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FEATHER RIVER WEST LEVEE PROJECT EIS/EIR

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December 2012



ICF International. 2012. *Feather River West Levee Project EIS/EIR*. Draft. December. (ICF 00852.10.) Sacramento, CA. Prepared for U.S. Army Corp of Engineers, Sacramento, CA, and Sutter Butte Flood Control Agency, Yuba City, CA.

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

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	<u>Sutter County:</u> 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 <u>Butte County:</u> 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	<u>Sutter County:</u> 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%) <u>Butte County:</u> 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.

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Acronyms and Abbreviations

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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

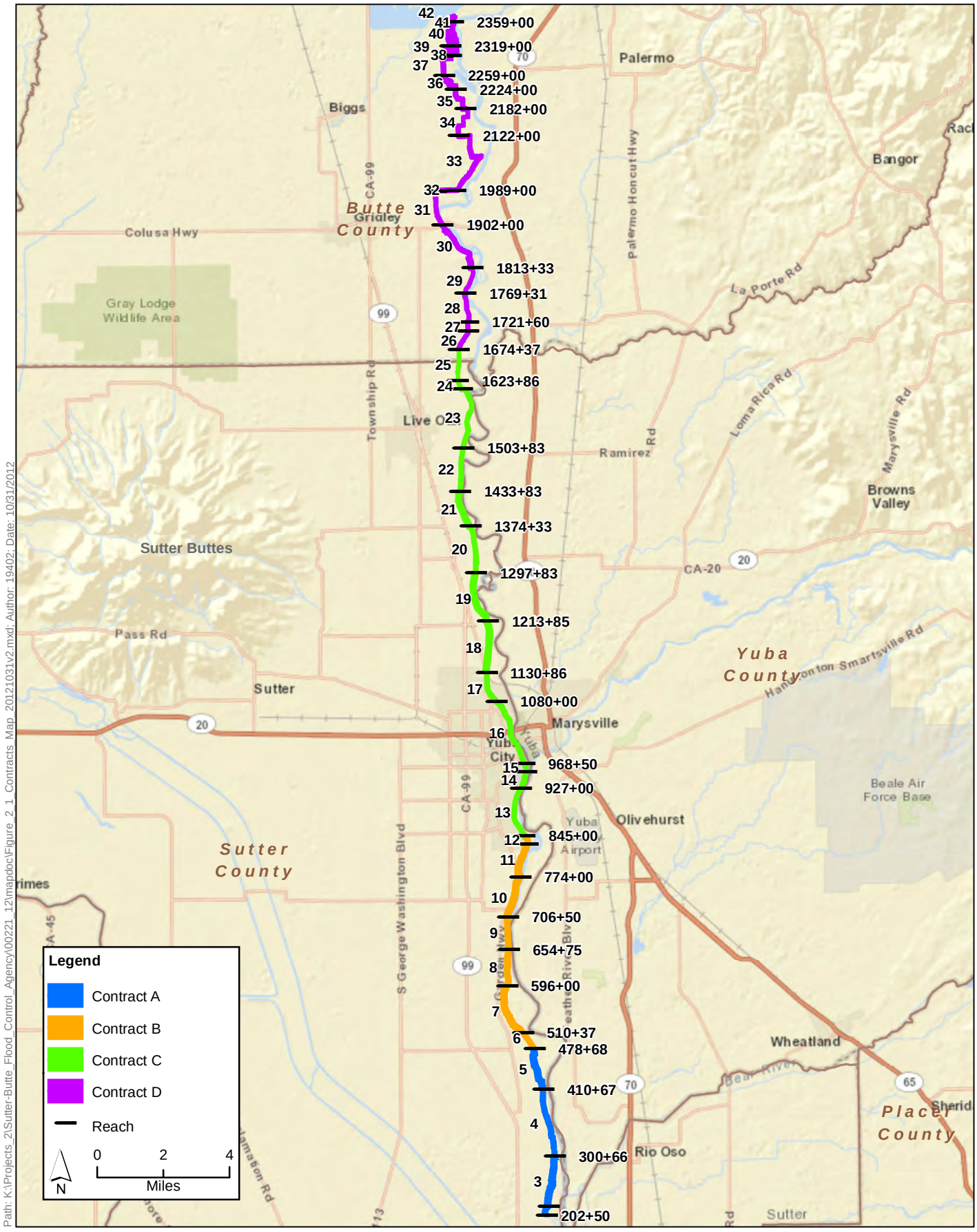

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Figure 2-1
Project Contract Reaches

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	Alternative 2	Alternative 3
			Flood Management Measure	Flood Management Measure	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	Alternative 2	Alternative 3
			Flood Management Measure	Flood Management Measure	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	Alternative 2	Alternative 3
			Flood Management Measure	Flood Management Measure	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	Alternative 2	Alternative 3
			Flood Management Measure	Flood Management Measure	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	Alternative 2	Alternative 3
			Flood Management Measure	Flood Management Measure	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	Alternative 2	Alternative 3
			Flood Management Measure	Flood Management Measure	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).

[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

[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	Agriculture
	Group A pesticides	Agriculture
	Mercury	Resource extraction
	PCBs	Unknown
	Unknown toxicity	Unknown
Oroville Wildlife Area Fishing Pond (Butte County)	Unknown toxicity	Unknown
Gilsizer Slough (from Yuba City to downstream of Township Road, Sutter County)	Diazinon	Agriculture
	Oxyfluofen	Agriculture
	pH	Unknown
Wadsworth Canal	Chlorpyrifos	Agriculture
	Diazinon	Agriculture
Morrison Slough	Diazinon	Unknown
Sutter Bypass	Mercury	Resources extraction
Live Oak Slough	Diazinon	Agriculture
	Oxyfluorfen	Agriculture
	Dissolved oxygen	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

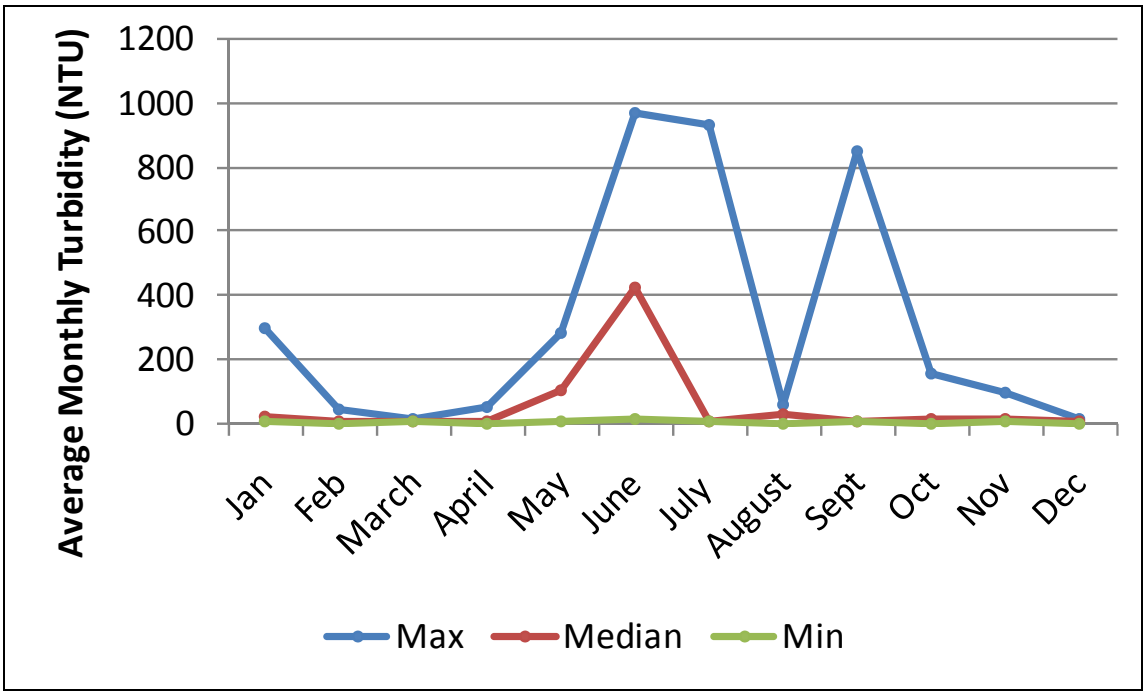
Total suspended sediment (TSS) is indicative of upstream scouring, bank erosion, and agricultural return flow transporting and depositing sediment (ICF International 2010a). Turbidity is a convenient field measurement that can be switched to TSS using simple conversions. Excessive soil erosion and sedimentation 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.

[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/m^3)		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/m^3)		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/m^3= 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]						

	Yuba City			Gridley		
Pollutant Standards	2007	2008	2009	2007	2008	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:

$$PPV = PPV_{ref} \times (25/Distance)^{1.5}$$

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		Existing Average Daily Traffic Volume	Existing Traffic Noise Level (L_{dn})[a]
From	To		
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		Existing Average Daily Traffic Volume	Existing Traffic Noise Level (L_{dn})[a]
From	To		
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:

[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)*	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)*	Alternative Corridor For Segment (Afterbay outlet to Butte County line)			
	Corridor A	Corridor B	Corridor C	Corridor D
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: *Dan Taverner* 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	Moderately High	= 4.5–5.49
	Low	= 1.5–2.49	High	= 5.5–6.49
	Moderately Low	= 2.5–3.49	Very High	= 6.5–7
	Moderate	= 3.5–4.49		

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		33 USTs*
		One landfill
		Two ASTs
		Four RCRA-SQG or small quantity generators
		One pesticide producer
	8–17	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

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8.2 U.S. Army Corps of Engineers

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Name	Education/Experience	Contribution/Role
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8.4 Other Contributors

Name	Education/Experience	Contribution/Role
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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
Adrian Pitts	HDR B.S. Biological Sciences; 15 years experience	Fish and Aquatics Resource Specialist
Jelica Arsenijevic	B.S. Marine Coastal Ecology; 11 years experience	Authored USFWS Biological Assessment

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.

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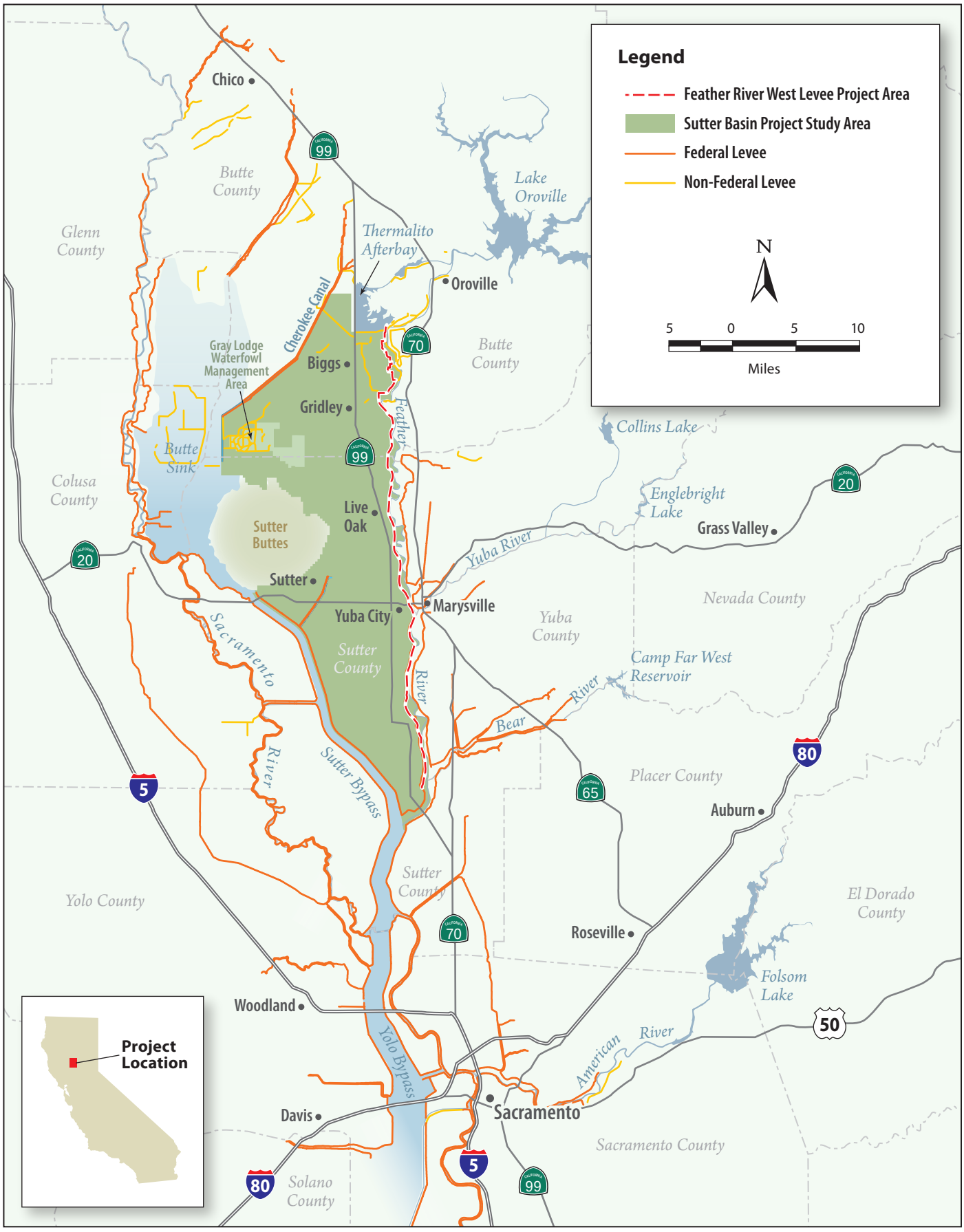

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Plate 1-1
Regional Setting

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

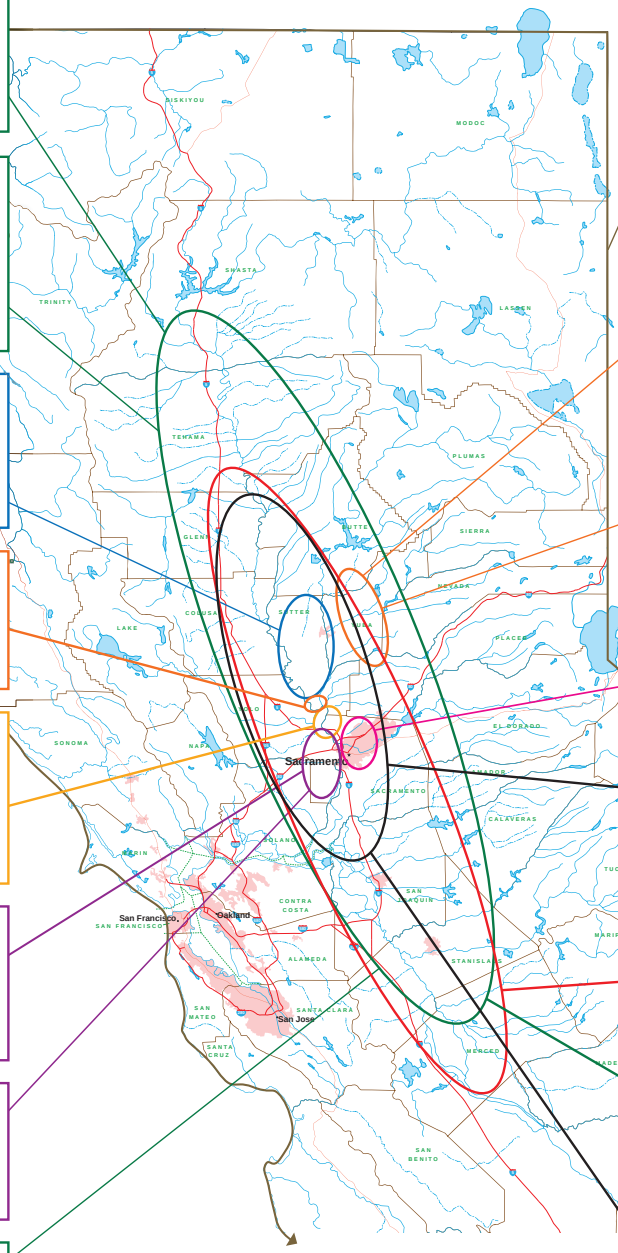
Lead Agency: USACE and WSAFCA
Location: West Sacramento
Goal: Achieve 200-year flood protection for the City of West Sacramento
Phase (Timeline): EIS/EIR (2010)

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

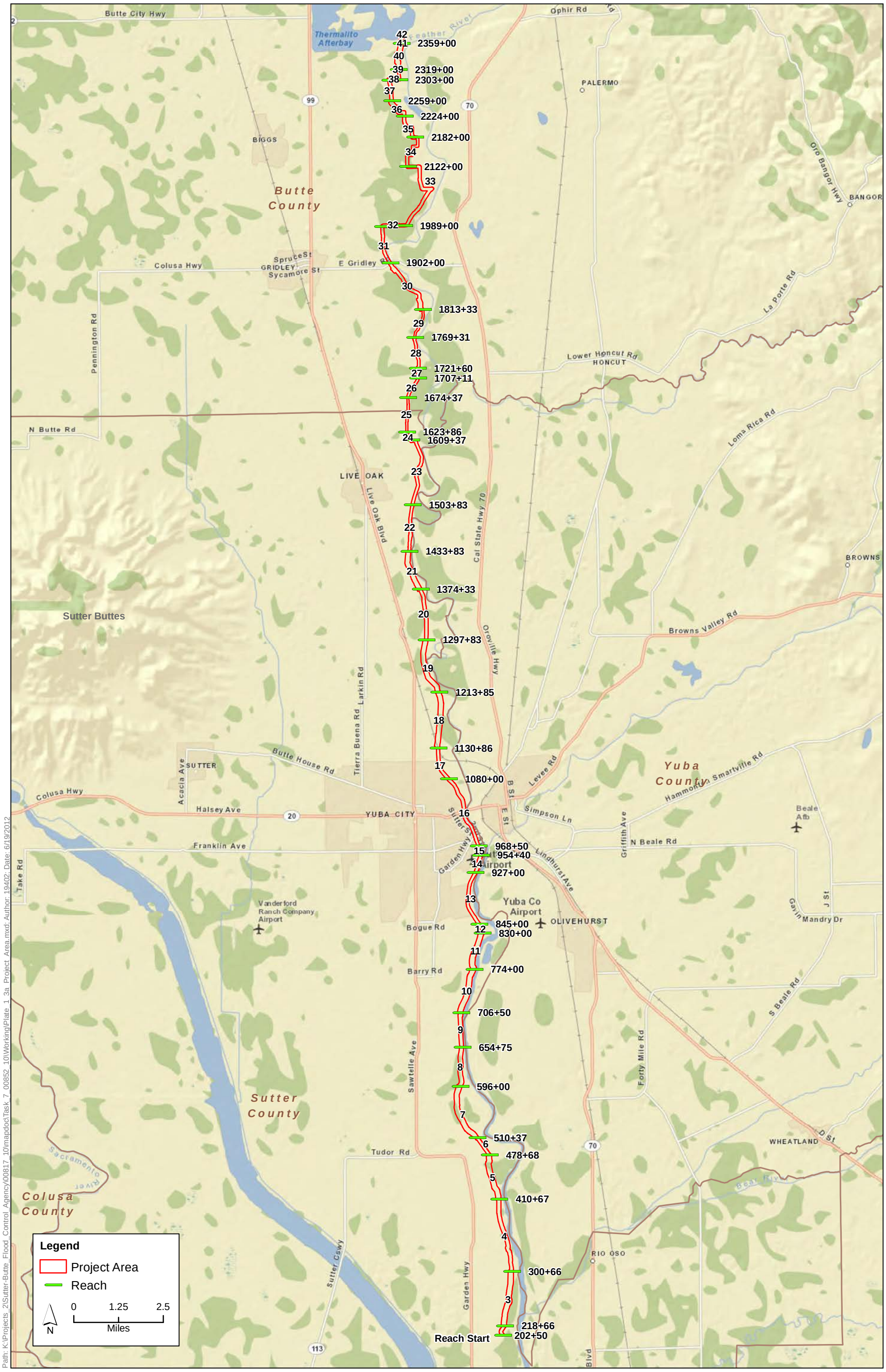

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Plate 1-3a
Project Area

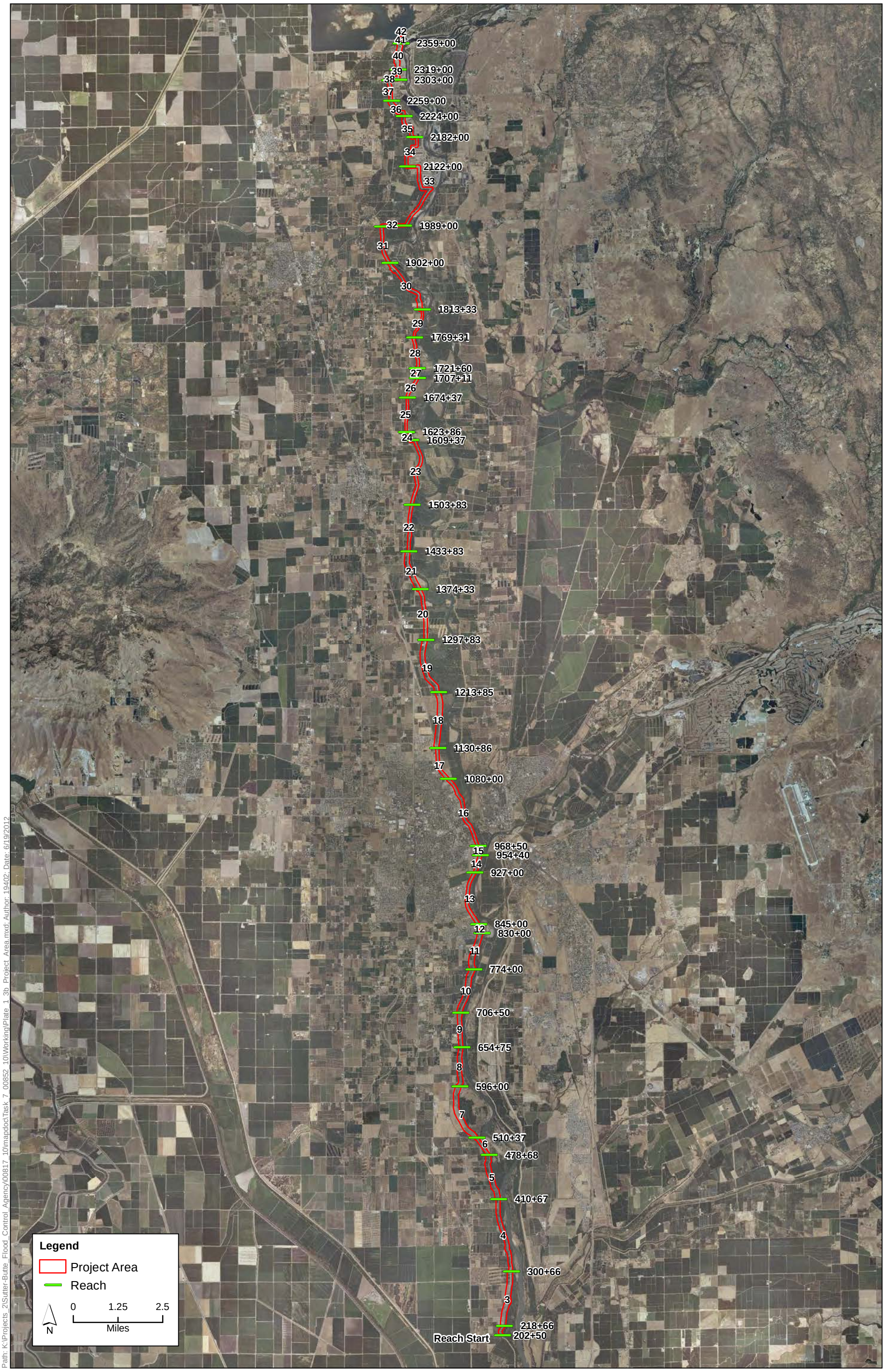

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Plate 1-3b
Project Area



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.

Graphics ... 00852.10 (6/26/12) AB

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.

Graphics ... 00852.10 (6/26/12) AB

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.

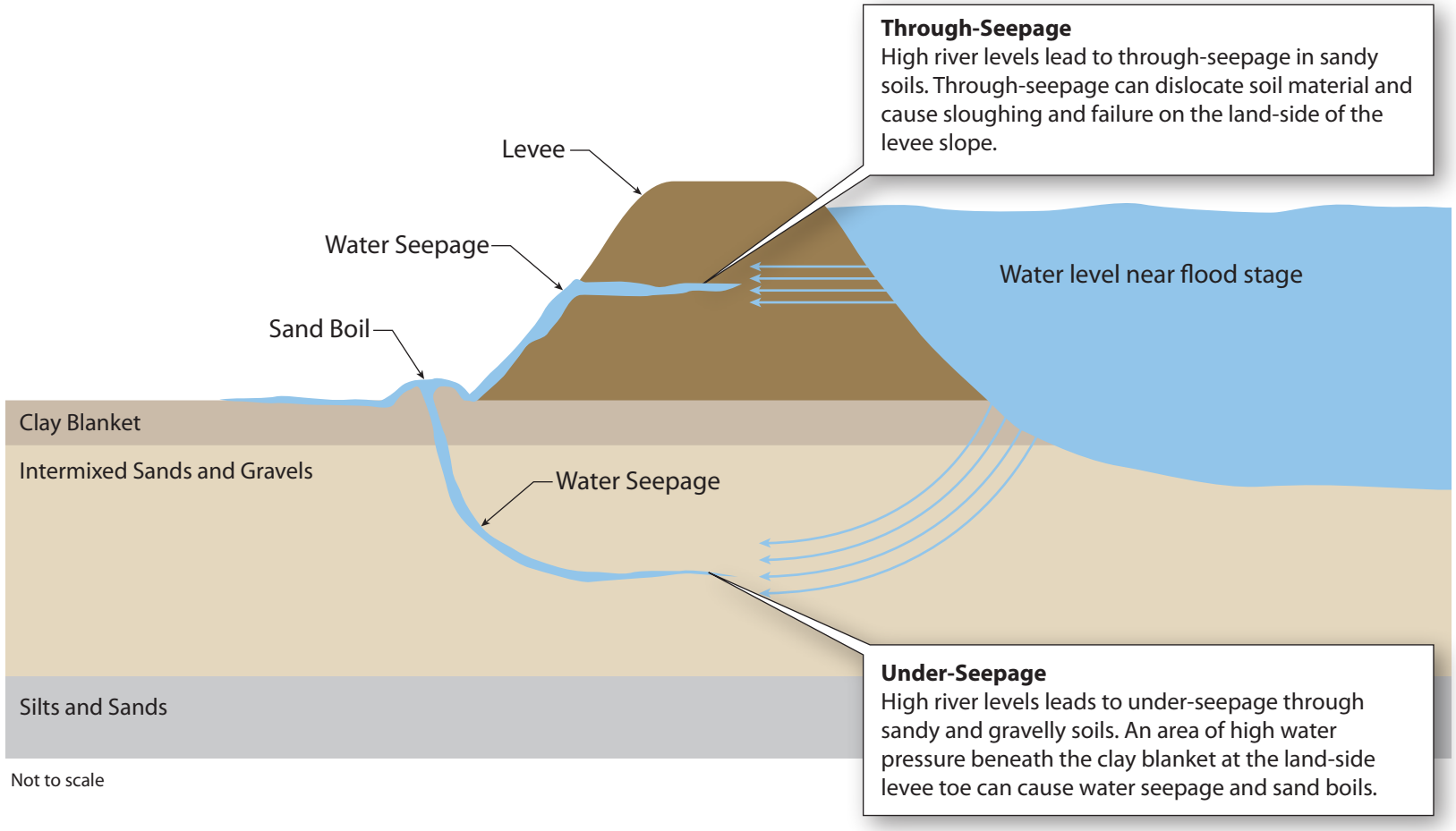

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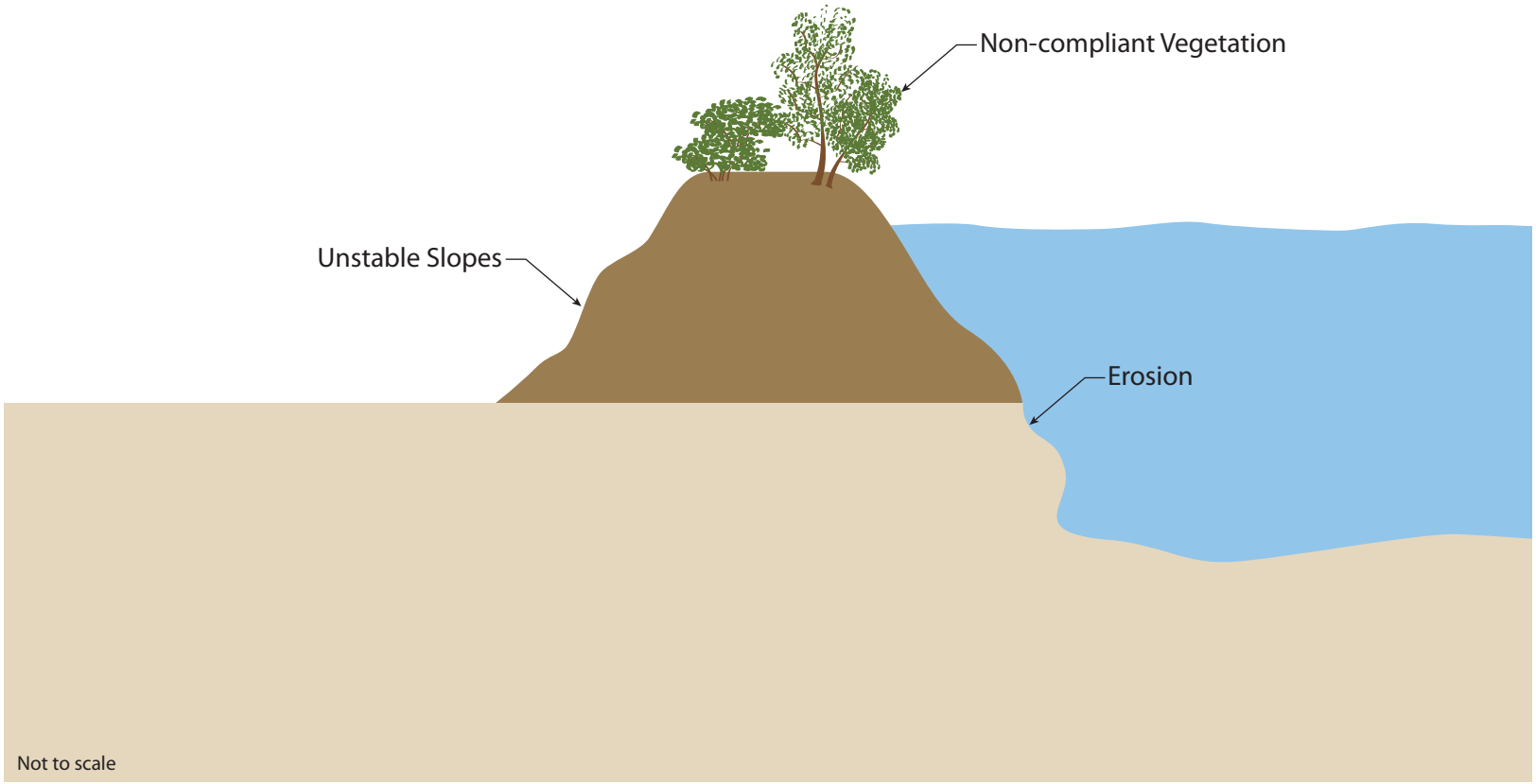
Plate 1-11
Levee Seepage

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

Bellevue Ave

Laurel Ave

Oak Ave

Cypress Ave

Central Ave

Clayton Ave

202+50

218+66 3

300+66 4

Levee Rd

Map Sheet Index

113

99

162

South Yuba City

Yuba City

20

Marysville

Linda

Olivehurst

70

65

Legend

- Reach
- Station 202+50
- Alternative 1
- Alternative 2
- Alternative 3

Plate 2-1
Alternatives 1-3

Sheet 1

0 450 900
Feet

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Garden Hwy

Willkie Ave

Lyon Ave

Oconnor Ave

Peck Ave

Ashford Ave

Carlisle Rd

Clayton Ave

410+67 5

478+68 6

Map Sheet Index

113

South Yuba City

Yuba City

20

Marysville

Linda

Olivehurst

70

65

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162

Legend

- Reach
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- Alternative 1
- Alternative 2
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Plate 2-1
Alternatives 1-3

Sheet 2

0 450 900
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Garden Hwy

Garden Hwy

Obanion Rd

Star Bend Rd

Shannon Rd

596+00 8

510+37 7

Levee Rd

Country Club Rd

Anderson Ave

Map Sheet Index

113

99

162

South Yuba City

Yuba City

20

Marysville

Linda

Olivehurst

70

65

Legend

- Reach
- Station 202+50
- Alternative 1
- Alternative 2
- Alternative 3

Plate 2-1
Alternatives 1-3

Sheet 3

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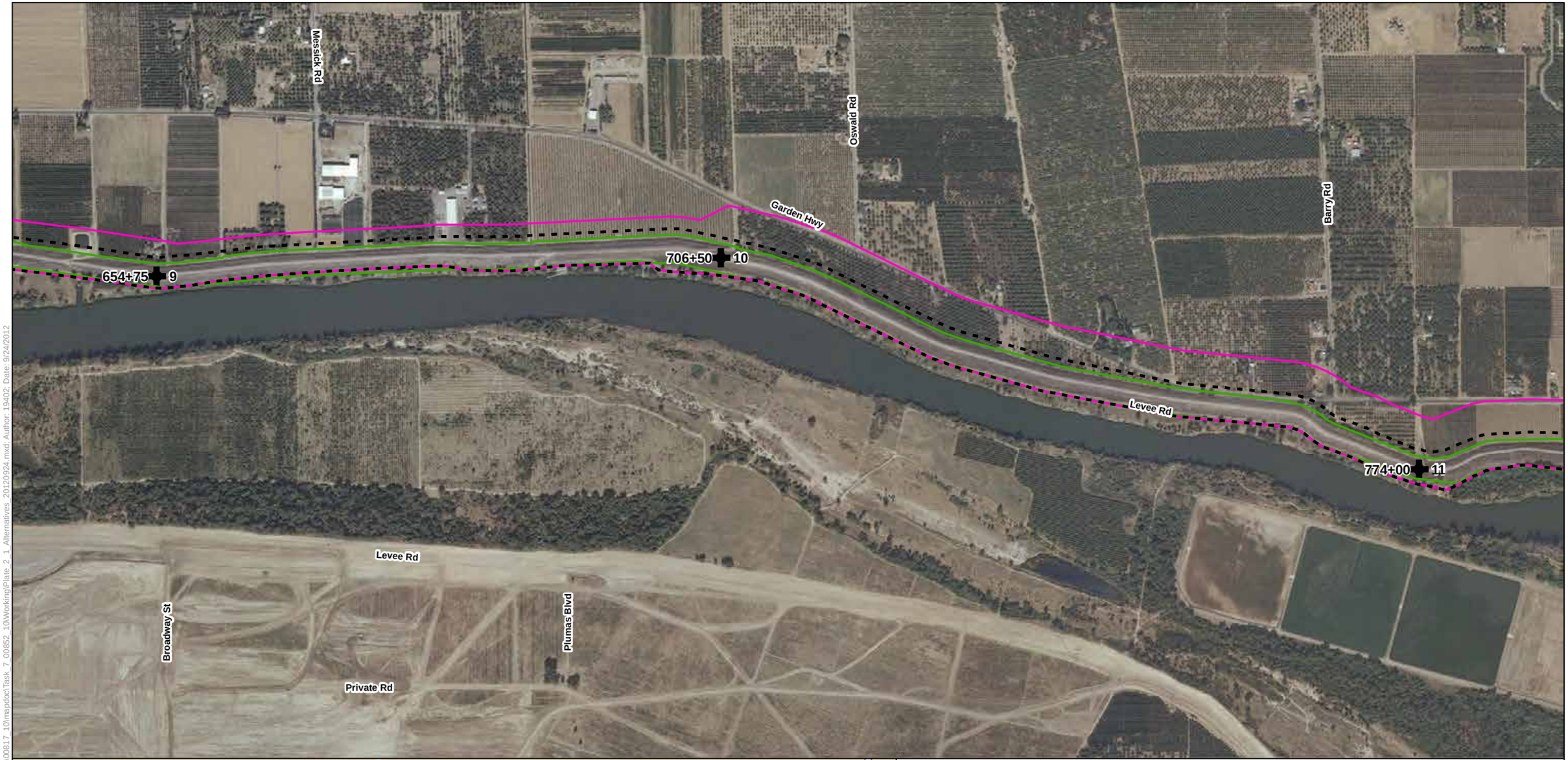

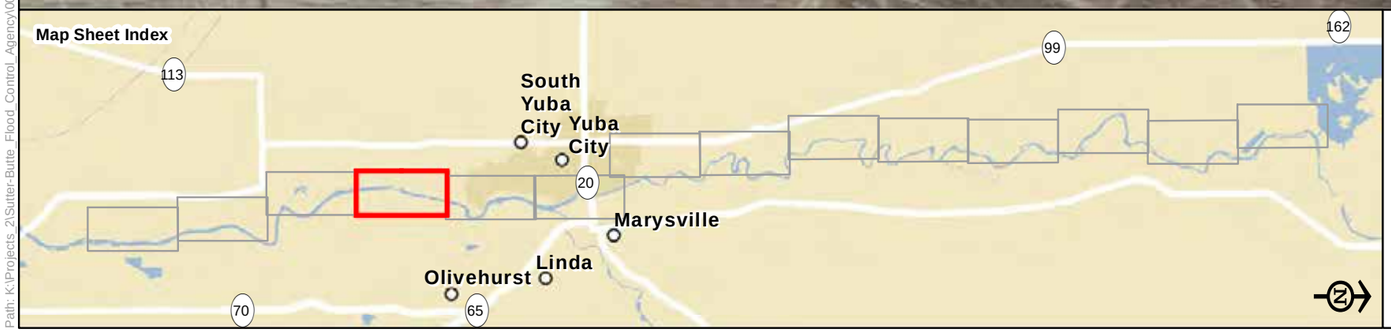

Legend

- Reach
- Station 202+50
- Alternative 1
- Alternative 2
- Alternative 3

Plate 2-1
Alternatives 1-3

Sheet 4

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Feet

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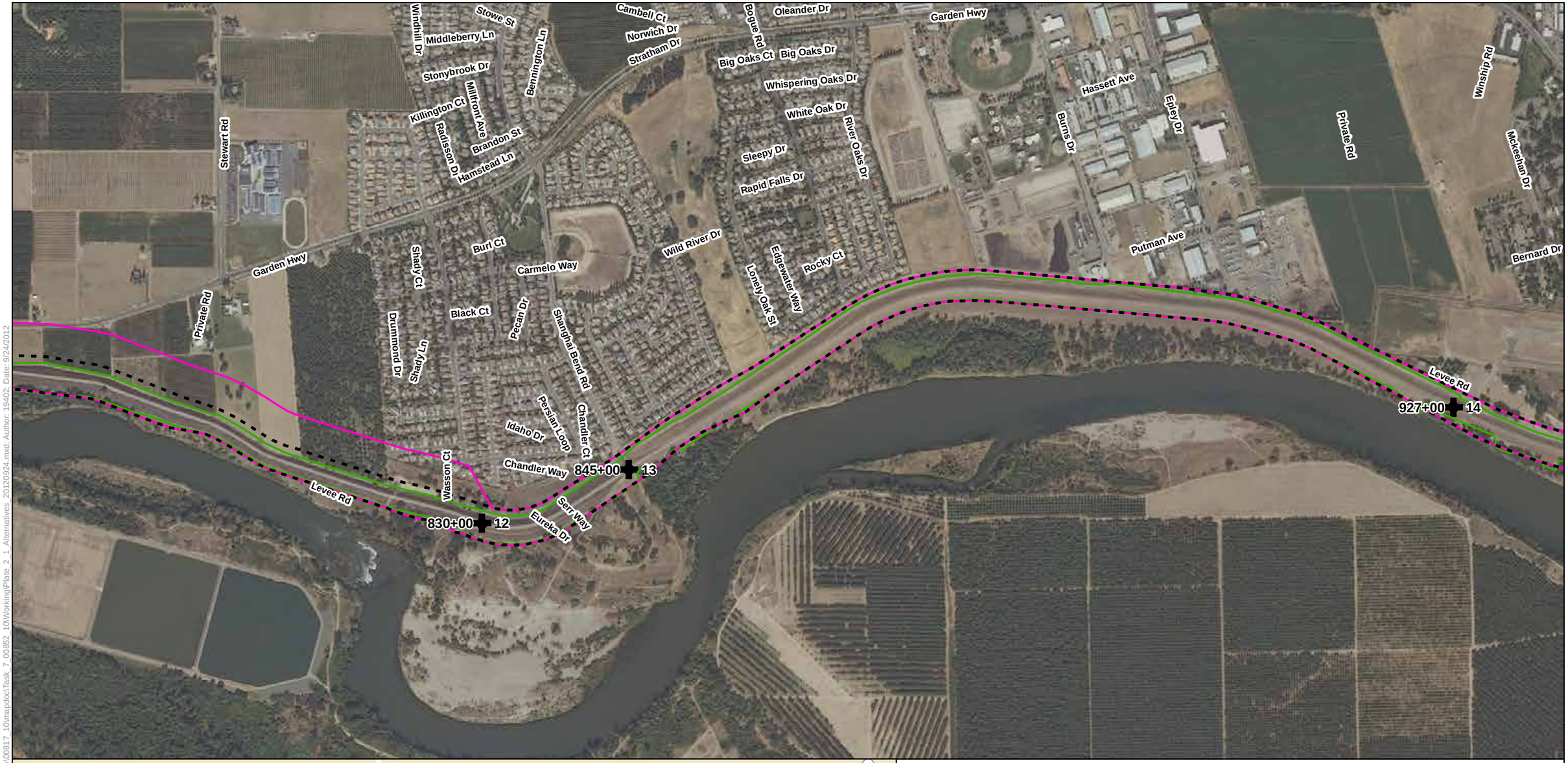

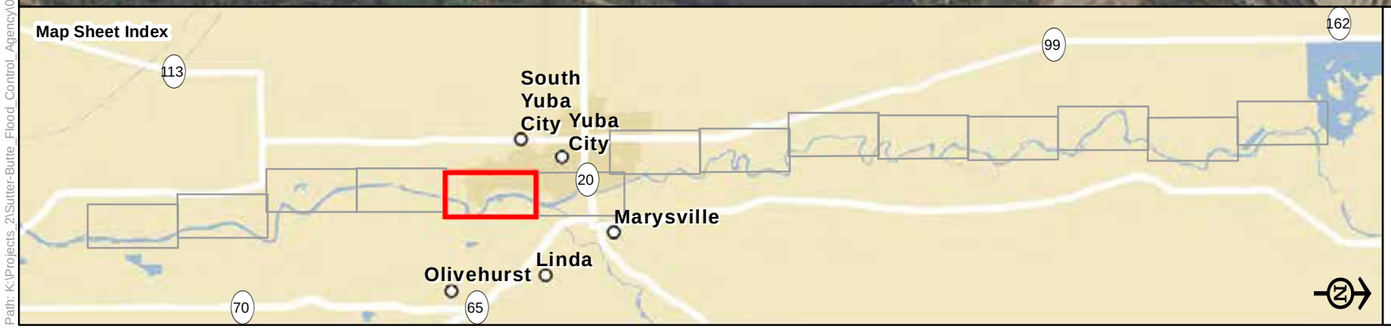

Legend

- Reach
- Station 202+50
- Alternative 1
- Alternative 2
- Alternative 3

Plate 2-1
Alternatives 1-3

Sheet 5

0 450 900
Feet

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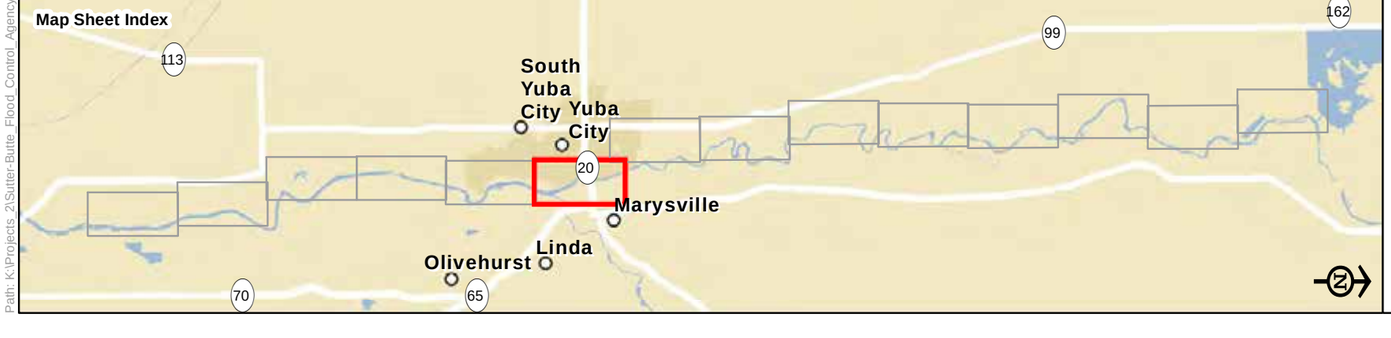

Legend

- Reach
- Station 202+50
- Alternative 1
- Alternative 2
- Alternative 3

Plate 2-1
Alternatives 1-3

Sheet 6

0 450 900
Feet

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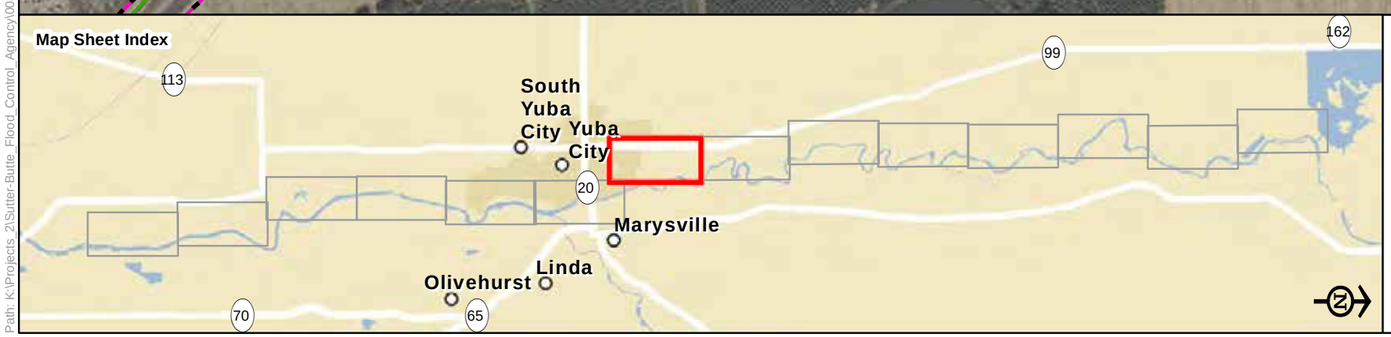
Christifer Ln
Valley View Dr
Spencer Ln
Debbie Ln
Jennifer Ln
Jennifer Ct
West St
Exit 342
Eden Way
Nancy Ct
Messina Dr
Messina Ct
Sevilla Ct
Cartagena Dr
Portofino Dr
Tortosa Ct
Majorca Dr
Meadowlark Way
Jamie Dr
Pheasant Dr
Osprey Ct
Robin Ct
Tres Picos Dr
State Hwy 99
W Onstott Rd
E Onstott Rd
State Hwy 99
Exit 344
Eager Rd
Onstott Frontage Rd
Forestwood Dr
Woodland Dr
Northridge Dr
Kenny Dr
Casa Loma Ln
Casita Dr
La Colina Ln
Melton Dr
Mcmullen Ave
Mosswood Dr
Rosewood Dr
Willow Glen Dr
Willow Creek Dr
Brookside Ct
Whitney Dr
Gray Ave
Oakwood Dr
Sandalwood Ct
Greengate St
Baywood Ct
N Point Dr
Santa Barbara Way
Vista Ct
Pease Rd
April Ln
Winslow Dr
Aspen Dr
Elder Ct
Aster Ct
Tamarack Dr
Teakwood Dr
Hunt St
Oakview Dr
Parkbrook Ct
Clark Ave
Upland Dr
Debra Ln
Darrough Dr
Cassidy Ct
Cassidy Ave
Bal Sukh Mhp Rd
Northgate Dr
Bal Sukh Mhp
Youngs Ln
Melanie Ln
Downie St
Timothy Ln
Lorel Way
Private Rd
Hospital Rd
Live Oak Blvd
Redmall Rd
1130+86
18
1213+85
Levee
1080+00
17

Map Sheet Index



Legend

- Reach
- Station 202+50
- Alternative 1
- Alternative 2
- Alternative 3

Plate 2-1
Alternatives 1-3

Sheet 7

0 450 900
Feet

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Sanders Rd
Onstott Frontage Rd
Live Oak Blvd
Exit 344
State Hwy 99
Morse Rd
Koch Ln
Levee Rd
1297+83
20
19

Map Sheet Index
113
South Yuba City
Yuba City
20
Marysville
Linda
Olivehurst
70
65
99
162

Legend

- Reach
- Station 202+50
- Alternative 1
- Alternative 2
- Alternative 3

Plate 2-1
Alternatives 1-3

Sheet 8

0 450 900
Feet

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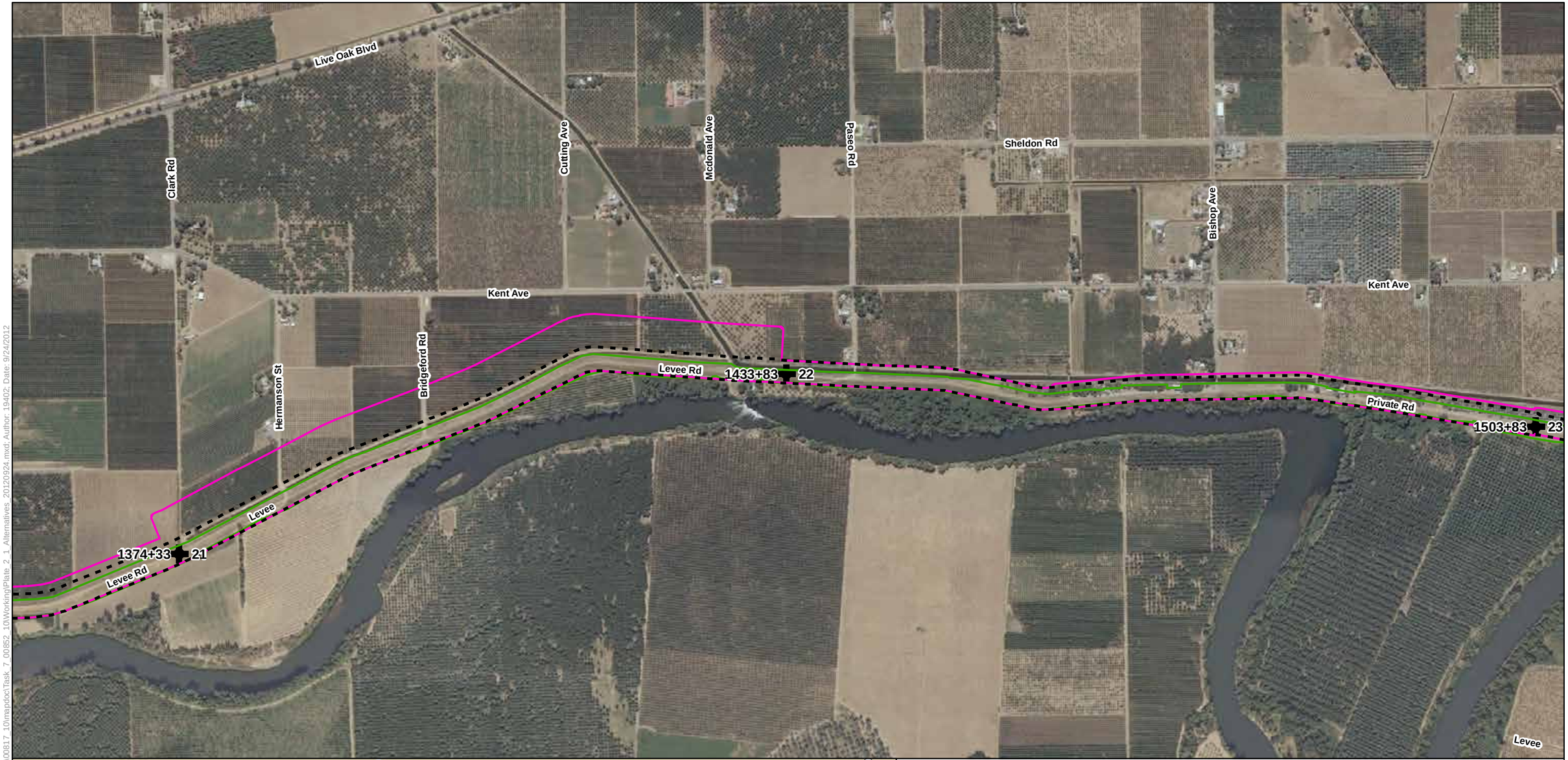

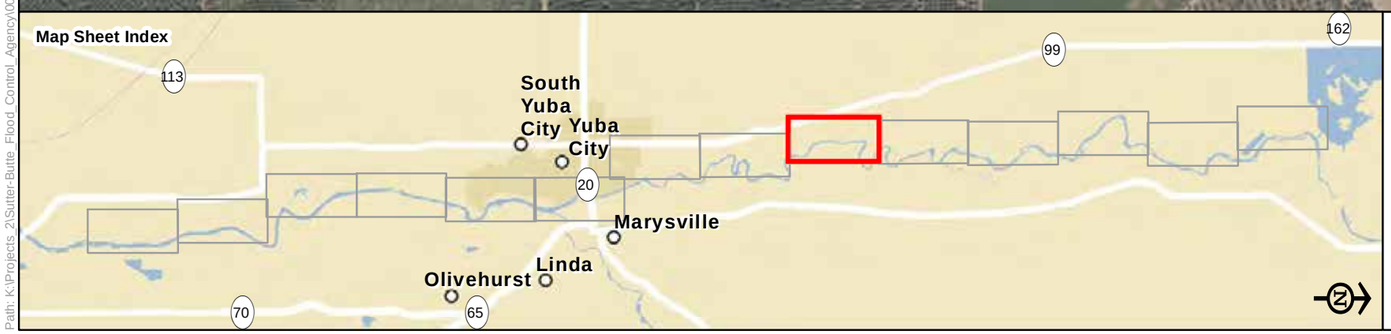

Legend

- Reach
- Station 202+50
- Alternative 1
- Alternative 2
- Alternative 3

Plate 2-1
Alternatives 1-3

Sheet 9

0 450 900
Feet

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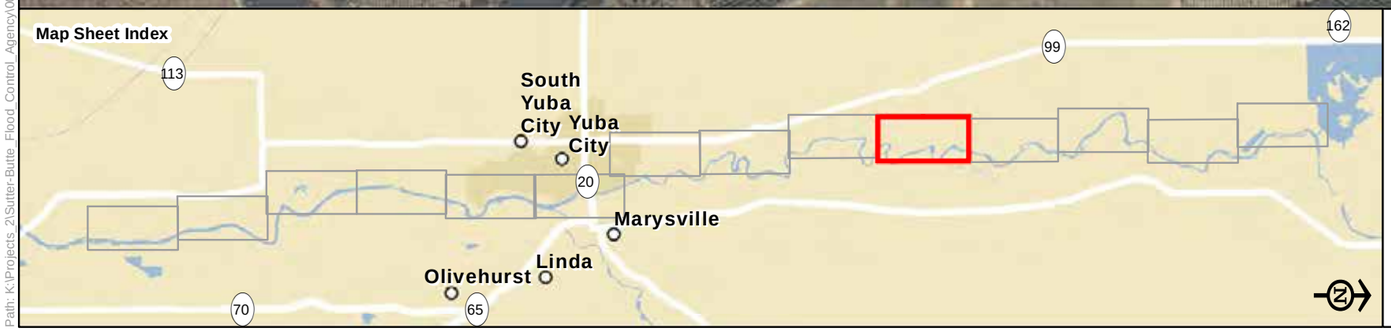
Sheldon Rd
Kent Ave
Archer Ave
Pennington Rd
Cooley Rd
Metteer Rd
Campbell Rd
Encinal Rd
Riviera Rd
Private Rd
Levee Rd
1623+86
25
1609+37
24
Private Rd
Levee
Sparrow Ln

Map Sheet Index



Legend

- Reach
- Station 202+50
- Alternative 1
- Alternative 2
- Alternative 3

Plate 2-1
Alternatives 1-3

Sheet 10

0 450 900
Feet

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Metteer Rd
Chandon Ave
Campbell Ave
E Evans Reimer Rd
Center Ave
Thresher Ave
Clardy Ave
Alexander Ave
Levee Rd
1674+37
26
1707+11
27
1721+60
28
1769+31
29

Map Sheet Index
113
South Yuba City
Yuba City
20
Marysville
Linda
Olivehurst
70
65
99
162

Legend
Reach
Station 202+50
Alternative 1
Alternative 2
Alternative 3

Plate 2-1
Alternatives 1-3

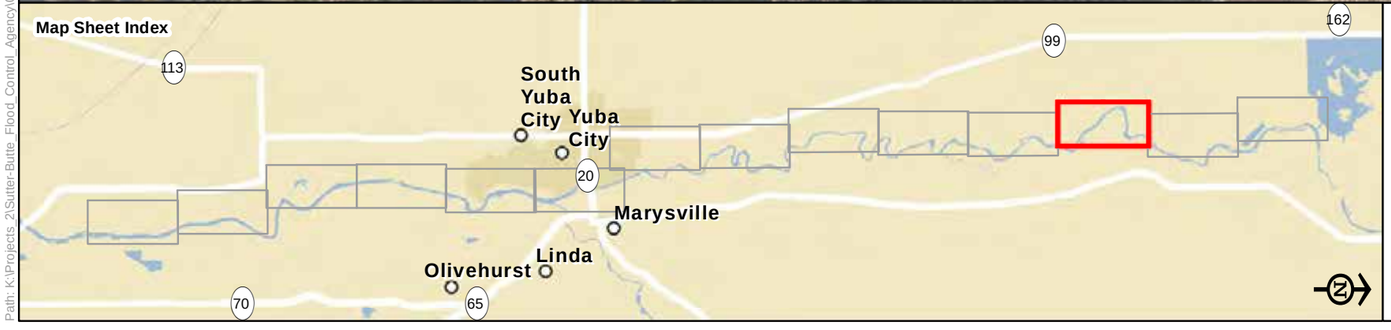
Sheet 11

0 450 900
Feet

Path: K:\Projects_2\Sutter-Butte_Flood_Control_Agency\00817_10\mapdoc\Task_7_00852_10\Working\Plate_2_1_Alternatives_20120924.mxd Author: 19402 Date: 9/24/2012

River Ave
Keifer Ave
Fagan Ln
Kirk Rd
Rutland Ct
Marie Ct
Maitland Ct
Keith Ave
Staff Dr
Sussex Ave
Ogden Ave
Mcconnell Ave
Booth Dr
1902+00
31
1958+00
32
Richards Ave
Hutchins Dr
Ord Ranch Rd
E Gridley Rd
1989+00
33
Alexander Ave
1813+33
30

Map Sheet Index



Legend

- Reach
- Station 202+50
- Alternative 1
- Alternative 2
- Alternative 3

Plate 2-1
Alternatives 1-3

Sheet 12

0 450 900
Feet

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Larkin Rd
Watson Rd
Biggs East Hwy
Palm Ave
Steadman Rd
Almond Ave
Hixon Ave
2122+00
34
2182+00
35

Map Sheet Index
113
99
162
South Yuba City
Yuba City
20
Marysville
Linda
Olivehurst
70
65

Legend

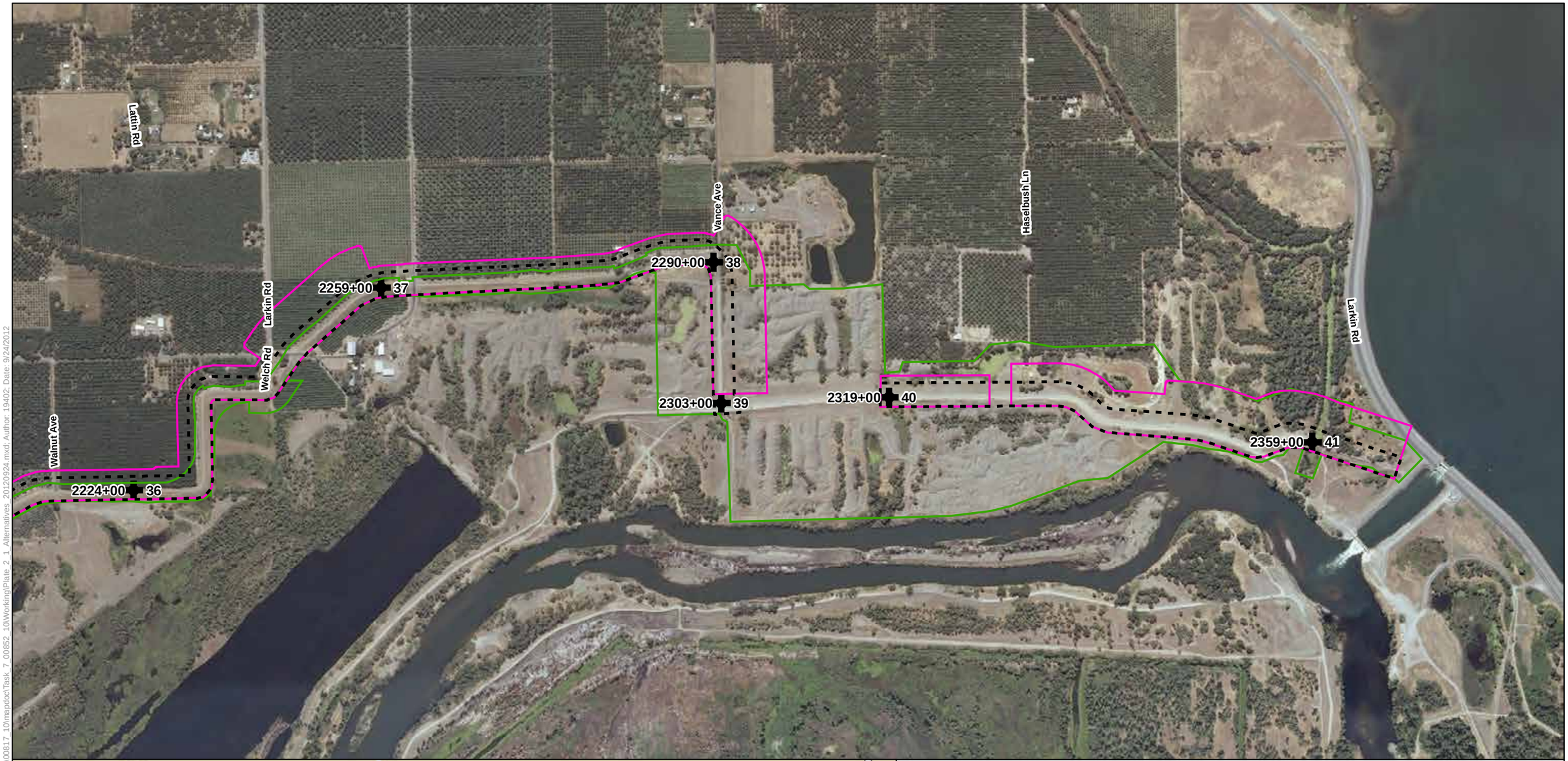
- Reach
- Station 202+50
- Alternative 1
- Alternative 2
- Alternative 3

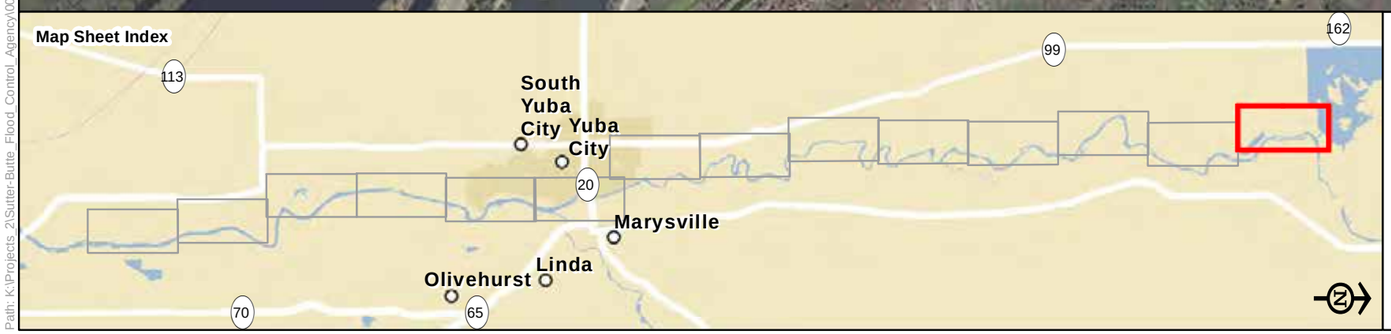
Plate 2-1
Alternatives 1-3

Sheet 13

0 450 900
Feet

Path: K:\Projects_2\Sutter-Butte_Flood_Control_Agency\00817_10\mapdoc\Task_7_00852_10\Working\Plate_2_1_Alternatives_20120924.mxd; Author: 19402; Date: 9/24/2012





Legend

- Reach
- Station 202+50
- Alternative 1
- Alternative 2
- Alternative 3

Plate 2-1
Alternatives 1-3

Sheet 14

0 450 900
Feet

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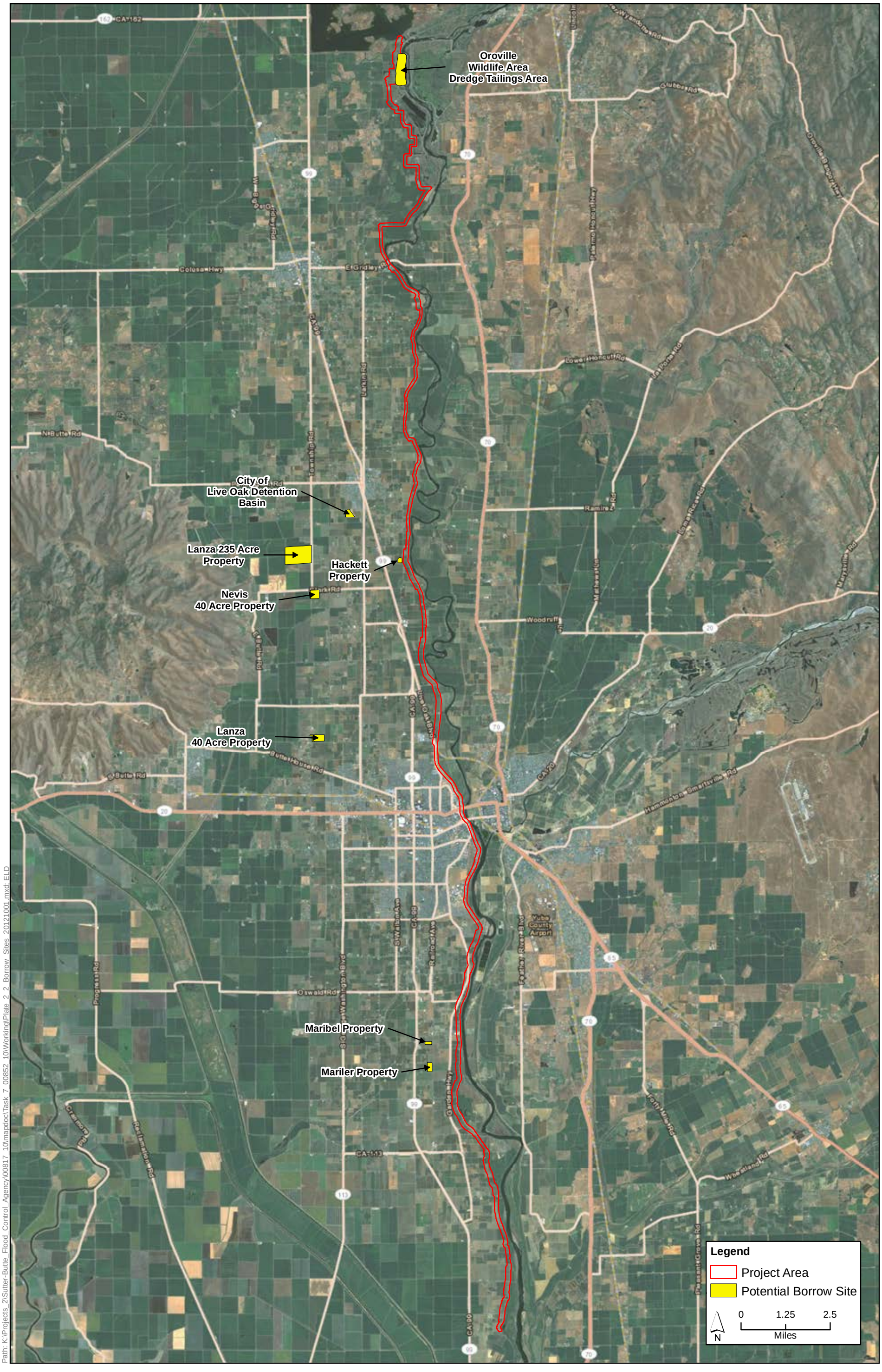

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Plate 2-2
Potential FRWLP Borrow Sites

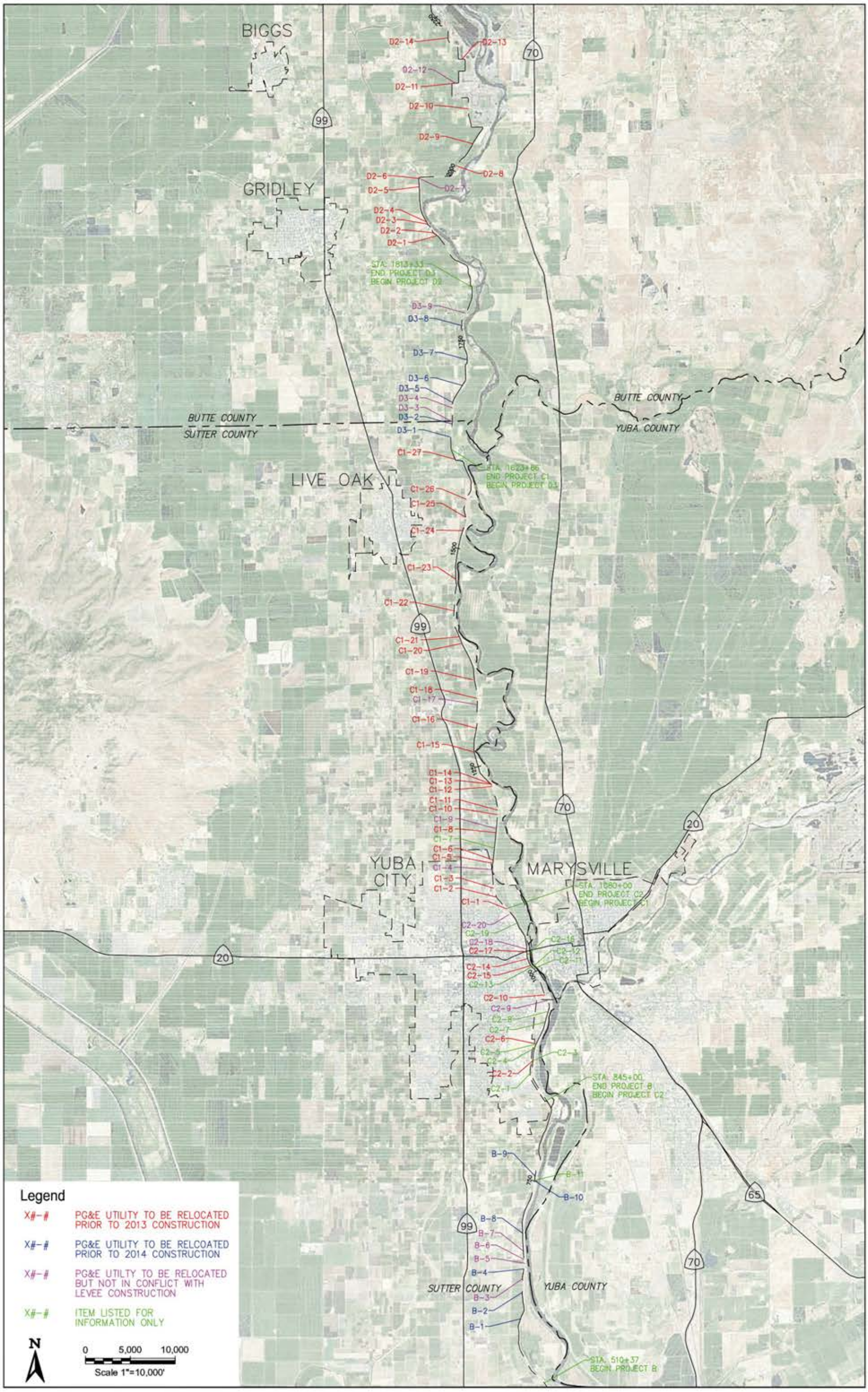


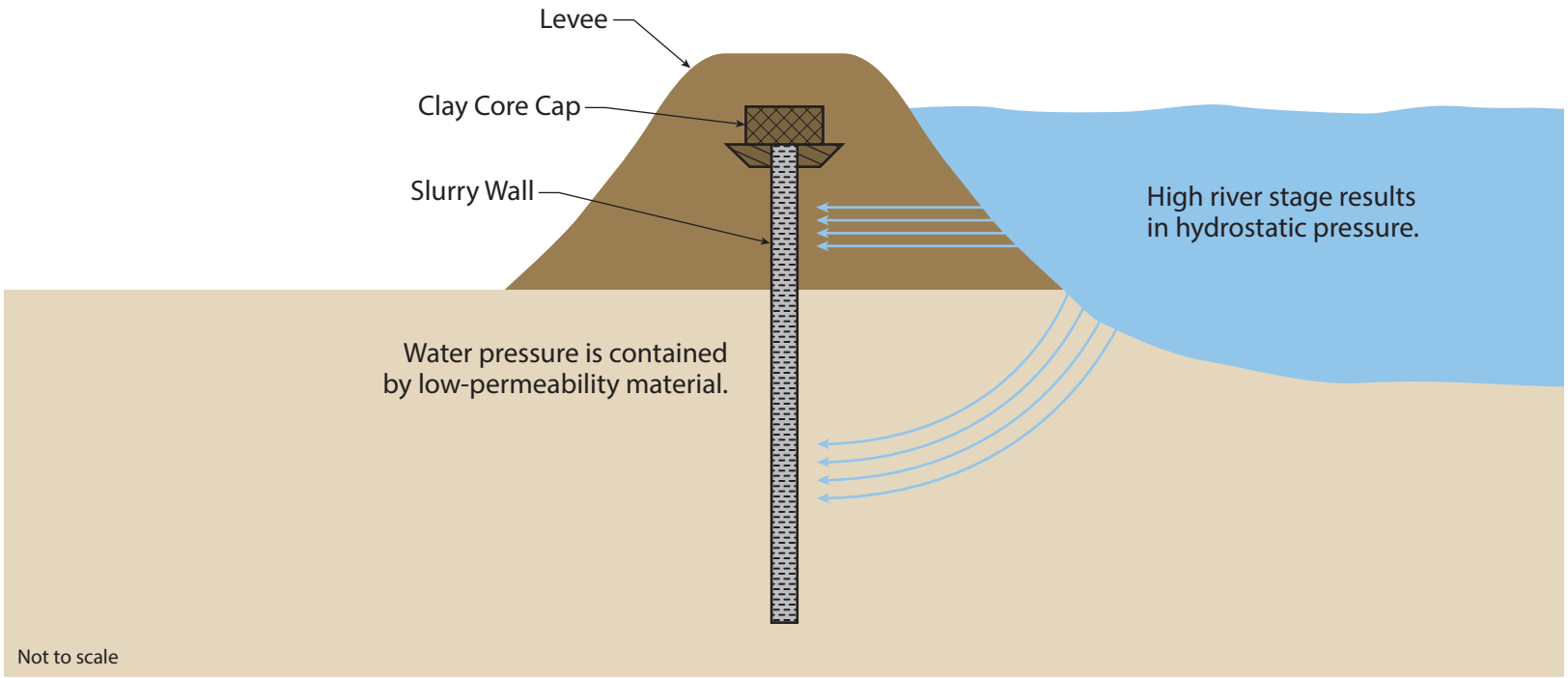
Plate 2-3
PG&E Project Relocations

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

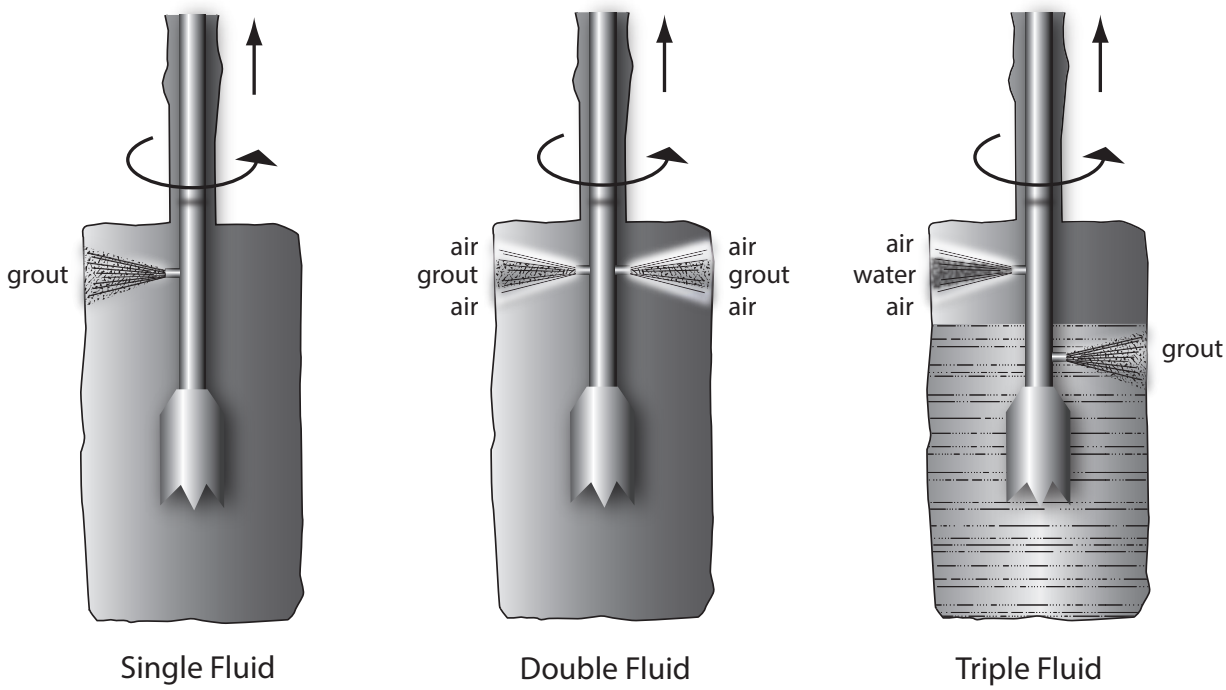
Plate 2-4
Slurry Cutoff Wall



Plate 2-5
Deep Soil Mixing

Graphics . . . 00852.10 (8/3/12) AB





Graphics . . . 00852.10 (8/3/12) AB

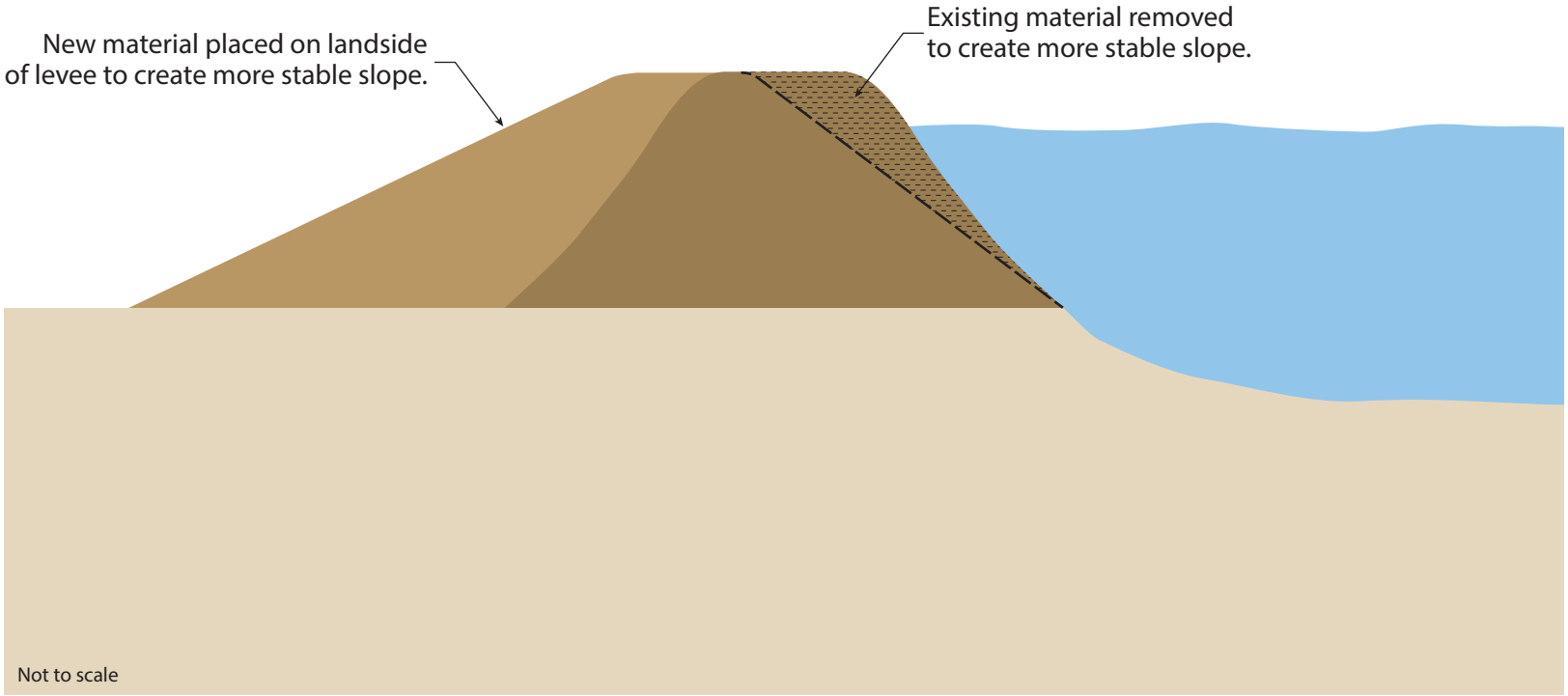
Plate 2-6
Jet Grouting Diagrams

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

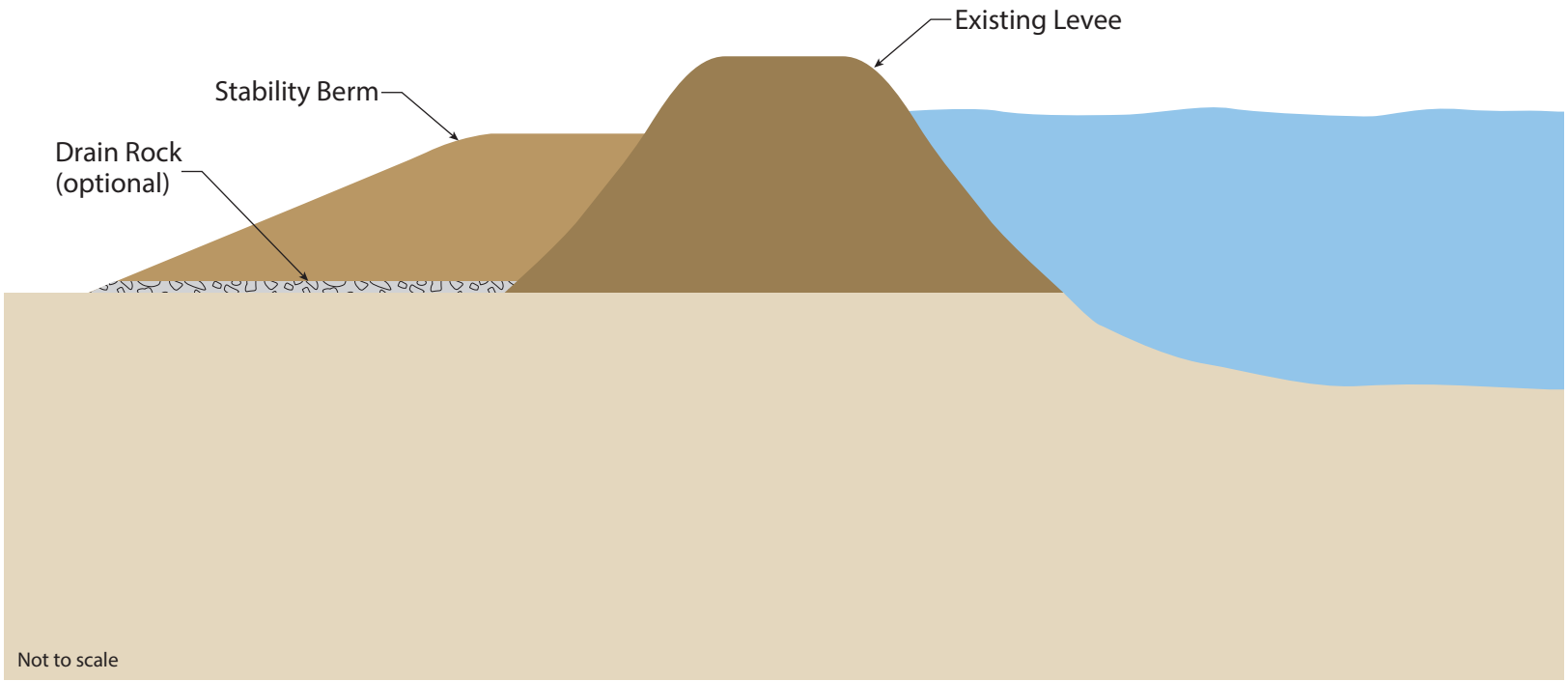
Plate 2-7
Slope Flattening

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.



