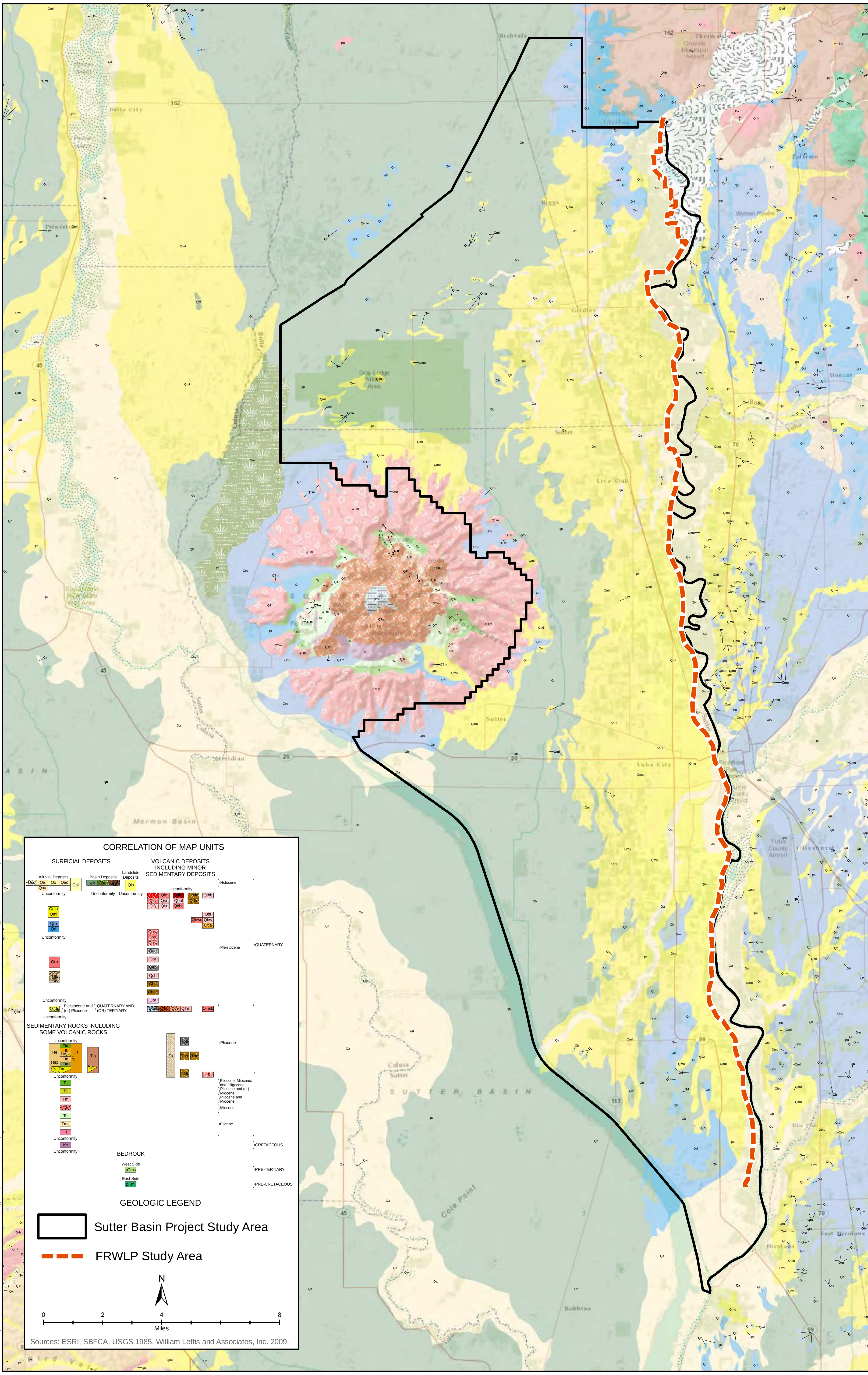

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Plate 3.3-1
General Geologic Map

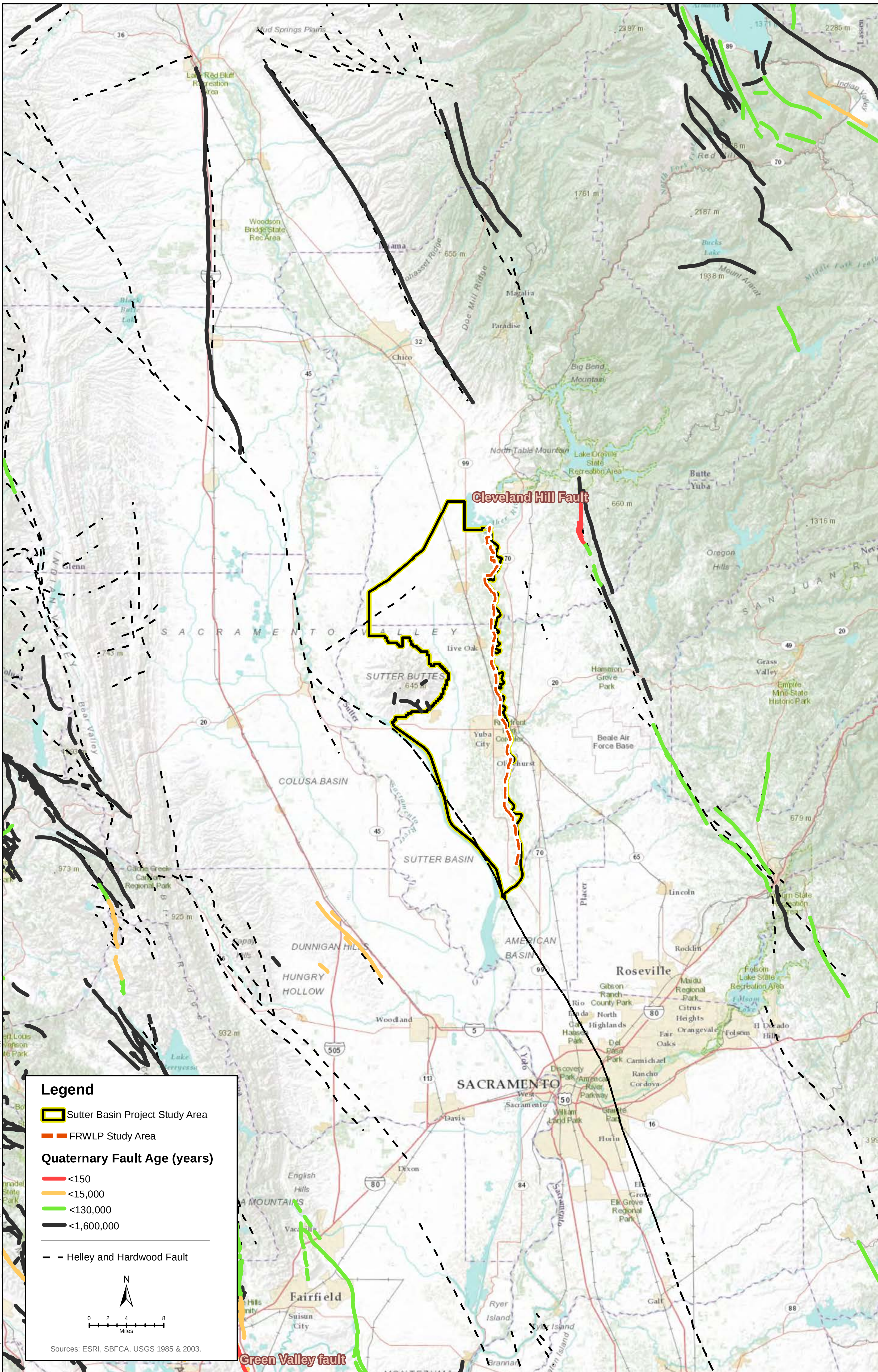

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Plate 3.3-2
Geologic Faults Near the Study Area

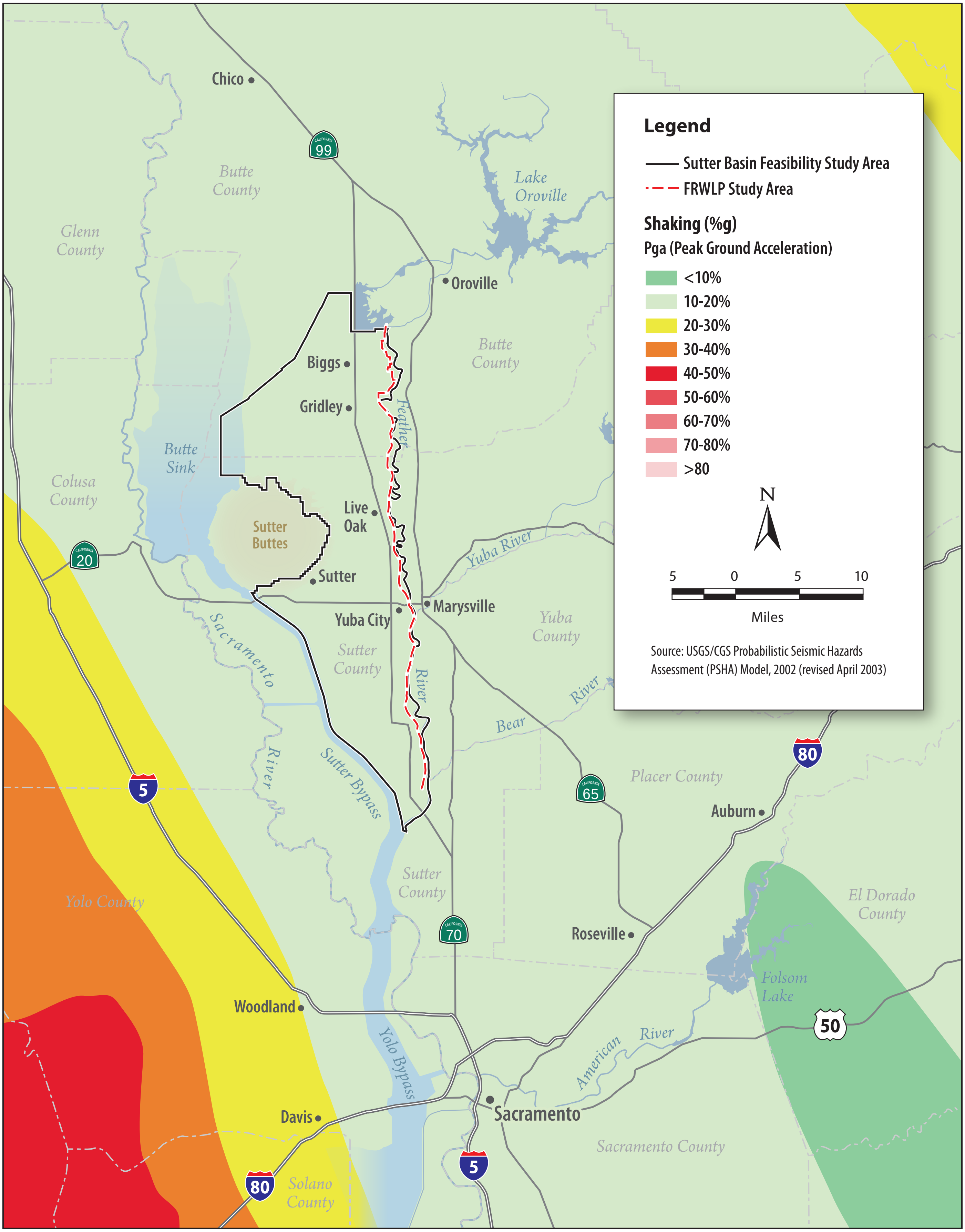

Plate 3.3-3
Minimum Peak Horizontal Ground Acceleration in the Study Area Vicinity

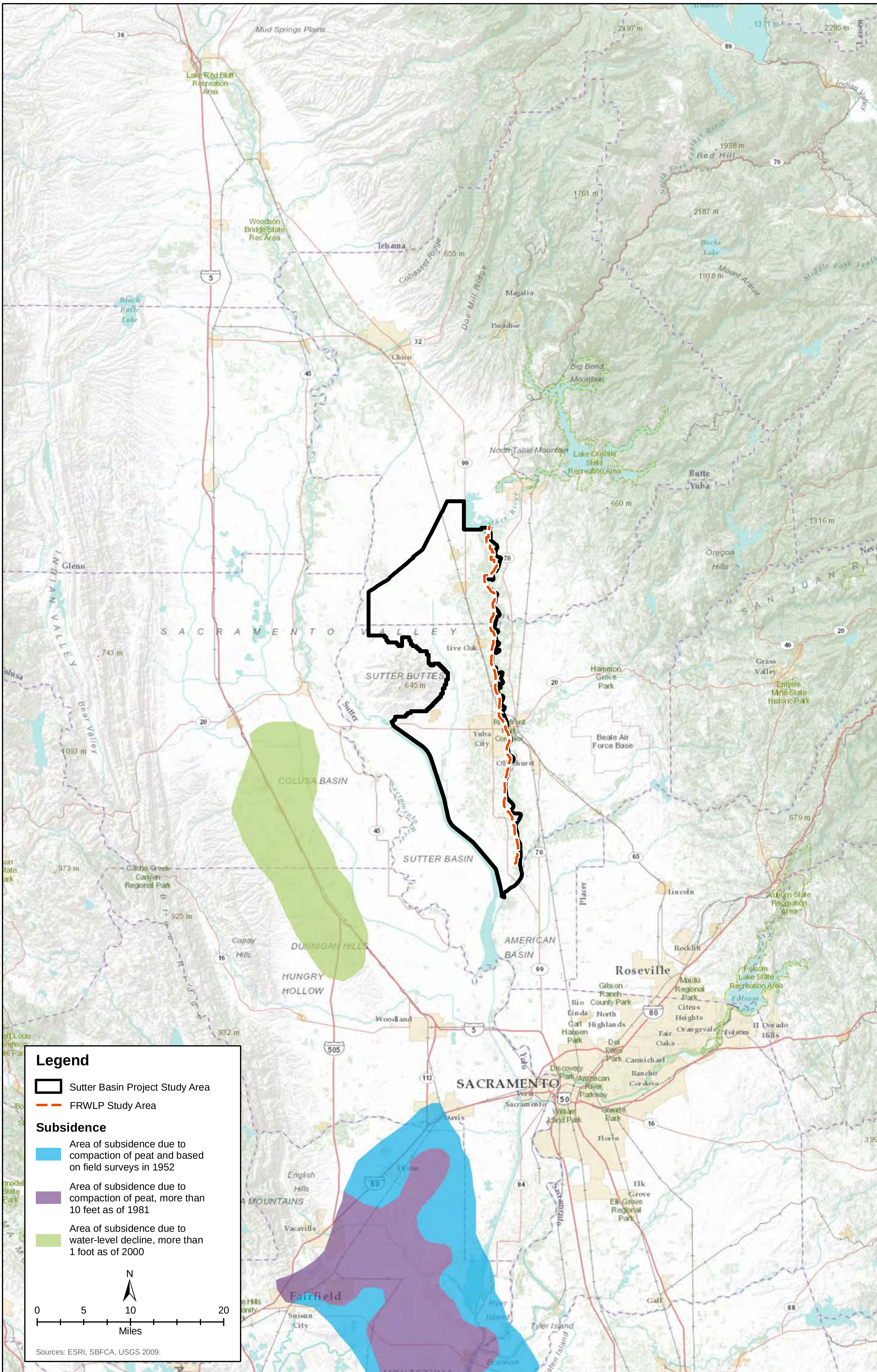

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Plate 3.3-4
Subsidence in the Study Area Vicinity

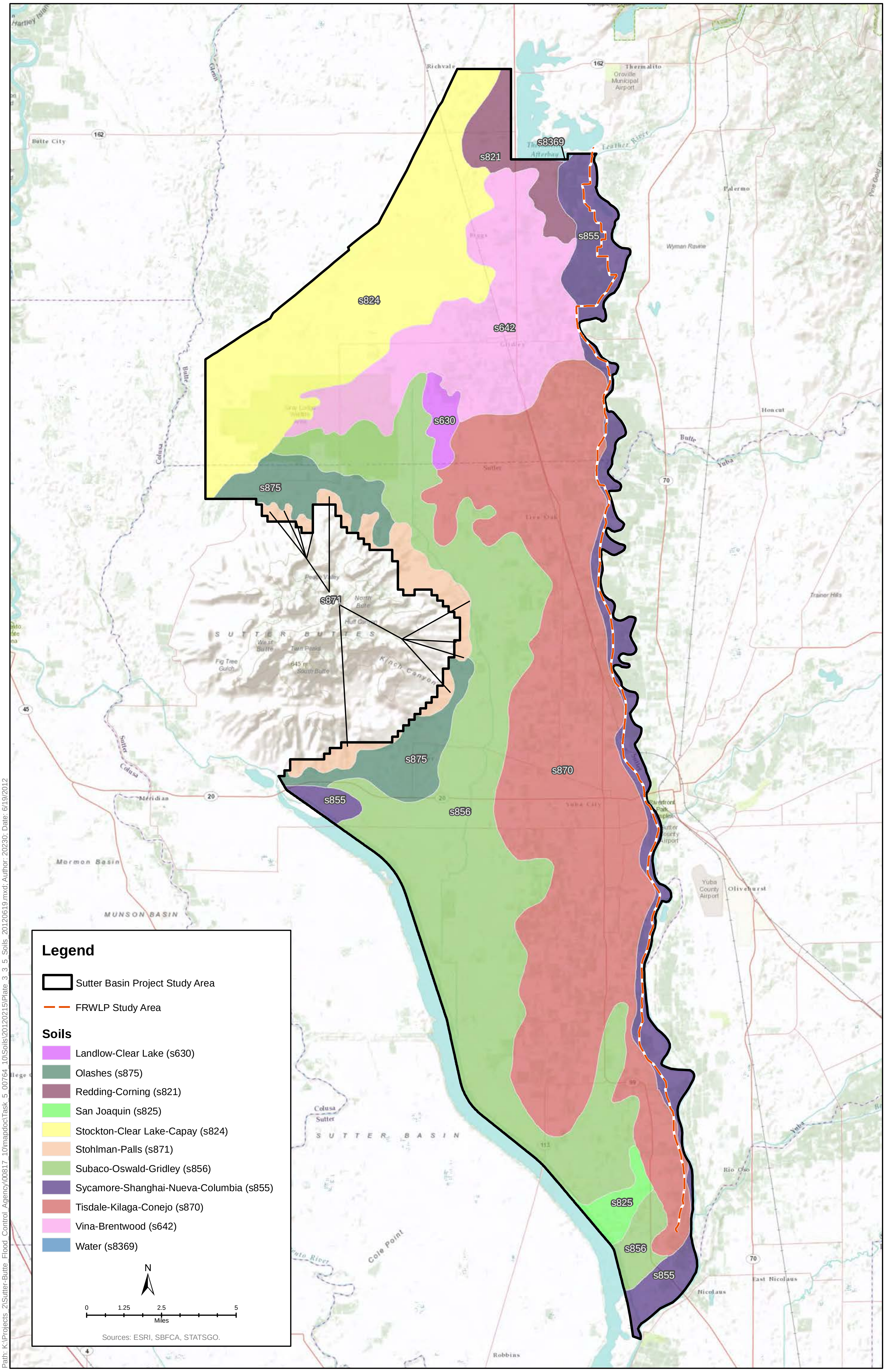

Plate 3.3-5
Soils in the Study Area

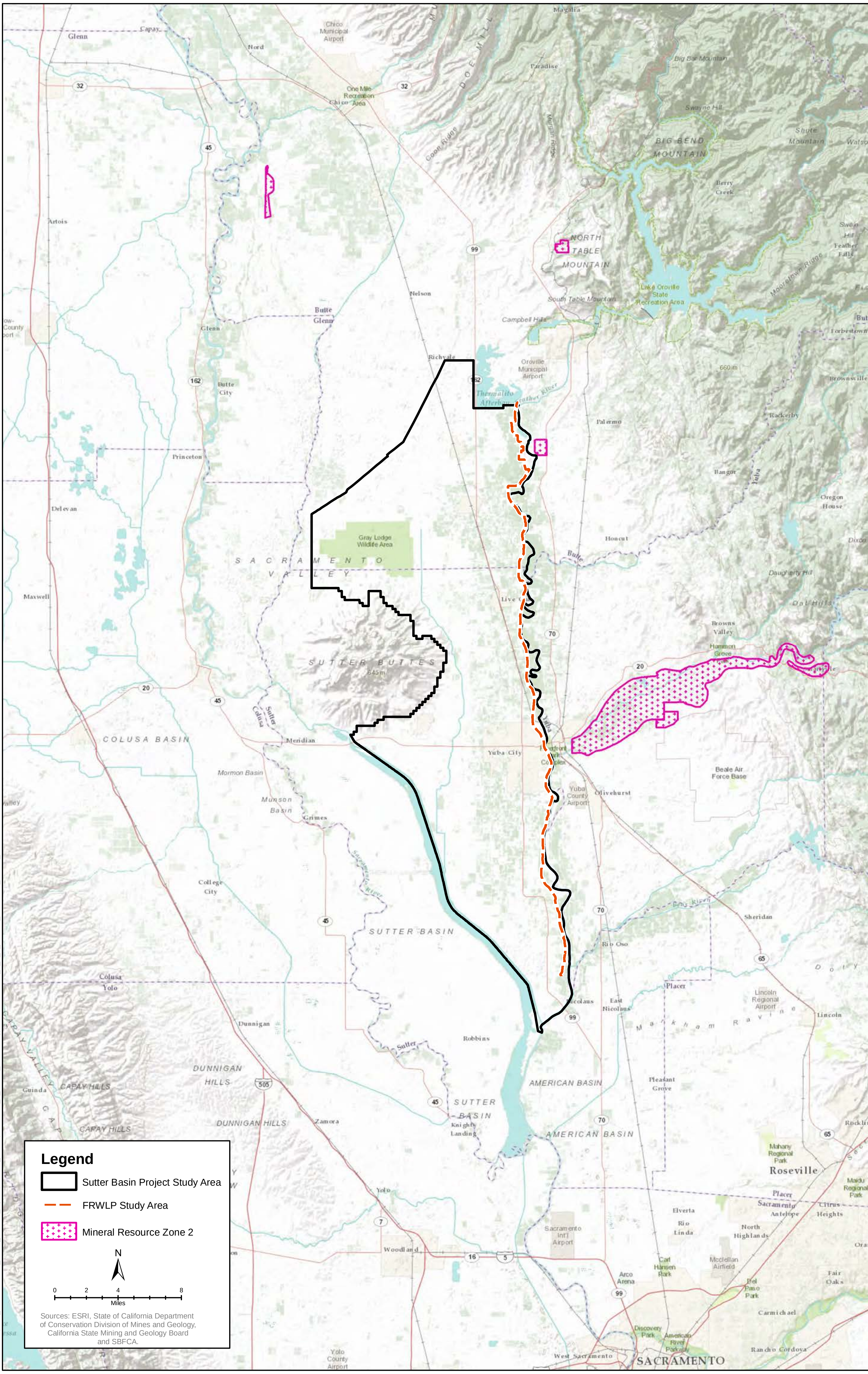

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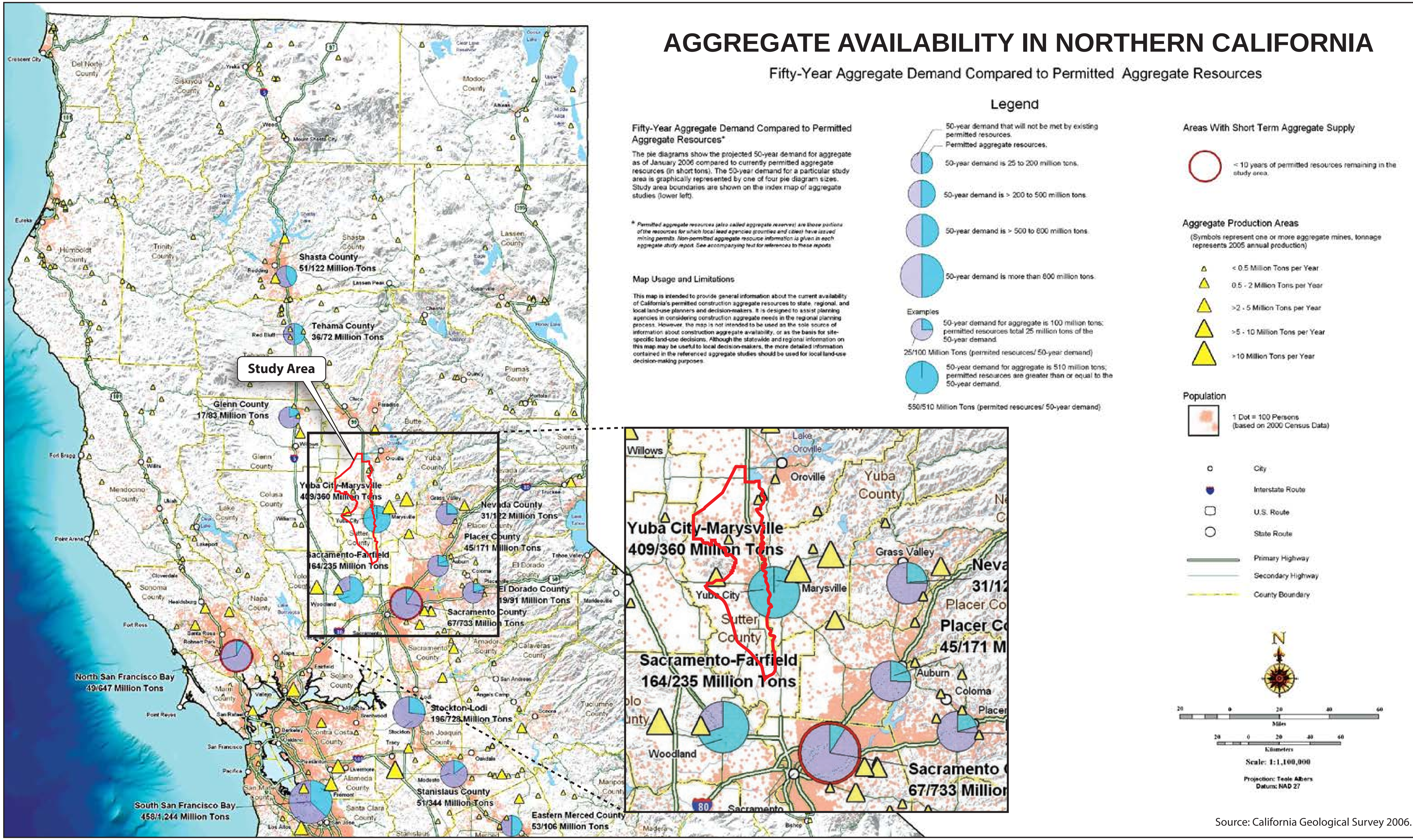
Plate 3.3-6
Mineral Resource Zone 2 in the Study Area Vicinity



Graphics...00852.10 (6/19/12) AB

Plate 3.3-7
Aggregate Demand and Availability in Northern California and the Study Area