Graphics ... 00852.10 (8/3/12) AB

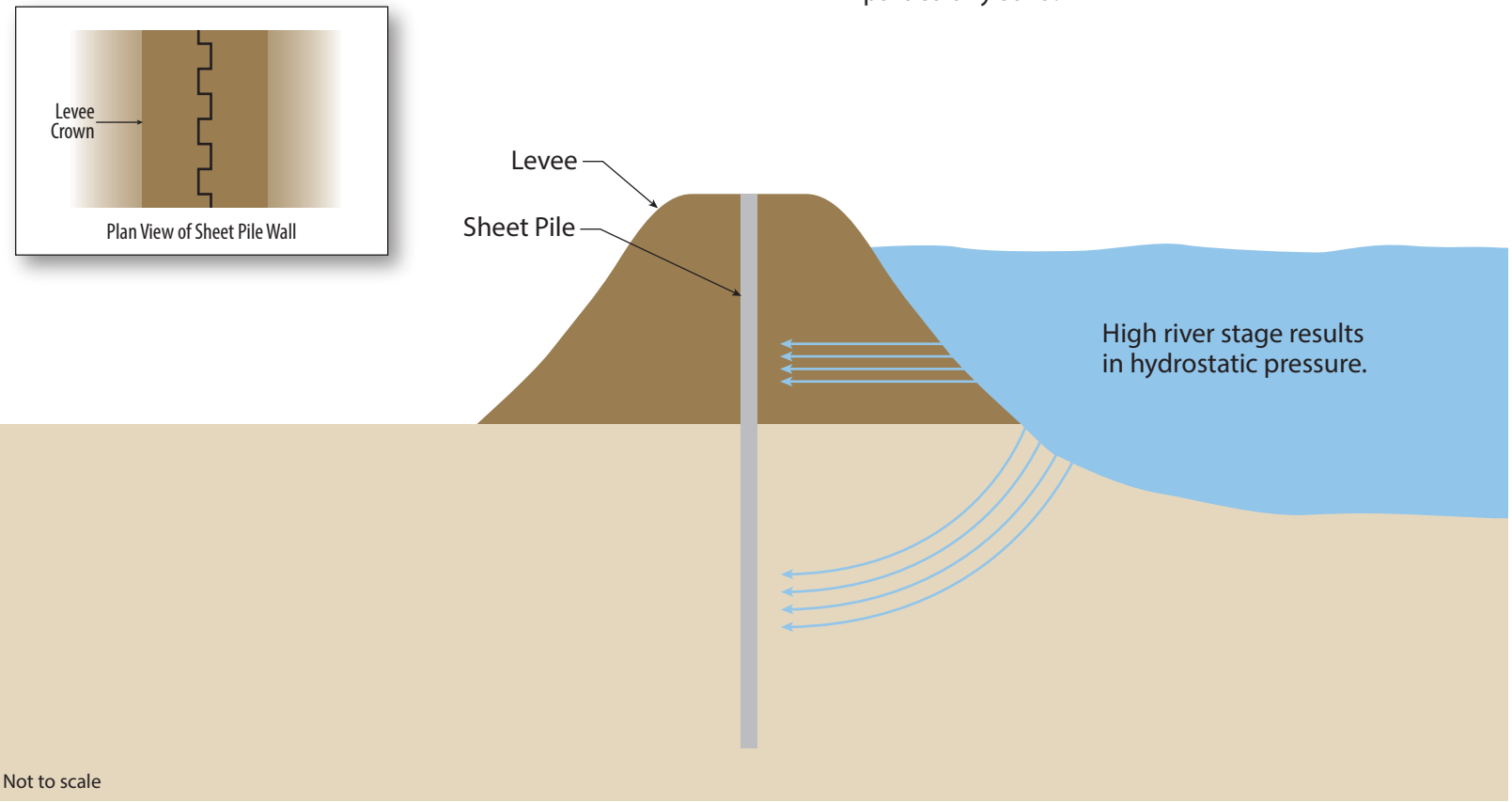
Plate 2-8
Stability Berm

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

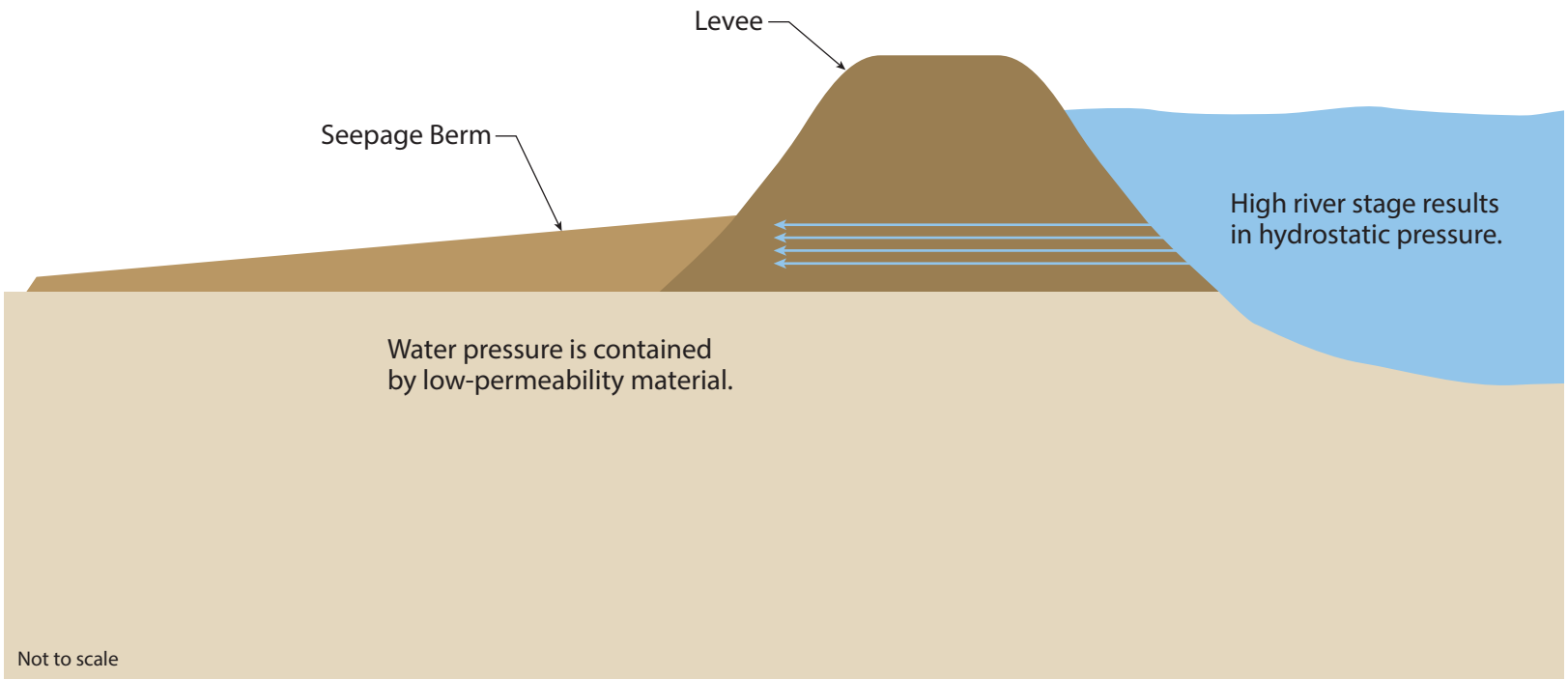
Plate 2-9
Sheet Pile Wall

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

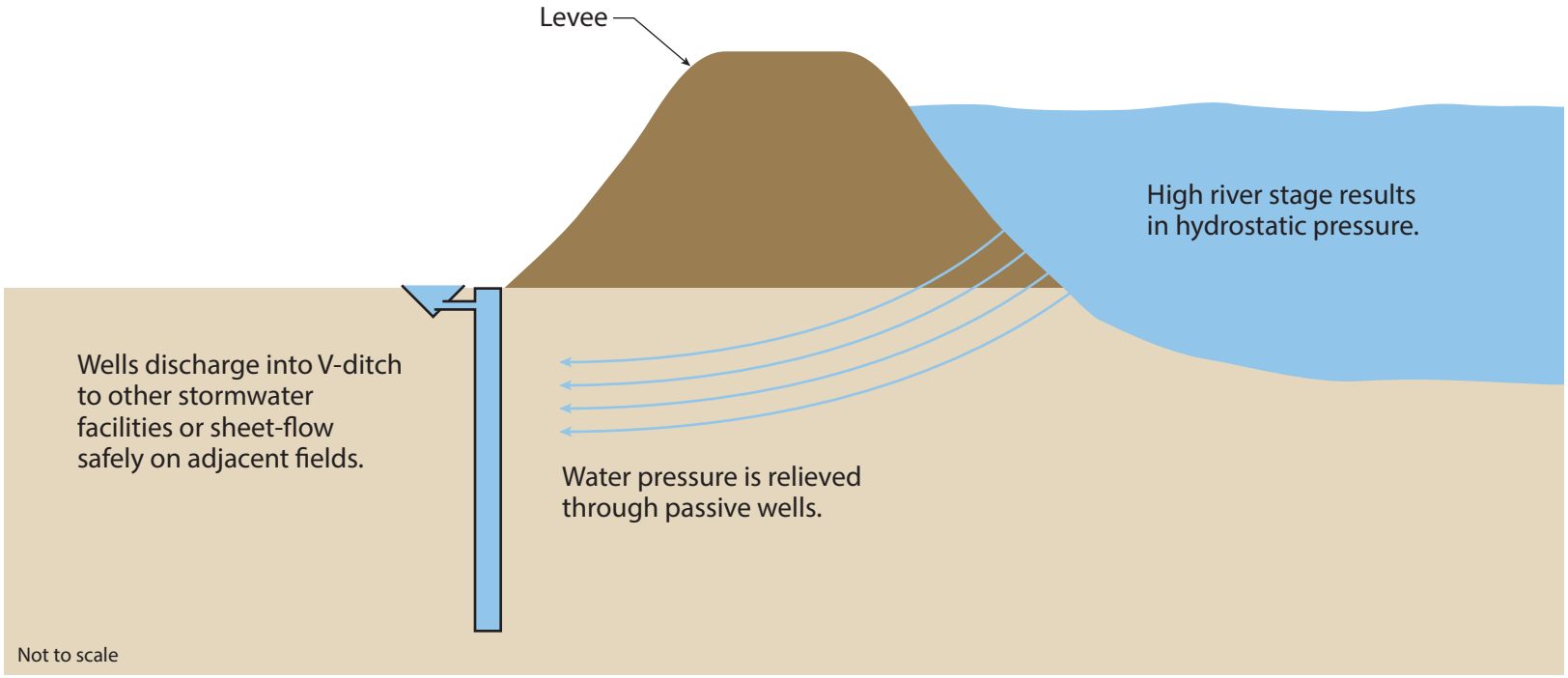
Plate 2-10
Seepage Berm

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

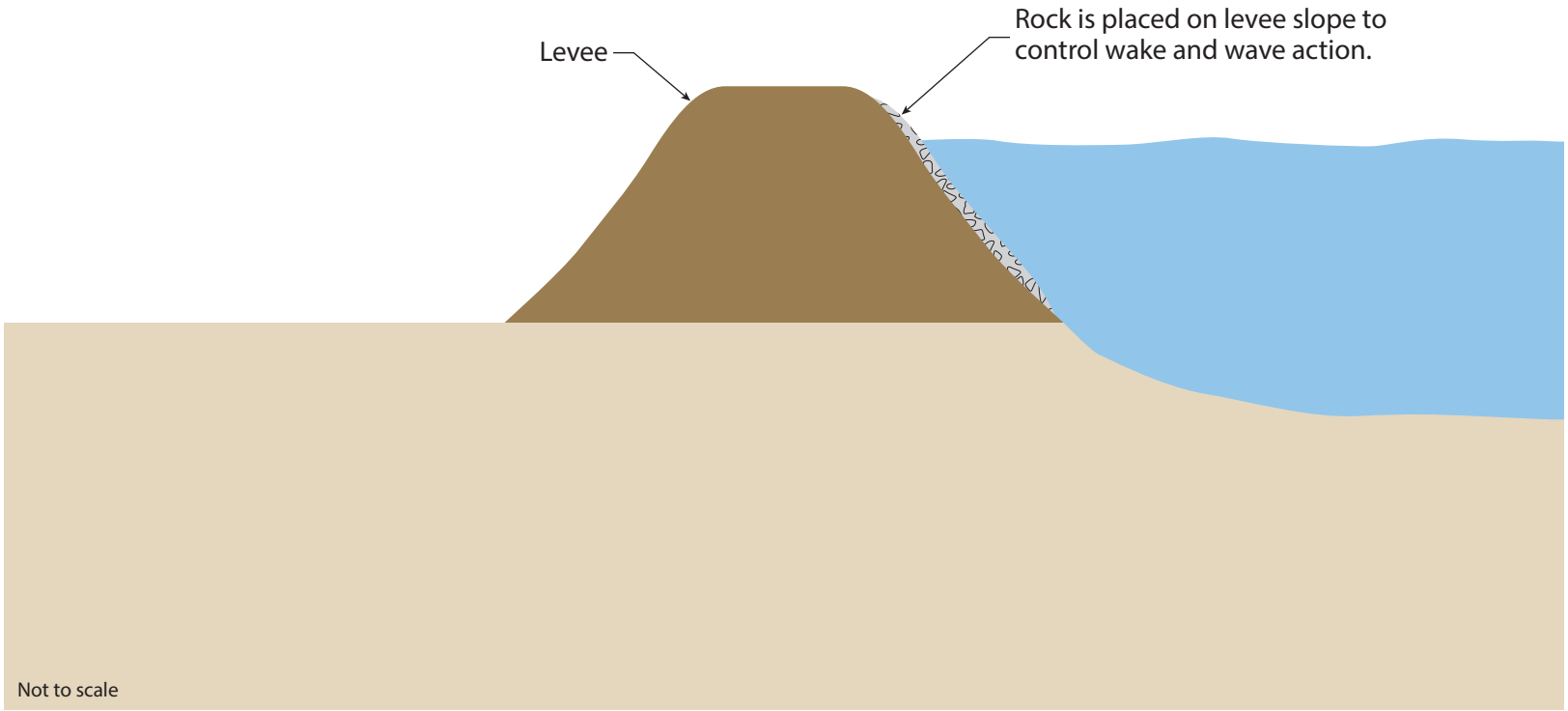
Plate 2-11
Relief Well

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.



Graphics ... 00852.10 (8/3/12) AB

Plate 2-12
Rock Slope Protection

GLENN CO

BUTTE CO

COLUSA CO

SUTTER CO

YUBA CO

Legend

Sutter Basin Project Study Area

200-year Flood Event Estimated Inundation Depth

- 0.010 - 1
- 1 - 2
- 2 - 3
- 3 - 4
- 4 - 5
- 5 - 10
- 10 - 15

N

0 1.5 3

Miles

Source: Peterson Brustad, Inc. 2012

Path: K:\Projects_2\Sutter-Butte_Flood_Control_Agency\00817_10\mapdoc\Task_5_00764_10\FEMA_Flood\Plate_2dNPlate_200yr_Flood_Segment_1.mxd; Author: 20230; Date: 10/1/2012

Plate 2-13

200-year Flood Event Estimated Inundation Depth - Segment 1

GLENN CO

BUTTE CO

COLUSA CO

SUTTER CO

YUBA CO

Legend

Sutter Basin Project Study Area

200-year Flood Event Estimated Inundation Depth

- 0.010 - 1
- 1 - 2
- 2 - 3
- 3 - 4
- 4 - 5
- 5 - 10
- 10 - 18

N

0 1.5 3

Miles

Source: Peterson Brustad, Inc. 2012

Path: K:\Projects_2\Sutter-Butte_Flood_Control_Agency\00817_10\mapdoc\Task_5_00764_10\FEMA_Flood\Plate_200yr_Flood_Segment_2.mxd; Author: 20230; Date: 10/1/2012

Plate 2-14

200-year Flood Event Estimated Inundation Depth - Segment 2

GLENN CO

BUTTE CO

COLUSA CO

SUTTER CO

YUBA CO

Legend

Sutter Basin Project Study Area

200-year Flood Event Estimated Inundation Depth

0.010 - 1

1 - 2

2 - 3

3 - 4

4 - 5

5 - 10

11 - 12

N

0 1.5 3

Miles

Source: Peterson Brustad, Inc. 2012

Path: K:\Projects_2\Sutter-Butte_Flood_Control_Agency\00817_10\mapdoc\Task_5_00764_10\FEMA_FloodPlate_200yr_Flood_Segment_3.mxd; Author: 20230; Date: 10/1/2012

Plate 2-15

200-year Flood Event Estimated Inundation Depth - Segment 3

GLENN CO

BUTTE CO

COLUSA CO

SUTTER CO

YUBA CO

Legend

Sutter Basin Project Study Area

200-year Flood Event Estimated Inundation Depth

- 0.010 - 1
- 1 - 2
- 2 - 3
- 3 - 4
- 4 - 5
- 5 - 10
- 10 - 21

N

0 1.5 3

Miles

Source: Peterson Brustad, Inc. 2012

Path: K:\Projects_2\Sutter-Butte_Flood_Control_Agency\00817_10\mapdoc\Task_5_00764_10\FEMA_FloodPlate_200yr_Flood_Segment_4.mxd; Author: 20230; Date: 10/1/2012

Plate 2-16

200-year Flood Event Estimated Inundation Depth - Segment 4

GLENN CO

BUTTE CO

SUTTER CO

YUBA CO

COLUSA CO

Legend

Sutter Basin Project Study Area

200-year Flood Event Estimated Inundation Depth

- 0.010 - 1
- 1 - 2
- 2 - 3
- 3 - 4
- 4 - 5
- 5 - 10
- 10 - 25

N

0 1.5 3

Miles

Source: Peterson Brustad, Inc. 2012

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Plate 2-17

200-year Flood Event Estimated Inundation Depth - Segment 5

GLENN CO

BUTTE CO

COLUSA CO

SUTTER CO

YUBA CO

Legend

Sutter Basin Project Study Area

200-year Flood Event Estimated Inundation Depth

- 0.010 - 1
- 1 - 2
- 2 - 3
- 3 - 4
- 4 - 5
- 5 - 10
- 10 - 22

N

0 1.5 3

Miles

Source: Peterson Brustad, Inc. 2012

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Plate 2-18

200-year Flood Event Estimated Inundation Depth - Segment 6

GLENN CO

BUTTE CO

COLUSA CO

SUTTER CO

YUBA CO

Legend

Sutter Basin Project Study Area

200-year Flood Event Estimated Inundation Depth

- 0.050 - 1
- 1 - 2
- 2 - 3
- 3 - 4
- 4 - 5
- 5 - 10
- 10 - 22

N

0 1.5 3

Miles

Source: Peterson Brustad, Inc. 2012

Path: K:\Projects_2\Sutter-Butte_Flood_Control_Agency\00817_10\mapdoc\Task_5_00764_10\FEMA_Flood\Plate_200yr_Flood_Segment_7.mxd; Author: 20230; Date: 10/1/2012

Plate 2-19

200-year Flood Event Estimated Inundation Depth - Segment 7

GLENN CO

BUTTE CO

Re-Mapping Currently Underway

SUTTER CO

YUBA CO

COLUSA CO

Legend

FRWLP Study Area

Sutter Basin Project Study Area

FEMA Flood Zones

Zone A = Subject to inundation by 100-year flood event.
FEMA Base Flood Elevations (BFE) have not been determined.

Zone AE = Subject to inundation by 100-year flood event.
FEMA BFE have been determined.

Zone AH = Subject to inundation by 1% annual-chance shallow flooding (usually areas of ponding) with average depths of between 1-3 feet.

Zone AO = Subject to inundation by 1% annual-chance shallow flooding (usually sheet flow on sloping terrain) with average depths of between 1-3 feet.

Zone D = Possible but undetermined flood hazards—no flood hazards analysis has been conducted.

Unshaded Zone X: Areas to be determinde to be outside the 0.2% annual chance floodplain

Shaded Zone X: Areas of .2% annual chance of flood; areas of 1% annual chance of flood with average depths of less than 1 foot or with drainage areas less than 1 sq miles; and areas protected by levees from 1% annual chance flood

Area Not Included

Re-Mapping Currently Underway

N

0 2 4 8

Miles

Source: National Flood Hazard Layer (NFHL), FEMA, 2011.

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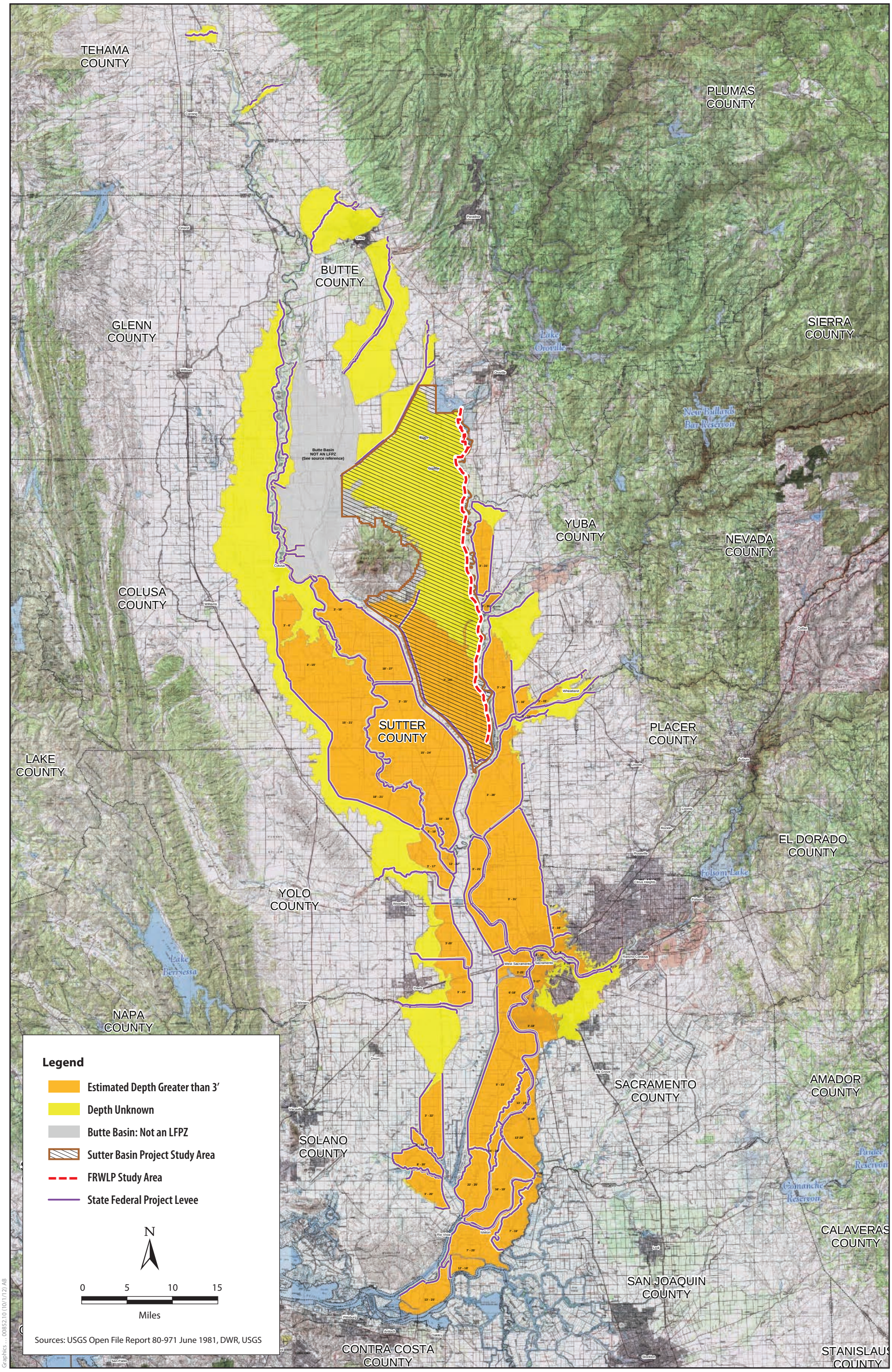
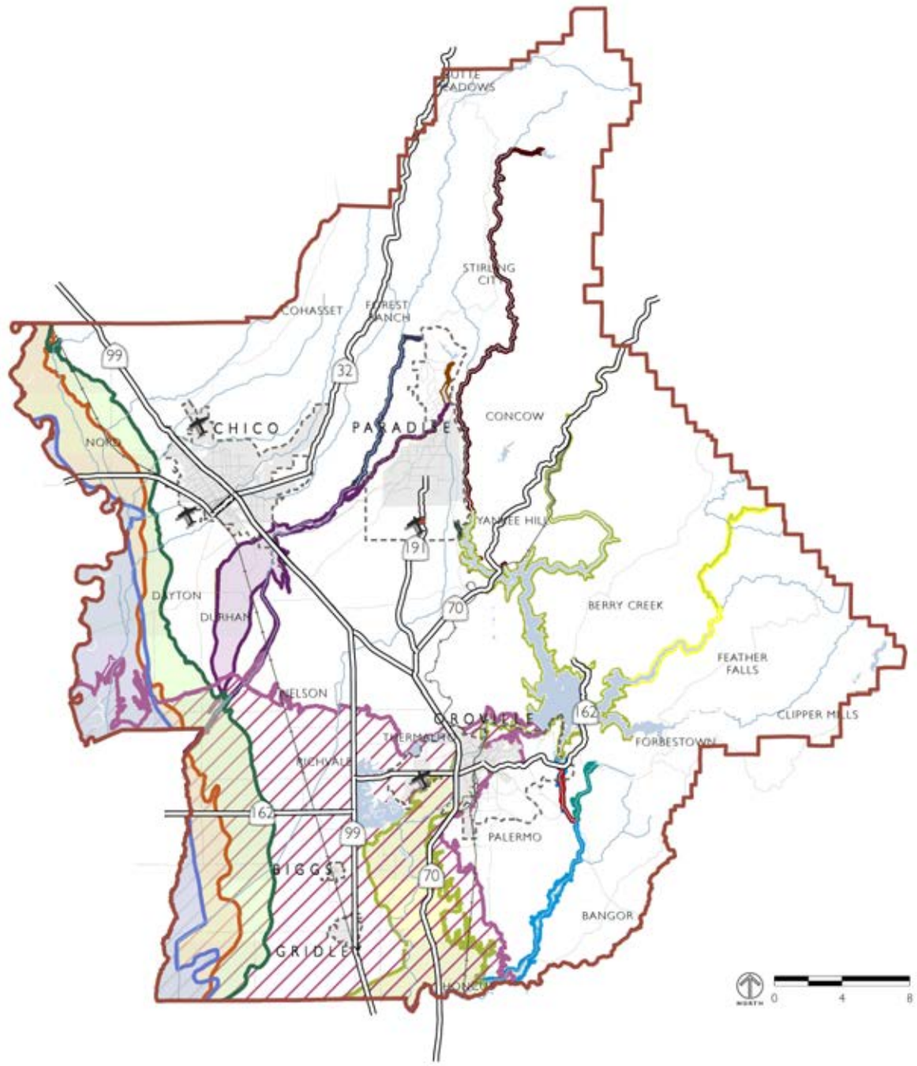
Plate 2-20
FEMA Zones



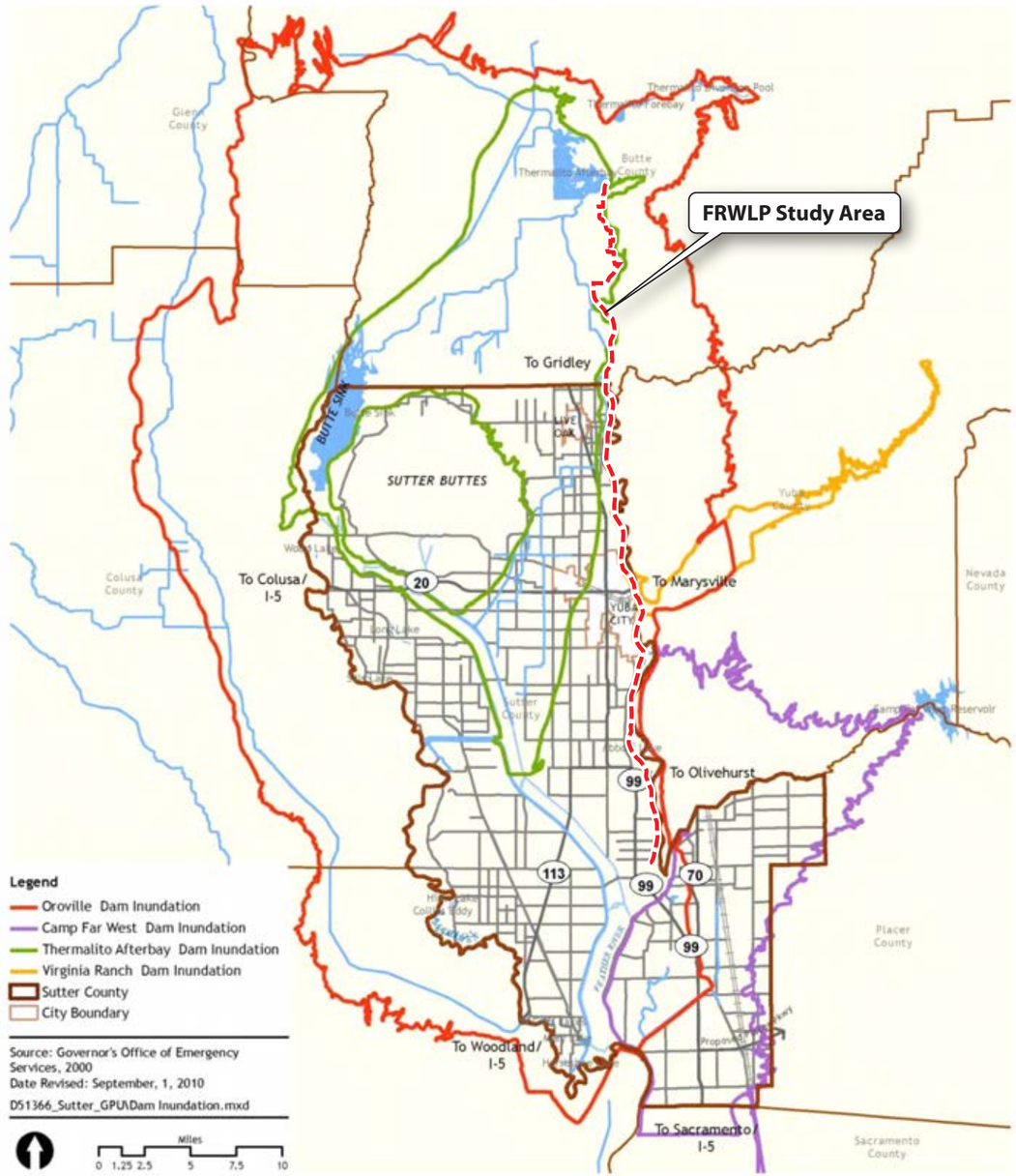
Graphics ... 00852.10 (10/1/12) AB

Plate 3.1-1
Levee Flood Protection Zones



Sources: Butte County Geographic Information Systems, 2009; California Office of Emergency Services, 2006.

- Airports
- Highways
- Railroad
- Major Roads
- Sphere of Influence
- City/Town Limits
- County Boundary
- Black Butte Dam Inundation Area
- Whiskeytown Dam Inundation Area
- Shasta Dam Inundation Area
- Lake Oroville Dam Inundation Area
- Lake Almanor Dam Inundation Area
- Kunkle Dam Inundation Area
- Frenchman Dam Inundation Area
- Magalia Dam Inundation Area
- Paradise Dam Inundation Area
- DeSalba Dam Inundation Area
- Philbrook Dam Inundation Area
- Miner's Ranch Dam Inundation Area
- Bidwell Bar Dam Inundation Area
- Lake Wyandotte Dam Inundation Area



Legend

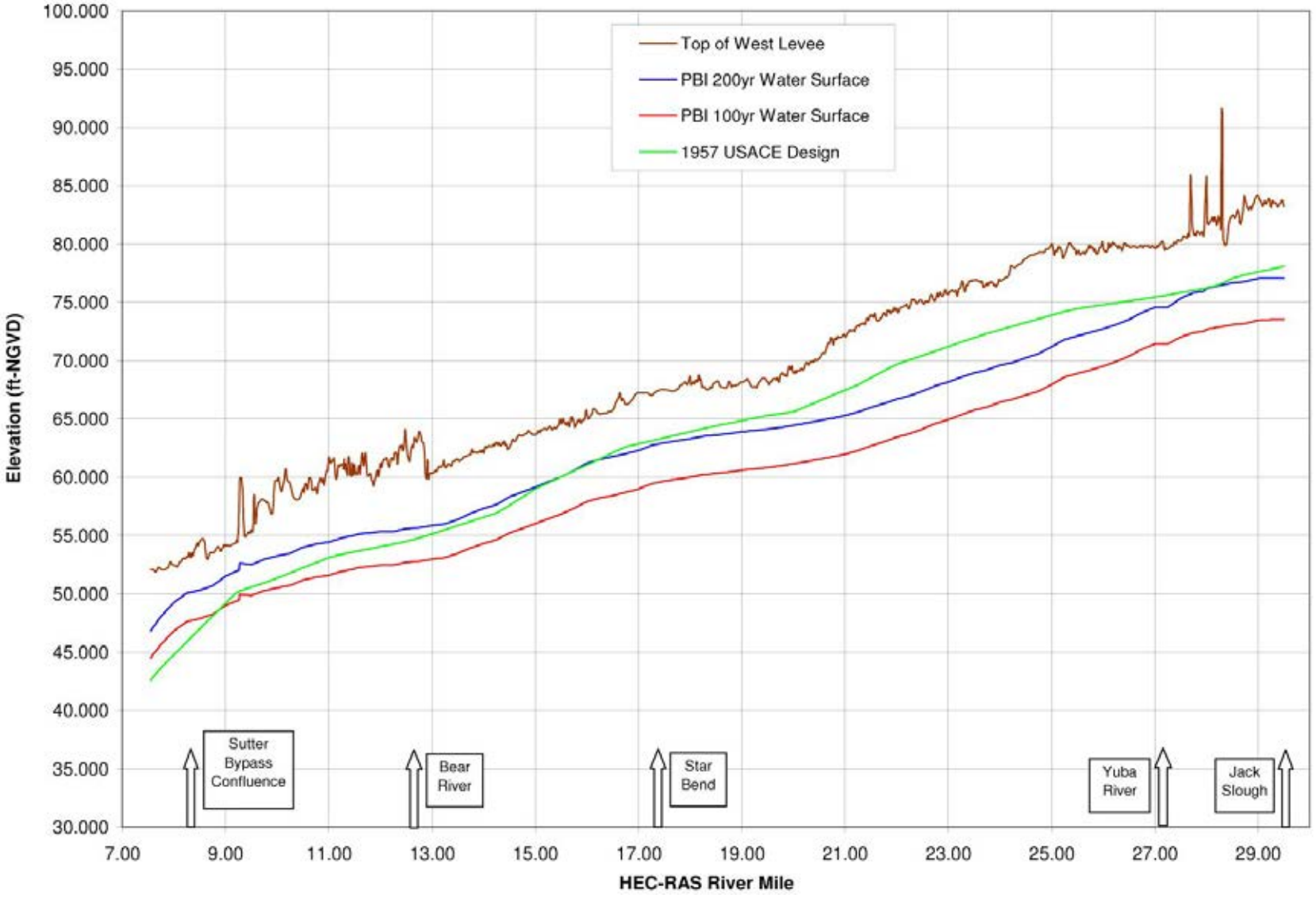
- Oroville Dam Inundation
- Camp Far West Dam Inundation
- Thermalito Afterbay Dam Inundation
- Virginia Ranch Dam Inundation
- Sutter County
- City Boundary

Source: Governor's Office of Emergency Services, 2000
Date Revised: September, 1, 2010
D51366_Sutter_GPU\Dam Inundation.mxd

Miles
0 1.25 2.5 5 7.5 10

Graphics ... 00852.10 (6/19/12) AB

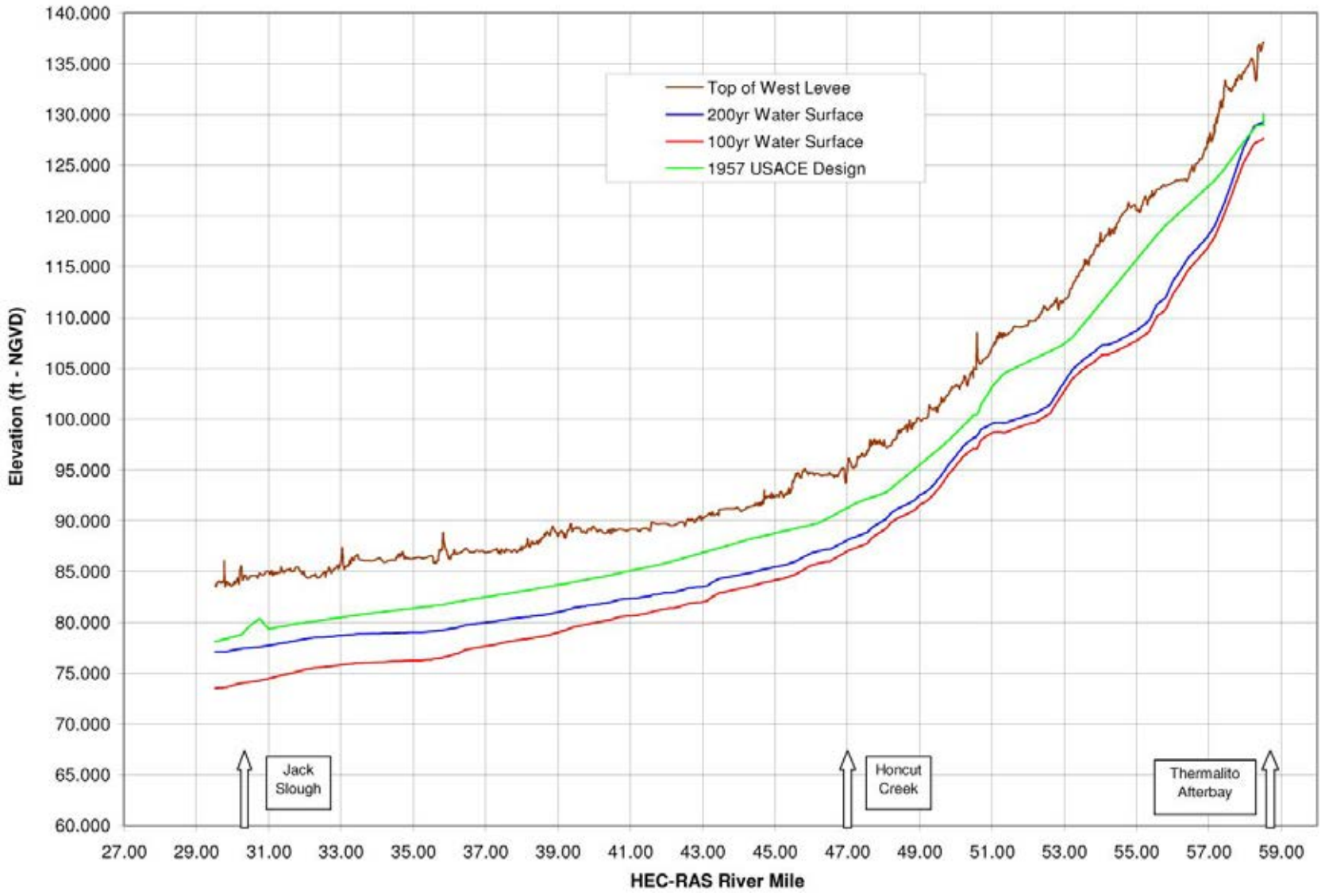
Plate 3.1-2
Dam Inundation Areas



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

Graphics ... 00852.10 (10/1/12)

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

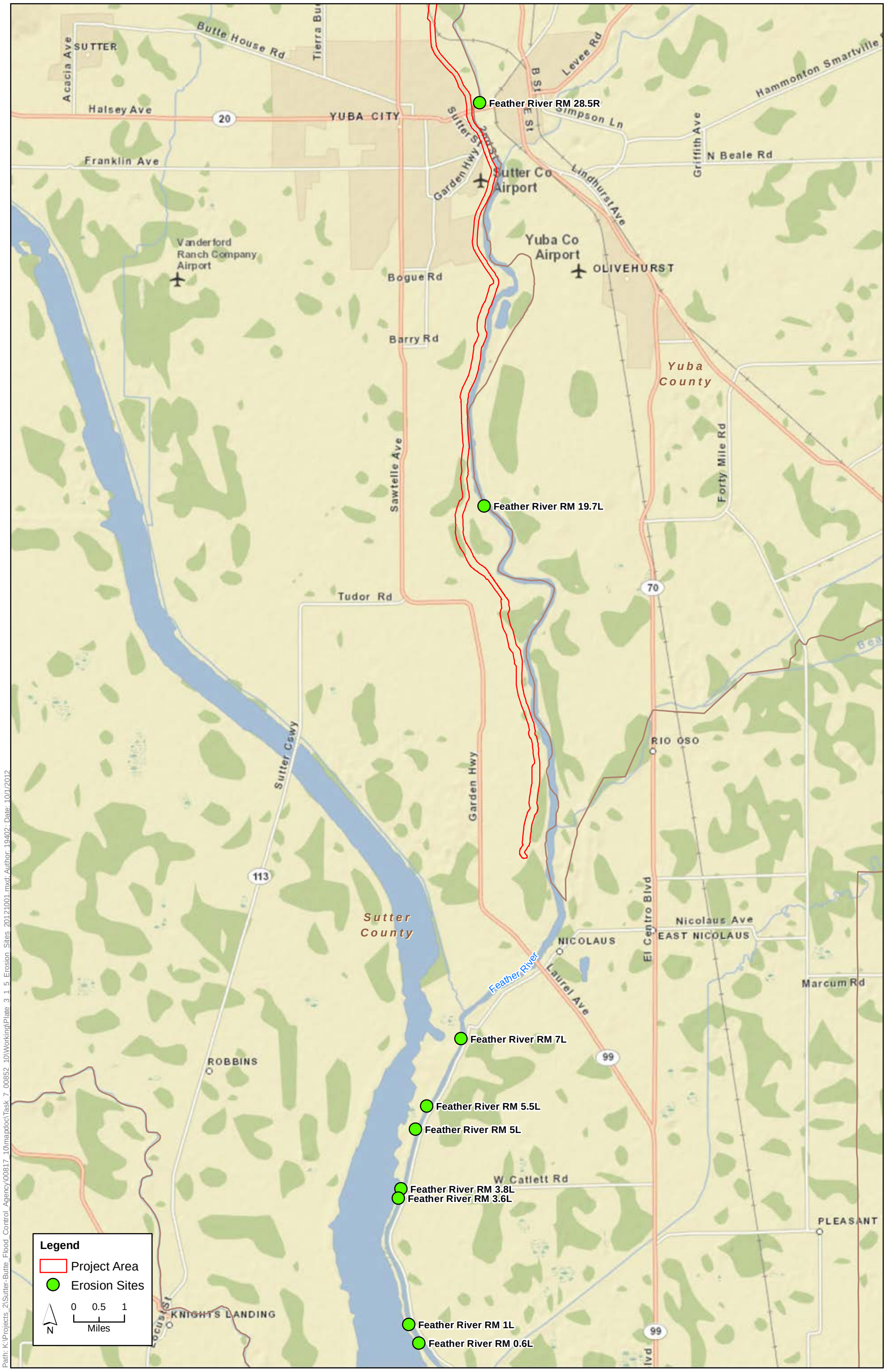


Plate 3.1-5
Erosion Sites

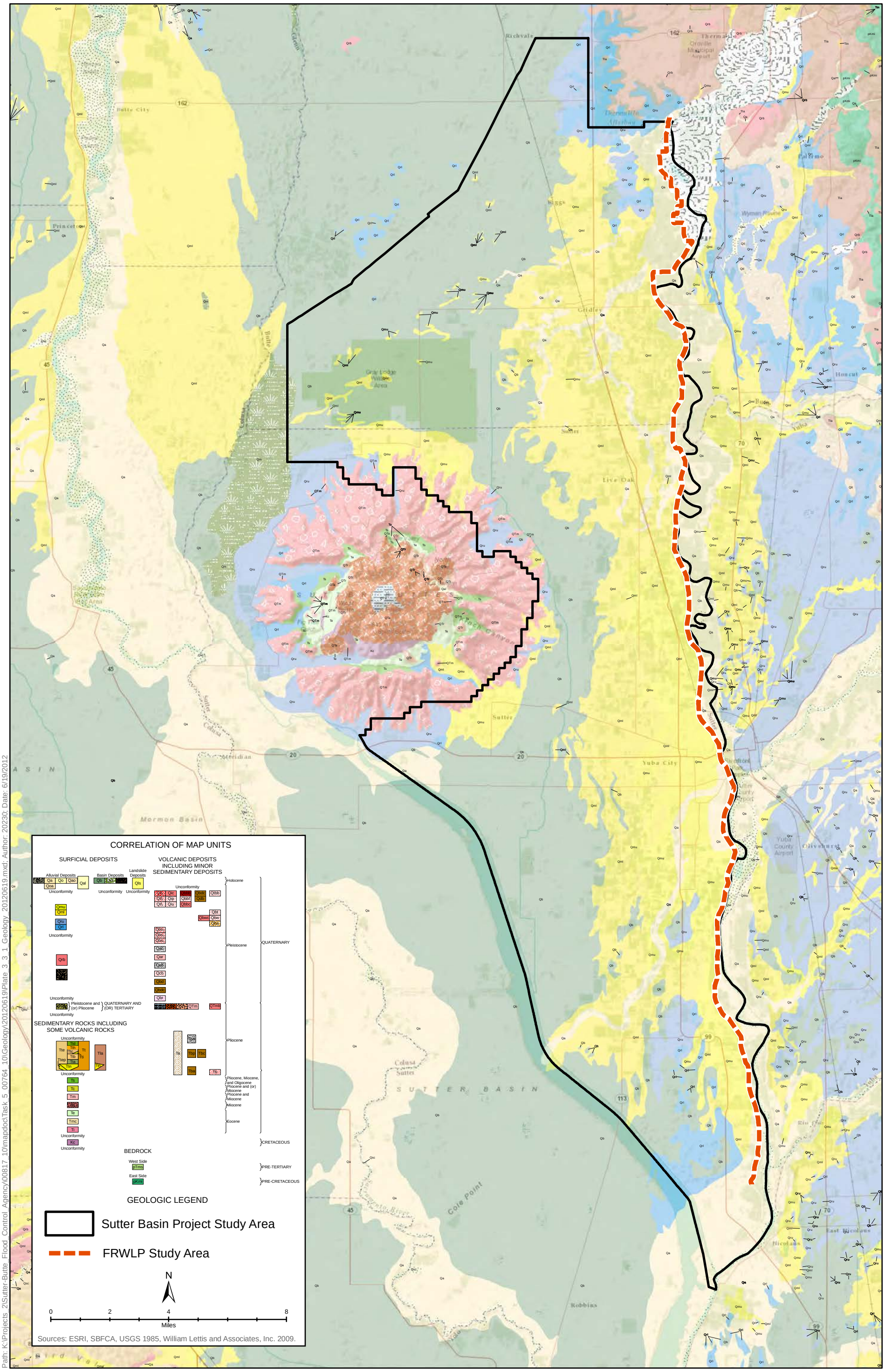
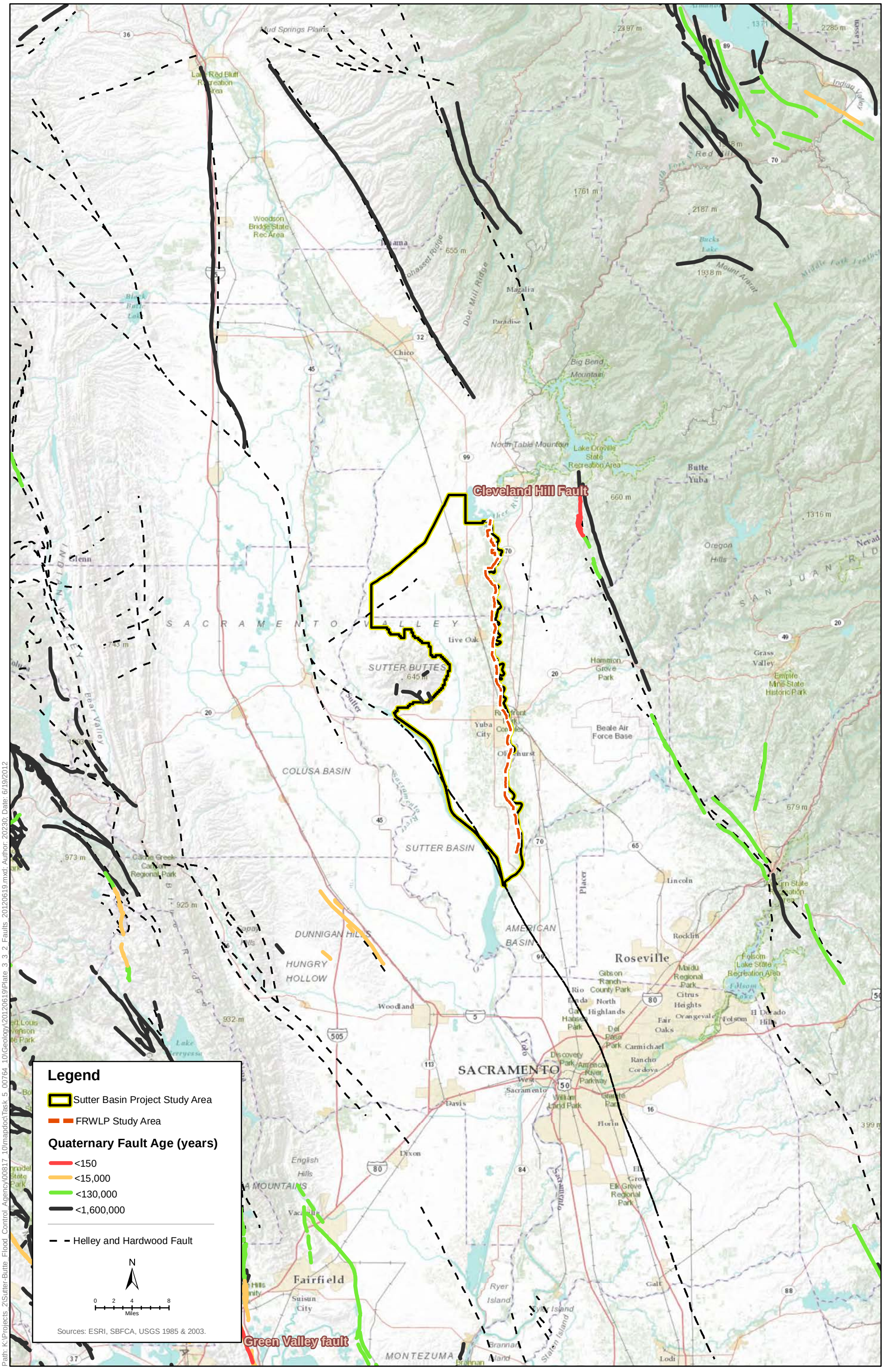
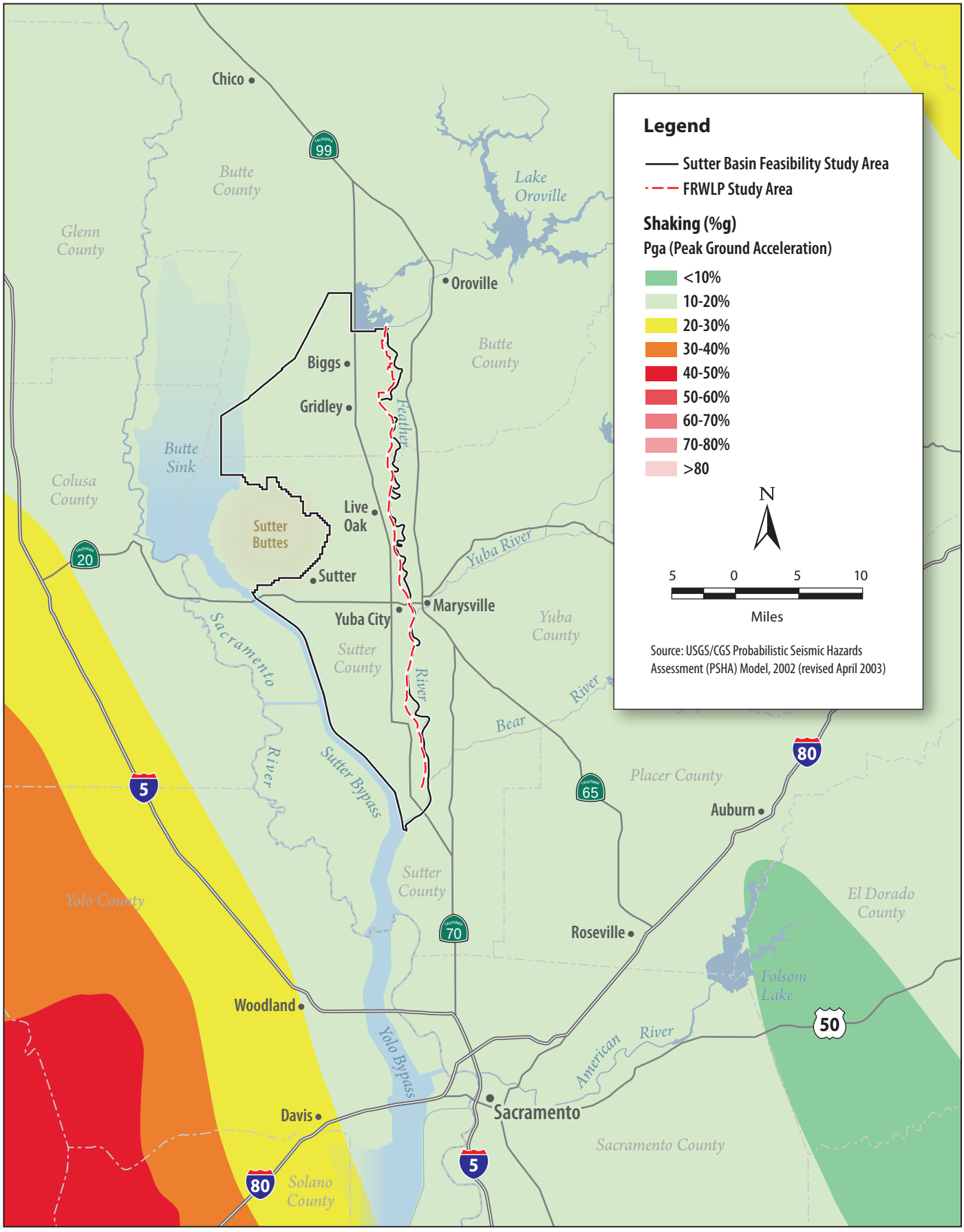


Plate 3.3-1
General Geologic Map


Cleveland Hill Fault
Green Valley fault
Legend
Sutter Basin Project Study Area
FRWLP Study Area
Quaternary Fault Age (years)
<150
<15,000
<130,000
<1,600,000
Helley and Hardwood Fault
N
0 2 4 8
Miles
Sources: ESRI, SBFCA, USGS 1985 & 2003.
SACRAMENTO VALLEY
SUTTER BUTTES
COLUSA BASIN
SUTTER BASIN
AMERICAN BASIN
DUNNIGAN HILLS
HUNGRY HOLLOW
SACRAMENTO
Chico
Oroville
Roseville
Lincoln
Rocklin
Woodland
Davis
Dixon
Fairfield
Suisun City
Vacaville
Yuba City
Marysville
Beale Air Force Base
Grass Valley
Lake Oroville State Recreation Area
Folsom Lake State Recreation Area
Woodson Bridge State Rec Area
Lake Red Bluff Recreation Area
Hamman Grove Park
Empire Mine State Historic Park
Big Bend Mountain
North Table Mountain
Oregon Hills
Mud Springs Plains
Magalia
Paradise
Doe Mill Ridge
Mount Ararat
Bucks Lake
Indian Valley
Lake Berryessa
Cache Creek Canyon Regional Park
Elk Grove Regional Park
Maidu Regional Park
Gibson Ranch County Park
Hansen Park
Del Paso Park
Discovery Park
William Land Park
Granite Park
Rancho Cordova
Carmichael
Fair Oaks
Orangevale
Folsom
Citrus Heights
North Highlands
Rio Linda
Oak Park
Sacramento West
American River Parkway
Yolo
Sacramento
Placer
Lassen
Butte
Yuba
Glenn
Colusa
Solano
Yolo
Sutter
Bear Valley
Indian Valley
English Hills
Ryer Island
Staten Island
Brannan Island
Cache Creek
Putah Creek
Sacramento River
Feather River
North Fork Feather River
Middle Fork Feather River
San Juan Ridge
Nevada
Placer
Lassen
Yuba
Sutter
Colusa
Solano
Yolo
Glenn
Tehama
Butte



Graphics ... 00852.10 (6/19/12) AB

Plate 3.3-3
Minimum Peak Horizontal Ground Acceleration in the Study Area Vicinity

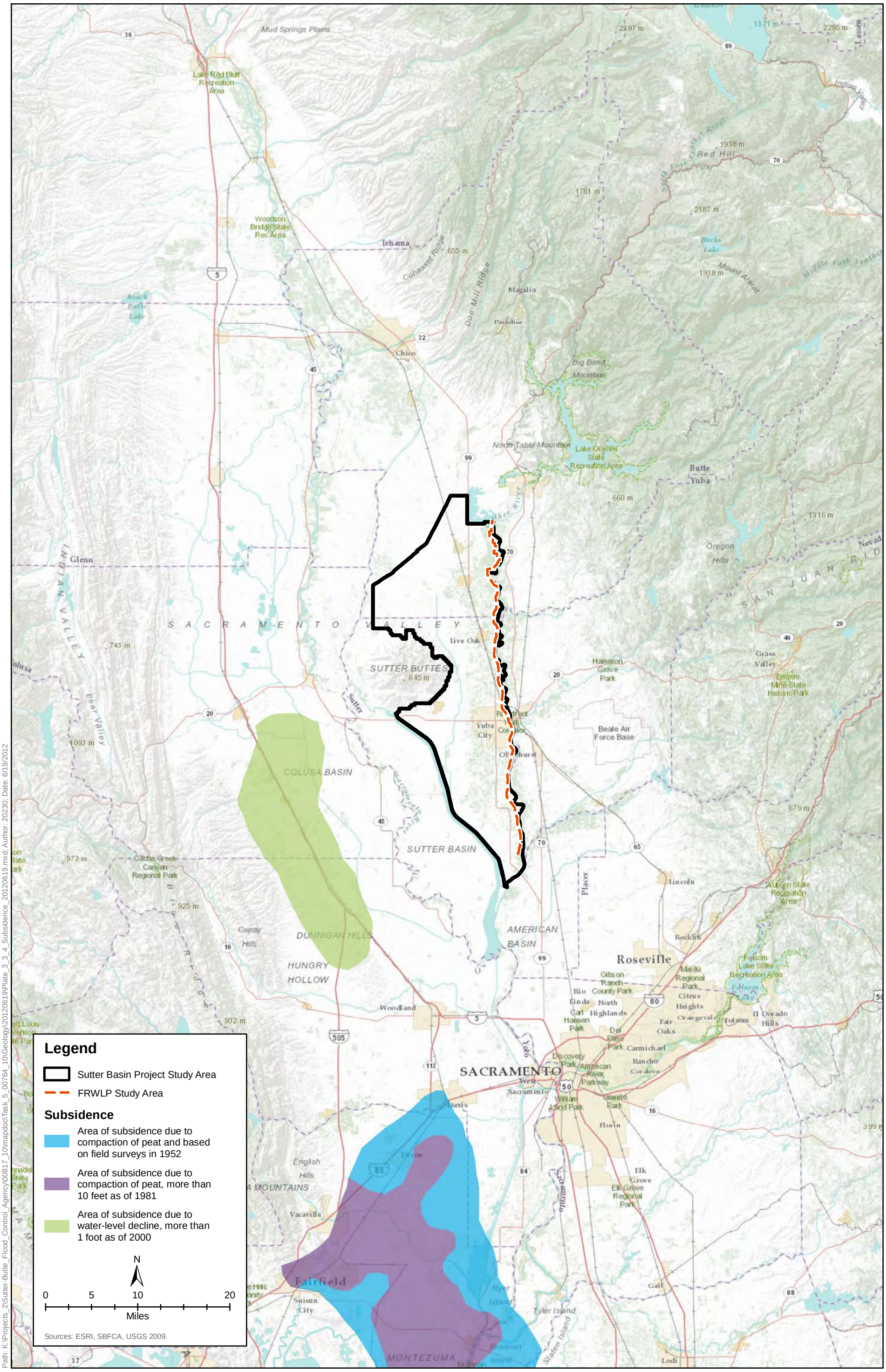


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Plate 3.3-4
Subsidence in the Study Area Vicinity

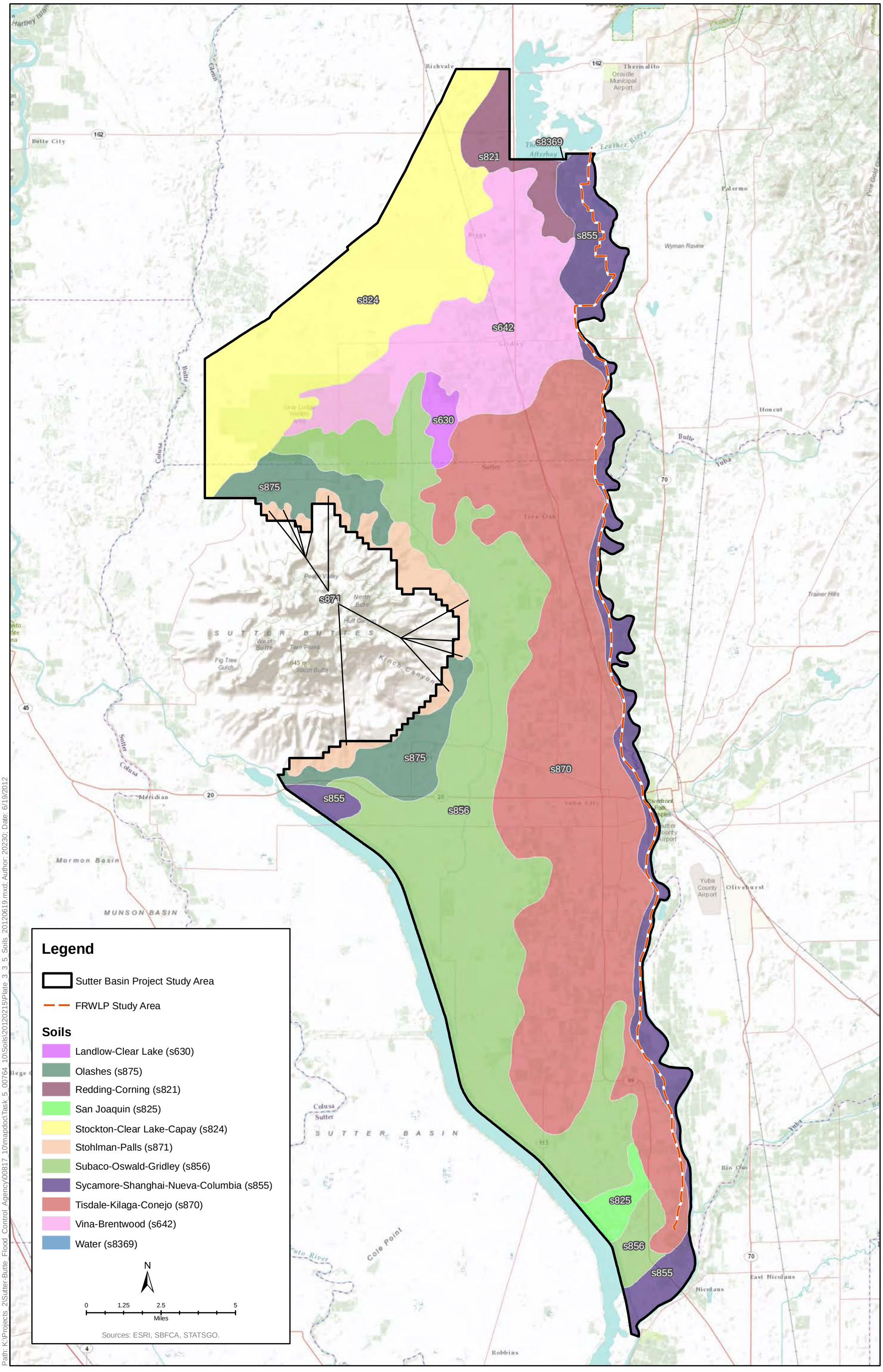

Plate 3.3-5
Soils in the Study Area

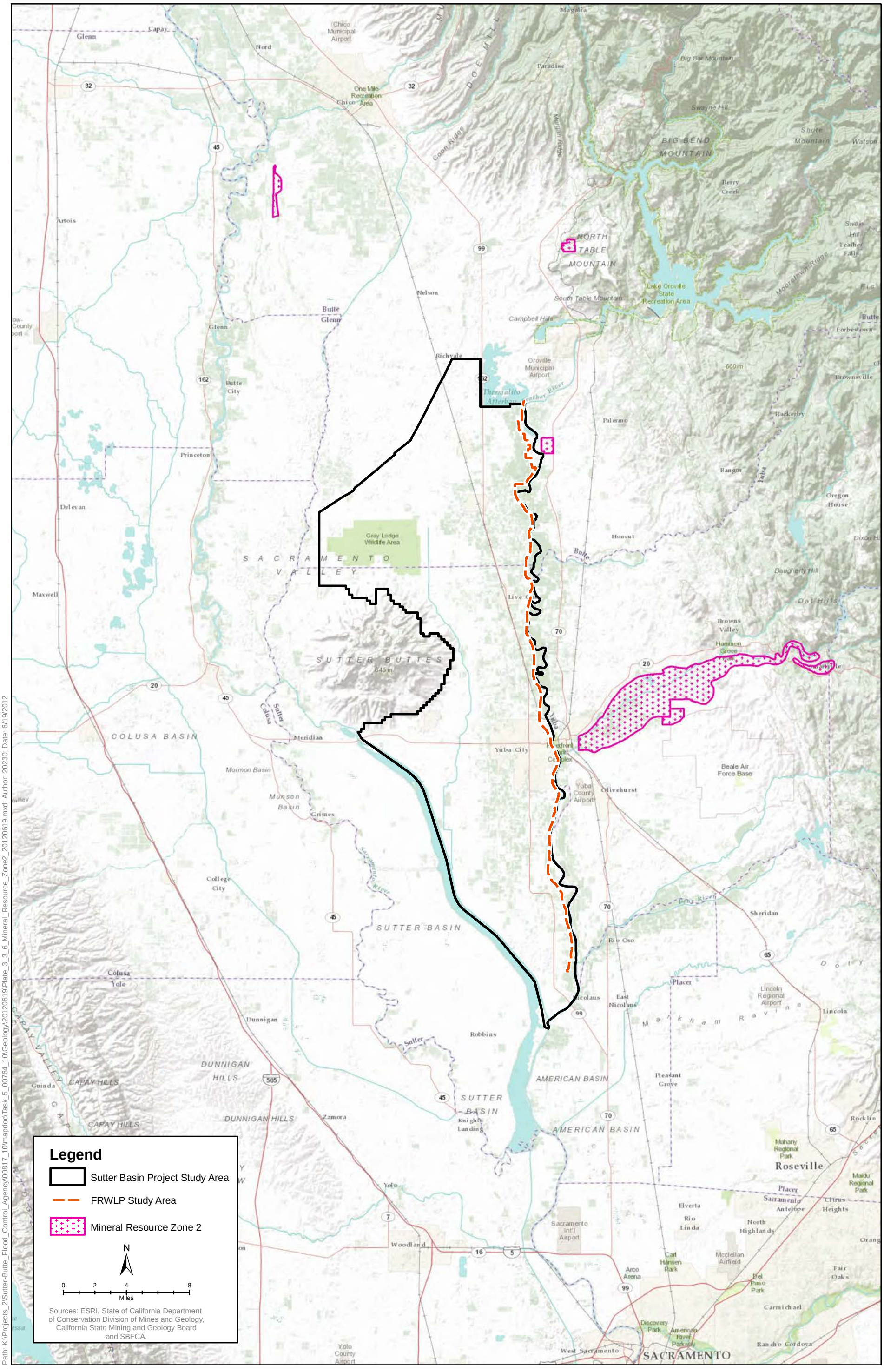

Plate 3.3-6
Mineral Resource Zone 2 in the Study Area Vicinity

AGGREGATE AVAILABILITY IN NORTHERN CALIFORNIA

Fifty-Year Aggregate Demand Compared to Permitted Aggregate Resources

Fifty-Year Aggregate Demand Compared to Permitted Aggregate Resources*

The pie diagrams show the projected 50-year demand for aggregate as of January 2006 compared to currently permitted aggregate resources (in short tons). The 50-year demand for a particular study area is graphically represented by one of four pie diagram sizes. Study area boundaries are shown on the index map of aggregate studies (lower left).

** Permitted aggregate resources (also called aggregate reserves) are those portions of the resources for which local lead agencies (counties and cities) have issued mining permits. Non-permitted aggregate resource information is given in each aggregate study report. See accompanying text for references to these reports.*

Map Usage and Limitations

This map is intended to provide general information about the current availability of California's permitted construction aggregate resources to state, regional, and local land-use planners and decision-makers. It is designed to assist planning agencies in considering construction aggregate needs in the regional planning process. However, the map is not intended to be used as the sole source of information about construction aggregate availability, or as the basis for site-specific land-use decisions. Although the statewide and regional information on this map may be useful to local decision-makers, the more detailed information contained in the referenced aggregate studies should be used for local land-use decision-making purposes.

Legend

50-year demand that will not be met by existing permitted resources.
Permitted aggregate resources.

50-year demand is 25 to 200 million tons.

50-year demand is > 200 to 500 million tons.

50-year demand is > 500 to 800 million tons.

50-year demand is more than 800 million tons.

Examples

50-year demand for aggregate is 100 million tons; permitted resources total 25 million tons of the 50-year demand.

25/100 Million Tons (permited resources/ 50-year demand)

50-year demand for aggregate is 510 million tons; permitted resources are greater than or equal to the 50-year demand.

550/510 Million Tons (permited resources/ 50-year demand)

Areas With Short Term Aggregate Supply

< 10 years of permitted resources remaining in the study area.

Aggregate Production Areas

(Symbols represent one or more aggregate mines, tonnage represents 2005 annual production)

- < 0.5 Million Tons per Year
- 0.5 - 2 Million Tons per Year
- >2 - 5 Million Tons per Year
- >5 - 10 Million Tons per Year
- >10 Million Tons per Year

Population

1 Dot = 100 Persons
(based on 2000 Census Data)

- City
- Interstate Route
- U.S. Route
- State Route
- Primary Highway
- Secondary Highway
- County Boundary

N

20 0 20 40 60
Miles
20 0 20 40 60
Kilometers

Scale: 1:1,100,000

Projection: Teale Albers
Datum: NAD 27

Source: California Geological Survey 2006.

Shasta County
51/122 Million Tons

Tehama County
36/72 Million Tons

Study Area

Glenn County
17/83 Million Tons

Yuba City-Marysville
409/360 Million Tons

Nevada County
31/122 Million Tons

Placer County
45/171 Million Tons

Sacramento-Fairfield
164/235 Million Tons

El Dorado County
19/91 Million Tons

Sacramento County
67/733 Million Tons

North San Francisco Bay
49/647 Million Tons

Stockton-Lodi
196/728 Million Tons

Stanislaus County
51/344 Million Tons

Eastern Merced County
53/106 Million Tons

South San Francisco Bay
458/1,244 Million Tons

Graphics...00852.10 (6/19/12) AB

Plate 3.3-7
Aggregate Demand and Availability in Northern California and the Study Area

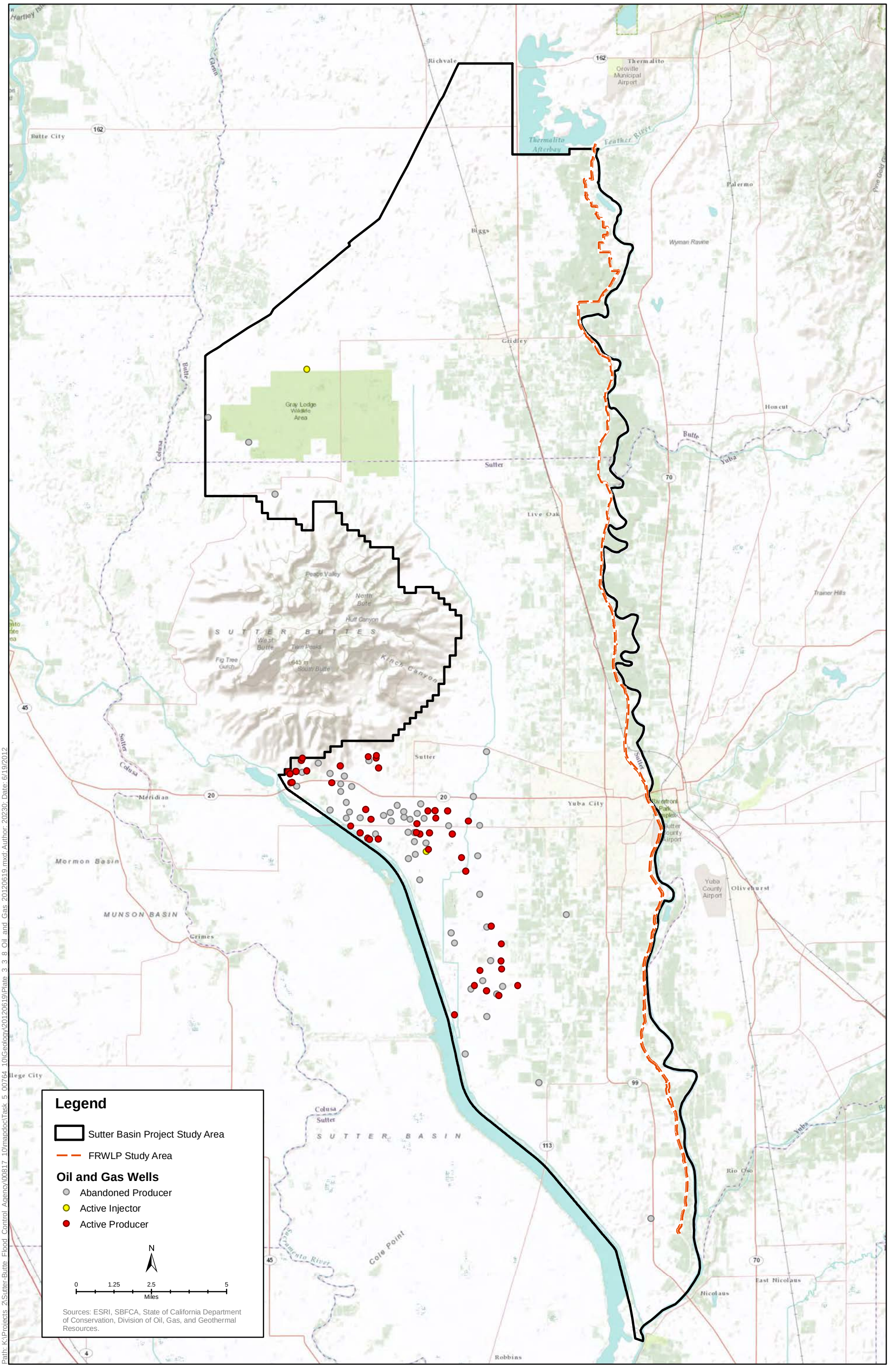

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Plate 3.3-8
Oil and Gas Wells Within the Study Area

Bellevue Ave
Laurel Ave
Oak Ave
Cypress Ave

Map Sheet Index
113
South Yuba City
Yuba City
20
Marysville
Linda
Olivehurst
70
65
99
162

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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Feet

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Bellevue Ave

Laurel Ave

Oak Ave

Cypress Ave

202+50

218+66

3

Map Sheet Index

113

99

162

South Yuba City

Yuba City

20

Marysville

Linda

Olivehurst

70

65

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

0 250 500

Feet

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Cypress Ave

Clayton Ave

Central Ave

4

Map Sheet Index

113

South Yuba City

Yuba City

20

Marysville

Linda

Olivehurst

70

65

99

162

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

0 250 500

Feet

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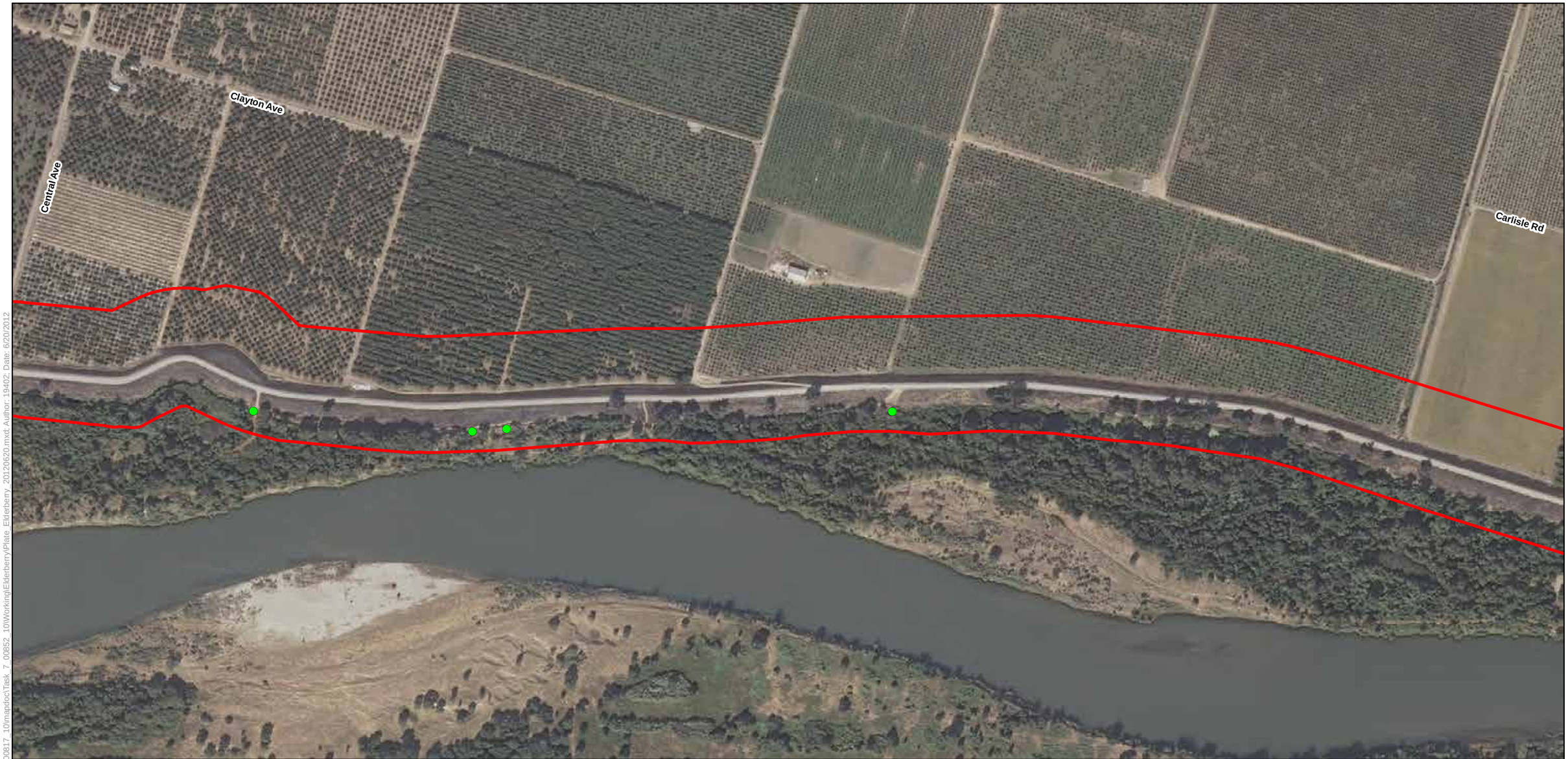



Legend

- 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

0 250 500
Feet

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Carlisle Rd

Wilkie Ave

Lyon Ave

Oconnor Ave

Peck Ave

Ashford Ave

410+67 5

478+68 6

Map Sheet Index

113

99

162

South Yuba City

Yuba City

20

Marysville

Linda

Olivehurst

70

65

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

0 250 500

Feet

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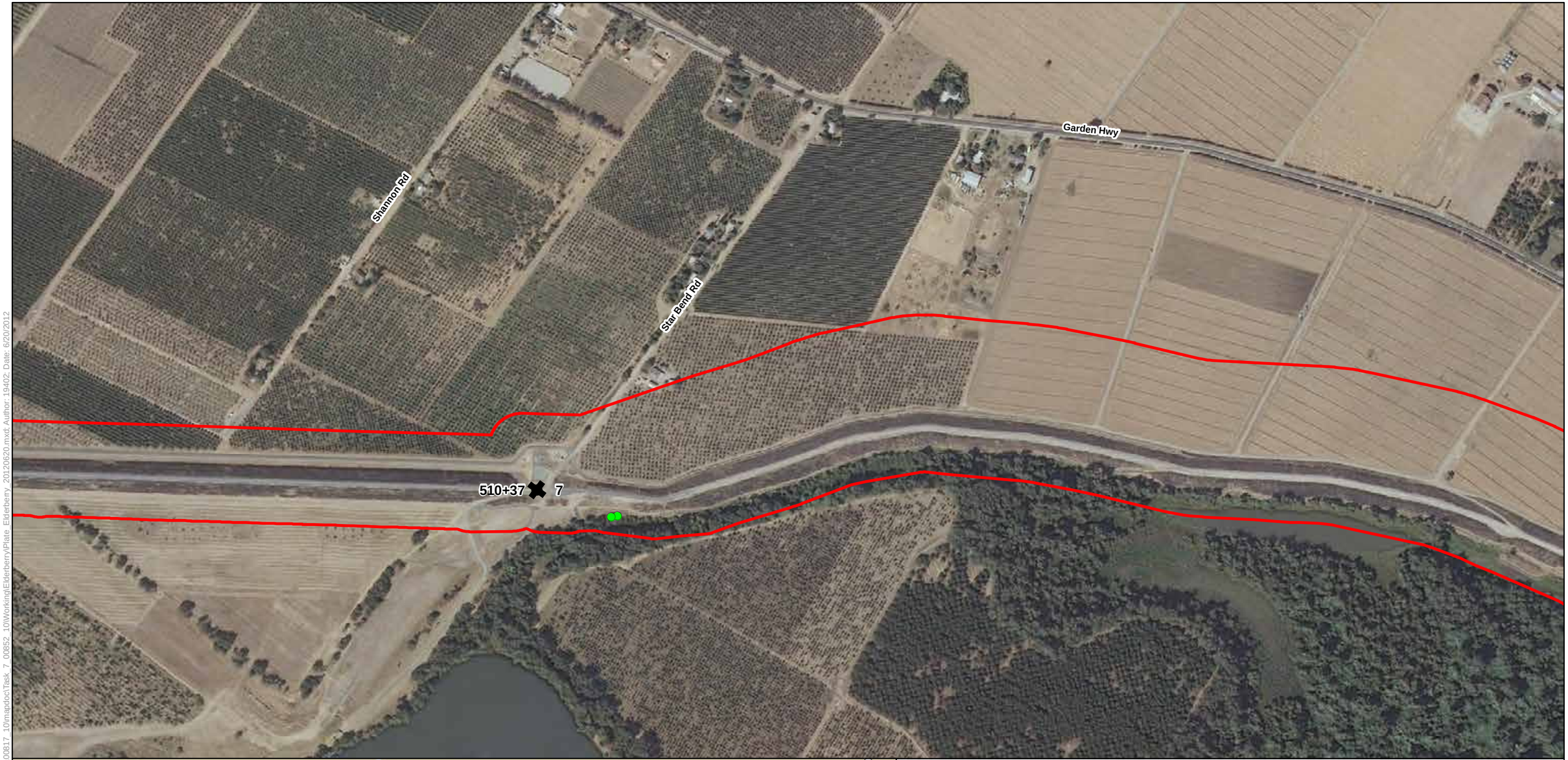



Legend

- 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 5

0 250 500

Feet

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Garden Hwy

Obanion Rd

596+00

8

Map Sheet Index

113

South Yuba City

Yuba City

20

Marysville

Linda

Olivehurst

70

65

99

162

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

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Garden Hwy

Messick Rd

654+75

9

Map Sheet Index

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South Yuba City

Yuba City

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Marysville

Linda

Olivehurst

70

65

99

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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 7

0 250 500

Feet

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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

0 250 500

Feet

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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

0 250 500

Feet

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Wild River Dr
Crystal Creek Ln
Bogue Rd
Lonely Oak St
Edgewater Way
Rocky Ct
Rapid Water Way
Private Rd
Burns Dr
Putman Ave
Epley Dr
Levee Rd
927+00
Idaho Dr
845+00
13
Shanghai Bend Rd
Eureka Dr
Levee Rd

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South Yuba City
Yuba City
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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

0 250 500
Feet

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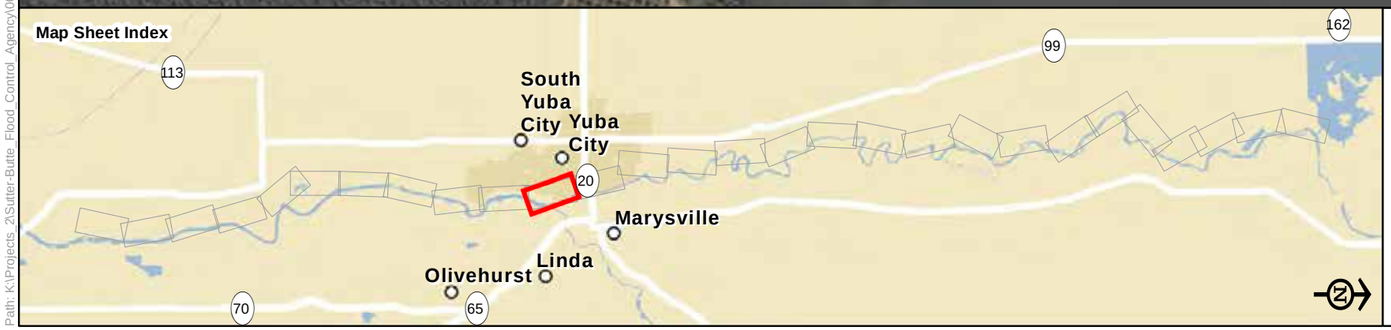

Legend

- 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

0 250 500

Feet

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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

0 250 500
Feet

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Sandalwood Ct
Teakwood Dr
Beechwood St
Oakview Dr
Forestview Dr
Baywood Ct
N Point Dr
Northridge Dr
Santa Barbara Way
Pease Rd
Tamarack Dr
Hunt St
Clark Ave
Parkbrook Ct
Cassidy Ct
Bal Sukh Mhp Rd
Northgate Dr
Live Oak Blvd
1130+86
18
Levee
Cassidy Ave
Bal Sukh Mhp
Private Rd
17

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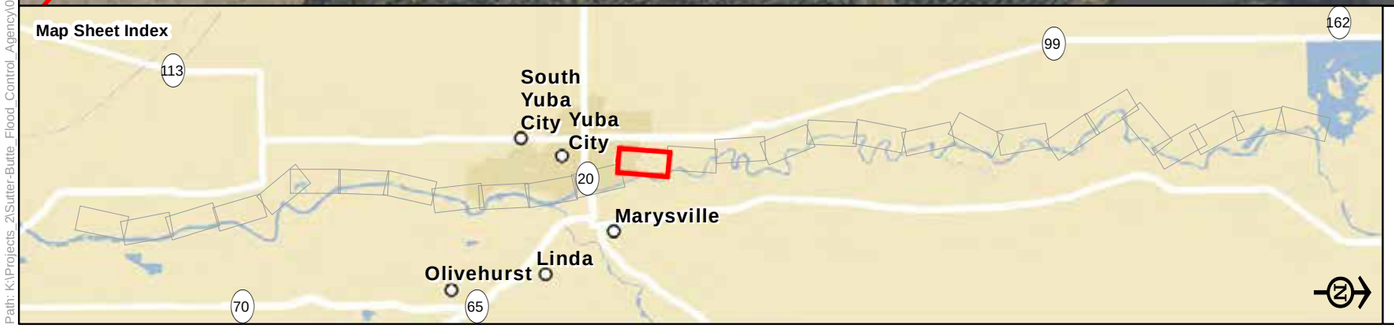
Map Sheet Index



Legend

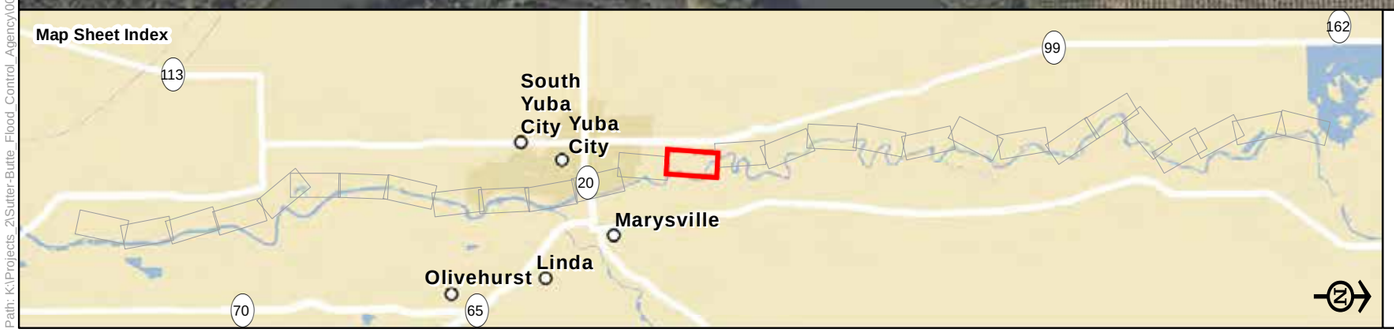
- Biological Study Area
- Reach
- Station 202+50
- Elderberry Shrub
- Elderberry Shrub Clusters

Plate 3.9-1
Locations of Elderberry Shrubs in the Study Area

Sheet 13

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 14

0 250 500
Feet

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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 15

0 250 500
Feet

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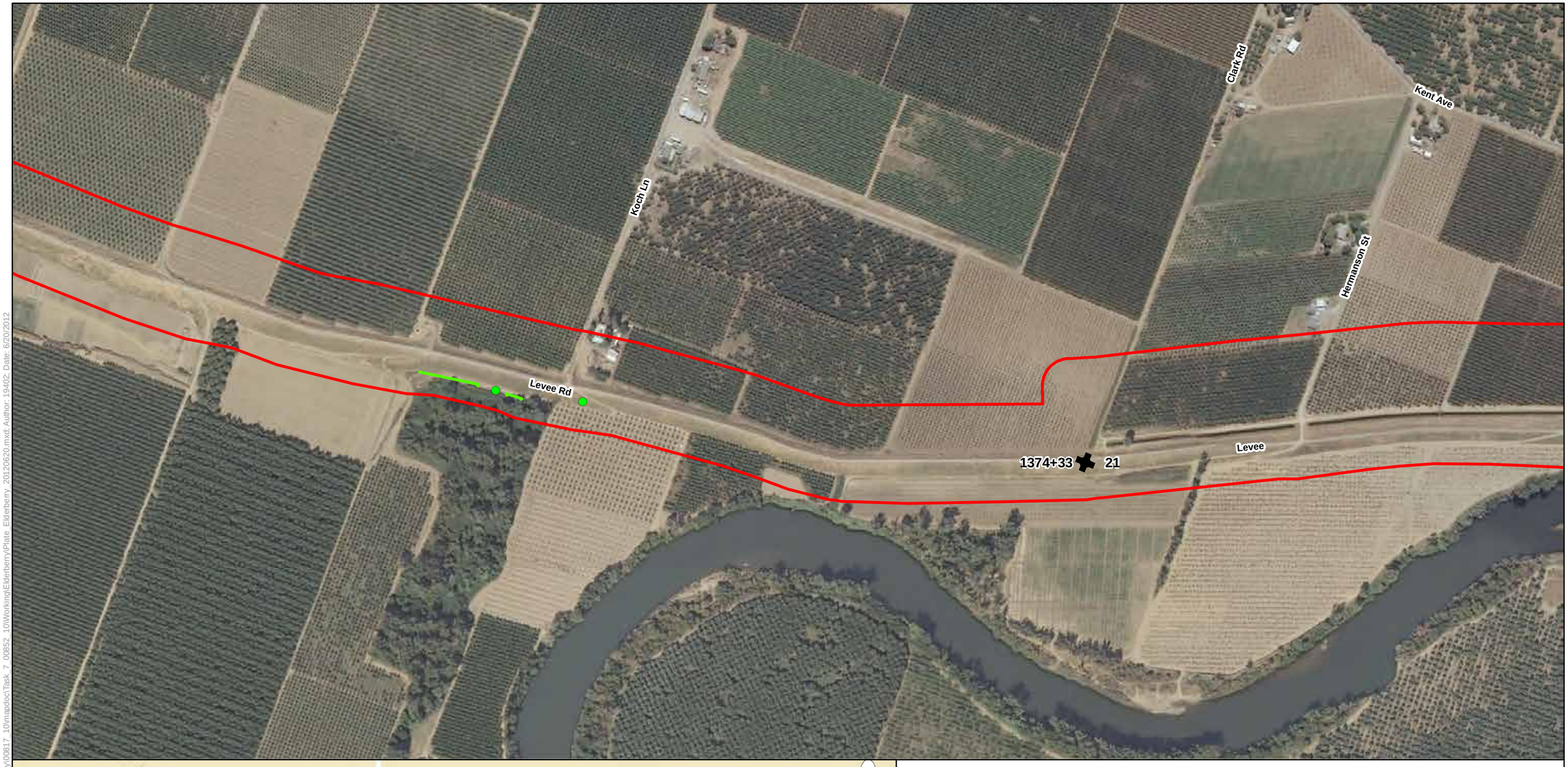

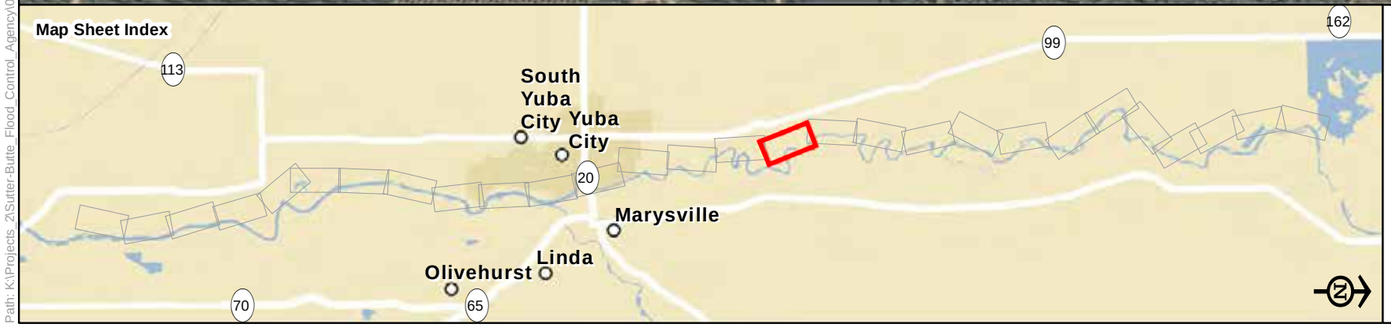

Legend

- 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

0 250 500

Feet

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Cutting Ave

Mcdonald Ave

Paseo Rd

Kent Ave

Bridgeford Rd

Levee Rd

1433+83

22

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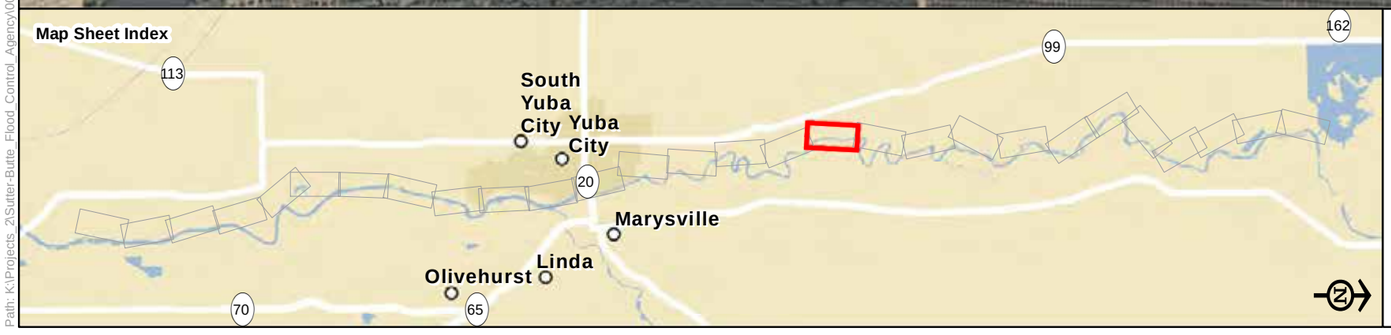

Legend

- 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 17

0 250 500

Feet

Bishop Ave
Kent Ave
Archer Ave
Pennington Rd
1503+83
23
Private Rd
Levee Rd

Map Sheet Index
113
South Yuba City
Yuba City
20
Marysville
Linda
Olivehurst
70
65
99
162

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

0 250 500
Feet

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Campbell Rd

Encinal Rd

Private Rd

Cooley Rd

1623+86 25

1609+37 24

Sparrow Ln

Map Sheet Index

113

99

162

South Yuba City

Yuba City

20

Marysville

Linda

Olivehurst

70

65

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

0 250 500

Feet

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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

0 250 500

Feet

Campbell Ave

E Evans Reimer Rd

Center Ave

1721+60 28

Levee Rd

1769+31 29

Alexander Ave

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 21

0 250 500

Feet

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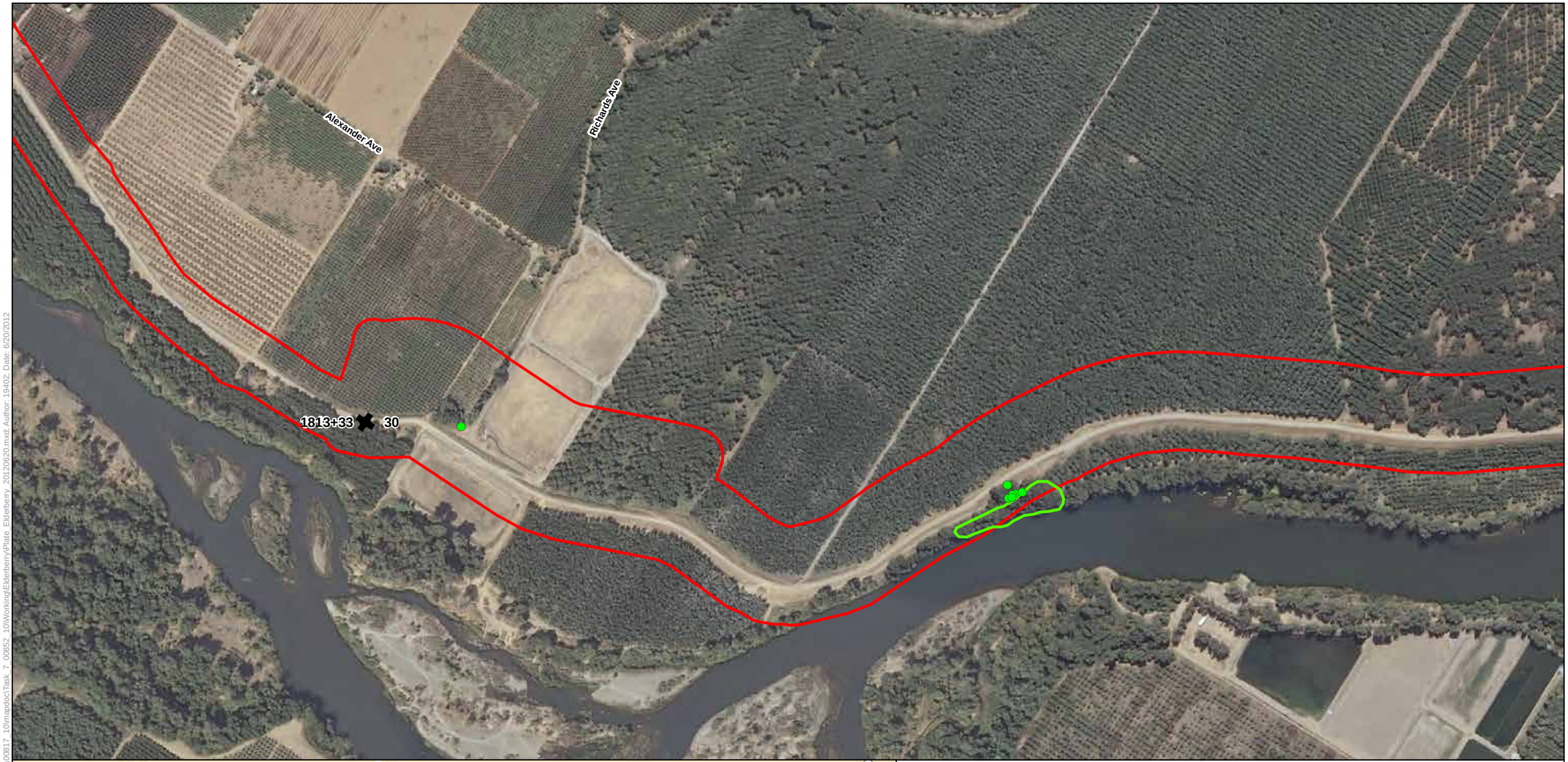



Legend

- 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

0 250 500
Feet

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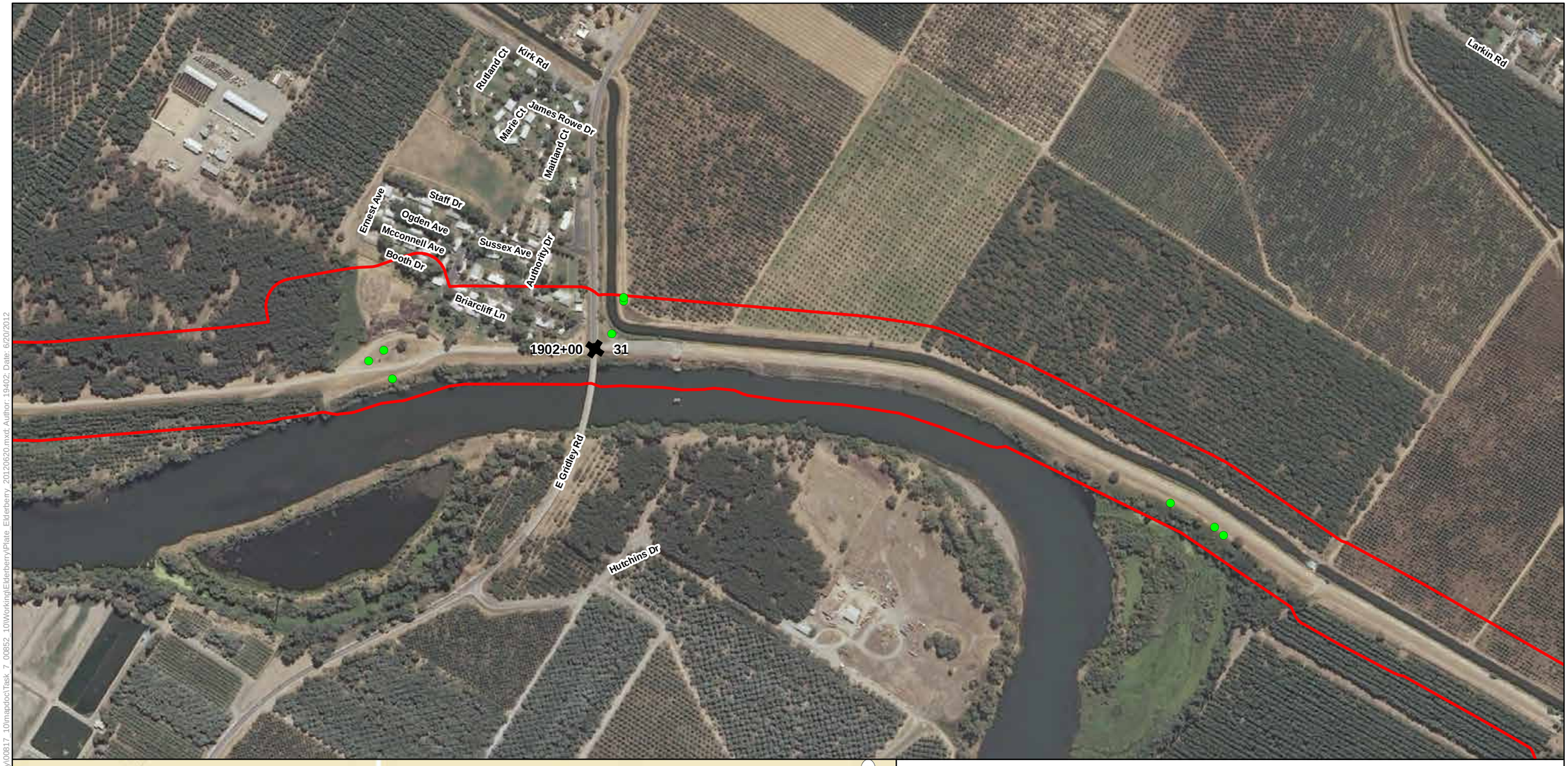



Legend

- 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

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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 24

0 250 500
Feet

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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

0 250 500
Feet

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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

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Haselbush Ln

Larkin Rd

Vance Ave

2359+00 41

2319+00 40

39

Map Sheet Index

113 99 162 20 70 65

South Yuba City

Yuba City

Marysville

Linda

Olivehurst

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

0 250 500
Feet

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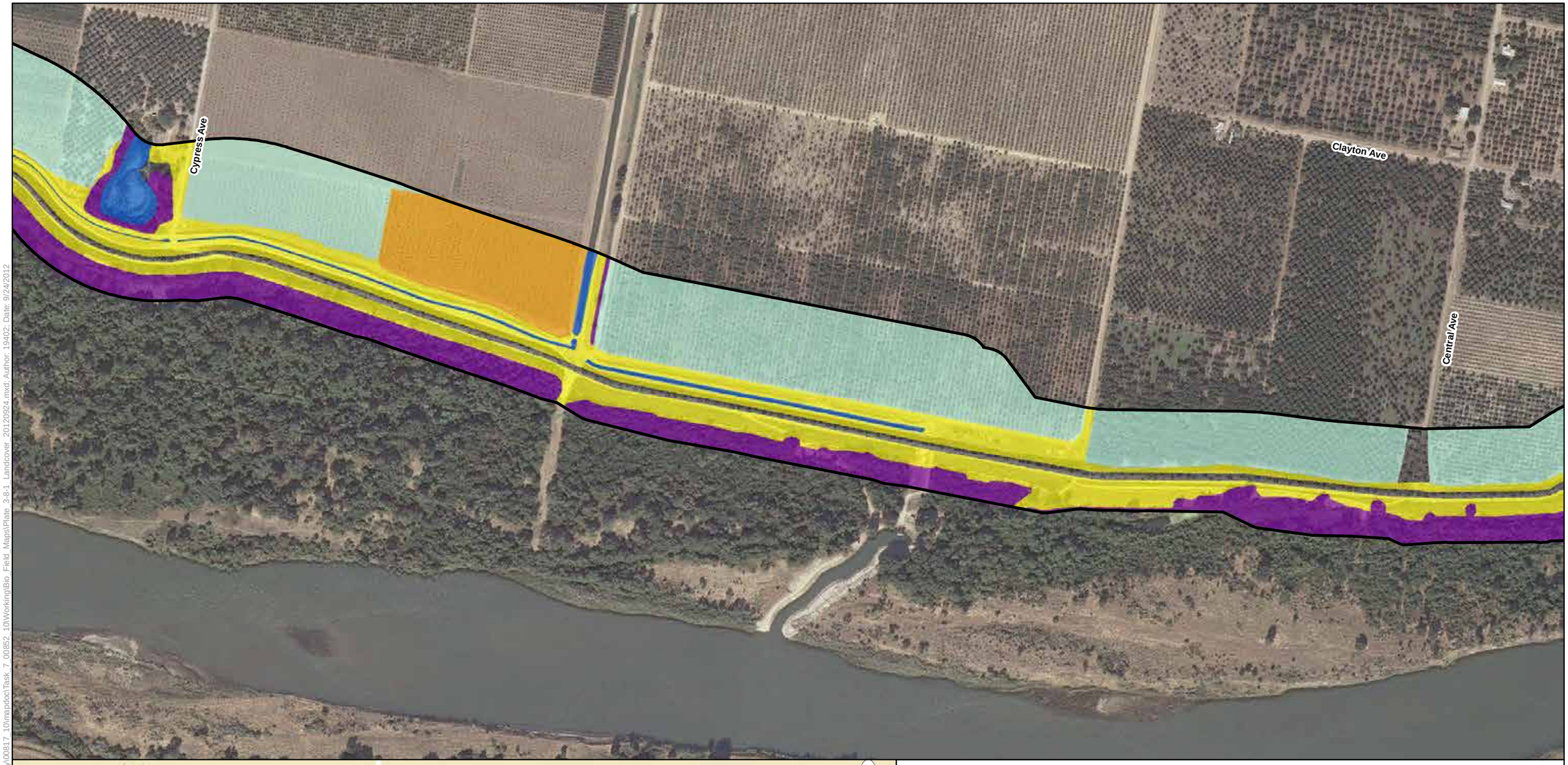



Legend

- 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 2

0 250 500
Feet

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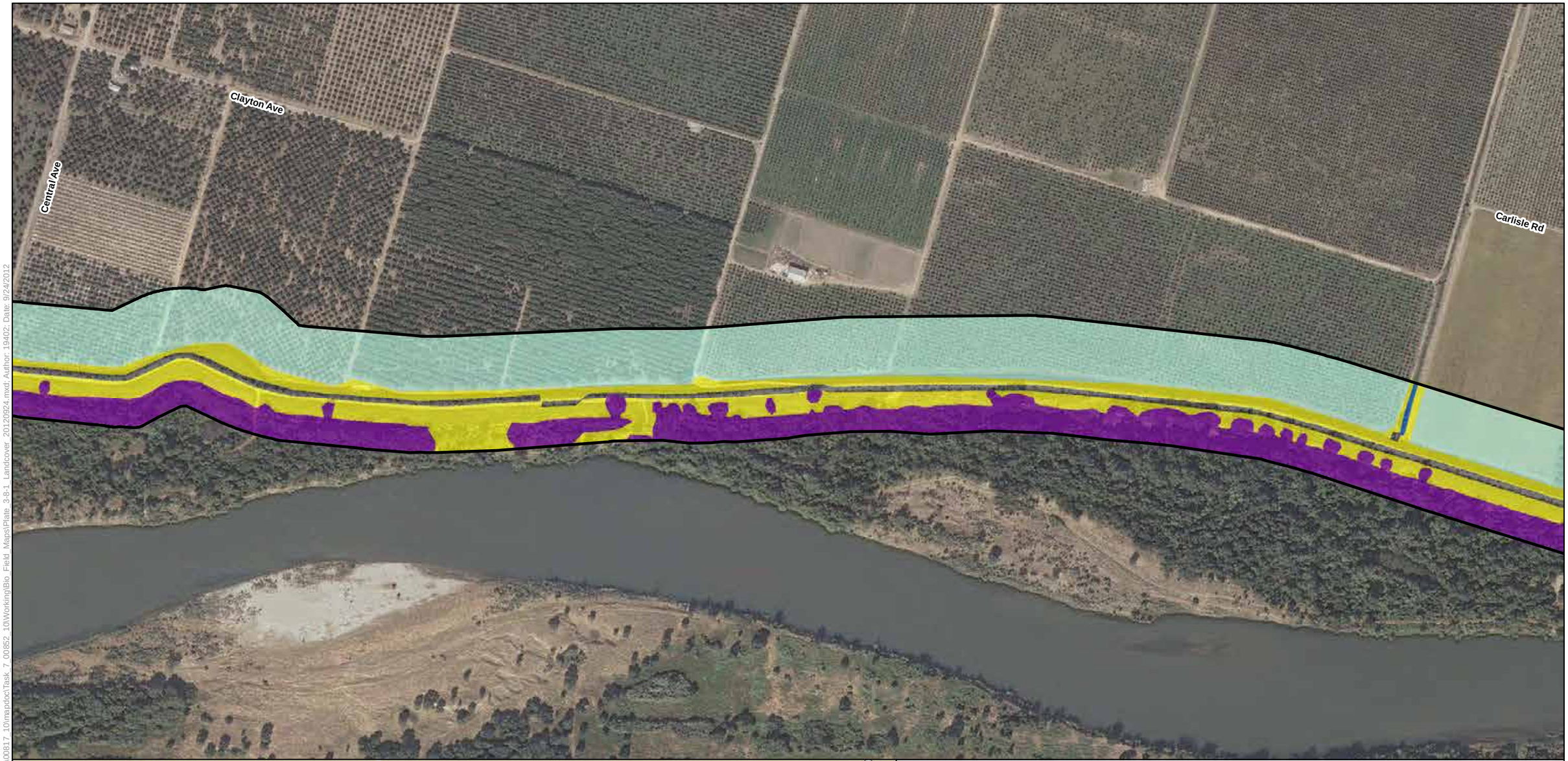



Legend

- 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 3

0 250 500
Feet

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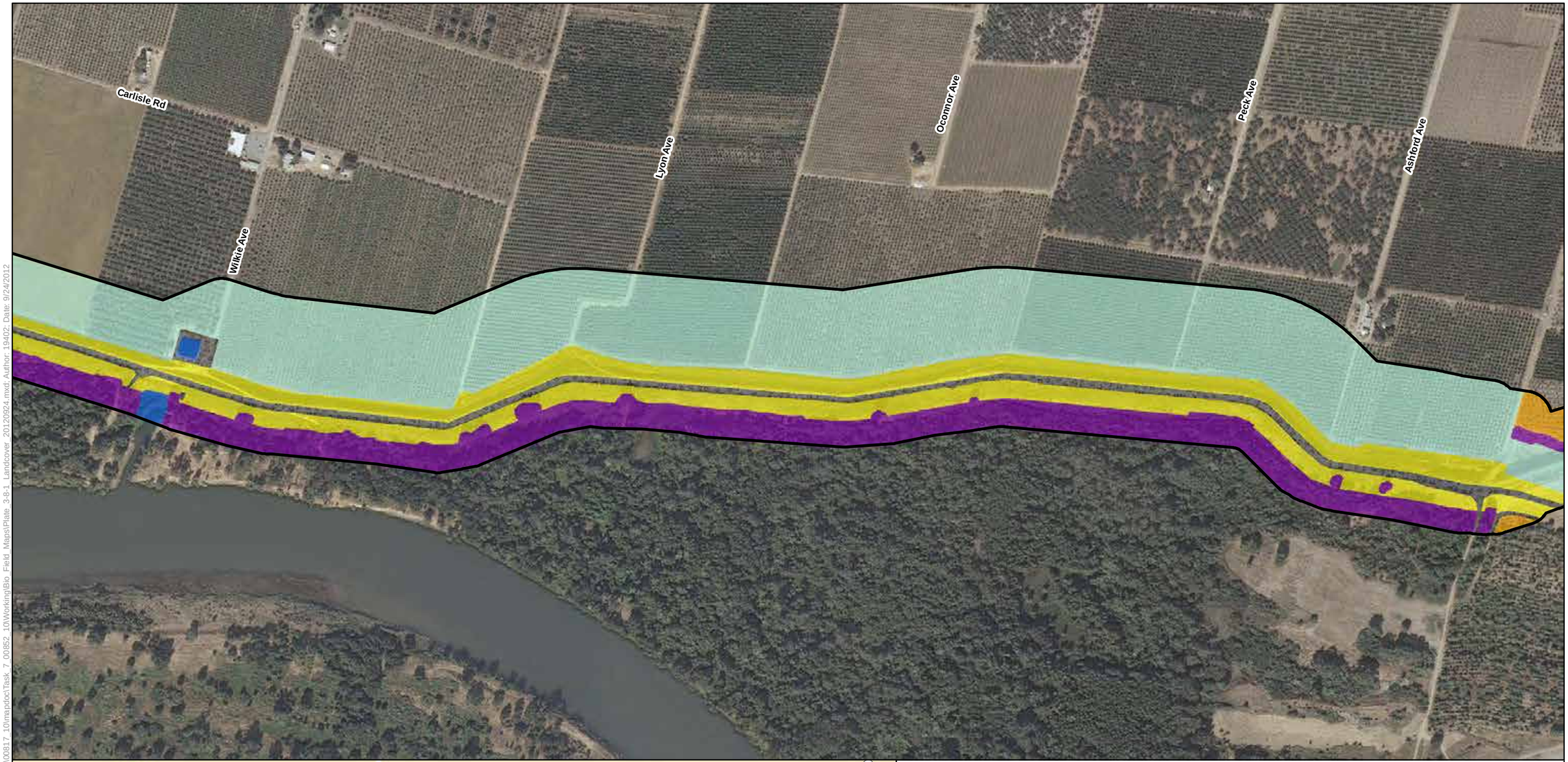



Legend

- 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 4

0 250 500
Feet

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Garden Hwy

Shannon Rd

Star Bend Rd

Map Sheet Index

113

South Yuba City

Yuba City

20

Marysville

Linda

Olivehurst

70

65

99

162

2

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

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 6

0 250 500
Feet

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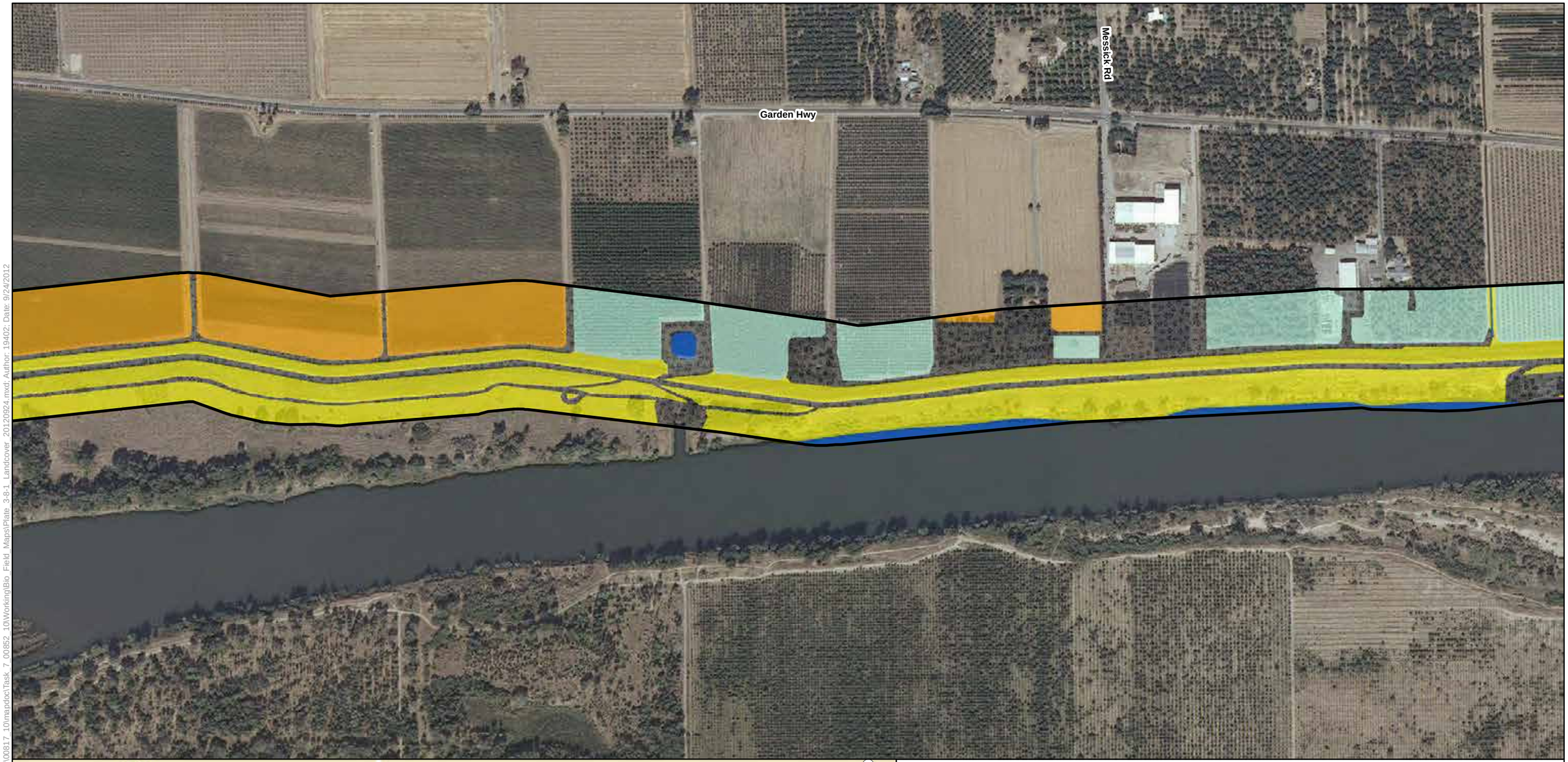



Legend

- 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 7

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Feet

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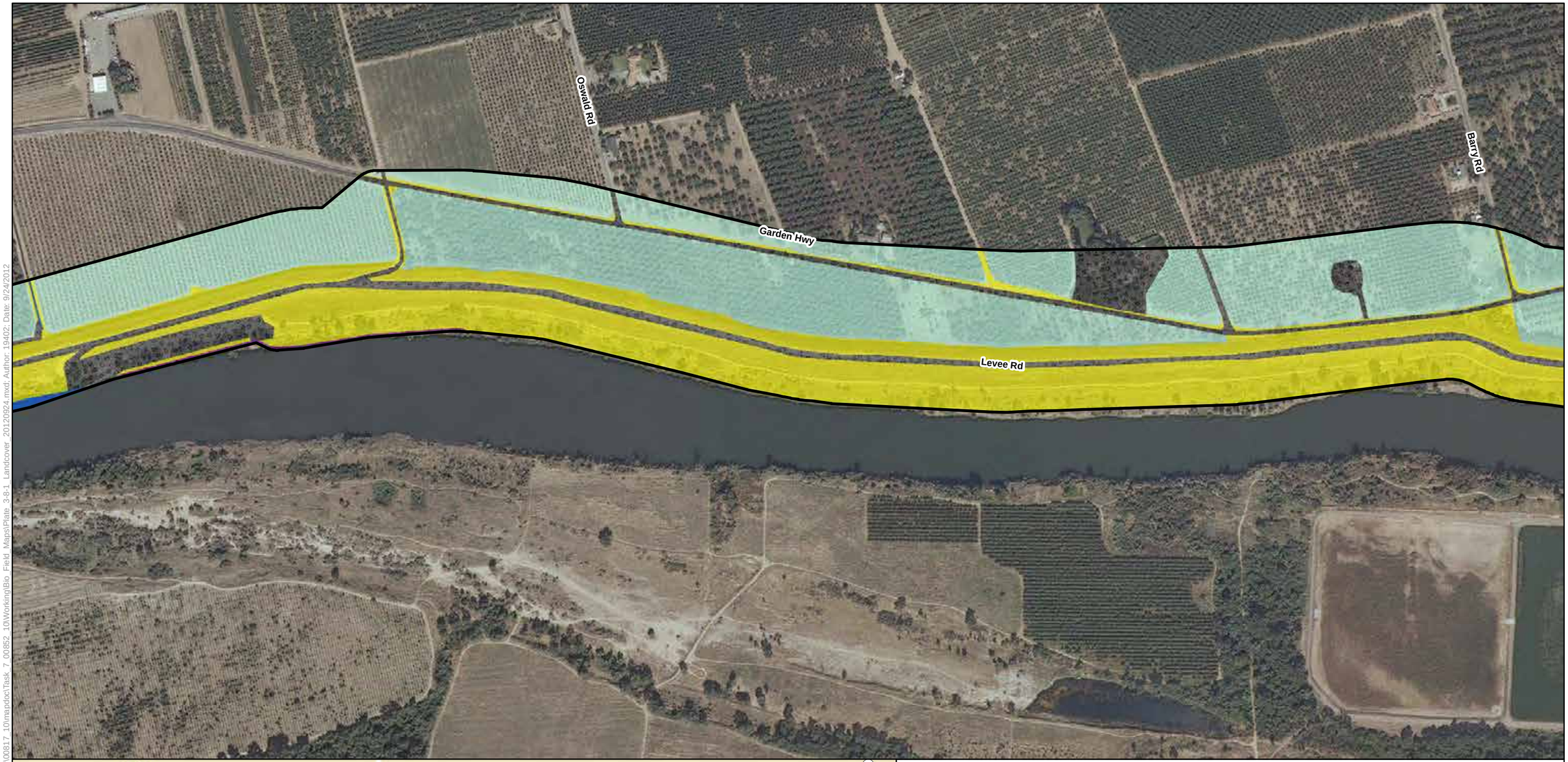



Legend

- 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 8

0 250 500
Feet

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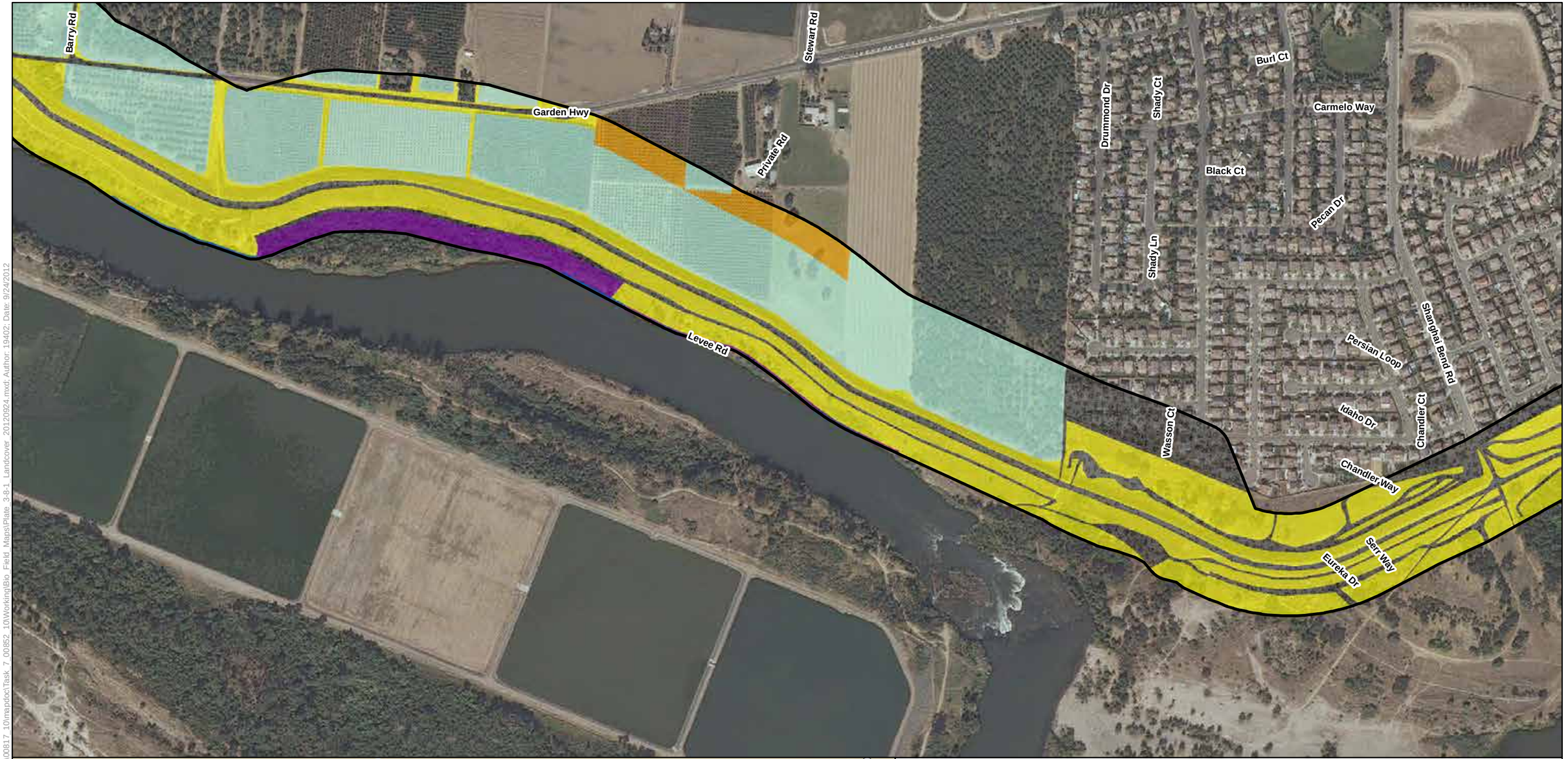

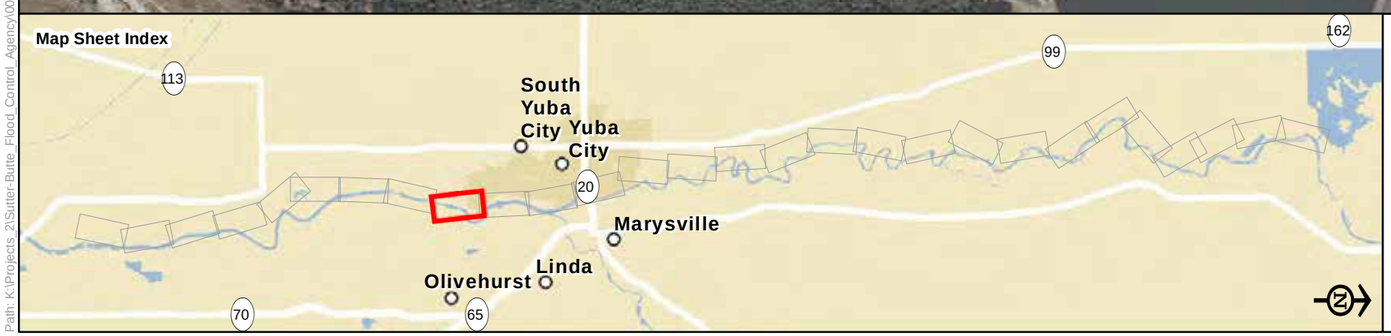

Legend

- 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 9

0 250 500
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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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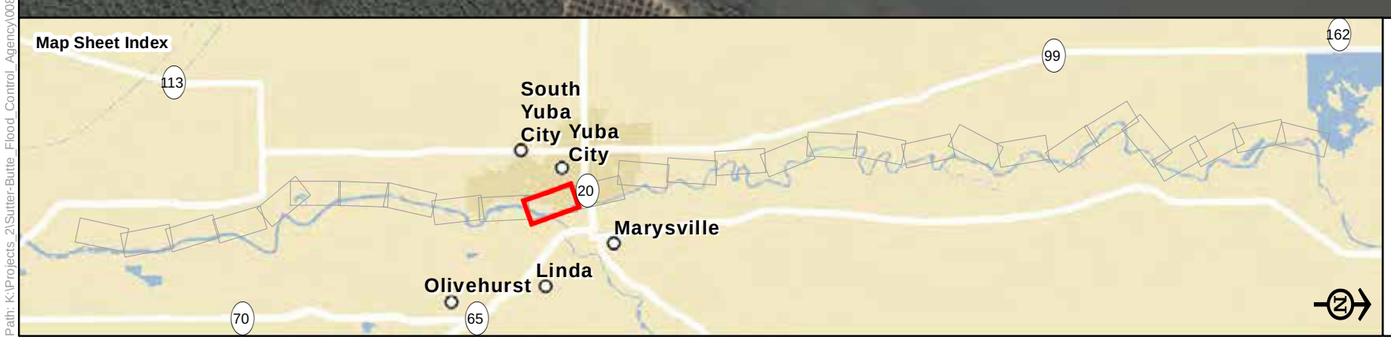

Legend

- 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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Feet

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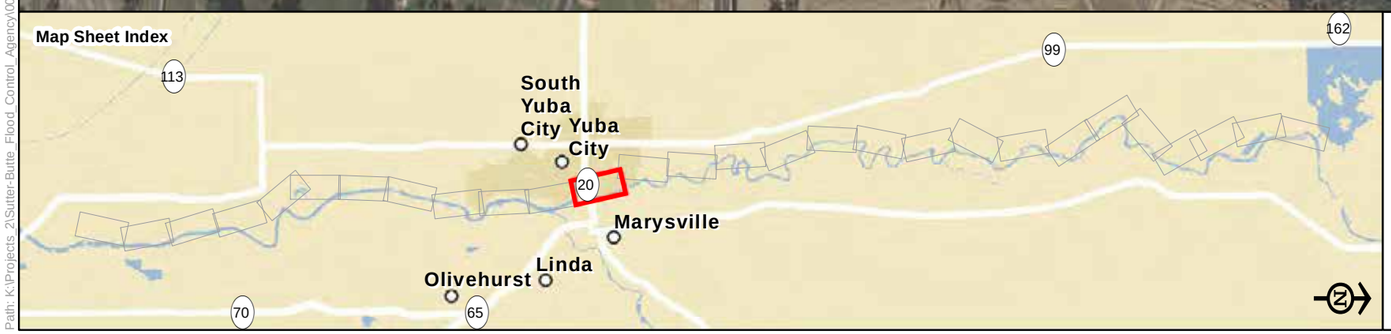
Center St
Cemetery Way
Francis Way
Kiley Ave
Colusa Ave
Alturas St
Perkins Way
Shasta St
Harkey Way
Sumner St
Del Norte Ave
Ainsley Ave
Bird St
Plumas St
Lynn Way
Alemar Way
Grant Way
Queens Ave
Hospital Rd
Live Oak Blvd
Private Rd
Market St
Boyd St
Ramp
Bridge St
Aylor Ave
Teegarden Ave
Heiken Way
Twin Cities Memorial Ramp
Sutter St
Yolo St
Von Geldern Way
Webb St
2Nd St
State Hwy 20
Levee Rd
5Th St



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

0 250 500
Feet

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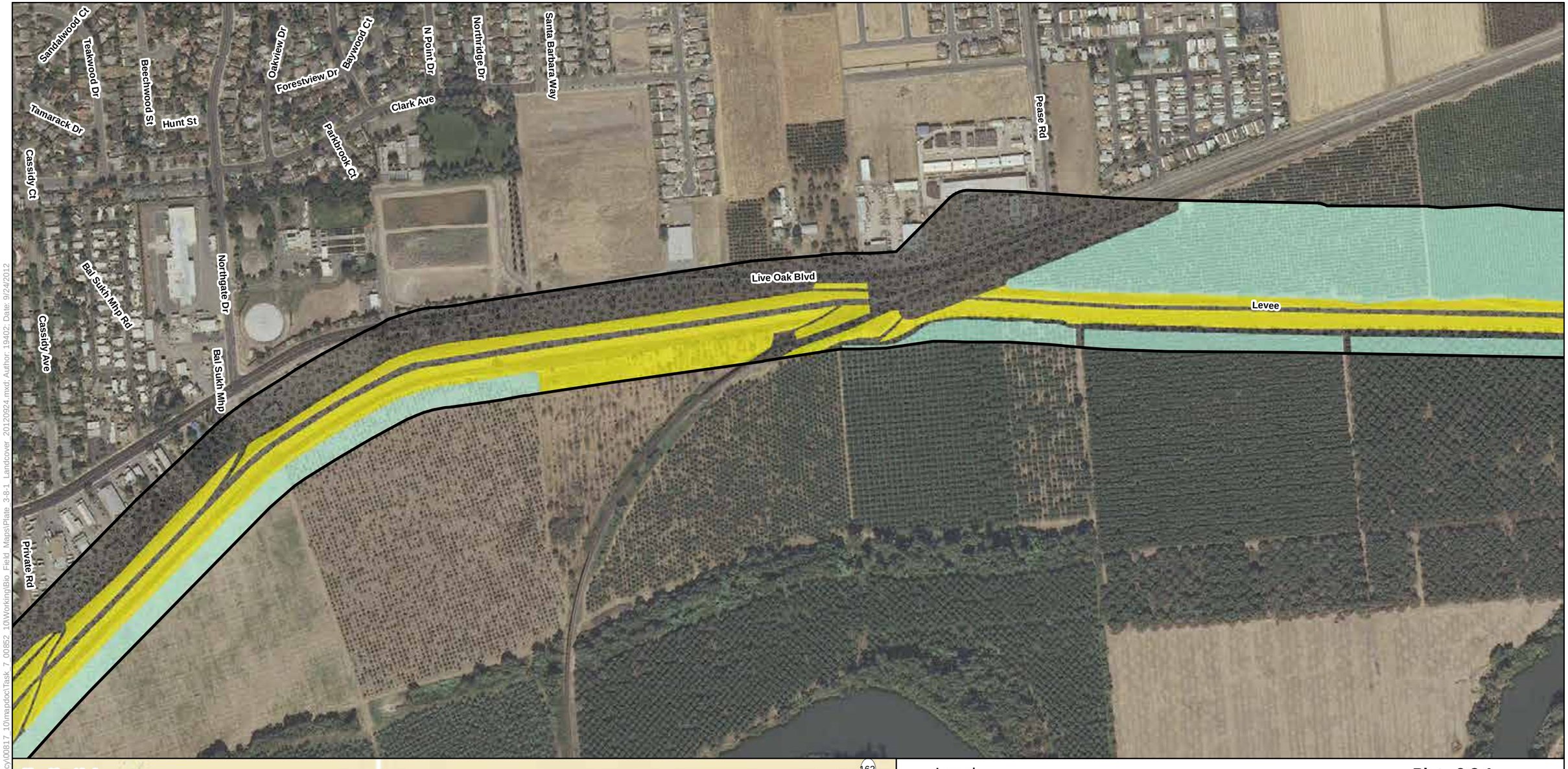



Legend

- 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 13

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Feet

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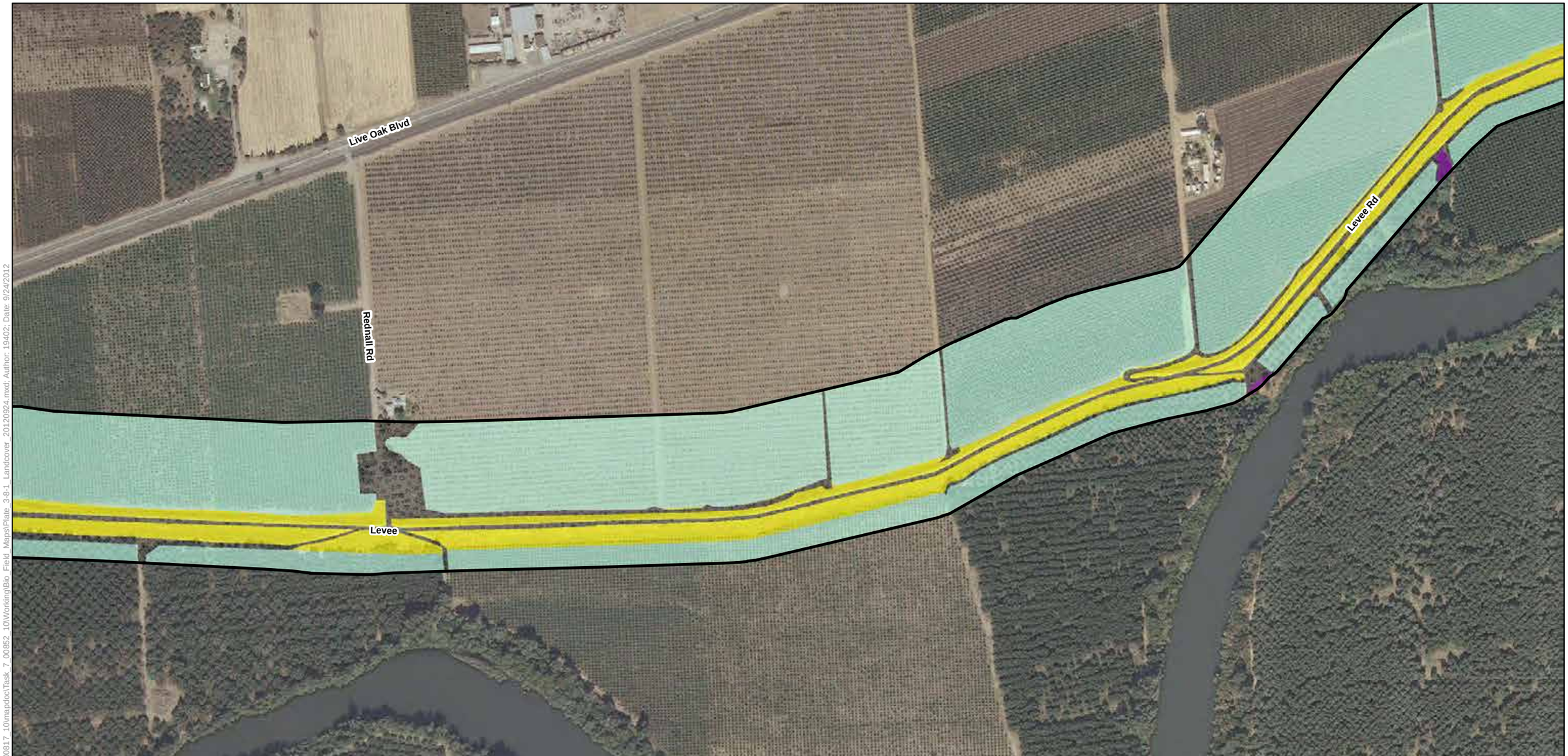



Legend

- 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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Feet

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Live Oak Blvd

Morse Rd

Levee Rd

Map Sheet Index

113

South Yuba City

Yuba City

20

Marysville

Linda

Olivehurst

70

65

99

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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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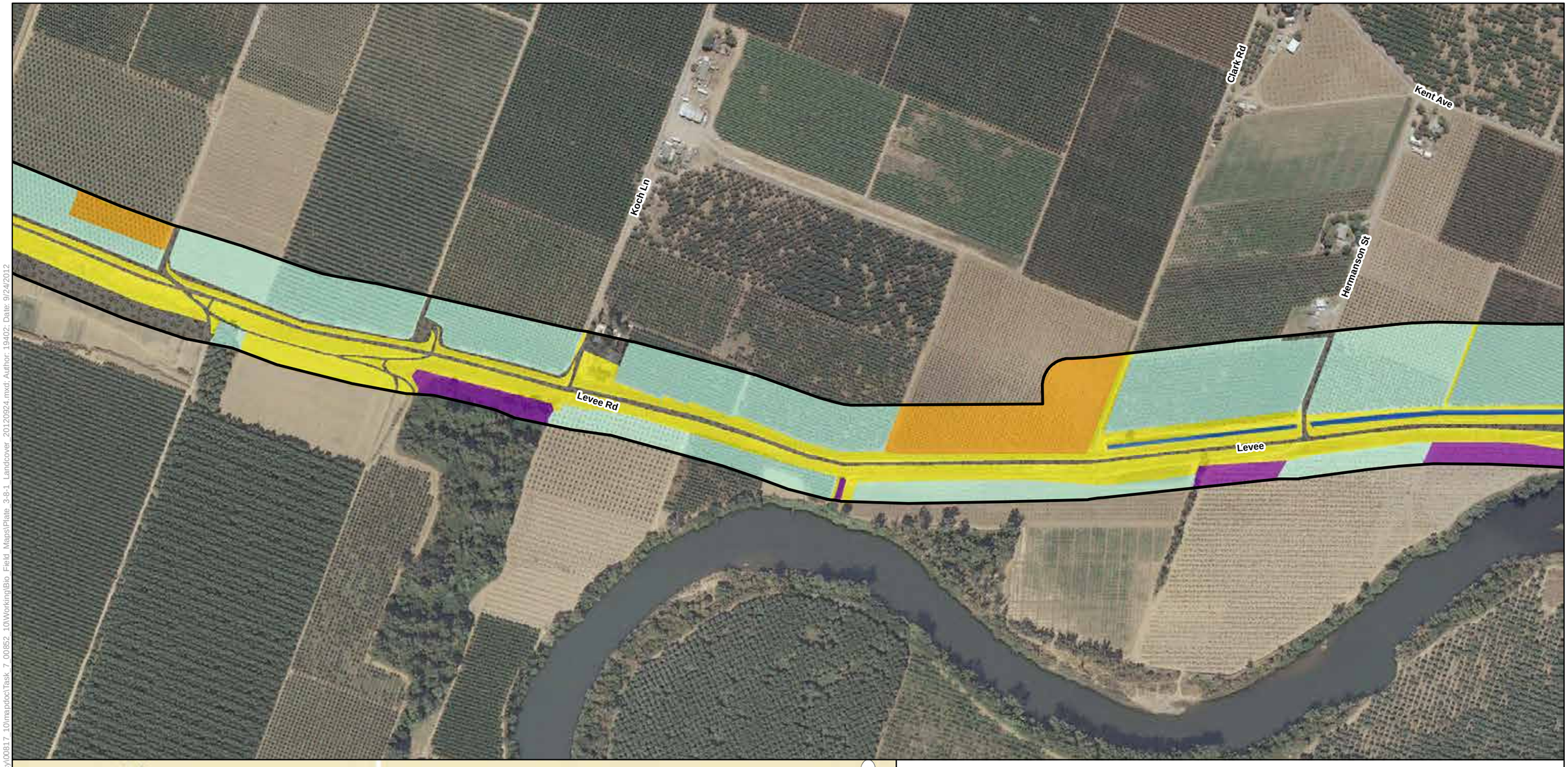

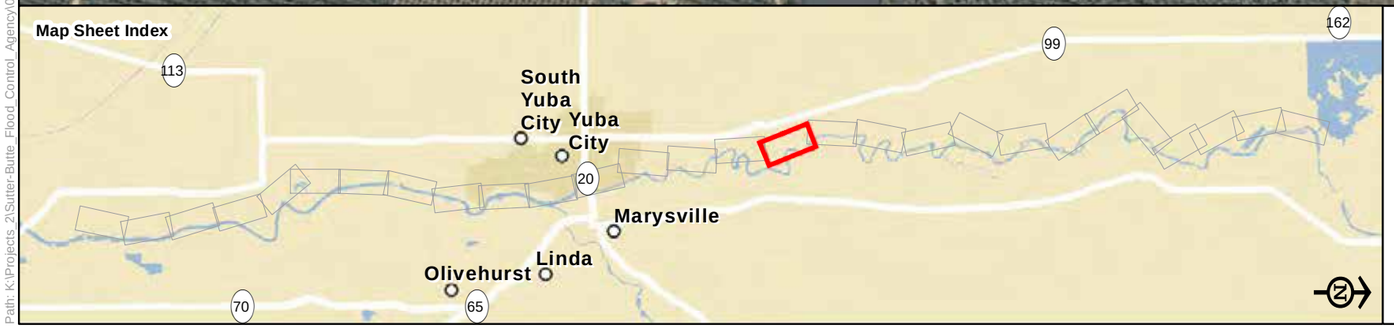

Legend

- 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

0 250 500
Feet

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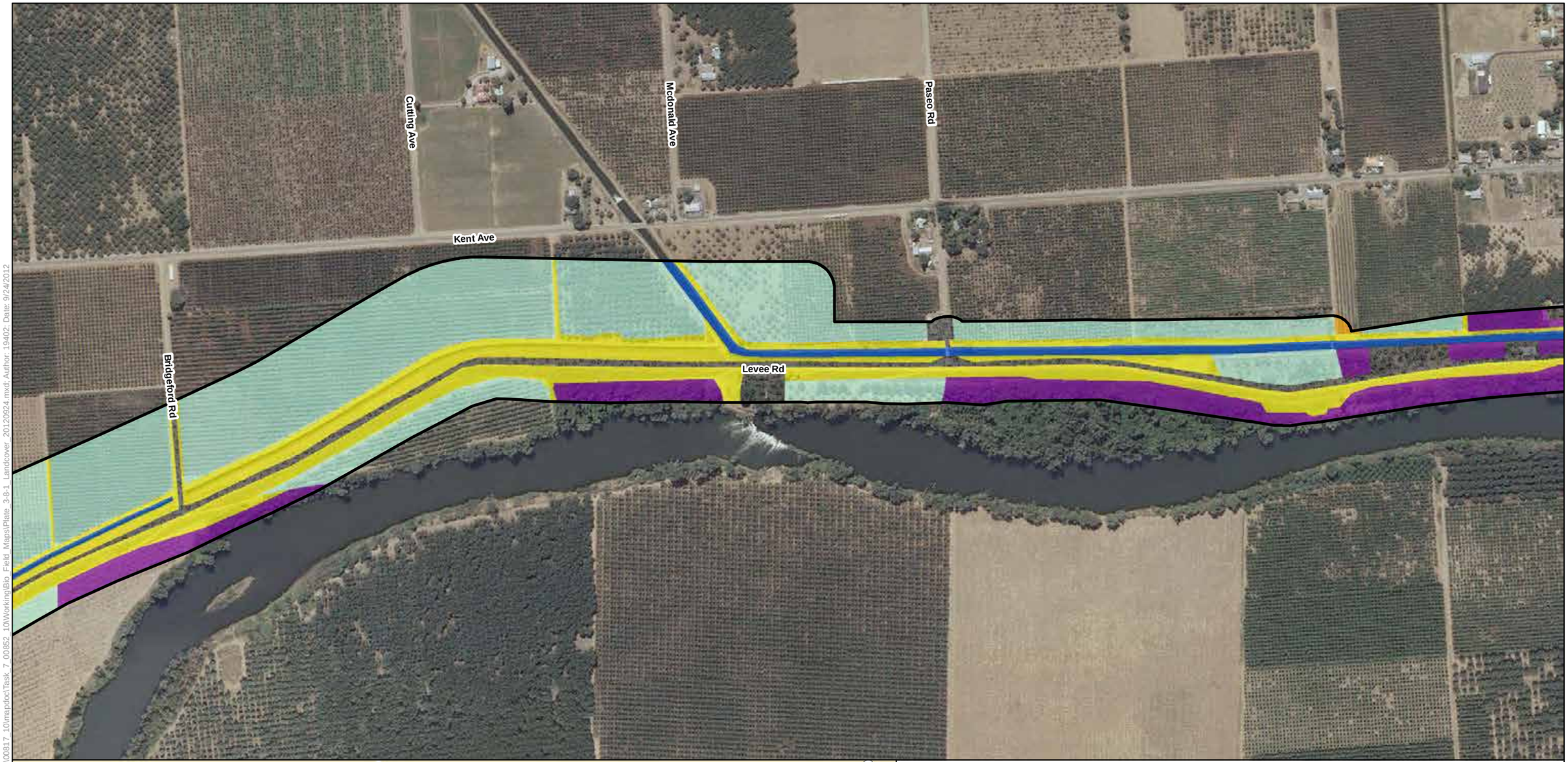

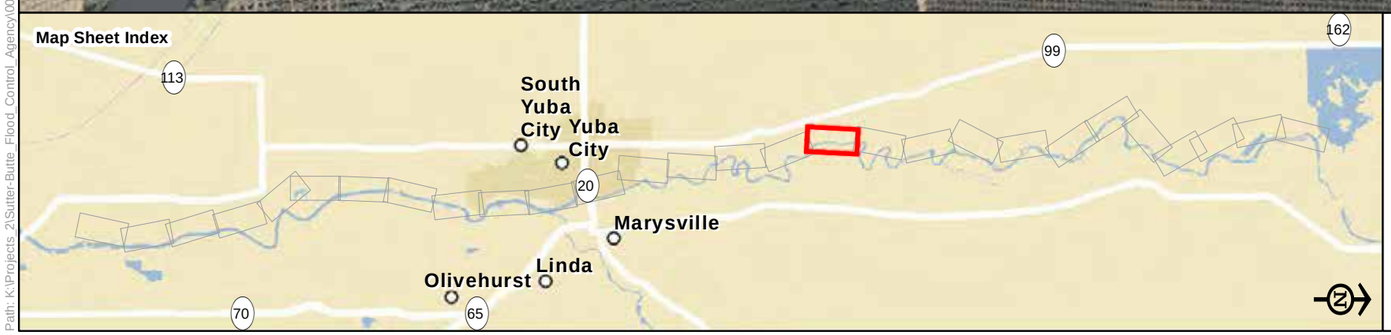

Legend

- 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 17

0 250 500
Feet

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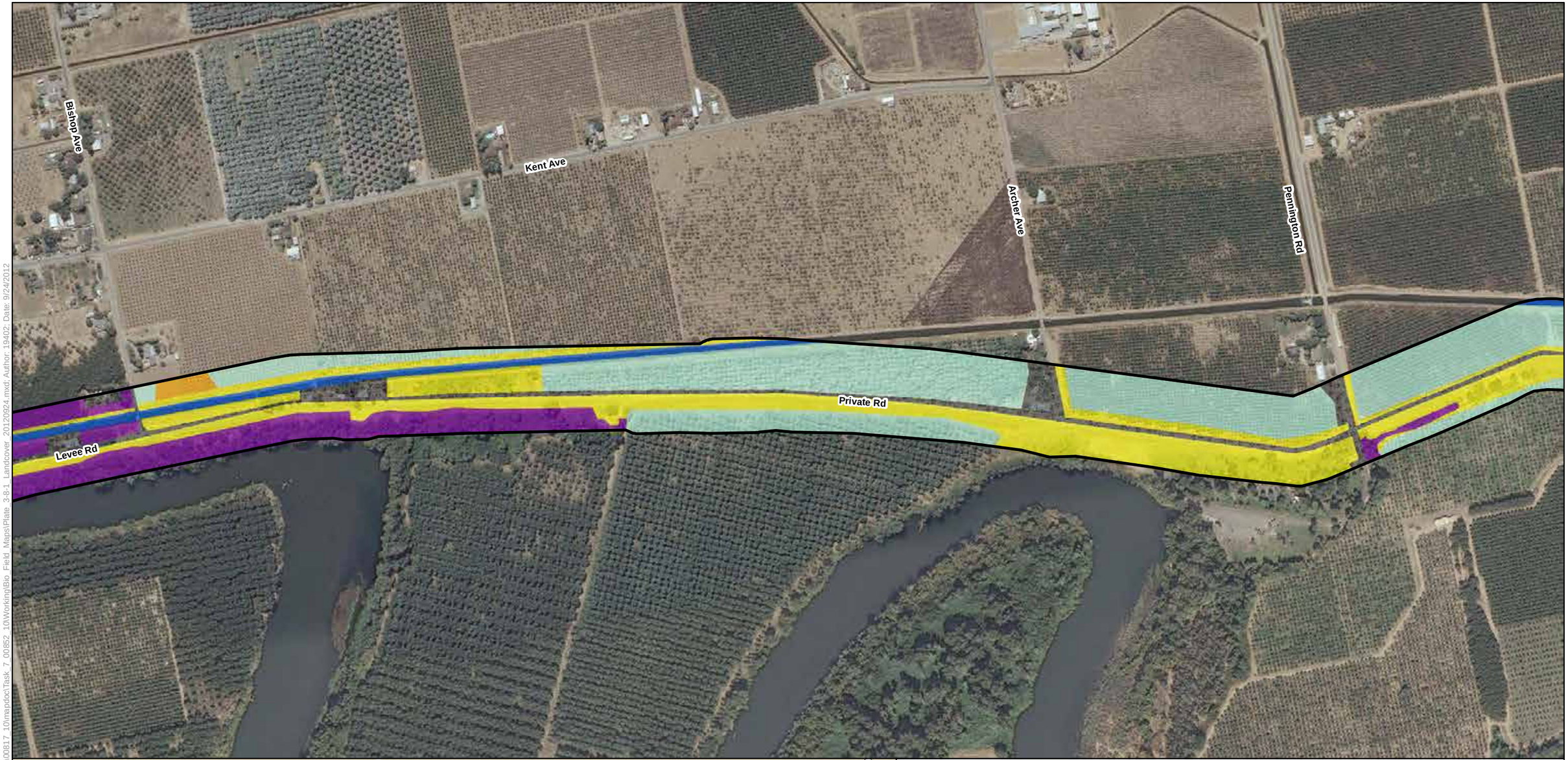



Legend

- 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 18

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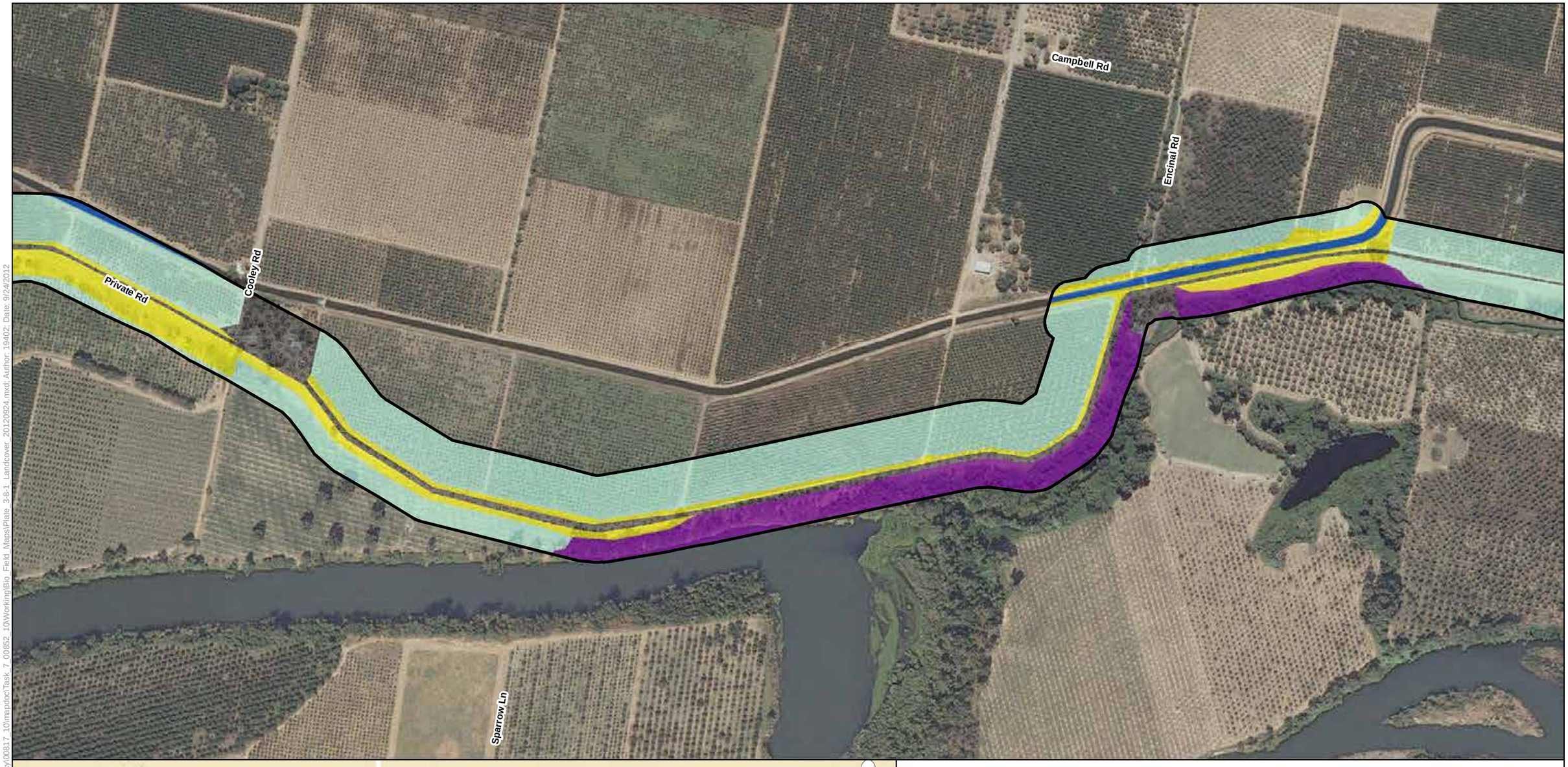