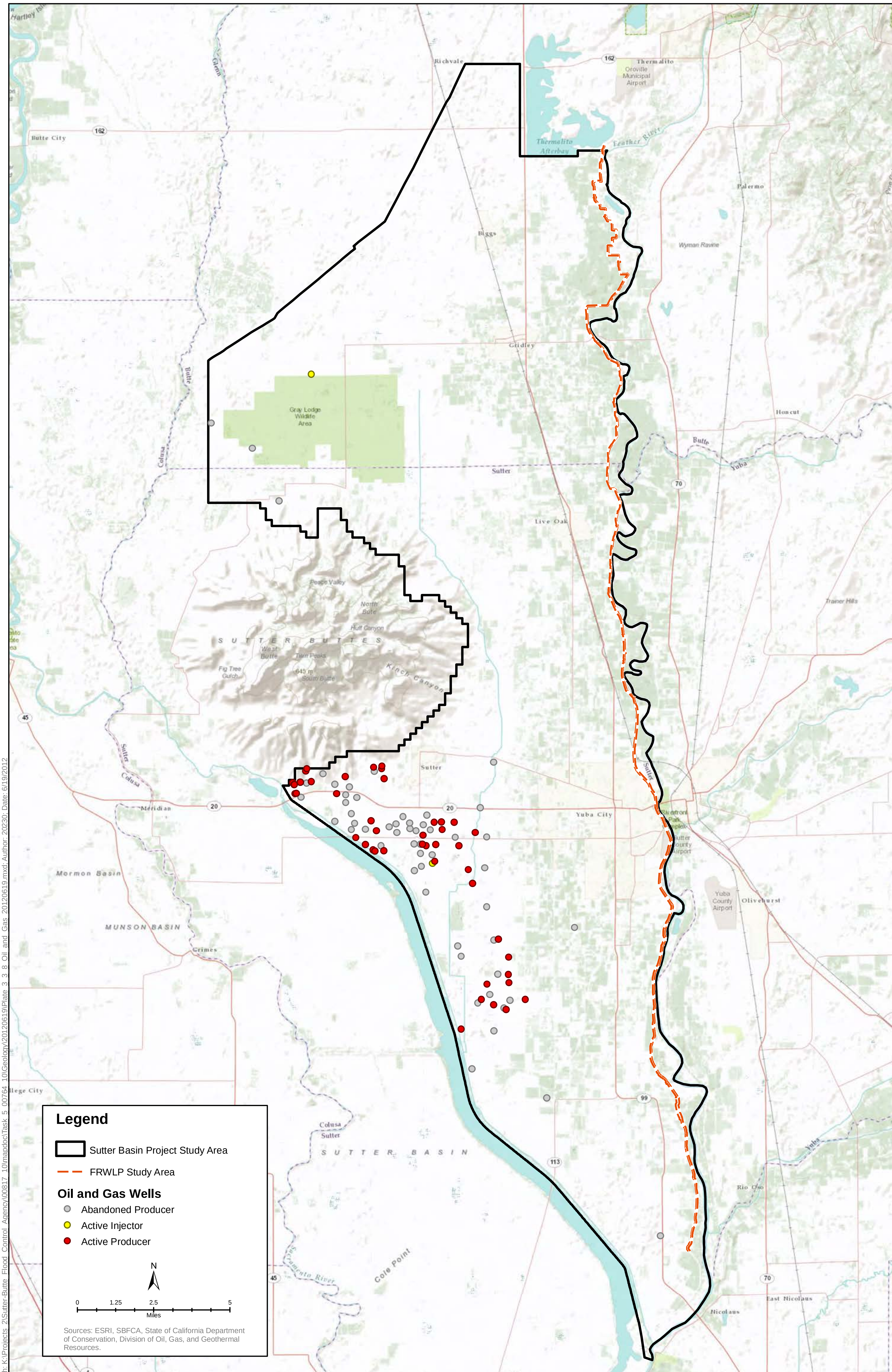
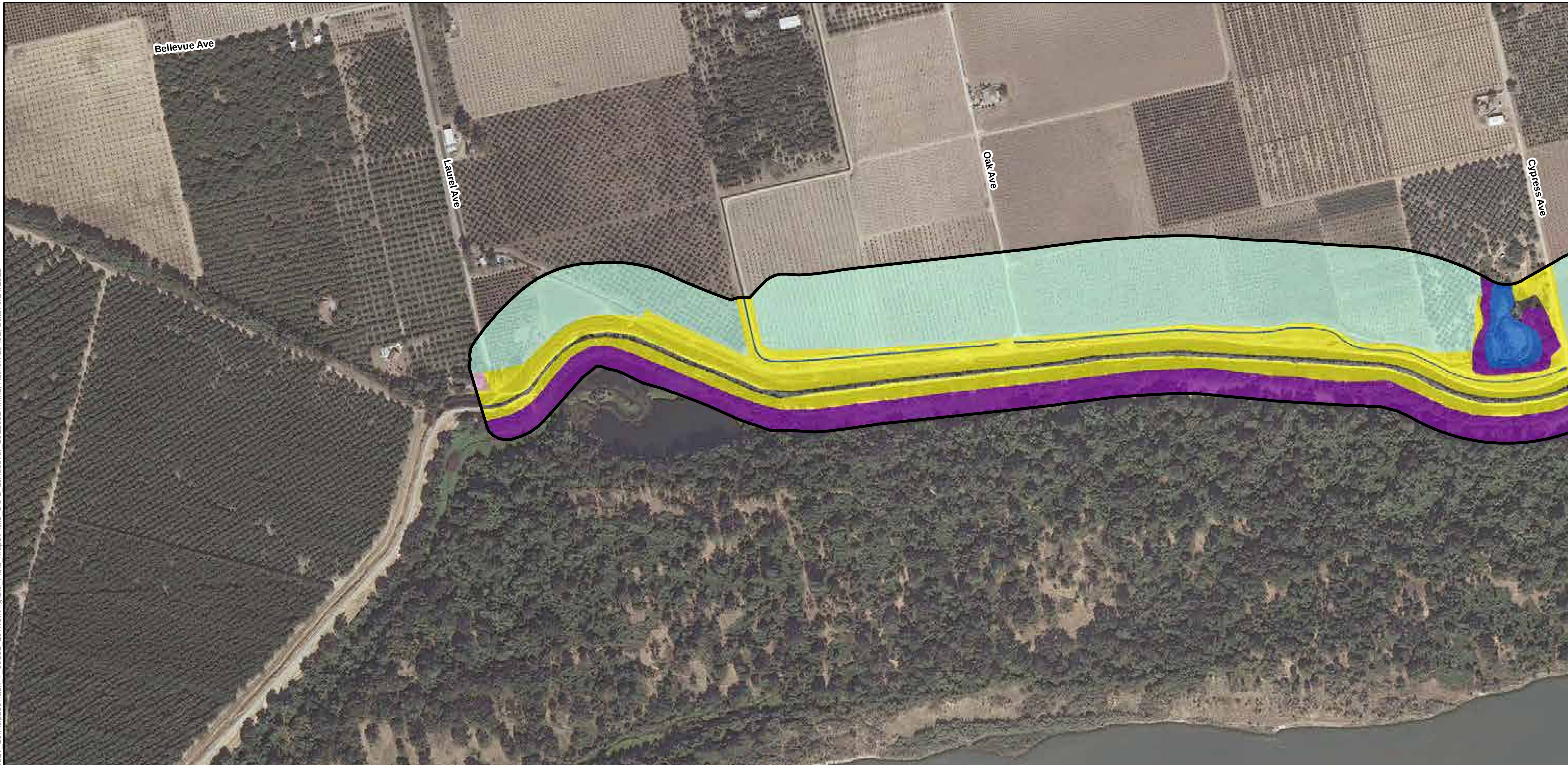


Plate 3.3-8
Oil and Gas Wells Within the Study Area



Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Land Cover Types

- Developed
- Field and Row Crops
- Oak Woodland
- Orchard
- Riparian Forest
- Ruderal
- Water

Plate 3.8-1 Land Cover Types in the Biological Study Area for Alternative 1-3

Sheet 1

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Legend

- Biological Study Area
- Reach
- Station 202+50
- Elderberry Shrub
- Elderberry Shrub Clusters

Plate 3.9-1
Locations of Elderberry Shrubs in the Study Area

Sheet 1

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Legend

- Biological Study Area
- Reach
- Station 202+50
- Elderberry Shrub
- Elderberry Shrub Clusters

Plate 3.9-1
Locations of Elderberry Shrubs in the Study Area

Sheet 2

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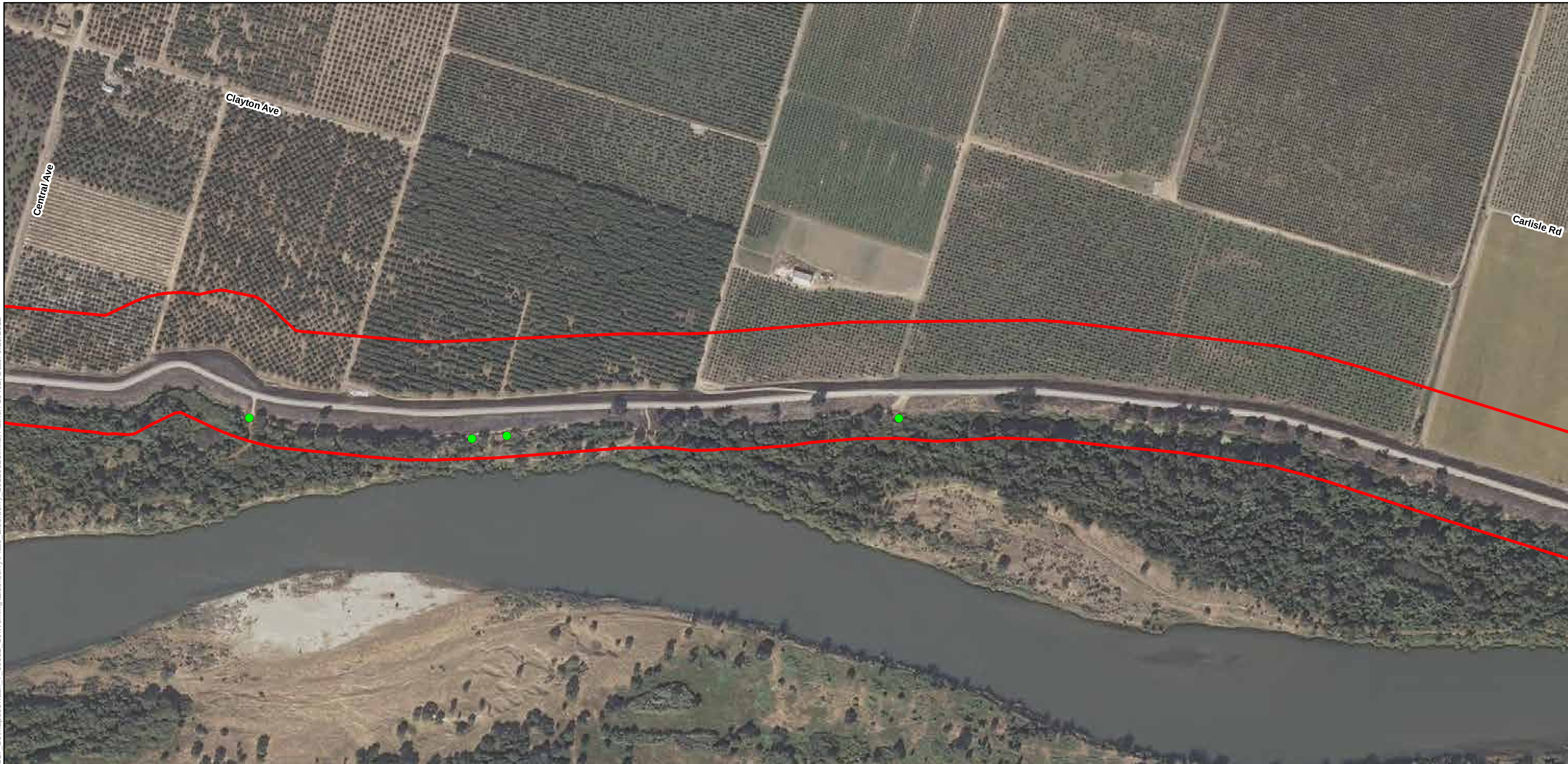

Legend
- Biological Study Area
- Reach
- Station 202+50
- Elderberry Shrub
- Elderberry Shrub Clusters

Plate 3.9-1
Locations of Elderberry Shrubs in the Study Area

Sheet 3

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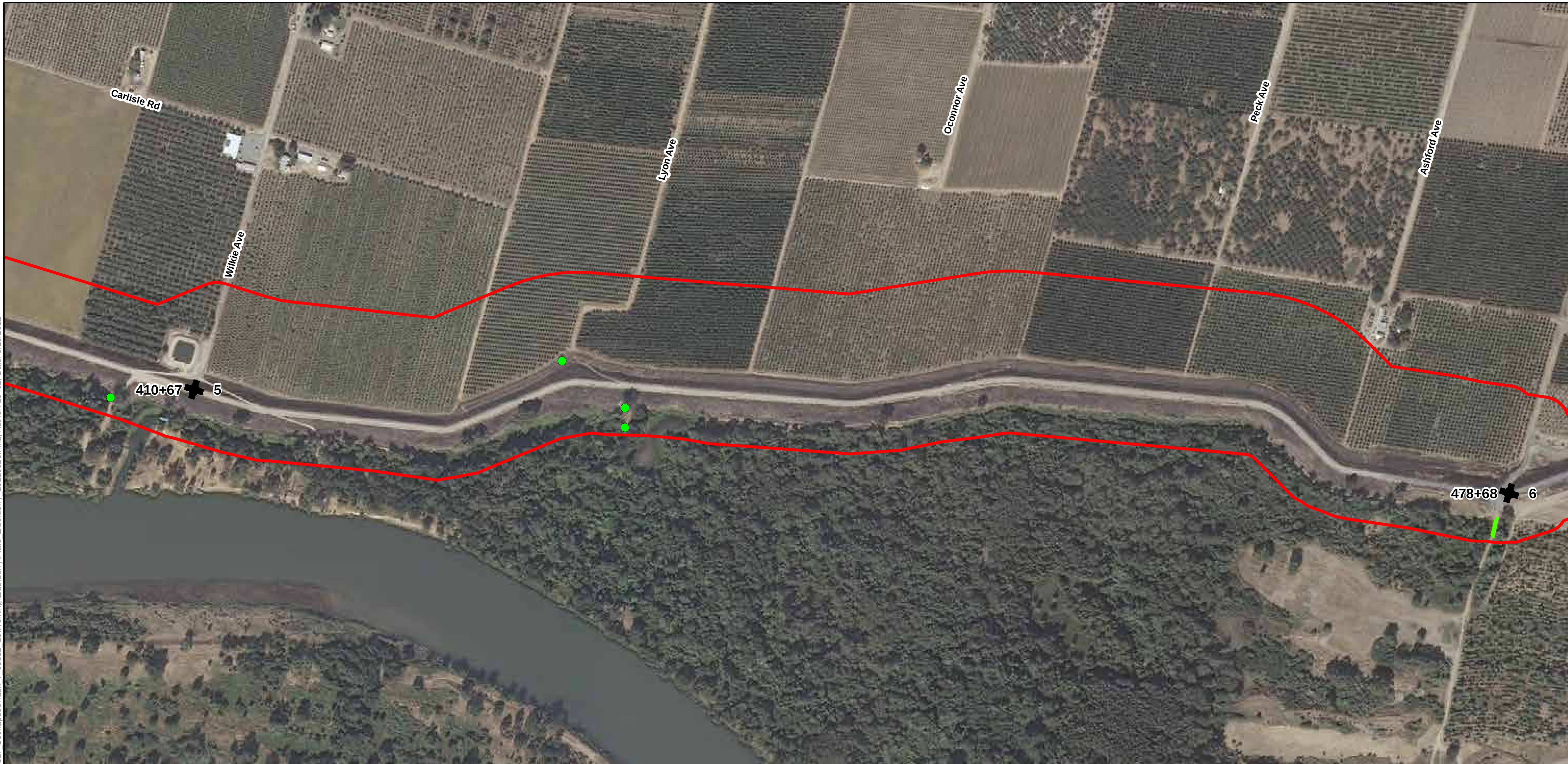
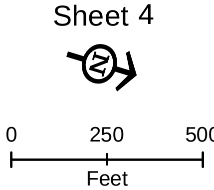


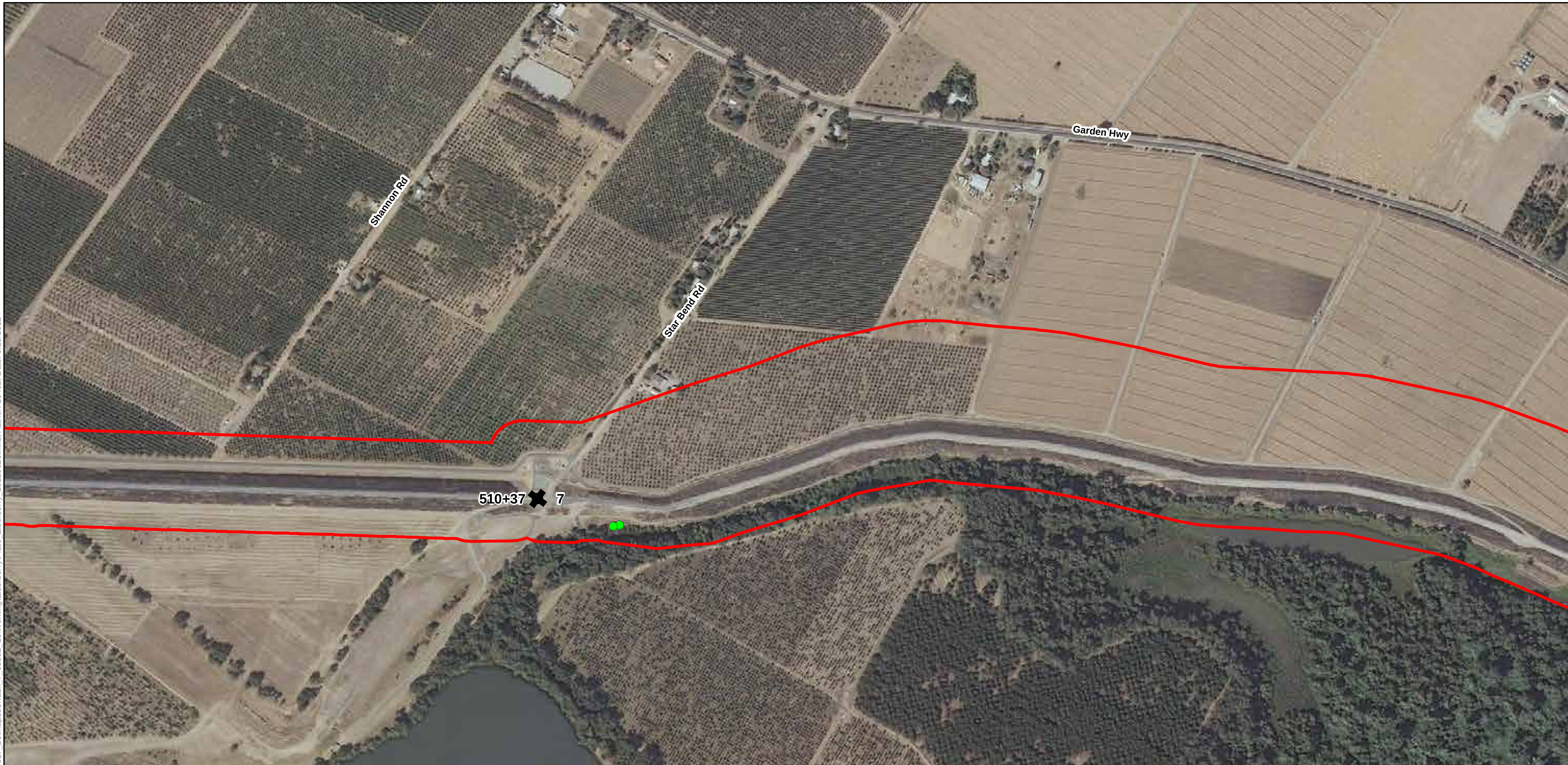
Legend

- Biological Study Area
- Reach
- Station 202+50
- Elderberry Shrub
- Elderberry Shrub Clusters

Plate 3.9-1
Locations of Elderberry Shrubs in the Study Area

Sheet 4





Legend

- Biological Study Area
- Reach
- Station 202+50
- Elderberry Shrub
- Elderberry Shrub Clusters

Plate 3.9-1
Locations of Elderberry Shrubs in the Study Area

Sheet 5

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Feet

Legend

- Biological Study Area
- Reach
- Station 202+50
- Elderberry Shrub
- Elderberry Shrub Clusters

Plate 3.9-1
Locations of Elderberry Shrubs in the Study Area

Sheet 6

0 250 500
Feet

Map Sheet Index

Legend

- Biological Study Area
- Reach
- Station 202+50
- Elderberry Shrub
- Elderberry Shrub Clusters

Plate 3.9-1
Locations of Elderberry Shrubs in the Study Area

Sheet 7

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Legend

- Biological Study Area
- Reach
- Station 202+50
- Elderberry Shrub
- Elderberry Shrub Clusters

Plate 3.9-1
Locations of Elderberry Shrubs in the Study Area

Sheet 8

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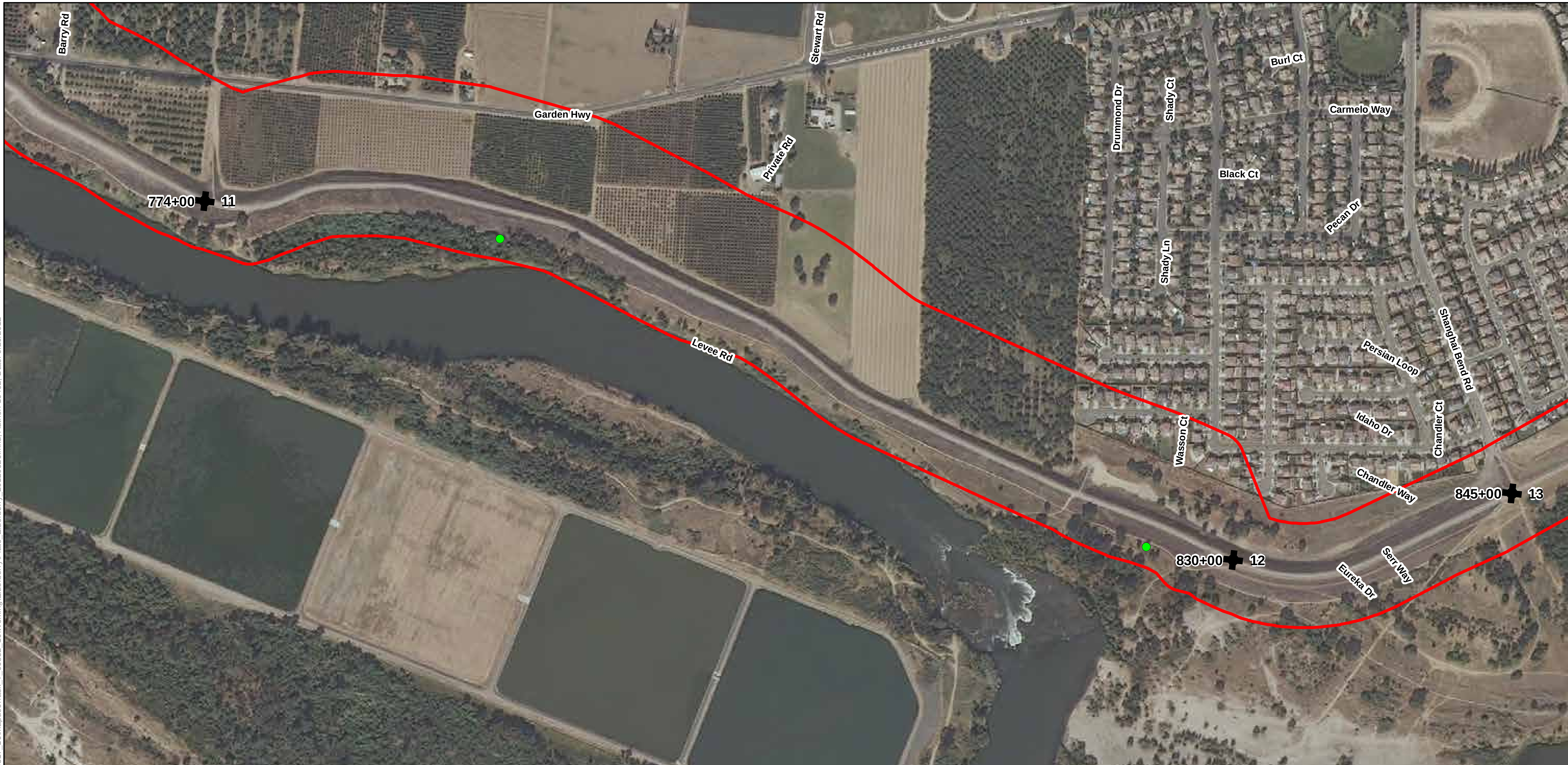

Legend
- Biological Study Area
- Reach
- Station 202+50
- Elderberry Shrub
- Elderberry Shrub Clusters

Plate 3.9-1
Locations of Elderberry Shrubs in the Study Area

Sheet 9

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Legend

- Biological Study Area
- Reach
- Station 202+50
- Elderberry Shrub
- Elderberry Shrub Clusters

Plate 3.9-1 Locations of Elderberry Shrubs in the Study Area

Sheet 10

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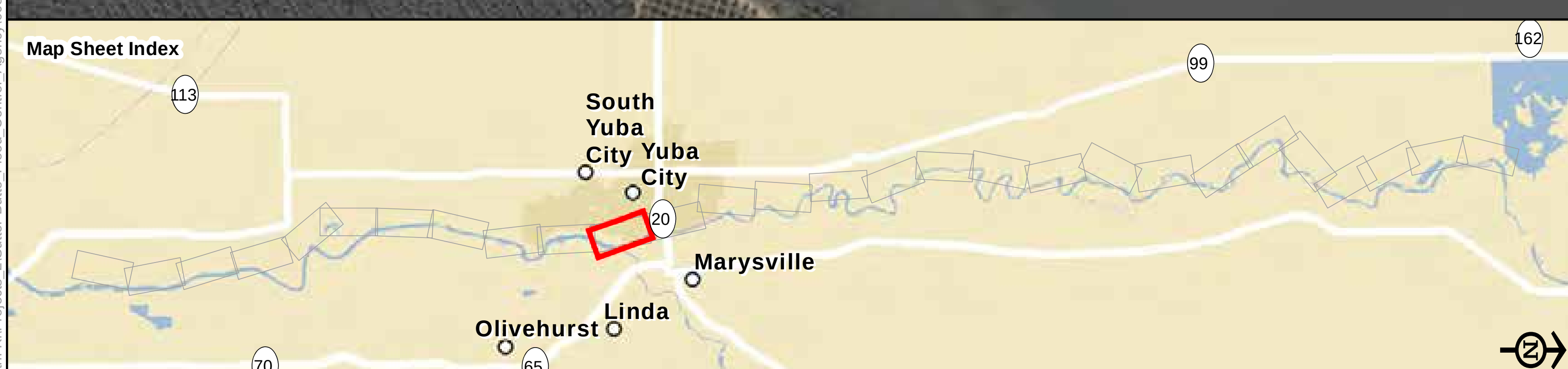

Legend

- Biological Study Area
- Reach
- Station 202+50
- Elderberry Shrub
- Elderberry Shrub Clusters