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- Water

Plate 3.8-1
Land Cover Types in the Biological Study Area for Alternative 1-3

Sheet 19

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Metteer Rd

Chandon Ave

Levee Rd

Private Rd

Map Sheet Index

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South Yuba City

Yuba City

20

Marysville

Linda

Olivehurst

70

65

99

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Legend

- Biological Study Area
- Alternative 1
- Alternative 2
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- Reach
- Station 202+50

Land Cover Types

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- 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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Campbell Ave

E Evans Reimer Rd

Center Ave

Levee Rd

Alexander Ave

Map Sheet Index

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South Yuba City

Yuba City

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Marysville

Linda

Olivehurst

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Legend

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Plate 3.8-1
Land Cover Types in the Biological Study Area for Alternative 1-3

Sheet 21

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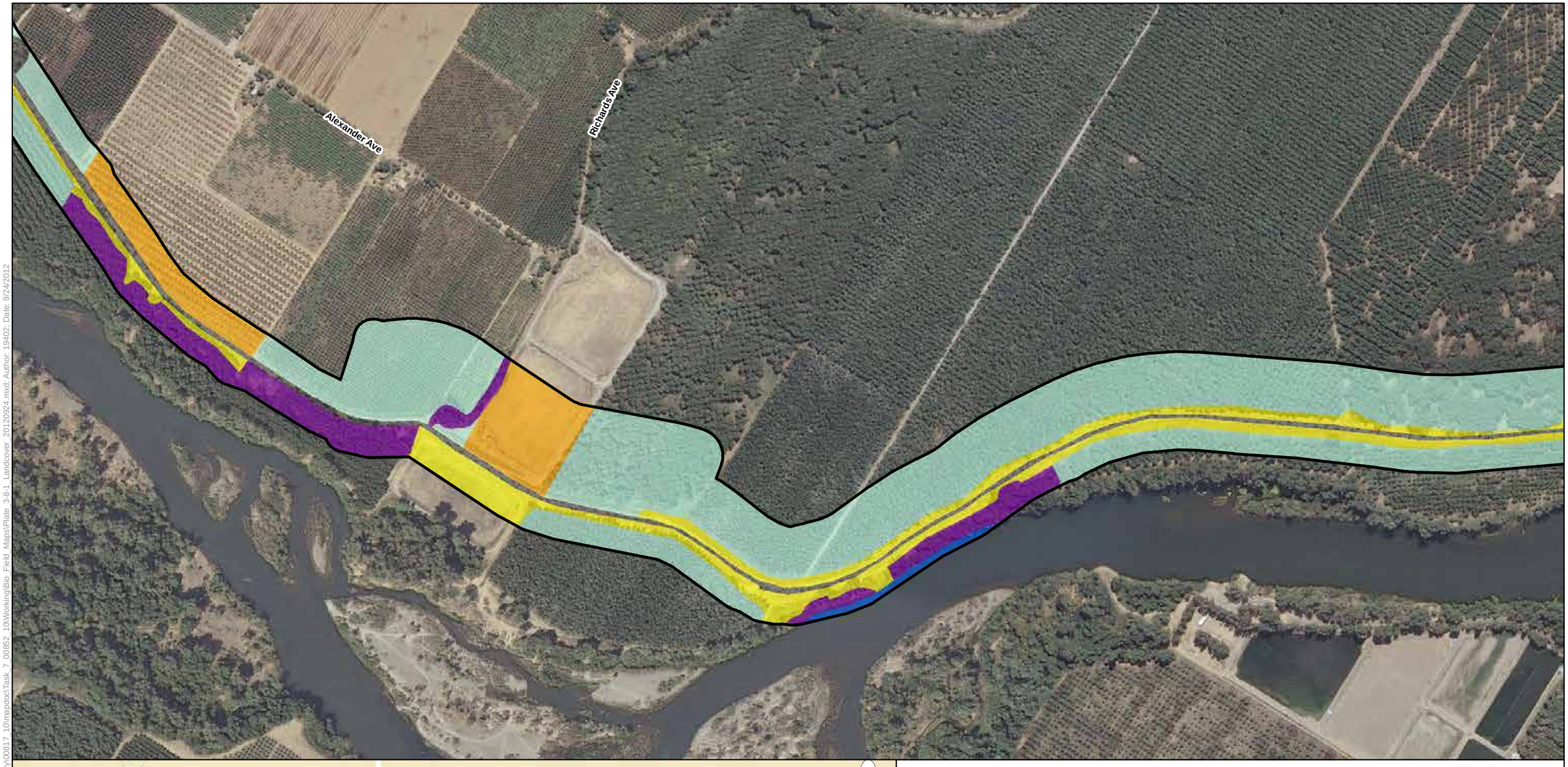



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Land Cover Types

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- Ruderal
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Plate 3.8-1
Land Cover Types in the Biological Study Area for Alternative 1-3

Sheet 22

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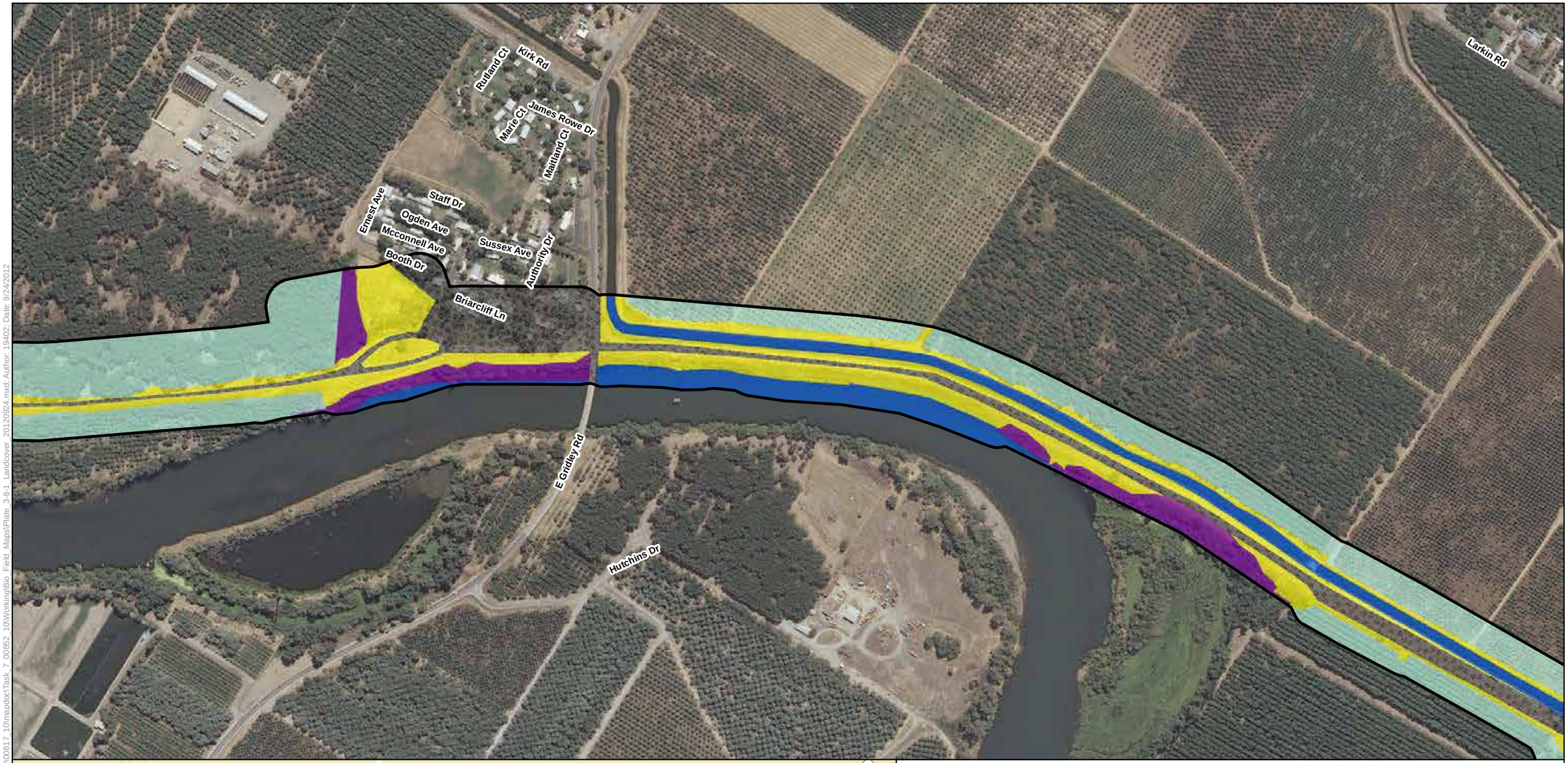



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Land Cover Types

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Plate 3.8-1
Land Cover Types in the Biological Study Area for Alternative 1-3

Sheet 23

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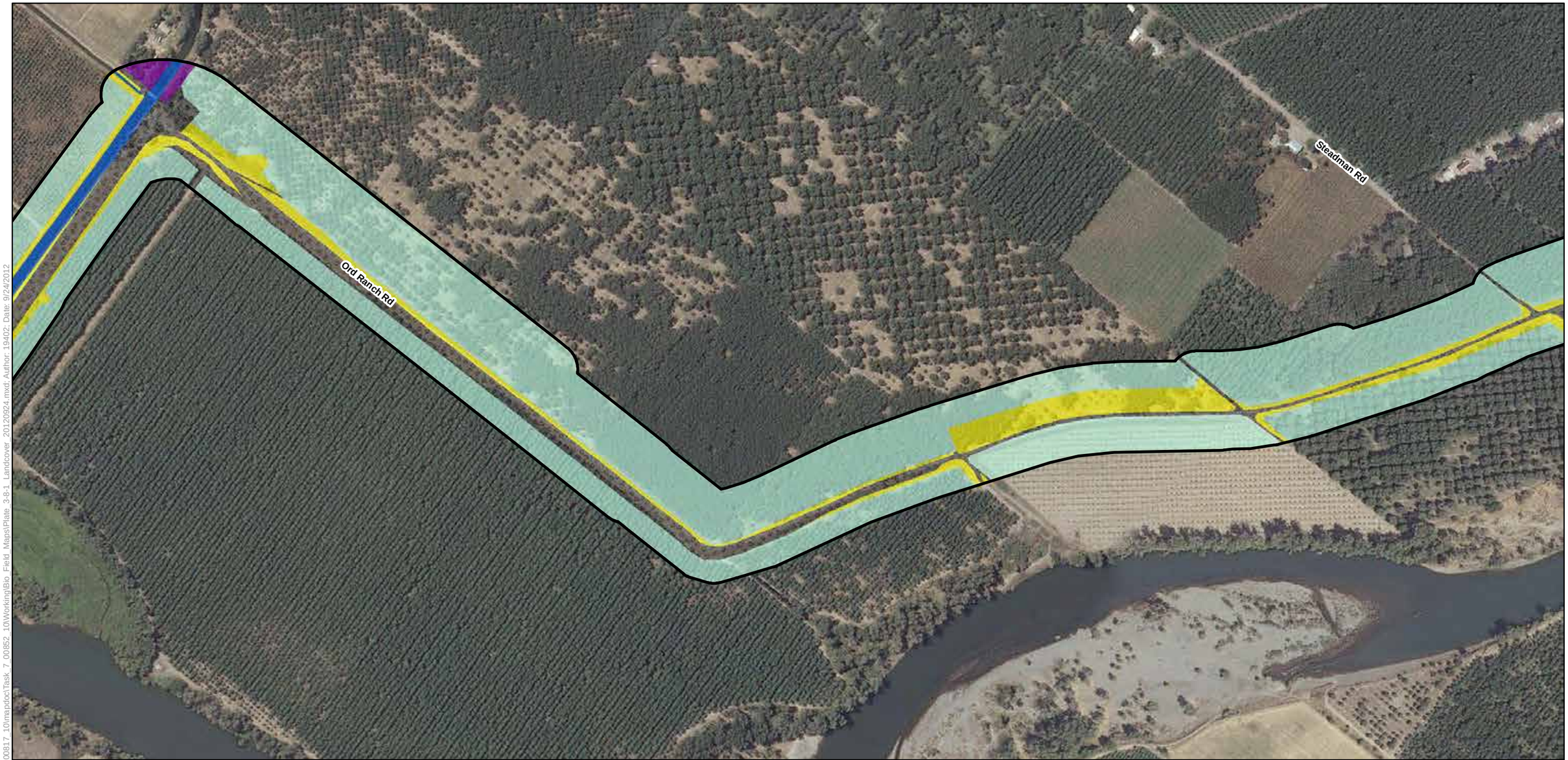



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- Reach
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Land Cover Types

- Developed
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- 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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Steadman Rd

Almond Ave

Map Sheet Index

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South Yuba City

Yuba City

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Marysville

Linda

Olivehurst

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Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
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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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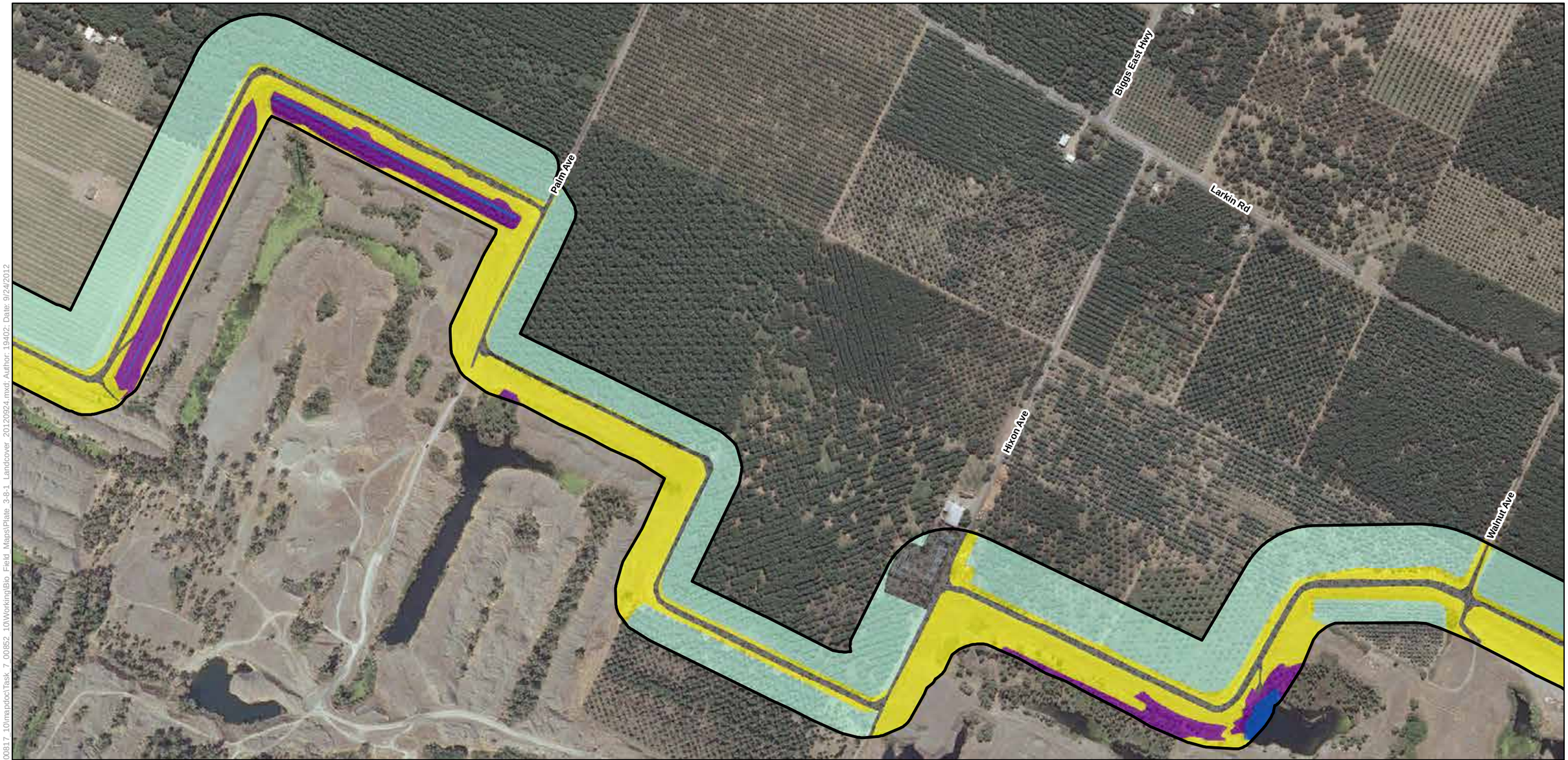



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- Reach
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Land Cover Types

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- Oak Woodland
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- 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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Larkin Rd

Walnut Ave

Welch Rd

Vance Ave

Map Sheet Index

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South Yuba City

Yuba City

20

Marysville

Linda

Olivehurst

70

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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

0 250 500

Feet

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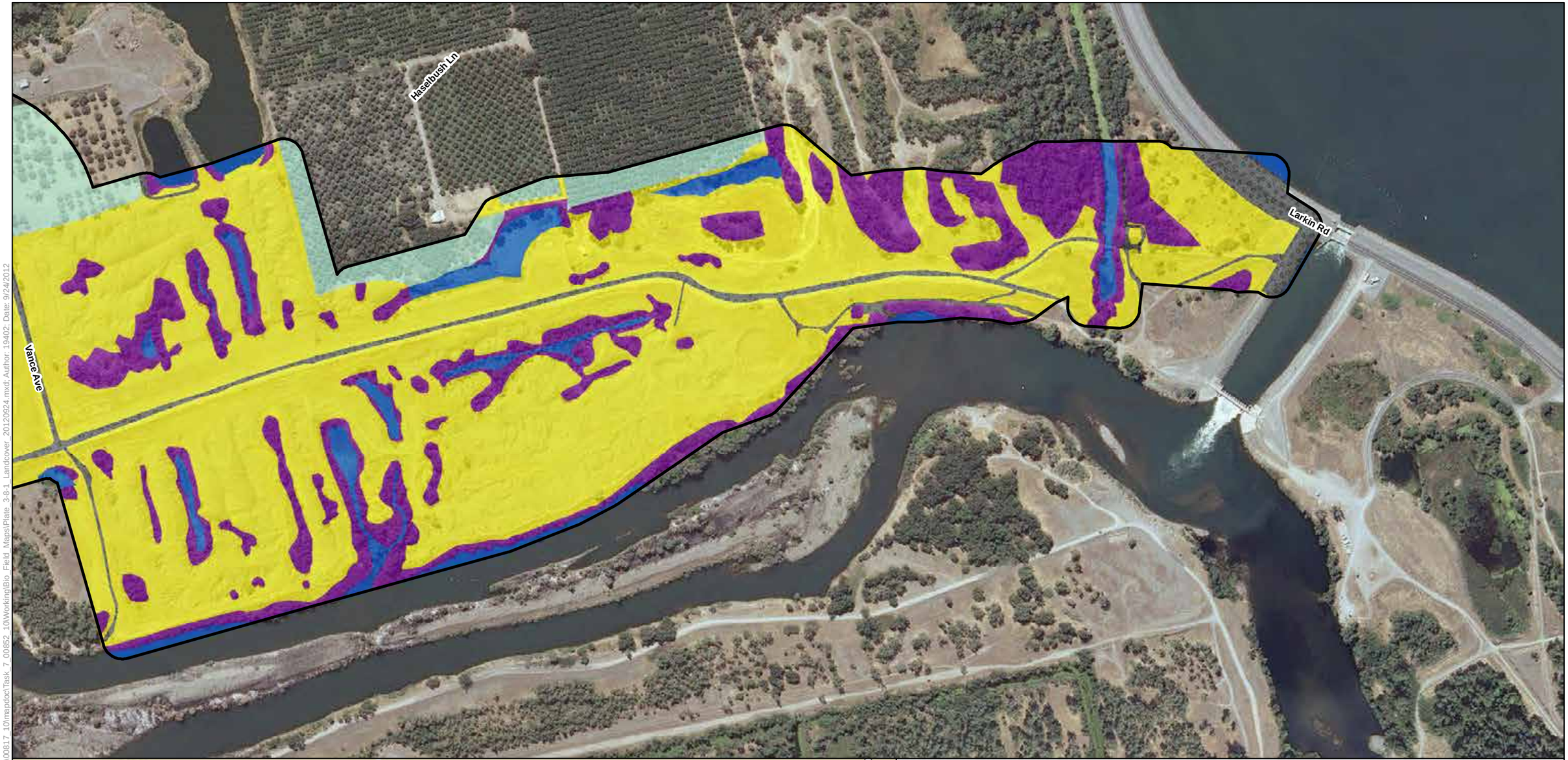



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- Orchard
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Plate 3.8-1
Land Cover Types in the Biological Study Area for Alternative 1-3

Sheet 28

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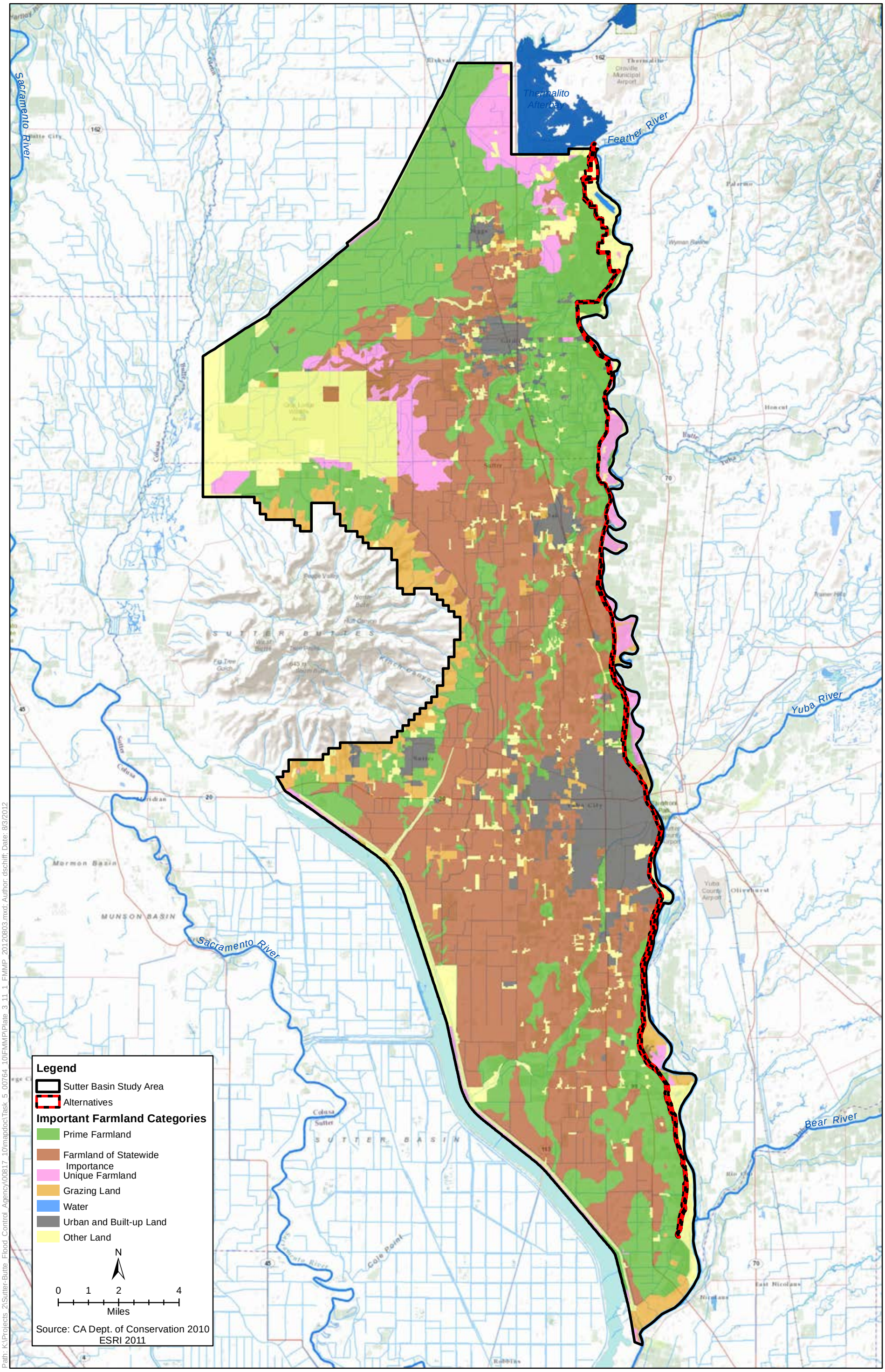

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Plate 3.11-1
Important Farmland Within the Study Area

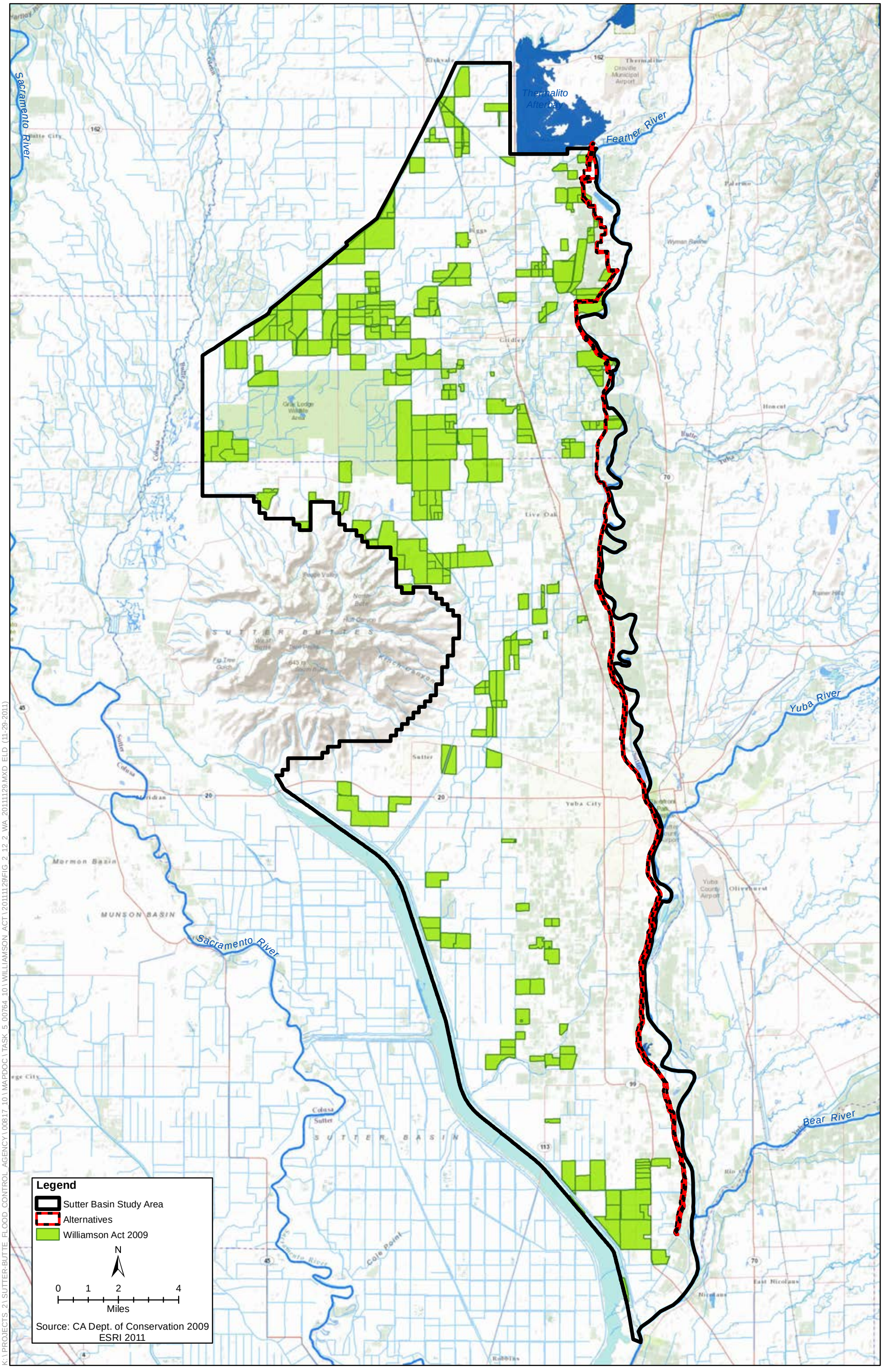

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Figure 3.11-2
Williamson Act Lands in the Study Area

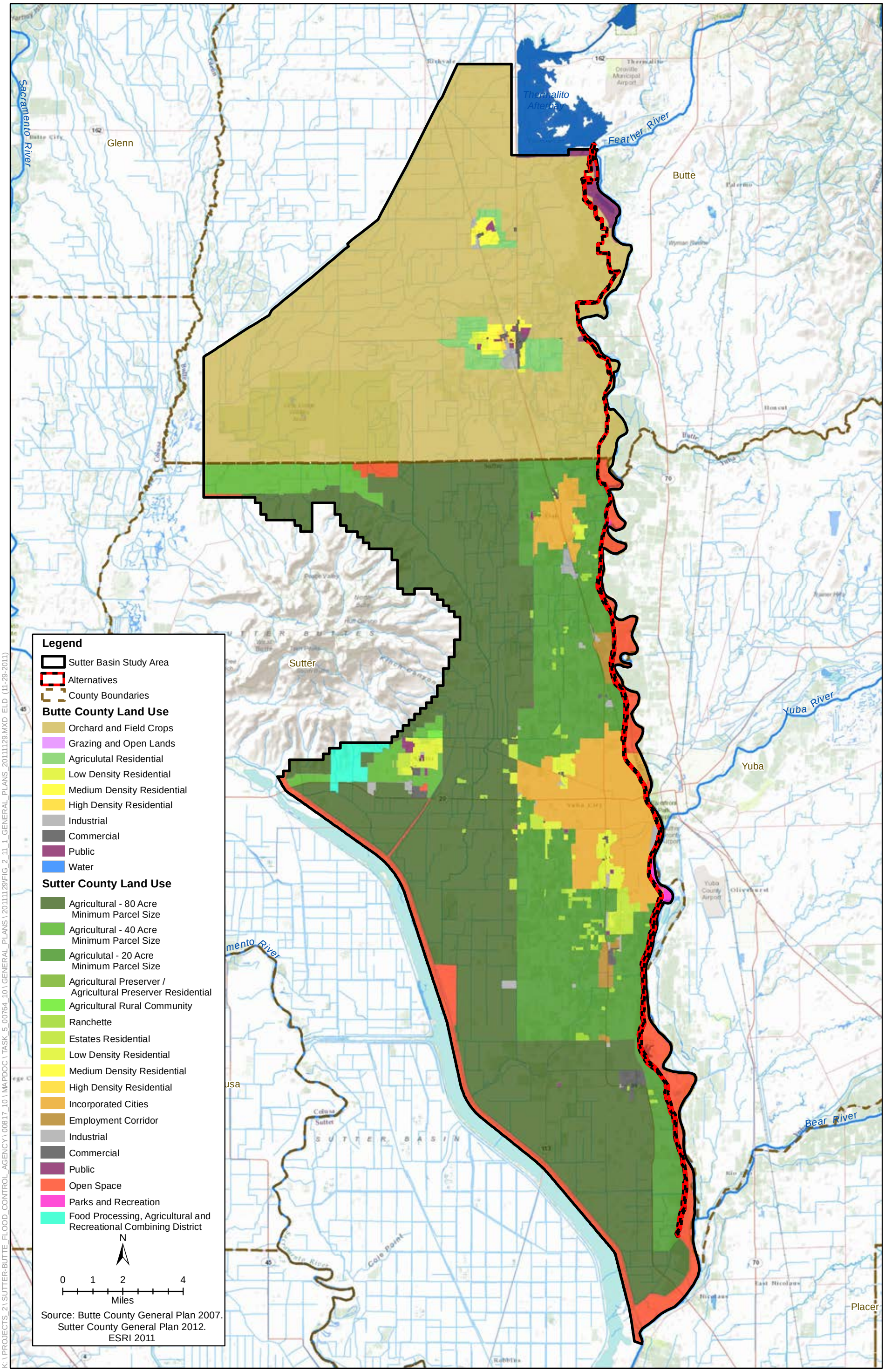

Figure 3.11-3
Land Use Designations Within the Study Area

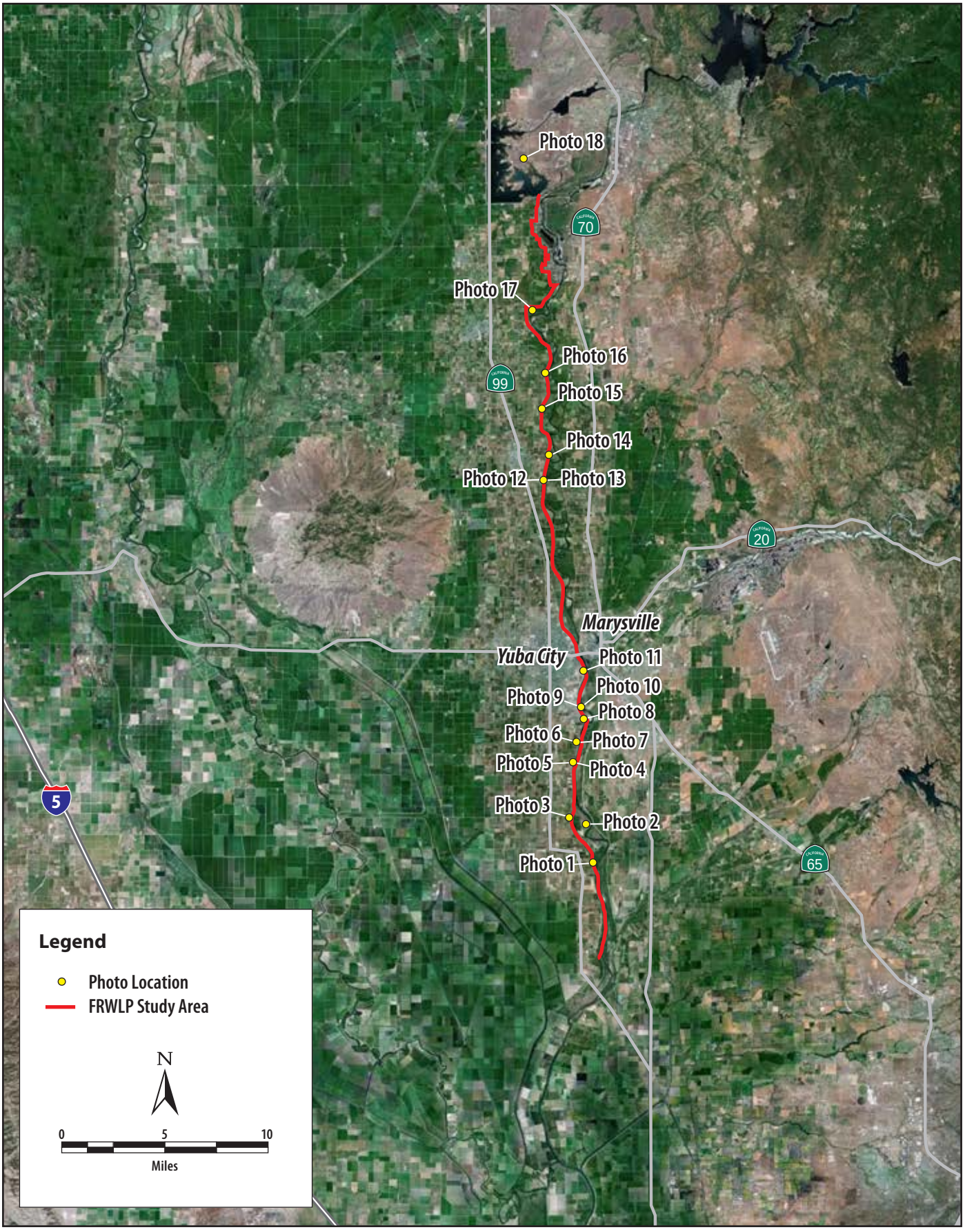

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Plate 3.13-1
Representative Photograph Locations



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.

Graphics ...00852.10 (6/19/12) AB

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.

Graphics ...00852.10 (6/19/12) AB

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.

Graphics ...00852.10 (6/19/12) AB

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.

Graphics ...00852.10 (6/19/12) AB

Plate 3.13-2
Representative Photographs



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.

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Plate 3.13-2
Representative Photographs

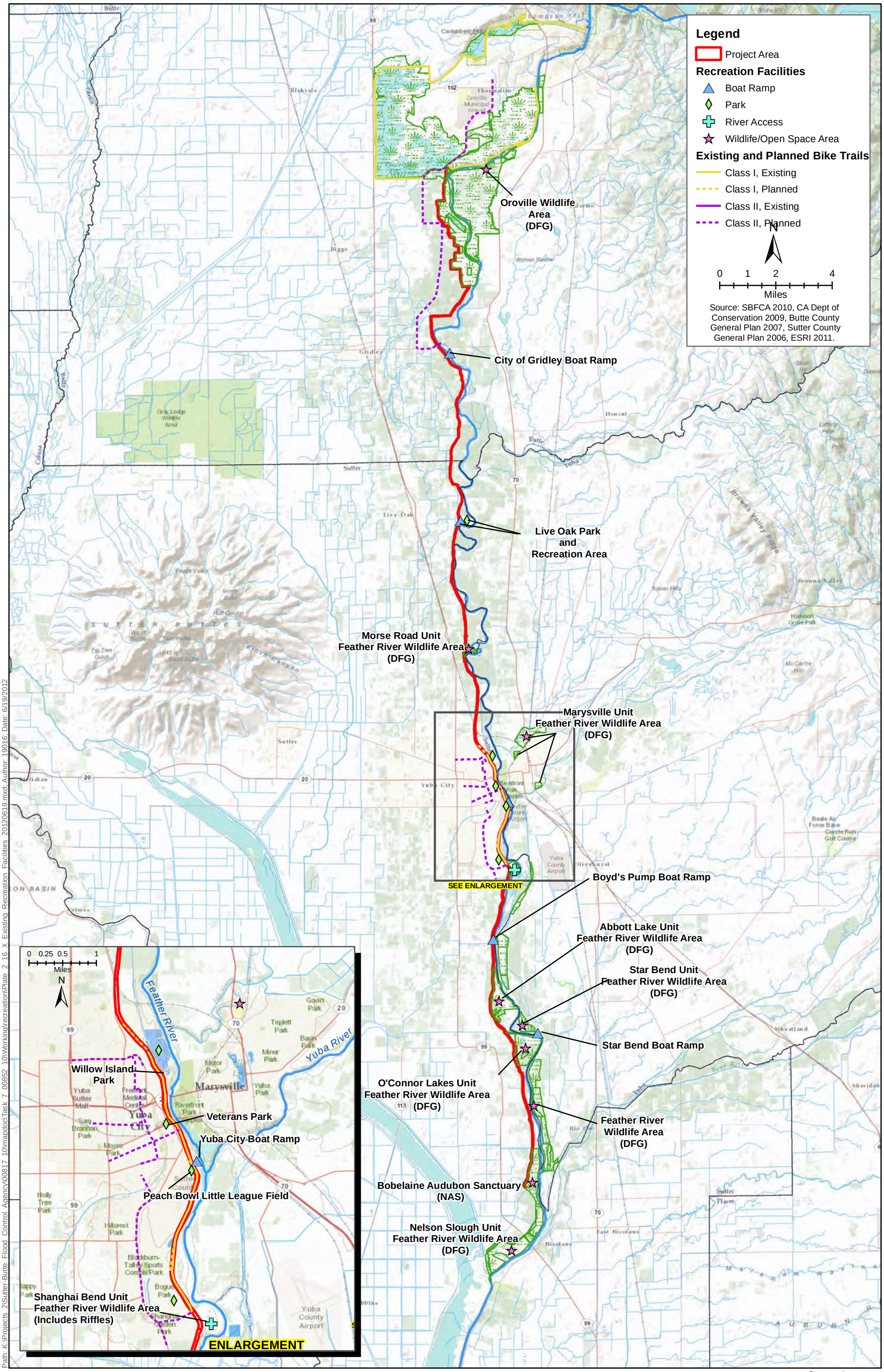

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Plate 3.14-1
Existing Recreation Facilities
Near the Project Area

Appendix A

Regulatory Background

Appendix A
Regulatory Background

This appendix provides regulatory background for the project in terms of Federal, state, and local laws, ordinances, regulations, and planning guidance. This regulatory background indicates approvals that may be required for implementation of the project or contextual information to be considered in environmental analysis. Table A-1 presents a list of acronyms and abbreviations found in this appendix.

Table A-1. List of Acronyms and Abbreviations

AB	Assembly Bill
ACHP	Advisory Council on Historic Preservation
AG	California Attorney General
Alquist-Priolo Act	Alquist-Priolo Earthquake Fault Zoning Act
APE	area of potential effects
ARB	California Air Resources Board
ARPA	Archaeological Resources Protection Act
basin plan	water quality control plan
BCAQMD	Butte County Air Quality Management District
BMP	best management practice
Butte County FMP	Butte County Flood Mitigation Plan
Butte County MHMP	Butte County Multi-Jurisdictional All-Hazard Pre-Disaster Mitigation Plan
Butte Regional HCP/NCCP	Butte Regional Habitat Conservation Plan/Natural Community Conservation Plan
CAA	Clean Air Act
CAFE	Corporate Average Fuel Economy
Cal/EPA	California Environmental Protection Agency
Caltrans	California Department of Transportation
CAPCOA	California Air Pollution Control Officers Association
Carl Moyer Program	Carl Moyer Memorial Air Quality Standards Attainment Program
CBSC	California Building Standards Code
CCA	Community Choice Aggregation
CCR	California Code of Regulations
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CERCLA or Superfund	Comprehensive Environmental Response, Compensation, and Liability Act
CESA	California Endangered Species Act
CGS	California Geological Survey
CNEL	community noise equivalent level
CO	carbon monoxide
CO_2e	carbon dioxide equivalent
CRHR	California Register of Historical Resources
CTR	California Toxics Rule
CVFPB	Central Valley Flood Protection Board

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CVFPP	Central Valley Flood Protection Plan
CWA	Clean Water Act
dbh	diameter at breast height
DO	dissolved oxygen
DWR	California Department of Water Resources
EFH	essential fish habitat
EIR	environmental impact report
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ESP	energy service provider
FEMA	Federal Emergency Management Agency
FIS	Flood Insurance Studies
FRAQMD	Feather River Air Quality Management District
FRWLP	Feather River West Levee Project
GC	Government Code
General Dewatering Order	General Order for Dewatering and Other Low Threat Discharges to Surface Waters
GHG	greenhouse gas
HCP	habitat conservation plan
ICLEI	International Council of Local Environmental Initiatives
ICW	Inspection of Completed Works
IOU	investor-owned utility
ISR	Indirect Source Review
LCFS	low carbon fuel standard
Ldn	day-night average sound level
LGOP	Local Government Operations Protocol
MBTA	Migratory Bird Treaty Act
MOA	memorandum of agreement
mpg	miles per gallon
MPO	metropolitan planning organization
MRZ	Mineral Resource Zone
MS4	Municipal Separate Storm Sewer Systems
MS4 Permit	National Pollutant Discharge Elimination System General Permit for Municipal Separate Storm Sewer Systems
MT	metric ton
MW	megawatt
NAGPRA	Native American Graves Protection and Repatriation Act
NAHC	Native American Heritage Commission
NCCP	natural community conservation plan
NCCPA	Natural Community Conservation Planning Act
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NHPA	National Historic Preservation Act
NISC	National Invasive Species Council
NMFS	National Marine Fisheries Service

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NOI	notice of intent
NO_X	oxides of nitrogen
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NTR	National Toxics Rule
OHWM	ordinary high water mark
OPR	Office of Planning and Research
PA	programmatic agreement
PM	particulate matter
PPMP	pollution prevention and monitoring program
PRC	Public Resources Code
ROG	reactive organic gas
RPS	California's Renewable Portfolio Standard
RTP	regional transportation plan
RWQCB	regional water quality control board
SACOG	Sacramento Area Council of Governments
SAFCA	Sacramento Area Flood Control Agency
SB	Senate Bill
SBFCA	Sutter Butte Flood Control Agency
SCS	sustainable communities strategy
SHPO	State Historic Preservation Officer
SIP	state implementation plan
SMARA	Surface Mining and Reclamation Act of 1975
SOI	sphere of influence
SR	State Route
SWMP	stormwater management plan
SWPPP	stormwater pollution prevention plan
TAC	toxic air contaminant
TMDL	Total Maximum Daily Load
ULDC	Urban Levee Design Criteria
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
VMT	vehicle miles traveled
WDR	waste discharge requirement

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A.1 Federal Plans, Policies, and Regulations

A.1.1 National Environmental Policy Act

The National Environmental Policy Act (NEPA) is the nation's broadest environmental law, applying to all Federal agencies and most of the activities they manage, regulate, or fund that have the potential to affect the environment. It requires Federal agencies to disclose and consider the environmental implications of their proposed actions. NEPA establishes environmental policies for the nation, provides an interdisciplinary framework for Federal agencies to prevent environmental damage, and contains action-forcing procedures to ensure that Federal agency decision makers take environmental factors into account.

NEPA requires the preparation of an appropriate document to ensure that Federal agencies accomplish the law's purposes. The Council on Environmental Quality (CEQ) has adopted regulations and other guidance that provide detailed procedures that Federal agencies must follow to implement NEPA.

This document is the instrument for NEPA compliance for the project under U.S. Army Corps of Engineers' (USACE's) authority, as described in Chapter 1, *Introduction*.

A.1.2 Federal Endangered Species Act

Section 7 of the Endangered Species Act (ESA) requires Federal agencies, in consultation with the U.S. Fish and Wildlife Service (USFWS) and/or the National Marine Fisheries Service (NMFS), to ensure that their actions do not jeopardize the continued existence of endangered or threatened species, or result in the destruction or adverse modification of the critical habitat of these species. The required steps in the Section 7 consultation process are as follows.

- Agencies must request information from USFWS and/or NMFS on the existence in a project area of special-status species or species proposed for listing.
- Agencies must initiate formal consultation with USFWS and/or NMFS if the proposed action may adversely affect special-status species.

The project may affect special-status species. USACE and the Sutter Butte Flood Control Agency (SBFCA) are in coordination with USFWS and NMFS to initiate consultation under Section 7.

A.1.3 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) implements a series of international treaties that provide for migratory bird protection. The MBTA authorizes the Secretary of the Interior to regulate the taking of migratory birds; the act provides that it is unlawful, except as permitted by regulations, "to pursue, take, or kill any migratory bird, or any part, nest or egg of any such bird..." (16 USC 703). This prohibition includes both direct and indirect acts, although harassment and habitat modification are not included unless they result in direct loss of birds, nests, or eggs. The current list of species protected by the MBTA includes several hundred species and essentially includes all native birds. Permits for take of non-game migratory birds can be issued only for specific activities, such as scientific collecting, rehabilitation, propagation, education, taxidermy, and protection of human health and safety and personal property.

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Compliance with the MBTA would be addressed through compliance with the ESA and California Endangered Species Act (CESA). The project would incorporate mitigation measures that would help ensure that construction activities do not result in the take of migratory birds, as discussed in Section 3.9, *Wildlife*.

A.1.4 Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act provides for the protection of the bald eagle and the golden eagle by prohibiting, except under certain specified conditions, the take, possession, and commerce of such birds.

The project area does not contain bald eagle or golden eagle nesting habitat, and the project would not result in the take of bald or golden eagles. The project incorporates mitigation measures that would ensure that construction activities do not result in the take of any raptors, as discussed in Section 3.9, *Wildlife*.

A.1.5 Clean Water Act

The Clean Water Act (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. The following sections provide additional details on specific sections of the CWA.

Section 303

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 (see Section A.2.7). 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 Environmental Protection Agency (EPA) approves the state's list. The affected water body, and associated pollutant or stressor, is then prioritized in the 303(d) List. Section 303(d) also requires the development of a Total Maximum Daily Load (TMDL) for each listing. The current list, approved by the EPA, is the 2006 303(d) List.

In addition to the impaired water body list required by CWA Section 303(d), CWA section 305(b) requires states to develop a report assessing statewide surface water quality. Both CWA requirements are being addressed through the development of a 303(d)/305(b) Integrated Report, which will address both an update to the 303(d) list and a 305(b) assessment of statewide water quality. The State Water Board developed a statewide 2010 California Integrated Report based upon the Integrated Reports from each of the nine regional water quality control boards (RWQCBs). The 2010 California Integrated Report was approved by the State Water Board at a public hearing on August 4, 2010, and the report was submitted to the EPA for final approval. Although updates to the 303(d) list must be finalized by the EPA before becoming effective, this updated 303(d) list will be used for this analysis in order to have the most up-to-date information available.

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Section 401

Under the 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. In California, the authority to grant water quality certification has been delegated to the State Water Board, and applications for water quality certification under CWA Section 401 are typically processed by the RWQCB with local jurisdiction. Water quality certification requires evaluation of potential impacts in light of water quality standards and CWA Section 404 criteria governing discharge of dredged and fill materials into waters of the United States.

The Feather River West Levee Project (FRWLP) is subject to CWA Section 401 certification as a condition of USACE's authority under the CWA Section 404.

Section 402

CWA Section 402 regulates discharges to surface waters through the National Pollutant Discharge Elimination System (NPDES) program, administered by EPA. In California, the State Water Board is authorized by EPA to oversee the NPDES program through the RWQCBs (see related discussion regarding the Porter-Cologne Water Quality Control Act under state regulations, Section A.2.7). The NPDES program provides for both general permits (those that cover a number of similar or related activities) and individual permits.

Construction General Permit

Dischargers whose projects disturb 1 or more acres of soil or whose projects disturb less than 1 acre but are part of a larger common plan of development that in total disturbs 1 or more acres are required to file a notice of intent (NOI) to obtain coverage under the NPDES General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (General Order No. 2010-0014-DWQ—General Permit). Construction activities subject to this permit include clearing, grading, and disturbances to the ground such as stockpiling or excavation, but do not include regular maintenance activities performed to restore the original line, grade, or capacity of the facility.

The Construction General Permit requires the preparation and implementation of a stormwater pollution prevention plan (SWPPP), which must be completed before construction begins. The SWPPP should contain a site map that shows the construction site perimeter; existing and proposed buildings, lots, roadways, and stormwater collection and discharge points; general topography both before and after construction; and drainage patterns across the project. The SWPPP must list best management practices (BMPs) the discharger will use to protect stormwater runoff and the placement of those BMPs. Additionally, the SWPPP must contain a visual monitoring program; a chemical monitoring program for non-visible pollutants to be implemented if there is a failure of BMPs; and a sediment monitoring plan if the site discharges directly to a water body listed on the 303(d) list for sediment. Section A (or Section XIV) of the Construction General Permit describes the elements that must be contained in a SWPPP.

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Municipal Activities

CWA Section 402 mandates permits for municipal stormwater discharges, which are regulated under the NPDES General Permit for Municipal Separate Storm Sewer Systems (MS4) (MS4 Permit). Phase 1 MS4 regulations cover municipalities with populations greater than 100,000, certain industrial processes, or construction activities disturbing an area of 5 acres or more. Phase 2 MS4 regulations require that stormwater management plans be developed by municipalities with populations smaller than 100,000 and construction activities disturbing 1 or more acres of land area.

Several of the cities and counties within the affected area have their own NPDES municipal stormwater permits for the regulation of stormwater discharges. Yuba City and Sutter County (joint program) as well as Butte County are permit holders under the general Phase 2 MS4 Permit (Order No. 2003-0005-DWQ) in the affected area. These permits require that controls are implemented to reduce the discharge of pollutants in stormwater discharges to the maximum extent possible, including management practices, control techniques, system design and engineering methods, and other measures as appropriate. As part of permit compliance, these permit holders have created stormwater management plans for their respective locations. These plans outline the requirements for municipal operations, industrial and commercial businesses, construction sites, and planning and land development. These requirements may include multiple measures to control pollutants in stormwater discharge. During implementation of specific projects, project applicants would be required to follow the guidance contained in the stormwater management plans as defined by the permit holder in that location.

General Dewatering Permit

Although small amounts of construction-related dewatering are covered under the Construction General Permit, the Central Valley RWQCB has also adopted a General Order for Dewatering and Other Low-Threat Discharges to Surface Waters for which a permit is required (General Dewatering Permit). This permit applies to various categories of dewatering activities if construction required dewatering in greater quantities than that allowed by the Construction General Permit and the effluent is discharged to surface waters. The General Dewatering Permit contains waste discharge limitations and prohibitions similar to those in the Construction General Permit. To obtain coverage, the applicant must submit an NOI and pollution prevention and monitoring program (PPMP) to the Central Valley RWQCB. The PPMP must include a description of the discharge location, discharge characteristics, primary pollutants, receiving water, treatment systems, spill prevention plans, and other measures necessary to comply with discharge limits. A representative sampling and analysis program must be prepared as part of the PPMP and implemented by the permittee, along with recordkeeping and quarterly reporting requirements during dewatering activities.

Municipal Separate Storm Sewer System Program (MS4s)

EPA defines an MS4 as any conveyance or system of conveyances (roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, human-made channels, and storm drains) owned or operated by a state, city, town, county, or other public body having jurisdiction over stormwater, that is designed or used for collecting or conveying stormwater. As part of the NPDES program, EPA initiated a program requiring that entities having MS4s apply to their local RWQCBs for stormwater discharge permits. The program proceeded through two phases. Under Phase I, the program initiated permit requirements for designated municipalities with populations of 100,000 or more to obtain NPDES permit coverage for their stormwater discharges. Phase II expanded the

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program to municipalities with populations less than 100,000, as well as small MS4s outside the urbanized areas that are designated by the permitting authority to obtain NPDES permit coverage for their stormwater discharges.

Generally, Phase I MS4s are covered by individual permits and Phase II MS4s are covered by a general permit. Each regulated MS4 is required to develop and implement a stormwater management program to reduce the contamination of stormwater runoff and prohibit illicit discharges.

Section 404

Section 404 of the CWA requires that a permit be obtained from USACE for the discharge of dredged or fill material into "waters of the United States, including wetlands."

Waters of the United States include wetlands and lakes, rivers, streams, and their tributaries. *Wetlands* are defined for regulatory purposes, at 33 CFR § 328.3 as:

> (1) All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of tide; (2) All interstate waters, including interstate wetlands; (3) All other waters such as intrastate lakes, rivers, streams, mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce; (4) All impoundments of waters otherwise defined as waters of the United States under the definition; (5) Tributaries of waters identified in paragraphs 1–4 in this section; (6) The territorial seas; and (7) Wetlands adjacent to waters identified in paragraphs 1–6 in this section.

CWA Section 404(b) requires that USACE process permits in compliance with guidelines developed by EPA. These guidelines (404[b][1] Guidelines) require that there be an analysis of alternatives available to meet the project purpose and need, including those that avoid and minimize discharges of dredged or fill materials in waters. Once this first test has been satisfied, the project that is permitted must be the least environmentally damaging practicable alternative before USACE may issue a permit for the proposed activity.

Before any actions that may affect surface waters are implemented, a delineation of jurisdictional waters of the United States must be completed following USACE protocols to determine whether the affected area contains wetlands or other waters of the United States that qualify for CWA protection. These areas include:

- Sections within the ordinary high water mark (OHWM) of a stream, including non-perennial 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.

*[**Note:** Section 404 does not apply to authorities under the Rivers and Harbors Appropriation Act of 1899, except that some of the same waters may be regulated under both statutes; the USACE typically combines the permit requirements of Section 10 and Section 404 into one permitting process.]*

A.1.6 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 across any navigable water, or that place obstructions to navigation outside established Federal lines and excavate from or deposit material in such waters.

Such activities require permits from USACE. *Navigable waters* are defined in Section 329.4 of the act 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.

Section 9

Section 9 (33 USC 401) prohibits the construction of any bridge, dam, dike, or causeway across any navigable water of the United States in the absence of congressional consent and approval of the plans by the Chief of Engineers and the Secretary of the Army. Where the navigable portions of the water body lie wholly within the limits of a single state, the structure may be built under authority of the legislature of that state, if the location and plans or any modification thereof are approved by the Chief of Engineers and by the Secretary of the Army.

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.

Section 13

Section 13 (33 USC 407) provides that the Secretary of the Army, whenever the Chief of Engineers determines that anchorage and navigation would not be injured thereby, may permit the discharge of refuse into navigable waters. In the absence of a permit, such discharge of refuse is prohibited. While the prohibition of this section, known as the Refuse Act, is still in effect, the permit authority of the Secretary of the Army has been superseded by the permit authority provided the Administrator, EPA, and the states under Sections 402 and 405 of the CWA, respectively.

As described above, the proposed project may affect waters of the United States under Section 404 and navigable waters under the Rivers and Harbors Appropriation Act of 1899. Consultation with USACE is in progress.

Section 14

Under Section 14 (33 USC 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. Minor modifications to flood control facilities have been further delegated via Section 208 (33 CFR 208.10) to the District Engineer.

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Section 208 (33 CFR 208.10)

While not technically part of the Rivers and Harbors Act, as introduced above, Section 208 (33 CFR 208.10) authorizes the USACE District Engineer to approve relatively minor, low impact alterations/modifications related to the operation and maintenance responsibilities of the non-Federal sponsors, provided these alterations and modifications do not adversely affect the functioning of the project and flood fighting activities. The project is considered to fall under Section 408, as described in the preceding paragraph, the process for which includes and goes beyond the Section 208 District Engineer level to the Chief of Engineers.

A.1.7 Magnuson-Stevens Fishery Conservation and Management Act

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 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.

A.1.8 Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act in general requires Federal agencies to coordinate with USFWS, NMFS, and state fish and game agencies whenever streams or bodies of water are controlled or modified. This coordination is intended both to promote the conservation of wildlife resources by providing equal consideration for fish and wildlife in water project planning and to provide for the development and improvement of wildlife resources in connection with water projects. Federal agencies undertaking water projects are required to include recommendations made by USFWS and state fish and game agencies in project reports, and give full consideration to these recommendations.

USACE and SBFCA are in coordination with the resource agencies in accordance with the act.

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A.1.9 Farmland Protection Policy Act and Memoranda on Farmland Preservation

Two policies require Federal agencies to include assessments of the potential effects of a proposed project on prime and unique farmland. These policies are the Farmland Protection Policy Act and the Memoranda on Farmland Preservation, dated August 30, 1976, and August 11, 1980, respectively, from the CEQ. Under requirements set forth in these policies, Federal agencies must determine these effects before taking any action that could result in converting designated prime or unique farmland for non-agricultural purposes. If implementing a project would adversely affect farmland preservation, the agencies must consider alternative actions to lessen those effects. Federal agencies also must ensure that their programs, to the extent feasible, are compatible with state, local, and private programs to protect farmland. The Natural Resources Conservation Service is the Federal agency responsible for ensuring that these laws and policies are followed.

The project may affect farmland adjacent to the levee, as discussed in Section 3.11, *Agriculture, Land Use, and Socioeconomics*.

A.1.10 National Historic Preservation Act

Section 106 of the National Historic Preservation Act (NHPA) requires Federal agencies to evaluate the effects of their undertakings on historic properties, which are those properties listed or eligible for listing on the National Register of Historic Places (NRHP). Implementing regulations at 36 CFR Part 800 require that Federal agencies, in consultation with the State Historic Preservation Officer (SHPO), identify historic properties within the area of potential effects (APE) of the proposed project and make an assessment of adverse effects if any are identified. If the project is determined to have an adverse effect on historic properties, the Federal agency is required to consult further with SHPO and the Advisory Council on Historic Preservation (ACHP) to develop methods to resolve the adverse effects. The Section 106 process has five basic steps.

1. Initiate the Section 106 process, including the identification of consulting parties, such as Native American tribes.
2. Identify and evaluate cultural resources to determine whether they are historic properties.
3. Assess the effects of the undertaking on historic properties within the APE.
4. If historic properties may be subject to an adverse effect, the Federal agency, the SHPO, and any other consulting parties (including Native American tribes and the ACHP) continue consultation to seek ways to avoid, minimize, or mitigate the adverse effect. A memorandum of agreement (MOA) is usually developed to document the measures agreed upon to resolve adverse effects. Alternatively, the Federal agency may prepare and execute a programmatic agreement (PA) with the aforementioned parties to comply with 36 CFR 800, particularly in the context of complex undertakings that entail years of implementation actions or where the undertaking's effects on historic properties cannot be well characterized during the planning phase.
5. Proceed in accordance with the terms of the MOA or PA.

The efforts taken to identify cultural resources within the APE and any potential effects are discussed in Section 3.17, *Cultural Resources*. Consultation with SHPO is in progress.

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A.1.11 American Indian Religious Freedom Act

The American Indian Religious Freedom Act of 1978 is also applicable to Federal undertakings. This act established "the policy of the United States to protect and preserve for American Indians their inherent right of freedom to believe, express, and exercise the traditional religions, including but not limited to access to sites, use and possession of sacred objects, and the freedom to worship through ceremonial and traditional rites" (Public Law 95-431).

It is not anticipated that actions related to the project would conflict with the American Indian Religious Freedom Act. Consultation with the Native American Heritage Commission and the Sacred Lands database was negative for findings in the project areas, which is discussed in Section 3.17, *Cultural Resources*.

A.1.12 Wild and Scenic Rivers Act

The Wild and Scenic Rivers Act (16 USC 1271 et seq.) establishes a National Wild and Scenic Rivers System for the protection of rivers with important scenic, recreational, fish and wildlife, and other values. Rivers are classified as wild, scenic, or recreational. The act designates specific rivers for inclusion in the System and prescribes the methods and standards by which additional rivers may be added. The Feather River in the project area is not designated under this act.

A.1.13 Executive Order 11988 (Floodplain Management)

Executive Order 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 the 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 involves siting in a floodplain, the agency must minimize potential harm to or in the floodplain and explain why the action is proposed in the floodplain.

A.1.14 Executive Order 11990 (Protection of Wetlands)

Executive Order 11990 (May 24, 1977) requires Federal agencies to prepare wetland assessments for proposed actions located in or affecting wetlands. Agencies must avoid undertaking new construction in wetlands unless no practicable alternative is available and the proposed action includes all practicable measures to minimize harm to wetlands. Section 3.8, *Vegetation*, describes effects on wetlands and mitigation measures for reducing significant effects for the project.

A.1.15 Executive Order 12898 (Environmental Justice)

Executive Order 12898 (February 11, 1994) requires Federal agencies to identify and address adverse human health or environmental effects of Federal programs, policies, and activities that could be disproportionately high on minority and low-income populations. Federal agencies must ensure that Federal programs or activities do not directly or indirectly result in discrimination on the basis of race, color, or national origin. Federal agencies must provide opportunities for input into the NEPA process by affected communities and must evaluate the potentially significant and adverse environmental effects of proposed actions on minority and low-income communities during environmental document preparation. Even if a proposed Federal project would not result in

significant adverse effects on minority and low-income populations, the environmental document must describe how Executive Order 12898 was addressed during the NEPA process.

Environmental justice issues are discussed in Section 3.12, *Population, Housing, and Environmental Justice*.

A.1.16 Executive Order 13007 (Indian Sacred Sites) and April 29, 1994, Executive Memorandum

Executive Order 13007 (May 24, 1996) requires Federal agencies with land management responsibilities to accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners and avoid adversely affecting the physical integrity of such sacred sites. Where appropriate, agencies are to maintain the confidentiality of sacred sites. Among other things, Federal agencies must provide reasonable notice of proposed actions or land management policies that may restrict future access to or ceremonial use of, or adversely affect the physical integrity of, sacred sites. The agencies must comply with the April 29, 1994, Executive Memorandum, *Government-to-Government Relations with Native American Tribal Governments*.

Based on the analysis described in Section 3.17, *Cultural Resources*, no sacred sites would be significantly affected by the implementation of the project.

A.1.17 Federal Clean Air Act

The Federal Clean Air Act (CAA) was enacted to protect and enhance the nation's air quality in order to promote public health and welfare and the productive capacity of the nation's population. The CAA requires an evaluation of any Federal action to determine its potential effects on air quality in the project region. California has a corresponding law, which also must be considered during the environmental impact report (EIR) process.

For specific projects, Federal agencies must coordinate with the appropriate air quality management district as well as with EPA. This coordination would determine whether the project conforms to the CAA and the state implementation plan (SIP).

Section 176 of the CAA prohibits Federal agencies from engaging in or supporting in any way an action or activity that does not conform to an applicable SIP. Actions and activities must conform to a SIP's purpose of eliminating or reducing the severity and number of violations of the national ambient air quality standards and in attaining those standards expeditiously. EPA promulgated conformity regulations (codified in 40 CFR 93.150 et seq.).

The potential air quality effects of the project resulting from construction (such as equipment emissions and fugitive dust) are discussed in Section 3.5, *Air Quality*, which analyzes and documents compliance with the CAA.

A.1.18 Federal Water Project Recreation Act

The Federal Water Project Recreation Act requires Federal agencies with authority to approve water projects to include recreation development as a condition of approving permits. Recreation development must be considered along with any navigation, flood control, reclamation, hydroelectric, or multi-purpose water resource project. The act states that,

consideration should be given to opportunities for outdoor recreation and fish and wildlife enhancement whenever any such project can reasonably serve either or both purposes consistently.

Recreation effects, such as temporary loss to river access, are described in Section 3.14, *Recreation*.

A.1.19 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.

No materials classified as hazardous are proposed to be used for the project.

A.1.20 Comprehensive Environmental Response, Compensation, and Liability Act

The Comprehensive Environmental Response, Compensation, and Liability Act (also known as CERCLA or 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.

Hazardous waste sites are discussed in Section 3.16, *Public Health and Environmental Hazards*.

A.1.21 Wildlife Hazards on or Near Airports

The Federal Aviation Administration addresses control of hazardous wildlife in Advisory Circular 150/5200-33B, *Hazardous Wildlife Attractants on or near Airports*. The Federal Aviation Administration provides direction on where public-use airports should restrict land uses that have the potential to attract hazardous wildlife. The Federal Aviation Administration recommends a distance of 10,000 feet separating wildlife attractants and aircraft movement areas. The area within a 10,000-foot radius of the Airport Operations Area is designated as the Critical Zone. The definition of wildlife attractants in Advisory Circular 150/5200-33A includes human-made or natural areas, such as poorly drained areas, retention ponds, agricultural activities, and wetlands. Advisory Circular 150/5200-33A recommends against the use of airport property for agricultural production within a 5-mile radius of the Airport Operations Area unless the income from the agricultural crops is necessary for the economic viability of the airport.

A.1.22 Sustainable Fisheries Act

In response to growing concern about the status of United States fisheries, Congress passed the Sustainable Fisheries Act of 1996 (PL 104-297) to amend the Magnuson-Stevens Fishery Conservation and Management Act (PL 94-265), the primary law governing marine fisheries management in the Federal waters of the United States. Under the Sustainable Fisheries Act, consultation is required by NMFS on any activity that might adversely affect EFH. EFH includes those habitats that fish rely on throughout their life cycles. It encompasses habitats necessary to allow sufficient production of commercially valuable aquatic species to support a long-term

sustainable fishery and contribute to a healthy ecosystem. The Feather River has been designated as EFH by the Pacific Fishery Management Council. As described in Section A.1.2, *Federal Endangered Species Act*, USACE and SBFCA are in coordination with USFWS and NMFS and consultation would be initiated under Section 7 with publication of the Draft EIS/EIR. That process would include consideration of and compliance with the Magnuson-Stevens Act to determine effects on EFH. At this time, it is considered that no EFH would be affected.

A.1.23 Uniform Relocation Assistance and Real Property Acquisition Policies Act

All or portions of parcels within the project footprint may need to be acquired to construct either of the action alternatives. Federal, state, local government agencies, and others 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 costs reimbursement, replacement housing, and reimbursement for related expenses and rights of appeal are provided for in the Uniform Act.

If necessary, 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 and California Government Code Section 7267 et seq.

A.1.24 Code of Federal Regulations, Title 40, Part 131, Water Quality Standards

This regulation establishes requirements for water quality, including activities related to in-channel construction, dredging, and long-term effects resulting in sediment transport and scouring.

A.1.25 USACE Levee Safety Program

The USACE Rehabilitation and Inspection Program provides for rehabilitation and/or repair of Public Law 84-99 eligible (active status) levees that are damaged during flood events. This authority covers post flood repair of both Federally authorized and/or constructed and non-Federally constructed flood control works. Inspections of Federal levees are funded and conducted under the Inspection of Completed Works (ICW) program. Inspection of non-Federal levees are funded and conducted under the PL 84-99 Rehabilitation and Inspection Program. Because the subject levees in the proposed project area are classified as Federal levees, inspections are funded and conducted under the ICW program.

A.1.26 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

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the Federal government. This review of NAGPRA is provided because the FRWLP may traverse Federal lands. NAGPRA establishes a hierarchy of ownership as follows (25 USC 3002[a]).

- Where the lineal descendants can be found, the lineal descendants own the remains.
- Where the lineal descendants cannot be found, the remains belong to the Indian tribe or Native Hawaiian organization on whose land the remains were found.
- If the remains are discovered on other lands owned or controlled by the Federal government and the lineal descendants cannot be determined, the remains belong to the Indian tribe or Native Hawaiian organization that is culturally affiliated with the remains, or the tribe that aboriginally occupied the land where the remains were discovered.

Under NAGPRA, intentional excavation of Native American human remains on lands owned or controlled by the Federal government may occur (25 USC 3002[c]) only under the following circumstances.

- With a permit issued under the Archaeological Resources Protection Act (16 USC 470cc).
- After documented consultation with the relevant tribal or Native American groups.

NAGPRA also provides guidance on inadvertent discoveries of Native American or Hawaiian human remains on lands owned or controlled by the Federal government. When an inadvertent discovery on these lands occurs in association with construction, construction must cease. The party that discovers the remains must notify the relevant Federal agency, and the remains must be transferred according to the ownership provisions above (25 USC 3002[d]).

A.1.27 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]). This review of ARPA is provided 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 Section 7.5). The permit may require notice to affected Indian tribes (43 CFR Section 7.7), and compliance with the terms and conditions provided in the ARPA regulations (43 CFR Section 7.9).

A.1.28 Executive Order 13112: Prevention and Control of Invasive Species

EO 13112, signed February 3, 1999, directs all Federal agencies to prevent and control the introduction of invasive species in a cost-effective and environmentally sound manner. The EO established the National Invasive Species Council (NISC), which is composed of Federal agencies and departments, and a supporting Invasive Species Advisory Committee composed of state, local, and private entities. In 2008, the NISC released an updated national invasive species management plan that recommends objectives and measures to implement the EO and prevent the introduction and spread of invasive species (National Invasive Species Council 2008). The EO requires consideration of invasive species in NEPA analyses, including their identification and distribution, their potential effects, and measures to prevent or eradicate them.

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A.1.29 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.)

A.1.30 Federal - *Massachusetts et al. v. U.S. Environmental Protection Agency* (2007)

Twelve U.S. states and cities, including California, in conjunction with several environmental organizations, sued to force EPA to regulate greenhouse gases (GHGs) as a pollutant pursuant to the CAA in *Massachusetts et al. v. Environmental Protection Agency 549 US 497* (2007). The court ruled

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that the plaintiffs had standing to sue, GHGs fit within the CAA's definition of a pollutant, and EPA's reasons for not regulating GHGs were insufficiently grounded in the CAA.

A.1.31 Energy Independence and Security Act of 2007

The Energy Independence and Security Act of 2007 mandates a host of actions that would aid in the reduction of GHG emissions. These actions include (but are not limited to): fuel economy standard of 35 miles per gallon (mpg) by 2020; improved energy efficiency in lighting and appliances; and investments in efficiency and renewable energy use.

A.1.32 Update to Corporate Average Fuel Economy Standards (2009)

The new Corporate Average Fuel Economy (CAFE) standards incorporate stricter fuel economy standards promulgated by the State of California into one uniform standard. Additionally, automakers are required to cut GHG emissions in new vehicles by roughly 25% by 2016. Rule-making to adopt these new standards is in process, and thus they are not yet in effect. When the national program takes effect, California has committed to allowing automakers who show compliance with the national program also to be deemed in compliance with state requirements (U.S. Environmental Protection Agency 2010a).

A.1.33 EPA Rule: Mandatory Reporting of Greenhouse Gases (2009)

Under the rule, suppliers of fossil fuels or industrial GHGs, manufacturers of vehicles and engines, and facilities that emit 25,000 metric tons (MT) or more per year of GHGs are required to report annual emissions to the EPA. The first annual reports for the largest emitting facilities, covering calendar year 2010, would be submitted to the EPA in 2011. The mandatory reporting rule does not limit GHG emissions but establishes a standard framework for emissions reporting and tracking of large emitters (U.S. Environmental Protection Agency 2010a).

A.1.34 EPA Endangerment Finding and Cause or Contribute Finding (2009)

In its Endangerment Finding, the Administrator of the EPA found, as described above, that GHGs in the atmosphere threaten the public health and welfare of current and future generations. The Administrator also found that the combined emissions of well-mixed GHGs from new motor vehicles and new motor vehicle engines contribute to the GHG pollution that threatens public health and welfare. Although the Finding of Endangerment does not place requirements on industry, it is an important step in the EPA's process to develop regulation. This action is a prerequisite to finalizing the EPA's proposed GHG emission standards for light-duty vehicles, which were jointly proposed by EPA and the Department of Transportation's National Highway Safety Administration on September 15, 2009 (U.S. Environmental Protection Agency 2010a).

In its Cause or Contribute Finding the Administrator found that the combined emissions of well-mixed GHG from new motor vehicles and new motor vehicle engines contribute to the GHG pollution that threatens public health and welfare (U.S. Environmental Protection Agency 2010a).

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A.1.35 National Global Change Research Plan, 2012–2021 (Published in 2012)

In 2012 the National Science and Technology Council published the most recent update to the *National Global Change Research Plan, 2012-2021* (National Science and Technology Council, 2012). The National Science and Technology Council represents 13 Federal agencies which are responsible for developing policies and procedures to research, track and mitigate global change, including sea-level rise, ocean acidification, heat waves and drought, severe storms, floods, and forest fires that pose an ever-growing risk to life, property and agriculture. The Research Plan presented four major goals: Advance Scientific Knowledge; Inform Decisions; Conduct Sustained Assessments; and Communicate and Educate.

A.1.36 Federal Tailpipe Emission Standards

To reduce emissions from off-road diesel equipment, on-road diesel trucks, and harbor craft, EPA 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, will be required to comply with the emission standards.

A.2 State Plans, Policies, and Regulations

A.2.1 California Environmental Quality Act

The California Environmental Quality Act (CEQA) requires state and local agencies to identify the significant environmental impacts of their actions and to avoid or mitigate those impacts, if feasible. The environmental review required imposes both procedural and substantive requirements. At a minimum, an initial review of the project and its environmental effects must be conducted. CEQA's primary objectives are listed below.

- Disclose to decision makers and the public the significant environmental effects of proposed activities.
- Identify ways to avoid or reduce environmental damage.
- Prevent environmental damage by requiring implementation of feasible alternatives or mitigation measures.
- Disclose to the public reasons for agency approval of projects with significant environmental effects.
- Foster interagency coordination in the review of projects.
- Enhance public participation in the planning process.

CEQA applies to all discretionary activities proposed to be carried out or approved by California public agencies, including state, regional, county, and local agencies, unless an exemption applies. The act requires that public agencies comply with both procedural and substantive requirements. Procedural requirements include the preparation of the appropriate public notices (including notices of preparation), scoping documents, alternatives, environmental documents (including mitigation measures, mitigation monitoring plans, responses to comments, findings, and statements

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of overriding considerations), completion of agency consultation and State Clearinghouse review, and provisions for legal enforcement and citizen access to the courts.

CEQA's substantive provisions require agencies to address environmental impacts disclosed in an appropriate document. When avoiding or minimizing environmental damage is not feasible, CEQA requires agencies to prepare a written statement of overriding considerations when they decide to approve a project that would cause one or more significant effects on the environment that cannot be mitigated. CEQA establishes a series of action-forcing procedures to ensure that agencies accomplish the purposes of the law. In addition, under the direction of CEQA, the California Resources Agency has adopted regulations, known as the State CEQA Guidelines, which provide detailed procedures that agencies must follow to implement the law.

This document is the instrument for CEQA compliance, as described in Chapter 1, *Introduction*.

Cultural Resources Protection under CEQA

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 Section 15064.5[b]) and unique archaeological sites (State CEQA Guidelines 15064.5[c] and PRC Section 21083.2). Different legal rules apply to the two different categories of cultural resources, although the two categories sometimes overlap where a "unique archaeological resource" also qualifies as a "historical resource." In such an instance, the more stringent rules for archaeological resources that are historical resources apply, as explained below. CEQA and other California laws also set forth special rules for dealing with human remains that might be encountered during construction.

Historical resources are those meeting any of the requirements listed below.

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

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

- Resources that are associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage, or the United States (California Code of Regulations [CCR], Title 14, Section 4852[b][1]).
- Resources that are associated with the lives of persons important in our past (14 CCR 4852[b][2]).

- Resources that embody the distinctive characteristics of a type, period, region, or method of construction, or represent the work of an important creative individual, or possess high artistic values (14 CCR 4852[b][3]).
- Resources that yield, or may be likely to yield, information important in prehistory or history (14 CCR 4852[b][4]).

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

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

The fact that a resource is not listed in, or determined to be eligible for listing in the California Register of Historical Resources, not included in a local register of historical resources, or identified in a historical resource survey does not preclude a lead agency under CEQA from determining that the resource *may* be a historical resource as defined in California PRC Section 5020.1(j) or 5024.1 (State CEQA Guidelines Section 15064.5[a][4]).

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

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

Unique archaeological resources, on the other hand, are defined in California PRC Section 21083.2 as a resource that meets at least one of the following criteria.

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

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Mitigation Requirements for Archaeological Resources Qualifying As Historical Resources

As set forth in State CEQA Guidelines Section 15064.5[c], special rules apply where a lead agency is not certain at first whether an archaeological resource qualifies as either a "historical resource" or a "unique archaeological resource." That section provides that "[w]hen a project will impact an archaeological site, a lead agency shall first determine whether the site is a historical resource." "If a lead agency determines that the archaeological site is a historical resource," the resource will be subject to the rules set forth above regarding historical resources. In addition, according to State CEQA Guidelines Section 15126.4[b]:

> [p]ublic agencies should, whenever feasible, seek to avoid damaging effects on any historical resource of an archaeological nature. The following factors shall be considered and discussed in an EIR for a project involving such an archaeological site:
>
> (A) Preservation in place is the preferred manner of mitigating impacts to archaeological sites. Preservation in place maintains the relationship between artifacts and the archaeological context. Preservation may also avoid conflict with religious or cultural values of groups associated with the site.
>
> (B) Preservation in place may be accomplished by, but is not limited to, the following:
>
> 1. Planning construction to avoid archaeological sites;
> 2. Incorporation of sites within parks, greenspace, or other open space;
> 3. Covering the archaeological sites with a layer of chemically stable soil before building tennis courts, parking lots, or similar facilities on the site.
> 4. Deeding the site into a permanent conservation easement.

Thus, although California PRC Section 21083.2, in dealing with "unique archaeological sites," provides for specific mitigation options "in no order of preference," CEQA Guidelines Section 15126.4(b), in dealing with "historical resources of an archaeological nature," provides that "preservation in place is the preferred manner of mitigating impacts to archaeological sites."

For archaeological resources that qualify as historical resources, "data recovery" is a disfavored form of mitigation compared with "preservation in place." Yet "[w]hen data recovery through excavation is the only feasible mitigation, a data recovery plan, which makes provisions for adequately recovering the scientifically consequential information from and about the historical resource, would be prepared and adopted prior to any excavation being undertaken. Such studies would be deposited with the California Historical Resources Regional Information Center." Moreover, "[i]f an artifact must be removed during project excavation or testing, curation may be an appropriate mitigation" (State CEQA Guidelines Section 15126.4[b][3][C]). "Data recovery shall not be required [, however,] for a historical resource [as with a unique archaeological resource] if the lead agency determines that testing or studies already completed have adequately recovered the scientifically consequential information from and about the archaeological or historical resource, provided that the determination is documented in the EIR and that the studies are deposited with the California Historical Resources Regional Information Center" (State CEQA Guidelines Section 15126.4[b][3][D]).

With respect to *both* historical resources and unique archaeological resources:

> a lead agency should make provisions for…resources accidentally discovered during construction. These provisions should include an immediate evaluation of the find by a qualified archaeologist. If the find is determined to be a historical or unique archaeological resource, contingency funding and a time allotment sufficient to allow for implementation of avoidance measures or appropriate

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mitigation should be available. Work could continue on other parts of the building site while historical or unique archaeological resource mitigation takes place (State CEQA Guidelines Section 15064.5[f]).

Mitigation for Unique Archaeological Resources

If a lead agency determines that "an archaeological site does *not* meet the criteria" for qualifying as a historical resource "but does meet the definition of a unique archeological resource…, the site shall be treated in accordance with the provisions of section 21083.2" (described above). Section 21083.2 contains the special rules for mitigation for "unique archaeological resources." These rules do not apply if the archaeological resource is a historical resource (State CEQA Guidelines Section 15064.5[c][1]). The CEQA Statute states:

> [i]f it can be demonstrated that a project will cause damage to a unique archaeological resource, the lead agency may require reasonable efforts to be made to permit any or all of these resources to be preserved in place or left in an undisturbed state. Examples of that treatment, in no order of preference, may include, but are not limited to, any of the following:
>
> 1. Planning construction to avoid archaeological sites.
> 2. Deeding archaeological sites into permanent conservation easements.
> 3. Capping or covering archaeological sites with a layer of soil before building on the sites.
> 4. Planning parks, greenspace, or other open space to incorporate archaeological sites.
>
> Excavation as mitigation shall be restricted to those parts of the unique archaeological resource that would be damaged or destroyed by the project. Excavation as mitigation shall not be required for a unique archaeological resource if the lead agency determines that testing or studies already completed have adequately recovered the scientifically consequential information from and about the resource, if this determination is documented in the environmental impact report (California Public Resources Code Section 21083.2[d]).

If, however, "an archaeological resource is neither a unique archaeological nor a historical resource, the effects of the project on those resources shall not be considered a significant effect on the environment. It shall be sufficient that both the resource and the effect on it are noted in the Initial Study or EIR, if one is prepared to address impacts on other resources, but they need not be considered further in the CEQA process" (State CEQA Guidelines Section 15064.5[c][4]).

Discoveries of Human Remains under CEQA

California law sets forth special rules that apply where *human remains* are encountered during project construction. These rules are set forth in State CEQA Guidelines Section 15064.5[e] as follows:

> In the event of the accidental discovery or recognition of any human remains in any location other than a dedicated cemetery, the following steps should be taken:
>
> (1) There shall be no further excavation or disturbance of the site or any nearby area reasonably suspected to overlie adjacent human remains until:
>
> (A) The coroner of the county in which the remains are discovered must be contacted to determine that no investigation of the cause of death is required (as required under California Health and Safety Code Section 7050.5).
>
> (B) If the coroner determines the remains to be Native American:
>
> 1. The coroner shall contact the Native American Heritage Commission within 24 hours.

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2. The Native American Heritage Commission shall identify the person or persons it believes to be the most likely descended from the deceased Native American.
3. The most likely descendent may make recommendations to the landowner or the person responsible for the excavation work, for means of treating or disposing of, with appropriate dignity, the human remains and any associated grave goods (as provided in Public Resources Code Section 5097.98), or

(2) Where the following conditions occur, the landowner or his authorized representative shall rebury the Native American human remains and associated grave goods with appropriate dignity on the property in a location not subject to further subsurface disturbance.

(A) The Native American Heritage Commission is unable to identify a most likely descendent or the most likely descendent failed to make a recommendation within 24 hours after being notified by the commission.

(B) The descendant identified fails to make a recommendation; or

(C) The landowner or his authorized representative rejects the recommendation of the descendant, and the mediation by the Native American Heritage Commission fails to provide measures acceptable to the landowner.

A.2.2 California Register of Historical Resources

The CRHR includes resources that are listed in or formally determined eligible for listing in the NRHP (see Section 3.17, *Cultural Resources*) as well as some California State Landmarks and Points of Historical Interest (PRC Section 5024.1, 14, CCR Section 4850). Properties of local significance that have been designated under a local preservation ordinance (local landmarks or landmark districts) or that have been identified in a local historical resources inventory may be eligible for listing in the CRHR and are presumed to be significant resources for purposes of CEQA unless a preponderance of evidence indicates otherwise (State CEQA Guidelines Section 15064.5[a][2]). The eligibility criteria for listing in the CRHR are similar to those for NRHP listing but focus on the importance of the resources to California history and heritage. A cultural resource may be eligible for listing in the CRHR if it:

1. is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage;
2. is associated with the lives of person important in our past;
3. embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important individual, or possesses high artistic values; or
4. has yielded, or may be likely to yield, information important in prehistory or history.

A.2.3 Native American Heritage Commission

The Native American Heritage Commission (NAHC) identifies and catalogs places of special religious or social significance to Native Americans and known graves and cemeteries of Native Americans on private lands, and performs other duties regarding the preservation and accessibility of sacred sites and burials and the disposition of Native American human remains and burial items. Consultation with NAHC and the Sacred Lands database was negative for findings in the affected area.

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A.2.4 California Native American Graves Protection and Repatriation Act

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

A.2.5 California Endangered Species Act

CESA is similar to ESA but pertains only to state-listed endangered and threatened species. CESA requires state agencies to consult with the California Department of Fish and Game (DFG) when preparing documents under CEQA to ensure that the actions of the state lead agency do not jeopardize the continued existence of listed species. CESA directs agencies to consult with DFG on projects or actions that could affect listed species, directs DFG to determine whether there would be jeopardy to listed species, and allows DFG to identify "reasonable and prudent alternatives" to the project consistent with conserving the species. Agencies can approve a project that affects a listed species if the agency determines that there are "overriding considerations;" however, the agencies are prohibited from approving projects that would cause the extinction of a listed species.

Mitigating impacts on state-listed species involves avoidance, minimization, and compensation (listed in order of preference). Unavoidable effects on state-listed species are typically addressed in a detailed mitigation plan prepared in accordance with DFG guidelines. DFG exercises authority over mitigation projects involving state-listed species, including those resulting from CEQA mitigation requirements.

CESA prohibits the "take" of plant and wildlife species state-listed as endangered or threatened. DFG may authorize take if there is an approved habitat management plan or management agreement that avoids or compensates for effects on listed species.

Effects on wildlife resources are discussed in Section 3.9, *Wildlife*.

A.2.6 California Fish and Game Code

Protection of Fully protected species is described in Sections 3511, 4700, 5050, and 5515 of the California Fish and Game Code. These statutes prohibit take or possession of fully protected species and do not provide for authorization of incidental take of fully protected species. DFG has informed non-Federal agencies and private parties that their actions must avoid take of any fully protected species.

Section 1600

DFG regulates work that would substantially affect resources associated with rivers, streams, and lakes in California, pursuant to Fish and Game Code Sections 1600 to 1607. Any action from a public project that substantially diverts or obstructs the natural flow or changes the bed, channel, or bank of any river, stream, or lake, or uses material from a streambed must be previously authorized by

DFG in a lake or streambed alteration agreement under Section 1602 of the Fish and Game Code. This requirement may in some cases apply to any work undertaken within the 100-year floodplain of a body of water or its tributaries, including intermittent streams and desert washes. As a general rule, however, it applies to any work done within the annual high-water mark of a wash, stream, or lake that contains or once contained fish and wildlife, or that supports or once supported riparian vegetation.

Applications for a Streambed Alteration Agreement would be submitted to DFG to authorize the project under Section 1602.

Section 2800/Natural Community Conservation Planning Act

The Natural Community Conservation Planning Act (NCCPA) (California Fish and Game Code Section 2800 et seq.) was enacted to support broad-based planning for effective protection and conservation of the state's wildlife heritage, while continuing to allow appropriate development and growth. The purpose of natural community conservation planning is to sustain and restore those species and their habitat identified by DFG that are necessary to maintain the continued viability of biological communities affected by human changes to the landscape. A Natural Community Conservation Plan identifies and provides for those measures necessary to conserve and manage natural biological diversity within the plan area while allowing compatible use of the land. DFG may authorize the take of any identified species, including listed and non-special-status species, pursuant to Section 2835 of the NCCPA, if the conservation and management of such species is provided for in a Natural Community Conservation Plan (NCCP) approved by DFG.

The project would not affect the take of state-listed species or substantially degrade habitat, so a Natural Community Conservation Plan is not triggered. Effects on biological resources are discussed in Section 3.8, *Vegetation*, and Section 3.9, *Wildlife*.

Section 3503 and 3503.5

Section 3503 of the California Fish and Game Code states that it is unlawful to take, possess, or needlessly destroy the nest or eggs of any bird. Section 3503.5 specifically states that it is unlawful to take, possess, or destroy any raptors (i.e., species in the orders *Falconiformes* and *Strigiformes*), including their nests or eggs. Typical violations of these codes include destruction of active nests resulting from removal of vegetation in which the nests are located. Violation of Section 3503.5 could also include failure of active raptor nests resulting from disturbance of nesting pairs by nearby project construction. This statute does not provide for the issuance of any type of incidental take permit.

A.2.7 Porter-Cologne Water Quality Control Act of 1969

In 1967, the Porter-Cologne Act established the State Water Board and nine RWQCBs as the primary state agencies with regulatory authority over California water quality and appropriative surface water rights allocations. Under this act (and the CWA), the state is required to adopt a water quality control policy and waste discharge requirements (WDRs) to be implemented by the State Water Board and nine RWQCBs. The State Water Board also establishes Basin Plans and statewide plans. The RWQCBs carry out State Water Board policies and procedures throughout the state.

Pursuant to the Porter-Cologne Act, the Central Valley RWQCB prepares and updates the Basin Plan for the Sacramento and San Joaquin River Basins every 3 years. The Basin Plan describes the

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officially designated beneficial uses for specific surface water and groundwater resources and the enforceable water quality objectives necessary to protect those beneficial uses. The planning area is located within the Central Valley RWQCB jurisdiction and is subject to the Basin Plan.

The Basin Plan includes numerical and narrative water quality objectives for physical and chemical water quality constituents. Numerical objectives are set for temperature, dissolved oxygen (DO, turbidity, and pH; total dissolved solids, electrical conductivity, bacterial content, and various specific ions; trace metals; and synthetic organic compounds. Narrative objectives are set for parameters such as suspended solids, biostimulatory substances (e.g., nitrogen and phosphorus), oil and grease, color, taste, odor, and aquatic toxicity. Narrative objectives are often precursors to numeric objectives. The primary method used by the Central Valley RWQCB to ensure conformance with the Basin Plan's water quality objectives and implementation policies and procedures is to issue WDRs for projects that may discharge wastes to land or water. WDRs specify terms and conditions that must be followed during the implementation and operation of a project.

Basin Plans designate beneficial uses for specific surface water and groundwater resources and establish water quality objectives to protect those uses. The project has the potential to affect water quality in surface water or groundwater within the project area which is governed by the Central Valley RWQCB.

Section 3.2, *Water Quality and Groundwater Resources*, describes water quality effects and mitigation measures for the project.

Central Valley Regional Water Quality Control Board

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 its 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 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 system under CWA above). Basin plans are supposed to be updated every 3 years and provide the technical basis for determining WDRs and taking enforcement actions. The Central Valley RWQCB Basin Plan was last updated in 2007. Another method the Central Valley RWQCB uses to implement the basin plan criteria is by 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.

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 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.

The CTR was promulgated in 2000 in response to requirements of the EPA NTR. The NTR and CTR criteria are regulatory criteria adopted for inland surface waters, enclosed bays, and estuaries in California that are subject to regulation pursuant to Section 303(c) of the CWA. The NTR and CTR include criteria for the protection of aquatic life and human health. Human health criteria (water and organisms) apply to all waters with a Municipal and Domestic Supply beneficial use designation as indicated in the RWQCBs' basin plans. The Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California, also known as the State Implementation Plan, was adopted by the State Water Board in 2000 to establish provisions for translating CTR criteria, NTR criteria, and basin plan water quality objectives for toxic pollutants into the following.

- NPDES permit effluent limits
- Compliance determinations
- Monitoring for dioxin (2,3,7,8-TCDD) equivalents
- Chronic toxicity control provisions
- Initiating site-specific objective development
- Granting exceptions.

See Section 3.2, *Water Quality and Groundwater Resources*, for information related to the project.

A.2.8 California Code of Regulations, Title 23

The Central Valley Flood Protection Board (CVFPB) (formerly the California Reclamation Board) of the State of California regulates the modification and construction of levees and floodways in the Central Valley defined as part of the Sacramento Valley and San Joaquin Valley flood control projects. Rules promulgated in Title 23 of the California Code of Regulations (CCR) (Title 23, Division 1, Article 8 [Section 111 through 137]) regulate the modification and construction of levees to ensure public safety. The CVFPB requires an encroachment permit for any non-Federal activity along or near Federal flood damage reduction project levees and floodways or in CVFPB-designated floodways to ensure that proposed local actions or projects do not impair the integrity of existing flood damage reduction systems to withstand flood conditions. The permits are conditioned upon SBFCA's receipt of permission from USACE for alteration of the Federal project works pursuant to Section 408.The rules further state that existing levees may not be excavated or left partially excavated during the flood season, which is generally November 1 through April 15 for the proposed project area levees.

The following CVFPB guidance applies:

> The California Reclamation Board has primary jurisdiction approval of levee design and construction. The Reclamation Board standards are found in Title 23, Division 1, Article 8 (Sections 111 through 137) of the California Code of Regulations (CCR), and constitute the primary state standard. Section 120 of the CCR directs that levee design and construction be in accordance with the USACE's

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Engineer Manual EM 1110-2-1913, Design and Construction of Levees. This document is the primary federal standard applicable to this project, as supplemented by additional prescriptive standards contained in Section 120 of the CCR. These additional standards prescribe minimum levee cross-sectional dimensions, construction material types, and compaction levels.

A.2.9 Central Valley Flood Control Act of 2008

The Central Valley Flood Control Act of 2008, passed in 2007, recognizes that the Central Valley of California, which includes the planning area, is experiencing unprecedented development, resulting in the conversion of historically agricultural lands and communities to densely populated residential and urban centers. Because of the potentially catastrophic consequences of flooding, the Act recognizes that the Federal government's current 100-year flood protection standard is not sufficient to protect urban and urbanizing areas within flood-prone areas throughout the Central Valley and declares that the minimum standard for these areas is a 200-year level of flood protection. To continue with urban development, cities and counties must develop and implement plans for achieving this new standard by 2025. With respect to flood risk reduction, the Central Valley Flood Control Act also calls upon the California Department of Water Resources (DWR) to develop a comprehensive Central Valley Flood Protection Plan (CVFPP) by the end of 2012 for protecting the lands currently within the Sacramento–San Joaquin River Flood Management System.

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 Ordinance in a manner consistent with the CVFPP within 24 months after the CVFPP's adoption, which occurred July 1, 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.

Senate Bill 5, Senate Bill 17, and Assembly Bill 162

According to legislation as part of Senate Bill (SB) 5 (Machado and Wolk), SB 17 (Florez) and Assembly Bill (AB) 162 (Wolk), urban and urbanizing areas in the Sacramento Valley and San Joaquin Valley will be required to achieve, or make adequate progress toward achieving, 200-year protection by the year 2015 to continue to have development approved in the floodplain. Specifically, AB 162 requires that each local jurisdiction's Safety Element include 200-year floodplain maps. Maps must be based on the best available data on flood protection, including areas protected by state and Federal project levees, and areas outside of these areas.

California 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 Version 4 of 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.

A.2.10 California Surface Mining and Reclamation Act

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 in response to land use conflicts between urban growth and essential mineral production. The stated purpose of SMARA is 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. SMARA governs the use and conservation of a wide variety of mineral resources, although some resources and activities are exempt from its provisions, including excavation and grading conducted for farming, construction, or recovery from flooding or other natural disaster.

Activities subject to SMARA include, but are not limited to, mining of minerals, gravel, and borrow material. The SMARA statute requires mitigation to reduce adverse effects on public health, property, and the environment. Because the Sacramento Area Flood Control Agency (SAFCA) would require borrow material for project construction, SAFCA must comply with SMARA. SMARA applies to an individual or entity that would disturb more than 1 acre or remove more than 1,000 cubic yards of material through surface mining activities, including the excavation of borrow pits for soil material. SMARA is implemented through ordinances for permitting developed by local government "lead agencies" that provide the regulatory framework under which local mining and reclamation activities are conducted. The State Mining and Geology Board reviews the local ordinances to ensure that they meet the procedures established by SMARA.

SMARA provides for the evaluation of an area's mineral resources using a system of Mineral Resource Zone (MRZ) classifications that reflect the known or inferred presence and significance of a given mineral resource. The MRZ classifications are based on available geologic information, including geologic mapping and other information on surface exposures, drilling records, and mine data; and socioeconomic factors such as market conditions and urban development patterns. The MRZ classifications are defined as follows.

- **MRZ-1**—areas where adequate information indicates that no significant mineral deposits are present, or where it is judged that little likelihood exists for their presence.
- **MRZ-2**—areas where adequate information indicates that significant mineral deposits are present, or where it is judged that a high likelihood for their presence exists.

- **MRZ-3**—areas containing mineral deposits, the significance of which cannot be evaluated from available data.
- **MRZ-4**—areas where available information is inadequate for assignment into any other MRZ.

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 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. The project is under evaluation for SMARA applicability.

A.2.11 California Important Farmland Inventory System and Farmland Mapping and Monitoring Program

The California Department of Conservation, Office of Land Conservation, maintains a statewide inventory of farmlands. These lands are mapped by the Division of Land Resource Protection as part of the Farmland Mapping and Monitoring Program. The maps are updated every 2 years with the use of aerial photographs, a computer mapping system, public review, and field reconnaissance. Farmlands are divided into the following five categories based on their suitability for agriculture.

- Prime Farmland: land that has the best combination of physical and chemical characteristics for crop production. It has the soil quality, growing season, and moisture supply needed to produce sustained high yields of crops when treated and managed.
- Farmland of Statewide Importance: land other than Prime Farmland that has a good combination of physical and chemical characteristics for crop production.
- Unique Farmland: land that does not meet the criteria for Prime Farmland or Farmland of Statewide Importance, but that has been used for the production of specific crops with high economic value.
- Farmland of Local Importance: land that is either currently producing crops or has the capability of production, but that does not meet the criteria of the categories above.
- Grazing Land: land on which the vegetation is suited to the grazing of livestock.

These categories are sometimes referred to as Important Farmland. Other categories used in the mapping system are urban and built-up lands, lands committed to non-agricultural use, and other lands (land that does not meet the criteria of any of the other categories).

Section 3.11, *Agriculture, Land Use, and Socioeconomics,* addresses effects on farmland.

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A.2.12 California Land Conservation Act (Williamson Act)

The California Land Conservation Act of 1965, commonly known as the Williamson Act (California Government Code Section 51200 et seq.), enables local governments to enter into contracts with private landowners for the purpose of promoting the continued use of the relevant land in agricultural or related open space use. In return, landowners receive property tax assessments that are based on farming and open space uses instead of full market value. Local governments receive an annual subvention (subsidy) of forgone property tax revenues from the state via the Open Space Subvention Act of 1971.

The Williamson Act empowers local governments to establish agricultural preserves consisting of lands devoted to agricultural uses and other compatible uses. Upon establishment of such preserves, the locality may offer to owners of included agricultural land the opportunity to enter into annually renewable contracts that restrict the land to agricultural use for at least 10 years (i.e., the contract continues to run for 10 years following the first date upon which the contract is not renewed). In return, the landowner is guaranteed a relatively stable tax rate, based on the value of the land for agricultural/open space use only and unaffected by its development potential.

As a public agency that may acquire lands within agricultural preserves, including lands under contract, SBFCA is exempt from the normal cancellation process for Williamson Act contracts, because the contract is nullified for the portion of the land actually acquired (California Government Code Section 51295). SAFCA must provide notice to the California Department of Conservation prior to acquiring such lands (California Government Code Section 51291[b]). A second notice is required within 10 working days after the land is actually acquired (California Government Code Section 51291 (c J). As the land would be acquired for flood damage reduction measures, SAFCA is exempt from the findings required in California Government Code Section 51292 (California Government Code Section 51293[e][1]) because the proposed project consists of flood control works. The preliminary notice to the California Department of Conservation, provided before lands are actually acquired, would demonstrate the purpose of the project and the exemption from the findings.

Section 3.11, *Agriculture, Land Use, and Socioeconomics*, addresses effects on farmland.

A.2.13 California Climate Solutions Act

In September 2006, Governor Arnold Schwarzenegger signed AB 32, the California Climate Solutions Act of 2006. AB 32 requires that statewide GHG emissions be reduced to 1990 levels by 2020. This reduction would be accomplished through an enforceable statewide cap on GHG emissions that would be phased in starting in 2012. To effectively implement the cap, AB 32 directs the California Air Resources Board (ARB) to develop and implement regulations to reduce statewide GHG emissions from stationary sources. AB 32 specifies that regulations adopted in response to AB 1493 should be used to address GHG emissions from vehicles. However, AB 32 also includes language stating that if the AB 1493 regulations cannot be implemented, then ARB should develop new regulations to control vehicle GHG emissions under the authorization of AB 32.

AB 32 requires that ARB adopt a quantified cap on GHG emissions representing 1990 emissions levels and disclose how it arrives at the cap; institute a schedule to meet the emissions cap; and develop tracking, reporting, and enforcement mechanisms to ensure that the state achieves the reductions in GHG emissions necessary to meet the cap. AB 32 also includes guidance to institute

emissions reductions in an economically efficient manner and conditions to ensure that businesses and consumers are not unfairly affected by the reductions.

Contributions of GHG emissions related to the project are discussed in Section 3.6, *Climate Change and Greenhouse Gas*.

A.2.14 California Regulations for Environmental Justice

Most state governments have plans and policies intended to protect and expand the local and regional economies affecting the communities within their jurisdictions. State plans and policies also frequently address other social and economic impact topics, including fiscal conditions and related public services that affect local residents' quality of life.

Within California, SB 115 (Chapter 690, Statutes of 1999) was signed into law in 1999. The legislation established OPR as the coordinating agency for state environmental justice programs (California Government Code, Section 65040.12[a]) and defined environmental justice in statute as "the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies" (Government Code Section 65040.12(e). SB 115 further required the California Environmental Protection Agency (Cal/EPA) to develop a model environmental justice mission statement for boards, departments, and offices within the agency by January 1, 2001 (Public Resources Code, Sections 72000–72001).

In 2000, SB 89 (Chapter 728, Statutes of 2000) was signed, which complemented SB 115 by requiring the creation of an environmental justice working group and an advisory group to assist Cal/EPA in developing an intra-agency environmental justice strategy (PRC Sections 72002–72003). SB 828 (Chapter 765, Statutes of 2001) added and modified due dates for the development of Cal/EPA's intra-agency environmental justice strategy and required each board, department, and office within Cal/EPA to identify and address, no later than January 1,2004, any gaps in its existing programs, policies, and activities that may impede environmental justice (PRC, Sections 71114–71115).

Cal/EPA adopted its environmental justice policy in 2004 (California PRC, Sections 71110–71113). This policy (or strategy) provides guidance to its resource boards, departments, and offices. It is intended to help achieve the state's goal of "achieving fair treatment of people of all races, cultures and incomes with respect to the development, adoption, implementation and enforcement of environmental laws and policies."

AB 1553 (Chapter 762, Statutes of 2001) required OPR to incorporate environmental justice considerations in the General Plan Guidelines. AB 1553 specified that the guidelines should propose methods for local governments to address the following goals.

- Plan for the equitable distribution of new public facilities and services that increase and enhance community quality of life.
- Provide for the location of industrial facilities and uses that pose a significant hazard to human health and safety in a manner that seeks to avoid over-concentrating these uses in proximity to schools or residential dwellings.

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- Provide for the location of new schools and residential dwellings in a manner that avoids proximity to industrial facilities and uses that pose a significant hazard to human health and safety.
- Promote more livable communities by expanding opportunities for transit-oriented development.

Although environmental justice is not a mandatory topic in the general plan, OPR is required to provide guidance to cities and counties for integrating environmental justice into their general plans. The 2003 edition of the *General Plan Guidelines* included the contents required by AB 1553 (see pages 8, 12, 20–27, 40, 114, 142, 144, and 260 of the revised *General Plan Guidelines*).

Environmental justice issues pertaining to the project are discussed in Section 3.12, *Population, Housing, and Environmental Justice*.

A.2.15 Water Use Efficiency

The California Constitution prohibits the waste or unreasonable use of water. Further, Water Code Section 275 directs DWR and the State Water Board to "take all appropriate proceedings or actions before executive, legislative, or judicial agencies to prevent waste or unreasonable use of water." Several legislative acts have been adopted to develop efficient use of water in the state.

- Urban Water Management Planning Act of 1985
- Water Conservation in Landscaping Act of 1992
- Agricultural Water Management Planning Act
- Agricultural Water Suppliers Efficient Management Practices Act of 1990
- Water Recycling Act of 1991
- Agricultural Water Conservation and Management Act of 1992

The purpose of the project is to address flood issues; it would not result in the waste or unreasonable use of water.

A.2.16 Public Trust Doctrine

When planning and allocating water resources, the State of California is required to consider the public trust and preserve for the public interest the uses protected by the trust. The public trust doctrine embodies the principle that certain resources, including water, belong to all and, thus, are held in trust by the state for future generations.

In common law, the public trust doctrine protects navigation, commerce, and fisheries uses in navigable waterways. However, the courts have expanded the doctrine's application to include protecting tideland, wildlife, recreation, and other public trust resources in their natural state for recreational, ecological, and habitat purposes as they affect birds and marine life in navigable waters. *The National Audubon Society v. Superior Court of Alpine County* (1983) 33 Cal 3d 419 decision extended the public trust doctrine's limitations on private rights to appropriative water rights, and also ruled that longstanding water rights could be subject to reconsideration and could possibly be curtailed. The doctrine, however, generally requires the court and the State Water Board

to perform a balancing test to weigh the potential value to society of a proposed or existing diversion against its effect on trust resources.

The 1986 Rancanelli decision applied the public trust doctrine to decisions by the State Water Board and held that this doctrine must be applied by the State Water Board in balancing all the competing interests in the uses of Bay-Delta waters (*United States v. State Water Resources Control Board* [1986] 182 Cal. App. 3d 82).

The project is consistent with the public trust doctrine, as the primary goals include improved flood protection.

A.2.17 Davis-Dolwig Act

The Davis-Dolwig Act declares that recreation and fish and wildlife enhancement are among the purposes of state water projects. It specifies that costs for recreation and fish and wildlife enhancement not be included in prices, rates, and charges for water and power to urban and agricultural users. Under the Davis-Dolwig Act, land for recreation and fish and wildlife enhancement must be planned and initiated at the same time as any other land acquisition for the project. Implementation of the project would maintain existing recreation areas and not preclude opportunities for future recreation use or facilities. While the project is not related to water supply, it consistent with this act.

A.2.18 Relocation Assistance and Property Acquisition

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 implementing Title 42, Chapter 61 of the USC, 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 act, persons required to relocate temporarily are not considered displaced, but must be treated fairly. Such persons have a right to temporary housing that is decent, safe, and sanitary, and must be reimbursed for all reasonable out-of-pocket expenses. In accordance with these guidelines, people may 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 owners of displaced 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 above) and California Government Code Section 7267 et seq.

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A.2.19 Safe, Clean, Reliable Water Supply Act

This act declares that the basic goals of the state are, among other findings, to protect the integrity of the state's water supply system from catastrophic failure attributable to earthquakes and flooding.

A.2.20 Alquist-Priolo Earthquake Fault Zoning Act

California's Alquist-Priolo Earthquake Fault Zoning Act (Alquist-Priolo Act) (Public Resources Code [PRC] Section 2621 et seq.), originally enacted in 1972 as the Alquist-Priolo Special Studies Zones Act and renamed in 1994, is intended to reduce risks to life and property from surface fault rupture during earthquakes. The Alquist-Priolo Act prohibits the location of most types of structures intended for human occupancy across the traces of active faults and strictly regulates construction in the corridors along active faults (earthquake fault zones). It also defines criteria for identifying active faults, giving legal weight to terms such as active, and establishes a process for reviewing building proposals in and adjacent to earthquake fault zones.

Under the Alquist-Priolo Act, faults are zoned, and construction along or across them is strictly regulated if they are "sufficiently active" and "well defined." A fault is considered sufficiently active if one or more of its segments or strands shows evidence of surface displacement during Holocene time (defined for purposes of the act as referring to approximately the last 11,000 years). A fault is considered well-defined if its trace can be identified clearly by a trained geologist at the ground surface, or in the shallow subsurface using standard professional techniques, criteria, and judgment (Bryant and Hart 2007).

The act directs California Geological Survey (CGS) to establish the regulatory zones, called AP Earthquake Fault Zones, around the known surface traces of active faults and to publish maps showing these zones. Each fault zone extends approximately 200 to 500 feet on each side of the mapped fault trace to account for potential branches of active faults.

CGS Special Publication 42 (Bryant and Hart 2007) states that in the absence of a site-specific faulting study, the areas within 50 feet of the mapped fault should be considered to have the potential for surface faulting and, therefore, no structure for human occupancy should be in these areas. Construction of buildings intended for human occupancy within the fault zone boundaries is strictly regulated, and site-specific faulting investigations are required.

Title 14 of CCR, Section 3601(e), defines buildings intended for human occupancy as those that would be inhabited for more than 2,000 hours per year. If no facilities are to be within AP Earthquake Fault Zones, this act would not apply.

A.2.21 Seismic Hazards Mapping Act

Like the Alquist-Priolo Act, the Seismic Hazards Mapping Act of 1990 (PRC Sections 2690–2699.6) is intended to reduce damage resulting from earthquakes. While the Alquist-Priolo Act addresses surface fault rupture, the Seismic Hazards Mapping Act addresses other earthquake-related hazards, including strong ground shaking, liquefaction, and seismically induced landslides. Its provisions are similar in concept to those of the Alquist-Priolo Act: The state is charged with identifying and mapping areas at risk of strong ground shaking, liquefaction, landslides, and other corollary hazards; and cities and counties are required to regulate development within mapped seismic hazard zones.

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Under the Seismic Hazards Mapping Act, permit review is the primary mechanism for local regulation of development. Specifically, cities and counties are prohibited from issuing development permits for sites within seismic hazard zones until appropriate site-specific geologic and/or geotechnical investigations have been carried out and measures to reduce potential damage have been incorporated into the development plans.

A.2.22 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.

A.2.23 Assembly Bill 939, Titles 14, 17, and 27, Chapter 1095, Statutes of 1989

GHG emissions from landfills are regulated under AB 939, Titles 14 and 27. AB 939 mandated local jurisdictions to meet waste diversion goals of 25% by 1995 and 50% by 2000. In addition, AB 939 established an integrated statewide system for compliance and program implementation. Titles 14 and 27 contain detailed rules on daily operations, handling of specific waste types, monitoring, closure, and record-keeping.

At its June 25, 2009, public hearing, ARB approved for adoption CCR Title 17, article 4, sub-article 6, sections 95460 to 95476, Methane Emissions from Municipal Solid Waste Landfills. This regulation is a discrete early action GHG-reduction measure, as described in the California Global Warming Solutions Act of 2006 (AB 32; Stats. 2006, chapter 488). It would reduce methane emissions from landfills primarily by requiring owners and operators of certain uncontrolled landfills to install gas collection and control systems, and by requiring existing and newly installed gas collection and control systems to operate optimally.

A.2.24 Assembly Bill 1493—Pavley Rule (2002)

Known as Pavley I, AB 1493 standards are the nation's first GHG standards for automobiles. AB 1493 requires ARB to adopt vehicle standards that will lower GHG emissions from new light duty autos to the maximum extent feasible beginning in 2009. Additional strengthening of the Pavley standards (Pavley II) has been proposed for vehicle model years 2017–2020. Together, the two standards are expected to increase average fuel economy to roughly 43 mpg by 2020 and reduce GHG emissions from the transportation sector in California by approximately 14%. In June 2009, the EPA granted California's waiver request, enabling the state to enforce its GHG emissions standards for new motor vehicles beginning with the current model year. The new Federal CAFE standards, described above, are the analogous national policy.

A.2.25 Executive Order S-03-05 (2005)

Executive Order S-03-05 established the following GHG emission reduction targets for California's state agencies:

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- By 2010, reduce GHG emissions to 2000 levels.
- By 2020, reduce GHG emissions to 1990 levels.
- By 2050, reduce GHG emissions to 80% below 1990 levels.

Executive orders are binding only on state agencies. Accordingly, Executive Order S-03-05 will guide state agencies' efforts to control and regulate GHG emissions but would have no direct binding effect on local efforts. The Secretary of the Cal/EPA is required to report to the Governor and state legislature biannually on the effects of climate change on California, mitigation and adaptation plans, and progress made toward reducing GHG emissions to meet the targets established in this executive order.

A.2.26 Senate Bill 97, Chapter 185 (2007)

SB 97 of 2007 requires that the State's OPR prepare guidelines to submit to the California Resources Agency regarding feasible mitigation of GHG emissions or the effects of GHG emissions as required by CEQA. The Natural Resources Agency adopted Amendments to the State CEQA Guidelines for GHG emissions on December 30, 2009. On February 16, 2010, the State's Office of Administrative Law approved the amendments and filed them with the Secretary of State for inclusion in the California Code of Regulations. The amendments became effective March 18, 2010.

A.2.27 Executive Order S-01-07, Low Carbon Fuel Standard (2007)

Executive Order S-01-07 essentially mandates: (1) that a statewide goal be established to reduce the carbon intensity of California's transportation fuels by at least 10% by 2020, and (2) that a low carbon fuel standard (LCFS) for transportation fuels be established in California. The executive order initiates a research and regulatory process at the ARB. Based on an implementation plan developed by the CEC, ARB will be responsible for implementing the LCFS.

A.2.28 California Air Resources Board Mandatory Greenhouse Gas Reporting Rule (Title 17) (2007)

In December of 2007, ARB approved a rule requiring mandatory reporting of GHG emissions from certain sources, pursuant to AB 32. Facilities subject to the mandatory reporting rule must report their emissions either annually for large facilities or triennially for smaller facilities starting from 2010. In general the rule applies to facilities emitting more than 25,000 MT of carbon dioxide equivalent (CO_2e) in any given calendar year and electricity generating facilities with a nameplate generating capacity greater than 1 megawatt (MW) and/or emitting more than 2,500 MT CO_2e per year. Additional requirements apply to cement plants and entities that buy and sell electricity in the state.

A.2.29 California Air Resources Board Local Government Operations Protocol (2008)

On September 25, 2008, the Local Government Operations Protocol (LGOP) was adopted by ARB. The protocol, prepared by ARB, California Climate Action Registry, International Council of Local

Environmental Initiatives (ICLEI), and The Climate Registry, provides methods and techniques for the preparation of GHG emission inventories for local government municipal operations. The adopted protocol does not recommended any particular measures for GHG reductions by local governments (California Air Resources Board 2010a).

A.2.30 Senate Bill 375—Sustainable Communities Strategy, Chapter 728 (2008)

SB 375 provides for a new planning process that coordinates land use planning, regional transportation plans, and funding priorities in order to help California meet the GHG reduction goals established in AB 32. SB 375 requires regional transportation plans (RTPs), developed by metropolitan planning organizations (MPOs), including the Sacramento Area Council of Governments (SACOG), to incorporate a "sustainable communities strategy" (SCS) in their Regional Transportation Plans. The goal of the SCS is to reduce regional vehicle miles traveled (VMT) through land use planning and consequent transportation patterns. On September 23, 2010, ARB adopted regional GHG reduction targets that will focus each SCS. The target for the Sacramento region specifies a 7% reduction in per capita emissions by 2020 and a 16% reduction by 2035. SACOG is in the process of developing its SCS, pursuant to the regional GHG target. Completion is expected in December 2011. SB 375 also includes provisions for streamlined CEQA review for some infill projects such as transit-oriented development. However, those provisions would not become effective until an SCS is adopted.

A.2.31 Senate Bills 1078/107 and Executive Order S-14-08—Renewable Portfolio Standard (2008)

SBs 1078 and 107, California's Renewable Portfolio Standard (RPS), obligates investor-owned utilities (IOUs), energy service providers (ESPs), and Community Choice Aggregations (CCAs) to procure an additional 1% of retail sales per year from eligible renewable sources until 20% is reached, no later than 2010. The CPUC and CEC are jointly responsible for implementing the program. EO S-14-08 set forth a longer range target of procuring 33% of retail sales by 2020.

A.2.32 California Energy Efficiency Standards for Residential and Non-Residential Buildings (Title 24)(2008)

Energy Conservation Standards for new residential and nonresidential buildings were adopted by the California Energy Resources Conservation and Development Commission in June 1977 and most recently revised in 2008 (24 CCR 6). Title 24 requires that building shells and building components be designed to conserve energy and the standards are updated periodically (roughly every 3 years) to allow consideration and incorporation of new energy efficiency technologies. This program has been partially responsible for keeping California's per capita energy use approximately constant over the past 30 years.

Title 24 standards were most recently updated on July 17, 2008. The new code, adopted by the California Building Standards Commission, represents the nation's first green building standards and went into effect on January 1, 2010. Part 11 of the code established voluntary actions (Tier 1 and 2), designed to achieve a higher level of efficiency and sustainability, including planning and design for sustainable site development, energy efficiency (in excess of the California Energy Code

requirements), water conservation, material conservation, and internal air contaminants. The voluntary standards became mandatory on January 1, 2011.

A.2.33 California Cap-and-Trade (2010)

Pursuant to the directives of AB 32, ARB recently approved measures on December 16, 2010, to enact a GHG Cap-and-Trade program for the state of California. The California Cap-and-Trade program would create a CO_2 market system with a GHG emissions cap that will be decreased over time. Building on the data required by the 2007 California Mandatory GHG Reporting rule, only stationary sources that emit more than 25,000 MT of CO_2e per year would be affected by the Cap-and-Trade program. These sources include mostly large operations such as power plants, refineries, cement plants, hydrogen production facilities, and other large, stationary sources. Official rulemaking associated with achieving this emissions cap was adopted by January 1, 2011, and the actual program is to commence in 2012.

A.2.34 Actions Taken by California Attorney General's Office

The California Attorney General (AG) has filed comment letters under CEQA about a number of proposed projects. The AG also has filed several complaints and obtained settlement agreements for CEQA documents covering general plans and individual programs that the AG found either failed to analyze GHG emissions or failed to provide adequate GHG mitigation. The AG's office prepared a report listing the measures that local agencies should consider under CEQA to offset or reduce global warming effects. The AG's office also has prepared a chart of modeling tools to estimate GHG emissions effects of projects and plans. Information on the AG's actions can be found on the California Department of Justice, Office of Attorney General web site (California Department of Justice 2008).

A.2.35 California Air Pollution Control Officers Association Guidance

The California Air Pollution Control Officers Association (CAPCOA) released a report in January 2008 that describes methods to estimate and mitigate GHG emissions from projects subject to CEQA. The CAPCOA report evaluates several GHG thresholds that could be used to evaluate the significance of a project's GHG emissions. The CAPCOA report, however, does not recommend any one threshold. The report is designed as a resource for public agencies as they establish agency procedures for reviewing GHG emissions from projects subject to CEQA (California Air Pollution Control Officers Association 2008).

In 2010 CAPCOA prepared a supplemental guidance document entitled Quantifying Greenhouse Gas Mitigation Measures (California Air Pollution Control Officers Association 2010). The report is intended to provide a resource for applicants and planners who might be required to mitigate GHG emissions, and provides tools to quantify a wide range of potentially feasible GHG reduction measures. However, the document does not specify GHG significance thresholds, nor does it advocate any policy or specific set of GHG mitigation measures.

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A.2.36 Executive Order S-13-08

Executive Order S-13-08, issued November 14, 2008, directs the California Natural Resources Agency, DWR, Office of Planning and Research, Energy Commission, State Water Resources Control Board, State Parks Department, and California's coastal management agencies to participate in a number of planning and research activities to advance California's ability to adapt to the impacts of climate change. The order specifically directs agencies to work with the National Academy of Sciences to initiate the first California Sea Level Rise Assessment and to review and update the assessment every 2 years after completion; to immediately assess the vulnerability of the California transportation system to sea level rise; and to develop a California Climate Change Adaptation Strategy.

A.2.37 Idling Limit Regulation

On June 15, 2008, 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).

A.2.38 State Tailpipe Emission Standards

To reduce emissions from off-road diesel equipment, on-road diesel trucks, and harbor craft, 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, will be required to comply with the standards.

A.2.39 Carl Moyer Memorial Air Quality Attainment Program

The Carl Moyer Memorial Air Quality Standards Attainment Program (Carl Moyer Program) is a voluntary program that offers grants to owners of heavy-duty vehicles and equipment. The program is a partnership between ARB and the local air districts throughout the state. Locally, the air districts administer the Carl Moyer program. The purpose of the program is to reduce air pollution emissions from heavy-duty engines.

A.3 Local Plans, Policies, and Regulations

In addition to Federal and state regulatory requirements, the project may be subject to certain zoning or other ordinances and general plans of Butte and Sutter Counties and cities in the affected area. These are presented below by resource topic for convenience. For more discussion on local plans and requirements applicable to the project, refer to the Regulatory Setting part of the specific resource sections of interest within this document.

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A.3.1 Flood Control and Geomorphology

A.3.1.1 Butte County

Butte County General Plan 2030

Both the Water Resources Element and the Health and Safety Element of the Butte County General Plan 2030 (Butte County 2010) contain goals and policies relevant to flood control. These goals and policies focus on minimizing risk and property damage from flooding, protection of surface water and groundwater resources and quality, and management of stormwater runoff.

- **Goal W-6** Improve streambank stability and protect riparian resources.
    - **Policy W-P6.1** Any alteration of natural channels for flood control shall retain and protect riparian vegetation to the extent possible while still accomplishing the goal of providing flood control. Where removing existing riparian vegetation is unavoidable, the alteration shall allow for reestablishment of vegetation without compromising the floodflow capacity.
    - **Policy W-P6.2** Where streambanks are already unstable, as demonstrated by erosion or landslides along banks, tree collapse, or severe in-channel sedimentation, proponents of new development projects shall prepare a hydraulic and/or geomorphic assessment of on-site and downstream drainageways that are affected by project area runoff.
- **Goal HS-2** Protect people and property from flood risk.
    - **Policy HS-P2.1** The County supports the efforts of regional, State and federal agencies to improve flood management facilities along the Sacramento River while conserving the riparian habitat of the river.
    - **Policy HS-P2.2** The County supports the efforts of private landowners and public agencies to maintain existing flood management facilities.
    - **Policy HS-P2.3** The County supports the Flood Mitigation Plan and the Flooding Mitigation Action Plan in the Butte County Multi-Jurisdictional All-Hazard Pre-Disaster Mitigation Plan (MHMP).
    - **Policy HS-P2.4** Development projects on lands within the 100-year flood zone, as identified on the most current available maps from FEMA (the most current available map at the time of the publication of General Plan 2030 is shown on Figure HS-1), shall be allowed only if the applicant demonstrates that it will not:*
        a. Create danger to life and property due to increased flood heights or velocities caused by excavation, fill, roads and intended use.
        b. Create difficult emergency vehicle access in times of flood.
        c. Create a safety hazard due to the height, velocity, duration, rate of rise and sediment transport of the flood waters expected at the site.
        d. Create excessive costs in providing governmental services during and after flood conditions, including maintenance and repair of public facilities.
        e. Interfere with the existing water conveyance capacity of the floodway.
        f. Substantially increase erosion and/or sedimentation.

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g. Require significant storage of material or any substantial grading or substantial placement of fill that is not approved by the County through a development agreement, discretionary permit, or other discretionary entitlement; a ministerial permit that would result in the construction of a new residence; or a tentative map or parcel map.

h. Conflict with the provisions of the applicable requirements of Government Code Sections 65865.5, 65962 or 66474.5.

- **Policy HS-P2.5** The lowest floor of any new construction or substantial improvement within Flood Zones A, AE, AH and shaded Zone X, as shown in Figure HS-1 or the most current maps available from FEMA, shall be elevated 1 foot or more above the 100-year flood elevation. (County Flood Ordinance Sec. 26-22). Within urban or urbanizing areas, as defined in Government Code 65007, the lowest floor of any new construction or substantial improvements shall be elevated a minimum of 1 foot above the 200-year flood elevation.
- **Policy HS-P2.6** After General Plan 2030 and the Zoning Ordinance are amended to be consistent with the Central Valley Flood Protection Plan, scheduled for adoption in July 2012, the County shall make specific findings prior to approval of a development agreement, subdivision or discretionary permit or other discretionary entitlement, or any ministerial permit that would result in the construction of a new residence. The County shall make findings that it has imposed conditions that will protect the property to the urban level of flood protection, as defined in Government Code Section 65007, in urban and urbanizing areas, or to the national Federal Emergency Management Agency standard of flood protection in nonurbanized areas.

- **Goal HS-3** Prevent and reduce flooding.
  - **Policy HS-P3.1** Watersheds shall be managed to minimize flooding by minimizing impermeable surfaces, retaining or detaining stormwater and controlling erosion.
  - **Policy HS-P3.2** Applicants for new development projects shall provide plans detailing existing drainage conditions and specifying how runoff will be detained or retained on-site and/or conveyed to the nearest drainage facility and shall provide that there shall be no increase in the peak flow runoff to said channel or facility.
  - **Policy HS-P3.3** All development projects shall include stormwater control measures and site design features that prevent any increase in the peak flow runoff to existing drainage facilities.
  - **Policy HS-P3.4** Developers shall pay their fair share for construction of off-site drainage improvements necessitated by their projects.
- **Goal HS-4** Reduce risks from levee failure.
  - **Policy HS-P4.1** The County supports the efforts of regional, State or federal agencies to study levee stability throughout the county, particularly levees that were designed and constructed to provide a minimum 100-year level of protection.
  - **Policy HS-P4.2** The County supports the efforts of levee owners and regional, State, or federal agencies to design and reconstruct levees that do not meet flood protection standards (200-year for urban or urbanizing areas, 100-year for all other areas) to bring them into compliance with adopted State and/or federal standards.

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- **Policy HS-P4.3** New development proposals in levee inundation areas shall consider risk from failure of these levees.

County Ordinance

The delineation of flood boundaries and adoption of County ordinances regulating development within identified floodplains/floodways are the basic flood management tools that the County uses to identify flood hazards and implement its own flood management program. The Federal Emergency Management Agency's (FEMA's) flood mapping program is a critical component of these efforts. A County ordinance adopted in March 1983 enforced flood hazard prevention, as set forth in Article IV in Chapter 26 of the Butte County Code. The Code assigns authority for enforcement of County flood hazard prevention policy to the floodplain administrator, in this case the Director of Development Services. The Code relies on FEMA and Flood Insurance Studies (FIS) data, although other studies may supplement these data if the floodplain administrator recommends it and the Board of Supervisors approves it. The Flood Hazard Prevention Ordinance appoints the Department of Development Services to review all applications for new construction or subdivisions within flood hazard areas. The ordinance's basic requirement, in order to reduce flood hazards, is that the lowest floor of any new construction or substantial improvement within Flood Zones A, AE, AH, and shaded Zone X be elevated 1 foot or more above the regulatory flood elevation. Also, it must be shown that development within the floodplain will not raise the existing flood level. There are other criteria for building in flood hazard areas, including flood-proofing nonresidential structures and designing structures to withstand hydrostatic pressures and hydrodynamic loads.

In areas subject to flooding that are proposed for subdivision, the County is required to ensure that:

- All such proposed developments are consistent with the need to minimize flood damage,
- Subdivisions and parcel maps must, as a condition of approval, establish regulatory flood elevations and note same on final maps prior to recordation of the final map,
- Adequate drainage is provided to reduce exposure to flood hazards.
- All public utilities and facilities are located so as to minimize or eliminate flood damage.

Butte County Multi-Jurisdictional All-Hazard Pre-Disaster Mitigation Plan

The County's principal emergency response plan is the Butte County Multi-Jurisdictional All-Hazard Pre-Disaster Mitigation Plan (Butte County MHMP) (Butte County 2007), adopted in March 2007. The purpose of the plan is to meet the requirements of the Disaster Mitigation Act and thereby maintain continued eligibility for certain hazard mitigation (or disaster loss reduction) programs from FEMA. The plan lays out the strategy that will enable Butte County to become less vulnerable to future disaster losses. The plan reviews the County's capabilities with regard to reducing impacts of natural hazards (e.g., flooding, dam failure) and identifies recommended action items to reduce vulnerability to these hazards. The most relevant section of the plan with respect to flood control issues is the Flooding Mitigation Action Plan. The Flooding Mitigation Action Plan contains a description of flood hazards, a risk assessment, plans and programs to address the hazards, and mitigation goals and strategies for each jurisdiction in Butte County.

In essence, the main goal of the Butte County MHMP with respect to flood control is to protect infrastructure and agriculture from long-term risks of flood, and this goal is to be achieved by implementation of the Flooding Mitigation Action Plan.

Butte County Flood Mitigation Plan

The County established the Butte County Flood Mitigation Plan (Butte County FMP) (Wood Rodgers 2006) to provide guidance to agencies that protect life, property, and livestock; are involved in land use planning; administer FEMA's National Flood Insurance Program (NFIP); and respond to flood emergencies in Butte County. The Butte County FMP will need to be updated to address new state flood control regulations described above.

City of Biggs

Biggs does not have any FEMA-identified flood hazard areas. The elevation of the city from 96+ feet above sea level in the northeast to 86+ feet above sea level near its westerly boundary generally prevents water accumulation in depths that create dangerous flooding. However, the city of Biggs is subject to inundation if the Thermalito Afterbay levee or the Oroville Dam fails.

City of Biggs General Plan 1997–2015

Flood mitigation goals, policies, and programs described in the Public Health and Safety Element of the City of Biggs General Plan 1997–2015 (City of Biggs 1998) include the following.

- **Goal 6.2** Minimize the risk of personal injury and property damage resulting from flooding.
    - **Policy 6.2.A** Develop flood control strategies and improvement plans for the City of Biggs in coordination with RD 833.
    - **Policy 6.2.B** New development shall not be approved in areas which are subject to flooding without prior review and approval of plans for improvements which provide a minimum flood protection level equal to the 100 year occurrence storm event.
    - **Policy 6.2.C** Development of structures must be in compliance with FEMA standards. All 100 year flood hazards must be completely mitigated through proper design.
    - **Policy 6.2.D** All new residential development shall be constructed on pads which are at least six inches above the top of curb of the street on which the development fronts.
    - **Policy 6.2.E** New development projects shall be designed to avoid increases in peak storm runoff levels entering RD 833 channels.
    - **Program 6.2.1** Encourage the California Department of Water Resources to determine the maximum flow capacity for the Feather River and to identify portions of the Feather River levees, particularly in the vicinity of Hazelbush Levee, which are subject to failure or overtopping during periods of high water flow.

Also see the discussion above for Butte County MHMP, which is applicable to flood control in the city of Biggs.

City of Gridley

Flooding is a hazard for Gridley, which is in the SBFCA assessment district. The city of Gridley is approximately 1.3 miles west of the 100-year floodplain (as mapped by FEMA) of the Feather River and the levees that exist there. When 200-year floodplain maps for the Gridley area become available from DWR, they must be analyzed to determine whether any areas planned for development under the General Plan are within the 200-year floodplain. If the possibility of flooding does exist from flood levels occurring at intervals of 200 years or less, such measures as necessary

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must be taken to meet the state law requirements for development in Flood Hazard Zones. Gridley and likely evacuation routes (State Route [SR] 99, SR 70, and SR 162) are located in an area subject to inundation following partial or total failure of Oroville Dam.

City of Gridley 2030 General Plan

Flood hazard safety goals and policies described in the Safety Element of the City of Gridley 2030 General Plan (City of Gridley 2010) include the following.

- **Safety Goal 2:** To reduce risks to people and property from flooding.
    - **Safety Policy 2.1** The City will use the best available flood hazard information and mapping from regional, state, and federal agencies and use this information to inform land use and public facilities investment decisions.
    - **Safety Policy 2.2** The City will regulate development within floodplains in accordance with state and federal requirements.
    - **Safety Policy 2.3** New development shall provide an evaluation of potential flood hazards and demonstrate compliance with state and federal flood standards prior to approval.

Also see the discussion above for Butte County MHMP, which is applicable to flood control in the city of Gridley.

A.3.1.2 Sutter County

Sutter County General Plan

The Public Health and Safety Element of the Sutter County General Plan (Sutter County 2010) contains goals and policies relevant to flood control. These goals and policies focus on minimizing risk and property damage from flooding, protection of surface water and groundwater resources and quality, and stormwater runoff management. They also presently reflect the requirements established by SB 5 pertaining to planning and other efforts necessary ultimately to provide for 200-year flood protection.

- **Goal PHS 1** Minimize the potential for loss of life, personal injury and property damage associated with floods.
    - **PHS 1.1** NFIP. Continue to participate in the National Flood Insurance Program and the Community Rating System.
    - **PHS 1.2** Minimize Risk of Flood Damage. Require a minimum of 100-year flood protection and regulate development in accordance with local, State, and federal requirements to avoid or minimize the risk of flood damage.
    - **PHS 1.3** Flood Protection for New Development. Require new development in urban and/or urbanizing areas to provide 200-year flood protection within three years of adoption of the Central Valley Flood Protection Plan in accordance with state regulations, and require new development outside urban or urbanizing areas to provide 100-year flood protection in accordance with Federal regulations.
    - **PHS 1.4** Development in Dam Inundation Areas. Require new development located in dam inundation areas to consider the risks from dam failure.

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- **PHS 1.5** Essential Facilities. Require that new essential public facilities (e.g., hospitals, health care facilities, emergency shelters, fire stations, etc.) be located, when feasible, outside of flood hazard zones, as defined by FEMA, or designed to maintain the structural and operational integrity of the facility during flooding events.
- **PHS 1.6** Inter-Agency Coordination. Coordinate efforts with local, regional, State, and federal agencies to maintain and improve the existing levee system to protect life and property.

County Ordinance

As a participant in the NFIP, Sutter County is required to adopt and enforce a floodplain management ordinance that minimizes future flood risks to new or existing construction. The Floodplain Management Ordinance (Chapter 1780 of the Sutter County Codes and Ordinances):

- Restricts land use in flood prone areas.
- Requires flood protection measures at the time of initial construction for uses that are vulnerable to floods.
- Controls the alteration of natural floodplains.
- Controls activities that may increase flood damage.
- Prevents or regulates unnatural diversions of floodwaters that could increase flood hazards in other areas.

The current Floodplain Management Ordinance was adopted in October 2008. The ordinance refers to the revised FIRMs dated December 2, 2008, and all subsequent amendments and/or revisions (1780-320). The ordinance will be amended, as necessary, to reflect minor changes (including referencing the revised FIRMs) sometime between the Letter of Final Determination (August 2011) and the effective date of the new FIRMs (February 2012).

Final Yuba City–Sutter County, California Multi-Hazard Mitigation Plan

The County's principal emergency response plan is the Final Yuba City–Sutter County, California Multi-Hazard Mitigation Plan (AMEC 2007), adopted in January 2008. The purpose of the plan is to meet the requirements of the Disaster Mitigation Act and thereby maintain continued eligibility for certain hazard mitigation (or disaster loss reduction) programs from FEMA. The plan lays out the strategy that will enable Sutter County to become less vulnerable to future disaster losses. The plan reviews the County's capabilities with regard to reducing effects of natural hazards (e.g., flooding, dam failure) and identifies recommended action items to reduce vulnerability to these hazards. The plan addresses the unincorporated county, as well as the cities of Yuba City and Live Oak, and six participating districts: the Gilsizer County Drainage District, Levee District 1, and RDs 1001, 1500, 70, and 1660.

The plan identifies the following goals and objectives related to flood hazard protection, but it does not contain any specific policies.

- **Goal 1:** Improve community awareness about hazards that threaten our communities and identify appropriate actions to minimize their impacts upon people and property.

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- **Objective 1.1:** Increase public awareness about the nature and extent of hazards they are exposed to, where they occur, and recommend responses to identified hazards (create/continue an outreach program, provide educational resources and training)

- **Goal 2:** Minimize Risk and Vulnerability to Flood Hazards
  - **Objective 2.1:** Improve the integrity of the levees to at least 100-year flood protection
  - **Objective 2.2:** Eliminate open drainage ditches within 20' of traveled roadways within urbanized areas
  - **Objective 2.3:** Minimize damage/loss to roads
  - **Objective 2.4:** Identify/Protect evacuation routes
  - **Objective 2.5:** Reduce localized flooding from storm events
  - **Objective 2.6:** Provide Protection for community critical facilities

City of Yuba City

Yuba City General Plan

The Noise and Safety Element of the Yuba City General Plan (City of Yuba City 2004) contains guiding policies and implementing policies relevant to flood control. These guiding and implementing policies focus on minimizing risk and property damage from flooding, protection of surface water and groundwater resources and quality, and management of stormwater runoff.

- **9.3-G-1** Protect the community from risks to lives and property posed by flooding and stormwater runoff.
- **9.3-G-2** Collect and dispose of storm water in a safe and efficient manner.
- **9.3-G-3** Ensure that dams and levees are properly maintained for long-term flood protection.
- **9.3-I-1** Implement the drainage improvements identified in the City's Capital Improvement Program.
- **9.3-I-2** Continue to work with the U.S. Army Corps of Engineers to implement levee improvements on the Feather River. Incorporate features in the levee system to ensure flood protection and at the same time improve the connection between the city and the river.
- **9.3-I-3** When necessary, require new development to prepare hydrologic studies to assess storm runoff impacts on the local and subregional storm drainage systems and, if warranted, require new development to provide adequate drainage facilities and to mitigate increases in storm water flows and/or volume to avoid cumulative increases in downstream flows.

  Developers shall provide an assessment of a project's potential impacts on the local and subregional storm drainage systems, so that the City can determine appropriate mitigation to ensure that system capacity and peak flow restrictions are not exceeded.

- **9.3-I-4** Restrict new development in areas subject to 100 year flooding, as shown in Figure 9-6.
- **9.3-I-5** Provide information to property owners about the availability of flood insurance.

  This policy can be implemented with counter handouts and stories in the City's newsletter and pages on the City's website.

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- **9.3-I-6** As new development occurs, work with Sutter County to establish drainage areas that serve the entire Planning Area.

  A new drainage study may be appropriate to determine the best means to establish drainage areas that would safely channel runoff and provide protection from flooding.

- **9.3-I-7** Utilize parks for the secondary purpose of storm water storage.

Final Yuba City–Sutter County, California Multi-Hazard Mitigation Plan

See the Final Yuba City–Sutter County, California Multi-Hazard Mitigation Plan (AMEC 2007) and discussion above under Sutter County for relevant goals adopted by Yuba City that apply to the proposed project area.

City of Live Oak

City of Live Oak 2030 General Plan

The Public Utilities, Services, and Facilities Element and the Public Safety Element of the City of Live Oak 2030 General Plan (City of Live Oak 2010) contain goals, policies, and implementation programs relevant to flood control. These goals, policies, and implementation programs focus on minimizing risk and property damage from flooding, protection of surface water and groundwater resources and quality, and stormwater runoff management.

Within the Public Utilities, Services, and Facilities Element, the following flood protection goal, policies, and implementation program are included.

- **Goal PUBLIC-6.** Protect property and public health through adequate flood protection.
  - **Policy PUBLIC-6.1** The City will coordinate with ongoing regional efforts to verify and improve flood protection for the Planning Area, consistent with state and federal regulations.
  - **Policy PUBLIC-6.2** The City will assess fees for new development on a fair-share basis to fund regional flood protection improvements needed to meet state and federal standards.
  - **Policy PUBLIC-6.3** The City will proactively identify and take advantage of regional, state, and federal funding that may be available for use in flood protection improvements.
    - **Implementation Program PUBLIC-6.1**

      The City will continue its participation with the regional flood protection joint powers authority addressing the assessment and improvement of levees on the west side of the Feather River to meet state and federal standards.

Within the Public Safety Element, the following flood protection goal, policies, and implementation programs are included.

- **Goal PS-2.** Minimize the loss of life and damage to property caused by flood events.
  - **Policy PS-2.1** The City will coordinate with the Sutter Butte Flood Control Agency to ensure that flood control facilities protecting Live Oak's Planning Area from flood risks to the City are well maintained and capable of protecting existing and proposed structures from flooding, in accordance with state law.

- **Policy PS-2.2** The City will regulate development within floodplains according to state and federal requirements to minimize human and environmental risks and maintain the City's eligibility under the National Flood Insurance Program.
- **Policy PS-2.3** The City will require evaluation of potential flood hazards before approving development projects.
- **Policy PS-2.4** The City will require applicants for development to submit drainage studies that adhere to City stormwater design requirements and incorporate measures from the City's master drainage plan to prevent on- or off-site flooding.
- **Policy PS-2.5** New development shall be required to be consistent with regional flood control improvement efforts. New development shall contribute on a fair-share basis to regional solutions to improve flood protection to meet state and federal standards.
- **Policy PS-2.6** The City will use the most current flood hazard and floodplain information from state and federal agencies (such as the State Department of Water Resources, the Federal Emergency Management Agency, and the Army Corps of Engineers) as a basis for project review and to guide development in accordance with federal and state regulations.
- **Policy PS-2.7** As feasible, new development should incorporate stormwater treatment practices that allow percolation to the underlying aquifer and minimize off-site surface runoff (and therefore flooding).

  - **Implementation Program PS-1**

    The City will continue its participation with the regional flood protection joint powers authority addressing the assessment and improvement of levees on the west side of the Feather River to meet federal and state standards. The City will implement development impact fees to provide for necessary levee studies and improvement programs in coordination with the regional flood control joint powers authority. The City will proactively identify and take advantage of federal, state, and regional funding that may be available for use in flood protection improvements.

  - **Implementation Program PS-3**

    Consistent with state law, the City will consult with the Central Valley Flood Protection Board and local flood protection agencies serving the Planning Area, to obtain updated floodway and floodplain maps, data, and policies. When this information is available, if necessary, the City will update the General Plan and revise all applicable development standards, including the zoning code. Subdivision approvals, development agreements, permits, and other City entitlements will incorporate these revised City policies and regulations.

  - **Implementation Program PS-4**

    If necessary, the City will update the General Plan to incorporate 200-year floodplain mapping from the California Department of Water Resources and Central Valley Flood Protection Board, once available.

  - **Implementation Program PS-5**

    In review of new development projects, require disclosure of risk where proposed development would occur in flood risk areas. This disclosure may include notifying new residents in these areas and encouraging purchase of appropriate insurance.

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A.3.2 Water Quality and Groundwater Resources

A.3.2.1 Butte County

Butte County 2030 General Plan

The Butte County General Plan 2030 was adopted in October 2010 and became effective on November 30, 2010 (Butte County 2010). The plan includes several goals and policies related to water resources. For example, the plan contains the following goal related to water quality.

- **Goal W-1** Maintain and enhance water quality.

The goal is followed by policies, such as integrating county planning and programs with other watershed planning efforts, including BMPs, guidelines, and policies of the Central Valley RWQCB, and identifying and eliminating or minimizing all sources of existing and potential point and non-point sources of pollution to ground and surface waters.

Butte County Stormwater 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 stormwater management plan (SWMP).

City of Biggs

City of Biggs General Plan 1997–2015

The City of Biggs is currently involved in the general plan update process. The existing City of Biggs General Plan 1997–2015 was adopted in January 1998 (City of Biggs 1998). This plan contains goals and policies related to water resources. For example, the Open Space and Conservation Element of the plan highlights the following goal related to water resources.

- **GOAL 5.4:** Protect the quantity and quality of community water supplies and avoid degradation of water quality downstream from Biggs.

City of Gridley

City of Gridley 2030 General Plan

The City of Gridley specifies water-related policies in various sections of the City of Gridley 2030 General Plan (City of Gridley 2010). These policies are primarily outlined in the Public Services and Facilities Element. For example, the plan includes the following water resources goal.

- **Public Facilities Goal 1:** To maintain safe and reliable ongoing water supply.

A.3.2.2 Sutter County

Sutter County General Plan—Public Draft

The county is in the process of updating its general plan that was adopted in 1996. The public draft (September 2010) is available on the County's website (Sutter County 2010). The draft general plan

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contains a number of goals and related policies related to water resources. For example, the Environmental Resources Element includes the following goal.

- **Goal ER 6:** Preserve and protect the County's surface water and groundwater resources.

The goal is followed by several policies consistent with achieving this goal, such as integrated water management programs, surface water resource protection, groundwater protection and sustainability, and stormwater quality.

Yuba City–Sutter County Stormwater Management Program

Sutter County and the City of Yuba City are co-permittees of the NPDES Phase II MS4 General Permit, which requires the development of a 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).

City of Yuba City

Yuba City General Plan

The City of Yuba City General Plan was updated in April 2004 (City of Yuba City 2004). The Environmental Conservation Section has numerous goals, or guiding policies, and implementing policies related to water quality. Guiding policies include protecting and enhancing surface water and groundwater resources and enhancing the natural condition of the Feather River waterway. Related implementing policies include complying with the Central Valley RWQCBs regulations and standards to maintain and improve the quality of both surface water and groundwater resources; continuing to control stormwater pollution and protect the quality of the city's waterways by preventing oil and sediment from entering the river; and requiring new construction to utilize BMPs such as site preparation, grading, and foundation designs for erosion control to prevent sediment runoff into waterways, specifically the Feather River.

City of Live Oak

City of Live Oak 2030 General Plan

The City of Live Oak 2030 General Plan was adopted in May 2010 (City of Live Oak 2010). The city's plan contains several water goals, policies, and implementation programs. For example, the Public Utilities, Services, and Facilities Element of the plan includes the following goal related to water resources.

- **Goal PUBLIC-1:** Provide a safe and reliable water supply and delivery system.

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A.3.3 Geology, Soils, Seismicity, and Mineral Resources

A.3.3.1 Butte County

Butte County General Plan 2030

The Health and Safety Element of the Butte County General Plan 2030 (Butte County 2010) includes the following goals and policies related to geologic and seismic hazards.

- **Goal HS-6** Reduce risks from earthquakes.
    - **Policy HS-P6.1** Appropriate detailed seismic investigations shall be completed for all public and private development projects in accordance with the Alquist-Priolo Earthquake Fault Zoning Act.*
    - **Policy HS-P6.2** Geotechnical investigations shall be completed prior to approval of schools, hospitals, fire stations and sheriff stations, as a means to ensure that these critical facilities are constructed in a way that mitigates site-specific seismic hazards.
    - **Action HS-A6.1** Continue to require applicants to seismically retrofit existing homes where required under existing building codes.
- **Goal HS-7** Reduce risks from steep slopes and landslides.
    - **Policy HS-P7.1** Site-specific geotechnical investigations shall be required to assess landslide potential for private development and public facilities projects in areas rated "Moderate to High" and "High" in Figure HS-4 or the most current available mapping.*
- **Goal HS-8** Reduce risks from erosion.
    - **Policy HS-P8.1** Site-specific geotechnical investigations shall be required to assess erosion potential for private development projects and public facilities in areas rated "Very High" in Figure HS-5 or the most current available mapping.*
- **Goal HS-9** Reduce risks from expansive soils.
    - **Policy HS-P9.1** Site-specific geotechnical investigations shall be required to assess risks from expansive soils for private development projects and public facilities in areas rated "High" in Figure HS-6 or the most current available mapping.*
- **Goal HS-10** Avoid subsidence from groundwater withdrawal.
    - **Policy HS-P10.1** Continue to work with water providers and regulatory agencies to ensure that groundwater withdrawals do not lead to subsidence problems.
    - **Policy HS-P10.2** Existing programs to monitor potential subsidence activity shall be supported.

The Agriculture Element and Area and Neighborhood Plans Element of the plan include the following goal, policies, and objectives related to soils.

- **Goal AG-1** Maintain, promote and enhance Butte County's agriculture uses and resources, a major source of food, employment and income in Butte County.
    - **Policy AG-P1.1** The County supports State and federal legislation designed to conserve soil and protect agricultural land.

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- **Policy AG-P1.2** The County supports agricultural education and research at Butte County educational institutions.
- **Policy AG-P1.3** Continue to work with landowners in establishing new and maintaining existing Williamson Act contracts.
    - **Objective D2N-O6.2** Protection of soil resources.

      a. To eliminate potential for soil erosion or degradation of its agricultural productivity.
- **Policy D2N-P6.5** Require standard erosion-control measures and construction practices to minimize soil erosion.
- **Policy D2N-P6.6** Protect agricultural lands which currently produce, or have the potential to produce, from encroaching urban uses.

The Conservation and Open Space Element and Area and Neighborhood Plans Element contain the following goals, policies, actions, and objectives related to mineral resources.

- **Goal COS-12** Protect economically viable mineral resources and related industries while avoiding land use conflicts and environmental impacts from mining activities.
    - **Policy COS-P12.1** Sufficient aggregate resources to meet the County's fair share of future regional needs shall be conserved.
    - **Policy COS-P12.2** Mineral resources identified by the State to be of regional or statewide significance for mineral resource extraction shall be conserved.*
    - **Policy COS-P12.3** Permitted uses on lands containing and adjacent to important mineral resources shall be restricted to those compatible with mineral extraction, except in cases where such uses offer public benefits that outweigh those of resource extraction.
    - **Policy COS-P12.4** Prior to approval of any new or expanded mining operation, the applicant shall demonstrate that the operation will not create significant nuisances, hazards or adverse environmental effects.
    - **Policy COS-P12.5** New mineral haul routes shall avoid landslides, highly erodible soils, residential areas and schools, when feasible.
    - **Policy COS-P12.6** Discretionary development projects in the vicinity of permitted mining extraction sites or along existing haul routes shall record a notice of the right to mine against the property for which a discretionary permit is sought. The notice shall advise owners and subsequent interests in ownership that the existing mining operation has a permitted right to continued mining operations.
    - **Policy COS-P12.7** Mined property shall be left in a condition suitable for reuse in conformance with the General Plan land use designations and in accordance with the California Surface Mining and Reclamation Act (SMARA).
        - **Action COS-A12.1** Apply zoning regulations permitting extraction and processing as a conditional use on any lands classified by the State Mining and Geology Board as Mineral Resource Zone 2 (MRZ-2) or Scientific Zone (SZ).
- **Goal D2N-6** Utilize and develop natural resources so as to protect those resources and eliminate exposure of persons and property to environmental hazards.
    - **Objective D2N-O6.1** Management of mineral resources.

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a. Efficiently utilize mineral resources and ensure their continued supply.

- **Policy D2N-P6.1** Encourage proper development and management of sand and gravel.
- **Policy D2N-P6.2** Ensure that all commercial development of sand and gravel deposits is compatible with nearby land uses.
- **Policy D2N-P6.3** Ensure that extraction operations of sand and gravel adhere to all environmental quality regulations of the County and State.
- **Policy D2N-P6.4** Locate commercial, industrial, open space and agricultural uses adjacent to prime mineral resource areas to avoid conflicts between mineral production activities and present or planned residential and institutional land uses.

County Ordinance

Many California counties and cities have grading and erosion control ordinances. These ordinances are intended to control erosion and sedimentation caused by construction activities. As part of the grading permit, a project applicant must submit a grading and erosion control plan, project vicinity and site maps, and other supplemental information. Standard conditions in the grading permit include an extensive list of BMPs similar to those contained in a SWPPP.

The purpose of the grading portion of the Butte County Grading and Mining Ordinance is "the control of erosion and siltation, the enhancement of slope stability, the protection of said resources and the prevention of related environmental damage by establishing standards and requiring permits for grading." In general, a grading permit is required for any earthmoving activities involving 50 cubic yards or more of material. Depending on the project, the county may require environmental review, engineering plans and specifications, soils engineering report, and/or an erosion and sediment control plan.

The purpose of the mining portion of the Butte County Grading and Mining Ordinance is to comply with the requirements of SMARA, encourage production and conservation of mineral resources in balance with other beneficial uses, and prevent or minimize damage to the environment. Applicants must file a permit application with the county, submit mining and reclamation plans, and provide financial assurances. The application then goes through a review and public hearing process before a determination is made by the Butte County Planning Commission.

City of Biggs

City of Biggs General Plan

The Public Health and Safety Element of the City of Biggs General Plan (City of Biggs 1998) includes the following goal, policies, and program related to geologic and seismic hazards.

- **Goal 6.5** Minimize the threat of personal injury and property damage due to seismic and geologic hazards.
  - **Policy 6.5.A** Consider the potential for expansive soils and earthquake related hazards when reviewing applications for developments.
  - **Policy 6.5.B** A soils report, prepared by a licensed soils engineer, shall be required for all residential subdivisions and development projects. Soils reports shall evaluate shrink/swell

and liquefaction potential of sites and recommend measures to minimize unstable soil hazards.

- **Policy 6.5.C** Applications for projects which extract groundwater, oil, or gas shall include a report evaluating the potential for resulting subsidence. Reports shall discuss appropriate mitigation measures to reduce the potential for subsidence.
- **Policy 6.5.D** The City encourages owners of buildings which are subject to seismic hazards to pursue structural improvements to remedy seismic related hazards.
- **Program 6.5.E** The City shall pursue funding options to assist property owners with costs related to seismic safety structural improvements.

The Public Health and Safety Element of the plan contains the following policies related to mineral resources.

- **Goal 5.1:** Promote and protect the continued viability of agriculture surrounding Biggs.
  - **Policy 5.1.D** No mineral, gas or other natural resource extraction shall occur within the City limits of Biggs without prior review and approval of the activity by the City.
  - **Policy 5.1.E** Ensure that any mineral extraction activities within the Biggs planning area to conform with the State Mining and Reclamation Act (SMARA) requirements, including financial assurances and reclamation plans.

City of Gridley

City of Gridley 2030 General Plan

The Safety Element of the City of Gridley 2030 General Plan (City of Gridley 2010) includes the following goal, policies, and strategies related to geologic and seismic hazards.

- **Safety Goal 1:** To reduce risks to people and property from geologic hazards and soils conditions.
  - **Safety Policy 1.1** New development shall implement state and local building code requirements, including those related to structural requirements and seismic safety criteria in order to reduce risks associated with seismic events and unstable and expansive soils.
  - **Safety Policy 1.2** New developments that could be adversely affected by geological and/or soil conditions shall include project features that minimize these risks.
  - **Safety Policy 1.3** The City will not allow new water well sites to be located in areas where subsidence could occur as a result of water well operation, or where the potential for subsidence could increase as a result of operation of a water well.
    - **Safety Implementation Strategy 1.1**

      The City will continue to enforce the most recent statewide building code requirements.
    - **Safety Implementation Strategy 1.2**

      The City will require geotechnical evaluation and recommendations before development or construction of buildings meant for public occupancy in geologic hazard areas may proceed. Such evaluations will be required to focus on potential hazards related to liquefaction, erosion, subsidence, seismic activity, and other relevant geologic hazards

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and soil conditions for development. New development would be required to incorporate project features that avoid or minimize the identified hazards to the satisfaction of the City.

The City of Gridley 2030 General Plan states that there are no significant mineral resources in the Gridley area and therefore does not address the topic (City of Gridley 2010:6–9).

A.3.3.2 Sutter County

Sutter County General Plan Policy Document

The Sutter County General Plan Policy Document (Sutter County 1996a) includes the following goal, policies, and program related to geologic and seismic hazards.

- **Goal 7.B** To minimize the risk of personal injury and property damage due to seismic and geological hazards.
  - **Policy 7.B-1** Where geologic hazards exist from landslides, the County should designate the land as open space or agriculture.
  - **Policy 7.B-2** The County may require the preparation of a soils engineering and/or geologic-seismic analysis prior to permitting development in areas of geologic or seismic hazards (i.e., ground shaking, landslides, liquefaction, expansive soils).
    - **Implementation Program**

      7.1 The County shall continue to enforce provisions of the Uniform Building Code which address seismic design criteria.

      Responsibility: Community Services Department

This document contains the following goal, policies, and implementation program related to mineral resources.

- **Goal 4.H** To encourage commercial resource extraction activities in locations where environmental, aesthetic, and adjacent land use compatibility impacts can be adequately mitigated.
  - **Policy 4.H-1** The County shall require that the development of gas and mineral resources be designed and conducted in a manner to minimize incompatibility with nearby land uses.
  - **Policy 4.H-2** The County shall prohibit the establishment of any new mining operations in the Sutter Buttes.
  - **Policy 4.H-3** The County shall require that all new gas and mineral extraction projects be designed to provide a buffer between existing and/or likely adjacent uses.
  - **Policy 4.H-4** The County shall require that all mining operations prepare and implement reclamation plans and provide adequate security to guarantee the proposed reclamation.
  - **Policy 4.H-5** The County shall require that gas, and mineral extraction projects incorporate adequate measures to minimize impacts to local residents, county roadways, services and facilities.

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- **Implementation Program**

  4.7 The County shall review and revise as necessary its ordinances governing gas and mineral extraction projects.

  Responsibility: Community Services Department

Sutter County General Plan

The *Sutter County General Plan* (Sutter County 2011) includes the following goal and policies related to geologic and seismic hazards.

- **Goal PHS 2** Minimize the risk of personal injury and property damage due to geologic and seismic hazards and adverse soil conditions.
  - **PHS 2.1 Review Standards.** Review and enforce seismic and geologic safety standards and require the use of best management practices in site design and building construction methods. (PHS 2-A)
  - **PHS 2.2 Minimize Exposure to Geologic Hazards.** Minimize development in areas where geologic hazards exist from landslides and erosion.
  - **PHS 2.3 Site-Specific Geotechnical Analysis.** Require the preparation of a County approved site-specific geotechnical analysis prior to approval of development in areas where the potential for geologic or seismic hazards exists (e.g., ground shaking, landslides, liquefaction, expansive soils, steep slopes, subsidence, and erosion) and incorporate recommended project features to avoid or minimize the identified hazards.
  - **PHS 2.4 Essential Facilities.** Promote the upgrade, retrofitting, and/or relocation of existing essential facilities (e.g., hospitals, schools, law enforcement and fire stations, etc.) that do not meet current building code standards and are within areas susceptible to seismic or geologic hazards.

The plan contains the following goal and policies related to mineral resources.

- **Goal ER 5** Encourage commercial resource extraction activities in locations where environmental, aesthetic, and adjacent land use compatibility impacts can be adequately mitigated.
  - **ER 5.1** Significant Resources. Conserve and protect mineral resources that may be identified by the state as a significant resource to allow for their continued use in the economy.
  - **ER 5.2** Compatible Operations. Require that gas and mineral resource extraction activities be designed and operated to minimize incompatibilities with nearby land uses and incorporate features that buffer existing and planned adjacent uses. Extraction activities shall incorporate adequate measures to minimize impacts to local residents, county roadways, services, facilities, and the environment.
  - **ER 5.3** No New Operations in Sutter Buttes. Prohibit the establishment of any new mining operations in the Sutter Buttes, which is defined as the area within the Sutter Buttes Overlay Zone.
  - **ER 5.4** Reclamation. Encourage disturbed mined areas to be reclaimed concurrent with mining (i.e., phased reclamation), and require reclamation that is consistent with an adopted reclamation plan, as appropriate, and in conjunction with the Surface Mining and

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Reclamation Act, and County and state standards to a condition that is sensitive to the natural environment and where subsequent, beneficial uses can occur.

County Codes and Ordinances

The purpose of the County of Sutter Land Grading and Erosion Control (Chapter 1770) ordinances is to minimize damage or degradation to waterways caused by excavation-related activities and comply with the provisions of NPDES permits covering the activities of the county issued by the RWQCB.

A grading permit is required in the unincorporated portion of the county for:

> grading to (1) grade, fill, excavate, store or dispose of 350 cubic yards or more of soil or earthly material, or (2) clear and grub one acre or more of land, or (3) grade, fill, or store 50 cubic yards or more of soil or earthly material in a designated floodway, or (4) relocate, reshape, re-route, obstruct, or alter an existing water course.

The purpose of the Sutter County Surface Mining and Reclamation Code is to "provide local procedures, processes and responsibilities for the implementation of SMARA and other State regulations pertaining to surface mining in Sutter County." Applicants must file a permit application with the county, submit mining and reclamation plans, and provide financial assurances. These documents are reviewed by the State Mining and Geology Board and the Sutter County Planning Commission. Approval is granted or denied by the planning commission.

Sutter County and the City of Yuba City adopted the 2010 California Building Code as part of their building standards. The Butte County Building Design Criteria incorporated the 2007 California Building Code.

City of Yuba City

Yuba City General Plan

The City of Yuba City General Plan (City of Yuba City 2004) contains the following policies related to geologic and seismic hazards.

- **Guiding Policy 9.2-G-1** Minimize risks of property damage and personal injury posed by geologic and seismic hazards.
    - **Implementing Policy 9.2-I-1** Review proposed development sites at the earliest stage of the planning process to locate any potential geologic or seismic hazards. Following receipt of a development proposal, engineering staff shall review the plans to determine whether a geotechnical review is required. If the review is required, then the applicant shall be referred to geotechnical experts for further evaluation.
    - **Implementing Policy 9.2-I-2** Prohibit structures intended for human occupancy within 50 feet of an active fault trace. Although no active faults are located within the Planning Area, this policy would apply if a new fault was discovered. It is also the City's intent to discourage homes, offices, hospitals, public buildings, and other similar structures over the trace of an inactive fault and to allow uses within setback areas that could experience displacement without undue risk to people and property.
    - **Implementing Policy 9.2-I-3** Require comprehensive geologic and engineering studies of critical structures regardless of location. Critical structures are those most needed following

a disaster or those that could pose hazards of their own if damaged. They include utility centers and substations, water reservoirs, hospitals, fire stations, police and emergency communications facilities, and bridges and overpasses.

- **Implementing Policy 9.2-I-4** Require preparation of a soils report as part of the development review and/or building permit process for development proposed in the area depicted with expansive soils. The southwest corner of the City is underlain by expansive soils that must be taken into account during building design if cracking and settling of structures are to be minimized. The report would not be necessary when soil characteristics are known, and the City's Building Official or Public Works Director determines it is not needed.
- **Implementing Policy 9.2-I-5** Provide information for property owners to rehabilitate existing buildings using construction techniques to protect against seismic hazards. The City-adopted Uniform Building Code specifies seismic standards for new construction, as well as for additions or expansions to buildings. It is in the community's best interest to do all that is necessary to ensure that all structures meet current seismic standards.

City of Live Oak

City of Live Oak 2030 General Plan

The Public Safety Element of the City of Live Oak 2030 General Plan (City of Live Oak 2010) contains the following goal and policies related to geologic and seismic hazards.