Plate 3.9-1
Locations of Elderberry Shrubs in the Study Area

Sheet 11

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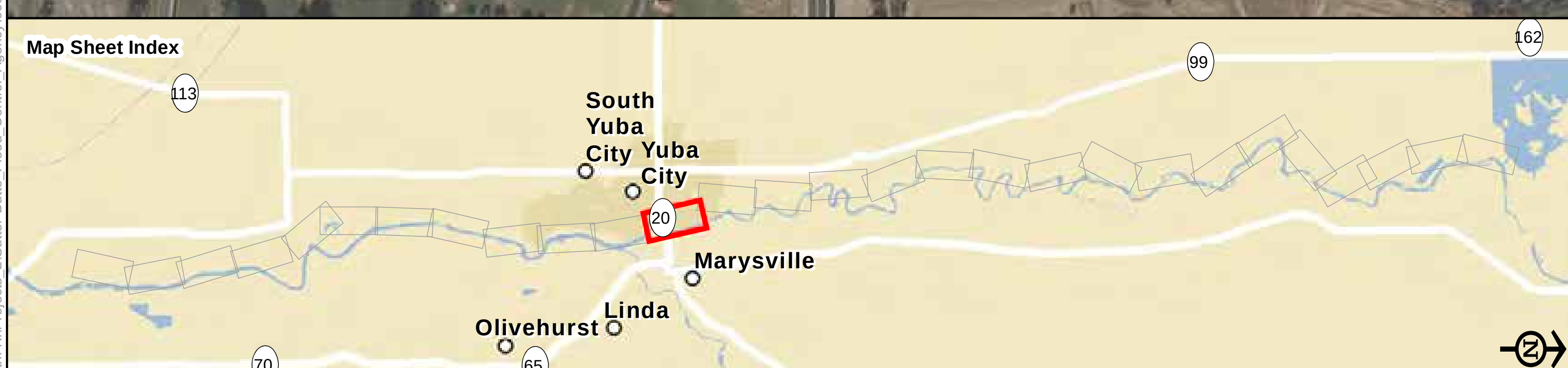

Legend

- Biological Study Area
- Reach
- Station 202+50
- Elderberry Shrub
- Elderberry Shrub Clusters

Plate 3.9-1
Locations of Elderberry Shrubs in the Study Area

Sheet 12

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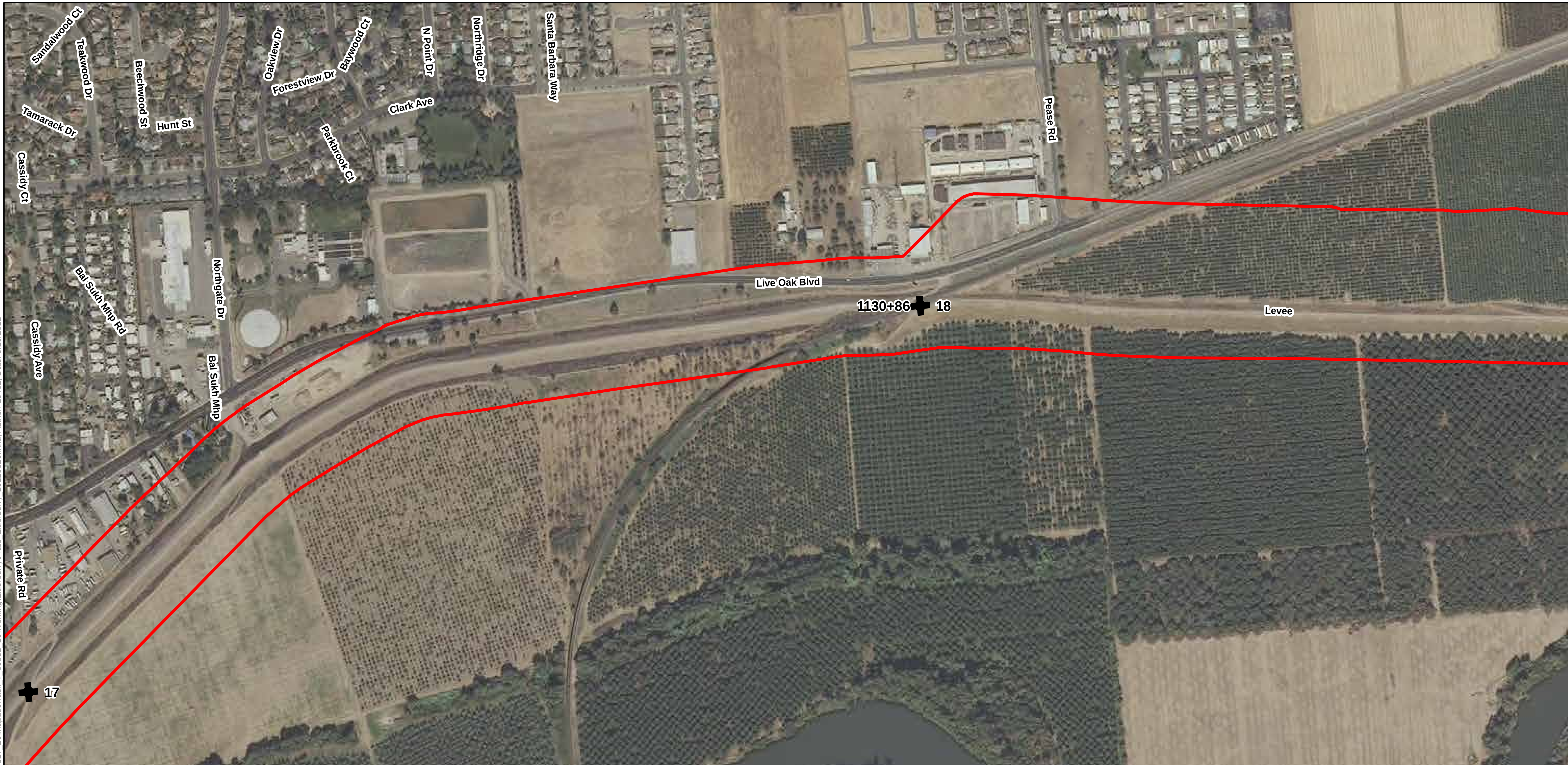

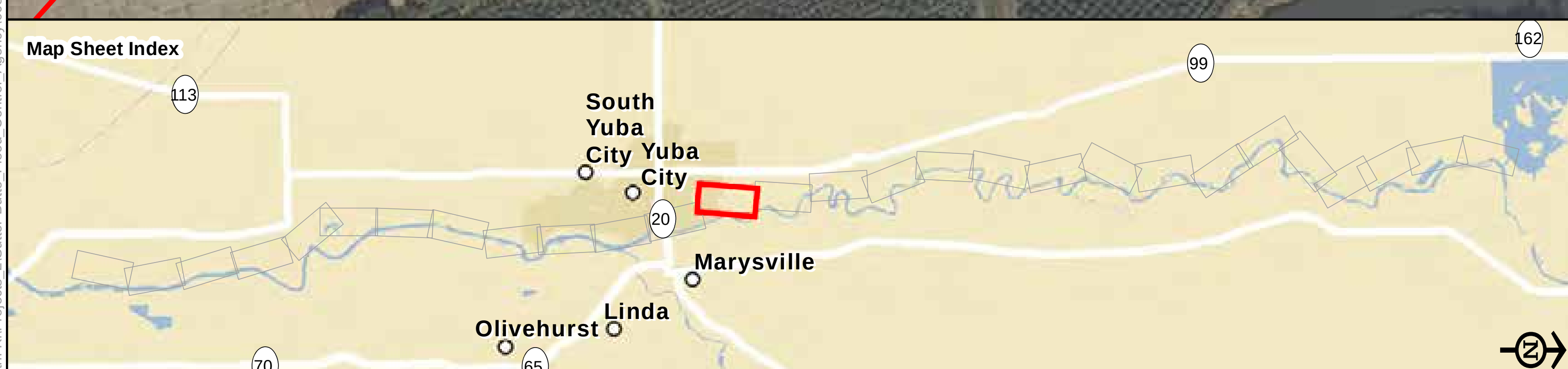

Legend

- Biological Study Area
- Reach
- Station 202+50
- Elderberry Shrub
- Elderberry Shrub Clusters

Plate 3.9-1
Locations of Elderberry Shrubs in the Study Area

Sheet 13

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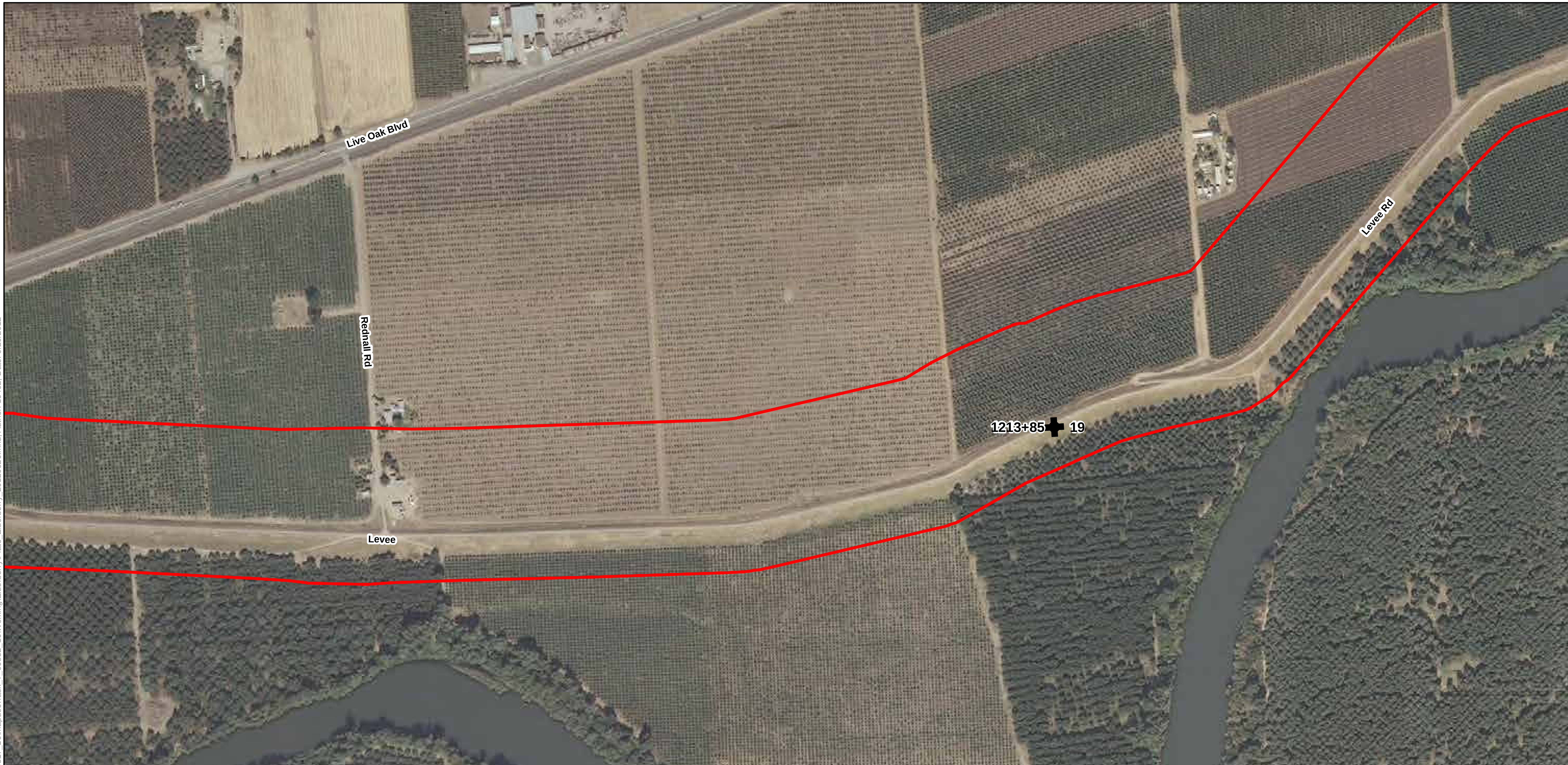

Legend

- Biological Study Area
- Reach
- Station 202+50
- Elderberry Shrub
- Elderberry Shrub Clusters

Plate 3.9-1
Locations of Elderberry Shrubs in the Study Area

Sheet 14

0 250 500
Feet

Legend

- Biological Study Area
- Reach
- Station 202+50
- Elderberry Shrub
- Elderberry Shrub Clusters

Plate 3.9-1
Locations of Elderberry Shrubs in the Study Area

Sheet 15

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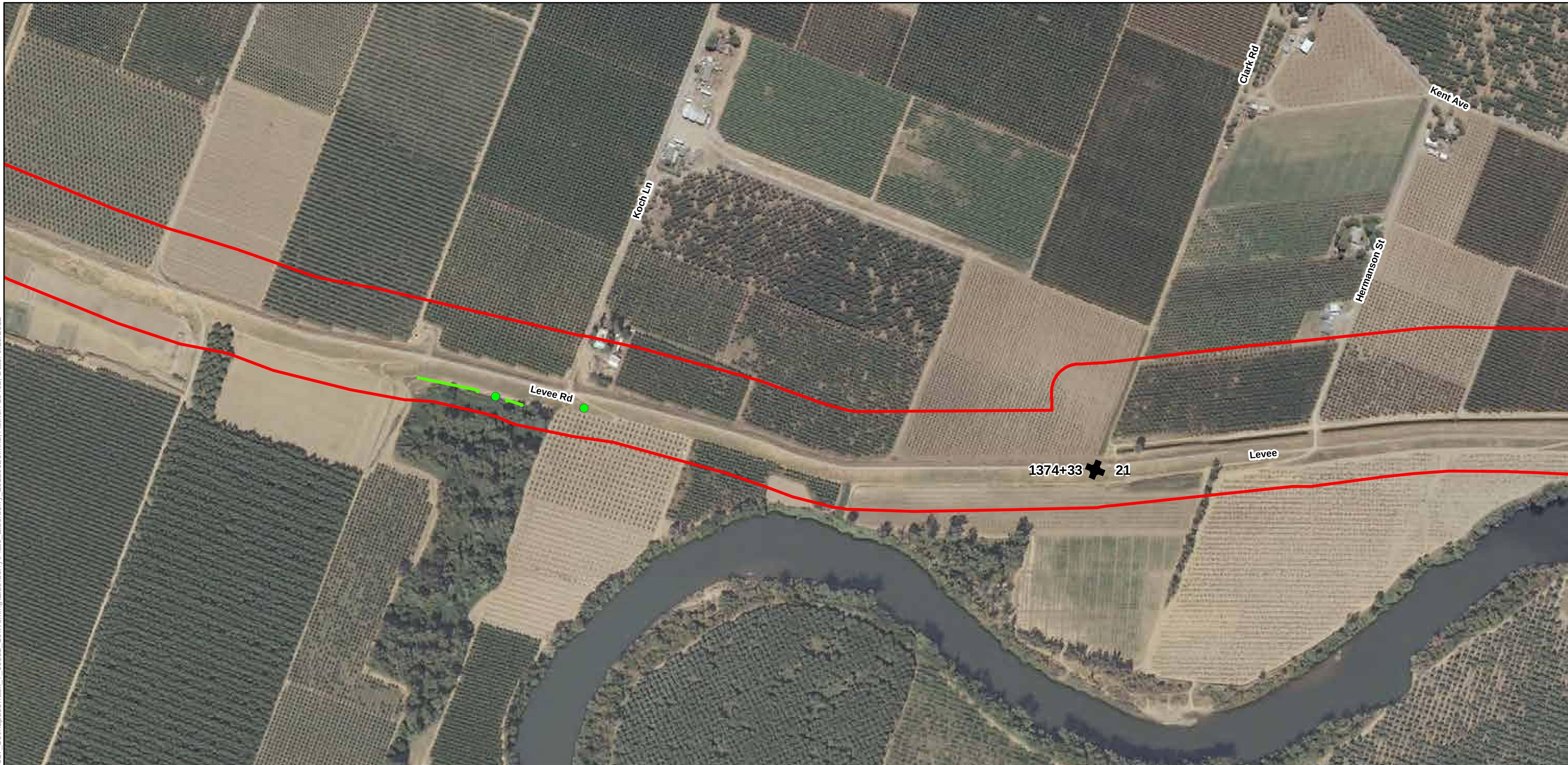

Legend

- Biological Study Area
- Reach
- Station 202+50
- Elderberry Shrub
- Elderberry Shrub Clusters

Plate 3.9-1
Locations of Elderberry Shrubs in the Study Area

Sheet 16

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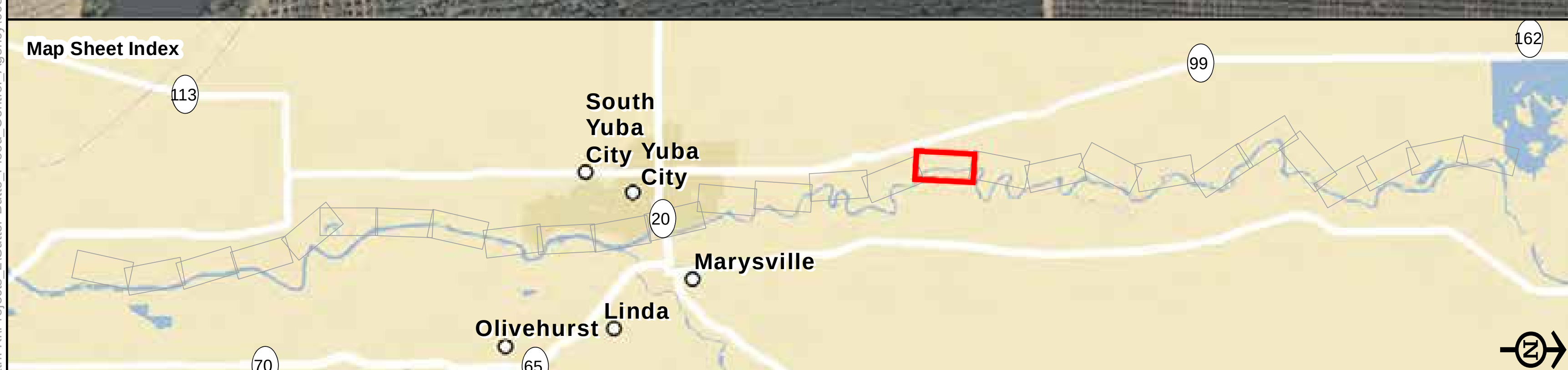

Legend

- Biological Study Area
- Reach
- Station 202+50
- Elderberry Shrub
- Elderberry Shrub Clusters

Plate 3.9-1 Locations of Elderberry Shrubs in the Study Area

Sheet 17

N

0 250 500

Feet

Legend

- Biological Study Area
- Reach
- Station 202+50
- Elderberry Shrub
- Elderberry Shrub Clusters

Plate 3.9-1
Locations of Elderberry Shrubs in the Study Area

Sheet 18

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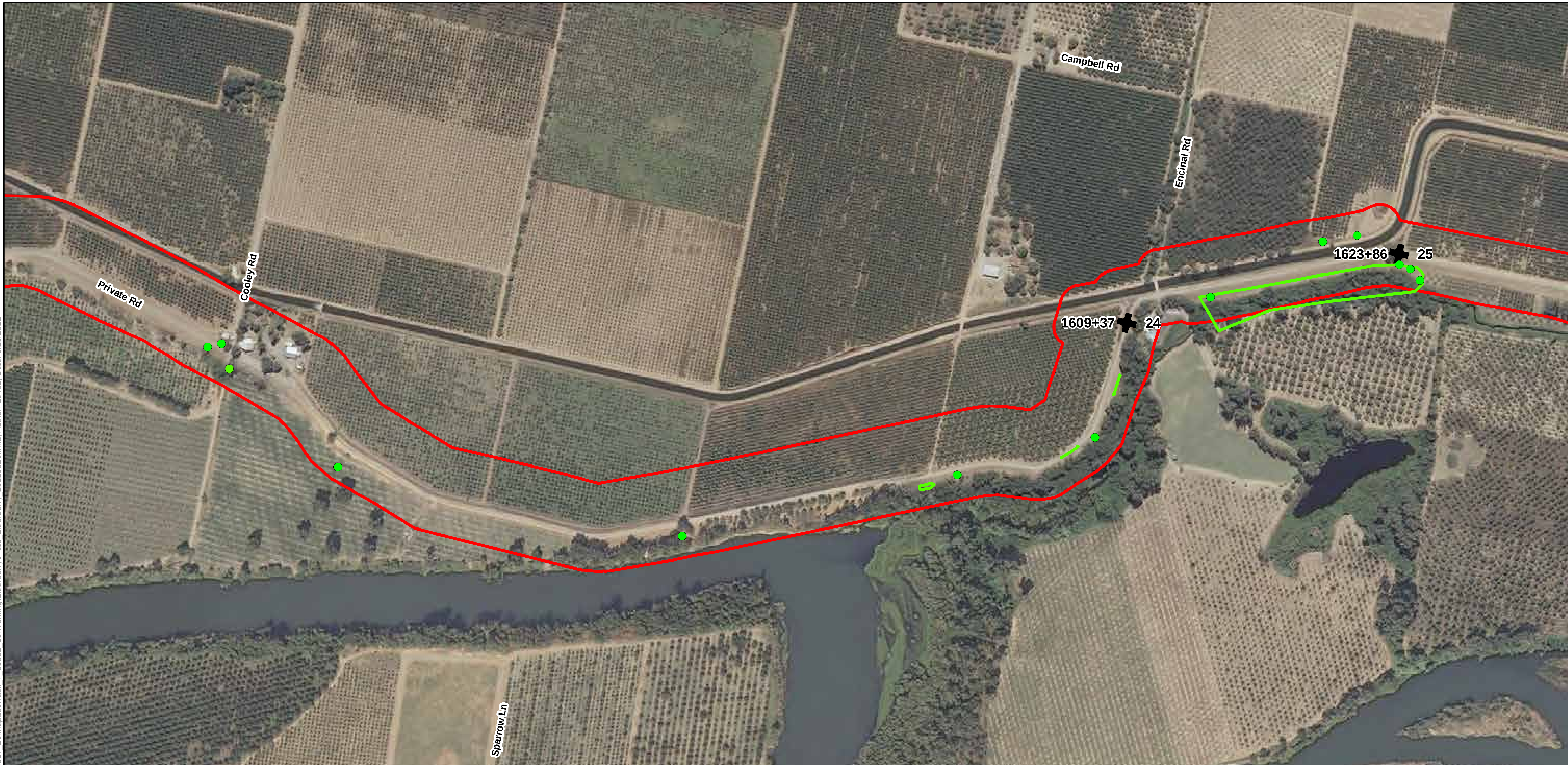

Legend

- Biological Study Area
- Reach
- Station 202+50
- Elderberry Shrub
- Elderberry Shrub Clusters

Plate 3.9-1
Locations of Elderberry Shrubs in the Study Area

Sheet 19

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Legend

- Biological Study Area
- Reach
- Station 202+50
- Elderberry Shrub
- Elderberry Shrub Clusters

Plate 3.9-1
Locations of Elderberry Shrubs in the Study Area

Sheet 20

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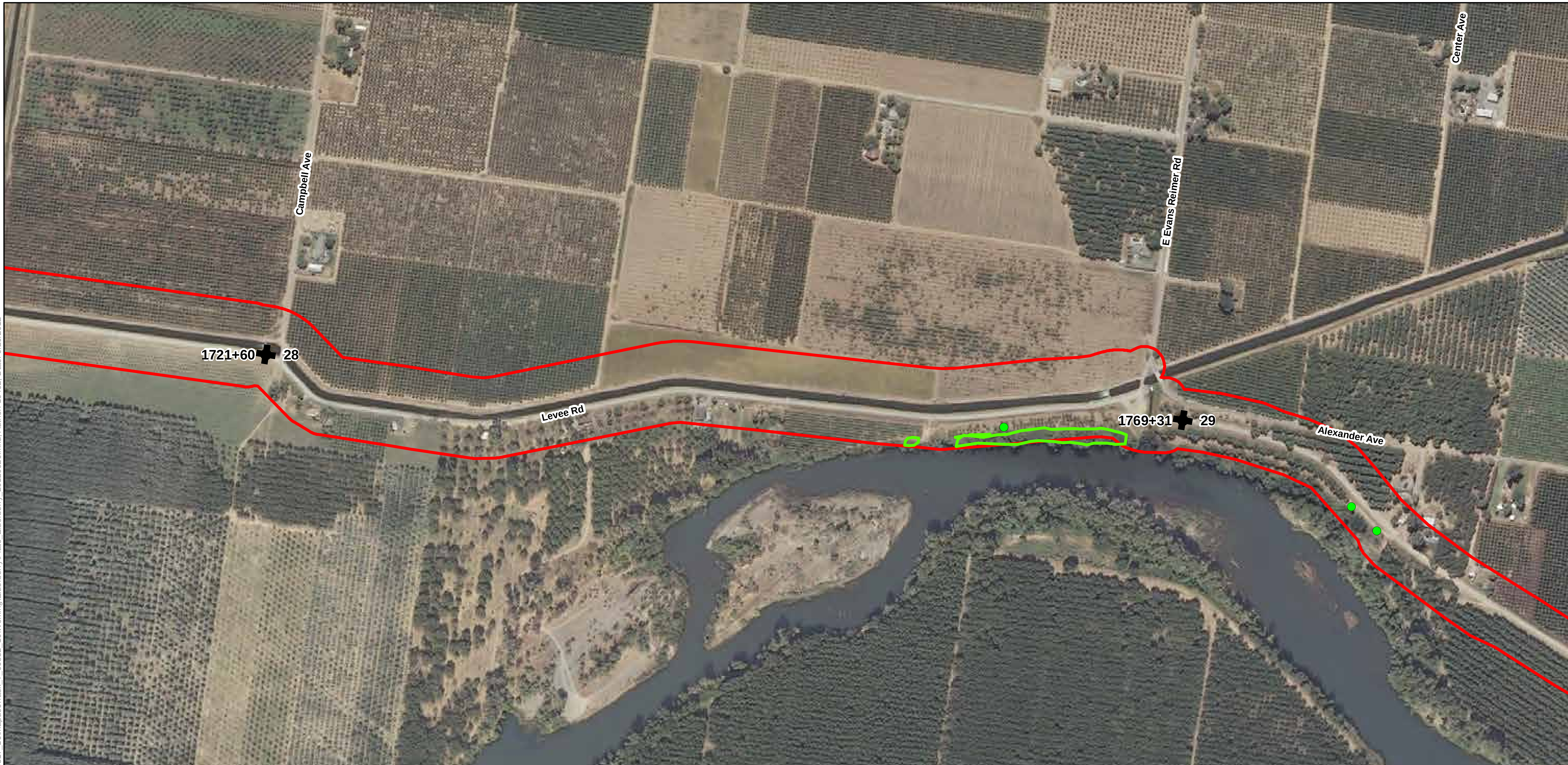

Legend

- Biological Study Area
- Reach
- Station 202+50
- Elderberry Shrub
- Elderberry Shrub Clusters