- **Goal PS-1.** Design buildings to prevent property damage and injury from hazards.
  - **Policy PS-1.1** All new buildings in the City shall be built under the seismic requirements of the California Building Code.
  - **Policy PS-1.2** The City will encourage the retrofitting of older buildings to current safety standards, as specified in locally applicable fire and building codes.
  - **Policy PS-1.3** New development shall ensure adequate water flow for fire suppression as required by City Public Works Improvement Standards.

The Conservation and Open Space Element contains the following goal and policy related to mineral resources.

- **Goal MINERAL-1.** Protect soil and mineral resources in the Live Oak Study Area consistent with other environmental, social, and economic goals.
  - **Policy Mineral-1.1** The City will coordinate with the state to incorporate, as necessary, any policies for conservation and possible future extraction of mineral or soil resources of regional or statewide significance.

A.3.3.3 Yuba County

County Ordinance Code

Title X, Buildings and Construction, of the Yuba County Ordinance Code, outlines all provisions relevant to grading and construction within the county. Chapter 10.05 addresses standards of construction, Chapter 10.30 addresses construction in areas of flood hazard, and Chapter 11.25 provides regulations related to grading and excavations. Chapter 11.25 also sets forth means for

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controlling soil erosion and problems associated with excavations, grading, and fill. The provisions provided in this chapter apply to the unincorporated areas of Yuba County.

A.3.4 Traffic, Transportation, and Navigation

A.3.4.1 Butte County

Butte County General Plan

The Circulation Element of the *Butte County General Plan*, adopted in 2010, is concerned with the safe and efficient movement of people and goods in and around the County. The element contains background circulation information for a wide range of existing and planned transportation modes, including roads, transit, non-motorized transportation, rail and aviation. To ensure that the county's transportation system can accommodate growth anticipated during the 20-year planning period, the Circulation Element works closely with the Land Use Element of the general plan, as required by Section 65302(b) of the California Government Code. The following goals and policies are applicable to traffic.

- **Goal CIR-6** Support a balanced and integrated road and highway network that maximizes the mobility of people and goods in a safe, efficient manner.
    - **Policy CIR-P6.1** The level of service for County-maintained roads within the unincorporated areas of the county but outside municipalities' sphere of influences (SOI) shall be level of service C or better during the PM peak hour. Within a municipality's SOI, the level of service shall meet the municipality's level of service policy.
    - **Policy CIR-P6.2** The level of service on State Highways should at least match the concept level of service for the facility, as defined by Caltrans.

Butte County roadway level of service (LOS) thresholds are provided in Table A-2, below.

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Table A-2. Butte County Roadway Level of Service Thresholds

Facility Type	A	B	C	D	E	F
Minor 2–Lane Highway	0–900	901–2,000	2,001–6,800	6,801–14,100	14,101–17,400	>17,400
Major 2–Lane Highway/ Expressway	0–1,200	1,201–2,900	2,901–7,900	7,901–16,000	16,001–20,500	>20,500
4–Lane, Multi–Lane Highway/ Expressway	0–10,700	10,701–17,600	17,601–25,300	25,301–32,800	32,801–36,500	>36,500
2–Lane Arterial	–	–	0–9,700	9,701–17,600	17,601–18,700	>18,700
4–Lane Arterial, Undivided	–	–	0–17,500	17,501–27,400	27,401–28,900	>28,900
4–Lane Arterial, Divided	–	–	0–19,200	19,201–35,400	35,401–37,400	>37,400
6–Lane Arterial, Divided	–	–	0–27,100	27,101–53,200	53,201–56,000	>56,000
3–Lane Arterial, 1–Way Roadway	–	–	0–13,100	13,101–20,600	20,601–21,700	>21,700
2–Lane Freeway	0–11,110	11,111–20,100	20101–28,800	28,801–35,700	35,701–40,100	>40,100
2–Lane Freeway + Auxiliary Lane	0–14,100	14,101–25,500	25,501–36,400	36,401–44,900	44,901–50,350	>50,350
3–Lane Freeway	0–17,000	17,001–30,800	30,801–44,000	44,001–54,100	54,101–60,600	>60,600
3–Lane Freeway + Auxiliary Lane	0–20,100	20,101–36,400	36,401–51,800	51,801–63,500	63,501–71,000	>71,000
4–Lane Freeway	0–23,200	23,201–42,000	42,001–59,500	59,501–72,800	72,801–81,400	>81,400
Major 2–Lane Collector	–	–	0–5,550	5,551–11,800	11,801–15,200	>15,200

Source: Transportation Research Board, Highway Capacity Manual. 2000.

City of Biggs

City of Biggs General Plan

The City of Biggs General Plan 1997–2015 outlines goals, policies, and guidelines that relate to transportation and circulation within the city. The following policy in the Circulation Element is applicable to traffic.

- **Policy 2.1.G** Functional performance of roadways throughout the community shall be maintained at a Level of Service C or better and shall conform with the Roadway Environmental Capacity as defined in Table 2.3 of this Element.

City of Gridley

City of Gridley 2030 General Plan

The *City of Gridley 2030 General Plan* outlines goals, policies, and guidelines that relate to transportation and circulation within the city. The following goals and policies in the Circulation Element are applicable to traffic.

- **Circulation Goal 4**: To improve connectivity in existing developed parts of Gridley.
  - **Circulation Policy 4.2:** The City will increase connectivity in the Highway 99 corridor by requiring new east-west and north-south connections in new developments, to the maximum extent feasible.

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- **Circulation Goal 8**: To provide efficient and effective freight systems that serve Gridley's businesses, while avoiding negative impacts to residents
    - **Circulation Policy 8.2:** The City will restrict truck traffic to Highway 99, Magnolia Avenue, West Biggs-Gridley Road, Ord Ranch Road, South Avenue, East Gridley Road, West Liberty Road, and streets in areas designated for Industrial and Agricultural Industrial development (see Exhibit Circulation-7). Trucks may go by direct route to and from restricted streets, where required for the purpose of making pickups and deliveries of goods, but are otherwise restricted to truck routes.

A.3.4.2 Sutter County

2011 Sutter County General Plan and General Plan Technical Background Report

The *2011 Sutter County General Plan* outlines goals, policies, and guidelines that relate to transportation and circulation within the county (Sutter County 2012: 6-9). The following goals and policies are applicable to traffic.

- **Goal M2** Provide for the long-range planning and development of the County's roadway system and the safe, efficient, and reliable movement of people and goods throughout Sutter County.
    - **Policy M 2.1** Plan, design, and regulate roadways in accordance with the circulation diagram contained within this element and the California Road System Functional Classification System as updated and approved by the Federal Highway Administration, unless otherwise addressed in an adopted specific plan or community plan.
    - **Policy M 2.5** Develop and manage the County roadway segments and intersections to maintain LOS D or better during peak hour, and LOS C or better at all other times. Adjust for seasonality. These standards shall apply to all County roadway segments and intersections, unless otherwise addressed in an adopted specific plan or community plan.
    - **Policy M 2.8** Coordinate with the cities of Yuba city and Live Oak to provide acceptable and compatible levels of service on roadways that cross county/City boundaries and when establishing future road alignments within the cities' spheres of influence.
    - **Policy M 2.10** maintain ongoing coordination with Caltrans, SACOG and other jurisdictions to address local and regional transportation issues.
    - **Policy M 2.11** Support projects that will improve traffic flows and safety on State Highways.
    - **Policy M 2.14** Develop local roads parallel to State Highways, where feasible, to reduce congestion and increase traffic safety on state facilities.

In addition to the above policies, the *General Plan Technical Background Report* states that the California Department of Transportation (Caltrans) has adopted LOS D as the minimum acceptable standard for SR 20 west of Humphrey Road and LOS E as the minimum acceptable standard for SR 20 east of Humphrey Road (Sutter County 2008: 3.2-2). SR 99 has a minimum acceptable LOS of E throughout the county.

Sutter County roadway LOS thresholds are provided in Table A-3.

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Table A-3. Sutter County Roadway Level of Service Thresholds

Roadway	LOS C	LOS D	LOS E
Rural—Two Lane	7,000–10,600	10,600–16,400	16,400–25,200
Urban—Three Lane	15,330–17,520	17,520–19,700	19,700–21,900
Urban—Five Lane	30,660–35,040	35,040–39,420	39,420–43,800
Expressway—Four Lane	29,100–41,800	41,801–53,500	53,501–59,500
Freeway—Four Lane	33,700–48,400	48,401–60,000	60,001–67,400
Freeway—Six Lane	51,800–73,900	73,901–90,900	90,901–101,800

Source: Sutter County 2008

City of Yuba City

Yuba City General Plan

The *Yuba City General Plan* outlines goals, policies, and guidelines that relate to transportation and circulation within the city. The following policies in the Transportation Element are applicable to traffic.

Policy 5.2-G-4 Coordinate local actions with state and County agencies to ensure consistency.

Policy 5.2-G-7 Maximize the carrying capacity of arterial roadways by controlling the number of intersections and driveways, prohibiting residential access, and requiring sufficient offstreet parking to meet the needs of each project.

Policy 5.2-I-12 Develop and manage the roadway system to obtain LOS D or better for all major roadways and intersections in the City. This policy does not extend to residential streets (i.e., streets with direct driveway access to homes) or bridges across the Feather River nor does the policy apply to state highways and their intersections, where Caltrans policies apply. Exceptions to LOS D policy may be allowed by the City Council in areas, such as downtown, where allowing a lower LOS would result in clear public benefits. Specific exceptions granted by the Council shall be added to the list of exceptions below:

- SR 20 (SR 99 to Feather River Bridge) – LOS F is acceptable;
- SR 20 (Feather River Bridge) – LOS F is acceptable;
- Bridge Street (Twin Cities Bridge) – LOS F is acceptable; and
- Lincoln Road (New Bridge across the Feather River) – LOS F is acceptable.
- No new development will be approved unless it can be shown that required level of service can be maintained on the affected roadways.

Policy 5.4-I-2 Develop bicycle routes that provide access to schools, parks, and the Feather River Parkway.

Policy 5.6-I-1 In consultation with Sutter County and Caltrans, designate and provide signed truck routes, ensure that adequate pavement depth, lane widths, bridge capacities, loading areas, and turn radii are maintained on the designated truck routes, and prohibit commercial trucks from non-truck routes except for deliveries. Require that a truck route be provided for

any approved development zoned regional commercial, community commercial, business technology and light industrial, or manufacturing, processing, and warehousing.

Policy 5.6-I-2 Maintain design standards for industrial streets that incorporate heavier loads associated with truck operations and larger turning radii to facilitate truck movements.

Policy 5.6-I-3 Continue to ensure adequate truck access to off-street loading areas in commercial areas.

Policy 5.6-I-4 Encourage regional freight movement on freeways and other appropriate routes; evaluate and implement vehicle weight limits as appropriate on arterial, collector, and local roadways to mitigate truck traffic impacts in the community.

The *Yuba City General Plan* does not identify LOS thresholds.

City of Live Oak

City of Live Oak 2030 General Plan

The *City of Live Oak 2030 General Plan* outlines goals and policies that relate to transportation and circulation within the city. The following goal and policy of the Circulation Element are applicable to traffic.

- **Goal CIRC-5** Allow for efficient delivery of materials and shipment of products for Live Oak businesses without adversely affecting residents.
    - **Policy CIRC-5.2** The City will consult with Caltrans, Sutter County, the California Highway Patrol, the California Public Utilities Commission, and the Union Pacific Railroad Company to appropriately regulate the safe movement of truck traffic and hazardous materials throughout the City.

A.3.5 Air Quality

A.3.5.1 Butte County

Butte County Air Quality Management District List of Rules

The Butte County Air Quality Management District (BCAQMD) has adopted local rules to reduce emissions throughout the district. Portions of the project in Butte County may be subject to the following rules and regulations (California Air Resources Board 2010b).

- **Rule 200 (Nuisance)**: Prohibits the discharge of air contaminants or other materials which cause injury, detriment, nuisance, or annoyance.
- **Rule 201 (Visible Emissions)**: Prohibits the discharge of air containments for a period or periods aggregating more than 3 minutes in any 1 hour.
- **Rule 202 (Particulate Matter Concentrations)**: Prohibits the discharge of particulate matter (PM) in excess of 0.3 grain per cubic foot of gas at standard conditions.
- **Rule 205 (Fugitive Dust Emissions)**: Limits the quantity of PM through BMPs.
- **Rule 252 (Stationary Internal Combustion Engines)**: Limits emissions of oxides of nitrogen (NO_X) and carbon monoxide (CO) from stationary internal combustion engines (if construction requires engines rated at more than 50 brake horsepower).

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- **Rule 309 (Wildland Vegetation Management Burning)**: Establishes standards for the use of wildland vegetation management burning, range improvement burning, and forest management burning.

A.3.5.2 Sutter County

Feather River Air Quality Management District List of Rules

Similar to the BCAQMD, the Feather River Air Quality Management District (FRAQMD) has developed local rules to reduce emissions throughout the district. The proposed project may be subject to the following FRAQMD rules. Failure to comply with any applicable district rule would be a violation subject to district enforcement action (California Air Resources Board 2009).

- **Rule 2.0 (Open Burning)**: Establishes standards for open burning to be conducted in a manner that minimizes emissions and smoke.
- **Rule 3.0 (Visible Emissions)**: Prohibits the discharge of air containments for a period or periods aggregating more than 3 minutes in any 1 hour.
- **Rule 3.2 (Particulate Matter)**: Prohibits the discharge of PM in excess of 0.3 grains per cubic foot of gas at standard conditions.
- **Rule 3.16 (Fugitive Dust Emissions)**: Limits emissions of fugitive dust from being airborne beyond the property line from which the emission originates.
- **Rule 3.22 (Stationary Internal Combustion Engines)**: Limits emissions of NO_x, reactive organic gases (ROG), and CO from stationary internal combustion engines (if construction requires engines rated at more than 50 brake horsepower).

FRAQMD has established significance thresholds for the evaluation of criteria pollutant emissions. These thresholds are based on the district's Indirect Source Review (ISR) Guidelines (Feather River Air Quality Management District 2010). FRAQMD's main CEQA guidance is found in the ISR guidelines, and additional clarifying language is located on their website (Feather River Air Quality Management District 2010). The district requires construction and operational emissions to be quantified for the determination of mitigation measures.

A.3.6 Vegetation

A.3.6.1 Butte County

Butte County General Plan 2030

The policies below are taken from the Conservation and Open Space Element of the Butte County General Plan 2030, adopted in October 2010 (Butte County 2010:235–240). These policies are designed to guide planning related to and affecting habitat and biological resources, including vegetation and wetlands, within Butte County's jurisdiction.

- **Goal COS-6:** Engage in cooperative planning efforts to protect biological resources.
    - **COS-P6.1** The County shall coordinate with applicable federal, State, regional and local agencies on natural resources and habitat planning.

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- **Goal COS-7:** Conserve and enhance habitat for protected species and sensitive biological communities.
    - **COS-P7.1** Conservation easements that protect habitat areas, habitat corridors and sensitive biological resources shall be promoted.
    - **COS-P7-2** Clustered development patterns shall be encouraged in order to conserve habitat for protected species and biological resources.
    - **COS-P7.3** Creeks shall be maintained in their natural state whenever possible, and creeks and floodways shall be allowed to function as natural flood protection features during storms.
    - **COS-P7.6** New development projects shall include setbacks and buffers along riparian corridors and adjacent to habitat for protected species, except where permitted in the Butte Regional Habitat Conservation Plan (HCP) and Natural Community Conservation Plan (NCCP) Planning Area and where such development is consistent with the conditions of the HCP/NCCP, upon the future adoption of the [Butte Regional] HCP/NCCP.
    - **COS-P7.7** Construction barrier fencing shall be installed around sensitive resources on or adjacent to construction sites. Fencing shall be installed prior to construction activities and maintained throughout the construction period.
    - **COS-P7.8** Where sensitive on-site biological resources have been identified, construction employees operating equipment or engaged in any development-associated activities involving vegetation removal or ground disturbing activities in sensitive resource areas shall be trained by a qualified biologist and/or botanist who will provide information on the on-site biological resources (sensitive natural communities, special status plant and wildlife habitats, nests of special-status birds, etc.), avoidance of invasive plant introduction and spread, and the penalties for not complying with biological mitigation requirements and other state and federal regulations.
    - **COS-P7.9** A biologist shall be retained to conduct construction monitoring in and adjacent to all habitats for protected species when construction is taking place near such habitat areas.
- **Goal COS-8:** Maintain and promote native vegetation.
    - **COS-P8.1** Native plant species shall be protected and planting and regeneration of native plant species shall be encouraged, wherever possible, in undisturbed portions of development sites.
    - **COS-P8.2** New landscaping shall promote the use of xeriscape and native tree and plant species, including those valued for traditional Native American cultural uses.
- **Goal COS-9:** Protect identified special-status plant and animal species.
    - **COS-P9.1** A biological resources assessment shall be required for any proposed development project where special-status species or critical habitat may be present. Assessments shall be carried out under the direction of Butte County. Additional focused surveys shall be conducted during the appropriate season if necessary. Upon adoption of the Butte Regional Habitat Conservation Plan (HCP) and Natural Community Conservation Plan (NCCP), assessment requirements of the [Butte Regional] HCP/NCCP shall be implemented for development projects within the [Butte Regional] HCP/NCCP area.

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- **COS-P9.2** If special-status plant or animal species are found to be located within a development site, proponents of the project shall engage in consultation with the appropriate federal, state and regional agencies and mitigate project impacts in accordance with state and federal law. Upon adoption of the Butte Regional Habitat Conservation Plan (HCP) and Natural Community Conservation Plan (NCCP), mitigation requirements of the [Butte Regional] HCP/NCCP shall be implemented for development projects within the [Butte Regional] HCP/NCCP area. Examples of mitigation may include:

  a. Design the proposed project to avoid and minimize impacts.

  b. Restrict construction to specific seasons based on project-specific special-status species issues (e.g. minimizing impacts to special-status nesting birds by constructing outside of the nesting season).

  c. Confine construction disturbance to the minimum area necessary to complete the work.

  d. Mitigate for the loss of special-status species by purchasing credits at an approved conservation bank (if a bank exists for the species in question), funding restoration or habitat improvement projects at existing preserves in Butte County, or purchasing or donating mitigation lands of substantially similar habitat.

  e. Maintain a minimum 100-foot buffer on each side of all riparian corridors, creeks and streams for special-status and common wildlife.

  f. Establish setbacks from the outer edge of special-status species habitat areas.

  g. Construct barriers to prevent compaction damage by foot or vehicular traffic.

Butte County Regional Habitat Conservation Plan/Natural Community Conservation Plan

Butte County is currently preparing a Butte Regional Habitat Conservation Plan/Natural Community Conservation Plan (Butte Regional HCP/NCCP) that will provide comprehensive species, wetlands, and ecosystem conservation and contribute to the recovery of endangered species within the plan area while also providing a more streamlined process for environmental permitting. Plan goals that will support the conservation of vegetation and wetland resources include the following.

- Balance open space, habitat, agriculture and urban development.
- Allow for appropriate and compatible growth and development in the Butte County region.
- Preserve aquatic and terrestrial resources and provide habitat for threatened and endangered species through conservation partnerships with local agencies.
- Provide greater conservation values than a project-by-project, species-by-species review.

The first administrative draft is a work-in-progress (available: http://www.buttehcp.com/BRCP-Documents/1st-Admin-Draft-BRCP/index.html) and finalization and adoption of the plan is scheduled for late 2012 or early 2013.

City of Biggs

City of Biggs General Plan 1997–2015

The policies below are taken from the Conservation and Open Space Element of the City of Biggs General Plan 1997–2015, adopted in 1998 (City of Biggs 1998:5-5–5-6). These policies are designed to guide planning related to and affecting habitat and biological and mineral resources within the City of Biggs' jurisdiction.

- **Policy 5.2.A** Apply mitigation measures to development projects to minimize impacts to biological resources during and after construction.
- **Policy 5.2.B** Consider opportunities for habitat preservation and enhancement in conjunction with public facility projects, particularly storm drainage facilities.
- **Policy 5.2.D** If the presence of protected species is determined to be likely, the project applicant shall be responsible for all costs associated with investigating species presence and preparation of any required mitigation plans.
- **Policy 5.2.E** Promote the establishment of an open space reserve along Hamilton Slough in areas southeast and south of the current City limits.

Municipal Code

According to Section 9.15.080 of the City of Biggs Municipal Code, *Tree care, planting, removing, and replacement – Permit required*, it is unlawful and prohibited for any person other than the superintendent or their authorized agent or deputy to cut, trim, prune, spray, brace, plant, move, remove, or replace any tree in any public street within the city.

City of Gridley

City of Gridley 2030 General Plan

The policies below are taken from the Conservation Element of the City of Gridley 2030 General Plan, adopted in December 2009 (City of Gridley 2010:17). These policies are designed to guide planning related to biological resources, including vegetation and wetlands, within the City of Gridley's jurisdiction.

- **Policy 5.1** New developments shall use techniques, such as buffers, setbacks, and clustering of development to protect wetlands, riparian corridors, vernal pools, and sensitive species.
- **Policy 5.3** The City will have former agricultural drainage ditches improved or restored in a way that avoids or improves habitat value and maintains or improves wetland function.
- **Policy 5.4** The City will condition new development, as necessary, to reduce erosion, siltation, and mitigate impacts to wetland, riverine, and riparian habitats.
- **Policy 5.7** The City will ensure consistency of new development with applicable portions of the Butte County Habitat Conservation Plan and Natural Communities Conservation Plan.
- **Policy 5.9** The City will continue to collaborate with the California Department of Fish and Game and the United States Fish and Wildlife Service, as appropriate, to ensure the protection and preservation of special-status species and their habitats within the Gridley Planning Area.

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A.3.6.2 Sutter County

Yuba-Sutter Habitat Conservation Plan/Natural Community Conservation Plan

Yuba and Sutter Counties are currently preparing a regional HCP, referred to as the Yuba-Sutter HCP/NCCP. The plan will include conservation goals, objectives, and measures that aim to preserve covered plant and wildlife species and important natural and agricultural communities that support these species as well as other local native and migratory wildlife within the plan area.

According to the November 2011 Planning Agreement (available: <http://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=39871>), the preliminary conservation objectives for the Plan are as follows.

- Provide for the protection of species and natural communities on an ecosystem or a landscape level.
- Preserve the diversity of plant and animal communities in the Planning Area;
- Assure connectivity to and compatibility with conserved areas within and adjacent to the Planning area boundaries.
- Protect the viability of threatened, endangered or other special status plant and animal species, and minimize and mitigate the take or loss of the Covered Species;
- Identify and designate biologically sensitive habitat areas;
- Preserve habitat and thereby contribute to the recovery of the Covered Species; and
- Reduce the need to list additional species.

Sutter County General Plan—Public Draft

The biological resource and open space policies below are taken from the Environmental Resources chapter of the *Sutter County General Plan—Public Draft*, released for public comment in fall 2010 (Sutter County 2010:9-4–9-7). These policies are designed to guide planning related to biological resources, including vegetation and wetlands, within Sutter County's jurisdiction.

- **Policy ER 1.3** Focus conservation efforts on areas identified as having very high and high habitat value as well as Sutter County's unique natural open space resources, including the Sutter Buttes, Sutter Bypass, Butte Sink, and the Sacramento, Feather, and Bear River corridors.
- **Policy ER 1.4** Emphasize the preservation, enhancement, and creation of sustainable, interconnected habitat and open space areas that highlight unique resources and integrate educational and recreational opportunities as appropriate.
- **Policy ER 1.7** Mitigate biological and open space effects that cannot be avoided in accordance with an applicable Habitat Conservation Plan and federal, state, and local regulations.
- **Policy ER 1.10** Identify and pursue economically viable methods and funding sources for the long-term maintenance and management of significant biological and open space resource areas, including state and federal programs.
- **Policy ER 2.2** Encourage and support the Sutter County Resource Conservation District's programs that facilitate preservation and restoration of natural wetland environments as long as these programs do not significantly affect Sutter County agricultural lands and flood control operations.

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- **Policy ER 2.4** Encourage the creation and use of regional wetland mitigation banks to the extent that they do not conflict with Sutter County agricultural lands and flood control operations
- **Policy ER 3.1** Preserve special-status fish, wildlife, and plant species (e.g., rare, threatened, or endangered species) and habitats consistent with an applicable Habitat Conservation Plan and federal, state, and local regulations.
- **Policy ER 3.2** Coordinate with federal, state, and local resource agencies (e.g., California Department of Fish and Game, U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers) to protect special-status species.
- **Policy ER 3.3** Support the preservation and re-establishment of fisheries in the rivers and streams within Sutter County.
- **Policy ER 3.4** Preserve and protect waterfowl resources along the Pacific Flyway Migration Corridor.
- **Policy ER 3.5** Preserve and enhance wildlife movement corridors between natural habitat areas to maintain biodiversity and prevent the creation of biological islands. Preserve contiguous habitat areas when possible.
- **Policy ER 3.6** Preserve important areas of natural vegetation and the ecological integrity of these habitats, where feasible, including but not limited to riparian, vernal pool, marshes, oak woodlands and annual grasslands.
- **Policy ER 3.7** Preserve native oak trees when possible through the review of discretionary development projects and activities. Reduce the loss of oak trees through consideration of tree mitigation/replanting programs.
- **Policy ER 3.8** Encourage the use of native and drought tolerant plant materials, including native tree species, in all public and private landscaping and revegetation projects.
- **Policy ER 4.1** Preserve natural landforms, natural vegetation, and natural resources as open space to the extent feasible.
- **Policy ER 4.2** Preserve the Sutter Buttes as an important agricultural, cultural, historic, habitat, and open space resource. Promote and support efforts by willing landowners to increase opportunities for public access to the Sutter Buttes and other open space areas.
- **Policy ER 4.3** Preserve the Sacramento, Feather, and Bear River corridors as important habitat, recreation and open space resources. Support efforts to increase public access and recreational uses along the County's river corridors.
- **Policy ER 4.4** Support efforts to acquire additional open space adjoining protected natural resource areas to increase the size, connectivity, and buffering of existing habitat.
- **Policy ER 4.6** Prohibit land mitigation within Sutter County for projects within other jurisdictions unless there is a benefit to Sutter County. Benefits can include, but are not limited to, providing flood protection for Sutter County, providing opportunities for Sutter County projects' use of the area for mitigation, or making the natural resources available for the enjoyment of Sutter County residents.

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City of Yuba City

Yuba City General Plan

The guiding and implementation policies below are taken from the Environmental Conservation chapter of the City of Yuba City General Plan, adopted in 2004 (City of Yuba City 2004:8-13–8-14). These policies are designed to guide planning related to biological resources, including vegetation and wetlands, within the City of Yuba City's jurisdiction.

- **Policy 8.4-G-1** Protect special status species, in accordance with State regulatory requirements.
- **Policy 8.4-G-2** Protect and enhance the natural habitat features of the Feather River and new open space corridors within and around the urban growth area.
- **Policy 8.4-G-3** Preserve and enhance heritage oaks in the Planning Area.
- **Policy 8.4-G-4** Where appropriate, incorporate natural, wildlife habitat features into public landscapes, parks, and other public facilities.
- **Policy 8.4-G-5** Support the preservation and enhancement of fisheries in the Feather River.
- **Policy 8.4-I-2** Require preservation of oak trees and other native trees that are of a significant size, by requiring site designs to incorporate these trees to the maximum extent feasible.
- **Policy 8.4-I-3** Require, to the extent feasible, use of drought tolerant plants in landscaping for new development, including private and public projects.
- **Policy 8.4-I-4** Require measures, as part of the Feather River Parkway Plan, to protect and enhance riparian zones, natural areas and wildlife habitat qualities; and establish and maintain protection zone along the river where development shall not occur, except a part of the parkway enhancement (e.g., trails and bikeways). For park improvements, require a buffer zone along the river in which no grading or construction activities will occur, except as needed for shoreline uses such as boat docks.
- **Policy 8.4-I-5** Establish wildlife corridors in conjunction with implementation of the Feather River Parkway Plan to minimize wildlife-urban conflicts.
- **Policy 8.4-I-6** Work with California Department of Fish and Game and other agencies to enhance and preserve fisheries in the Feather River.

Municipal Code

According to municipal code Section 9-2.04, *Care of trees, shrubbery, and lawns*, "it shall be unlawful for any person to damage, cut, carve, transplant, or remove any tree, plant, wood, turf, or grass, or pick the flowers or seeds of any tree or plant, or attach any rope, wire, or other object to any tree or plant located in any park or recreation area." The Feather River bike trail, a recreational facility, falls within the biological study area.

City of Live Oak

City of Live Oak 2030 General Plan

The policies below are taken from the Conservation and Open Space Element of the City of Live Oak 2030 General Plan (City of Live Oak 2010: CO-4–CO-9). These policies are designed to guide

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planning related to and affecting habitat and biological resources, including vegetation and wetlands, within the City of Live Oak's jurisdiction.

- **Goal BIOLOGICAL-1**. Protect and enhance habitat suitable for special-status species that can occur in the Study Area.
    - **Policy Biological-1.1** Applicants of projects that have the potential to negatively affect special-status species or their habitat shall conduct a biological resources assessment and identify design solutions that avoid such adverse effects. If adverse effects cannot be avoided, then they shall be mitigated in accordance with guidance from the appropriate state or federal agency charged with the protection of these species.
- **Goal BIOLOGICAL-2**. Protect native oak and other large tree species occurring throughout the Study Area that provide valuable habitat for wildlife species and contribute to the historic and aesthetic character of the city.
    - Policy Biological-2.1 New developments shall preserve all native oaks with a diameter at breast height (dbh) of 6 inches or greater and all other trees that have a dbh of 30 inches or greater, to the maximum extent feasible.
- **Goal BIOLOGICAL-3**. Protect and enhance existing riparian habitat within the Study Area.
    - **Policy Biological-3.1** Where feasible, the City will require that new developments avoid the conversion of existing riparian habitat and require that an adequate buffer of the associated riparian areas be established to protect this resource. Where feasible, the riparian buffers shall be incorporated into open space corridors, public landscapes, and parks. Riparian buffers shall be designed to preserve existing wildlife habitat; restore degraded habitat; provide habitat conditions favorable to native local wildlife; restrict activities that may adversely affect wildlife habitat quality within the established buffer zone; and provide interpretive features educating the public about the beneficial effects of native riparian habitat and activities that adversely affect wildlife.
    - **Policy Biological-3.2** The City will take advantage of opportunities to enhance and restore existing riparian areas along Live Oak Slough and other drainage canals. Where feasible, these resources shall be incorporated into open space corridors, public landscapes, and park during the preparation of the Parks and Recreation Master Plan.
    - **Policy Biological-3.3** The City will require new developments to avoid the loss of federally protected and state-protected wetlands. If loss is unavoidable, the City will require applicants to mitigate the loss on a "no net loss" basis through a combination of avoidance, minimization, and/or compensation in accordance with federal and state law.
    - **Policy Biological-3.4** If development or expansion of the Live Oak Park and Recreation Area on the Feather River occurs, the City will encourage designs, construction, and operation to protect sensitive riparian habitat.

Municipal Code

Section 12.04.030 of the municipal code, *Permit to Plant or Remove*, states that "no trees or shrubs shall be planted in or removed from any public utility strip or other place in the city without a permit from the superintendent of streets. (Ord. 88 § 3, 1957)".

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A.3.7 Fish and Wildlife Resources

A.3.7.1 Sutter County

Yuba-Sutter Habitat Conservation Plan/Natural Community Conservation Plan

The Yuba-Sutter NCCP/HCP, currently under development, is a cooperative planning effort initiated by Yuba and Sutter Counties to address the effects of regional proposed transportation projects (SR 99 and SR 70) and any resulting development in the surrounding area. The purpose of the Yuba-Sutter NCCP/HCP is to provide a way to continue economic growth and community development; retain the economic vitality of the area's agricultural community; maintain public uses of open space; simplify and expedite land use and conservation planning in the plan area; protect threatened and endangered species; and preserve plant and wildlife communities.

Sutter County General Plan

The *Sutter County General Plan* update was initiated in fall 2007. The objective of the general plan is to provide guidance for the development of Sutter County. The general plan promotes a balance between strong agricultural traditions, natural resource preservation, and economic growth opportunities. The Environmental Resources chapter of the general plan was updated in 2010. The following goals, objectives, and policies are relevant to fish resources in the study area.

- **Goal ER 1:** Support a comprehensive approach for the conservation, enhancement, and regulation of Sutter County's significant habitat and natural open space resources.
    - **ER 1.3 Conservation Efforts.** Focus conservation efforts on areas identified as having very high and high habitat value as well as Sutter County's unique natural open space resources, including the Sutter Buttes, Sutter Bypass, Butte Sink, and the Sacramento, Feather, and Bear River corridors.
    - **ER 1.5 Resources Assessment.** Require discretionary development proposals that could potentially impact biological resources to conduct a biological resources assessment to determine if any resources will be adversely affected by the proposal and, if so, to identify appropriate measures to avoid or mitigate such effects.
    - **ER 1.6 Avoidance.** Ensure that new development projects avoid, to the extent feasible, significant biological resources (e.g., areas of rare, threatened or endangered species of plants, riparian areas, vernal pools), except where such projects are identified as —Authorized Development within an adopted Habitat Conservation Plan.
    - **ER 1.7 Mitigation.** Mitigate biological and open space effects that cannot be avoided in accordance with an applicable Habitat Conservation Plan and federal, state, and local regulations.
    - **ER 1.9 Buffers.** Ensure that new development incorporates buffers and other measures adequate to protect biological habitats that have been preserved, enhanced, and created.
- **GOAL ER 3:** Conserve, protect, and enhance Sutter County's varied wildlife and vegetation resources.
    - **ER 3.1 Special-Status Species.** Preserve special-status fish, wildlife, and plant species (e.g., rare, threatened, or endangered species) and habitats consistent with an applicable Habitat Conservation Plan and federal, state, and local regulations.

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- **ER 3.2 Agency Coordination.** Coordinate with federal, state, and local resource agencies (e.g., California Department of Fish and Game, U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers) to protect special-status species.
- **ER 3.3 Fisheries.** Support the preservation and re-establishment of fisheries in the rivers and streams within Sutter County.
- **ER 3.6 Natural Vegetation.** Preserve important areas of natural vegetation and the ecological integrity of these habitats, where feasible, including but not limited to riparian, vernal pool, marshes, oak woodlands and annual grasslands (ER 3-A).
- **ER 3.8 Native Plant Use.** Encourage the use of native and drought tolerant plant materials, including native tree species, in all public and private landscaping and revegetation projects (ER 3-D).

A.3.7.2 Butte County

Butte County General Plan 2030

The Butte County General Plan 2030 (Butte County 2010) was adopted in October 2010. The objective of the general plan is to provide direction on how the county will fulfill its community vision and manage its future growth. The general plan addresses all aspects of development, including land use; circulation and transportation; open space, natural resources and conservation; public facilities and services; safety; and noise. The Conservation and Open Space Element chapter of the general plan was updated in 2010. The following goals, objectives, and policies are relevant to fish resources in the study area.

- **Goal COS-9:** Protect identified special-status plant and animal species.
  - **COS-P9.1** A biological resources assessment shall be required for any proposed development project where special-status species or critical habitat may be present. Assessments shall be carried out under the direction of Butte County. Additional focused surveys shall be conducted during the appropriate season if necessary. Upon adoption of the Butte Regional Habitat Conservation Plan (HCP) and Natural Community Conservation Plan (NCCP), assessment requirements of the [Butte Regional] HCP/NCCP shall be implemented for development projects within the [Butte Regional]HCP/NCCP area.
  - **COS-P9.2** If special-status plant or animal species are found to be located within a development site, proponents of the project shall engage in consultation with the appropriate federal, State and regional agencies and mitigate project effects in accordance with State and federal law. Upon adoption of the Butte Regional Habitat Conservation Plan (HCP) and Natural Community Conservation Plan (NCCP), mitigation requirements of the [Butte Regional]HCP/NCCP shall be implemented for development projects within the [Butte Regional]HCP/NCCP area.

    Examples of mitigation may include:

    a. Design the proposed project to avoid and minimize effects.

    b. Restrict construction to specific seasons based on project specific special-status species issues (e.g. minimizing effects on special-status nesting birds by constructing outside of the nesting season).

    c. Confine construction disturbance to the minimum area necessary to complete the work.

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d. Mitigate for the loss of special-status species by purchasing credits at an approved conservation bank (if a bank exists for the species in question), funding restoration or habitat improvement projects at existing preserves in Butte County, or purchasing or donating mitigation lands of substantially similar habitat.

e. Maintain a minimum 100-foot buffer on each side of all riparian corridors, creeks and streams for special-status and common wildlife.

f. Establish setbacks from the outer edge of special-status species habitat areas.

A.3.8 Agriculture, Land Use, and Socioeconomics

A.3.8.1 Butte County

Butte County General Plan

The northern portion of Reach 25 through Reach 41 of the proposed project are located in unincorporated Butte County, and are subject to the goals and policies of the *Butte County General Plan*. Relevant goals and policies of the Agriculture Element follow.

- **Goal AG-1** Maintain, promote, and enhance Butte County's agriculture uses and resources, a major source of food, employment, and income in Butte County.
    - **Policy AG-P1.1** The County supports State and federal legislation designed to conserve soil and protect agricultural land.
    - **Policy AG-P1.3** Continue to work with landowners in establishing new and maintaining existing Williamson Act contracts.
- **Goal AG-2** Protect Butte County's agricultural lands from conversion to non-agricultural uses.
    - **Policy AG-P2.1** The county shall work with the Local Agency Formation Commission to create and maintain a consistent approach to the conservation of agricultural land through the designation of reasonable and logical sphere of influence boundaries.
    - **Policy AG-P2.2** The County supports private conservation organizations that utilize voluntary conservation easements as a tool for agricultural conservation, continued agricultural use, agricultural supportive uses, tax breaks and similar goals.
- **Goal AG-6** Provide adequate infrastructure and services to support agriculture.
    - **Policy AG-P6.1** The County supports the efforts of private landowners and public agencies to protect farmers from catastrophic and uncontrolled flooding of permanent crops, such as orchards, nurseries and other major agricultural investments.

Relevant goals and policies of the Land Use Element follow.

- **Goal LU-1** Continue to uphold and respect the planning principles on which the County's land use map is based.
    - **Policy LU-P1.1** The County shall protect and conserve land that is used for agricultural purposes, including cropland and grazing land.
    - **Policy LU-P1.2** The County shall promote economic development and job-generating industry in unincorporated areas.

- **Policy LU-P1.6** The County shall conserve important habitat and watershed areas, while protecting the public safety of County residents.

- **Goal LU-6** Provide adequate land for the development of public and quasi-public uses, as a means to provide necessary public services and facilities in support of existing and new residential, commercial, and industrial land uses.
- **Goal LU-12** Coordinate planning efforts within the county and region.
  - **Policy LU-P12.4** The County shall coordinate planning efforts with those of special districts and school districts.

Relevant goals and policies of the Economic Development Element follow.

- **Goal ED-1** Improve the local economy by diversifying the economy, reducing the unemployment rate, increasing business revenues to the county, and increasing wages.
  - **Policy ED-P1.1** The County's priority for future growth is creating sustainable jobs and providing a living wage to families to reduce poverty.
  - **Policy ED-P1.4** Products and services for County operations should be purchased from Butte County locally-owned businesses whenever possible.
  - **Policy ED-P1.5** The County supports education and job training for those county residents currently employed, dislocated, or unemployed in order to enhance existing skill levels and provide for job advancement, and supports removal of impediments to gainful employment for county residents.
- **Goal ED-2** Promote and support the local agricultural economic sector.
  - **Policy ED-P2.2** The County shall encourage development of food processing and other facilities that could support production of "value-added" agriculture products from Butte County.
- **Goal ED-3** Improve the county's fiscal health.

A.3.8.2 Sutter County

Sutter County General Plan

Project Reaches 2 through 10, part of Reach 11, and Reaches 14, 15, and 17 through the southern portion of Reach 25 lie within unincorporated Sutter County, and are subject to the goals and policies of the *Sutter County General Plan*. Relevant goals and policies of the Agriculture Element follow.

- **Goal AG 1** Preserve and protect high-quality agricultural lands for long-term agricultural production.
  - **Policy AG 1.1 Agricultural Land Preservation.** Preserve and maintain agriculturally designated lands for agricultural use and direct urban/suburban and other nonagricultural related development to the cities, unincorporated rural communities, and other clearly defined and comprehensively planned development areas.
  - **Policy AG 1.5 Agricultural Land Conversion.** Discourage the conversion of agricultural land to other uses unless all of the following findings can be made:

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a. The net community benefit derived from conversion of the land outweighs the need to protect the land for long-term agricultural use

b. There are no feasible alternative locations for the proposed use that would appreciably reduce impacts upon agricultural lands

c. The use will not have significant adverse effects, or can mitigate such effects, upon existing and future adjacent agricultural lands and operations

- **Policy AG 1.6 Interrelationship with Habitat Conservation.** Permit agriculturally designated lands to be used for habitat conservation and/or mitigation with approval of a development agreement, provided such use does not interfere or adversely affect existing or planned agricultural uses or impact County flood control operations.
- **Policy AG 1.9 Williamson Act.** Promote the use of the California Land Conservation Act (Williamson Act) on agricultural lands throughout the County provided the State continues to fund the subvention program to offset the loss of property taxes.
- **Policy AG 1.10 Transfer of Development Rights.** Explore, and if determined feasible, implement programs to permanently preserve agricultural lands through the use of voluntary transfer of development rights to guide development to more suitable areas.
- **Policy AG 1.11 Conservation Easements.** Explore, and if determined feasible, identify agricultural mitigation bank areas in which the County will encourage private landowners to voluntarily participate in agricultural conservation easements.
- **Policy AG 1.12 Land Mitigation Program.** Explore, and if determined feasible, create an Agricultural Land Mitigation Program.
- **Policy AG 1.13 Cooperation with Other Agencies.** Coordinate with the cities, the Local Agency Formation Commission (LAFCO), local service providers, and other relevant agencies on joint mechanisms to preserve agricultural lands and limit urban encroachment and the extension of urban service and infrastructure into agricultural areas.

- **Goal AG 2** Minimize conflicts between agricultural uses and operations and adjacent non-agricultural uses.
  - **Policy AG 2.1 Minimize Conflicts.** Require that new development adjacent to agricultural areas be designed to minimize conflicts with adjacent agricultural uses and operations.
  - **Policy AG 2.2 Right to Farm.** Affirm and protect the right of agricultural operators in agricultural areas to continue their agricultural practices ("right to farm"). The right to farm shall acknowledge through noticing that landowners and residents adjacent to agriculture should be prepared, accept, and not consider a nuisance the impacts inherent with lawful farming activities. At a minimum, the Right to Farm Notice shall be recorded with the Deed of Trust at the time of transfer of all applicable properties.
  - **Policy AG 2.3 Buffers.** Protect agricultural operations from conflicts with non-agricultural uses by requiring buffers between proposed non-agricultural uses and adjacent agricultural operations:

    a. Buffers should be physically and biologically designed to avoid conflicts between agricultural and nonagricultural uses. The biological design should ensure that the buffer does not provide a host environment for pests or carriers of disease which could potentially impact adjacent farming operations.

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b. Buffers shall not be located on the agricultural parcel(s).

c. Buffers should primarily consist of a physical separation (setback) between agricultural and non-agricultural uses. The appropriate width of the buffer shall be determined on a site-by-site basis taking into account the type of existing agricultural uses (i.e. crop type and associated operational requirements); the nature of the proposed non-agricultural development; the natural features of the site; landscaping, walls or other barriers planned by the proposed development; and any other factors that affect the specific situation.

d. In addition to a physical separation, the following buffer options may be considered: greenbelts/open space, limited park and recreation areas, roads, PUE's, waterways, and vegetative screens. These buffering options may be used in any combination to most effectively reduce conflicts arising from adjacent incompatible uses.

e. An ongoing maintenance program for the buffer shall be established and should include vector controls.

f. Buffer restrictions may be removed if all adjacent parcels have been irreversibly converted to nonagricultural uses.

- **Goal AG 3** Protect the natural resources needed to ensure that agriculture remains an essential and sustainable part of Sutter County's future.
- **Goal AG 4** Provide for growth, expansion, and diversification of Sutter County's agricultural industries.
    - **Policy AG 4.1 Transportation Systems.** Maintain existing regional transportation systems to support the local, national, and global movement of agricultural products. Support the extension of freight rail into Sutter County's industrial areas.
    - **Policy AG 4.2 Utility Infrastructure.** Implement mechanisms to provide the utility infrastructure, flood protection, and services necessary to lands designated for industrial use in order to support the growth and expansion of Sutter County's agriculture industries.
    - **Policy AG 4.5 Agricultural Industries.** Promote the growth and expansion of existing agricultural industries as well as the development of new and diverse agricultural production, processing, and distribution industries within Sutter County.
    - **Policy AG 4.6 Local Processing.** Support the local processing and distribution of agricultural products grown in Sutter County and other nearby locations.

Relevant goals and policies of the Land Use Element follow.

- **Goal LU 1** Promote the efficient and sensitive use of lands to protect and enhance Sutter County's quality of life and meet the needs of existing and future residents and businesses.
    - **Policy LU 1.2 Balanced Land Use Pattern.** Maintain a balance of land uses that allows residents the opportunity to live, work, and shop in the County.
    - **Policy LU 1.4 Identification of Floodplains.** Identify the unincorporated areas of Sutter County that are subject to flooding, and evaluate and regulate development within these areas according to state and federal regulations to minimize the loss of life and damage to property caused by potential flood events.

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- **Policy LU 1.5 Minimize Land Use Conflicts.** Avoid/minimize conflicts between land uses and ensure that new development maintains the viability of adjacent agricultural, open space, and rural uses and minimizes impacts upon existing residents, businesses, and resources.
- **Policy LU 1.6 Buffers.** Require new development adjacent to agricultural and open space lands to provide buffers and incorporate mitigation to minimize impacts as appropriate. Agricultural buffers shall be in accordance with the Sutter County Design Guidelines and project environmental review.
- **Policy LU 1.7 Growth Inducement.** Locate and size infrastructure to not induce growth within adjacent agricultural and open space areas.
- **Policy LU 1.11 Efficient Land Use Patterns.** Encourage land use patterns that support the efficient use of resources, enhance the timely provision of services and infrastructure, promote a variety of transportation modes, facilitate pedestrian mobility, and support health and wellness.

- **Goal LU 2** Preserve Sutter County's agricultural heritage and natural resources.
  - **Policy LU 2.1 Long-Term Conservation.** Promote the long-term conservation of agricultural and open space lands in accordance with the goals and policies of the Agricultural Resources and Environmental Resources elements.
  - **Policy LU 2.2 Isolated Urban and Rural Uses.** Prohibit the designation of new, and the expansion of existing, isolated rural or urban land uses within agricultural or other resource lands, unless such expansion is compatible with the existing use.
  - **Policy LU 2.5 Commercial Recreation Overlay.** Allow for the allocation of the Commercial Recreation Overlay land use designation within, or "inside" the levees along the Sacramento, Feather, and Bear River corridors. Consider allocation of this land use designation to adjacent areas "outside" the levees when determined to be necessary for the proposed use and if the use will not have an adverse impact on adjacent agricultural operations or natural resources.
- **Goal LU 4** Facilitate orderly, well-planned, sustainable, and efficient growth that balances aesthetic, functional, resource, and economic considerations.
  - **Policy LU 4.1 Growth Areas.** Direct future growth and development to the growth areas identified on Figure 3-1.
  - **Policy LU 4.6 Discontiguous Development.** Prohibit the establishment of new growth areas that are separated from existing cities and/or rural communities.
- **Goal LU 5** Promote a collaborative process for the planning and annexation of the area within the cities spheres of influence.
  - **Policy LU 5.1 Live Oak SOI.** Recognize the sphere of influence identified on the General Plan Land Use Diagrams as Live Oak's boundary of future planned urban growth.
  - **Policy LU 5.2 Yuba City Existing SOI.** Recognize the existing sphere of influence identified on the General Plan Land Use Diagrams as Yuba City's boundary of future planned urban growth.

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  - **Policy LU 5.3 Yuba City Possible Future SOI.** Consider the possible future expanded sphere of influence identified on the General Plan Land Use Diagrams as Yuba City's possible boundary of future planned urban growth. Enter into a memorandum of understanding (MOU) with Yuba City prior to supporting the City's possible future expanded sphere of influence.
  - **Policy LU 5.4 Sphere Expansion.** Discourage the modification or expansion of Yuba City's and Live Oak's spheres of influence beyond the boundaries identified (including the possible future expanded Yuba City sphere of influence) on the General Plan Land Use Diagrams until substantial build out has occurred within the existing spheres, and a clear market demand exists for new uses that cannot be more efficiently accommodated in other defined growth areas in the County.

- **Goal LU 9** Designate adequate and compatible sites for governmental/public uses, and take a lead role when feasible on regional issues of importance to Sutter County, its residents, and businesses.
  - **Policy LU 9.1 Co-Location.** Promote the co-location of parks, schools, police, fire, libraries, community centers and other community facilities to support community interaction, enhance neighborhood identity, support joint use, and leverage resources.
  - **Policy LU 9.4 Impacts to Nearby Uses.** Require public facilities such as wells, pumps, tanks, and yards to be located and designed to ensure that noise, light, odors, and appearance do not adversely affect nearby land uses.
  - **Policy LU 9.5 Regional Planning Efforts.** Support and participate as appropriate in countywide, regional, and other multi-agency planning efforts related to land use, housing, revenue, economic development, tourism, agriculture, natural resources, air quality, habitat conservation, transportation, transit, infrastructure, water supply, flood control, solid waste disposal, emergency preparedness, and other issues relevant to the County.
  - **Policy LU 9.7 Project Consultation.** Encourage early consultation with adjacent jurisdictions on development proposals in Sutter County that may have an impact to them. Respond to and comment on development proposals in other jurisdictions that may have an impact to Sutter County to ensure consistency with the County's General Plan and that appropriate mitigation is incorporated.

Relevant goals and policies of the Economic Development Element follow.

- **Goal ED 1** Maintain and enhance the County's long-term fiscal health.
- **Goal ED 2** Maintain a business-friendly environment for both existing and new companies.
  - **Policy ED 2.1** Infrastructure for New Business. Ensure the provision of adequate infrastructure for business development, including flood control, road and rail networks, telecommunications backbone, sewer, drainage facilities, and water supply.
  - **Policy ED 2.6** Interjurisdiction Coordination. Create alliances with local jurisdictions and agencies to promote economic growth within the county.
- **Goal ED 3** Enhance the desirability of the County for new business and business expansion by supporting investment in the professional skills of the work force.
  - **Policy ED 3.1** Stable Jobs. Encourage future growth that creates stable jobs.

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- **Policy ED 3.2** Financial Independence. Support economic opportunities that promote the self-sufficiency of residents and reduce dependence on County programs and services.

City of Yuba City

Yuba City General Plan

The *Yuba City General Plan* outlines land use and zoning policies for the area within the Yuba City limits. Although Reaches 11 through 18 of the proposed project skirt the eastern boundary of Yuba City, the project site lies, with three exceptions, within unincorporated Sutter County. These exceptions are the northernmost portion of Reach 11, Reach 16, and the southernmost portion of Reach 17, which fall within Yuba City limits.

Relevant policies of the Agriculture Element follow.

- **Policy 8.2-G-1** Promote preservation of agriculture outside of the urban growth area.
- **Policy 8.2-I-1** Work with the County to preserve agricultural uses in areas outside the Urban Growth Boundary and within greenbelts established around the exterior of the UGB. *The City should work with Sutter County to encourage the continuation of farming activities outside the City's and Urban Growth Boundary. Programs such as conservation easements and Williamson Act contracts should be pursued.*
- **Policy 8.2-I-2** Facilitate the continuance of agricultural activities within the City's urban growth area until the land is needed to accommodate population and employment growth. During this interim, minimize conflicts between agricultural uses and urban/suburban uses through site design techniques (not necessarily structural barriers).
- **Policy 8.2-I-5** Work with the Economic Development Corporation to assist proponents in continued and new agricultural processing uses in the proposed industrial area in order to support agricultural activities in the County.
- **Policy 8.2-I-6** Work with government agencies and non-profit land trusts to assist owners of undeveloped lands (sufficient in size to allow continued agricultural uses) to remain in agricultural open space on the perimeter of the urban growth area. *Potential programs may include purchase of conservation easements or creation of agricultural land trusts.*

Relevant policies of the Land Use Element follow.

- **Policy 3.4-I-2** Establish standards for urban edges and ensure that designated intensities and uses provide an appropriate transition to rural land at these edges.
- **Policy 3.4-I-4** Support the County's efforts to maintain viable agricultural uses surrounding the city in areas outside the proposed Urban Growth Boundary.
- **Policy 3.9-G-5** Protect the supply of land suitable for employment center uses by not allowing incompatible uses to locate in these areas.

Relevant policies of the Growth and Economic Development Element follow.

- **Policy 2.5-G-1** Foster a climate in which business can prosper and actively promote economic development opportunities and knowledge of Yuba City in the region, state and nation.

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- **Policy 2.5-G-5** Encourage agricultural processing and cooperative distribution and marketing of agricultural products.
- **Policy 2.5-G-6** Promote agricultural-related technology and opportunities for "back office" uses and specialty manufacturing.
- **Policy 2.5-G-7** Enhance aspects of the community that help economic development and draw residents to Yuba City, including small-town ambience, educational, cultural, environmental and recreational resources, and affordable housing.

City of Live Oak

City of Live Oak 2030 General Plan

The FRWLP project area lies approximately 1mile east of the Live Oak City limit, but portions of Reaches 22 through 25 fall within the City of Live Oak SOI. The SOI, as designated in the *City of Live Oak 2030 General Plan*, represents the city's probable ultimate physical boundary. Accordingly, the following goals and policies may apply to implementation of the proposed project.

The relevant goal and policies from the Agriculture Element follow.

- **Goal Agriculture-1** Preserve agricultural resources and support the practice of farming.
  - **Policy Agriculture-1.1** Preserve agricultural enterprises by supporting right-to-farm policies.
  - **Policy Agriculture-1.3** As a part of the City's economic development strategy, the City will focus on efforts to attract industries related to, and supportive of, the local agricultural economy.
  - **Policy Agriculture-1.5** The City will work with farmers, property owners, extensions, agencies, and agricultural organizations to enhance the viability of agricultural uses and activities.

The relevant goal of the Land Use Element follows.

- **Goal LU-5** Establish environmentally and economically sustainable land-use patterns.

Relevant goals and policies of the Economic Development Element follow.

- **Goal ED-3** Attract and develop new employment uses in Live Oak that can provide jobs for local workers, enhance the City's tax base, and diversify the local economy.
  - **Policy ED-3.2** The City will coordinate with Sutter County to ensure a mutual City-County benefit from agricultural processing plants that locate near Live Oak.
  - **Policy ED-3.3** The City will identify and proactively engage agricultural service businesses that could locate in Live Oak and support nearby agricultural processing and sales.
  - **Policy ED-3.6** The City will target attracting the types of industries that are not only suited to the assets offered by Live Oak's location, but also industries that will provide viable career ladders for local workers, from entry level through management positions.
- **Goal ED-5** Foster growth and expansion among existing businesses in the community as a primary strategy for improving the economic health of the City.

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A.3.9 Population, Housing, and Environmental Justice

A.3.9.1 Butte County

Butte County General Plan 2030

The relevant goals and policies of the Housing Element of the *Butte County General Plan 2030* are listed below.

- **Goal H-1:** Provide for the County's regional share of new housing for all income groups and future residents as identified in the Housing Needs Assessment.
- **Goal H-2:** Encourage the provision of affordable housing in the unincorporated area.
- **Goal H-3:** Partner with property owners to preserve and rehabilitate the existing supply of housing.
- **Goal H-4:** Collaborate with existing service providers to meet the special housing needs of homeless persons, elderly, large families, disabled persons, and farmworkers.
- **Goal H-5:** Ensure equal housing opportunity.
- **Goal H-6:** Promote energy conservation.

City of Biggs

City of Biggs General Plan

The relevant goals and policies of the City of Biggs General Plan Housing Element 2009–2014 (Pacific Municipal Consultants 2010) are listed below.

- **Goal 1—Housing Quality**: Provide an adequate supply of housing which is affordable, safe, sanitary, and desirable for all segments of the community. Housing should be of sufficient quality and quantity to afford all persons regardless of race, age, religion, sex, marital status, ethnic background, or personal disabilities an opportunity of selecting among varying types, designs, quality and value.
- **Goal 2—Housing Quantity and Affordability**: It is the goal of the City of Biggs to encourage the preservation of existing housing and the construction of new housing at a range of costs and in quantities to meet the needs of existing and future residents of the City.
- **Goal 3—Equal Housing opportunity**: It is the goal of the City of Biggs to assure that discrimination is not a factor in the ability of households to obtain housing.
- **Goal 4—Natural Resources and Energy Conservation**: It is the goal of the City to promote the conservation of natural resources and energy in housing production.

City of Gridley

City of Gridley 2030 General Plan

The relevant goals of the *City of Gridley 2030 General Plan* Housing Plan are listed below.

- **Housing Goal 1:** To promote the development of a variety of housing types throughout the city that are safe and built to complement the surrounding neighborhood.

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- **Housing Goal 2:** To facilitate the preservation and construction of housing to meet the needs of Gridley residents, including all household types and incomes.
- **Housing Goal 3:** To reduce and remove constraints to development and redevelopment of housing.
- **Housing Goal 4:** To promote development and redevelopment of affordable housing.
- **Housing Goal 5:** To ensure equal opportunity and access to housing for all residents.
- **Housing Goal 6:** To reduce household costs and conserve natural resources and energy in housing production.

A.3.9.2 Sutter County

Sutter County General Plan

The applicable goals and policies of the Sutter County General Plan Housing Element are listed below (Sutter County 2010:5-19 to 5-20).

- **Goal 1:** Remove governmental constraints, address accessibility needs, and provide a regulatory framework to encourage a variety of housing types that accommodate all income groups.
- **Goal 2:** Provide for an adequate supply of new housing to meet the needs of present and future Sutter County residents, incorporating a variety of housing types and densities that accommodate all income groups, including extremely low-income households.
- **Goal 3:** Provide opportunities for agricultural housing while preserving rural land for agricultural uses.
- **Goal 4:** Ensure that new housing in Sutter County is safe and sanitary and that it receives public services that are adequate to support the level of development.
- **Goal 5:** Conserve and improve existing housing in Sutter County to ensure safe and sanitary conditions.
- **Goal 6:** Support the Consolidated Area Housing Authority of Sutter County and other nonprofit and private affordable housing providers in the County.

City of Yuba City

Yuba City Housing Element Update

The City of Yuba City's policies on housing provided in its housing element update (2008–2013) (Stuart and Graham 2009: 56, 57, 63, 65, 71) are listed below.

- **H-A:** Provide incentives and programs to ensure the construction and maintenance of safe and sanitary housing with adequate public services for existing and future residents of the City.
- **H-B:** Provide incentives and programs to ensure the provision of very low, low, and moderate income housing units to meet community needs.
- **H-C:** Continue to work with Sutter County on actions to fulfill Yuba City's fair share of regional housing needs.
- **H-D:** Ensure that new housing will be safe and sanitary and in a livable environment with adequate public services for the level of development.

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- **H-E:** Facilitate the production of various housing types and densities to meet the needs of all income groups and ensure that housing opportunities are open to all without regard to race, color, age, sex, religion, national origin, family status, or physical handicap.
- **H-F:** Encourage the use of energy efficient materials and technology in new construction.

City of Live Oak

City of Live Oak 2030 General Plan

The relevant goals and policies of the *City of Live Oak 2030 General Plan* Housing Element are listed below.

- **Goal A:** To accommodate the City's share of the Regional Housing Need.
- **Goal B:** Provide for a variety of housing opportunities and affordability levels within the City of Live Oak.
- **Goal C:** Encourage and assist in the rehabilitation of housing units in need of repair and occupied by extremely low-, very low-, and low-income residents. Strive to enhance the overall quality of the City's existing housing stock.
- **Goal D:** Preserve, and if necessary replace, the City's publicly assisted affordable housing.
- **Goal E.1:** Ensure that no person seeking housing in the City of Live Oak is discriminated against on the basis of race, color, religion, sex, disability, familial status, ancestry, national origin, ancestry, marital status, sexual orientation, source of income, or age.
- **Goal F.1:** To promote energy conservation.

A.3.10 Visual

A.3.10.1 Butte County

Butte County General Plan 2030

The Butte County General Plan 2030 (Butte County 2010) establishes the Thermalito Afterbay as a Water-Based Scenic Area. There are no other county-designated Land- or Water-Based Scenic Areas in the project area. Relevant goals and policies of the Water Resources Element, Conservation and Open Space Element, and Public Facilities and Services Element are listed below.

- **Goal W-6**: Improve streambank stability and protect riparian resources
  - **W-P6.1** Any alteration of natural channels for flood control shall retain and protect riparian vegetation to the extent possible while still accomplishing the goal of providing flood control. Where removing existing riparian vegetation is unavoidable, the alteration shall allow for reestablishment of vegetation without compromising the flood flow capacity.
- **Goal COS-16**: Respect Native American culture and planning concerns.
  - **COS-P16.2** Impacts to the traditional Native American landscape shall be considered during California Environmental Quality Act or National Environmental Policy Act review of development proposals.

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- **COS-P17.1** Views of Butte County's scenic resources, including water features, unique geologic features and wildlife habitat areas, shall be maintained.

- **Goal PUB-8:** Coordinate an interconnected multi-use trail system.
  - **PUB-P8.3** The development of abandoned railroad rights-of-way, levee tops, utility easements and waterways for new multi-use trails shall be pursued where appropriate.

A.3.10.2 Sutter County

Sutter County General Plan

Signs are located along North Buttes Road indicating the North Buttes Scenic Route. This route, however, is not included in the Sutter County General Plan (Sutter County 2011) as a county-designated scenic route. The Sutter County General Plan contains the following policies related to visual resources.

Related policies of the Land Use Element are listed below. The policy concerning countywide land use is as follows.

- **LU 1.16** Views from Rural Roadways and Highways. Prohibit new projects and activities that would obscure, detract from, or negatively impact the quality of views from the County's rural roadways and highways. Limit off-site advertising along County roadways and highways. *(LU 1-B)*

The policies concerning agriculture and open space are shown below.

- **LU 2.5** Commercial Recreation Overlay. Allow for the allocation of the Commercial Recreation Overlay land use designation within, or "inside" the levees along the Sacramento, Feather, and Bear River corridors. Consider allocation of this land use designation to adjacent areas "outside" the levees when determined to be necessary for the proposed use and if the use will not have an adverse impact on adjacent agricultural operations or natural resources. *(LU 2-A/LU 2-B)*
- **LU 2.6** Rural Character. Ensure the density, intensity, and design of new development within agricultural areas is consistent with and maintains the County's rural/agricultural character. *(LU 1-B)*

The policy concerning rural communities is shown below.

- **LU 3.8** Landmarks and Resources. Preserve and protect local landmarks and significant natural resources within rural communities. *(LU 1-B/ LU 3-A)*

One policy of the Agricultural Resources Element relates to visitor services (agri-tourism).

- **AG 5.4** Recreational Uses. Support recreational uses on privately owned lands where such uses are compatible with on and off-site agriculture and with scenic and environmentally sensitive resources. *(AG 1-A)*

Several policies of the Environmental Resources Element related to biological resources and open space.

- **ER 3.6** Natural Vegetation. Preserve important areas of natural vegetation and the ecological integrity of these habitats, where feasible, including but not limited to riparian, vernal pool, marshes, oak woodlands and annual grasslands. *(ER 3-A)*

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- **ER 3.7** Oak Trees. Preserve native oak trees when possible through the review of discretionary development projects and activities. Reduce the loss of oak trees through consideration of tree mitigation/replanting programs. *(ER 3-B/ER 3C)*
- **ER 4.1** Preserve Natural Resources. Preserve natural landforms, natural vegetation, and natural resources as open space to the extent feasible.
- **ER 4.3** River Corridors. Preserve the Sacramento, Feather, and Bear River corridors as important habitat, recreation and open space resources. Support efforts to increase public access and recreational uses along the County's river corridors.

Other policies of the Environmental Resources Element concern visual resources.

- **ER 7.1** Scenic Resources. Protect views of Sutter County's unique scenic resources including the Sutter Buttes, wildlife and habitat areas, the Sacramento, Feather, and Bear Rivers, and other significant resources. *(ER 7-A)*
- **ER 7.2** Scenic Roadways. Enhance the visual character along the County's key transportation corridors, in particular Highways 99 and 20, through application of consistent design and landscape standards. *(ER 7-B)*
- **ER 7.3** Visually Complimentary Development. Require new development adjacent to the County's scenic resources to be sited and designed to visually complement the natural environment, topography, and aesthetic viewsheds. *(ER 7-A)*
- **ER 7.5** Lighting. Support practices that reduce light pollution and preserve views of the night sky including the design and sighting of light fixtures to minimize glare and light on adjacent properties. *(ER 7-A)*

City of Yuba City

The City of Yuba City General Plan (City of Yuba City 2004) contains the following Growth and Economic Development policy related to visual resources.

- **Guiding Policy 2.5-G-7** Enhance aspects of the community that help economic development and draw residents to Yuba City, including small-town ambience, educational, cultural, environmental and recreational resources, and affordable housing.

Community Design

Sutter Street/Second Street

- **Implementing Policy 4.4-I-10** Provide signage, landscaping, lighting, and other visual features to emphasize the existing and planned pedestrian access to the riverfront.

Parks, Schools, & Community Facilities

The general plan references the 2002 *Feather River Parkway Strategic Plan* that was developed to make use of the existing open space along the river that

> is visually inaccessible due to the existing levee. Proposed uses include a trail system, beaches, river viewing pavilions, boating facilities, and active recreational facilities, such as a golf course. The plan also addresses issues of waterfront accessibility, park space creation, and connections between the waterfront and Yuba City.

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- **Implementing Policy 6.1-I-10** Implement the Feather River Parkway Strategic Plan in a manner consistent with the plans and programs put forth in that document and consistent with policies in the Open Space and Conservation Chapter (Chapter 8). Proposed actions include:
    - Improve pedestrian access to the riverfront;
    - Provide a mix of active- and non-active recreational and open space in those areas delineated in the Feather River Parkway Strategic Plan; and
    - Ensure that the open spaces proposed in the Feather River Parkway Strategic Plan be designed in a manner flexible enough to accommodate a variety of activities.

Environmental Conservation

Open Space

- **Guiding Policy 8.1-G-2** Enhance the open space features of the Feather River.
- **Guiding Policy 8.1-G-3** Preserve and enhance the visual and scenic resources of the Planning Area.
- **Implementing Policy 8.1-I-1** Coordinate with Sutter County in the creation of a greenway/open space buffer around the perimeter of the City's urban growth area. Explore regulatory incentives (e.g., Williamson Act) and financing mechanisms necessary to ensure preservation of these lands as open space.
- **Implementing Policy 8.1-I-3** Work with public and private entities to implement open space features of the Feather River Parkway Plan.
- **Implementing Policy 8.1-I-4** Where feasible, encourage restoration of degraded open space areas in the Feather River Parkway planning area to an environmentally valuable and sustainable condition.

Biological Resources

- **Guiding Policy 8.4-G-2** Protect and enhance the natural habitat features of the Feather River and new open space corridors within and around the urban growth area.
- **Guiding Policy 8.4-G-3** Preserve and enhance heritage oaks in the Planning Area.
- **Implementing Policy 8.4-I-2** Require preservation of oak trees and other native trees that are of a significant size, by requiring site designs to incorporate these trees to the maximum extent feasible.

City of Live Oak

City of Live Oak 2030 General Plan

The City of Live Oak 2030 General Plan (City of Live Oak 2010) contains the following policies related to visual resources. One policy concerns community character.

- **Policy Design 3.1** Important visual gateways should be designed to:
    - Provide an attractive streetscape environment for visitors;
    - Preserve vegetation and add new landscaping to enhance aesthetics;

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- Preserve or enhance views of the Sutter Buttes, where possible;
- Visually "announce" to the visitor their arrival in Live Oak and the downtown core area; and
- Have attractive civic landmarks and public spaces.

Other policies relate to conservation and open space. Specifically, the following policies concern biological resources.

- **Policy Biological 3.1** Where feasible, the City will require that new developments avoid the conversion of existing riparian habitat and require that an adequate buffer of the associated riparian areas be established to protect this resource. Where feasible, the riparian buffers shall be incorporated into open space corridors, public landscapes, and parks. Riparian buffers shall be designed to preserve existing wildlife habitat; restore degraded habitat; provide habitat conditions favorable to native local wildlife; restrict activities that may adversely affect wildlife habitat quality within the established buffer zone; and provide interpretive features educating the public about the beneficial effects of native riparian habitat and activities that adversely affect wildlife.
- **Policy Biological 3.2** The City will take advantage of opportunities to enhance and restore existing riparian areas along Live Oak Slough and other drainage canals. Where feasible, these resources shall be incorporated into open space corridors, public landscapes, and park during the preparation of the Parks and Recreation Master Plan.
- **Policy Biological 3.4** If development or expansion of the Live Oak Park and Recreation Area on the Feather River occurs, the City will encourage designs, construction, and operation to protect sensitive riparian habitat.

The following policy concerns drainage and flood protection.

- **Policy Public 5.3** Existing Reclamation District 777 and Reclamation District 2056 drainage channels should be improved, to the greatest extent feasible, to create more naturalized swales that provide stormwater conveyance. These channels should be restored with native, low-maintenance landscaping to filter stormwater and enhance neighborhood aesthetics.

The following policy concerns parks and recreation.

- **Policy Parks 4.2** The City will coordinate with the other cities and the county to plan for improvements at Live Oak Park and Recreation Area to support and complement future trails along the Feather River.

A.3.11 Recreation

A.3.11.1 Butte County

Butte County General Plan 2030

The Butte County General Plan 2030 establishes several goals, policies, and actions affecting recreation including bicycle and park facilities (Butte County 2010:191). These appear in the Circulation Element and the Public Facilities and Services Element.

- **Goal CIR-1:** Promote intergovernmental communication and cooperation concerning transportation-related issues.

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- **Goal CIR-3:** Design new neighborhoods, and improve existing neighborhoods, to accommodate and promote alternative modes of transportation.
- **Goal CIR-5:** Provide a safe, continuous, integrated, and accessible bicycle system, so as to encourage the use of the bicycle as a viable transportation mode and as a form of recreation and exercise.
- **Goal CIR-9:** Provide a circulation system that supports public safety.
- **Goal PUB-6:** Support a comprehensive and high-quality system of recreational open space and facilities.
- **Goal PUB-7:** Encourage local, regional, and State parks providers to engage in coordinated and cooperative planning efforts.
- **Goal PUB-8:** Coordinate an interconnected multiuse trail system.
    - **Policy PUB-P8.1** The County shall work with the municipalities and park and recreation districts to connect between trails in incorporated and unincorporated regions of Butte County.
    - **Policy PUB-P8.2** The County shall work with local jurisdictions, Lassen and Plumas National Forests, the Department of Water Resources, and the Department of Fish and Game to designate additional shared use trails along unpaved County roads, access roads, and fire roads.
    - **Policy PUB-P8.3** The development of abandoned railroad rights-of-way, levee tops, utility easements, and waterways for new multiuse trails shall be pursued where appropriate.
    - **Policy PUB-P8.4** The County supports development of additional equestrian trails, including safe routes along roads.
    - **Policy PUB-P8.5** The County supports development of additional off-road vehicle trails.
    - **Policy PUB-P8.6** The County supports acquisition of appropriate and adequate funding for the creation and ongoing maintenance of trails.
    - **Policy PUB-P8.7** New development shall incorporate multiuse trails and connections to existing trail networks.
        - **Action PUB-A8.2** Cooperate with appropriate agencies to conduct a countywide trails planning study to identify new needed routes and connections to the existing trails network, as well as to address funding and management of trail facilities.

Countywide Bikeway Master Plan

Butte County adopted its Countywide Bikeway Master Plan in 1998 and is updating this plan (Butte County 2010:177). The Countywide Bikeway Master Plan identifies the following goals, objectives, and policies affecting recreation (Butte County 1998:39):

- **Goal 1:** Provide continuous and convenient bicycle access to and between major destinations throughout the County.
    - **Objective:** Develop a bikeway program that identifies interregional bikeway needs.
        - **Policy** Identify and give funding priority to projects which connect existing regional bikeway facilities.

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        - **Policy** Encourage linkages between local bikeways to regional bikeways.
        - **Policy** Promote bikeway linkages to regional educational, recreational, shopping, governmental, and other attractions.
- **Goal 2:** Provide a safe and efficient bikeway system.
- **Goal 3:** Promote bicycling as a part of the intermodal transportation system.
- **Goal 5:** Develop a bikeway system that encourages and facilitates commuter use.
- **Goal 6:** Develop a bikeway system that encourages and facilitates recreational use.
    - **Objective:** Encourage recreational bicycling by providing a bikeway system that responds to the riding needs of both the avid cyclist and the "weekend" rider.
        - **Policy** Emphasize connections to regional recreational centers, such as Lake Oroville and Bidwell Park.
        - **Policy** Provide adequate bicycle parking facilities at regional recreation areas where warranted by demand.
- **Goal 7:** Pursue and obtain maximum funding available for bikeway programs.

City of Gridley

City of Gridley 2030 Master Plan

The City of Gridley 2030 General Plan establishes a policy of achieving and maintaining a standard of 5 acres of park land per 1,000 population (City of Gridley 2010:10-22). The Circulation Element and the Open Space Element in the general plan contain several goals, policies, and programs affecting recreation including bicycle and park facilities (City of Gridley 2010:7-19).

- **Circulation Goal 1:** To ensure that new development accommodates safe and pleasant routes for pedestrians, bicyclists, and drivers.
    - **Circulation Implementation Strategy 1.3** The City will update the Bicycle Plan to incorporate the Planned Growth Area and implement policies of the updated 2030 General Plan. The City will incorporate connections to existing and planned regional pedestrian/bicycle routes shown on plans adopted by Butte County. The City will provide potential connections with the City of Biggs and will incorporate planned connections shown on plans adopted by the City of Biggs. The City will consult with BCAG, the County, Butte County Air Quality Management District, and other agencies to obtain funding for improvements described in the Bicycle Plan.
- **Circulation Goal 2:** To retrofit existing development for increased pedestrian, bicycle, and transit access.
- **Open Space Goal 1:** To create high-quality, functional open space corridors.
- **Open Space Goal 2:** To provide visual screening, buffering, trails, and drainage in open space corridors along the railroad and Highway 99 in the Planned Growth Area.
- **Open Space Goal 3:** To provide for drainage, pedestrian and bicycle circulation, and landscaping in open space corridors within neighborhoods.

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- **Open Space Goal 4:** To ensure adequate outdoor recreational open space to meet local needs as the City grows.
    - **Open Space Policy 4.1** New developments shall provide for improved, public park land according at a minimum rate of 5 acres per 1,000 residents.
- **Open Space Goal 5:** Maintain, expand, and upgrade facilities in existing recreation areas.
    - **Open Space Policy 5.6** The City will explore opportunities to improve ongoing public access to, and expand recreational opportunities related to the Feather River on property owned by the City and used for wastewater treatment.
    - **Open Space Implementation Strategy 5.1** The City will promote awareness of regional, state, and private parks and recreation planning and facilities development near Gridley, such as Grey Lodge, Lake Oroville Recreation Area, or new facilities. The City will encourage development of uses and facilities within Gridley that would be complementary to these regional recreation opportunities, in order to take best local advantage of these resources. The City will coordinate signage to promote awareness of these regional facilities.
- **Open Space Goal 6:** To provide recreation facilities and programs that meet the needs of existing and future residents.

City of Gridley Bicycle Plan

The City of Gridley Bicycle Plan identifies goals, objectives, and measures for developing a bicycle circulation network that ties into the region beyond the City and provides access to the Gray Lodge Wildlife Area, the City of Biggs, and the Feather River. The plan establishes several goals, objectives, and implementation measures affecting recreation facilities for bikes (City of Gridley 2003:16).

- **Goal:** A safe, effective, and efficient bicycle circulation system
    - **Implementation Measure 3.1:** Participate and comment on the Butte County Bicycle Plan update as it relates to Gridley-area routes, namely access to Feather River along East Gridley Road, and bikeways to Biggs and Gray Lodge Wildlife Area.

A.3.11.2 Sutter County

Sutter County General Plan

Sutter County does not have a park and recreation department and does not provide recreational facilities or opportunities through County programs under such a public agency (Sutter County 2011:8-1). The County does collect developer fees for parks and allocates the fees to one of five sectors. The fees are collected for recreation capital improvements (Sutter County 1996b:7.3). The Sutter County General Plan establishes a policy of achieving and maintaining a standard of 10 acres of park land per 1,000 population (Sutter County 2011:8-7). The plan identifies the following goals and policies affecting recreation, including bicycle and park facilities (Sutter County 2011:8-7–8-9).

- **Goal PS 6:** Ensure that adequate park, recreation, and open space lands and programs are provided to meet the diverse needs of Sutter County's residents.
    - **Policy PS 6.1 Park Facilities.** Support the development of new parks and recreational facilities, and the maintenance and enhancement of existing parks and recreational facilities, to provide for a variety of active and passive recreational needs.

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- **Policy PS 6.2 Countywide Parks and Open Space Standard.** Strive to achieve and maintain a standard of 10 acres per 1,000 residents of park and open space lands within the County.
- **Policy PS 6.3 Parks and Open Space Standard for New Large-Scale Development.** Require new large-scale development projects (i.e., Specific Plans, Rural Planned Communities) to provide 10 acres per 1,000 residents of active and passive parks and open space lands. New large-scale development projects shall prepare and implement a County approved Parks and Open Space Master Plan.
- **Policy PS 6.6 Access**. Locate new parks and recreation facilities within walking and bicycling distance of residential areas.
- **Policy PS 6.10 River Recreation.** Support the development of public recreational amenities that enhance public access to and use of the Sacramento, Feather, and Bear River corridors including launch ramps, marinas, camping facilities, picnic areas, vista points, interpretive centers, and commercial recreation and services.
- **Policy PS 6-B** Revise the Zoning Code to allow for and facilitate recreation, commercial recreation, service and related uses along the County's river corridors.

- **Goal PS 7:** Support creation of an interconnected multi-use trail system that enhances Sutter County's recreational opportunities.
  - **Policy PS 7.1 Multi-Use Trails.** Support the development of a network of safe, interconnected multi-use trails that link activity and resource areas, and connect with regional trail systems.
  - **Policy PS 7.3 River Trails.** Support opportunities to create multi-use trails along the Sacramento, Feather, and Bear Rivers, including enhancement of the Feather River Parkway, through collaboration with the cities of Yuba City and Live Oak.
  - **Policy PS 7.4 Trail Opportunities.** Encourage the development of abandoned rights-of-way, levee tops, utility easements, and waterways for new multi-use trails.

Yuba-Sutter Bikeway Master Plan

The Yuba-Sutter Bikeway Master Plan, completed by the FRQAMD, provides comprehensive trail facility planning in Sutter County (Feather River Air Quality Management District 1995:i). The plan identifies the following goals, objectives, and policies for trails that apply to the Sutter Basin Project feasibility study area (Feather River Air Quality Management District 1995:6).

- **Goal 1.0:** Develop a comprehensive regional bikeway system as a viable alternative to the automobile for all trip purposes.
  - **Objective:** Improve on-street and off-street bicycling conditions through the construction and maintenance of bikeway facilities.
    - **Policy 1.2** Encourage the use of existing natural and manmade corridors such as creeks and railroad right of ways for future bike path alignments.
    - **Policy 1.4** Develop a recreational bikeway system that uses lower volume streets, off-street bike paths, and serves regional historic and natural destinations.

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- **Policy 1.8** Develop a network of off-road mountain bicycling facilities that offer variety of experiences for the bicyclist while minimizing conflicts with hikers and equestrians, and environmental impacts.

- **Goal 2.0:** Maximize the amount of State and Federal funding for bikeway improvements that can be received by Yuba and Sutter Counties.
- **Goal 3.0:** Maximize Multi-Modal Connections to the Bikeway System.
- **Goal 4.0:** Improve bicycle safety conditions in Yuba and Sutter Counties.

City of Yuba City

Yuba City General Plan

Yuba City has a policy of achieving and maintaining a standard of 10 acres of park land per 1,000 population (City of Yuba City 2004:6-1). The City of Yuba City General Plan establishes several policies affecting recreation including bicycle and park facilities.

- **Policy 5.4-I-1** Establish a network of on- and off-roadway bicycle routes and encourage their use for commute, recreational, and other trips. Design bike routes with the safety of cyclists as a priority.
- **Policy 5.4-I-2** Develop bicycle routes that provide access to schools, parks, and the Feather River Parkway.
- **Policy 6.1-I-1** Establish and maintain a standard of 10 acres of public parks per 1,000 residents. Specific standards are as follows: 1 acre of Neighborhood Parks, 1.5 acres of Community Parks, 1.5 acres of City Parks, and 6 acres of Specialized Recreation Area per 1,000 residents.
- **Policy 6.1-I-10** Implement the Feather River Parkway Strategic Plan in a manner consistent with the plans and programs put forth in that document and consistent with policies in the Open Space and Conservation Chapter (Chapter 8). Proposed actions include:
  - Improved pedestrian access to the riverfront;
  - Provide a mix of active- and non-active recreational and open space in those areas delineated in the Feather River Parkway Strategic Plan; and
  - Ensure that the open spaces proposed in the Feather River Parkway Strategic Plan be designed in a manner flexible enough to accommodate a variety of activities.

Feather River Parkway Strategic Plan

The Feather River Parkway Strategic Plan is master plan for the space between the western Feather River Levee and the Feather River within Yuba City. The plan calls for an extensive network of bicycle and pedestrian trails, wildlife habitat preserves, campgrounds, water focused recreation facilities, civic and urban plaza elements, beach recreation, and equestrian facilities. The plan divides the space into five distinct sub-areas each with a unique program and master plan (City of Yuba City 2002:III-9).

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City of Live Oak

City of Live Oak 2030 General Plan

The City of Live Oak 2010 General Plan establishes a policy of achieving and maintaining a standard of 7 acres of park land per 1,000 population (City of Live Oak 2010). The City of Live Oak 2030 General Plan establishes several goals and policies affecting recreation including bicycle and park facilities (City of Live Oak 2010).

- **Goal CIRC-1:** Develop a highly connected circulation system.
- **Goal CIRC-2:** Improve the convenience and safety for multi-modal travel in existing development.
- **Goal CIRC-3:** Ensure safe and convenient daily travel for pedestrians, bicyclists, transit users, and drivers as Live Oak grows.
- **Goal PARKS-1:** Provide a variety of park land in the existing developed City to meet park standards.
- **Goal PARKS-2:** Ensure that accessible, high-quality park land is planned and developed as the City grows.
- **Goal PARKS-3:** Provide recreation facilities and programs to accommodate the needs of existing and future residents.
- **Goal PARKS-4:** Become a countywide or regional center for recreation.
    - **Policy PARKS-4.1** The City will proactively coordinate with Sutter County and Yuba City to identify regional park and recreation needs, such as regional parks or trails, which could be planned, jointly funded, and developed in Live Oak.
    - **Policy PARKS-4.2** The City will coordinate with the other cities and the county to plan for improvements at Live Oak Park and Recreation Area to support and complement future trails along the Feather River.
    - **Policy PARKS-4.3** The City will coordinate with the California Department of Parks and Recreation on funding opportunities to support local recreational goals and plan for improvements in Live Oak that would complement any future nearby state parks and recreational lands.

A.3.12 Public Health and Environmental Hazards

A.3.12.1 Butte County

Butte County General Plan

The Health and Safety Element in the *Butte County General Plan* outlines goals, policies, and implementation policies that address natural to human-made hazards.

- **Goal HS-14:** Reduce risks from the harmful effects of hazardous materials.
    - **Policy HS-P14.1** The County supports the hazardous materials Emergency Response Plan (Area Plan).

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- **Policy HS-P14.2** Hazardous materials carrier routes shall be designated to direct hazardous materials transport away from populated areas.
- **Policy HS-P14.5** Environmental assessment and/or investigation shall be required prior to General Plan Amendment or Rezone approval that would allow uses with sensitive receptors, such as residential developments, schools, or care facilities, on sites previously used for commercial, industrial, agricultural or mining uses to determine whether soils, groundwater and existing structures are contaminated and require remediation. Policies and oversight authority shall follow Health and Safety Code Division 20, Chapters 6.5 and 6.8 when determining jurisdiction.

- **Goal HS-15:** Ensure that Butte County is prepared for emergency situations.
  - **Policy HS-P15.1** The County shall conduct continuous advance planning to anticipate potential threats and improve emergency response effectiveness.
  - **Policy HS-P15.2** Critical emergency response facilities such as fire, police, emergency service facilities and utilities shall be sited to minimize their exposure to flooding, seismic effects, fire, or explosion.
  - **Policy HS-P15.3** Emergency access routes shall be kept free of traffic impediments.
  - **Policy HS-P15.4** Streets and developed properties shall be clearly marked to enable easy identification.
    - **Action HS-A15.1** Seek funding to develop community awareness and education programs for citizens that describe procedures and evacuation routes to be followed in the event of a disaster.

City of Biggs

City of Biggs General Plan

The Public Health and Safety Element of the City of Biggs General Plan establishes goals and policies that address public health and safety, and hazardous materials. These goals and policies address the city's approach to minimizing these hazards and maintaining a safe environment for residents.

- **Goal 6.1:** To ensure that the City and involved local agencies are able to effectively respond to emergency situations which may threaten the people or property of the Biggs community.
  - **Policy 6.1.A**: The City shall continue to participate in emergency preparedness planning with Butte County.
- **Goal 6.3:** Protect people and property within the City of Biggs against fire related loss and damage.
  - **Policy 6.3.A:** At a minimum, maintain current levels of service for fire protection by continuing to require development to provide and/or fund fire protection facilities, personnel, and operations and maintenance.
- **Goal 6.6:** Minimize the risk of personal injury, property damage, and environmental degradation resulting from the use, transport, disposal, and release/discharge of hazardous materials.

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City of Gridley

City of Gridley General Plan

The Safety Element of the *City of Gridley General Plan* outlines key safety issues facing Gridley, public health and hazardous materials. Goals and policies in this element describe the city's approach to minimizing these hazards and maintaining a safe environment for residents.

- **Safety Goal 3:** To protect people and resources from hazards posed by hazardous materials, including their extraction, manufacture, storage, use, disposal, and transport.
    - **Safety Policy 3.1**: The City will require that hazardous materials are used, stored, transported, and disposed in a safe manner and in compliance with local, State, and federal safety standards.
    - **Safety Policy 3.7**: The City will review development requests and require that any airborne, waterborne, windborne, and other hazardous materials uses are fully disclosed, analyzed, and mitigated to ensure against any risk relative to any nearby planned or existing land uses and their users.
- **Safety Goal 4:** To reduce risks to people and structures from fires.
    - **Safety Policy 4.1** The City will require setbacks, ignition resistant building materials, or other measures to reduce exposure to potential wildfires in areas designated for natural open space preservation, based on California Department of Forestry and Fire Protection recommendations and Maintenance of Defensible Space Measures, as appropriate.
- **Safety Goal 5:** To minimize the loss of life and damage to property from natural and human-caused hazards by ensuring adequate emergency routes and response.
    - **Safety Policy 5.1** New developments and City investments shall be consistent with the information provided in the Butte County Multi-Jurisdictional All Hazard Pre-Disaster Mitigation Plan.
    - **Safety Policy 5.2** The City will ensure the adequacy of disaster response and coordination with Butte County and the ability of individuals to survive disasters.
    - **Safety Policy 5.4** The City will identify and maintain, in consultation with the Butte County Office of Emergency Services, evacuation routes and operational plans for relevant local hazards.
    - **Safety Policy 5.6** The City will require development and maintenance of a road system that provides adequate access for emergency equipment.

A.3.12.2 Sutter County

Sutter County General Plan

The Hazards and Hazardous Materials Element and Public Services Element of the *Sutter County General Plan* contains goals, policies, and actions aimed at reducing the risk associated with natural and human-made hazards within the county.

- **Goal PHS 3:** Protect health, safety, property, and the environment from the use, transport, disposal, and release/discharge of hazardous materials and waste.

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- **Goal PHS 4:** Respond appropriately, effectively, and efficiently to natural and human-made emergencies and disasters.
    - **Policy PHS 4.1 Emergency Operation Plans.** Continue to implement and regularly update countywide emergency operation plans to reduce or eliminate long-term risk to life and property from natural or human-made emergencies and disasters.
    - **Policy PHS 4.2 Evacuation Routes.** Regularly review established evacuation routes to ensure emergency access to and from all parts of the County.
    - **Policy PHS 4.3 Post-Disaster Response.** Plan for the continued function of essential facilities following a major disaster to facilitate post-disaster response.
    - **Policy PHS 4.4 Emergency Access.** Require minimum road and driveway widths and clearances around structures consistent with established requirements in order to ensure emergency access.
    - **Policy PHS 4.5 Emergency and Disaster Preparedness Training.** Coordinate with local and regional agencies to regularly conduct emergency and disaster preparedness training to test operational and emergency plans.
    - **Policy PHS 4.7 Coordination.** Continue to be responsible for planning, preparedness, emergency response, and recovery activities associated with natural and human-made disasters. Provide communication and coordination between local and federal agencies, medical facilities, schools, local radio stations, and special needs service providers.
    - **Policy PHS 4.8 Mutual Aid Agreements.** Continue to participate in mutual aid agreements to ensure adequate resources, facilities, and other support services necessary for emergency response.

City of Yuba City

Yuba City General Plan

The Noise and Safety Element of the *Yuba City General Plan* provides information for the protection of the community from unreasonable risks associated with the effects of hazardous material accidents.

- **Guiding Policy 9.4-G-2** Minimize the risk of personal injury, property damage, and environmental damage from fire, hazardous chemicals releases, natural and human made disasters.
- **Implementing Policy 9.4-I-2** Prepare and disseminate information, including a page on the City's website, about emergency preparedness.
- **Guiding Policy 9.5-G-1** Minimize the risk of property damage and personal injury resulting from the production, use, storage, disposal, or transportation of hazardous materials.
- **Implementing Policy 9.5-I-1** Promote the reduction, recycling, and safe disposal of household hazardous wastes through public education and awareness. Expand collection programs in conjunction with new growth in the city.
- **Implementing Policy 9.5-I-2** Continue to pursue funding to conduct pre-plan visits to hazardous materials sites within the city, as well as major roadway and rail corridors used for hazardous materials transport.

- **Implementing Policy 9.5-I-3** Require the clean-up of sites contaminated with hazardous substances.
- **Implementing Policy 9.5-I-4** Implement policies contained in the Sutter County Hazardous Waste Management Plan that encourage and assist the reduction of hazardous waste from businesses and homes.
- **Implementing Policy 9.5-I-6** Specify routes for transporting hazardous materials, taking into account areas of projected new growth.

City of Live Oak

City of Live Oak 2030 General Plan

The Public Safety Element of the *City of Live Oak 2030 General Plan* contains goals, policies, and implementation measures related to public safety in the city of Live Oak. This element directs the city to evaluate potential hazards, develop policies and procedures to avoid hazards, and create adequate emergency responses.

- **Goal PS-3.** Provide for adequate emergency response.
  - **Policy PS-3.1** The City shall maintain and update the City's emergency response plan, as needed, and ensure ongoing consistency with the General Plan.
  - **Policy PS-3.2** The City will add a section to the emergency response plan on railroad safety to address potential releases related to accidents or spills of hazardous substances, such as gasoline, diesel, or transported hazardous materials/hazardous wastes.
  - **Policy PS-3.3** The City will maintain mutual aid agreements with other agencies in Sutter County.
  - **Safety Implementation Strategy 3.1:** The City will maintain and update a list of hazardous sites, buildings, and uses in the Sphere of Influence or use databases that track the location of hazardous materials sites, buildings, and similar features. The City will use updated lists to evaluate and condition development, as necessary, to protect environmental and public health.
- **Goal PS-4.** Protect the community from the harmful effects of hazardous materials.
  - **Policy PS-4.1:** The City, through its discretionary review authority, will assess potential risks associated with hazardous materials used, stored, transported, and disposed, and ensure they are handled in a safe manner and in compliance with local, state, and federal safety standards.
  - **Policy PS-4.2** The City will require that dumpsites for hazardous materials are cleaned in conformance with applicable federal and state laws before new uses are established.
  - **Policy PS-4.3** The City will coordinate with appropriate federal, state, and regional agencies to address local sources of groundwater and soil contamination, including underground storage tanks, septic tanks, agriculture, and industrial uses.
  - **Policy PS-4.4** New development adjacent to areas of ongoing agricultural development outside the City's Sphere of Influence shall provide agricultural buffers that are adequate to protect future residents from harmful effects of agricultural chemical use (see Conservation and Open Space Element).

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- **Policy PS-4.5** The City will support efforts to identify and remediate soils and groundwater contaminated with toxic materials, and to identify and eliminate sources contributing to such contamination.

A.3.13 Cultural Resources

A.3.13.1 Butte County

Butte County General Plan

The Butte County General Plan 2030 (Butte County 2010:253) contains a number of policies governing cultural resources. The following goals and policies of the Conservation and Open Space Element are relevant to review of the FRWLP.

- **Goal COS-14:** Preserve important cultural resources.
  - **Policy COS-P14.2** As part of CEQA and NEPA projects, evaluations of surface and subsurface cultural resources in the county shall be conducted. Such evaluations should involve consultation with the Northeast Information Center.
- **Goal COS-15:** Ensure that new development does not adversely impact cultural resources.
  - **Policy COS-P15.1** Areas found during construction to contain significant historic or prehistoric archaeological artifacts shall be examined by a qualified consulting archaeologist or historian for appropriate protection and preservation. Historic or prehistoric artifacts found during construction shall be examined by a qualified consulting archaeologist or historian to determine their significance and develop appropriate protection and preservation measures.
  - **Policy COS-P15.2** Any archaeological or paleontological resources on a development project site shall be either preserved in their sites or adequately documented as a condition of removal. When a development project has sufficient flexibility, avoidance and preservation of the resource shall be the primary mitigation measure.
- **Goal COS-16** Respect Native American culture and planning concerns.
  - **Policy COS-P16.2** Impacts to the traditional Native American landscape shall be considered during California Environmental Quality Act or National Environmental Protection Act review of development proposals.
  - **Policy COS-P16.3** Human remains discovered during implementation of public and private development projects shall be treated with dignity and respect. Such treatment shall fully comply with the federal Native American Graves Protection and Repatriation Act and other appropriate laws.
  - **Policy COS-P16.4** If human remains are located during any ground disturbing activity, work shall stop until the County Coroner has been contacted, and, if the human remains are determined to be of Native American origin, the NAHC and most likely descendant have been consulted.

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A.3.13.2 Sutter County

Sutter County General Plan

The Sutter County General Plan (Sutter County 2011:9-16, 9-17) identifies the following policies.

- **Policy ER-8A:** For projects subject to discretionary approval involving the demolition, relocation, or alteration of a building or structure over 45 years old or that would result in a change to the building or structure's immediate setting, the County shall require an assessment by a professional historic resource consultant to determine if the action would cause a substantial adverse change in the significance of an historical resource pursuant to CEQA Guidelines Section 15064.5.
- **Policy ER-8b:** If the historical resource assessment determines that the proposed action would cause a substantial adverse change in the significance of an historical resource, the County shall require as a condition of project approval the implementation of appropriate and feasible measures to reduce the potential impact, including the appropriate level of written and photographic documentation of significant historical resources that would be demolished.
- **Policy ER 8-C:** For projects subject to discretionary approval, which involve grading, excavation, or construction, require the applicant to hire a professional that meets the Secretary of Interior's professional qualifications standards for archaeology to conduct an archaeological resource investigation. As determined necessary by the archaeologist and the County, updated records search, pre-construction field surveys, research, and testing, and/or other methods that identify whether a substantial adverse impact on significant archaeological resource would occur. If cultural resources are discovered, the resource shall be examined by a qualified archaeologist to determine its significance and develop appropriate protection and preservation measures.
- **Policy ER 8-D:** Require that when any subsurface cultural resources, paleontological resources, or human remains are encountered, all work within 100 feet of the discovery be stopped and the area protected from further disturbance until the discovery is evaluated. The appropriate County personnel shall be notified immediately. The resources shall be examined by qualified personnel to determine their significance and develop appropriate protection and preservation measures. If human remains are discovered, they shall be treated in compliance with applicable state and Federal laws, including notifying the County Coroner and consulting with the California Native American Heritage Commission, as appropriate.

City of Yuba City

Yuba City General Plan

Yuba City's adopted general plan (Yuba City 2004:8-8) provides the following guiding and implementing policies related to cultural resources.

- **Guiding Policy: 8.3-G-1** Identify and preserve the archaeological, paleontological, and historic resources that are found within the Yuba City Planning Area.
- **Implementing Policy 8.3-I-1** Encourage the preservation of historic sites, buildings, and structures.

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- **Implementing Policy 8.3-I-3** Promote the registration of historic sites, buildings, and structures in the National Register of Historic Places, and inclusion in the California Inventory of Historic Resources.
- **Implementing Policy 8.3-I-4** Consult with the local Native American community in the cases where new development may result in disturbance to Native American sites.
- **Implementing Policy 8.3-I-5** Require that new development analyze and avoid any potential impacts to archaeological, paleontological, and historic resources by:
  - Requiring a records review for development proposed in areas that are considered archaeologically sensitive;
  - Studying the potential effects of development and construction (as required by CEQA);
  - Requiring pre-construction surveys and monitoring during any ground disturbance for all development in areas of historical and archaeological sensitivity; and
  - Implementing appropriate measures to avoid the identified impacts.
- **Implementing Policy 8.3-I-6** In accordance with CEQA and the State Public Resources Code, require the preparation of a resource mitigation plan and monitoring program by a qualified archaeologist in the event that archaeological resources are discovered.

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Appendix B
Scoping Report

This appendix contains the scoping report that was prepared for and delivered to the U.S. Army Corps of Engineers and Sutter Butte Area Flood Control Agency on July 29, 2011, that documented the preparation and outcomes of the joint environmental scoping process for both the Sutter Basin Project and the Feather River West Levee Project held in June 2011.

Memorandum

Date:	July 29, 2011
To:	Matt Davis, U.S. Army Corps of Engineers
Cc:	Chris Elliott, ICF International, Jennifer Rogers, ICF International
From:	Ingrid Norgaard, ICF International
Subject:	**Public Scoping Meeting Summary for the Sutter Basin Project and Feather River West Levee Project Environmental Scoping Meetings—June 27 and 28, 2011**

Introduction

Two efforts are presently underway to study flood risk reduction improvements in Sutter and Butte Counties, one known as the Sutter Basin Feasibility Study, sponsored by the U.S. Army Corps of Engineers (USACE) to determine federal interest in flood risk reduction project(s), and one known as the Feather River West Levee Project (FRWLP), sponsored by the Sutter Butte Flood Control Agency (SBFCA) as a locally driven flood risk reduction project.

The two projects are being studied in close coordination because they at least partially overlap in their study areas, purpose, potential improvements, potential effects, and involved parties. Therefore, a joint scoping process is being conducted for the two projects to explain the relationship between the two efforts and obtain public input in a manner that is convenient, efficient, and integrated. It is anticipated that the two planning efforts will result in a separate Environmental Impact Study/Environmental Impact Report (EIS/EIR) for each project, in accordance with the National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA).

Sutter Basin Feasibility Study

USACE initiated the Sutter Basin project in 2001 and is conducting a feasibility study to evaluate flood damage reduction, ecosystem restoration, and recreation opportunities within the study area. The Central Valley Flood Protection Board (CVFPB) and SBFCA, in their roles as non-federal local sponsors, are coordinating with USACE on the feasibility study. USACE, acting as the federal lead agency under NEPA, and SBFCA, acting as the state lead agency under CEQA, have determined that an EIS/EIR will be prepared to describe alternatives, potential environmental effects, and mitigation measures.

FRWLP

SBFCA is planning the FRWLP to address levee deficiencies in the west levee of the Feather River from Thermalito Afterbay to the Sutter Bypass confluence to meet federal, state, and local flood protection criteria and goals. In 2010, an assessment district was enacted to provide local funding toward flood management improvements. These funds will be matched with those from the Disaster Preparedness and Flood Prevention Bond Act of 2006 (Proposition 1E) administered by the California Department of Water Resources (DWR). The purpose of the FRWLP would be to construct improvements as quickly as possible in advance of and compatible with the Sutter Basin Feasibility Study. USACE, acting as the federal lead agency under NEPA, and SBFCA, acting as the state lead agency under the CEQA, have determined that an EIS/EIR will be prepared to describe alternatives, potential environmental effects, and mitigation measures.

Development of the draft EIS/EIR to evaluate the FRWLP is underway and scheduled for public release in early 2012. A public release date for the Sutter Basin Project draft EIS/EIR has yet to be determined.

SBFCA and USACE have been carrying out scoping activities to assist them in determining the scope, and content of the environmental information for these two projects. SBFCA and USACE have had ongoing inter-agency consultation with responsible and interested agencies such as the Central Valley Flood Protection Board, Department of Fish and Game, Department of Water Resources (DWR), and California Regional Water Quality Control Board to name a few. In addition, SBFCA and USACE conducted a total of four public scoping meetings for the public and for federal and state agency staff on June 27th and June 28th, 2011. The following summarizes the outreach conducted to inform responsible and interested agencies and the public of the proposed projects, the scoping meetings, and the public comment received.

Noticing

Notice of Intent/Preparation

In compliance with the requirements set forth in CEQA, SBFCA and USACE prepared a Notice of Preparation (NOP). The NOP contained a brief description of the proposed project, project date, probable environmental effects, the date, time and place of the public scoping meetings, and contact information. The NOP solicited participation in determining the scopes and content of the environmental information of the EIS/EIRs. On May 20, 2011 the NOP was sent to Responsible and Trustee Agencies and involved federal agencies, to the State Clearinghouse, and parties previously requesting notice in writing. The comment period on the NOP was May 20, 2011 to July 08, 2011.

In compliance with the requirements set forth in NEPA, USACE prepared a Notice of Intent (NOI) describing its intent to prepare an EIS/EIR, the proposed action, the possible alternatives, and relevant scoping meeting and contact information. The NOI was posted in the Federal Register, the United States Government's official noticing and reporting publication, on May 20, 2011. The official comment period for the NOI was May 20, 2011 to July 08, 2011.

Mailings

SBFCA utilized a previously developed mailing list of interested stakeholders to send an email notification encouraging attendance at the scoping meetings.

Notifications

Advertisements briefly introducing the lead agencies, the proposed projects and associated environmental review processes, and publicizing the scoping meetings were placed in the Appeal Democrat and the Gridley Herald newspapers. Both newspapers are intended to reach a local and regional public audience that residents routinely rely upon to keep them abreast of Sutter and Butte county issues. The advertisements were published in the Appeal Democrat on June 20 and June 27, 2011. The advertisements were published in the Gridley Herald on June 22 and June 24, 2011. A media release was also emailed out to a number media contacts within the region on June 22, 2011.

Attachment A contains copies of the following:

- Notice of Preparation
- Notice of Intent
- Email Notification
- Appeal Democrat and Gridley Herald Ledger Advertisements
- Media Release

Public Meetings

Four public scoping meetings were held to inform the public of the proposed projects and seek feedback on the range of alternatives, environmental effects, and issues of concern related to the Sutter Basin Project and the FRWLP. The four meetings were held at two different times for two days. On June 27, 2011 the meeting times were from 3:30 to 5:30 p.m. and 6:30 to 8:30 p.m., at the Yuba City Veterans Memorial Community Center. On June 28, 2011 the meeting times were from 3:30 to 5:30 p.m. and 6:30 to 8:30 p.m., 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, HDR Engineering consultant staff, and ICF International (ICF) environmental consulting staff.

Twenty-six graphic display boards were on display for attendees to review. The boards described and illustrated the Sutter Basin Project and FRWLP history, purpose, need and objectives, study area, levee deficiencies and potential improvements, environmental considerations, the CEQA/NEPA process and project timeline and were on display for attendees to review. SBFCA, USACE, HDR and

ICF staff were stationed at display boards to interact with public attendees and provide additional detail or answer any questions.

A Power Point presentation was given to provide a brief introduction to the Sutter Basin Project and the FRWLP including objectives, schedule, environmental compliance, and related flood control work in the region.

A fact sheet, providing an overview of the Sutter Basin Project and the FRWLP including purpose and goals, maps of the corresponding study areas, an overview of the environmental compliance process and timeline, was also made available.

Comment cards were prepared so that meeting attendees could provide feedback on the projects. These cards could be filled out during the meeting and given to a project team member.

Attachment B contains copies of the following:

- Display boards
- Power Point presentation
- Fact sheet
- Comment card templates

Public Feedback

There were 36 people in total who attended the two meetings. Twelve people attended the meeting from 3:30 to 5:00 p.m. and four people attended the meeting from 6:30 to 8:00 p.m. on June 27, 2011. Fifteen people attended the meeting from 3:30 to 5:00 p.m. and five people attended the meeting from 6:30 to 8:00 p.m. on June 28, 2011.

Five comments were received from the public regarding the EIS/EIRs during the scoping period. Below is a list summarizing the comments received.

- A request was made to keep the process for the Sutter Basin Feasibility Study on schedule so the state will be able to release EIP funding for the FRWLP.
- A comment was received regarding the importance of coordinating with the Lower Feather River Corridor Management Project so not to have to duplicate efforts on environmental studies.
- A comment was received in favor of the option of putting in a levee setback in the Nelson Slough area.
- A comment was received in opposition of the project.
- A comment addressed two issues. The first comment pertains to the lack of attention to the east levee of the Sutter Bypass. The second comment suggested using a perimeter levee around Yuba City, or a J levee on the south and west side.

Attachment C contains copies of the following:

- Comments received from all interested parties (including those transcribed by court reporter)
- Attendee sign-in sheet templates

Next Steps

The comments received during the scoping period will assist in determining which issues are evaluated in detail in both the Sutter Basin Project and FRWLP EIS/EIRs. Once alternatives have been developed based on the scoping process and preexisting information, they will be analyzed, and draft EIS/EIRs will be developed. Upon the release of the draft EIR/EIS, the public will have 45 days to comment on the document. Additionally, at least one public hearing will be held so the public and agencies can learn more about both of the draft EIR/EISs, ask questions regarding the analysis, and provide comments. At these meetings, the alternatives will be presented and explained.

Development of the draft EIS/EIR to evaluate the FRWLP is underway and scheduled for public release in early 2012. A public release date for the Sutter Basin Project draft EIS/EIR has yet to be determined.

Attachment A

- Notice of Preparation
- Notice of Intent
- Email Notification
- Appeal Democrat and Gridley Herald Ledger Advertisements
- Media Release

STATE OF CALIFORNIA

GOVERNOR'S OFFICE *of* PLANNING AND RESEARCH

STATE CLEARINGHOUSE AND PLANNING UNIT

JERRY BROWN
GOVERNOR

Notice of Preparation

May 20, 2011

To: Reviewing Agencies

Re: Sutter Basin Feasibility Study and Feather River West Levee Project
SCH# 2011052062

Attached for your review and comment is the Notice of Preparation (NOP) for the Sutter Basin Feasibility Study and Feather River West Levee Project draft Environmental Impact Report (EIR).

Responsible agencies must transmit their comments on the scope and content of the NOP, focusing on specific information related to their own statutory responsibility, within 30 days of receipt of the NOP from the Lead Agency. This is a courtesy notice provided by the State Clearinghouse with a reminder for you to comment in a timely manner. We encourage other agencies to also respond to this notice and express their concerns early in the environmental review process.

Please direct your comments to:

Ingrid Norgaard
Sutter Butte Flood Control Agency
c/o ICF International
630 K Street, Suite 400
Sacramento, CA 95814

with a copy to the State Clearinghouse in the Office of Planning and Research. Please refer to the SCH number noted above in all correspondence concerning this project.

If you have any questions about the environmental document review process, please call the State Clearinghouse at (916) 445-0613.

Sincerely,

Scott Morgan
Director, State Clearinghouse

Attachments
cc: Lead Agency

Document Details Report
State Clearinghouse Data Base

SCH# 2011052062
Project Title Sutter Basin Feasibility Study and Feather River West Levee Project
Lead Agency Sutter Butte Flood Control Agency

Type NOP Notice of Preparation

Description Two efforts are presently underway to study flood risk reduction improvements in Sutter and Butte Counties, one known as the Sutter Basin Feasibility Study, sponsored by the U.S. Army Corps of Engineers (USACE) to determine federal interest in flood risk reduction project(s), and one known as the Feather River West Levee Project (FRWLP), sponsored by the Sutter Butte Flood Control Agency (SBFCA) as a locally driven flood risk reduction project.

Lead Agency Contact

Name Ingrid Norgaard
Agency Sutter Butte Flood Control Agency
Phone 916 737-3000 **Fax**
email inorgaard@icfi.com
Address c/o ICF International
630 K Street, Suite 400
City Sacramento **State** CA **Zip** 95814

Project Location

County Sutter, Butte
City
Region
Cross Streets
Lat / Long
Parcel No.
Township **Range** **Section** **Base**

Proximity to:

Highways
Airports
Railways
Waterways
Schools
Land Use

Project Issues Aesthetic/Visual; Agricultural Land; Air Quality; Biological Resources; Archaeologic-Historic; Geologic/Seismic; Toxic/Hazardous; Water Quality; Landuse; Other Issues; Minerals; Noise; Population/Housing Balance; Public Services; Recreation/Parks; Economics/Jobs; Traffic/Circulation

---

Reviewing Agencies Resources Agency; Department of Conservation; Central Valley Flood Protection Board; Office of Historic Preservation; Department of Parks and Recreation; Department of Water Resources; Department of Fish and Game, Region 2; Office of Emergency Management Agency, California; Native American Heritage Commission; State Lands Commission; Caltrans, District 3; State Water Resources Control Board, Division of Water Quality; Regional Water Quality Control Bd., Region 5 (Sacramento); Regional Water Quality Control Bd., Region 5 (Redding)

Date Received 05/20/2011 **Start of Review** 05/20/2011 **End of Review** 06/20/2011

County: [illegible] SCH# [illegible]

ources Agency

Resources Agency
Nadell Gayou

Dept. of Boating & Waterways
Mike Sotelo

California Coastal Commission
Elizabeth A. Fuchs

Colorado River Board
Gerald R. Zimmerman

Dept. of Conservation
Rebecca Salazar

California Energy Commission
Eric Knight

Cal Fire
Allen Robertson

Central Valley Flood Protection Board
James Herota

Office of Historic Preservation
Ron Parsons

Dept of Parks & Recreation
Environmental Stewardship Section

California Department of Resources, Recycling & Recovery
Sue O'Leary

S.F. Bay Conservation & Dev't. Comm.
Steve McAdam

Dept. of Water Resources
Resources Agency
Nadell Gayou

_____
Conservancy

ı and Game

Depart. of Fish & Game
Scott Flint
Environmental Services Division

Fish & Game Region 1
Donald Koch

- [ ] **Fish & Game Region 1E**
  Laurie Harnsberger
- [x] **Fish & Game Region 2**
  Jeff Drongesen
- [ ] **Fish & Game Region 3**
  Charles Armor
- [ ] **Fish & Game Region 4**
  Julie Vance
- [ ] **Fish & Game Region 5**
  Don Chadwick
  Habitat Conservation Program
- [ ] **Fish & Game Region 6**
  Gabrina Gatchel
  Habitat Conservation Program
- [ ] **Fish & Game Region 6 I/M**
  Brad Henderson
  Inyo/Mono, Habitat Conservation Program
- [ ] **Dept. of Fish & Game M**
  George Isaac
  Marine Region

Other Departments

- [ ] **Food & Agriculture**
  Steve Shaffer
  Dept. of Food and Agriculture
- [ ] **Depart. of General Services**
  Public School Construction
- [ ] **Dept. of General Services**
  Anna Garbeff
  Environmental Services Section
- [ ] **Dept. of Public Health**
  Bridgette Binning
  Dept. of Health/Drinking Water

Independent Commissions,Boards

- [ ] **Delta Protection Commission**
  Linda Flack
- [x] **Cal EMA (Emergency Management Agency)**
  Dennis Castrillo
- [ ] **Governor's Office of Planning & Research**
  State Clearinghouse
- [x] **Native American Heritage Comm.**
  Debbie Treadway
- [ ] **Public Utilities Commission**
  Leo Wong
- [ ] **Santa Monica Bay Restoration**
  Guangyu Wang
- [x] **State Lands Commission**
  Marina Brand
- [ ] **Tahoe Regional Planning Agency (TRPA)**
  Cherry Jacques

Business, Trans & Housing

- [ ] **Caltrans - Division of Aeronautics**
  Philip Crimmins
- [ ] **Caltrans - Planning**
  Terri Pencovic
- [ ] **California Highway Patrol**
  Scott Loetscher
  Office of Special Projects
- [ ] **Housing & Community Development**
  CEQA Coordinator
  Housing Policy Division

Dept. of Transportation

- [ ] **Caltrans, District 1**
  Rex Jackman
- [ ] **Caltrans, District 2**
  Marcelino Gonzalez
- [x] **Caltrans, District 3**
  Bruce de Terra
- [ ] **Caltrans, District 4**
  Lisa Carboni
- [ ] **Caltrans, District 5**
  David Murray
- [ ] **Caltrans, District 6**
  Michael Navarro
- [ ] **Caltrans, District 7**
  Elmer Alvarez
- [ ] **Caltrans, District 8**
  Dan Kopulsky
- [ ] **Caltrans, District 9**
  Gayle Rosander
- [ ] **Caltrans, District 10**
  Tom Dumas
- [ ] **Caltrans, District 11**
  Jacob Armstrong
- [ ] **Caltrans, District 12**
  Chris Herre

Cal EPA

Air Resources Board

- [ ] Airport Projects
  Jim Lerner
  - [ ] Transportation Projects
    Douglas Ito
  - [ ] Industrial Projects
    Mike Tollstrup
- [ ] **State Water Resources Control Board**
  Regional Programs Unit
  Division of Financial Assistance
- [x] **State Water Resources Control Board**
  Student Intern, 401 Water Quality Certification Unit
  Division of Water Quality
- [ ] **State Water Resouces Control Board**
  Steven Herrera
  Division of Water Rights
- [ ] **Dept. of Toxic Substances Control**
  CEQA Tracking Center
- [ ] **Department of Pesticide Regulation**
  CEQA Coordinator

Regional Water Quality Control Board (RWQCB)

- [ ] **RWQCB 1**
  Cathleen Hudson
  North Coast Region (1)
- [ ] **RWQCB 2**
  Environmental Document Coordinator
  San Francisco Bay Region (2)
- [ ] **RWQCB 3**
  Central Coast Region (3)
- [ ] **RWQCB 4**
  Teresa Rodgers
  Los Angeles Region (4)
- [x] **RWQCB 5S**
  Central Valley Region (5)
  - [ ] **RWQCB 5F**
    Central Valley Region (5)
    Fresno Branch Office
  - [x] **RWQCB 5R**
    Central Valley Region (5)
    Redding Branch Office
- [ ] **RWQCB 6**
  Lahontan Region (6)
  - [ ] **RWQCB 6V**
    Lahontan Region (6)
    Victorville Branch Office
- [ ] **RWQCB 7**
  Colorado River Basin Region (7)
- [ ] **RWQCB 8**
  Santa Ana Region (8)
- [ ] **RWQCB 9**
  San Diego Region (9)

- [ ] **Other** _____

Last Updated on 01/10/11

POLICY JUSTIFICATION

Kingdom of Saudi Arabia – Night Vision Equipment

The Government of the Kingdom of Saudi Arabia has requested a possible sale of 200 High-performance In-Line Sniper Sight (HISS) Thermal Weapon Sights - 1500 meter, 200 MilCAM Recon III LocatIR Long Range, Light Weight Thermal Binoculars with Geo Location, 7,000 Dual Beam Aiming Lasers (DBAL A2), 6000 AN/PVS-21 Low Profile Night Vision Goggles (LPNVG), spare and repair parts, support equipment, technical documentation and publications, translation services, training, U. S. government and contractor technical and logistics support services, and other related elements of logistical and program support. The estimated cost is $330 million.

This proposed sale will contribute to the foreign policy and national security of the United States by helping to improve the security of a friendly country which has been, and continues to be, an important force for political stability and economic progress in the Middle East.

The proposed sale will augment Saudi Arabia's capability to meet current and future threats from potential adversaries during operations conducted at night and during low visibility conditions. The Royal Saudi Land Forces (RSLF) are responsible for regional, perimeter, and border security operations. This proposed sale meets their defense and counter-terrorism requirements to deter current insurgent activity along their southern border and contributes to their overall military posture. The RSLF already has night vision devices in its inventory and will have no difficulty absorbing this night vision equipment into its inventory.

The proposed sale of this equipment will not alter the basic military balance in the region.

The prime contractors will be FLIR Inc. in Boston, Massachusetts and Laser Devices, Inc. in Monterey, California. There are no known offset agreements proposed in connection with this potential sale.

Implementation of this sale will not require the assignment of any U.S. Government or contractor representatives to recipient.

There will be no adverse impact on U.S. defense readiness as a result of this proposed sale.

[FR Doc. 2011–12405 Filed 5–19–11; 8:45 am]
BILLING CODE 5001–06–C

DEPARTMENT OF DEFENSE

Department of the Army; Corps of Engineers

Notice of Intent To Prepare Draft Environmental Impact Statements/ Environmental Impact Reports for the Sutter Basin Feasibility Study and the Section 408 Permission for the Feather River West Levee Project, Sutter and Butte Counties, CA

AGENCY: Department of the Army, U.S. Army Corps of Engineers; DoD.

ACTION: Notice of intent.

SUMMARY: Pursuant to the National Environmental Policy Act of 1969, as amended, and the California Environmental Quality Act (CEQA), the U.S. Army Corps of Engineers (USACE) intends to prepare a separate Environmental Impact Statement/ Environmental Impact Report (EIS/EIR) for each of the following related flood risk management study efforts in north-central California: a Feasibility Study of flood risk management and related water resources problems in the Sutter Basin conducted by USACE under the authority of the Flood Control Act of 1962 (Pub. L. 87–874); and under Section 14 of the Rivers and Harbors Act

of 1899 (as amended) (33 U.S.C. 408), and Section 404 of the Clean Water Act (33 U.S.C. 1344), the proposed Feather River West Levee Project (FRWLP), sponsored by the Sutter Butte Flood Control Agency (SBFCA) as a locally driven flood management improvement project. The two projects are being studied in close coordination because they partially overlap in their study areas, purpose, potential improvements, potential effects, and involved parties. Therefore, a joint scoping process is being conducted for the two projects to explain the relationship between the two efforts and obtain public input in a manner that is convenient, efficient, and integrated. Figures of the two project areas can be viewed at the SBFCA *Web site at: http://www.sutterbutteflood.org/index.php/notices_documents.*

Sutter Basin Feasibility Study. On March 20, 2000, the State of California entered into a feasibility cost-sharing agreement (FCSA) with USACE to initiate a feasibility study. An amendment to the FCSA was signed in 2010, which included SBFCA as a non-Federal sponsor. The purpose of the study is to address flood risk, ecosystem restoration and recreation-related issues in the study area. If a Federal interest is determined, the study would result in a decision document, a General Investigation Feasibility Study report and EIS/EIR, which would be the basis for a recommendation to Congress for authorization. The Central Valley Flood Protection Board (CVFPB) and SBFCA are coordinating with USACE on the feasibility study. USACE, as the Federal lead agency under NEPA, and SBFCA, as the state lead agency under CEQA in coordination with CVFPB, have determined that an EIS/EIR will be prepared to describe alternatives, potential environmental effects, and mitigation measures.

FRWLP. SBFCA is planning the FRWLP to construct improvements to the west levee of the Feather River from Thermalito Afterbay to the Sutter Bypass confluence to meet Federal, state, and local flood protection criteria and goals. In 2010, an assessment district was enacted to provide local funding toward flood management improvements. These funds may be matched with those from the Early Implementation Program (funded through previous state bonds) administered by the California Department of Water Resources (DWR). In order to implement the project, the sponsor must acquire permission from USACE to alter the Federal project under Section 14 of the Rivers and Harbors Act of 1899 (as amended) (33 U.S.C. 408 or, Section 408). USACE also has authority under Section 404 of the Clean Water Act (33 U.S.C. 1344) over activities involving the discharge of dredged or fill material to waters of the United States, which are known to be in the project area. The purpose of the FRWLP would be to construct improvements as quickly as possible in advance of and compatible with the Sutter Basin Project. USACE, acting as the Federal lead agency under NEPA, and SBFCA, acting as the state lead agency under the CEQA in coordination with CVFPB, have determined that an EIS/EIR will be prepared to describe alternatives, potential environmental effects, and mitigation measures.

DATES: Public scoping meetings will be held on Monday, June 27 at 3:30 p.m. and 6:30 p.m. at the Veterans Memorial Community Building, 1425 Veterans Memorial Circle, Yuba City, CA and on Tuesday, June 28 at 3:30 p.m. and 6:30 p.m. at the Veterans Memorial Hall, 245 Sycamore Street, Gridley, CA. Send written comments by July 8, 2011 (see **ADDRESSES**).

ADDRESSES: Written comments and suggestions concerning the scope and content of the environmental information may be submitted to Mr. Matt Davis, U.S. Army Corps of Engineers, Sacramento District, Attn: Planning Division (CESPK–PD–R), 1325 J Street, Sacramento, CA 95814. Requests to be placed on the mailing list also should be sent to this address.

FOR FURTHER INFORMATION CONTACT: Questions about the proposed actions and environmental review process should be addressed to Matt Davis at (916) 557–6708, *e-mail: Matthew.G.Davis@usace.army.mil* (see **ADDRESSES**).

SUPPLEMENTARY INFORMATION:

1. *Proposed Action. Sutter Basin Feasibility Study.* USACE is conducting a feasibility study to evaluate structural and non-structural flood-risk-management measures, including re-operation of existing reservoirs; improvements to existing levees; construction of new levees; and other storage, conveyance, and non-structural options. The Sutter Basin study area covers approximately 285 square miles and is roughly bounded by the Feather River, Sutter Bypass, Wadsworth Canal, Sutter Buttes, and Cherokee Canal. Flood waters potentially threatening the study area originate from the Feather River watershed and/or the upper Sacramento River watershed, above Colusa Weir. The study area is essentially encircled by project levees and the high ground of Sutter Buttes. Geotechnical analysis and historical performance during past floods indicates the project levees are at risk of failure due to underseepage. The risk of levee failure coupled with the consequence of deep flooding presents a threat to public safety and property. Considering the collective changes to riparian and aquatic ecosystems brought about by agriculture, urbanization, mining, and flood risk management and water supply infrastructure, and the national concern for environmental quality and protection, every opportunity to restore and protect natural resources should be taken whenever changes in the water management system are being contemplated. Ecosystem restoration measures likely would include restoration of floodplain function and habitat. Recreation measures include those outdoor recreation opportunities associated with sustainable water resource development. The feasibility phase of this project is cost-shared 50% Federal, 50% non-Federal with the project sponsors, the State of California CVFPB and the SBFCA. The study will focus on alternatives in the study area that comprise flood risk management, ecosystem restoration, and recreation management measures. As part of the study, an EIS/EIR will be prepared with USACE as the lead agency under NEPA and SBFCA in cooperation with CVFPB as the lead agency under CEQA.

FRWLP. SBFCA is proposing a levee improvement project along the Feather River west levee under the California DWR's Early Implementation Program to expeditiously complete flood-risk reduction measures in advance of the Sutter Basin Feasibility Study. Known as the FRWLP, the project proposes to construct levee improvements between the Thermalito Afterbay and the Feather River/Sutter Bypass confluence. Primary deficiencies of the levee include through-seepage, under-seepage, and embankment instability (*e.g.,* overly steepened slopes). Alternatives considered may include measures such as slurry cutoff walls, seepage berms, stability berms, internal drains, relief wells, sheet-pile walls, slope flattening, and potential new levee alignments. As part of the project, an EIS/EIR is being prepared. USACE has authority under Section 14 of the Rivers and Harbors Act of 1899 (as amended) (33 U.S.C. 408), over alterations to Federal flood control project levees and any such alterations as proposed by SBFCA are subject to approval by USACE. USACE also has authority under Section 404 of the Clean Water Act (33 U.S.C. 1344) over activities involving the discharge of dredged or fill material to waters of the United States, which are known to be in

the project area. Due to these authorities, USACE is acting as the lead agency for the EIS pursuant to NEPA. SBFCA will be acting as the lead agency for the EIR according to CEQA as an agency of the State of California with delegated authority to approve the project.

2. *Alternatives.* The EIS/EIRs will consider several alternatives for reducing flood damage. Alternatives analyzed during the investigation will consist of a combination of one or more measures to reduce the risk of flooding. These measures include installing cutoff walls, and constructing seepage berms.

3. *Scoping Process.*

a. A series of public scoping meetings will be held on June 27 and 28, 2011, to present information to the public and to receive comments from the public on both the feasibility study and the FRWLP. These meetings are intended to initiate the process to involve concerned individuals, and local, state, and Federal agencies.

b. Significant issues to be analyzed in depth in the environmental documents include effects on hydraulics, wetlands and other waters of the U.S., vegetation and wildlife resources, special-status species, aesthetics, cultural resources, recreation, land use, fisheries, water quality, air quality, transportation, and socioeconomics; and cumulative effects of related projects in the study area.

c. USACE is consulting with the State Historic Preservation Officer to comply with the National Historic Preservation Act and with the U.S. Fish and Wildlife Service and National Marine Fisheries Service to comply with the Endangered Species Act. USACE also is coordinating with the U.S. Fish and Wildlife Service to comply with the Fish and Wildlife Coordination Act.

d. A 45-day public review period will be provided for individuals and agencies to review and comment on the draft environmental documents. All interested parties are encouraged to respond to this notice and provide a current address if they wish to be notified of the draft EIS/EIR circulation.

4. *Availability.* The draft EIS/EIR for the FRWLP is scheduled to be available for public review and comment in late 2011. The draft EIS/EIR for the Sutter Basin Feasibility Study is scheduled to be available for public review and comment in mid 2012.

Dated: May 12, 2011.

Andrew B. Kiger,

LTC, EN, Commanding.

[FR Doc. 2011–12510 Filed 5–19–11; 8:45 am]

BILLING CODE 3720–58–P

DEPARTMENT OF DEFENSE

Department of the Army; Corps of Engineers

Notice of Availability of the Final Programmatic Environmental Impact Statement for the Mechanical and Artificial Creation and Maintenance of Emergent Sandbar Habitat in the Riverine Segments of the Upper Missouri River, Missouri River Basin, United States

AGENCY: Department of the Army, U.S. Army Corps of Engineers, DoD.

ACTION: Notice of Availability.

SUMMARY: In accordance with the National Environmental Policy Act of 1969, as amended, the U.S. Army Corps of Engineers intends to file a Final Programmatic Environmental Impact Statement (FPEIS) for the Mechanical and Artificial Creation and Maintenance of Emergent Sandbar Habitat on the Riverine Segments of the Upper Missouri River with the U.S. Environmental Protection Agency. The FEIS is available for final public review. Details on the proposed action, location and areas of environmental concern addressed in the FPEIS are provided below under **SUPPLEMENTARY INFORMATION.**

DATES: The review period will be open 30 days from the date of this notice. The Record of Decision is anticipated to be issued in August, 2011.

ADDRESSES: Written comments should be sent to: Department of the Army; Corps of Engineers, Omaha District; CENWO–PM–AC; ATTN: Emergent Sandbar Habitat Programmatic EIS; 1616 Capitol Avenue; Omaha, NE 68102–4901, or e-mailed to: *Cynthia.s.upah@usace.army.mil.* Comments must be postmarked, e-mailed, or otherwise submitted no later than June 13, 2011. Copies of the FPEIS have been sent to all agencies and individuals who participated in the scoping process or public hearings and to those requesting copies. The FEIS is available online at: *http://www.moriverrecovery.org/mrrp/MRRP_PUB_DEV.download_documentation_peis.* To obtain a copy, please contact Ms. Cynthia Upah.

FOR FURTHER INFORMATION CONTACT: Ms. Cynthia Upah, Project Manager, by telephone: (402) 995–2672, by mail: 1616 Capitol Avenue, Omaha, NE 68102–4901, or by e-mail: *Cynthia.s.upah@usace.army.mil.* For inquires from the media, please contact the USACE Omaha District Public Affairs Officer (PAO), Ms. Monique Farmer by telephone: (402) 995–2416, by mail: 1616 Capitol Avenue, Omaha, NE 68102, or by e-mail: *Monique.l.farmer@usace.army.mil.*

SUPPLEMENTARY INFORMATION: 1. *Background.* The Emergent Sandbar Habitat (ESH) program is being implemented by the U.S. Army Corps of Engineers (Corps) for the benefit of the interior population of the Interior least tern (least tern) and the northern Great Plains piping plover (piping plover). This implementation program resulted from a Biological Opinion (BiOp) issued by the U.S. Fish and Wildlife Service (USFWS) in which the Reasonable and Prudent Alternative (RPA) called for the Corps to provide sufficient ESH acreage in order to meet biological metrics (fledge ratios) to avoid jeopardizing continued existence of the species, as defined by the Endangered Species Act (ESA).

The FPEIS is needed to provide National Environmental Policy Act (NEPA) coverage for the mechanical and artificial construction of ESH in the riverine segments of the Upper Missouri River, pursuant to the 2003 BiOp Amendment RPA IV(b) 3, and to compare impacts among a range of alternatives. The goal is to inform the selection of a preferred alternative that allows for the creation and replacement of sufficient habitat to support tern and plover populations on the Missouri River in a safe, efficient and cost-effective manner that minimizes negative environmental consequences.

Alternatives to the proposed project that are considered in the FPEIS include (1) no action, including existing program activities and no action; (2) and 6 action alternatives of various acreage creation. Environmental issues addressed in the FPEIS include hydrology, water quality, aggradation and degradation, biological resources, air quality, noise and recreation.

After detailed consideration of the environmental and social impacts, and cumulative effects, of the Alternatives, the Corps has identified an Adaptive Management Implementation Process (AMIP) as the preferred alternative, and not one of the specific acreage alternatives. The key aspect of the AMIP is that, rather than selecting a specific acreage alternative and pursuing such construction, actions would be progressively implemented with the focus on monitoring a combination of biological and physical metrics (measurements). Implementation of progressively larger acreage amounts of habitat would continue until the desired biological response is attained and sustained.

Join Us To Learn More About Local Flood Risk Reduction Efforts

Join the U.S. Army Corps of Engineers (USACE) and the Sutter Butte Flood Control Agency (SBFCA) for a public scoping meeting to learn about two proposed flood risk reduction efforts in Sutter and Butte counties. USACE's Sutter Basin Feasibility Study will look at potential improvements throughout the Sutter Basin, while SBFCA's Feather River West Levee Project is proposing to repair 44 miles of the river's west levee.

The public is encouraged to attend these meetings to comment on the scope of the proposed projects and the preparation of related environmental documents.

Meeting Dates & Times

June 27 at 3:30 p.m. and 6:30 p.m.
Veterans Memorial Community Building
1425 Veterans Memorial Circle, Yuba City

June 28 at 3:30 p.m. and 6:30 p.m.
Gridley Veterans Memorial Hall
249 Sycamore Street, Gridley

A presentation will begin 30 minutes after the start of each meeting. The same information will be presented at each meeting.

If you have questions or need special assistance or accommodations at a meeting, call 916-231-9618 at least 72 hours in advance of the meeting you plan to attend.

US Army Corps of Engineers.
Sacramento District

Sutter Butte Flood Control Agency

Department of Water Resources
State of California

www.sutterbutteflood.org • www.spk.usace.army.mil

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Gridley Veterans Memorial Hall
249 Sycamore Street, Gridley

A presentation will begin 30 minutes after the start of each meeting. The same information will be presented at each meeting.

If you have questions or need special assistance or accommodations at a meeting, call 916-231-9618 at least 72 hours in advance of the meeting you plan to attend.

US Army Corps of Engineers.
Sacramento District

www.sutterbutteflood.org • www.spk.usace.army.mil

FOR IMMEDIATE RELEASE
CONTACT: INGRID NORGAARD
EMAIL: inorgaard@icfi.com
PHONE: 916-737-3000

Agencies Hosting Public Meetings Related to Proposed Flood Improvements in Sutter and Butte Counties

The public is invited to attend to provide input on environmental process

Yuba City, June 22, 2011—The U.S. Army Corps of Engineers' (USACE) Sacramento District and the Sutter Butte Flood Control Agency (SBFCA) will hold four public scoping meetings on June 27 and 28 to provide the public an opportunity to comment on proposed regional flood risk management projects.

The purpose of the USACE's Sutter Basin Project is to address flood risk management, ecosystem restoration, and recreation issues in the Sutter Basin study area. The project is currently in the feasibility study phase. The study area covers approximately 285 square miles and is roughly bounded by the Feather River, Sutter Bypass, Wadsworth Canal, Sutter Buttes and Cherokee Canal.

SBFCA is planning the Feather River West Levee Project (FRWLP) to address levee deficiencies found along 44 miles of the west levee of the Feather River from the Thermalito Afterbay south to the Sutter Bypass. The west levee provides flood risk management benefits to the cities of Yuba City, Gridley, Live Oak, and Biggs and portions of unincorporated areas of Butte and Sutter counties. Measures are being evaluated to meet Federal, state, and local flood protection criteria and goals.

The Sutter Basin Project and FRWLP are being studied in close coordination because of related study areas, purpose, potential measures and potential effects. It is anticipated that two separate environmental impact statements/environmental impact reports (EIS/EIR) will be developed—one for the Sutter Basin Project and one for FRWLP. The public release of the draft EIS/EIR to evaluate FRWLP is scheduled for early 2012. The release of the Sutter Basin Project's draft EIS/EIR has yet to be determined. The California Department of Water Resources and Central Valley Flood Protection Board are also involved in these two efforts.

Combined and coordinated scoping for the two efforts is being conducted to ensure an efficient process for interested stakeholders. Public input will be solicited about the content of the environmental documents. Please join us at one of four scoping meetings to provide input.

City of Yuba City
June 27 at 3:30 p.m. *and* 6:30 p.m.
Veteran's Memorial Community Bldg.
1425 Veterans Memorial Circle,
Yuba City

City of Gridley
June 28 at 3:30 p.m. *and* 6:30 p.m.
Gridley Veteran's Memorial Hall
249 Sycamore Street, Gridley

-MORE-

A presentation will be given 30 minutes after each meeting begins. The content of all four meetings will be the same. For questions about the meetings or to make special accommodations for attendees, contact Ms. Norgaard at 916-737-3000 or via email at inorgaard@icfi.com.

Learn more about the Sutter Basin Project at www.spk.usace.army.mil and about the FRWLP at www.sutterbutteflood.org.

###

Attachment B

- Display boards
- Power Point presentation
- Fact sheet
- Comment card templates

Station 2 - Overview, Purpose, and Objectives 110x13

2A
About the SBP
36x18

2B
SBP Study Area MAP
36x24

2C
SBP Timeline
36x18

2D
Inside Look at a Levee
30x24

2E
Typical Levee Deficiencies
30x24

2F
About the FRWLP
36x18

2G
FRWLP Study Area MAP
36x24

2H
FRWLP Timeline & Funding
36x18

Station 3 - Potential Measures 110x13

3A
Slurry Wall
25x20

3B
Stability Berm
25x20

3C
Seepage Berm
25x20

3D
Relief Well
25x20

3E
Sheet-Pile Wall
25x20

3F
Slope Flattening
25x20

3G
Internal Drain
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3H
New/Relocated Levee
25x20

3I
Re-Operation
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3J
Non-Structural
25x20

3K
Ecosystem Restoration
25x20

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25x20

Station 4 - Environmental Process 110x13

4A
About NEPA/CEQA
24x32

4B
Scoping
24x32

4C
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24x32

4D
Regulatory Compliance
24x32

4E
SBP Photo
52x32

4F
FRWLP Photo
52x32

Welcome to the Sutter Basin Project & Feather River West Levee Project

Environmental Scoping Meeting

US Army Corps of Engineers®
Sacramento District

Overview, Purpose, and Objectives

About the Sutter Basin Project

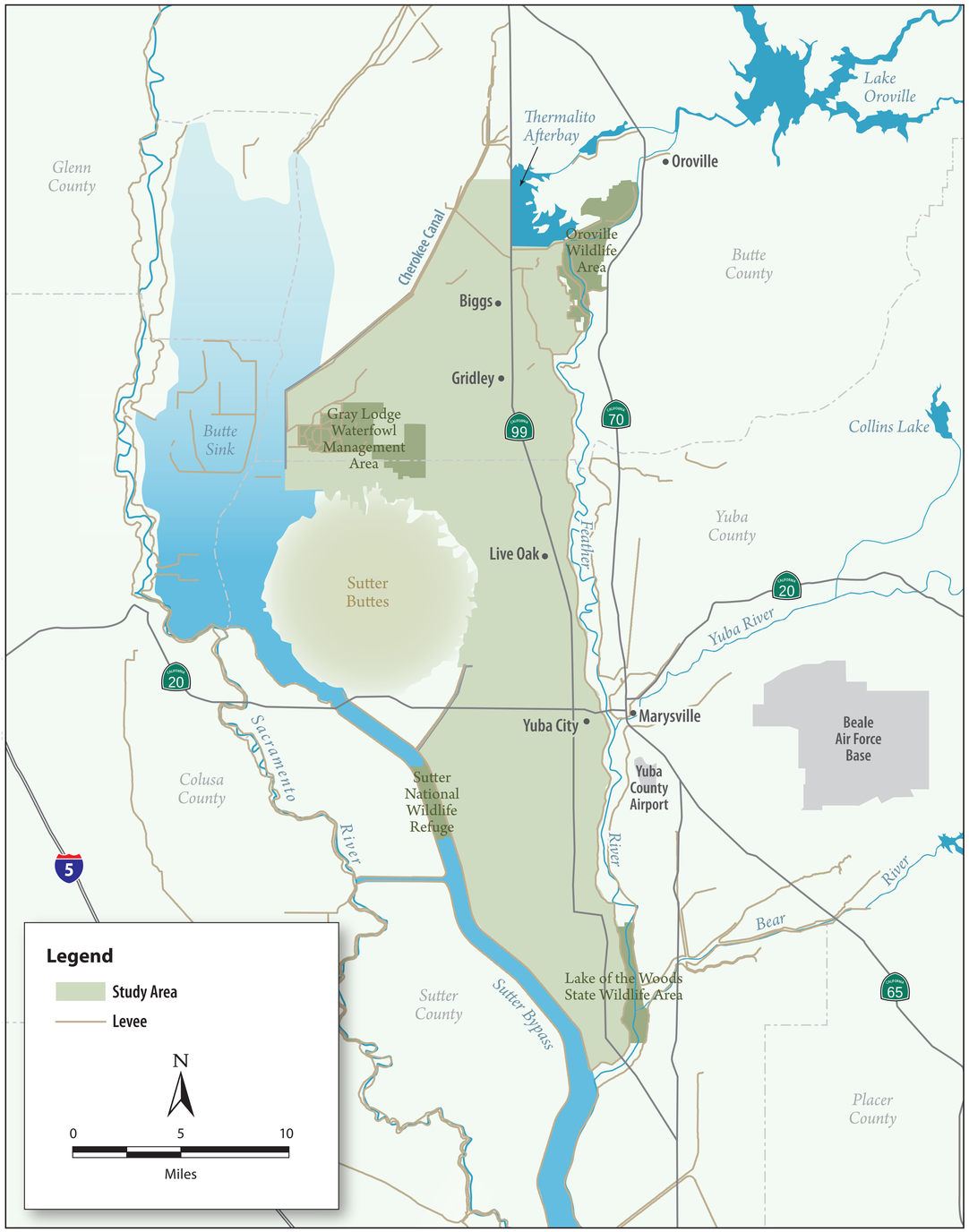
In 2000, the State of California and USACE entered into a cost-sharing agreement to initiate a feasibility study within the Sutter Basin. An amendment of the cost-sharing agreement was signed in July 2010 to include SBFCA as a non-Federal sponsor. The purpose of the feasibility study is to address flood risk management, ecosystem restoration, and recreation issues in the study area.

The Sutter Basin Project feasibility study evaluates approximately 285 square miles that are roughly bounded by the Feather River, Sutter Bypass, Wadsworth Canal, Sutter Buttes, and Cherokee Canal. The study area is essentially encircled by project levees and the high ground of the Sutter Buttes. Past flood events and geotechnical analysis show these levees 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.

As part of the Sutter Basin Project feasibility study, USACE is evaluating a variety of flood risk management measures that could include re-operation of reservoirs; improvements to existing levees; construction of new levees; other storage, conveyance, and non-structural options; and measures that could potentially restore the ecosystem within the study area and develop or expand recreation facilities.

This study will be the basis for a recommendation to Congress to address water resources and related issues within the study area.

Sutter Basin Project Area

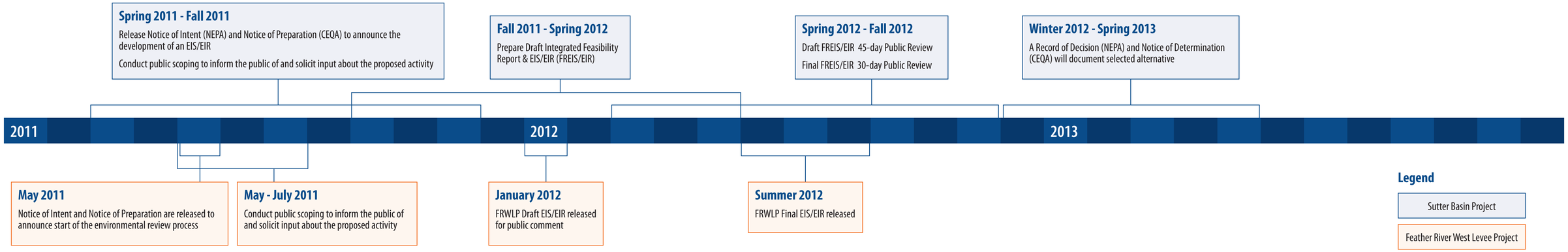


Sutter Basin Project Funding and Timeline

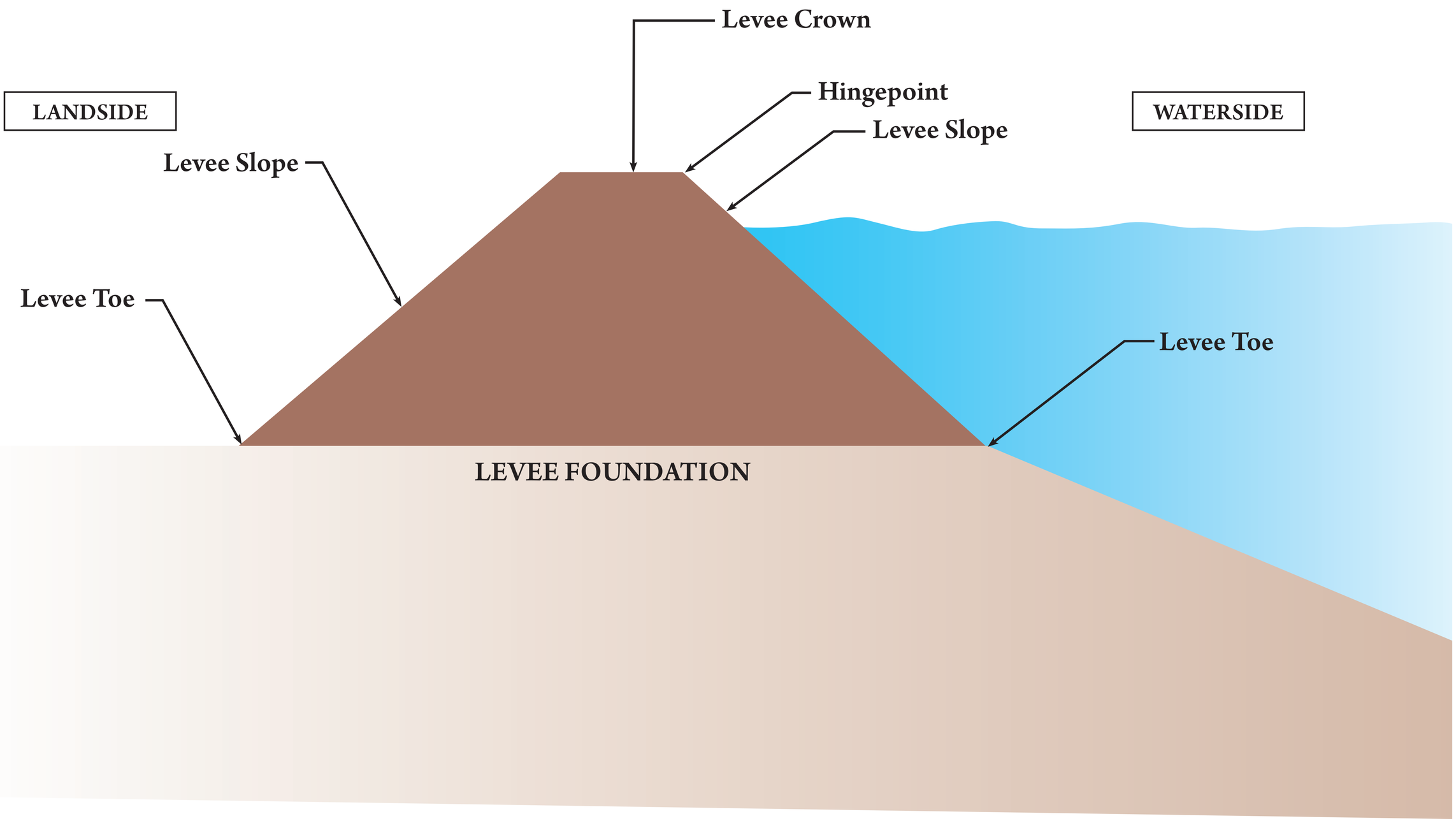
Funding

The feasibility study phase of this project is cost-shared; USACE will fund 50% and SBFCA and the State of California will fund the remaining 50% of the project.

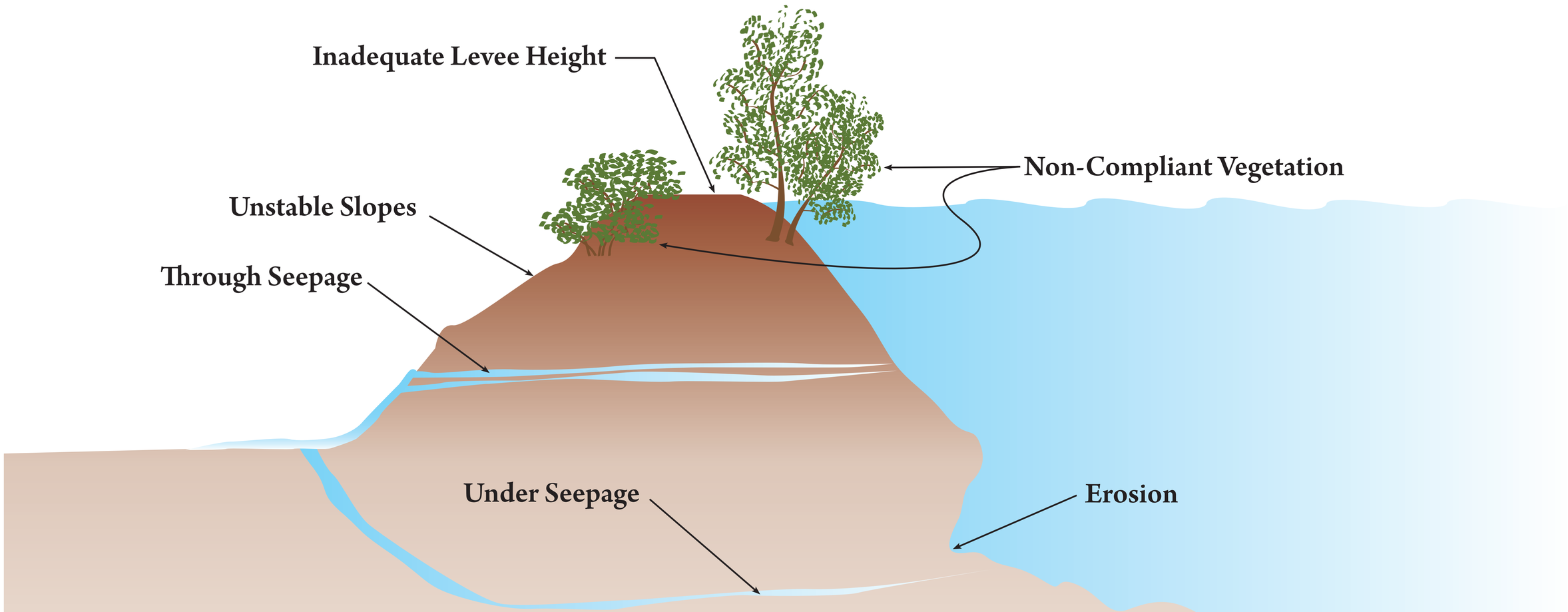
Timeline



An "Inside" Look at a Levee



Typical Levee Deficiencies



- **Unstable Slopes - irregular or overly steep slopes compromise the levee structure**
- **Inadequate levee height - levee height may be too low relative to predicted water levels**
- **Non-Compliant Vegetation - can lead to levee instability and hinder levee monitoring and maintenance**
- **Erosion - water flow, wakes and waves, remove soil material, damaging the levee**
- **Seepage**

2E - Levee Deficiencies.indd 1 6/21/11 2:13 PM

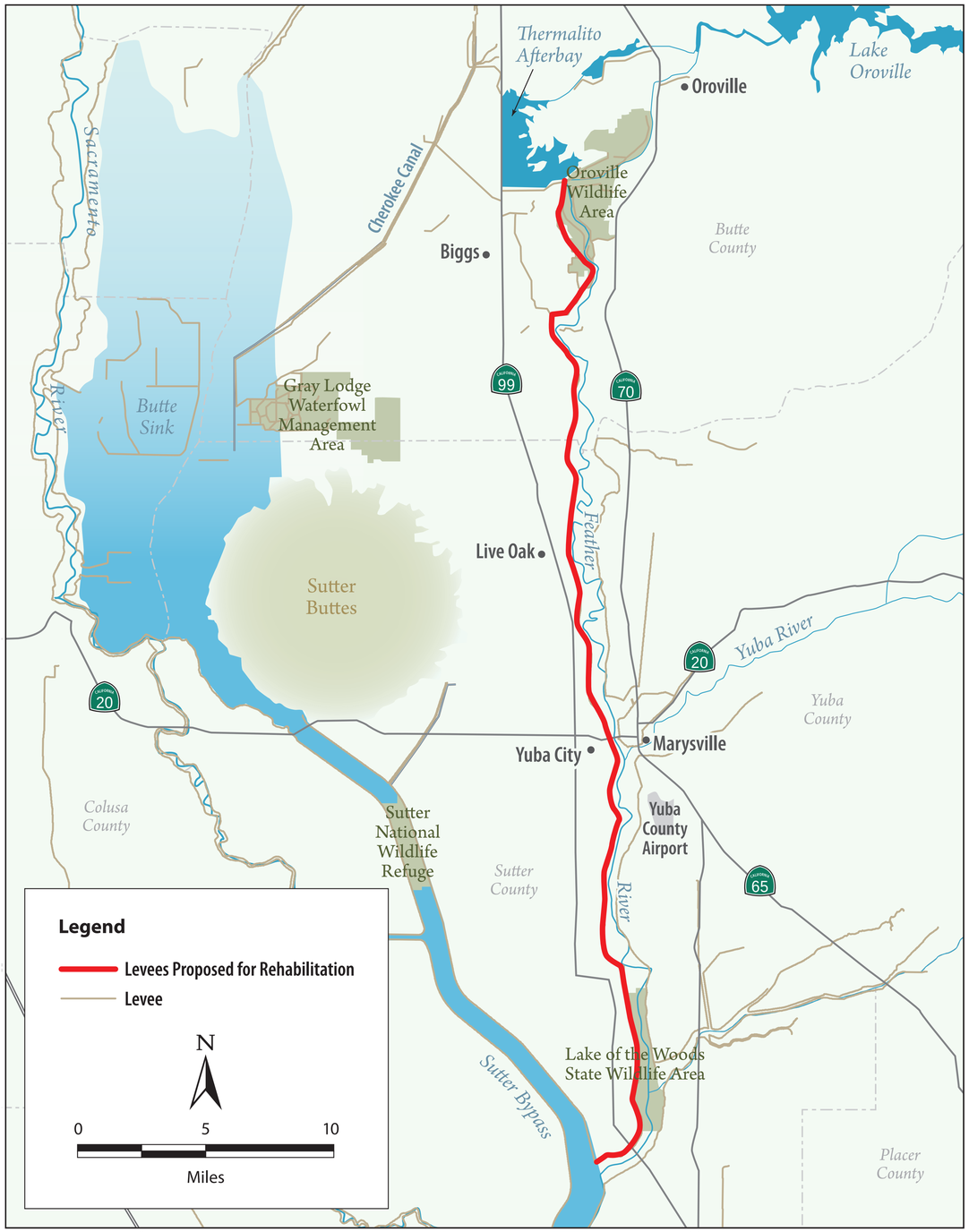
About the Feather River West Levee Project

Communities in both Butte and Sutter Counties have an unfortunate historical knowledge of devastating flood events within the region. Sutter Butte Flood Control Agency (SBFCA) is planning the Feather River West Levee Project (FRWLP) to address levee deficiencies found along 44 miles of the west levee of the Feather River from the Thermalito Afterbay south to the Sutter Bypass. Measures are being evaluated to meet Federal, state, and local flood protection criteria and goals. The FRWLP is expected to:

- Increase public safety by providing 200-year flood protection from Yuba City north to the Thermalito Afterbay, and the appropriate level of flood protection south of Yuba City (in conjunction with repairs to the Sutter Bypass, which are the responsibility of the state).
- Save property owners millions of dollars annually in flood insurance costs by delaying, preventing, or cutting short FEMA floodplain mapping.
- Allow cities and counties to implement general plans, which will soon be restricted for any urban or urbanizing community without 200-year flood protection. This would not apply to areas with fewer than 10,000 residents.
- Sustain and grow the local economy by creating construction jobs, protecting property values, and allowing for responsible development.

2F - About FRWLP.indd 1 6/22/11 12:46 PM

Feather River West Levee Project Area



2G - FRWLP Study Area.indd 1 6/21/11 2:16 PM

Feather River West Levee Project Funding and Timeline

Funding

The FRWLP is estimated at $250 million for construction. A local assessment district enacted in 2010 will pay 29% of the project cost and the State of California is expected to pay the remaining share.

Timeline

Environmental specialists are currently analyzing the effects the FRWLP could have if implemented, to comply with the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA). This analysis will help engineers finalize the project design, and request Federal and state permits. The goal is to construct the FRWLP as quickly as possible in advance of and compatible with the Sutter Basin Project, potentially beginning construction in 2013.

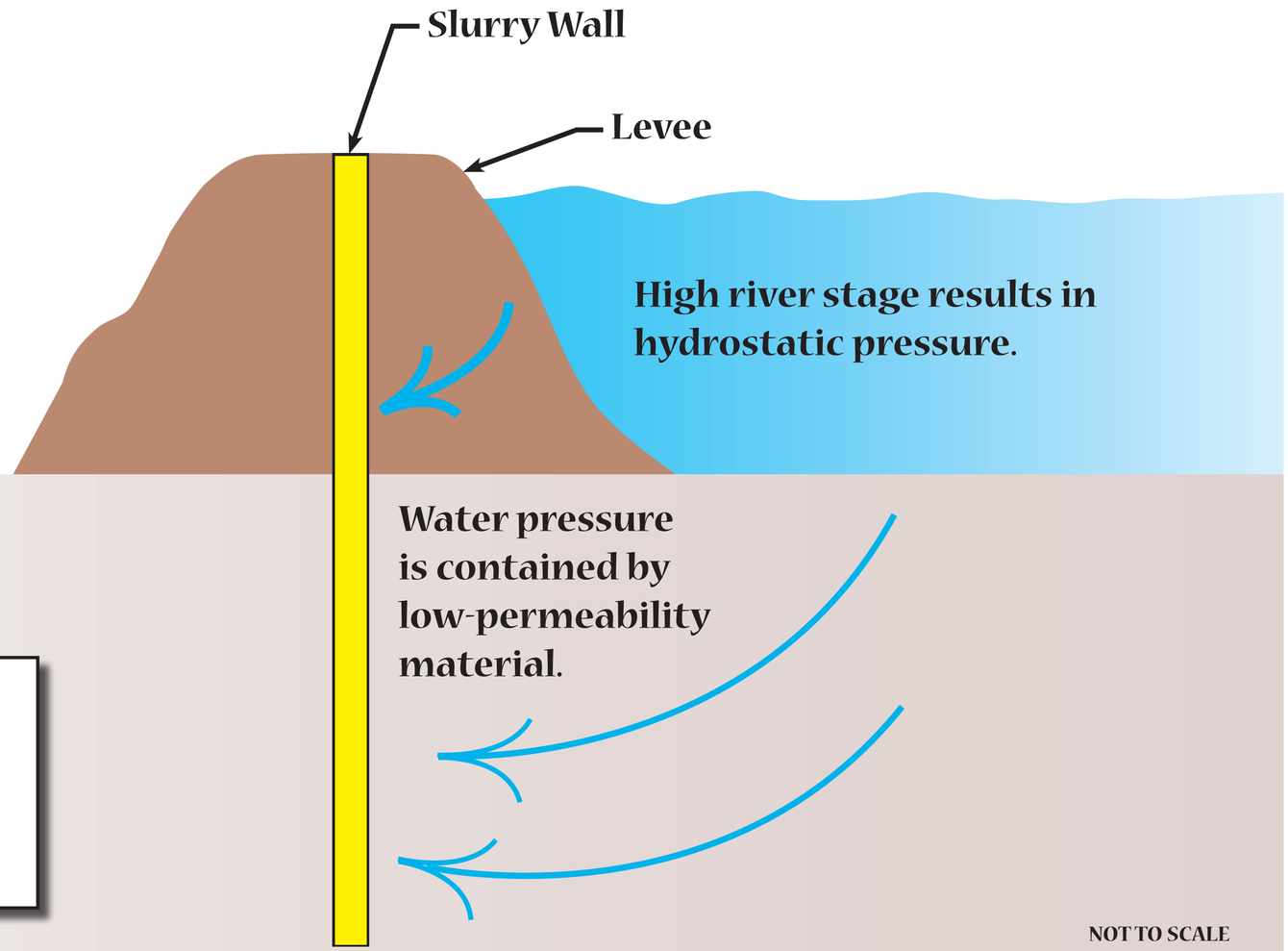


2H - Funding and Timeline.indd 1 6/22/11 1:24 PM

Potential Measures

Slurry Cut-off Wall

Concept:
Water-seepage and through-seepage
are controlled by a low-permeability wall
constructed within the levee cross section.

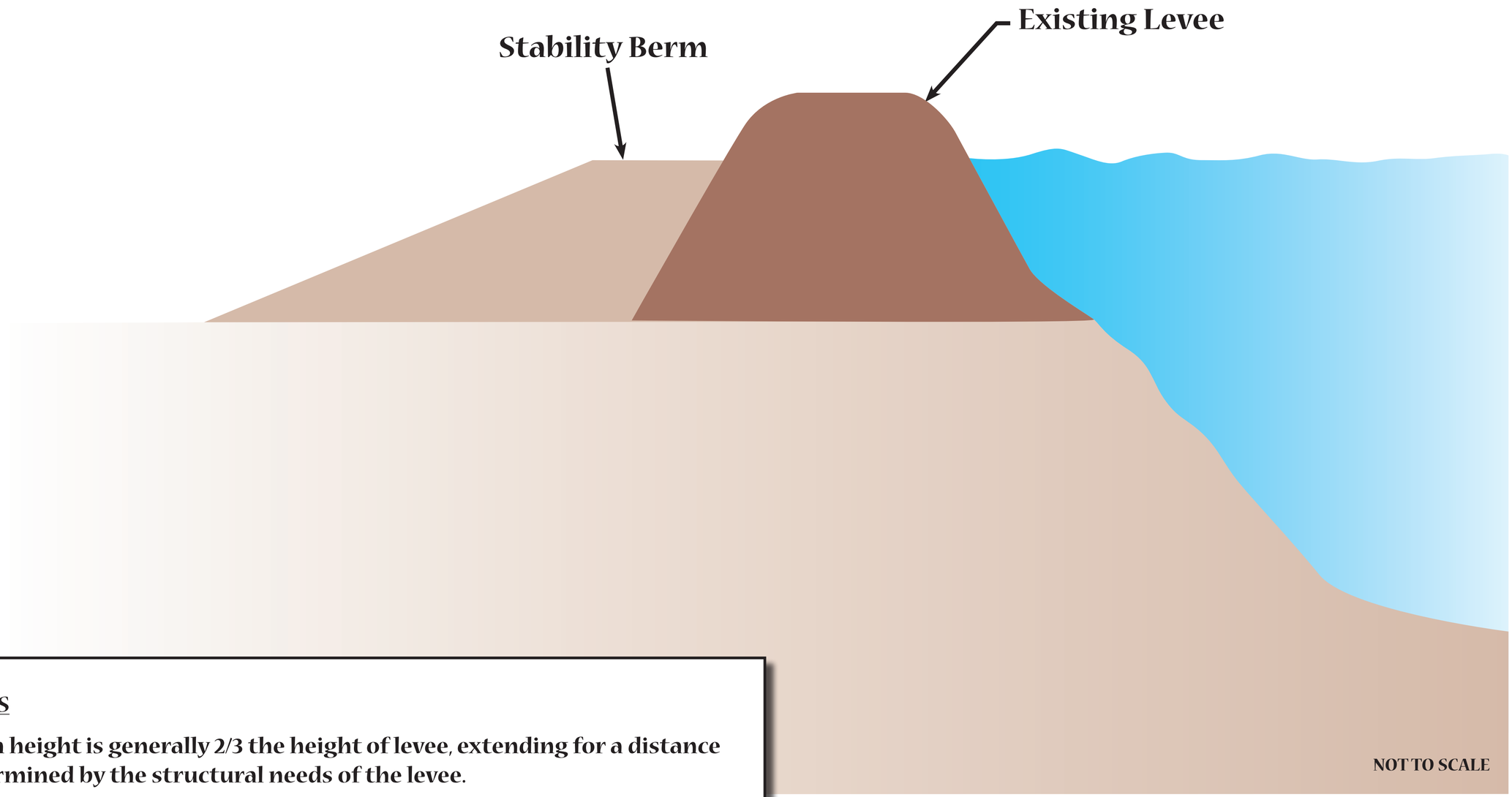


DETAILS

- Constructed via traditional slot trench, deep soil mix method, or jet grouting.
- Wall is approximately 3 ft wide and up to 140 ft deep.

Stability Berm

Concept:
Provides additional support to levee
to increase strength.