Plate 3.9-1
Locations of Elderberry Shrubs in the Study Area

Sheet 21

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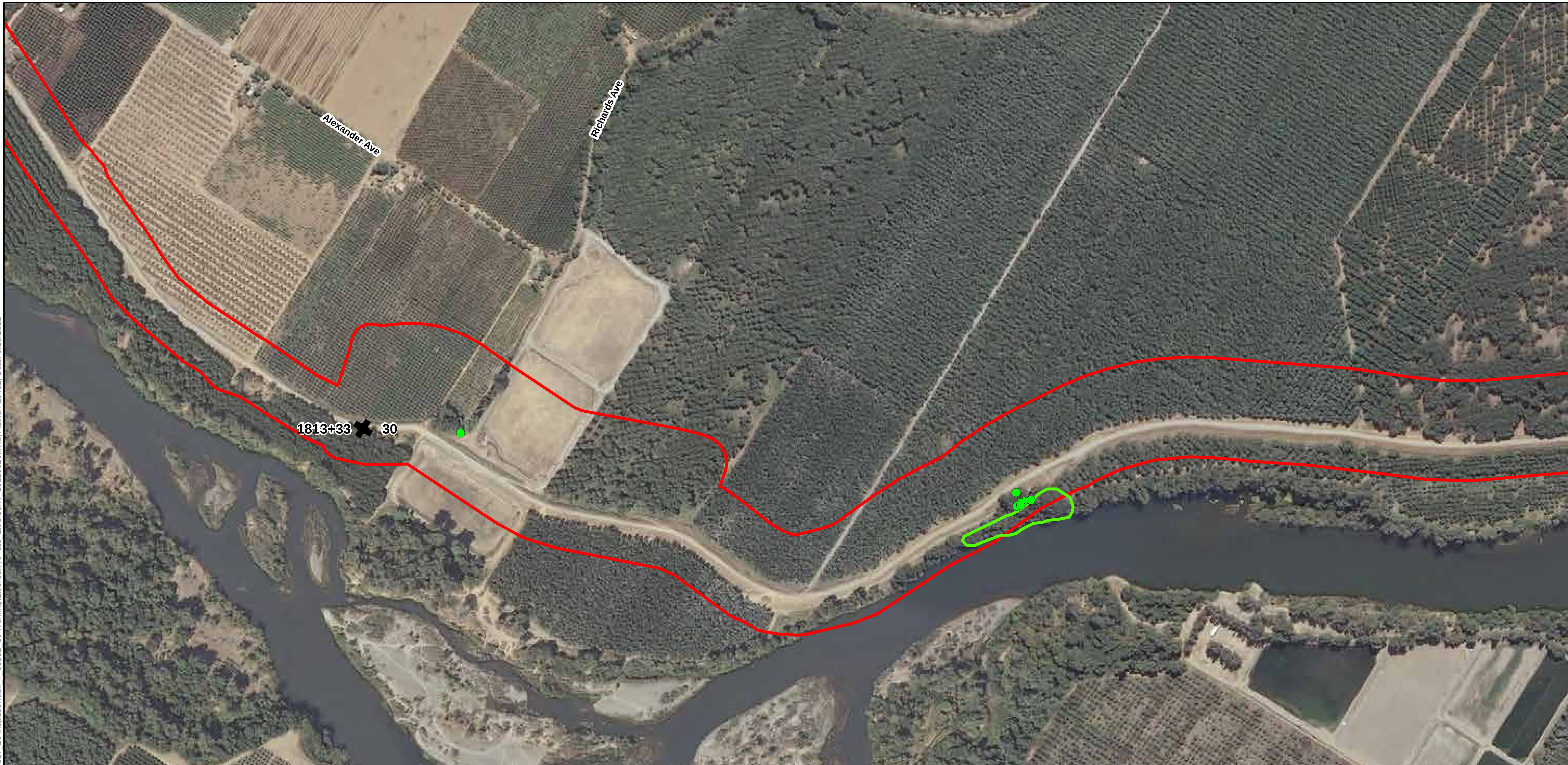

Legend

- Biological Study Area
- Reach
- Station 202+50
- Elderberry Shrub
- Elderberry Shrub Clusters

Plate 3.9-1
Locations of Elderberry Shrubs in the Study Area

Sheet 22

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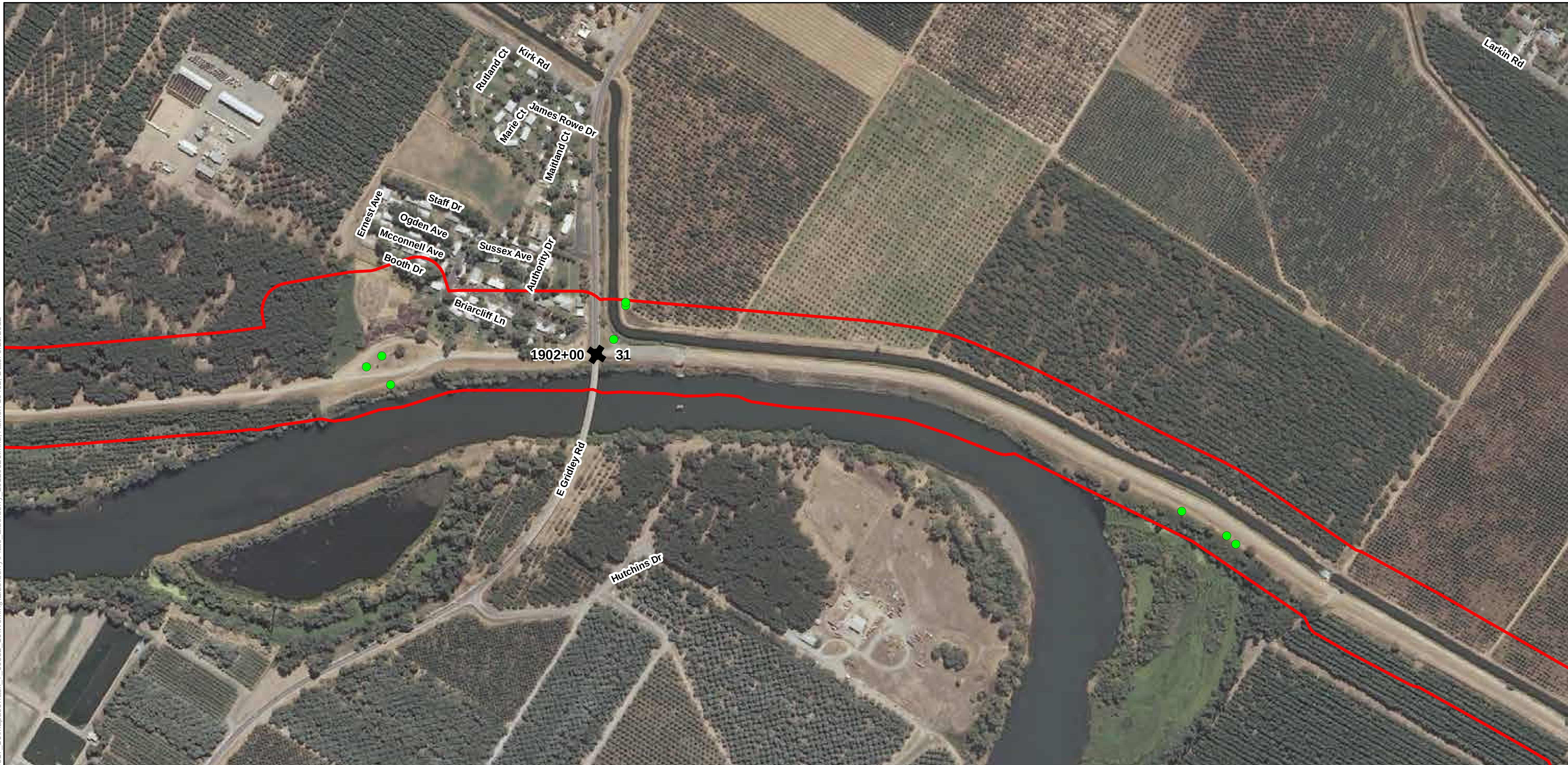

Legend

- Biological Study Area
- Reach
- Station 202+50
- Elderberry Shrub
- Elderberry Shrub Clusters

Plate 3.9-1
Locations of Elderberry Shrubs in the Study Area

Sheet 23

0 250 500
Feet

Legend

- Biological Study Area
- Reach
- Station 202+50
- Elderberry Shrub
- Elderberry Shrub Clusters

Plate 3.9-1
Locations of Elderberry Shrubs in the Study Area

Sheet 24

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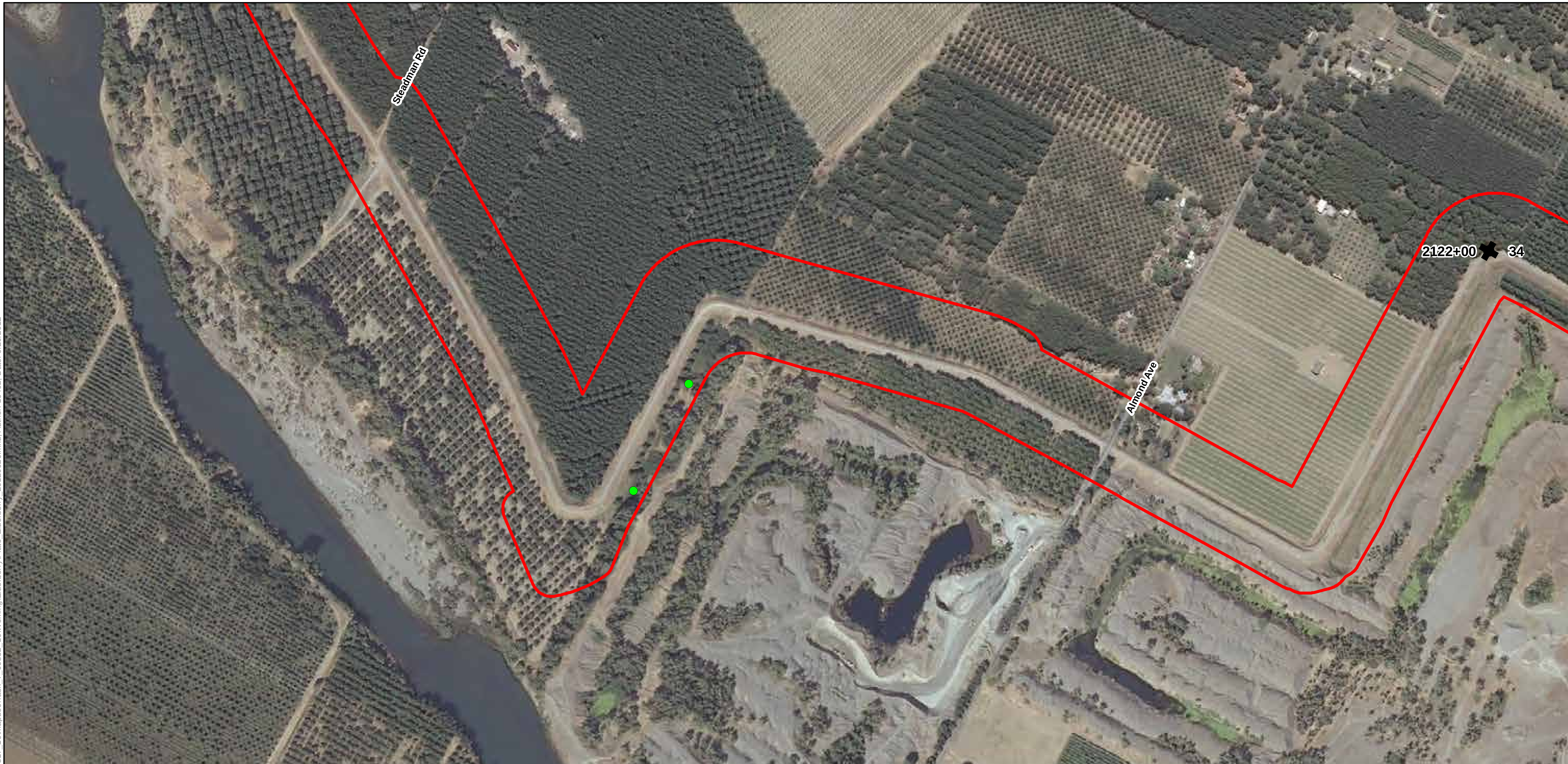

Legend

- Biological Study Area
- Reach
- Station 202+50
- Elderberry Shrub
- Elderberry Shrub Clusters

Plate 3.9-1 Locations of Elderberry Shrubs in the Study Area

Sheet 25

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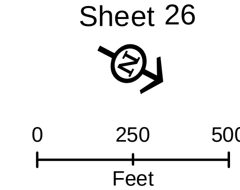
Legend

- Biological Study Area
- Reach
- Station 202+50
- Elderberry Shrub
- Elderberry Shrub Clusters

Plate 3.9-1 Locations of Elderberry Shrubs in the Study Area

Sheet 26



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Legend

- Biological Study Area
- Reach
- Station 202+50
- Elderberry Shrub
- Elderberry Shrub Clusters

Plate 3.9-1
Locations of Elderberry Shrubs in the Study Area

Sheet 27

0 250 500
Feet

Legend

- Biological Study Area
- Reach
- Station 202+50
- Elderberry Shrub
- Elderberry Shrub Clusters

Plate 3.9-1 Locations of Elderberry Shrubs in the Study Area

Sheet 28

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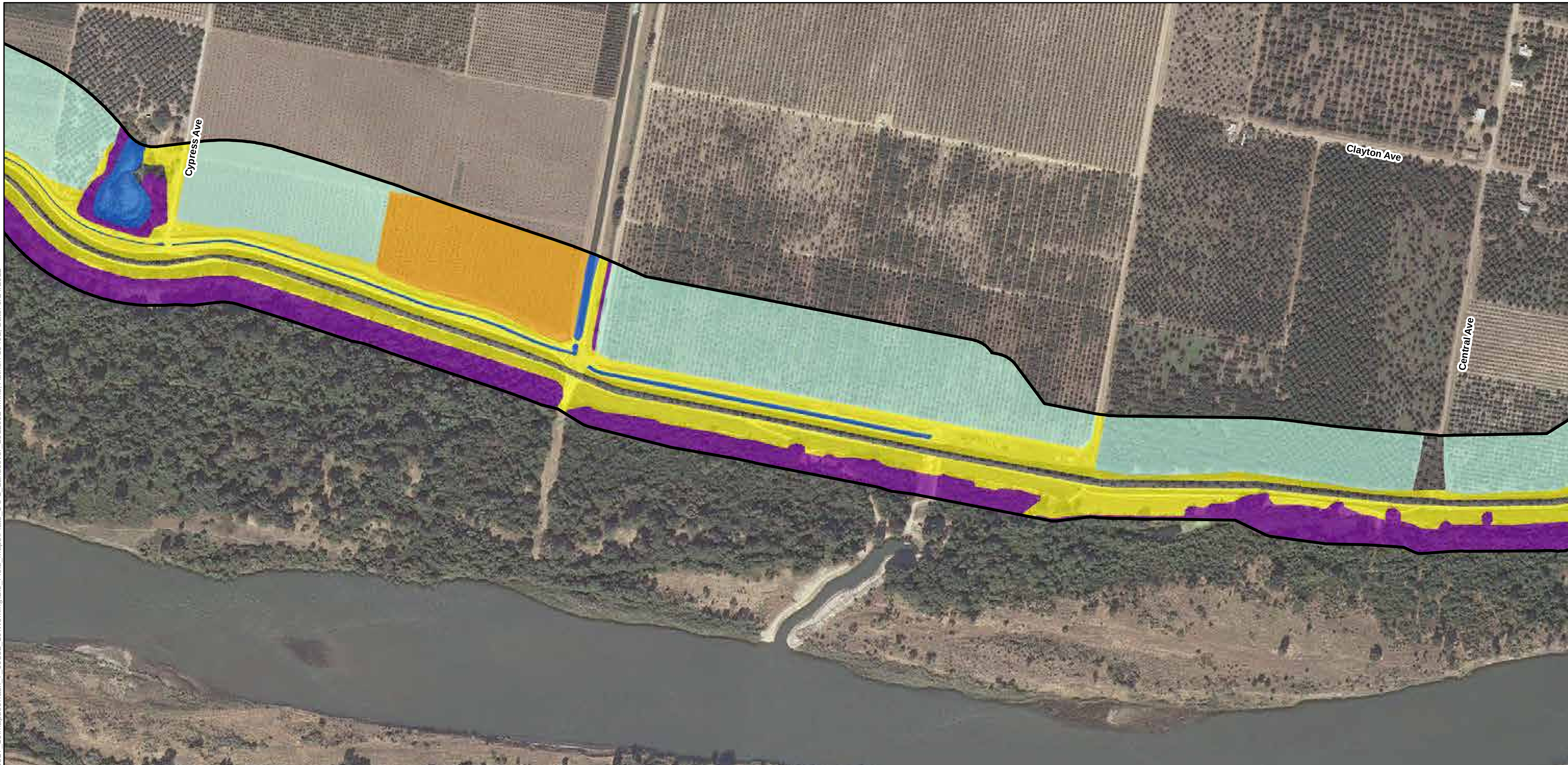

Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Land Cover Types

- Developed
- Field and Row Crops
- Oak Woodland
- Orchard
- Riparian Forest
- Ruderal
- Water

Plate 3.8-1 Land Cover Types in the Biological Study Area for Alternative 1-3

Sheet 2

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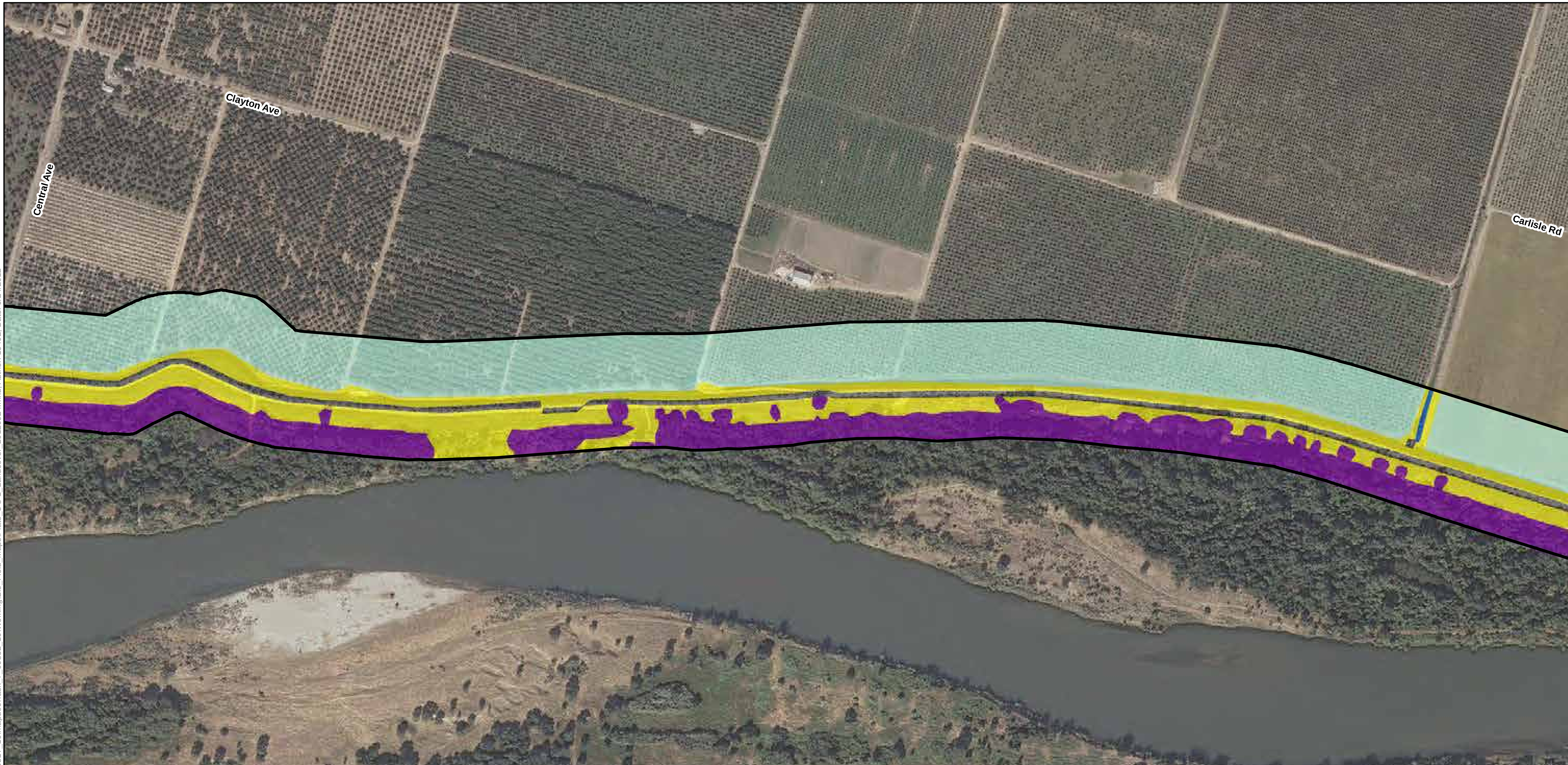

Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Land Cover Types

- Developed
- Field and Row Crops
- Oak Woodland
- Orchard
- Riparian Forest
- Ruderal
- Water

Plate 3.8-1
Land Cover Types in the Biological Study Area for Alternative 1-3

Sheet 3

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Feet

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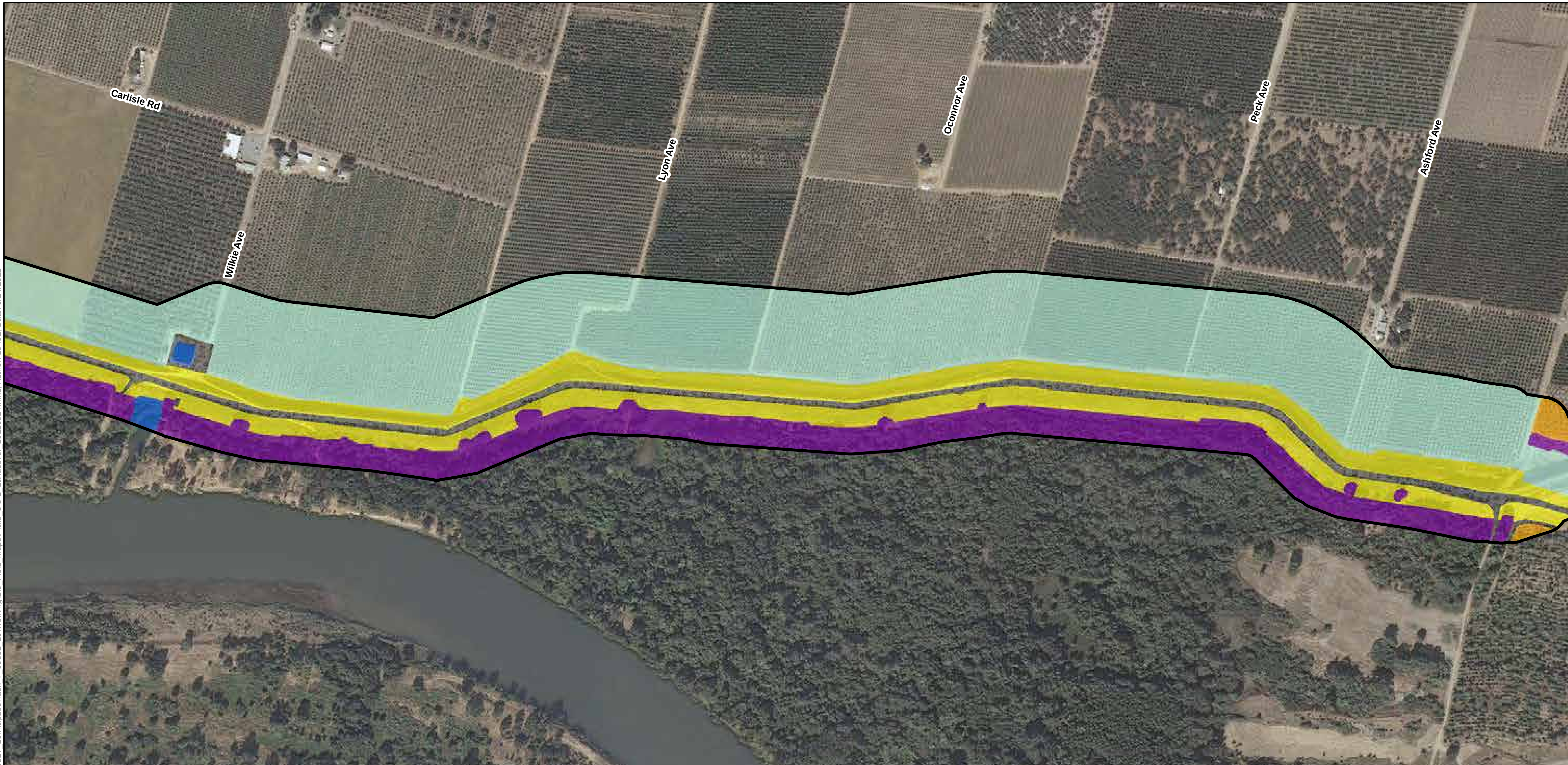

Map Sheet Index

Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Land Cover Types

- Developed
- Field and Row Crops
- Oak Woodland
- Orchard
- Riparian Forest
- Ruderal
- Water

Plate 3.8-1
Land Cover Types in the Biological Study Area for Alternative 1-3

Sheet 4

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Feet

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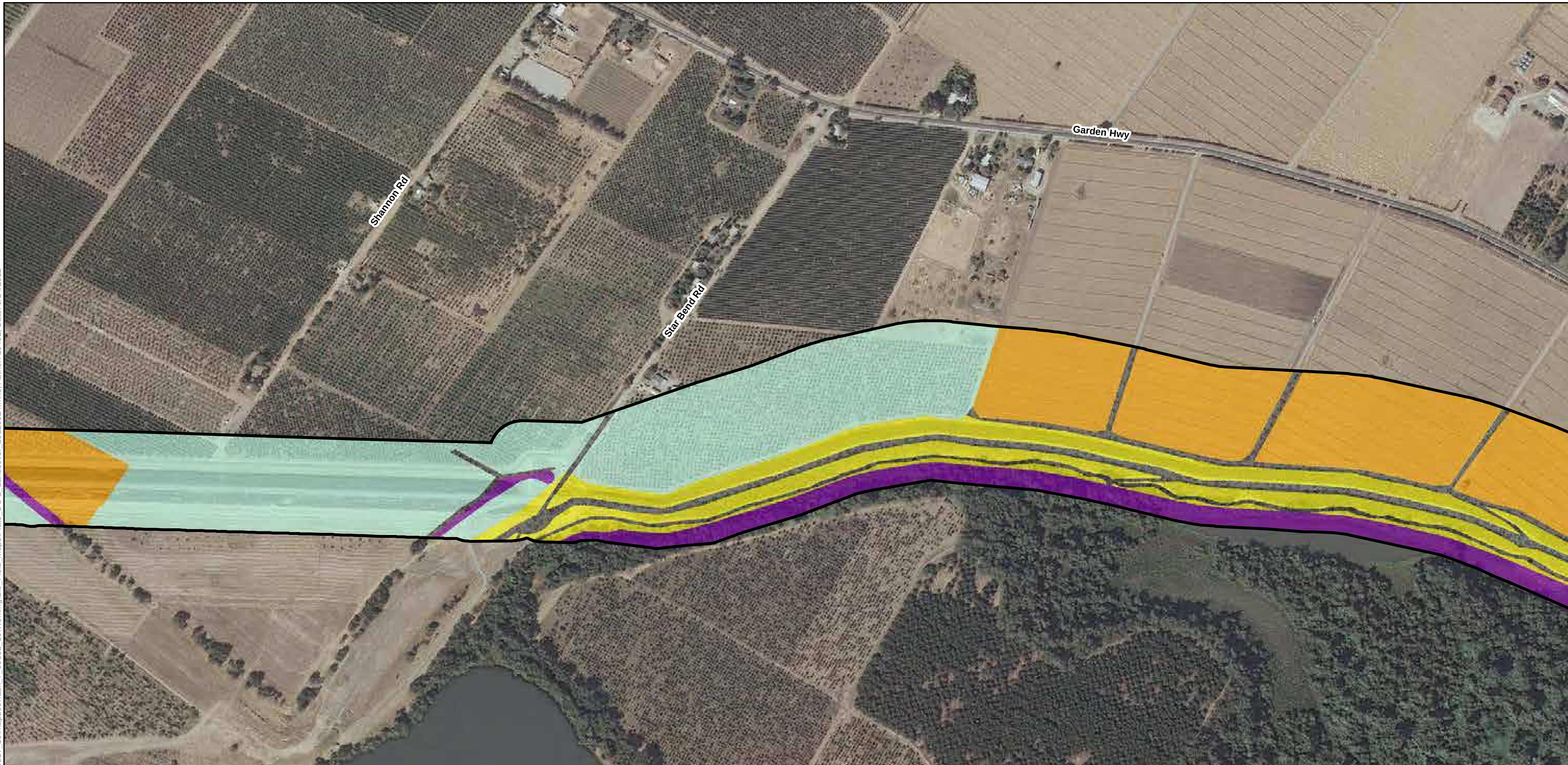

Legend

Biological Study Area
Alternative 1
Alternative 2
Alternative 3
Reach
Station 202+50

Land Cover Types

Developed
Field and Row Crops
Oak Woodland
Orchard
Riparian Forest
Ruderal
Water

Plate 3.8-1
Land Cover Types in the Biological Study Area for Alternative 1-3

Sheet 5

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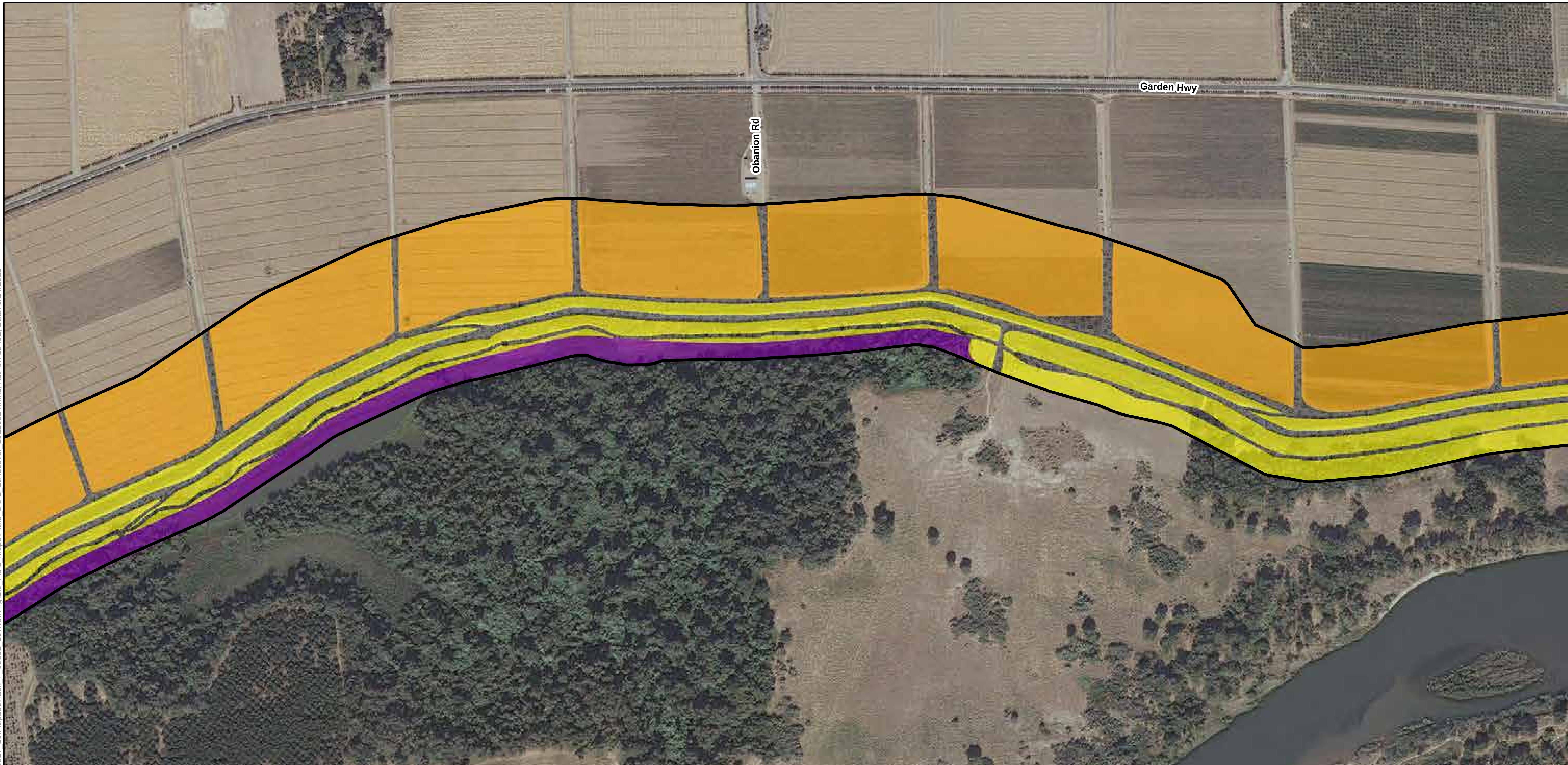

Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Land Cover Types

- Developed
- Field and Row Crops
- Oak Woodland
- Orchard
- Riparian Forest
- Ruderal
- Water

Plate 3.8-1 Land Cover Types in the Biological Study Area for Alternative 1-3

Sheet 6

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Feet

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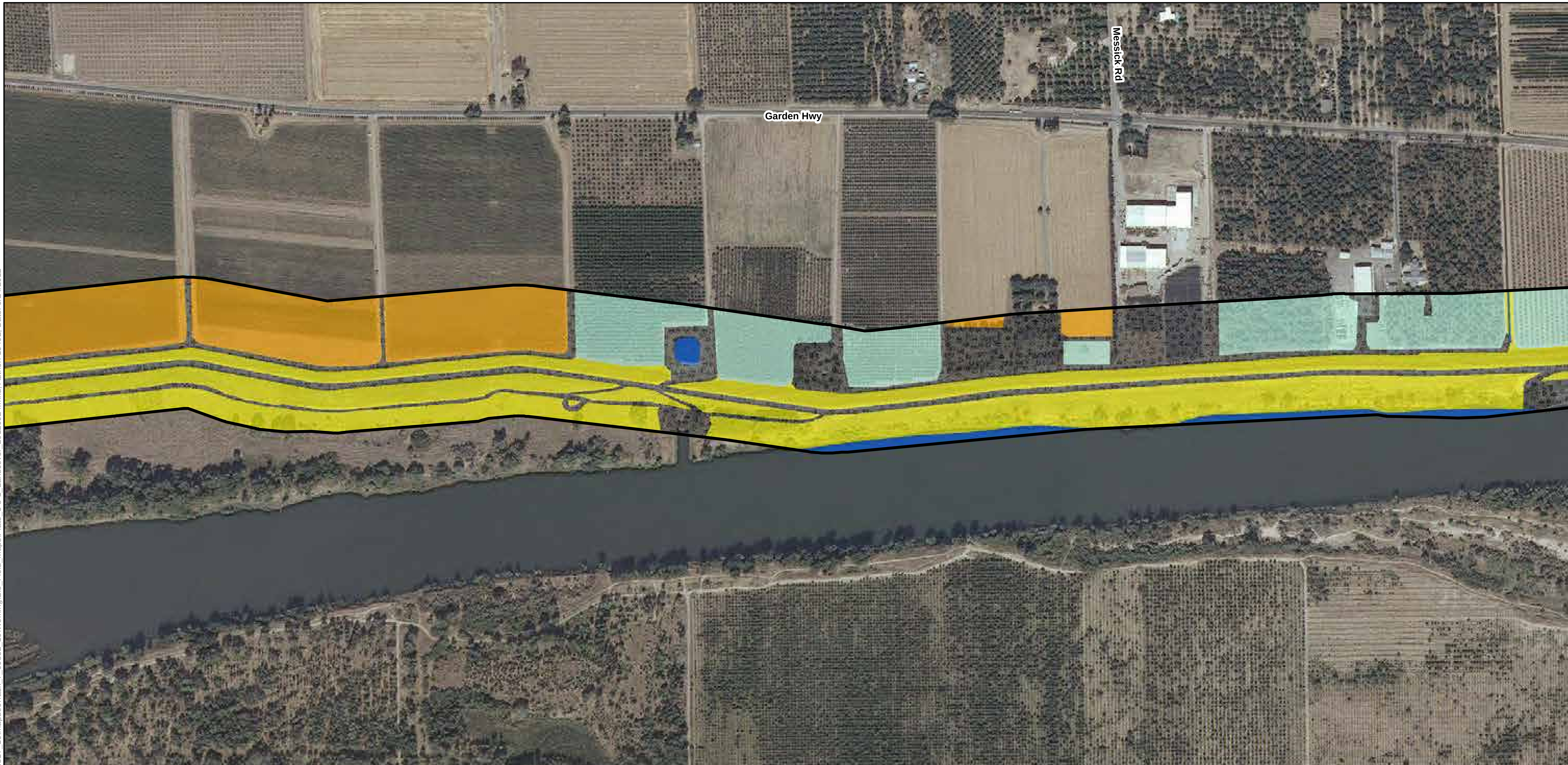

Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Land Cover Types

- Developed
- Field and Row Crops
- Oak Woodland
- Orchard
- Riparian Forest
- Ruderal
- Water

Plate 3.8-1
Land Cover Types in the Biological Study Area for Alternative 1-3

Sheet 7

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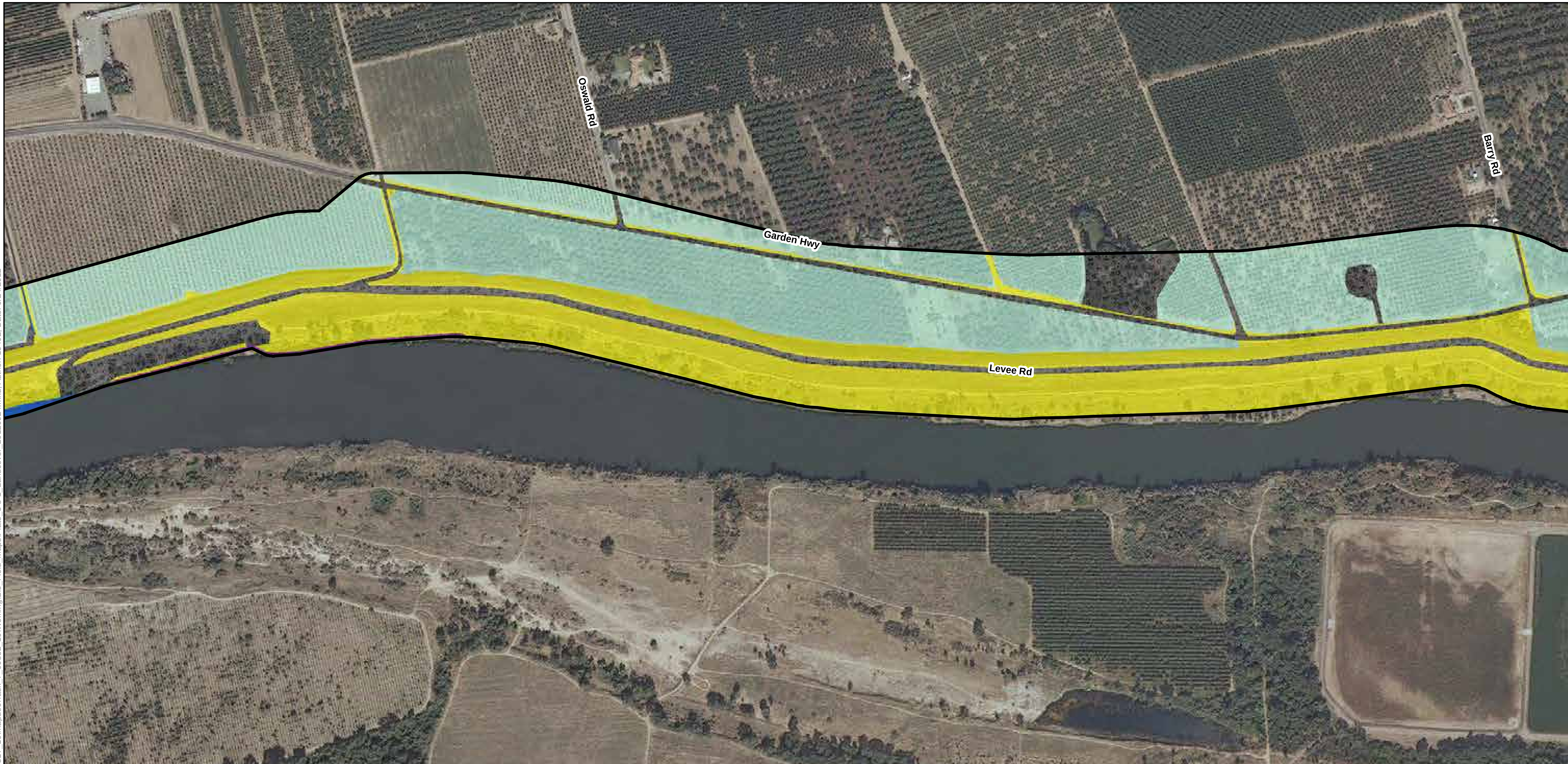

Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Land Cover Types

- Developed
- Field and Row Crops
- Oak Woodland
- Orchard
- Riparian Forest
- Ruderal
- Water

Plate 3.8-1
Land Cover Types in the Biological Study Area for Alternative 1-3

Sheet 8

N

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Feet

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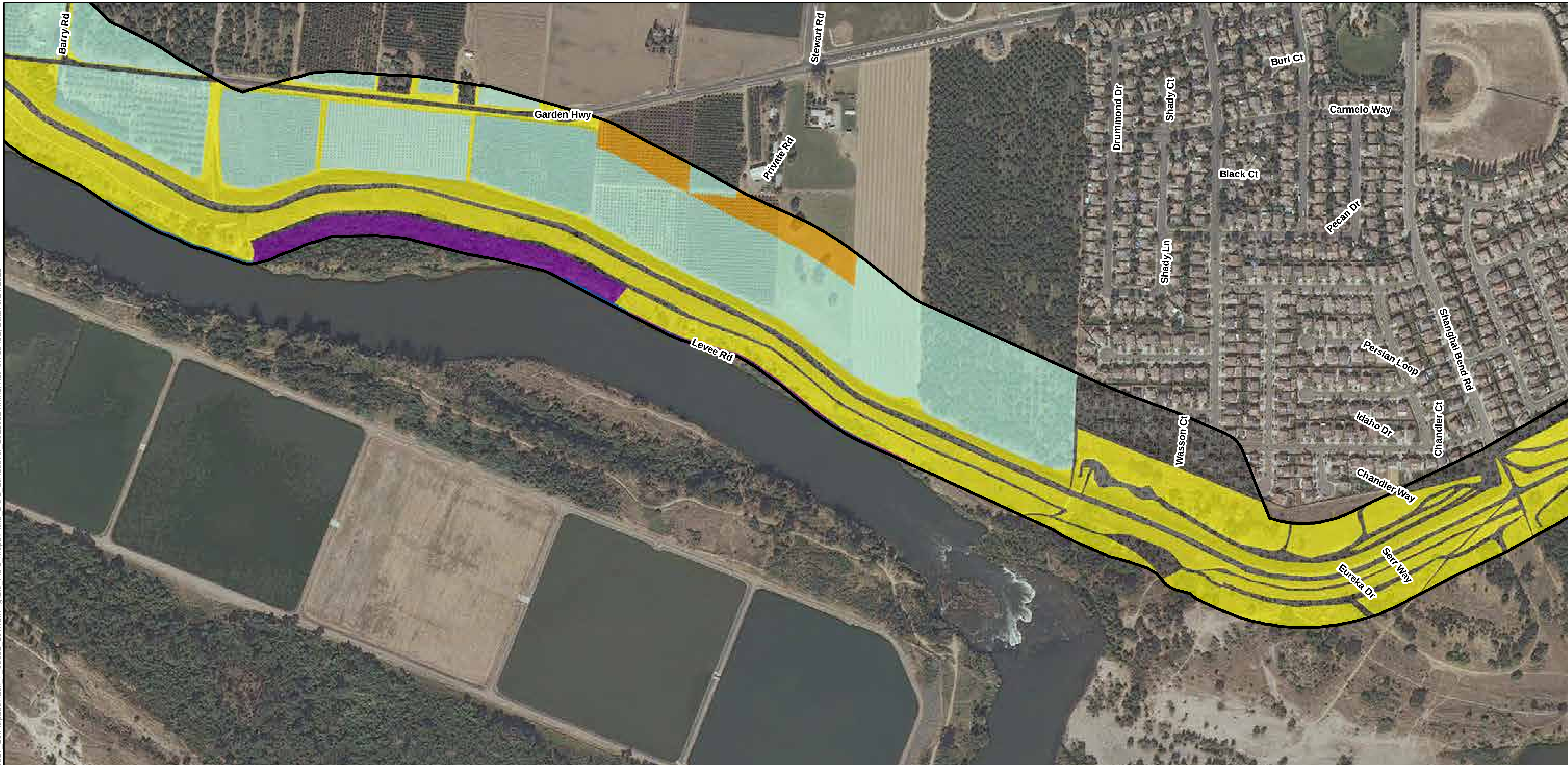

Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Land Cover Types

- Developed
- Field and Row Crops
- Oak Woodland
- Orchard
- Riparian Forest
- Ruderal
- Water

Plate 3.8-1
Land Cover Types in the Biological Study Area for Alternative 1-3

Sheet 9

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Legend

Biological Study Area
Alternative 1
Alternative 2
Alternative 3
Reach
Station 202+50

Land Cover Types

Developed
Field and Row Crops
Oak Woodland
Orchard
Riparian Forest
Ruderal
Water

Plate 3.8-1
Land Cover Types in the Biological Study Area for Alternative 1-3

Sheet 10

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Feet

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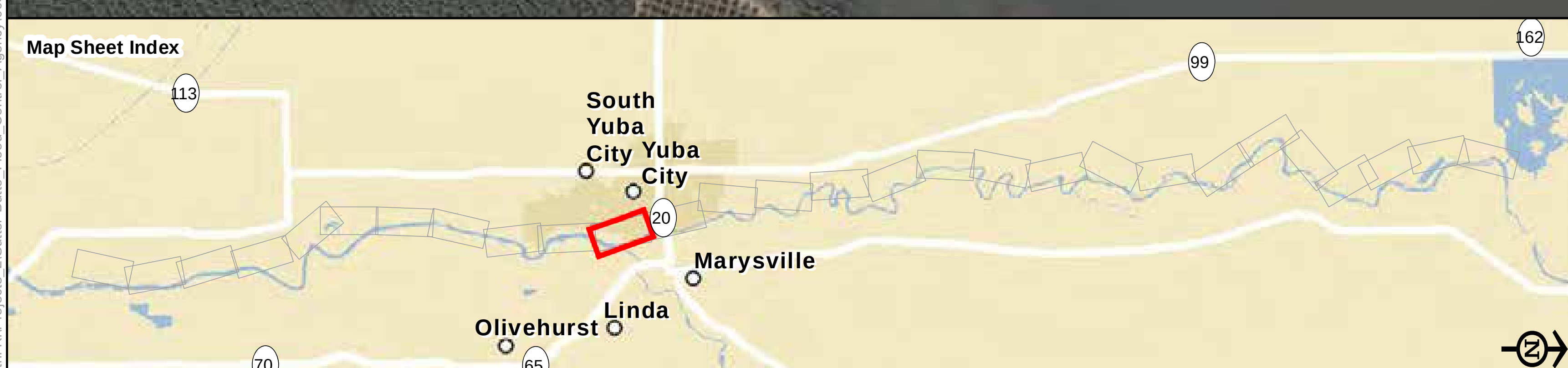

Legend

Biological Study Area
Alternative 1
Alternative 2
Alternative 3
Reach
Station 202+50

Land Cover Types

Developed
Field and Row Crops
Oak Woodland
Orchard
Riparian Forest
Ruderal
Water

Plate 3.8-1
Land Cover Types in the Biological Study Area for Alternative 1-3

Sheet 11

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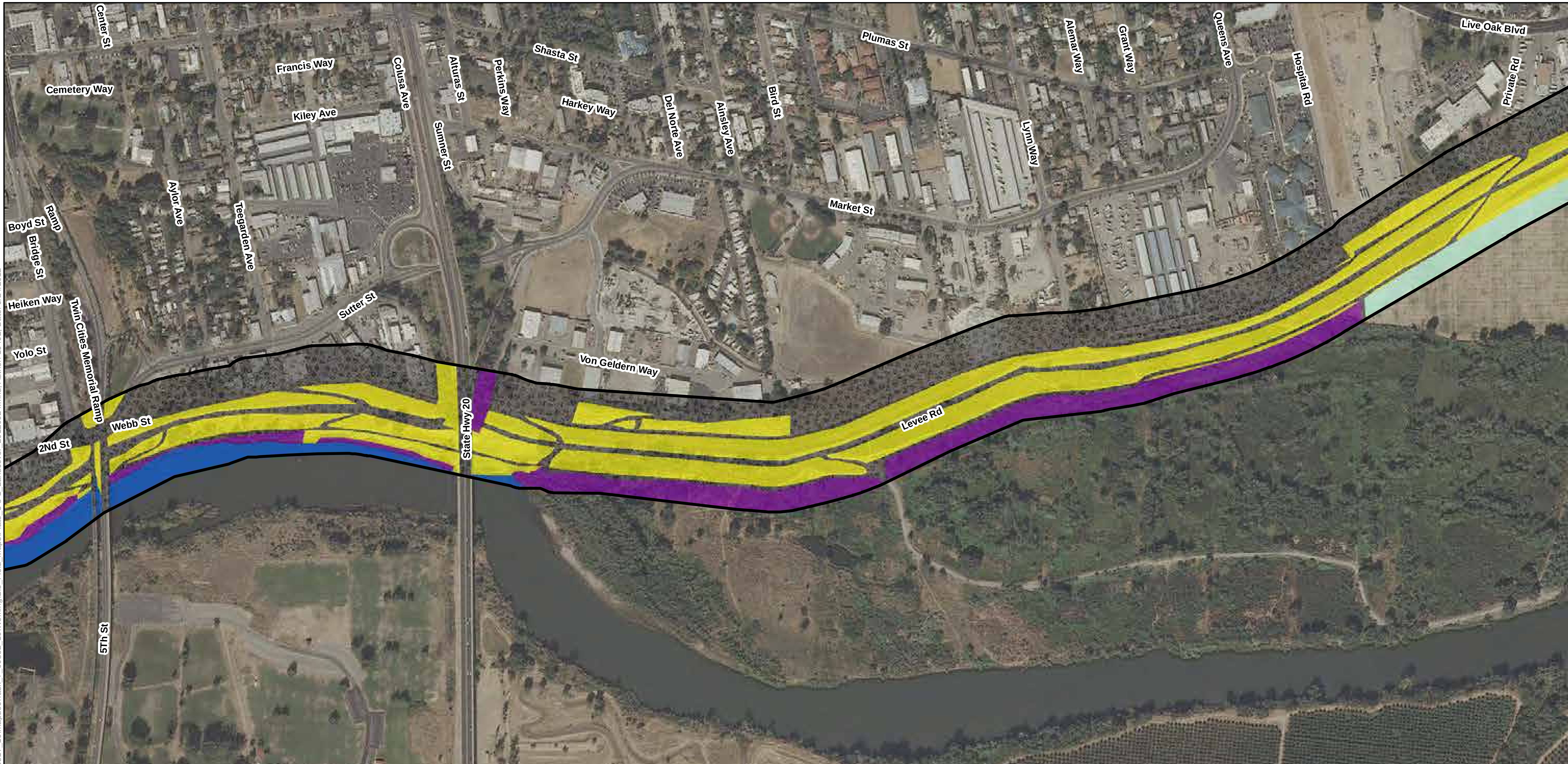

Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Land Cover Types

- Developed
- Field and Row Crops
- Oak Woodland
- Orchard
- Riparian Forest
- Ruderal
- Water

Plate 3.8-1
Land Cover Types in the Biological Study Area for Alternative 1-3

Sheet 12

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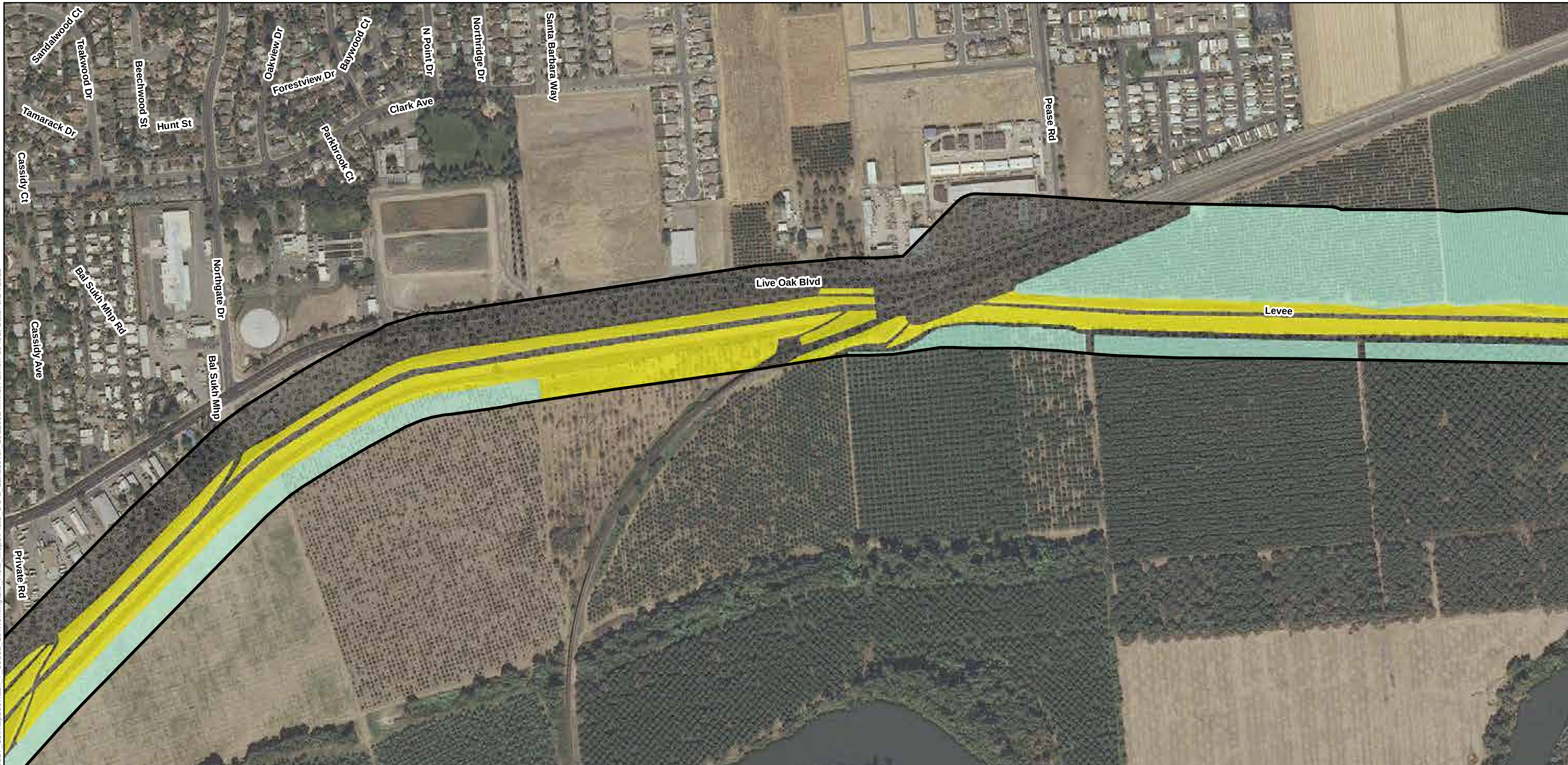

Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Land Cover Types

- Developed
- Field and Row Crops
- Oak Woodland
- Orchard
- Riparian Forest
- Ruderal
- Water

Plate 3.8-1
Land Cover Types in the Biological Study Area for Alternative 1-3

Sheet 13

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Feet

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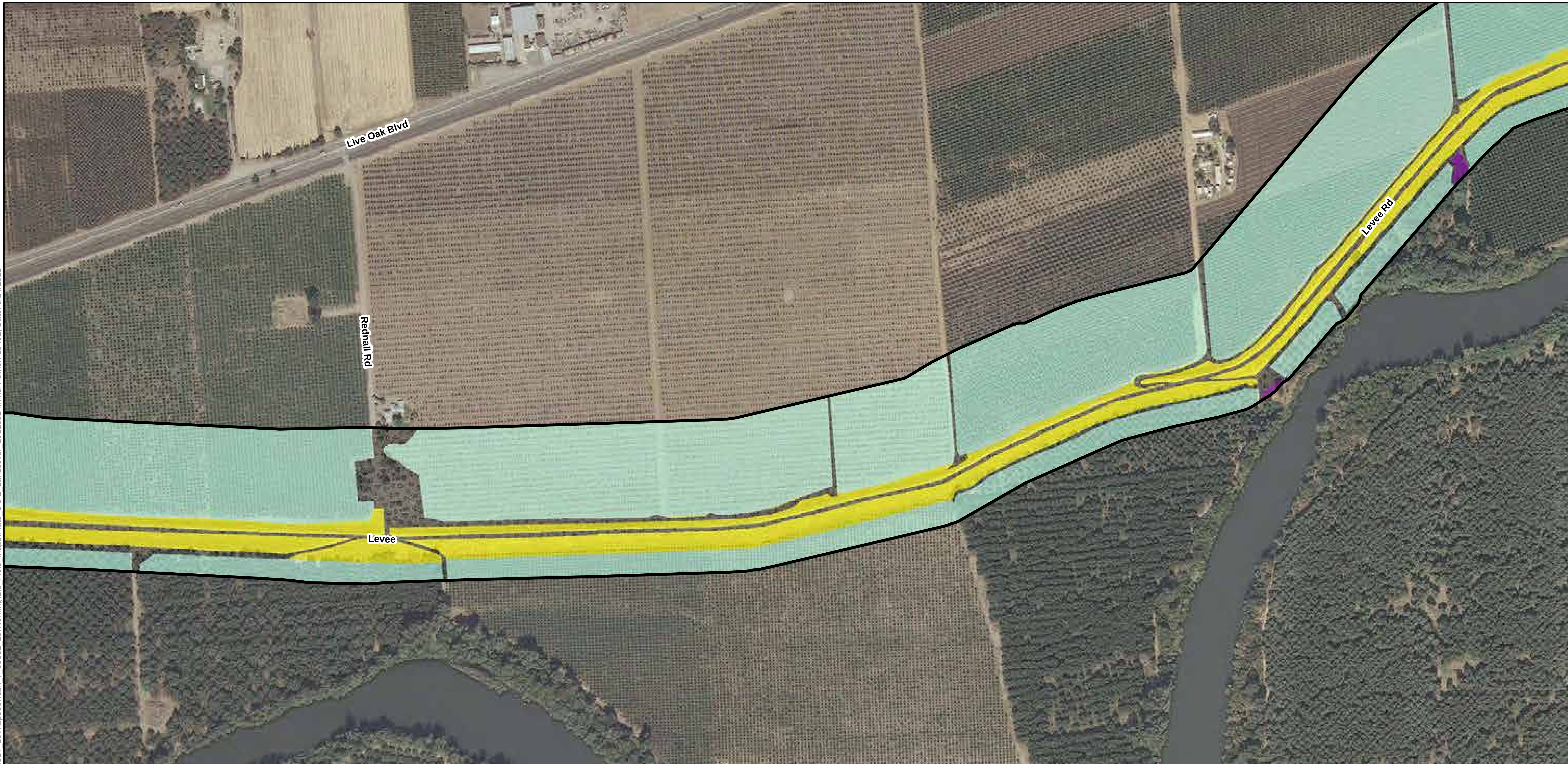

Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Land Cover Types

- Developed
- Field and Row Crops
- Oak Woodland
- Orchard
- Riparian Forest
- Ruderal
- Water

Plate 3.8-1
Land Cover Types in the Biological Study Area for Alternative 1-3

Sheet 14

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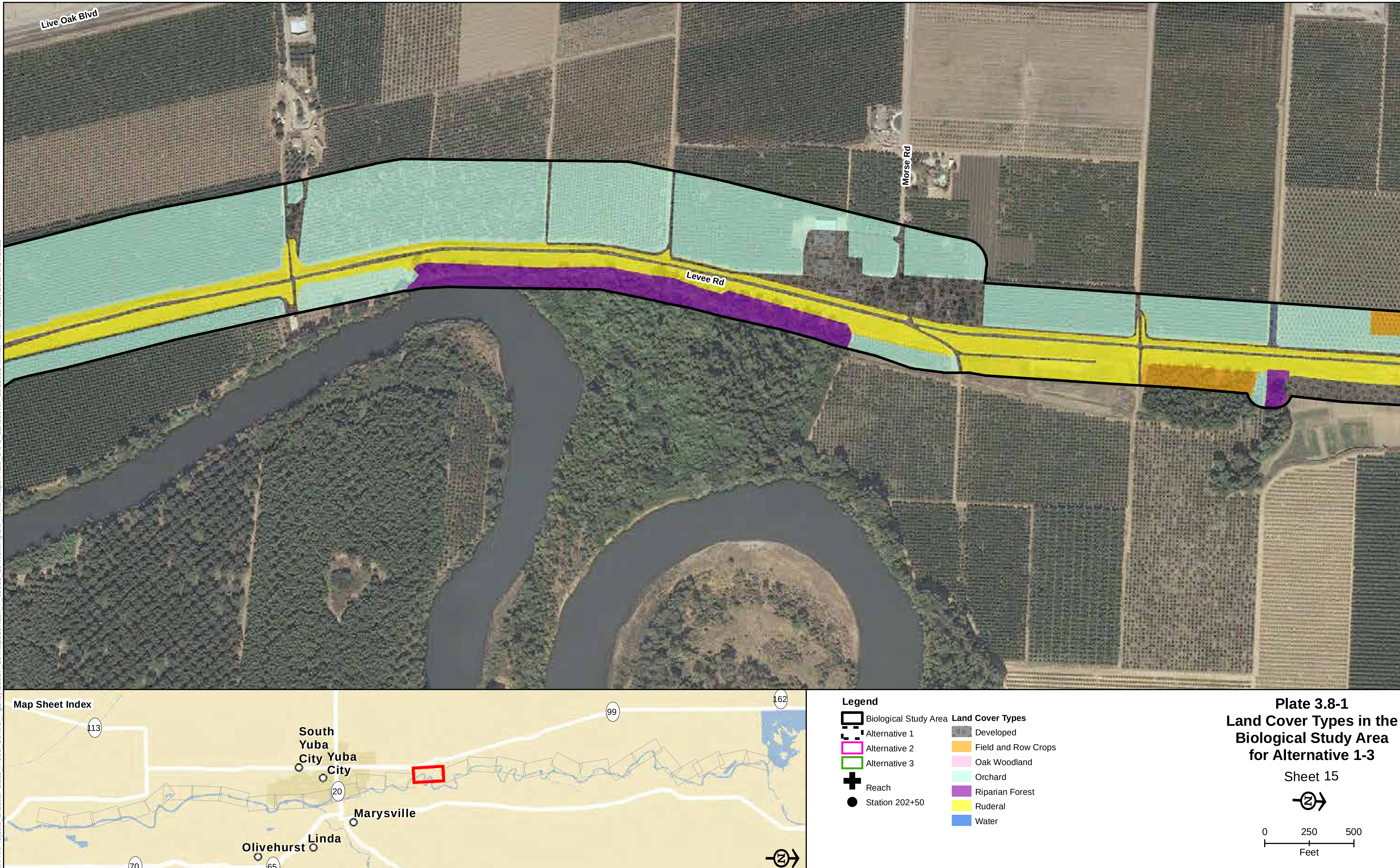

Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Land Cover Types

- Developed
- Field and Row Crops
- Oak Woodland
- Orchard
- Riparian Forest
- Ruderal
- Water

Plate 3.8-1 Land Cover Types in the Biological Study Area for Alternative 1-3

Sheet 15

0 250 500
Feet

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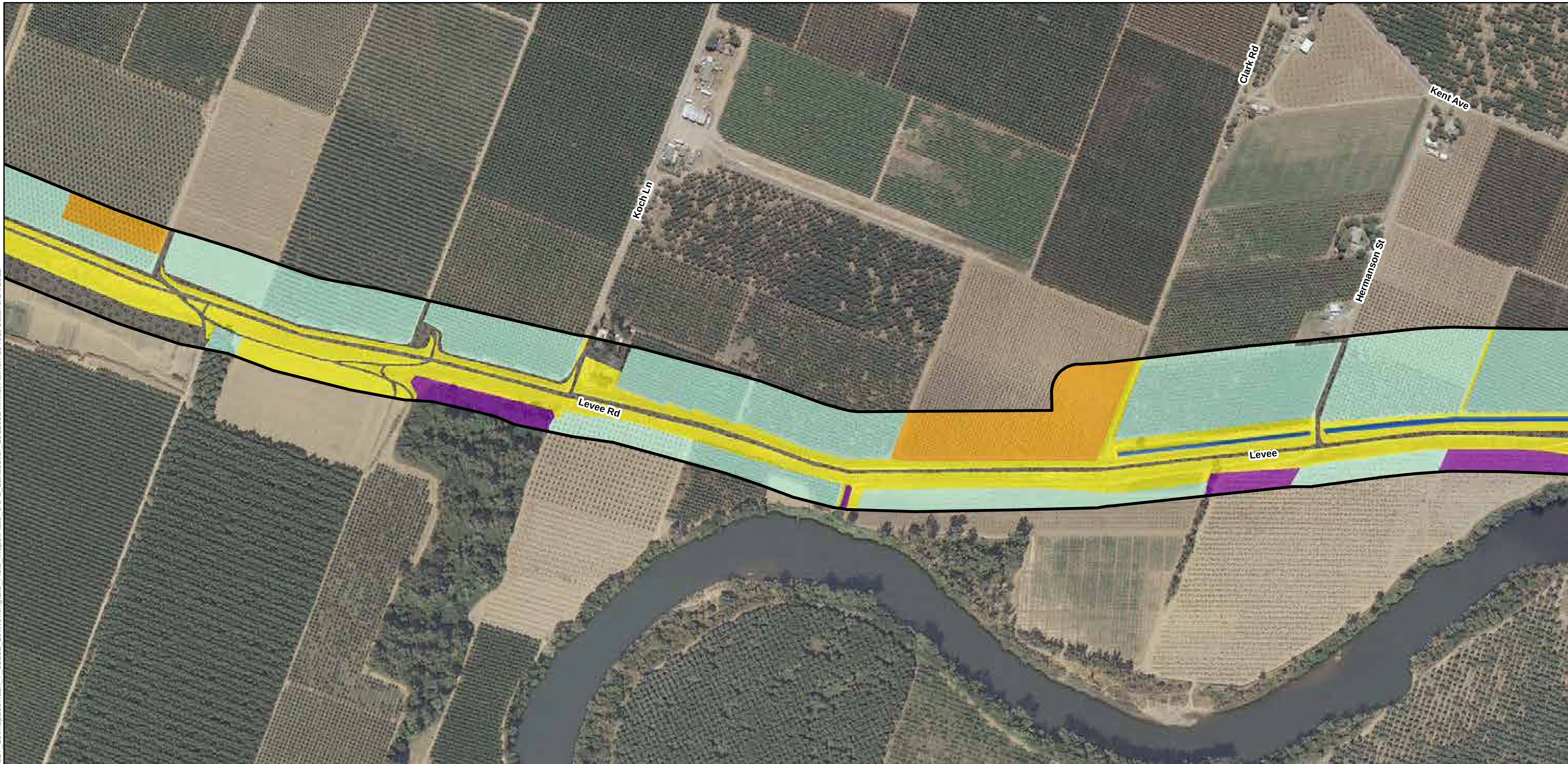

Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Land Cover Types

- Developed
- Field and Row Crops
- Oak Woodland
- Orchard
- Riparian Forest
- Ruderal
- Water

Plate 3.8-1
Land Cover Types in the Biological Study Area for Alternative 1-3

Sheet 16

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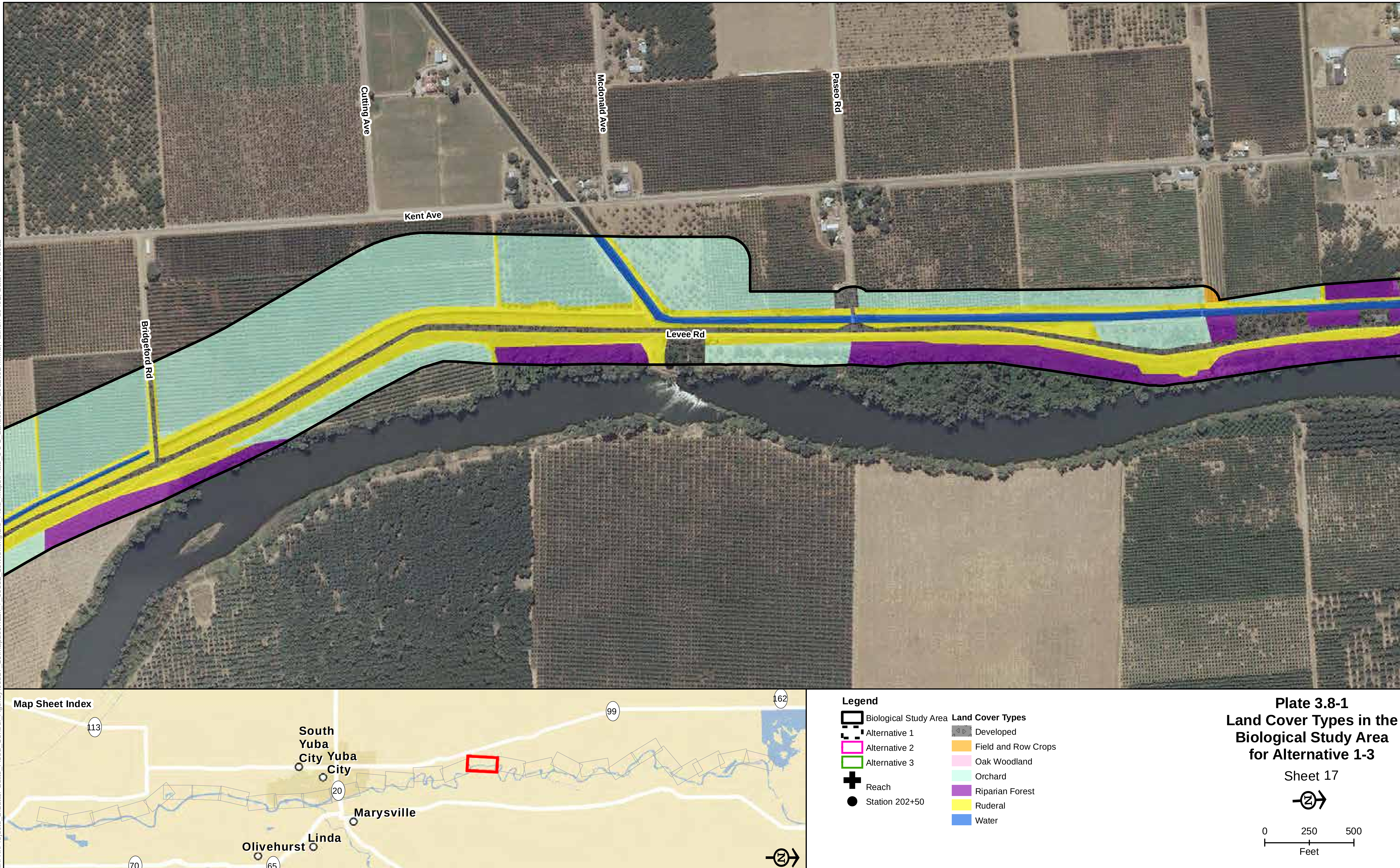

Plate 3.8-1
Land Cover Types in the Biological Study Area for Alternative 1-3

Sheet 17

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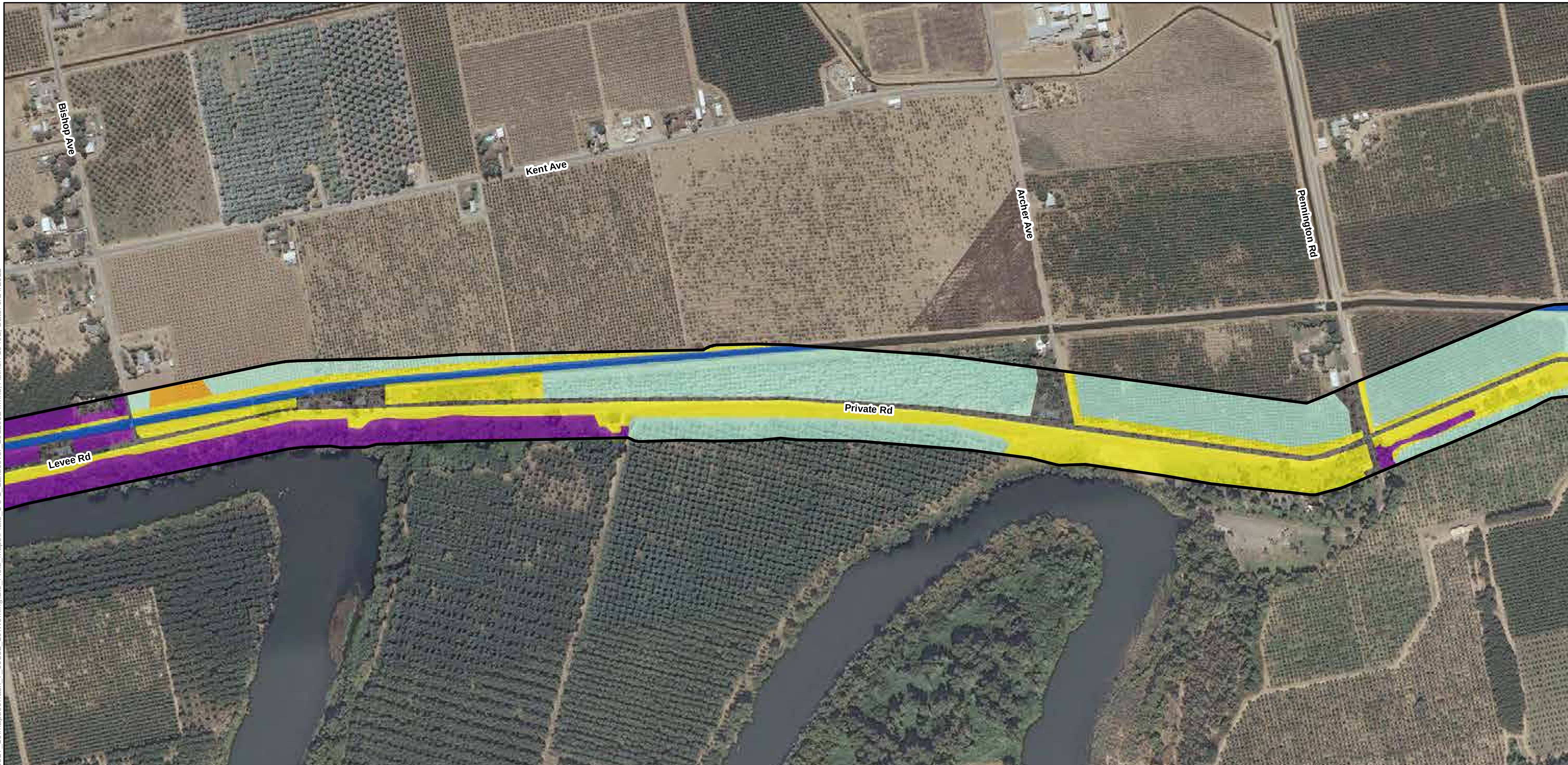

Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Land Cover Types

- Developed
- Field and Row Crops
- Oak Woodland
- Orchard
- Riparian Forest
- Ruderal
- Water

Plate 3.8-1
Land Cover Types in the Biological Study Area for Alternative 1-3

Sheet 18

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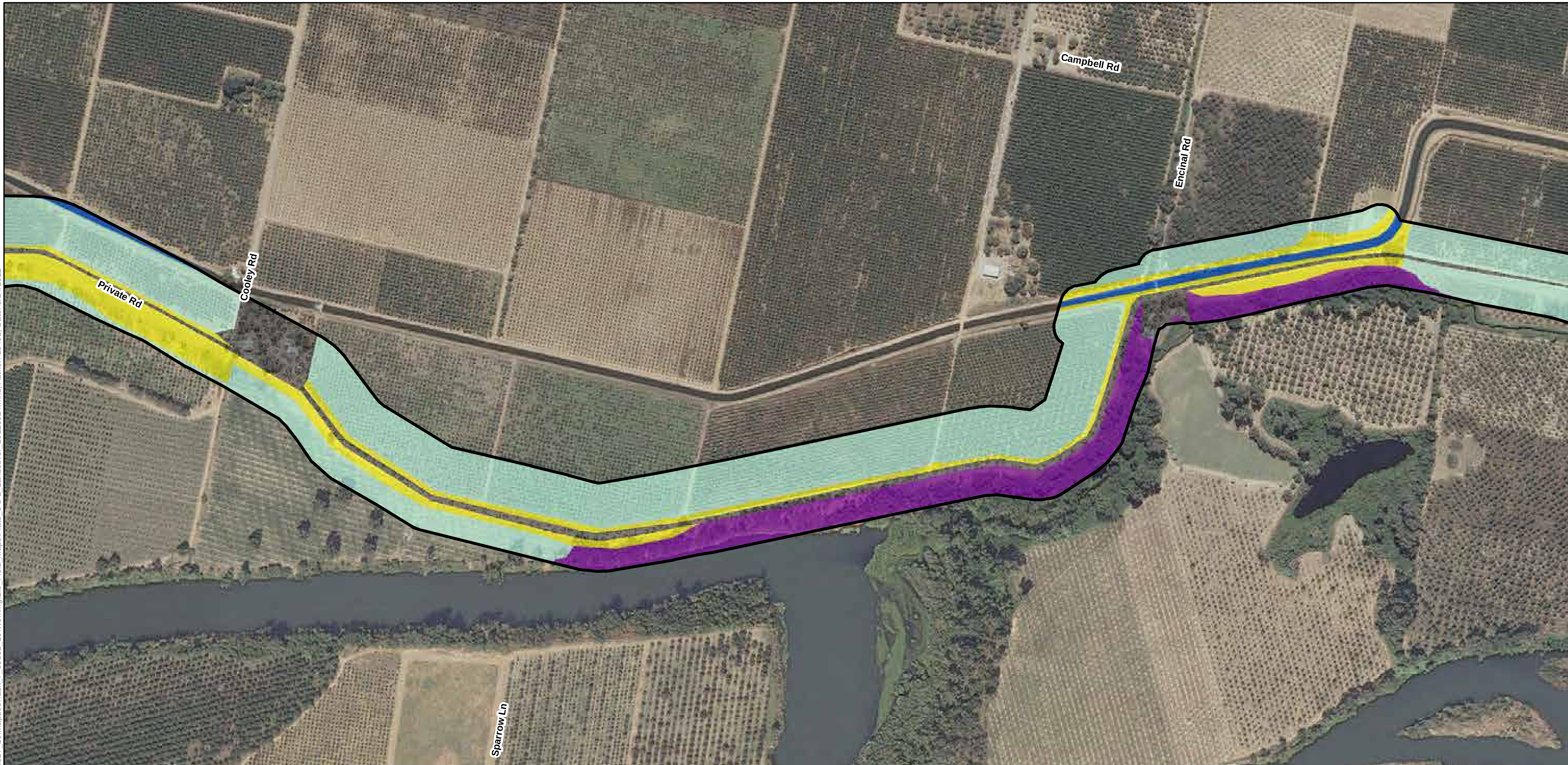

Legend

Biological Study Area
Alternative 1
Alternative 2
Alternative 3
Reach
Station 202+50

Land Cover Types

Developed
Field and Row Crops
Oak Woodland
Orchard
Riparian Forest
Ruderal
Water

Plate 3.8-1
Land Cover Types in the Biological Study Area for Alternative 1-3

Sheet 19

0 250 500
Feet

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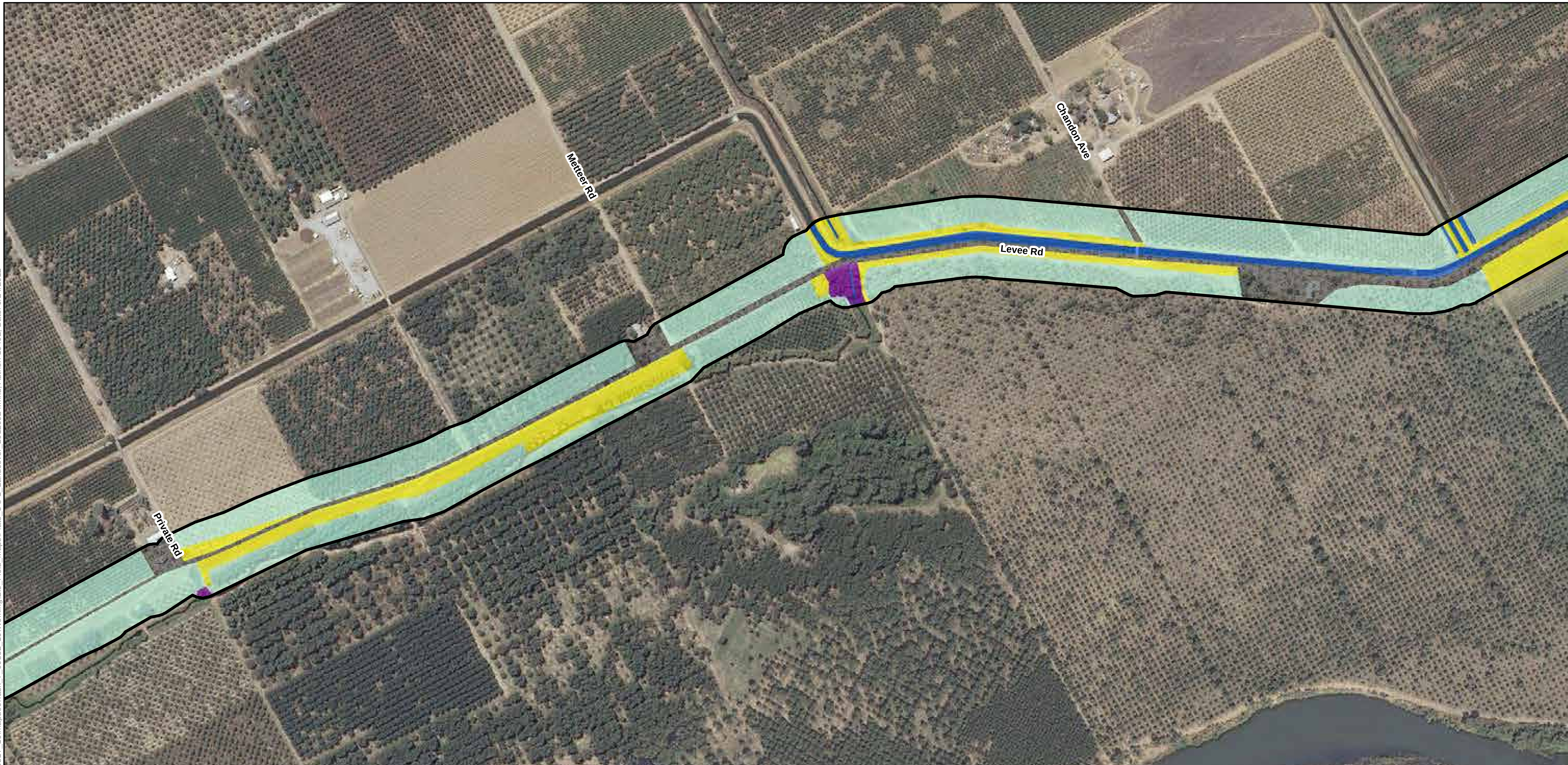

Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Land Cover Types

- Developed
- Field and Row Crops
- Oak Woodland
- Orchard
- Riparian Forest
- Ruderal
- Water

Plate 3.8-1
Land Cover Types in the Biological Study Area for Alternative 1-3

Sheet 20

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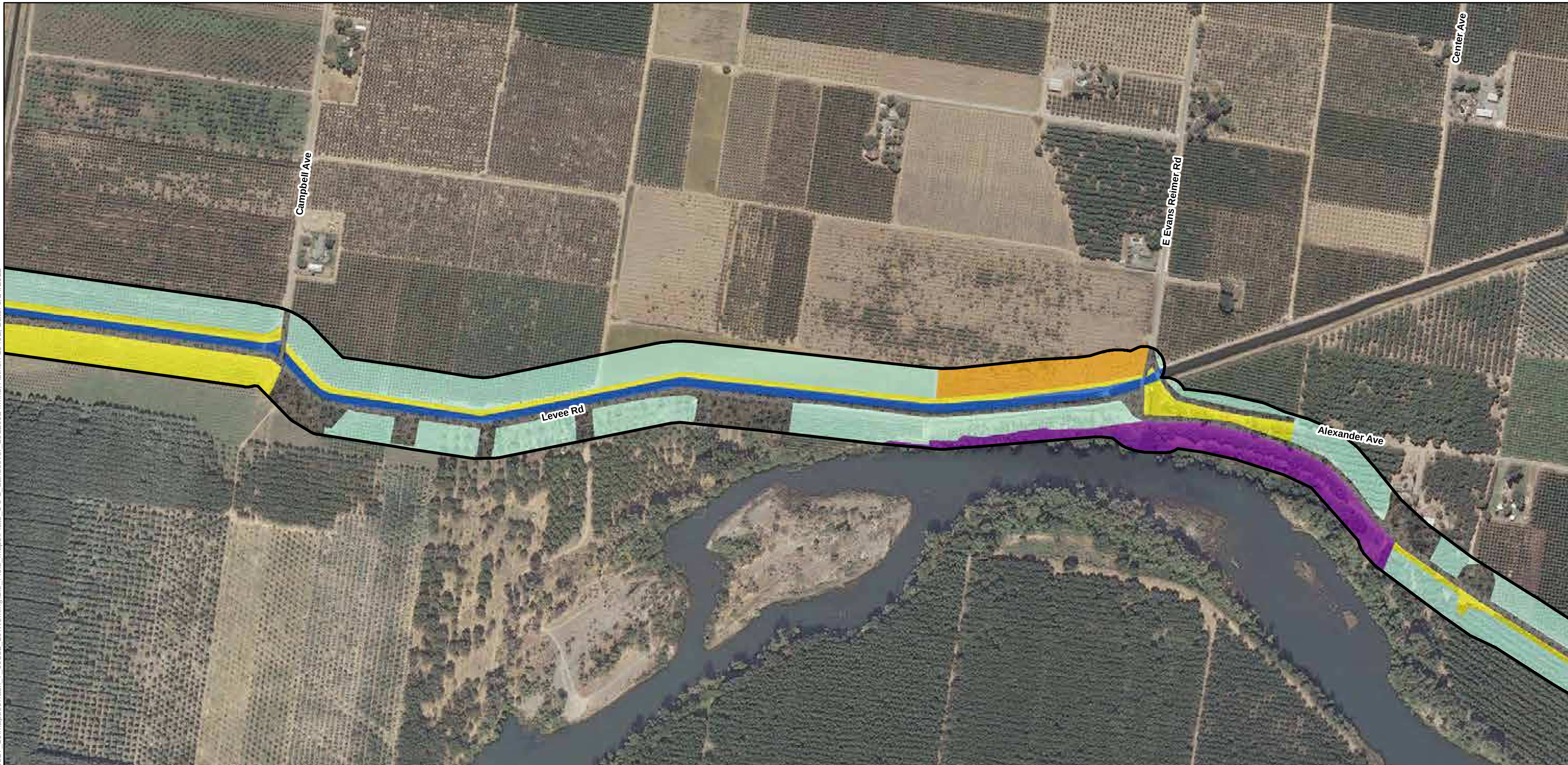

Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Land Cover Types

- Developed
- Field and Row Crops
- Oak Woodland
- Orchard
- Riparian Forest
- Ruderal
- Water

Plate 3.8-1
Land Cover Types in the Biological Study Area for Alternative 1-3

Sheet 21

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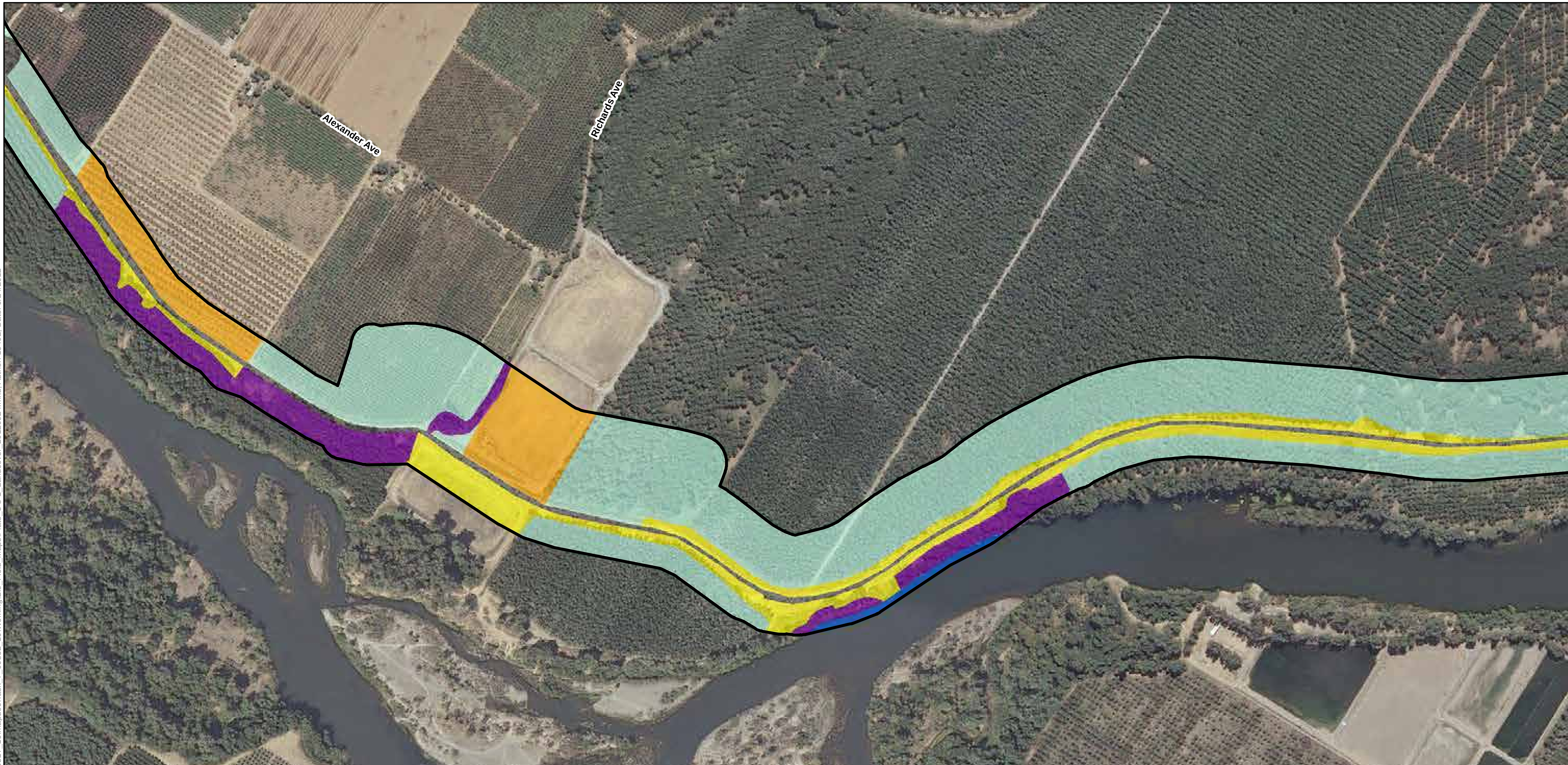

Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Land Cover Types

- Developed
- Field and Row Crops
- Oak Woodland
- Orchard
- Riparian Forest
- Ruderal
- Water

Plate 3.8-1 Land Cover Types in the Biological Study Area for Alternative 1-3

Sheet 22

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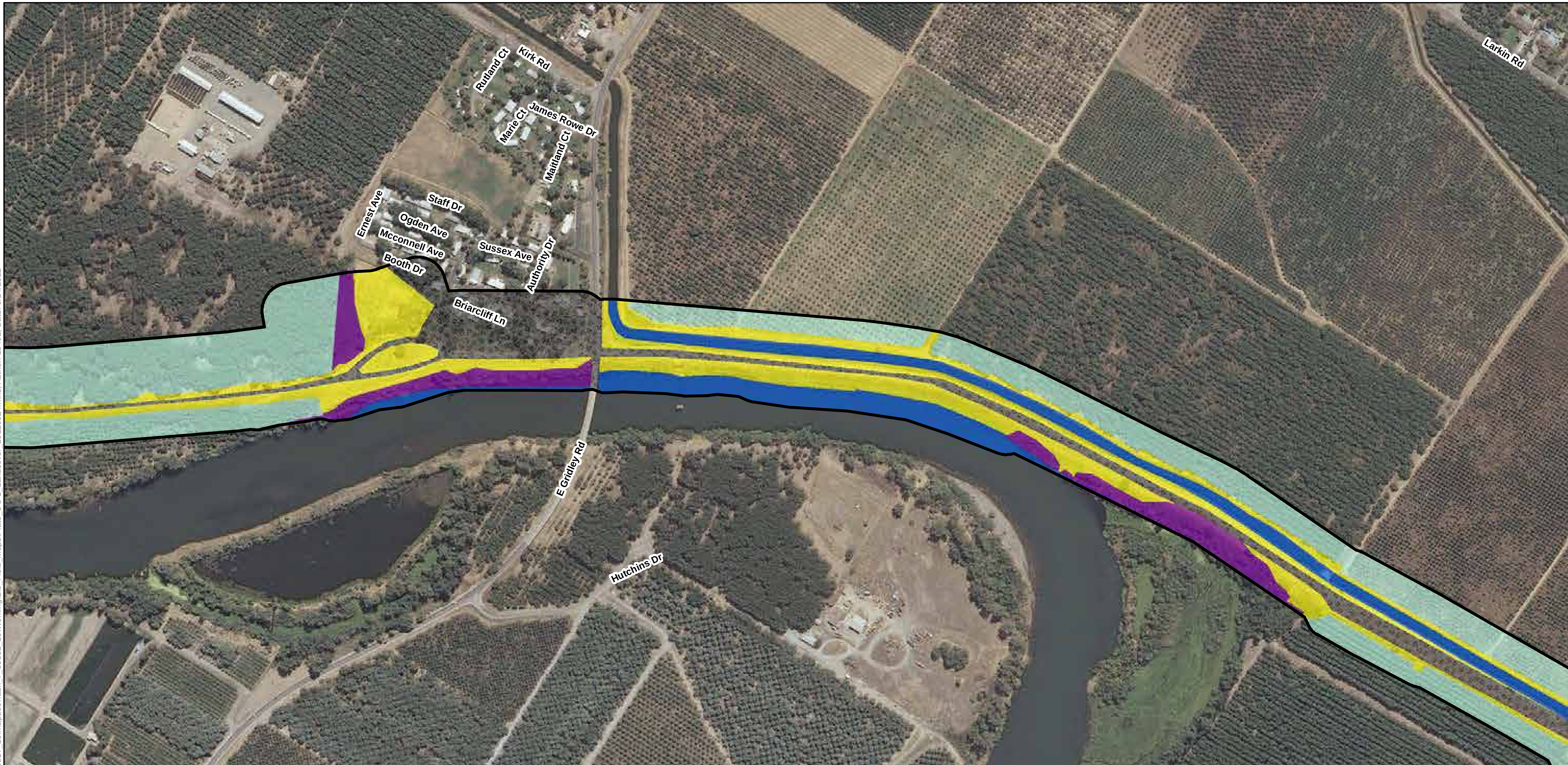

Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Land Cover Types

- Developed
- Field and Row Crops
- Oak Woodland
- Orchard
- Riparian Forest
- Ruderal
- Water

Plate 3.8-1 Land Cover Types in the Biological Study Area for Alternative 1-3

Sheet 23

0 250 500
Feet

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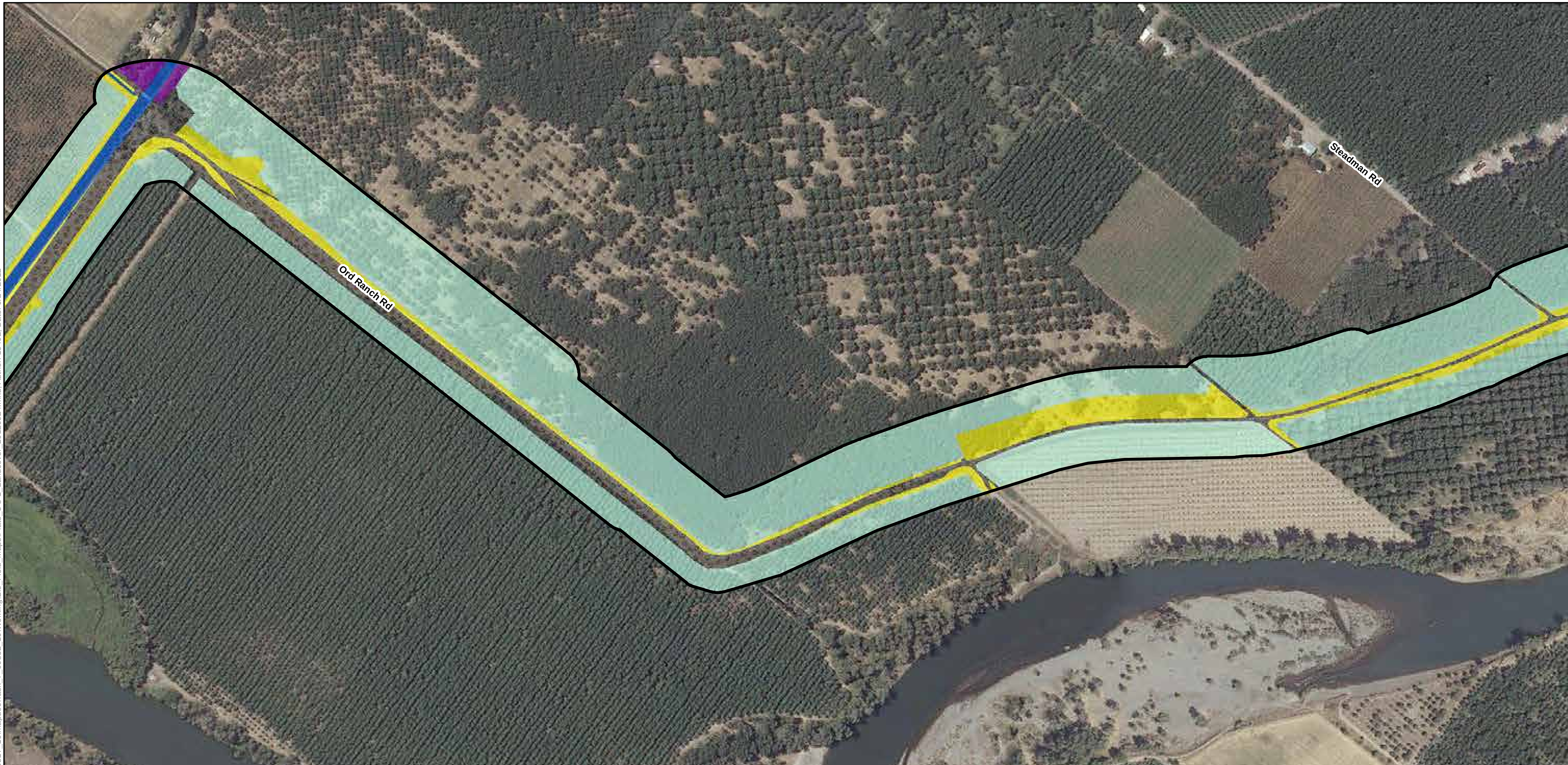

Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Land Cover Types

- Developed
- Field and Row Crops
- Oak Woodland
- Orchard
- Riparian Forest
- Ruderal
- Water

Plate 3.8-1
Land Cover Types in the Biological Study Area for Alternative 1-3

Sheet 24

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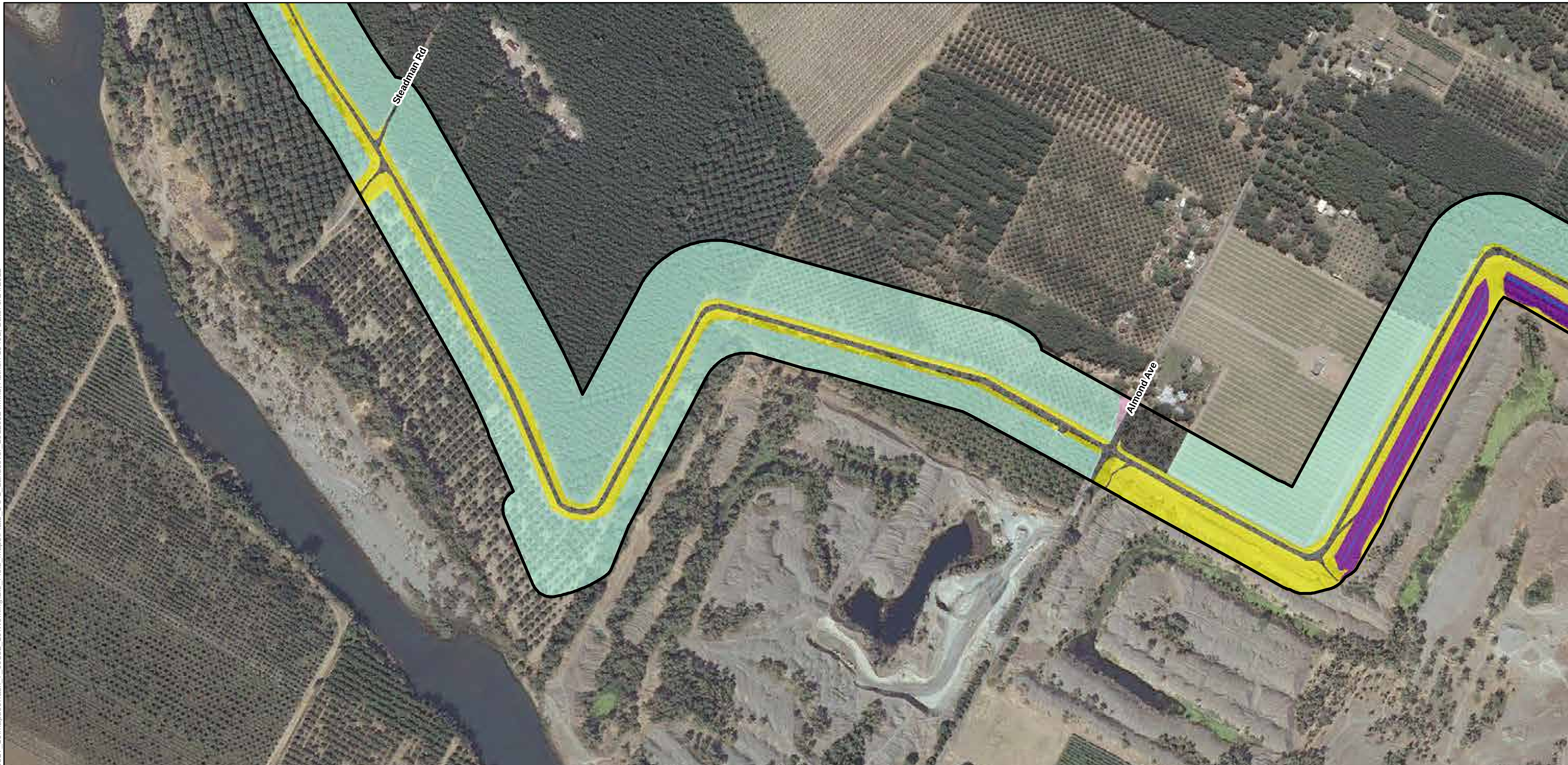

Map Sheet Index

Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Land Cover Types

- Developed
- Field and Row Crops
- Oak Woodland
- Orchard
- Riparian Forest
- Ruderal
- Water

Plate 3.8-1 Land Cover Types in the Biological Study Area for Alternative 1-3

Sheet 25

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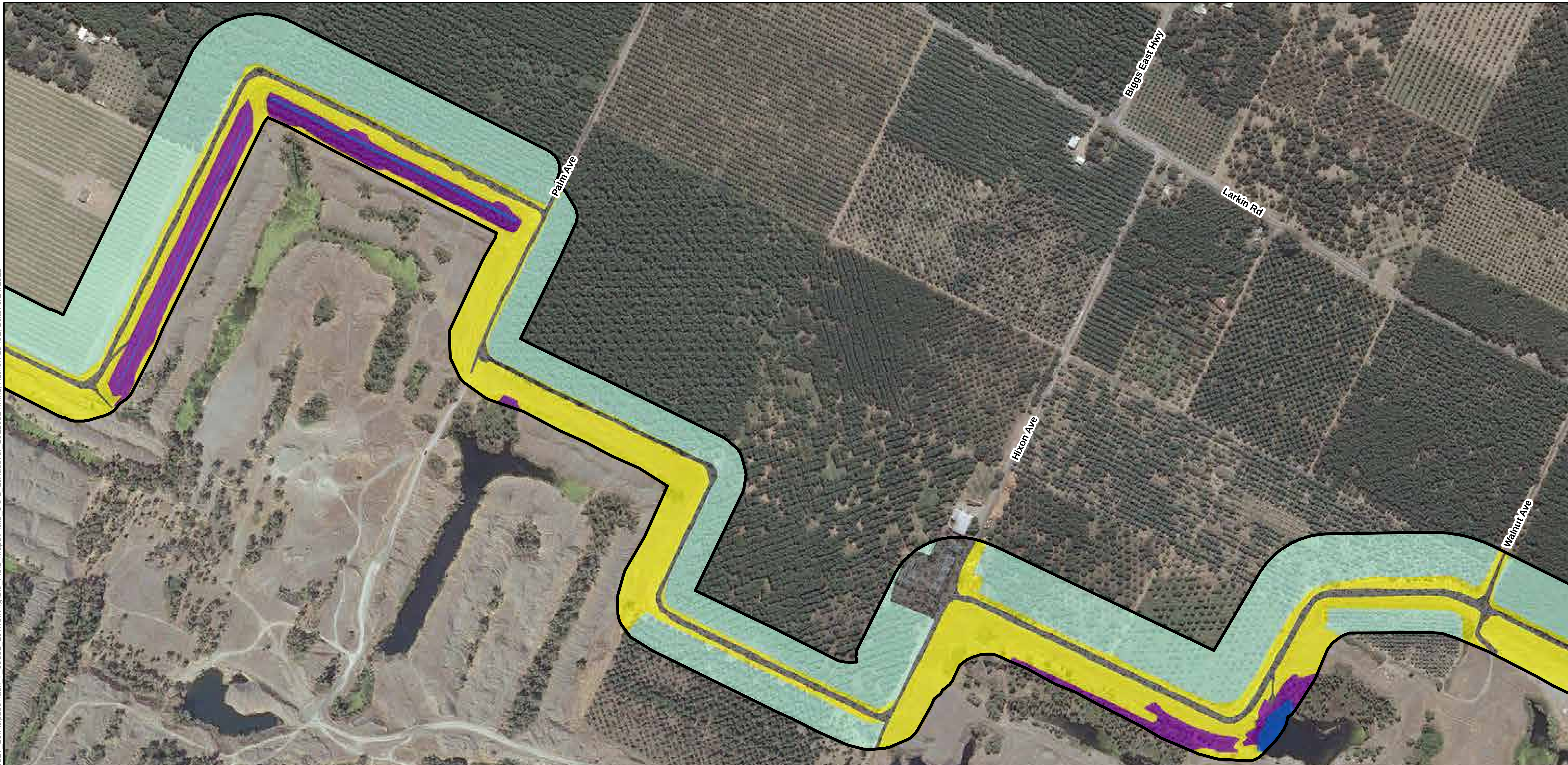

Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Land Cover Types

- Developed
- Field and Row Crops
- Oak Woodland
- Orchard
- Riparian Forest
- Ruderal
- Water

Plate 3.8-1
Land Cover Types in the Biological Study Area for Alternative 1-3

Sheet 26

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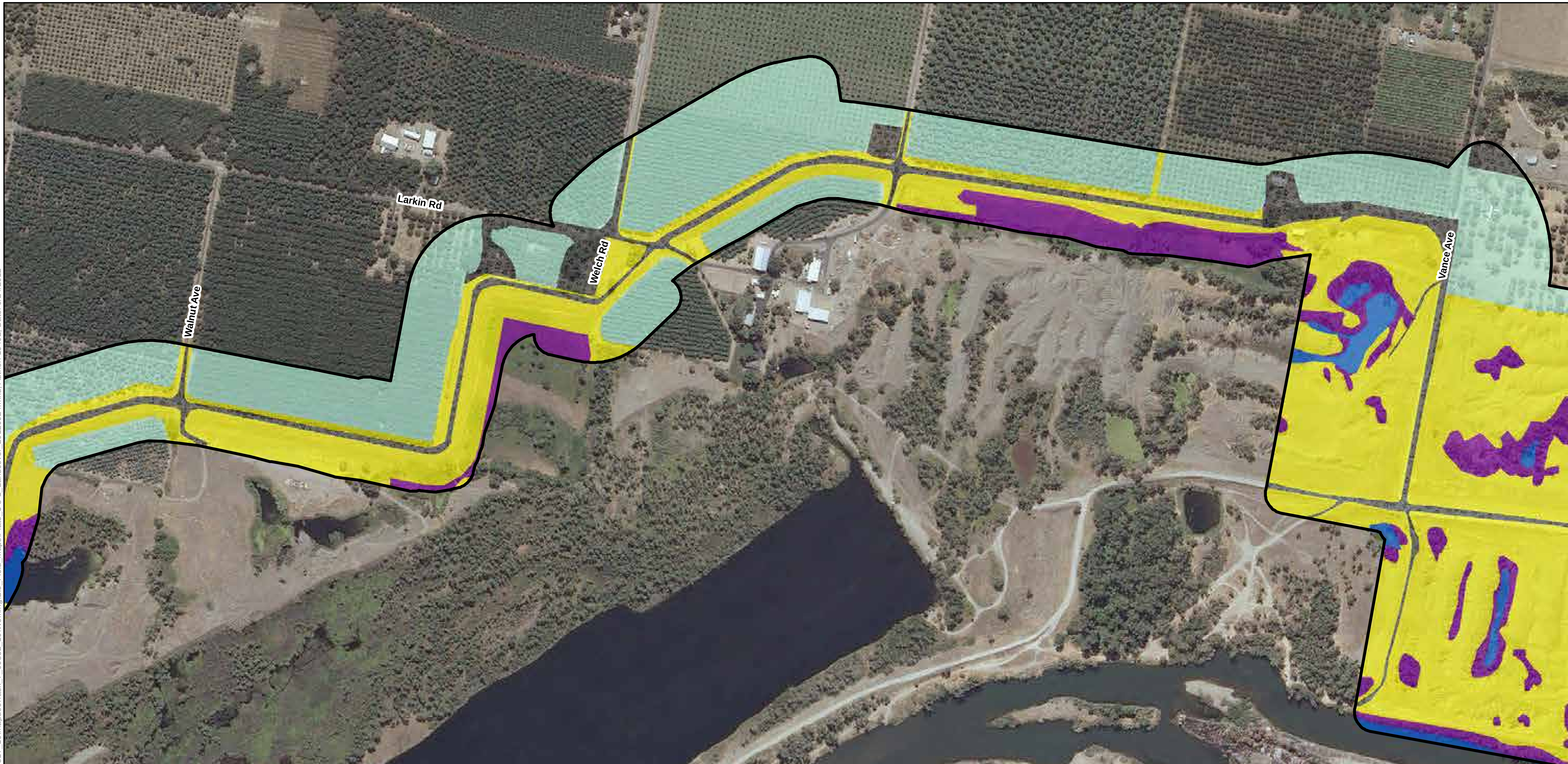

Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Land Cover Types

- Developed
- Field and Row Crops
- Oak Woodland
- Orchard
- Riparian Forest
- Ruderal
- Water

Plate 3.8-1 Land Cover Types in the Biological Study Area for Alternative 1-3

Sheet 27

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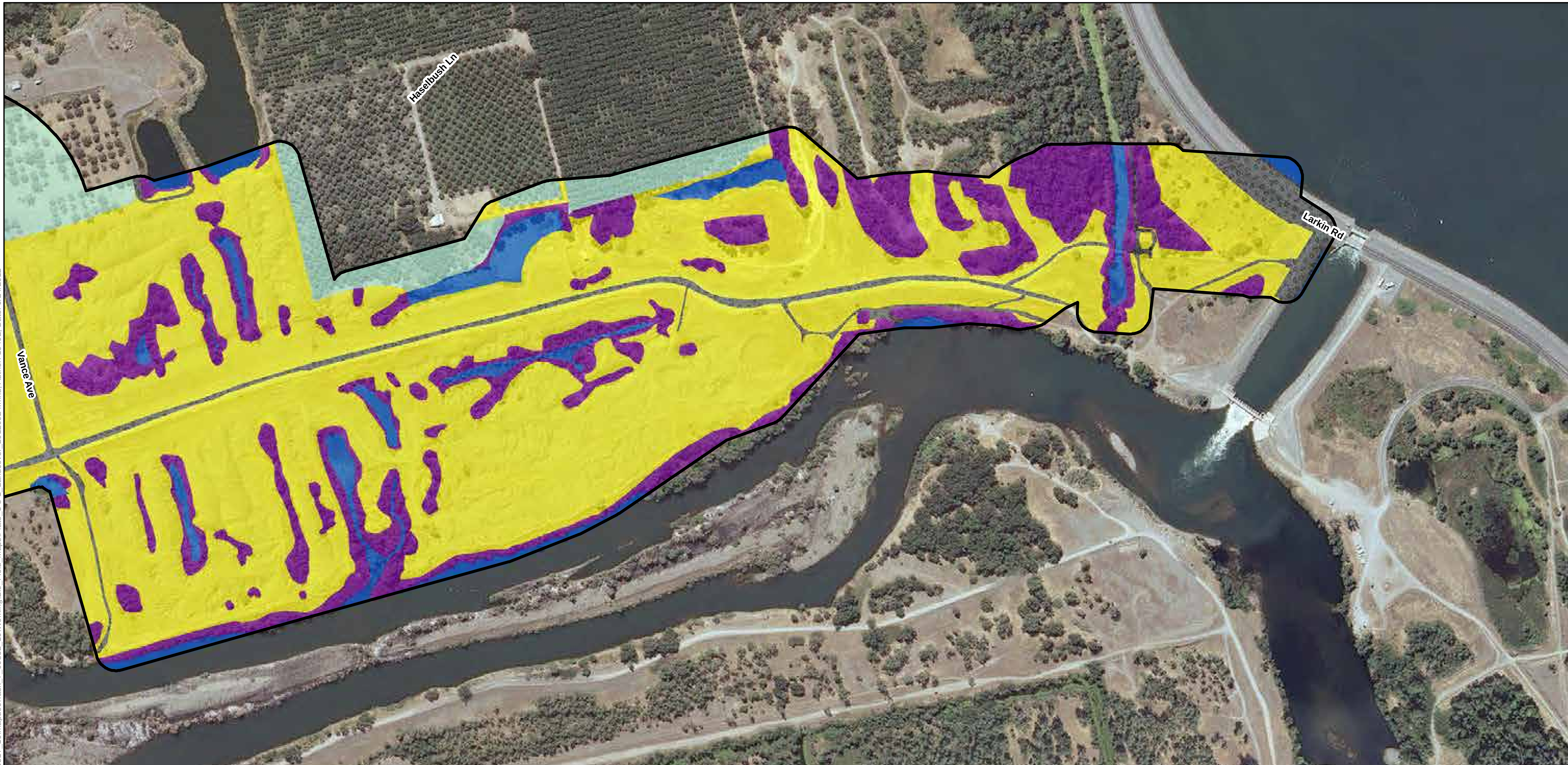
Feet



Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Land Cover Types

- Developed
- Field and Row Crops
- Oak Woodland
- Orchard
- Riparian Forest
- Ruderal
- Water

Plate 3.8-1 Land Cover Types in the Biological Study Area for Alternative 1-3

Sheet 28

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Feet

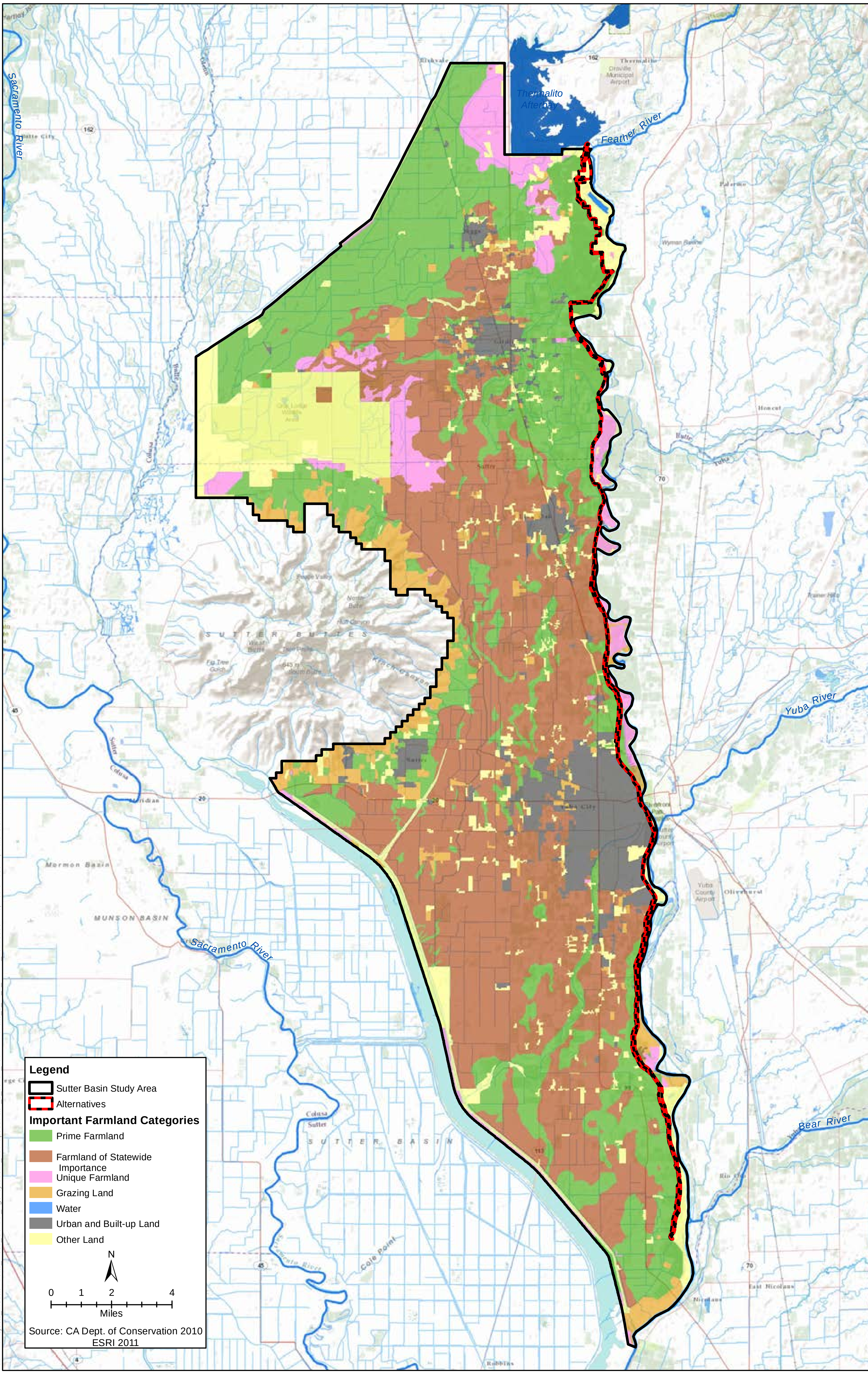

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Plate 3.11-1
Important Farmland Within the Study Area

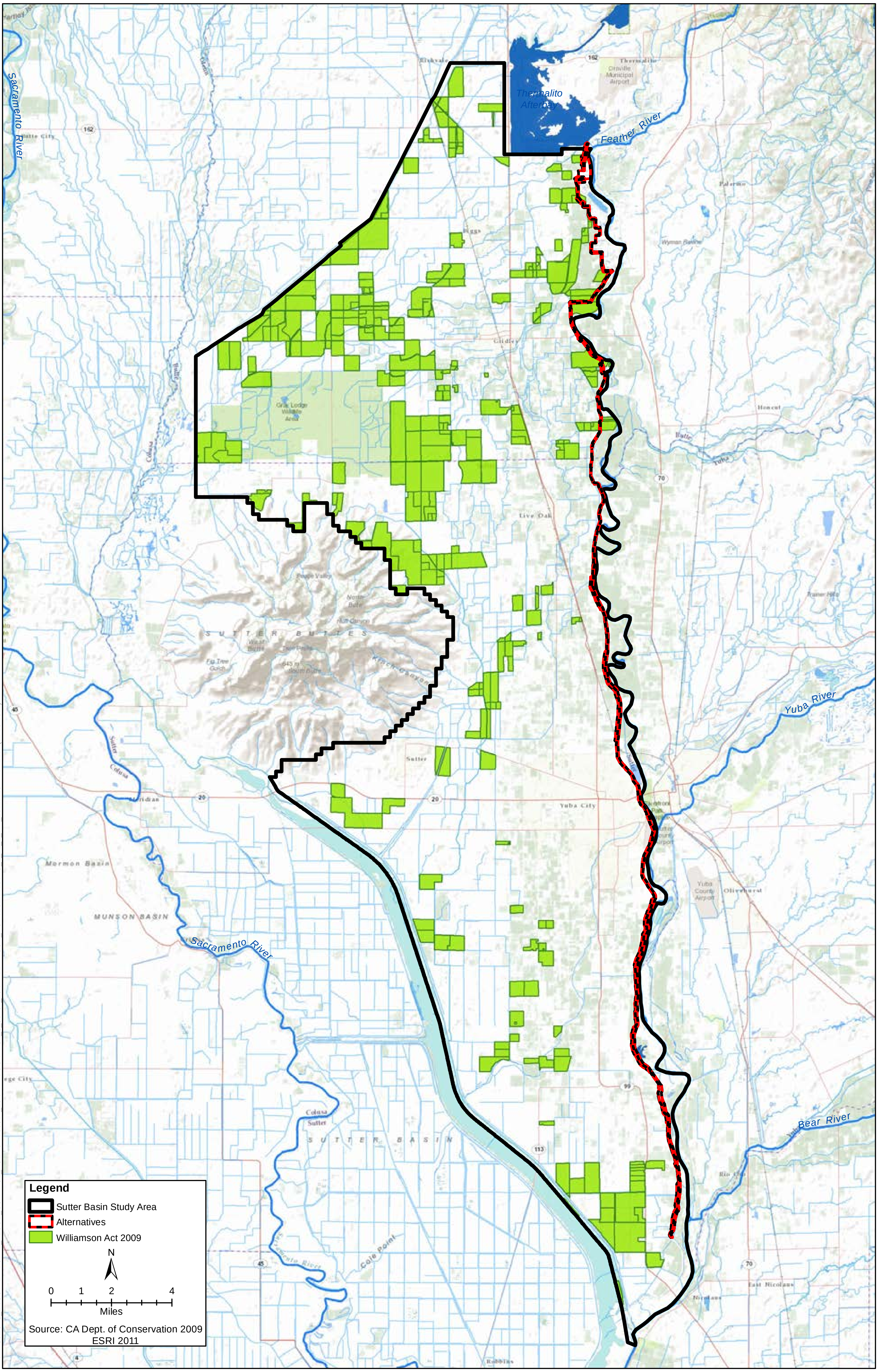

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Figure 3.11-2
Williamson Act Lands in the Study Area

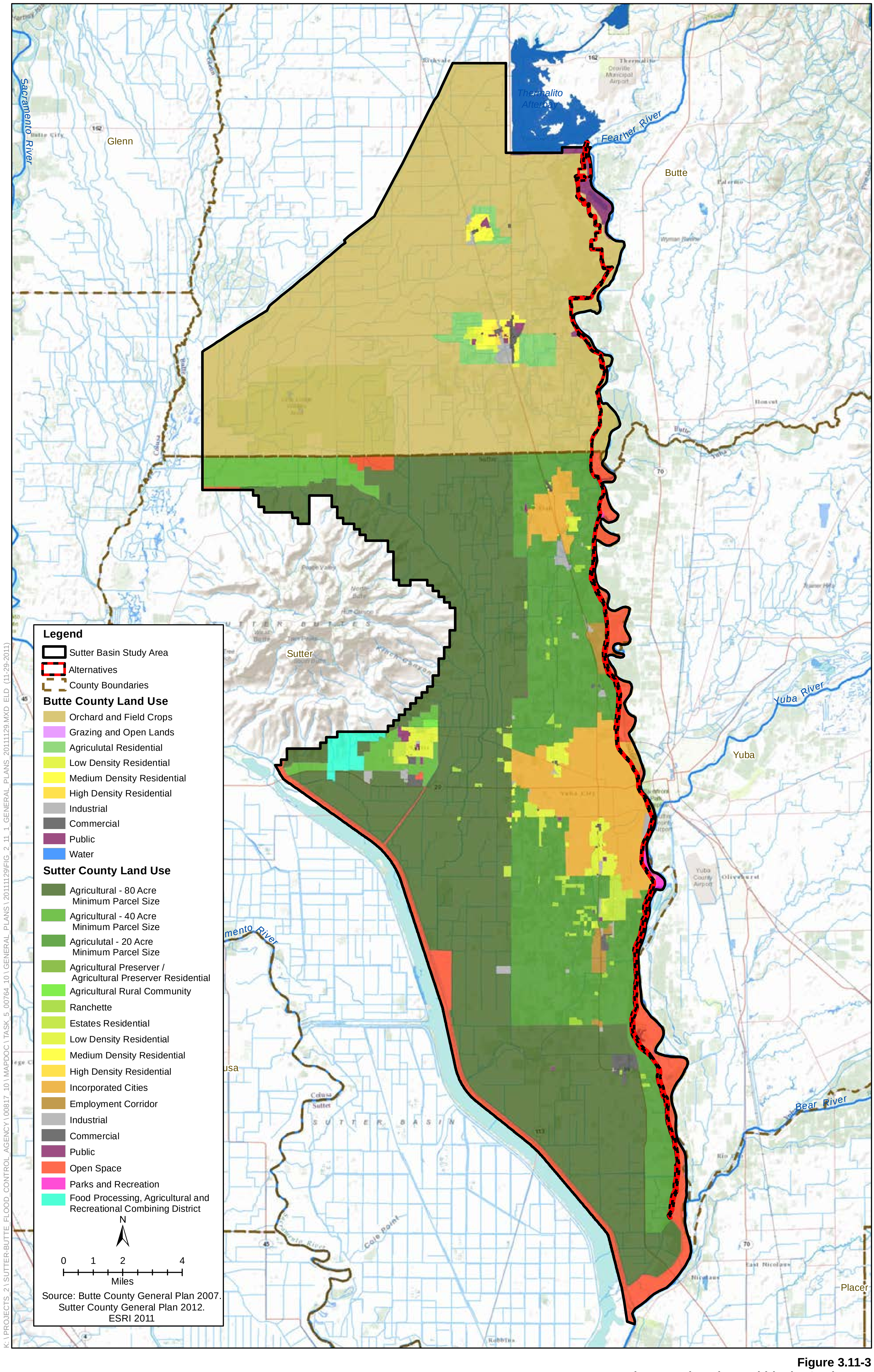
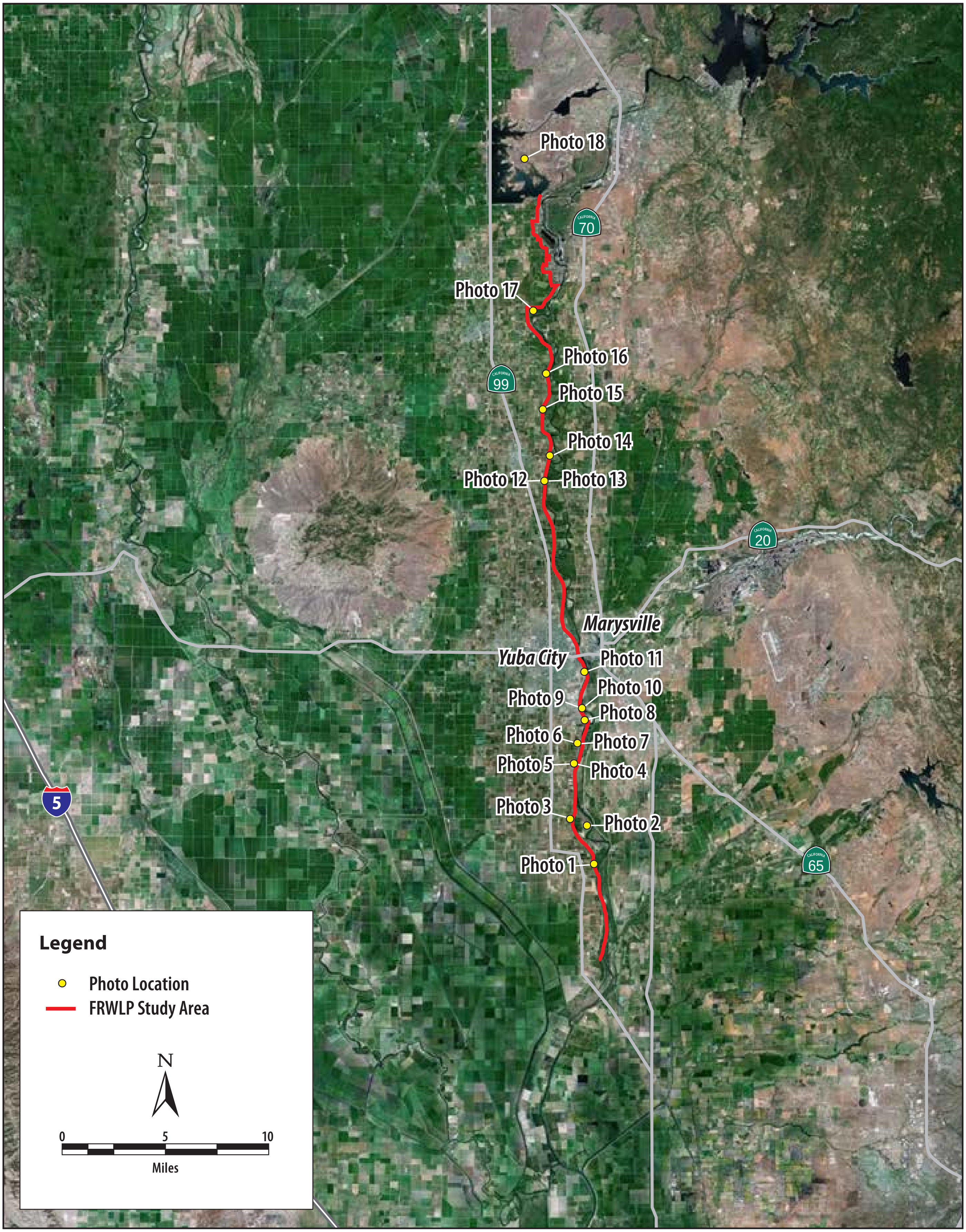


Figure 3.11-3
Land Use Designations Within the Study Area



Graphics ...00852.10 (6/19/12) AB

Plate 3.13-1
Representative Photograph Locations

Photo 1. Within Reach 5, view from atop the levee, looking west over view adjacent orchards.

Photo 2. View looking south over adjacent agricultural fields near Star Bend.

Graphics …00852.10 (6/19/12) AB

Plate 3.13-2
Representative Photographs

Photo 3. Within Reach 7, view from atop the levee, looking west over adjacent agricultural land.

Photo 4. View looking north toward the Sierra Gold Nursery.

Plate 3.13-2
Representative Photographs

Photo 5. View of Feather River looking south near the Sierra Gold Nursery.

Photo 6. Within Reach 10, view from atop the levee, looking west over Garden Highway to adjacent orchards.

Plate 3.13-2
Representative Photographs

Photo 7. Within Reach 10, view from atop the levee, looking southeast at riparian vegetation associated with the Feather River.

Photo 8. View from atop the levee, looking west over vegetation to a residential subdivision in Yuba City.

Plate 3.13-2
Representative Photographs

Photo 9. View from atop the levee, looking southeast at riparian vegetation adjacent to the Feather River.

Photo 10. View from atop the levee, looking northwest towards a residential subdivision within Yuba City.

Graphics …00852.10 (6/19/12) AB

Plate 3.13-2
Representative Photographs

Photo 11. View from atop the levee looking northwest at the Sutter County Airport.

Photo 12. View from atop the levee looking southwest.

Photo 13. View from atop the levee looking north at an adjacent structure.

Photo 14. View from atop the levee looking northeast at the Live Oak Park and Recreation Area.

Graphics …00852.10 (6/19/12) AB

Plate 3.13-2
Representative Photographs

Photo 15. View from atop the levee looking north at adjacent orchards.

Photo 16. View from atop the levee looking southwest at adjacent vineyard located within the Feather River corridor.

Graphics …00852.10 (6/19/12) AB

Plate 3.13-2
Representative Photographs

Photo 17. View looking east toward East Gridley Road Bridge over the Feather River with agricultural fields in the floodplain.

Photo 18. View of Sutter Buttes in the background, looking southwest from Thermalito Afterbay.

Graphics ...00852.10 (6/19/12) AB

Plate 3.13-2
Representative Photographs

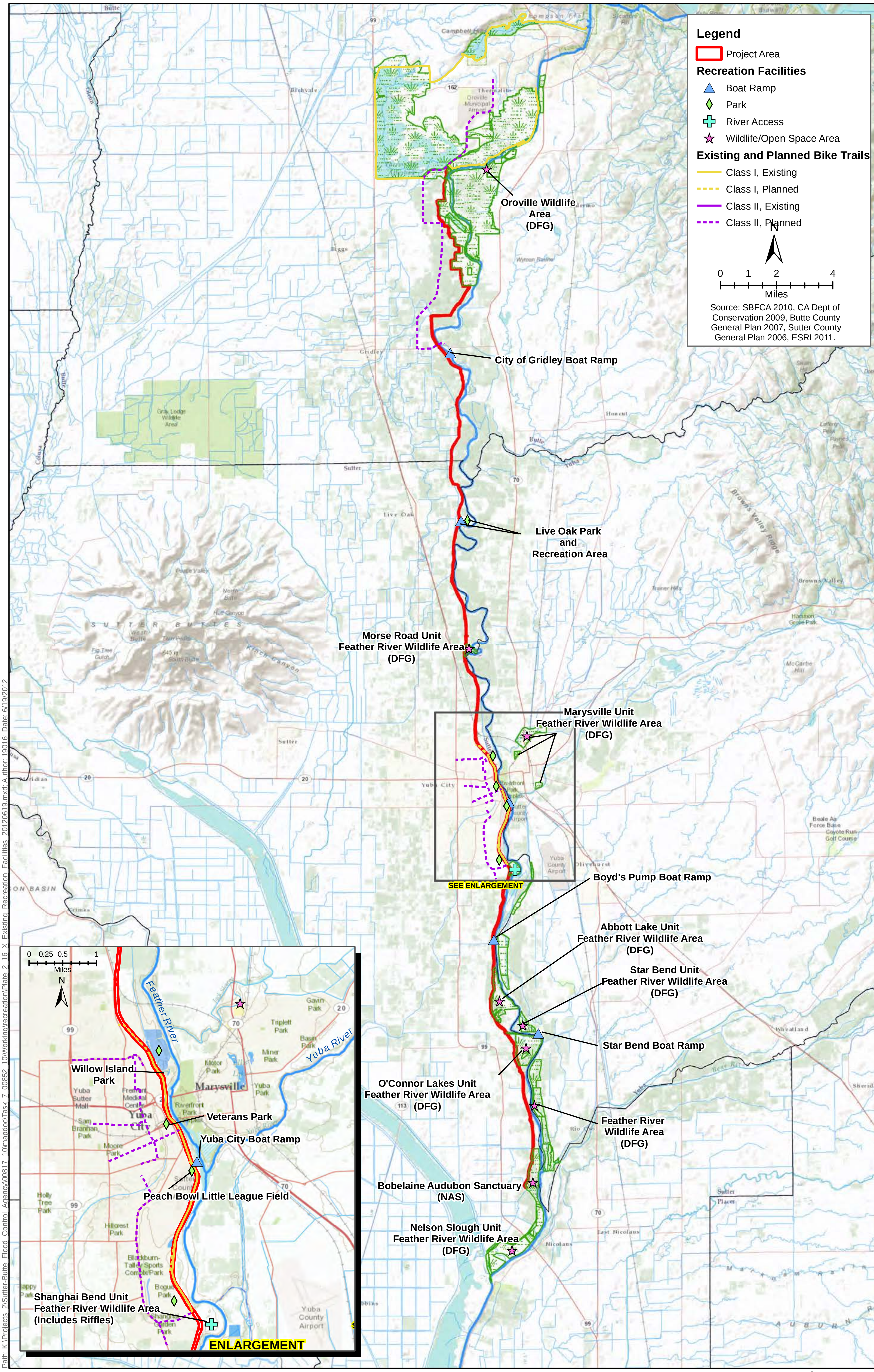


Plate 3.14-1
Existing Recreation Facilities
Near the Project Area