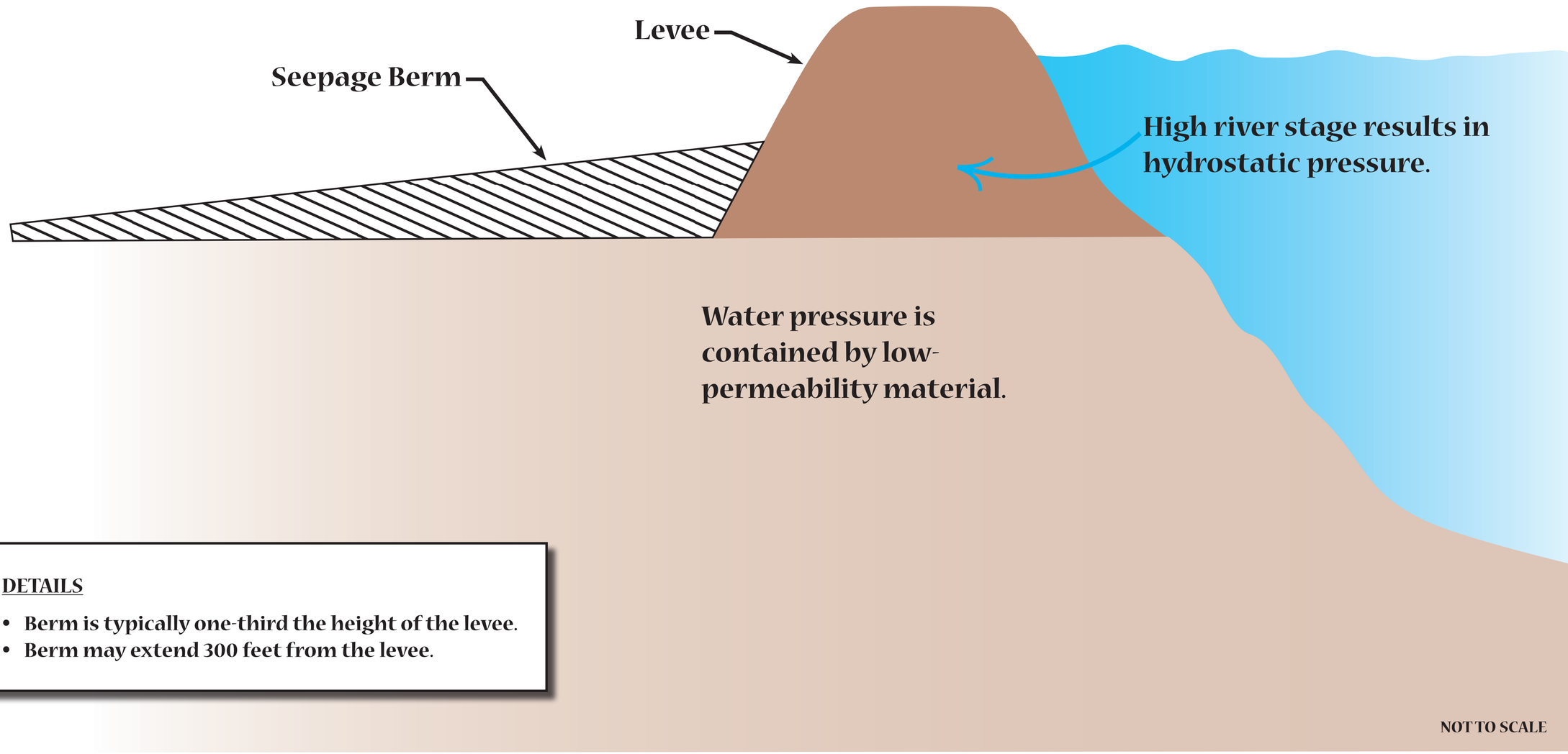
DETAILS

- **Berm height is generally 2/3 the height of levee, extending for a distance determined by the structural needs of the levee.**

3B - Stability Berm.indd 1 6/21/11 2:17 PM

Seepage Berm

Concept:
Water pressure is contained and dispersed by a thickened soil layer.

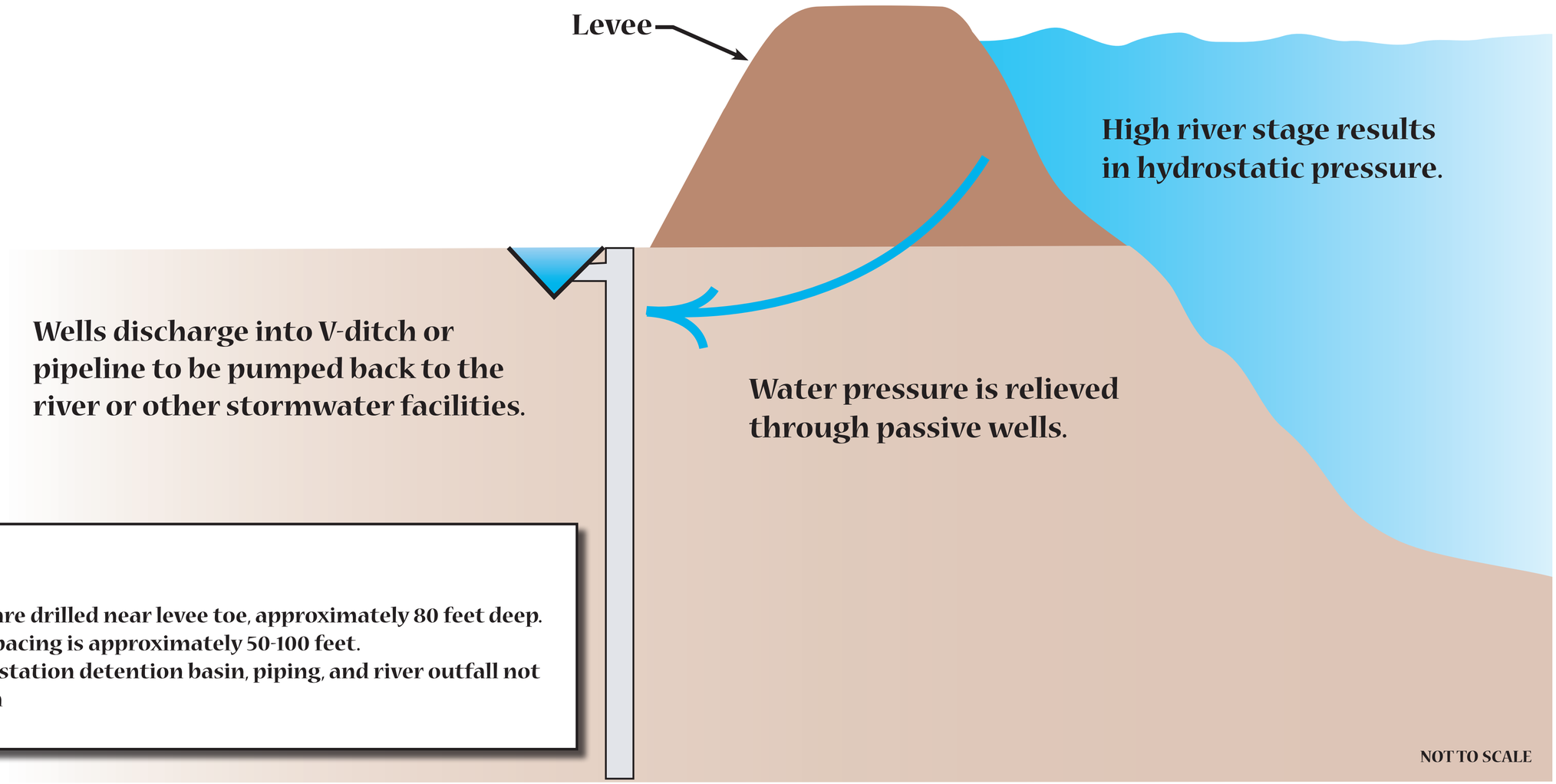


DETAILS

- Berm is typically one-third the height of the levee.
- Berm may extend 300 feet from the levee.

Relief Well

Concept:
Water pressure is relieved via passive wells, which direct water discharge into a collection system.

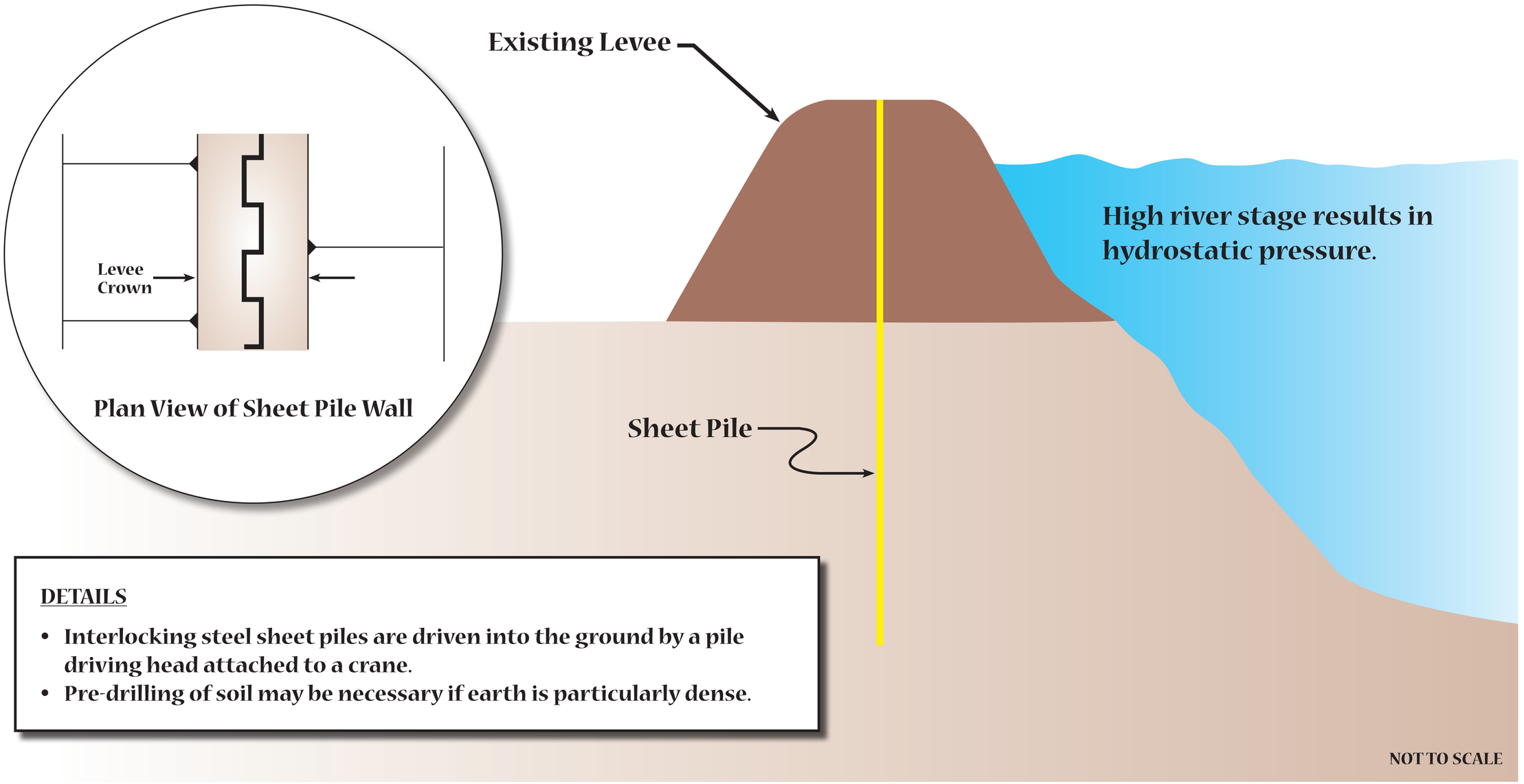


DETAILS

- Wells are drilled near levee toe, approximately 80 feet deep.
- Well spacing is approximately 50-100 feet.
- Pump station detention basin, piping, and river outfall not shown

Sheet Pile Wall

Concept:
Steel panels are driven into the levee core to provide a seepage barrier.

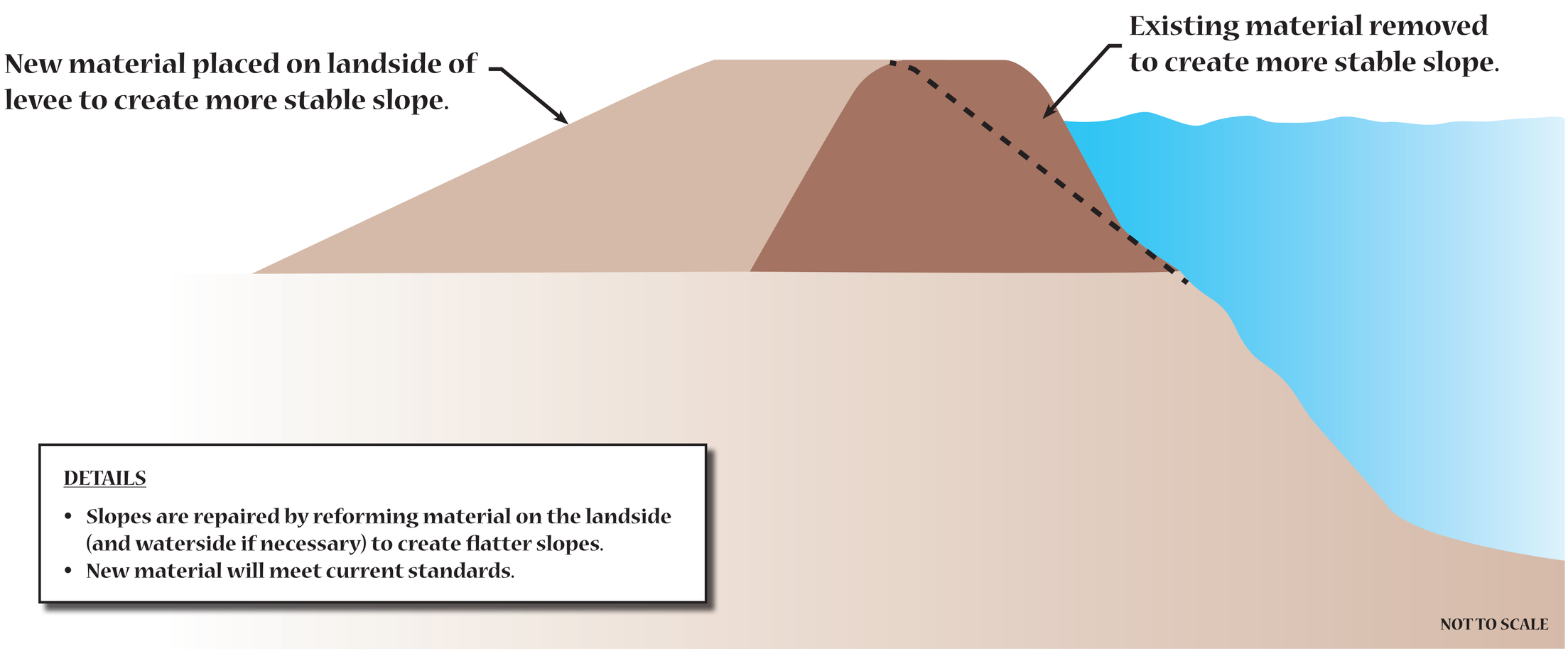


DETAILS

- 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 dense.

Slope Flattening

Concept:
Flatter slopes are more stable and
less susceptible to erosion.



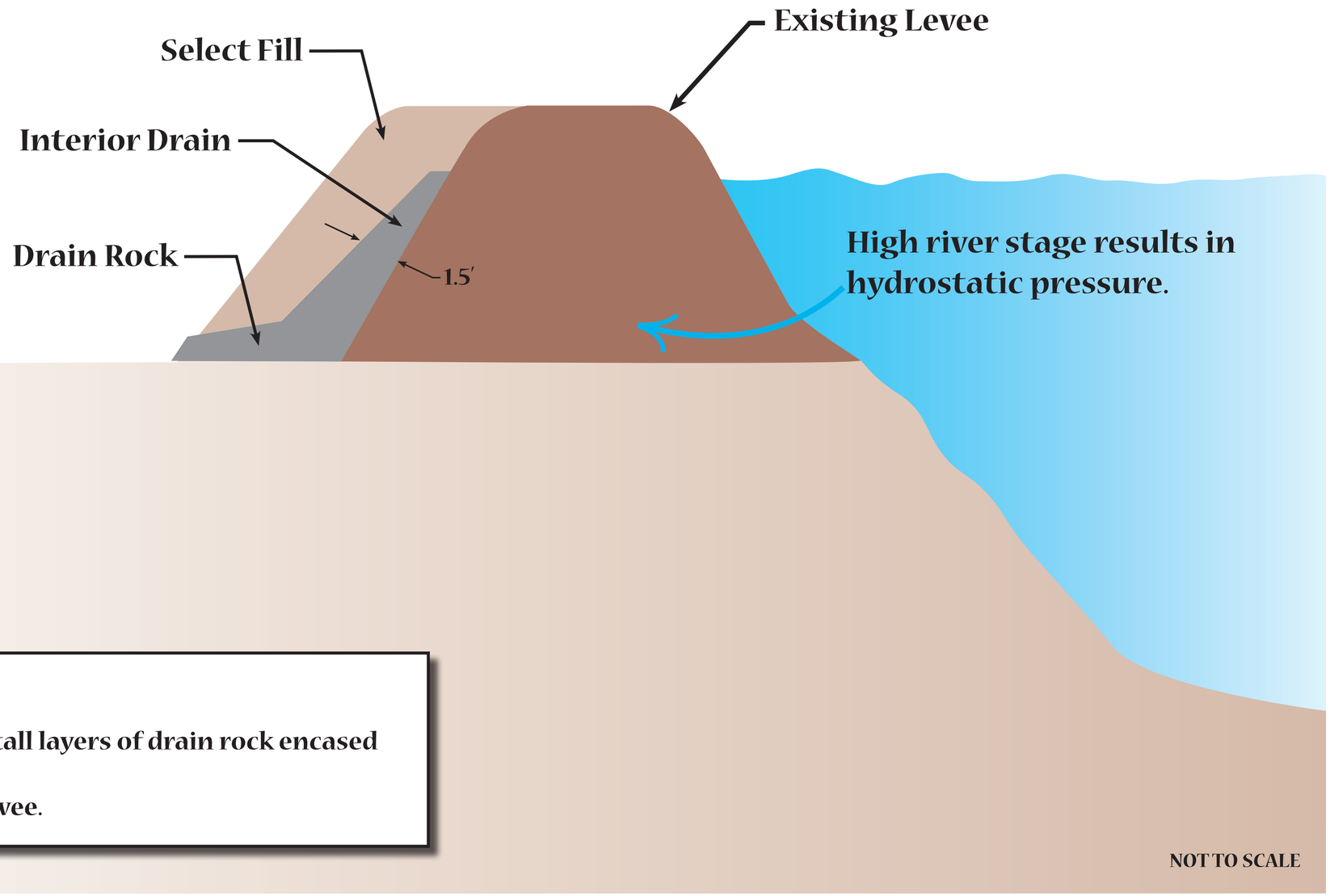
DETAILS

- Slopes are repaired by reforming material on the landside (and waterside if necessary) to create flatter slopes.
- New material will meet current standards.

3F - Slope Flattening.indd 1 6/21/11 2:19 PM

Internal Drain

Concept:
Capture any through-seepage and
direct it away from the face of the levee.

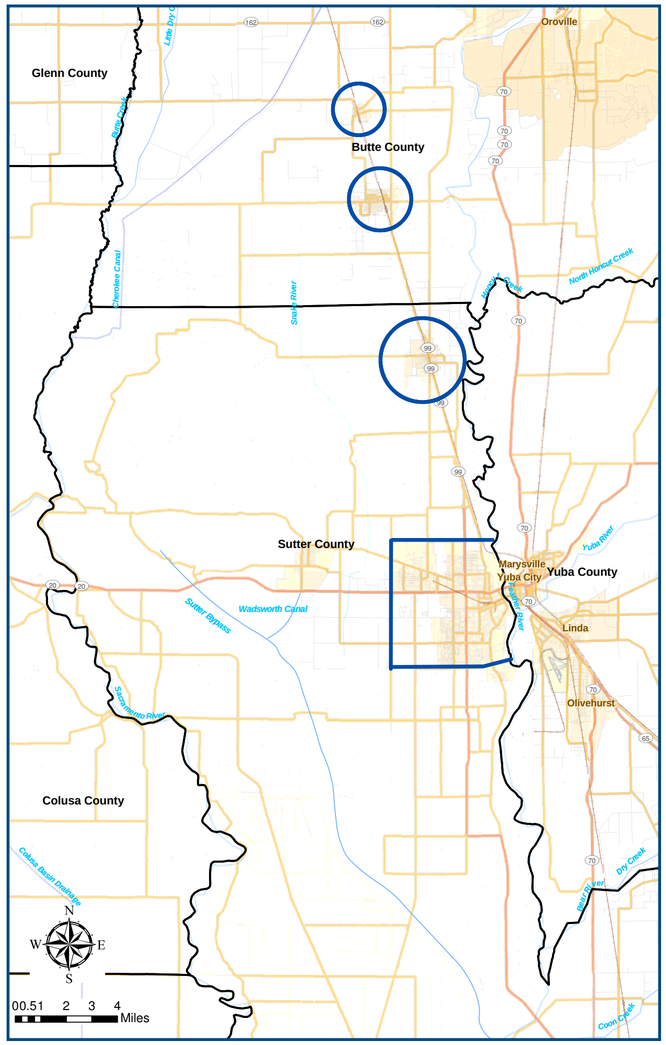


DETAILS

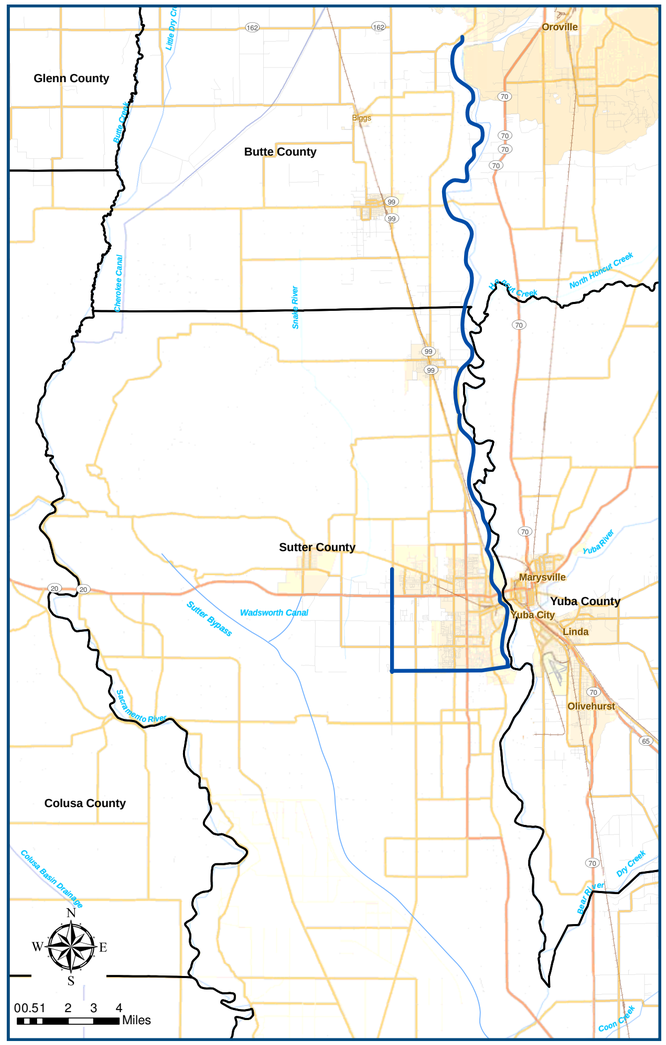
- Levee is partially excavated to install layers of drain rock encased in filter sand.
- Placed on the landside 1/3 of the levee.

New Levee Location

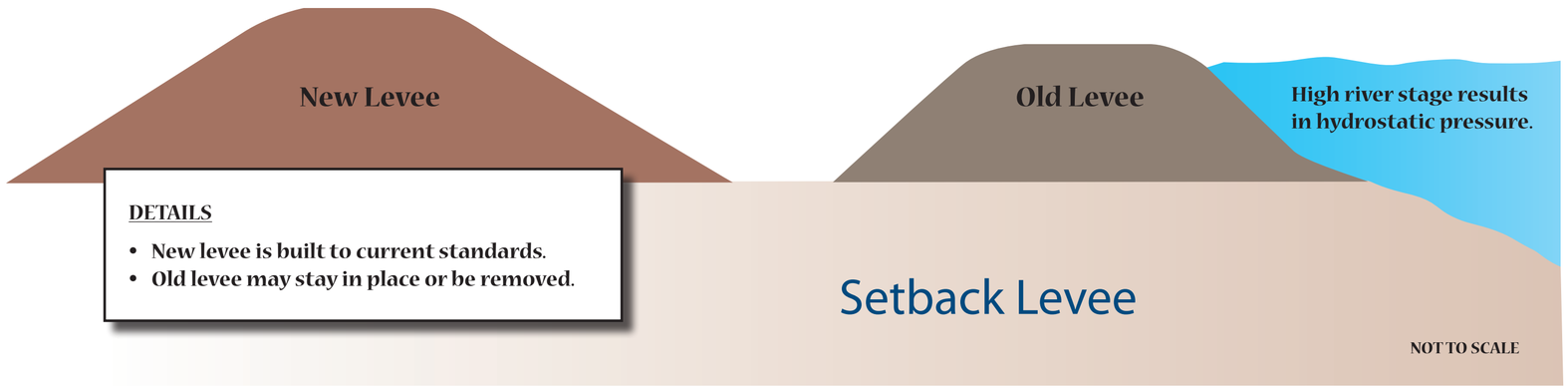
Concept:
A new levee is built where the existing levee is not readily repairable or where a change in the floodplain is an option (such as setback levees, ring levees, J-levees or similar concepts).



Ring Levees



J-Levees



Reservoir Reoperation Flood Risk Management

Reduce flood risk by improving a reservoir's ability to store peak flood flows through a variety of operational or physical modifications.

Examples:

- Reallocate storage for flood risk management purposes.
- Utilize flood forecast based operations to release storage in anticipation of a flood event.

3I - Re-operation of Reservoirs.indd 1 6/22/11 12:08 PM

Non-Structural Flood Risk Management

Non-structural measures reduce flood risk without significantly altering the nature or extent of the flooding. They do this by changing the use made of the floodplains, or by accommodating existing uses to the flood hazard.

Examples:

- Flood proofing
- Relocation of structures
- Flood warning/preparedness systems
- Regulation of floodplain uses

Ecosystem Restoration

Existing levees have isolated the floodplains from waterways, thereby eliminating significant floodplain habitats for native species, including Federally-listed species and other special-status species. There is potential to restore these areas in conjunction with flood risk management measures.

Examples:

- Realign levees to restore floodplains and river function
- Establish riparian/wetland habitat in conjunction with detention basins and other storage facilities
- Modify water inflow to select ponds to restore fish production and riparian/wetland habitats
- Convert nonnative habitats to native riparian/wetland habitats
- Eradicate exotic invasive plant species and establish native habitat

Recreation

An opportunity exists to create or enhance recreation features consistent with flood damage reduction and ecosystem restoration project features.

Examples:

- Multi-purpose paved trail on levee crown with access points, highway under crossings, public safety facilities, and appropriate signage
- Provide wildlife viewing platforms
- Picnic areas with associated parking and facilities
- Provide increased river access points

3L - Restoration and Recreation.indd 1 6/22/11 12:09 PM

Environmental Process

About NEPA & CEQA

It is anticipated the Sutter Basin Project and FRWLP will result in two separate environmental impact statements/ environmental impact reports (EIS/EIR)—one for each project. Both documents will disclose an activity's potential alternatives, potential effects, and proposed mitigation measures in compliance with the National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA), respectively.

A joint EIS/EIR is prepared when there is both a Federal and state agency interest in an activity, and/or when a state agency needs permission to perform an action under Federal jurisdiction. The development of the draft joint EIS/EIR to evaluate the FRWLP is underway and scheduled for release in early 2012. The release date of USACE's draft joint EIS/EIR for the Sutter Basin Project has yet to be determined.

Scoping and Other Public Engagement

Scoping is a process used to inform the public of a proposed activity and provide an opportunity to give comment, insight, and local information related to the range of alternatives, environmental effects, and/or issues of concern related to the proposed activity.

Because the agencies are working to create two joint, albeit separate, environmental documents for these two projects, a joint scoping period is also being held. During the scoping process public input will be solicited about the scope of the environmental documents and the agencies will communicate with the public about the two efforts.

Scoping is particularly informative in a flood risk management project because the citizens of the effected community could have insight into the performance of a levee that the agencies are unaware of (think locations of under-seepage or boils or areas of general poor levee performance).

The comments received from public scoping will be used to inform development of the alternatives; defining the environment and resources potentially affected by the alternatives; and analysis of effects resulting from the alternatives. The affected environment broadly includes physical, biological, and social topic areas. Effects are identified and analyzed both for project construction and long-term operations and maintenance.

Potential Environmental Issues

The effect of a proposed activity on natural and built resources will be evaluated in the environmental documents for the Sutter Basin Project and the FRWLP. Resources analyzed in the EIS/EIRs will include, but are not limited to:

- Transportation and Navigation
- Vegetation and Wetlands
- Socioeconomics and Environmental Justice
- Wildlife
- Fisheries and Aquatics
- Cultural Resources
- Air Quality, GHG and Climate Change
- Public Health and Environmental Hazards
- Land Use and Agriculture

Other Regulatory Compliance

USACE and SBFCA will need to comply with several regulations to complete the environmental process. Those could include:

Section 404: Establishes regulation of discharges of pollutants

- USACE grants 404 permits. The compliance mechanism is an Individual Permit, including 404(b)(1) alternatives analysis to identify least environmentally damaging practicable alternative (LEDPA)

Section 401: Requires certification that the project will not adversely affect water quality

- Administered by State of California through the Regional Water Quality Control Board

Rivers and Harbors Act

- Section 14 of the Rivers and Harbors Act requires permission from USACE for alterations to Federal flood control projects
    - More commonly referred to as Section 408

Endangered Species Act

- Purpose is to protect species and the ecosystems upon which they depend
- Administered by two Federal agencies: NMFS and USFWS
- Section 7 requires Federal agencies to ensure any action authorized, funded, or carried out is not likely to jeopardize the continued existence of a listed species or modify their habitat
- If a listed species may be present, the agency must conduct a biological assessment (BA)
    - Analyzes the potential effects of the project on listed species and critical habitat
- NMFS/USFWS then determines a need for a biological opinion (BO) or letter of concurrence

National Historic Preservation Act

- Section 106: Requires consideration of resources eligible or potentially eligible for the National Register of Historic Places
    - Administered by California State Historic Preservation Officer (SHPO)

Fish and Game Code

- Section 1600 et seq.: Work on the waterside of the levee will require Streambed Alteration Agreement
- Section 2050 et seq.: Potential effects on listed species will require demonstration that effects have been fully mitigated or incidental take permit





Thank you for your interest in these two public safety projects. Please provide us with your input on the scope of the projects and the environmental analysis here.

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Sacramento District

5A - Comments.indd 1 6/22/11 5:44 AM

Welcome to the

SUTTER BASIN PROJECT FEASIBILITY STUDY
&
FEATHER RIVER WEST LEVEE PROJECT

PUBLIC SCOPING MEETING

JUNE 27 & 28, 2011

US Army Corps
of Engineers
Sacramento District

Presentation Outline

1. Coordinated Flood Management Efforts
2. How Did We Get Here?
3. A Closer Look at Each Project
4. The Environmental Process

US Army Corps of Engineers
Sacramento District

Coordinated Flood Management Efforts

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Sacramento District

Sutter Basin Project Feasibility Study

- Led by U.S. Army Corps of Engineers (USACE)
- Initiated in 2001
- Purpose is to evaluate a Federal interest in flood risk management, ecosystem restoration, and recreation projects in study area
- Coordinating with Sutter Butte Flood Control Agency (SBFCA), Central Valley Flood Protection Board (CVFPB), and California Department of Water Resources (DWR)

US Army Corps of Engineers
Sacramento District

FEATHER RIVER WEST LEVEE PROJECT (FRWLP)

- Led by local agency SBFCA
- Initiated upon approval of annual property assessment in 2010
- Purpose is to address levee deficiencies in the Feather River's west levee from Thermalito Afterbay to Sutter Bypass
- Construction start targeted for 2013
- SBFCA is coordinating with USACE, CVFPB, and DWR

US Army Corps of Engineers
Sacramento District

A Joint Approach

- Studied in coordination due to similar study areas, purpose, potential improvements, effects, and parties involved
- Separate but coordinated EIS/EIRs will be developed for each project
- USACE is NEPA lead and SBFCA is CEQA lead agency for environmental process, jointly coordinating with CVFPB and DWR

US Army Corps of Engineers
Sacramento District

How Did We Get Here?

US Army Corps of Engineers
Sacramento District

A Brief Local History

- Before 1850, the Feather and Sacramento Rivers overflowed their banks in high-water periods every few years
- Sediment from hydraulic mining in the mid-1800s caused river beds to rise
- Levees were consequently privately constructed in late 1800s and early 1900s to combat primarily overtopping
- Levees were improved and incorporated under the Sacramento River Flood Control Project by USACE in early 1900s

US Army Corps of Engineers
Sacramento District

A Brief Local History (cont.)

- Oroville Dam and Reservoir were completed in 1967, adding substantial flood storage
- New Bullards Bar Dam and Reservoir completed in 1970, adding substantial flood storage
- Flood risk is still present, with major events
- In 1955, breach on Feather River near Shanghai Bend (38 people killed)
- In 1986, break on Yuba River and slump on Sutter Bypass
- In 1997, breaches on Feather River and Sutter Bypass

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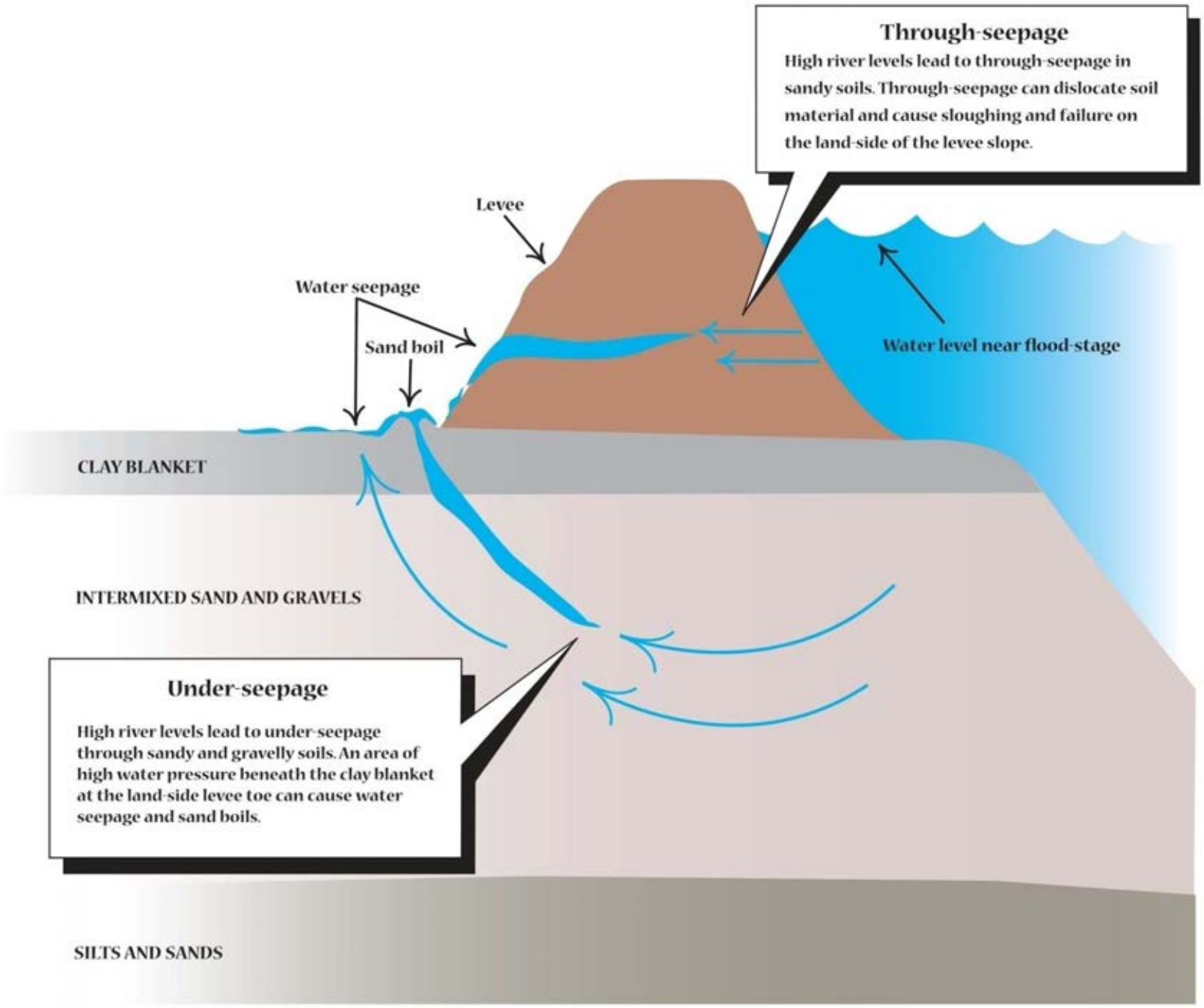
Sacramento District

Recent Flood Management Efforts

- Levee evaluation studies by USACE, DWR, and SBFCA have documented deficiencies in the system
- In 2010, property owners of Sutter and Butte Counties approved the formation of an assessment district to provide local funds for flood risk management

US Army Corps of Engineers
Sacramento District


Through-seepage
High river levels lead to through-seepage in sandy soils. Through-seepage can dislocate soil material and cause sloughing and failure on the land-side of the levee slope.
Levee
Water seepage
Sand boil
Water level near flood-stage
CLAY BLANKET
INTERMIXED SAND AND GRAVELS
Under-seepage
High river levels lead to under-seepage through sandy and gravelly soils. An area of high water pressure beneath the clay blanket at the land-side levee toe can cause water seepage and sand boils.
SILTS AND SANDS

A Closer Look at Each Project

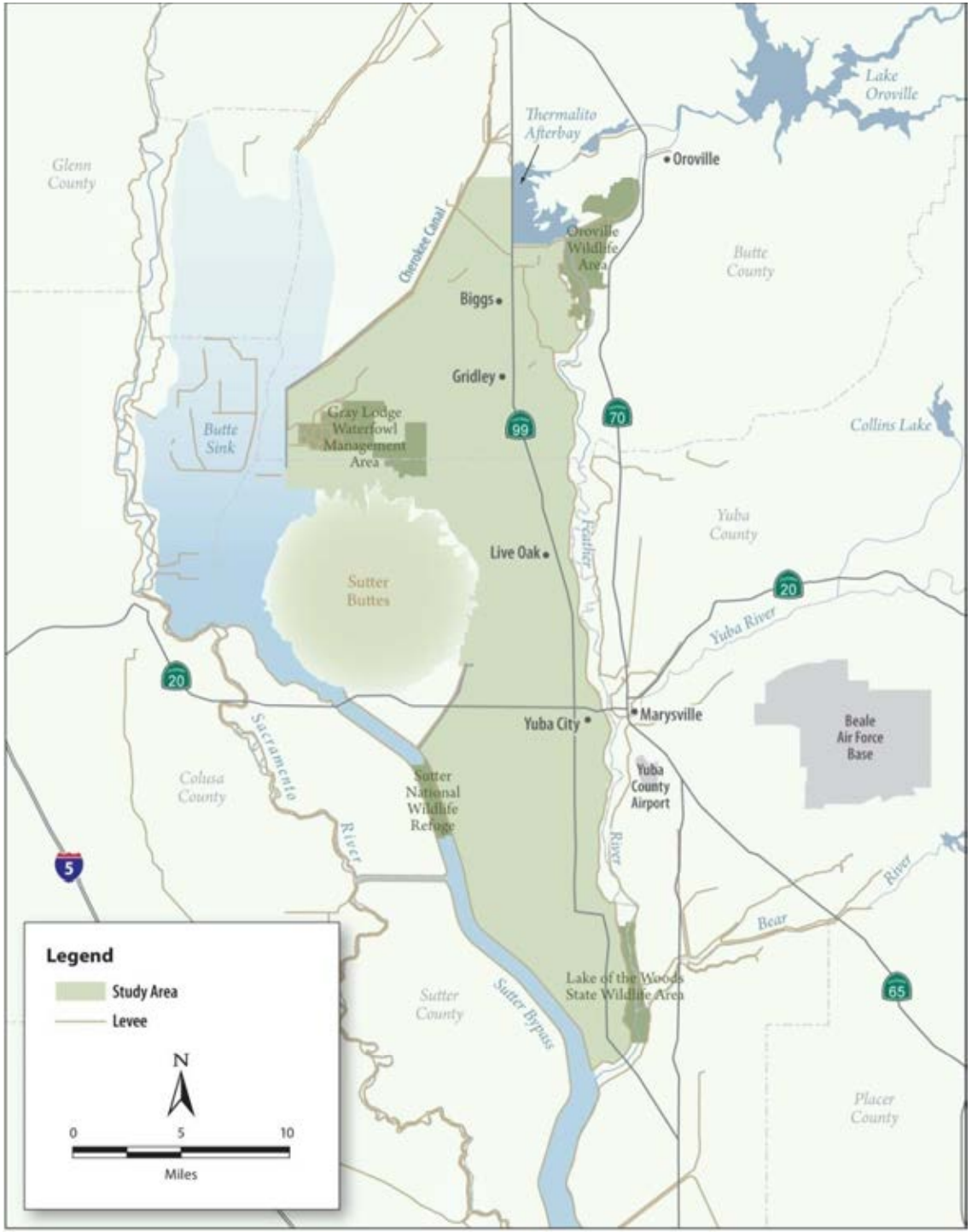
US Army Corps
of Engineers
Sacramento District

Sutter Basin Project Feasibility Study: Study Area

- Study area encompasses ~284 sq. miles and is nearly encircled by Federal Project levees
- Includes portions of Sutter and Butte Counties
- About 44 miles long and 9 miles wide
- Feather River to the east and the Cherokee Canal, Wadsworth Canal, Sutter Buttes, and Sutter Bypass to the west

US Army Corps of Engineers
Sacramento District

Sutter Basin Project Study Area



Sutter Basin Project Feasibility Study: Problems and Potential Measures

- Levees are at risk due to under- and through-seepage and overtopping
- Study will evaluate measures including: re-operation of reservoirs, improvements to existing levees, building new levees, and other storage & conveyance options
- Ecosystem restoration would include restoration of floodplain function and habitat

US Army Corps of Engineers
Sacramento District

Sutter Basin Project Feasibility Study: Potential Alternatives & Funding

- Potential alternatives include those that comprise flood risk management, ecosystem restoration, and recreation measures
- Funding for the feasibility study phase only is cost-shared, 50% Federal (USACE) and 50% non-Federal (SBFCA and CVFPB)

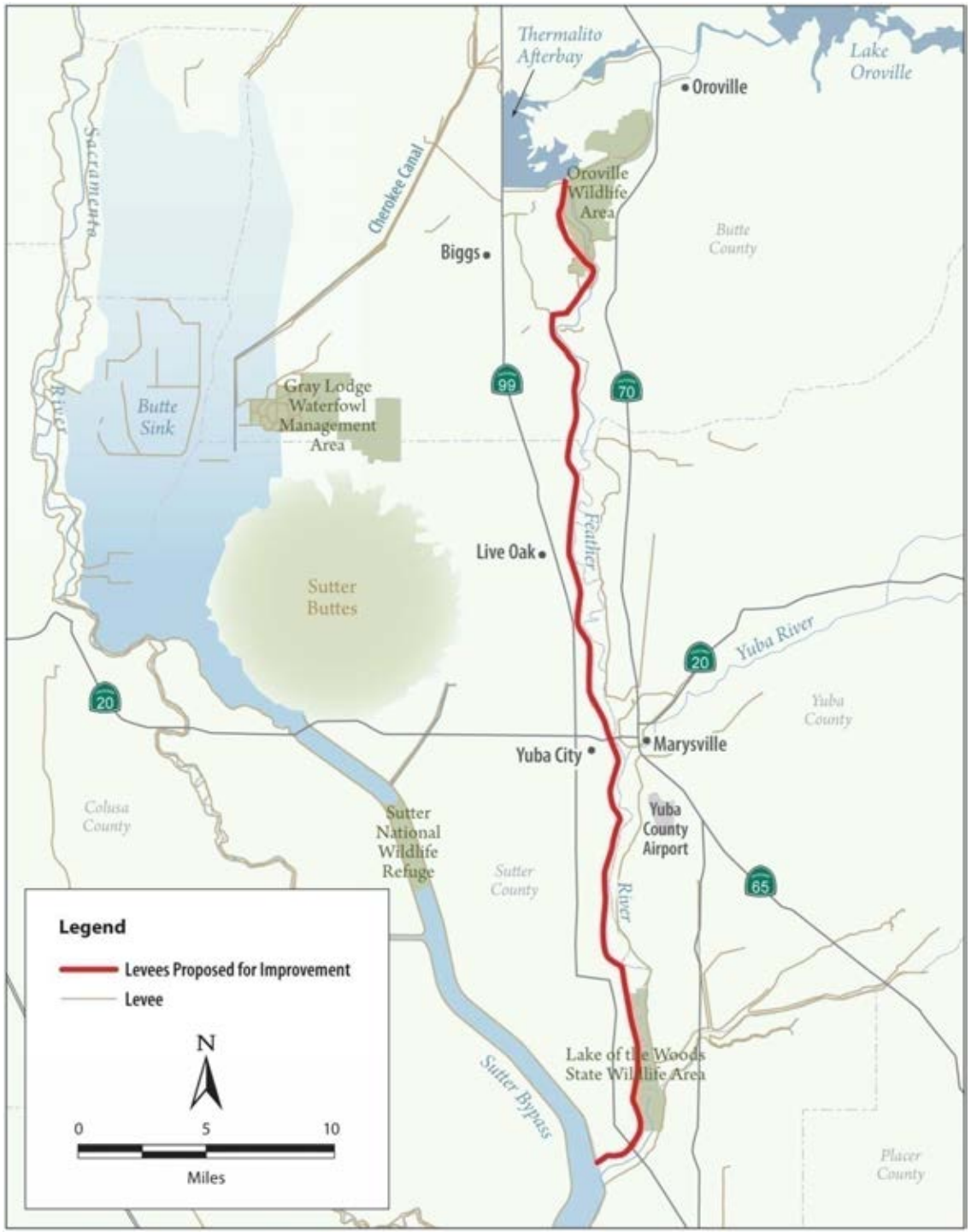
US Army Corps of Engineers
Sacramento District

Feather River West Levee Project: Study Area

- Will improve 44-miles of levees from the Thermalito Afterbay to the Sutter Bypass
- Provides flood risk management benefits to Live Oak, Biggs, Gridley, and Yuba City and unincorporated areas

US Army Corps of Engineers
Sacramento District

Feather River West Levee Project Study Area



Feather River West Levee Project: Problems and Potential Measures

- Primary deficiencies include through-seepage and under-seepage
- Measures may include slurry walls, seepage berms, stability berms, internal drains, relief wells, sheet-pile walls, slope flattening, and new levee alignments

US Army Corps of Engineers
Sacramento District

Feather River West Levee Project: Funding

- The project cost is estimated at $300 million
- The state is expected to pay as much as 76% of project costs
- Locals (within assessment district) will pay the remaining share through annual assessment (anticipated to be in effect for 33 years)

US Army Corps of Engineers
Sacramento District

THE ENVIRONMENTAL PROCESS

US Army Corps of Engineers
Sacramento District

NEPA & CEQA

- NEPA (Federal) and CEQA (state) are both processes that require:
  - Analysis and disclosure of an activity's potential effect on the natural and built environments
  - Identification of alternatives and mitigation measures to reduce effects
- Processes may necessitate an EIS and EIR depending on potential effects (type and degree)

US Army Corps of Engineers
Sacramento District

JOINT EIS/EIR

- Prepared when there is both a Federal and state agency interest in an activity, and/or
- When a state lead agency needs permission to perform an action under Federal jurisdiction (Section 408 permission & Section 404 permit)
- Agencies partner to analyze effects in a joint EIS/EIR and disclose an activity's potential effects

US Army Corps of Engineers
Sacramento District

WHAT IS *SCOPING*?

- Scoping is a process used to inform the public of the proposed activity and provide an opportunity to give input on the range of alternatives, potential environmental effects, and any issues of concern related to the proposed activity

US Army Corps of Engineers
Sacramento District

SCOPING PERIOD

- May 20, 2011 to July 8, 2011
- Comments will be accepted via e-mail, fax, and USPS
- Comments must be postmarked, faxed, or time-stamped (email) before or on July 8, 2011

US Army Corps of Engineers
Sacramento District

Ways to Comment

- Via E-mail
- Facsimile
- Via U.S. Postal Service
- Today via written comment (see comment cards)
- Provide oral comments to court reporter

US Army Corps of Engineers
Sacramento District

CONTACT INFORMATION

Mail or E-mail comments to:

Matt Davis
U.S Army Corps of Engineers
1325 J Street
Sacramento, CA 95814

Phone: 916-557-6708
Fax: 916-557-7856

Matthew.G.Davis@usace. army.mil

Ingrid Norgaard
Sutter Butte Flood Control Agency
c/o ICF International
630 K Street, Suite 400
Sacramento, CA 95814

Phone: 916-737-3000
Fax: 916-737-3030

inorgaard@icfi.com

US Army Corps of Engineers
Sacramento District

THANK YOU FOR ATTENDING

US Army Corps
of Engineers
Sacramento District



Coordinated Environmental Analysis

It is anticipated the Sutter Basin Project and FRWLP will result in two separate environmental impact statements/environmental impact reports (EIS/EIR)—one for each project. Both documents will disclose alternatives, potential effects, and proposed mitigation measures in compliance with the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA), respectively. A joint EIS/EIR is prepared when there is both a Federal and state agency interest in an activity, and/or when a state agency needs permission to perform an action under Federal jurisdiction.

Development of the draft EIS/EIR to evaluate the FRWLP is underway and scheduled for public release in early 2012. A public release date for the Sutter Basin Project draft EIS/EIR has yet to be determined.

The Scoping Process

USACE and SBFCA are working together to combine and coordinate this public scoping process for their two separate environmental documents.

Scoping is a process in which agencies inform the public of a proposed activity and provide an opportunity for public input on the range of alternatives, environmental effects, and issues of concern related to the proposed activity. It also allows agencies to gather insights and local information from the public related to the activity.

Comments received from this public scoping period will be used to inform development of the alternatives; define the environment and resources potentially affected by the alternatives; and analyze effects resulting from the alternatives. The affected environment broadly includes physical, biological, and social topic areas. Effects will be identified and analyzed both for project construction and long-term operations and maintenance. The scoping period is from May 20, 2011 to July 8, 2011.

For more information on these efforts, visit www.spk.usace.army.mil or www.sutterbutteflood.org.

6/23/11

Sutter Basin Project and Feather River West Levee Project



The U.S. Army Corps of Engineers (USACE) and the Sutter Butte Flood Control Agency (SBFCA), in coordination with the California Department of Water Resources (DWR) and the California Central Valley Flood Protection Board (CVFPB), are undertaking two related efforts to study flood risk management measures in Sutter and Butte Counties. USACE is leading a feasibility study for the Sutter Basin Project to determine Federal interest in flood risk management in conjunction with other related purposes in the Sutter Basin study area, while SBFCA is leading the Feather River West Levee Project (FRWLP) to address deficiencies in 44 miles along the west levee of the Feather River.

USACE and SBFCA are studying these two projects in close coordination because they are related in their study areas, purpose, potential measures, and potential effects.

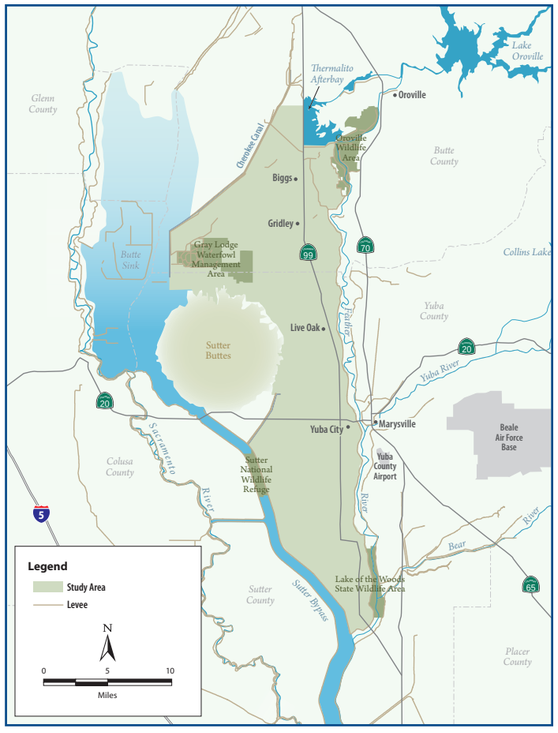
US Army Corps of Engineers.
Sacramento District

A Closer Look at the Two Projects

The Sutter Basin Project Feasibility Study

In 2000, the State of California and USACE entered into a cost-sharing agreement to initiate a feasibility study within the Sutter Basin. An amendment of the cost-sharing agreement was signed in July 2010 to include SBFCA as a non-Federal sponsor. The purpose of the feasibility study is to address flood risk management, ecosystem restoration, and recreation issues in the study area.

The Sutter Basin Project feasibility study evaluates approximately 285 square miles that are roughly bounded by the Feather River, Sutter Bypass, Wadsworth Canal, Sutter Buttes, and Cherokee Canal. The study area is essentially encircled by project levees and the high ground of the Sutter Buttes. Past flood events and geotechnical analysis show these levees 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.

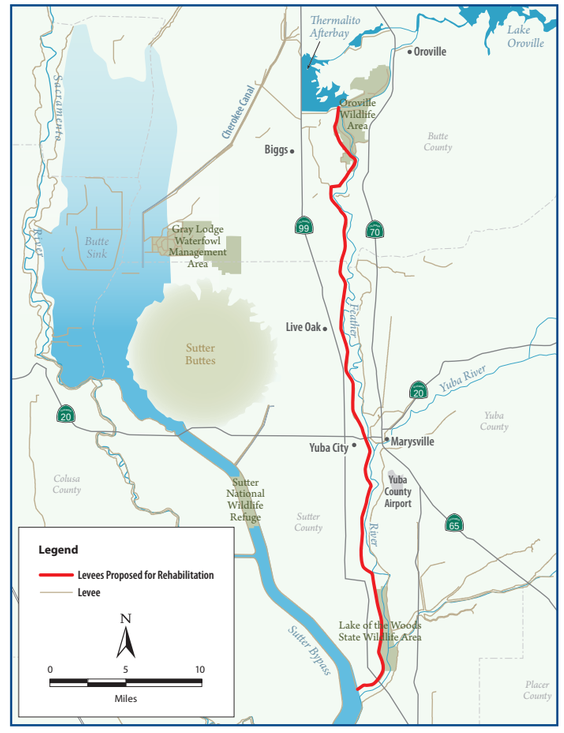


As part of the Sutter Basin Project feasibility study, USACE is evaluating a variety of flood risk management measures that could include re-operation of reservoirs; improvements to existing levees; construction of new levees; other storage, conveyance, and non-structural options; and measures that could potentially restore the ecosystem within the study area and develop or expand recreation facilities. This study will be the basis for a recommendation to Congress to address water resources and related issues within the study area. The feasibility study phase of this project is cost-shared: USACE will fund 50%, and SBFCA and the State of California will fund the remaining 50%.

The Feather River West Levee Project

SBFCA is planning the FRWLP to address levee deficiencies found along 44 miles of the Feather River's west levee from the Thermalito Afterbay south to the Sutter Bypass. The west levee provides flood risk management benefits to the cities of Yuba City, Gridley, Live Oak, and Biggs, and portions of Butte and Sutter Counties. Measures are being evaluated to meet Federal, state, and local flood protection criteria and goals.

The west levee is at risk of failure from through- and under-seepage and from overtopping caused by floods greater than the levee is designed to withstand. Alternatives to repair these deficiencies could include slurry walls, seepage berms, stability berms, internal drains, relief wells, sheet-pile walls, slope flattening, and new levee alignments. The goal is to construct the FRWLP as quickly as possible, in advance of and compatible with the Sutter Basin Project, potentially in 2013.



Environmental Review Process Timeline for the Sutter Basin Project and FRWLP

Spring 2011 - Fall 2011
Release Notice of Intent (NEPA) and Notice of Preparation (CEQA) to announce the development of an EIS/EIR
Conduct public scoping to inform the public of and solicit input about the proposed activity

Fall 2011 - Spring 2012
Prepare Draft Integrated Feasibility Report & EIS/EIR (FREIS/EIR)

Spring 2012 - Fall 2012
Draft FREIS/EIR 45-day Public Review
Final FREIS/EIR 30-day Public Review

Winter 2012 - Spring 2013
A Record of Decision (NEPA) and Notice of Determination (CEQA) will document selected alternative

2011 | 2012 | 2013

May 2011
Notice of Intent and Notice of Preparation are released to announce start of the environmental review process

May - July 2011
Conduct public scoping to inform the public of and solicit input about the proposed activity

January 2012
FRWLP Draft EIS/EIR released for public comment

Summer 2012
FRWLP Final EIS/EIR released

Legend
Sutter Basin Project
Feather River West Levee Project

Sutter Basin Project & Feather River West Levee Project

US Army Corps of Engineers. Sacramento District

June 27, 2011 Scoping Meeting Comment Card

Date:_____

Name:_____Title:_____

Phone:_____Fax:_____Affiliation:_____

Email:_____Street Address_____

City:_____State:_____Zip:_____

☐ Please add me to the mailing list to receive future updates.

Thank you for attending the Sutter Basin Project and Feather River West Levee Project (FRWLP) scoping meeting. Please provide your input in the space below about the content of the environmental impact statement/environmental impact report (EIS/EIR) for the Sutter Basin Project and/or for the EIS/EIR for the FRWLP. After you've written your comments in the space below, place this card in one of the designated baskets around the room or hand it to a project team member. Please write legibly.

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Sutter Basin Project & Feather River West Levee Project

US Army Corps of Engineers. Sacramento District

June 28, 2011 Scoping Meeting Comment Card

Date:_____

Name:_____Title:_____

Phone:_____Fax:_____Affiliation:_____

Email:_____Street Address_____

City:_____State:_____Zip:_____

☐ Please add me to the mailing list to receive future updates.

Thank you for attending the Sutter Basin Project and Feather River West Levee Project (FRWLP) scoping meeting. Please provide your input in the space below about the content of the environmental impact statement/environmental impact report (EIS/EIR) for the Sutter Basin Project and/or for the EIS/EIR for the FRWLP. After you've written your comments in the space below, place this card in one of the designated baskets around the room or hand it to a project team member. Please write legibly.

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Attachment C

- Comments received from all interested parties (including those transcribed by court reporter)
- Attendee sign-in sheet templates

Sutter Basin Project & Feather River West Levee Project

US Army Corps of Engineers
Sacramento District

June 27, 2011 Scoping Meeting Comment Card

Date: 6/27/11

Name: Douglas Gault Title: Director of Public Works, Sutter County

Phone: Fax: Affiliation:

Email: Street Address

City: State: Zip:

☐ Please add me to the mailing list to receive future updates.

Thank you for attending the Sutter Basin Project and Feather River West Levee Project (FRWLP) scoping meeting. Please provide your input in the space below about the content of the environmental impact statement/environmental impact report (EIS/EIR) for the Sutter Basin Project and/or for the EIS/EIR for the FRWLP. After you've written your comments in the space below, place this card in one of the designated baskets around the room or hand it to a project team member. Please write legibly.

Meet Spring 2013 ~~Scheduled~~ completion. of USACE Feasibility study. Do not delay. 104 certification must be issued at that time to allow state to releare EIP funding for West Levee Project.

Keep the process for feasibility study on schedule.

ORIGINAL

SUTTER BASIN PROJECT FEASIBILITY STUDY & FEATHER RIVER WEST LEVEE PROJECT PUBLIC SCOPING MEETING û YUBA CITY, CA

DATE: June 27, 2011

TIME: 3:30 p.m. and 6:30 p.m.

REPORTED BY: Jillian Bassett
Certified Shorthand Reporter No. 13619

NCCR
Northern California Court Reporters
Certified Shorthand Reporters & Legal Photocopy
(916) 485-4949 ■ Fax (916) 485-1323 ■ (888) 600-NCCR
1325 Howe Avenue, Suite 105 ■ Sacramento, CA 95825
nccr@norcalreporters.com ■ www.norcalreporters.com

STAN CLEVELAND, COUNTY SUPERVISOR:

I was told to repeat the comment I made regarding including the DWR Corridor Management Project, which is called The Lower Feather River Corridor Management Project. And there's a management group, and then there's -- I forgot what the other one is; there's two groups. And Aecom, they're the project, I guess, engineer group for that. And making sure that that is coordinated with this here. Because in that corridor of the Feather River, they're doing a lot of environmental planning and setting a foundation, or a level base, to where everybody won't have to come back and start from scratch on any of their studies -- environmental studies.

Certificate

of

Certified Shorthand Reporter

The undersigned certified shorthand reporter of the state of California does hereby certify:

That the foregoing deposition was taken before me at the time and place therein set forth, at which time the witness was duly sworn by me;

That the testimony of the witness and all objections made at the time of the examination were recorded stenographically by me and thereafter transcribed, said transcript being a true copy of my shorthand notes thereof.

In witness whereof, I have subscribed my name this date July 25 2011.

Jill Bessett

Certificate number 13019

ORIGINAL

SUTTER BASIN PROJECT FEASIBILITY STUDY & FEATHER RIVER WEST LEVEE PROJECT PUBLIC SCOPING MEETING û GRIDLEY, CA

DATE: June 28, 2011

TIME: 3:30 p.m. and 6:30 p.m.

REPORTED BY: Jillian Bassett
Certified Shorthand Reporter No. 13619

NCCR
Northern California Court Reporters
Certified Shorthand Reporters & Legal Photocopy
(916) 485-4949 ■ Fax (916) 485-1323 ■ (888) 600-NCCR
1325 Howe Avenue, Suite 105 ■ Sacramento, CA 95825
nccr@norcalreporters.com ■ www.norcalreporters.com

DAVID NEUBERT:

I live in Sutter County. I was speaking with your colleagues, and they mentioned one of the options they're looking at is a levee setback in the area of Nelson slough along Sacramento Avenue in Sutter County. And this would be the area between the Sacramento bypass and the Feather River, right where the Feather River enters the bypass. There's, I don't know, maybe 900,000 acres there that they could sort of cut the corner on the levee the way it exists now, and pick up 1,000 acres of floodplain.

And I'm just -- I think that's a great idea. There's -- I think there might be one house, and it's probably just a rental in that area. So you probably wouldn't have a lot of homeowners that would be hopping mad. And you'd probably pick up 10 or 15,000 acre-feet of flood storage. So it would be something, I think, that would -- engineering-wise, it would be an interesting levee setback to look at.

So the other thing that I think that as a resident of Sutter County, and I live in the LD-1 area -- I'm not sure if LD-1 has the capacity -- management capacity to pull something like that off. You know, maybe setting up something like

trilla (phonetic) like they did in Yuba County. Or maybe this super agency, the Sutter Butte Agency, could do it.

But I just -- I just don't think management capacity, or I should say the planning capacity of the board level -- I think the management, the managers of LD-1 are fine. But the board, I don't think, has vision for projects like this. So hopefully they do.

RICHARD KUCEK:

I guess it goes back to the building of the levee was our first project for the taxpayers to protect everybody from flooding. Okay. They knew after '55 when they finished the levee and had to break in Yuba City, that that wouldn't solve the problem. So they took -- and I wouldn't say they use -- it had scare tactic. But they got the taxpayers to fund another project which was get the dam at Lake Oroville. And the state of California, at that time, from what I understand, did not have enough money to build it. But the taxpayers voted it in, so it went on their tax board. But Southern California funded most of the money for building that in return for surplus water out at the lake.

And somewhere down the line it got turned around that I guess the water's worth more than the people in the houses. So they keep the lake elevation too high. But if they would keep it down, we would never need these projects that they're proposing today, which would be the third ones the taxpayers are going to pay for just for protection.

And like, the slurry would be the right way to fix this right now. If they went with the berm, that would cause a lot of problems, because there would be

maintenance, and they can't maintain the levees that there are right now. You can go out there and look at it; kids drive up and down on it, there's gophers and squirrels on it and everything else. And they don't spray it. They don't kill the weeds. They don't do nothing. So if they do, I guess that setback levee, that wouldn't cause a lot more problems on the east side of it, and then what do you do with that? Because you got to be in the floodplain. But the berm, to me, would be too expensive to keep in 33 years.

So I don't know how they got as far as they did with this project. But it should never happen because the taxpayers shouldn't have to pay three times for flood protection.

So I don't know. I guess we'll just go to the meetings and see how it comes out and, you know, if they're going to do all this, and Southern California has the right to all that water, why don't they pay the bills? I mean, why should we have to pay it? If they want to keep that lake full enough so it enables us from flooding, they should have to pay the bill if it does flood. Not raise our taxes and everything else, and our flood insurance, and they get all the water, and we got the bill.

BOB BARKHOUSE:

Two concerns I have is the east levee of the Sutter bypass, because, in my lifetime, on the west side -- I've had to live through two floods -- farmland on the other side -- major floods. Those levees on the west side -- east side are no better than west side, yet we're trying to contain the overflow from the Sacramento River between bypass. And we certainly are subject to flooding if the right condition --

And then my second concern was the maps continuously show a perimeter levee around Yuba City, or a J levee on the south and west side. And I'm concerned about building a levee around Yuba City and putting the city of Yuba City in the same parallel as the city of Marysville. Although Marysville has never flooded, but it's always -- the bowl is likely to fill up someday, and it would be a catastrophe.

But I am concerned about that part. They have a strong levee on the Feather River, and let that take care of itself. So that was my two concerns.

Certificate

of

Certified Shorthand Reporter

The undersigned certified shorthand reporter of the state of California does hereby certify:

That the foregoing deposition was taken before me at the time and place therein set forth, at which time the witness was duly sworn by me;

That the testimony of the witness and all objections made at the time of the examination were recorded stenographically by me and thereafter transcribed, said transcript being a true copy of my shorthand notes thereof.

In witness whereof, I have subscribed my name this date July 25 2011.

Jill Bassett

Certificate number 13019

Sutter Basin Project & Feather River West Levee Project

June 27, 2011 Scoping Meeting

Sign-in Sheet

US Army Corps of Engineers.
Sacramento District

Name	Title	Affiliation	Street Address	City	Zip Code	How did you hear about the meeting?

Sutter Basin Project & Feather River West Levee Project

June 28, 2011 Scoping Meeting

Sign-in Sheet

US Army Corps of Engineers.
Sacramento District

Name	Title	Affiliation	Street Address	City	Zip Code	How did you hear about the meeting?

Appendix E

Comments Received During the Scoping Period

[Excluding comments received at the scoping meetings. See Appendix D for those comments.]

E.1 Public Feedback

Seventeen comments were received apart from feedback received (comments and transcripts from oral comments) at the two scoping meetings. See Appendix D to view comments received at the scoping meetings.

Below is a list summarizing comments received.

1. Project lead agencies must obtain appropriate water quality/discharge permits including those related to dewatering, discharge, sewer, and construction and land disturbance.
2. The area being studied is located in the planning area of the Yuba/Sutter Habitat Conservation Plan/Natural Community Conservation Plan (HCP/HCCP); therefore please provide the Sutter County Community Services Director's office with all future notices regarding this project.
    a. The applicants currently are the Counties of Yuba and Sutter, the City of Wheatland, the City of Live Oak, and Yuba City. These agencies are available to provide additional information upon request.
3. Project teams need to review the current effective Flood Insurance Rate Maps for all counties and cities in the study area. Please note that these cities and counties are participants in the National Flood Insurance Program (NFIP) and the minimum, basic NFIP floodplain management building requirements are described in 44 Code of Federal Regulations (CFR) §§59–65.
4. General requests for more detailed information about the boundaries of each project and the relationship between the two projects.
5. A request to memorialize, in some way, the unreported deaths in 1955 caused by a levee break at Shanghai Bend.
6. The California State Lands Commission (CSLC) requests that as the Project proceeds, the Sutter Butte Flood Control Agency (SBFCA) submits additional information (e.g., detailed maps) to enable CSLC staff to determine if any components of the Project will require a lease or permit. CLSC additionally requests to be placed on any future distribution mailing list for the Project. A thorough project description should be included in the environmental impact statement/environmental impact report (EIS/EIR) in order to facilitate meaningful environmental review of potential impacts, mitigation measures, and alternatives. A thorough description will facilitate CSLC staff's determination of the extent and location of its leasing jurisdiction, make for a more robust analysis of the work that may be performed, and minimize the potential need for subsequent environmental analysis.
7. The project's EIS/EIR should carefully issues and mitigation alternatives in order to formulate a more comprehensive and sustainable approach to flood management in the Sutter/Butte region, as described below. These include:

a. Growth Inducing Impacts—Consider whether providing 200-year flood protection would increase rather than decrease flood risk by incentivizing development in these flood prone areas.

b. Downstream Flood Impacts—Proposed project could route more floodwater downstream to urban communities.

c. Impacts Under Climate Change—Will levee improvements really provide 100–200 year protection?

d. Evaluate a Broader Range of Alternatives—Levee Setbacks, Ring Levees and Building Modifications, Flood Bypass, Oroville Reservoir, Oroville Wildlife Area Levee Modification.

8. From the Feather River Air Quality Management District (AQMD): Recommends regarding the air quality and climate change for both projects. The EIS/EIR should include a discussion of greenhouse gas emissions and climate change impacts. The following District Rules and Regulations May apply:

   a. Rule 3.0 Visible Emissions.

   b. Rule 3.16 Fugitive Dust Emissions.

   c. Rule 4.1 Permit Requirements.

9. The project should submit a Fugitive Dust Control Plan to the Feather River AQMD prior to beginning work. The California Department of Fish and Game (CDFG) would like to emphasize the critical importance of coordination with CDFG during the California Environmental Quality Act (CEQA) and regulatory processes and asks that SBFCA and the U.S. Army Corps of Engineers (USACE) evaluate CDFG's comments closely to ensure that impacts are avoided, minimized and mitigated pursuant to the CEQA and the appropriate regulations and statutes:

   a. CDFG Authority—Commenting as Trustee Agency, landowner and conservation easement holder within the study area for both projects.

   b. California Endangered Species Act (CESA) Species—CDFG has identified species with potential to occur within the study area that may be affected by the projects. (See Attachment with List of Species.)

   c. Threatened and Endangered Plants—EIS/EIRs should include a full impact assessment.

   d. Other Species Considerations—Emphasis on describing and identifying locations of existing resources within the study area that are rare or unique.

   e. Lake or Streambed Alteration Agreement—Backfilling of a pond could be a solution to reducing levee permeability. EIS/EIRs should identify ponds and measures required to reduce an impact to below a level of significance.

   f. Other Habitat Considerations—Recommends the projects be designed to avoid impacts to wetlands and riparian habitat as much as possible.

   g. CDFG Lands, Restoration Efforts and Public Use—Identify lands subject to conservation easements in the study area and ensure that the projects are implemented consistent with the conservation easement terms.

   h. Other Considerations—Identify clear windows of construction, and other measures to minimize impact to wildlife and the recreating public. Detailed monitoring for all mitigation

measures. CEQA filing fees due at the time of the Notice of Determination (NOD) for final EIS/EIRs.

10. To adequately assess and mitigate project-related impacts to archaeological resources, the Native American Heritage Commission (NAHC) recommends the following actions:
    a. Contact the appropriate regional archaeological Information Center for a record search.
    b. If an archaeological inventory survey is required, the final stage is the preparation of a professional report detailing the findings and recommendations of the records search and field survey.
    c. Contact the NAHC for sacred lands file check and a list of contacts.
    d. Lack of surface evidence of archeological resources does not preclude their subsurface existence.
    e. Information presented at the scoping meetings and in the Notice of Preparation (NOP) was vague. Support for the development of a levee setback area near the confluence was voiced because this land is currently used for agriculture and USACE could minimize land acquisition costs by simply utilizing a flood easement rather than land purchase if the levee is moved north to widen the flood plan.
    f. The sharing of hydraulic models and other findings of levee setback options and costs as they are developed.
11. Keep the public informed about the following topics:
    a. The legal basis for the construction or improvement of levees, on each segment of levee, and include this in the documents.
    b. The extent to which the levee districts are obligated to provide for cross-levee access for private owners and the public; and, the extent to which the levee districts have a right to exclude underlying owners, owners of land on the water-side of the levee, and the public, from being on or crossing the levees
    c. Address the question of who owns the segments of land the levee sits on; what basis the levee district claims the right to maintain a levee on each segment; what extent the levee district may have the right to exclude land-owners and members of the public; and what extent is the burden of the levee district to build and maintain ramps to allow private owners or the public to cross the levee.
    d. The legal effect of the documents and general law on whether levee deeds are read as fee grants or mere easements; who is obligated to maintain ramps providing access across the levee; under what circumstances might the levee district be obligated to construct or maintain a ramp; when may the levee district exclude the underlying owner, owners inside the levee, or the public from crossing the levee.
    e. The tops of the levees were open for use apparently as public roads. What happened to rights which might have existed by dedication, grant, or county road action?

E.2 Next Steps

All comments received, both those at the scoping meetings and those received during the scoping period, will assist in determining which issues are evaluated in detail in both the Sutter Basin Project and Feather River West Levee Project (FRWLP) EIS/EIRs. Once alternatives have been developed based on the scoping process and preexisting information, they will be analyzed, and draft EIS/EIRs will be developed.

Upon the release of the draft EIS/EIR, the public will have 45 days to comment on the document. Additionally, at least one public hearing will be held so the public and agencies can learn more about both of the draft EIS/EIRs, ask questions regarding the analysis, and provide comments. At these meetings, the alternatives will be presented and explained.

Development of the draft EIS/EIR to evaluate the FRWLP is underway and scheduled for public release in 2012. A public release date for the Sutter Basin Project draft EIS/EIR has yet to be determined.

SUTTER COUNTY
COMMUNITY SERVICES DEPARTMENT

Animal Control
Building Inspection
Environmental Health
Planning

Director – Larry Bagley
Assistant Director – Randy Cagle
Fire Services – Dan Yager
Emergency Services – John DeBeaux

CERTIFIED AND FIRST CLASS MAIL

June 8, 2011

Ingrid Norgaard, Project Manager
Sutter Buttes Flood Control Agency
630 K Street, Suite 400
Sacramento, CA 95814

Matt Davis, Environmental Resources Branch
Sacramento District
U.S. Army Corps of Engineers
1325 J Street
Sacramento, CA 95814

Re: Response to the Notice of Preparation of an EIS/EIR for the Sutter Basin Feasibility Study and Feather River West Levee Project

Dear Ms. Norgaard and Mr. Davis,

Thank you for the opportunity to comment on the Notice of Preparation for the EIS/EIR on the Sutter Basin Feasibility Study and Feather River West Levee Project. The County of Sutter, County of Yuba, City of Yuba City, City of Live Oak, City of Wheatland, California Department of Fish and Game ("DFG") and the United States Fish and Wildlife Service ("USFWS") are in the process of preparing the Yuba-Sutter Natural Community Conservation Plan and Habitat Conservation Plan ("Yuba-Sutter NCCP/HCP"). The area you are studying is located in the planning area of the Yuba/Sutter NCCP/HCP; therefore please provide our office with all future notices regarding this project.

Sincerely,

Larry Bagley

LARRY BAGLEY
COMMUNITY SERVICES DIRECTOR

LB:tsg

cc: Yuba-Sutter NCCP/HCP Working Group Members

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U.S. Department of Homeland Security
FEMA Region IX
1111 Broadway, Suite 1200
Oakland, CA. 94607-4052

FEMA

June 9, 2011

Ingrid Norgaard, Project Manager
Sutter Butte Flood Control Agency
c/o ICF International
630 K Street, Suite 400
Sacramento, California 95814

Dear Ms. Norgaard:

This is in response to your request for comments on the Notice of Preparation of Draft Environmental Impact Statements/Environmental Impact Reports for the Sutter Basin Feasibility Study and Feather River West Levee Project.

Please review the current effective Flood Insurance Rate Maps (FIRMs) for the Counties of Butte (Community Number 060017) and Sutter (Community Number 060394), and Cities of Biggs (Community Number 060437), Gridley (Community Number 060019), Yuba City (Community Number 060396), and Live Oak (Community Number 060395). Please note that the above referenced Cities and Counties are participants in the National Flood Insurance Program (NFIP). The minimum, basic NFIP floodplain management building requirements are described in Vol. 44 Code of Federal Regulations (44 CFR), Sections 59 through 65.

A summary of these NFIP floodplain management building requirements are as follows:

- All buildings constructed within a riverine floodplain, (i.e., Flood Zones A, AO, AH, AE, and A1 through A30 as delineated on the FIRM), must be elevated so that the lowest floor is at or above the Base Flood Elevation level in accordance with the effective Flood Insurance Rate Map.

- If the area of construction is located within a Regulatory Floodway as delineated on the FIRM, any ***development*** must not increase base flood elevation levels. **The term *development* means any man-made change to improved or unimproved real estate, including but not limited to buildings, other structures, mining, dredging, filling, grading, paving, excavation or drilling operations, and storage of equipment or materials.** A hydrologic and hydraulic analysis must be performed *prior* to the start of development, and must demonstrate that the development would not cause any rise in base flood levels. No rise is permitted within regulatory floodways.

- Upon completion of any development that changes existing Special Flood Hazard Areas, the NFIP directs all participating communities to submit the appropriate hydrologic and hydraulic data to FEMA for a FIRM revision. In accordance with 44 CFR, Section 65.3, as soon as practicable, but not later than six months after such data becomes available, a community shall notify FEMA of the changes by submitting technical data for a flood map revision. To obtain copies of FEMA's Flood Map Revision Application Packages, please refer to the FEMA website at http://www.fema.gov/business/nfip/forms.shtm.

Please Note:

Many NFIP participating communities have adopted floodplain management building requirements which are more restrictive than the minimum federal standards described in 44 CFR. Please contact the local community's floodplain manager for more information on local floodplain management building requirements. The City of Gridley floodplain manager can be reached by calling Jerry Ann Fichter, Mayor, at (). The City of Biggs floodplain manager can be reached by calling Paul H. Pratt, Public Works Superintendent, at (530) 868-1396. The Sutter County floodplain manager can be reached by calling Douglas R. Gault, Director, Department of Public Works, at (530) 822-7450. The Yuba City floodplain manager can be reached by calling George Musallam, Director, Department of Public Works, at (530) 822-3288. The City of Live Oak floodplain manager can be reached by calling Bruce Nash, City Engineer, at (530) 895-1442. The Butte County floodplain manager can be reached by calling Mike Crump, Director, Department of Public Works, at (530) 538-7681.

If you have any questions or concerns, please do not hesitate to call Cynthia McKenzie (510) 627-7190 and/or Frank Mansell (510) 627-7191 of the Mitigation staff.

Sincerely,

Gregor Blackburn, CFM, Branch Chief
Floodplain Management and Insurance Branch

cc:
Jerry Ann Fichter, Mayor, City of Gridley
Paul H. Pratt, Public Works Superintendent, City of Biggs
Douglas R. Gault, Director, Department of Public Works, Sutter County
George Musallam, Director, Department of Public Works, Yuba City
Bruce Nash, City Engineer, City of Live Oak
Mike Crump, Director, Department of Public Works, Butte County
Raul Barba, State of California, Department of Water Resources, Northern Region Office
Ray Lee, State of California, Department of Water Resources, North Central Region Office
Cynthia McKenzie, Senior Floodplanner, CFM, DHS/FEMA Region IX
Frank Mansell, Floodplanner, DHS/FEMA Region IX
Alessandro Amaglio, Environmental Officer, DHS/FEMA Region IX

July 5, 2011

Ingrid Norgaard, Project Manager
Sutter Butte Flood Control Agency
c/o ICF International
630 K Street, Suite 400
Sacramento, CA 95814

Dear Ms. Norgaard,

American Rivers, in its commitment to river conservation, public safety, and sustainable flood management, would like to offer comments with respect to the proposed Feather River West Levee Project (FRWLP). It is American Rivers' concern that the project, as currently proposed, fails to incorporate long-term, sustainable flood management strategies, and places both human and natural communities at increased risk of future catastrophic flooding.

The project's EIR/EIS should examine a broad range of issues and mitigation alternatives in order to formulate a more comprehensive and sustainable approach to flood management in the Sutter/Butte region, as described below.

Growth Inducing Impacts
The report should consider whether providing 200-year flood protection from Thermalito Afterbay to Yuba City north would increase, rather than decrease, flood risk by incentivizing development in these flood-prone areas. Flood risk, as defined by the state of California, equals the probability of flooding multiplied by the consequences of a flood. Although the project will reduce the *probability* of local flooding, the *consequences* of eventual flooding in a heavily developed community would be much more severe. Facilitating development efforts by cities, counties, and property owners in flood-prone regions may substantially increase flood risk over the long term.

Downstream Flood Impacts
In its emphasis on structural levee improvements, the proposed project could route more floodwater downstream to urban communities. By reducing the probability of levee failure in the Yuba City area during a large flood event, the project would necessarily increase the probability that flows would be routed downstream, and this would increase the risk of catastrophic flooding in Sacramento and West Sacramento. The report should consider and select alternative improvement measures that would avoid or mitigate these impacts.

Impacts Under Climate Change
The project should consider whether the proposed levee improvements will actually provide 100-year and 200-year protection under projected future flows assuming climate change.

Evaluate a Broader Range of Alternatives

In order to better advance the state and federal flood management goals, the EIR/EIS must evaluate a broader range of alternatives including:

1. **Levee Setbacks**: Evaluate the potential benefits of levee setbacks, including reduced operations and maintenance costs, improvements to local flood protection in the face of climate change, and benefits for fisheries and wildlife habitat.
2. **Ring Levees and Building Modifications**: Examine the potential that ring levees offer for protecting the existing communities of Gridley, West Gridley, Biggs, and Yuba City as an alternative to the proposed project. Elevate buildings outside the ring levees to protect against flooding.
3. **Flood Bypass**: Evaluate the opportunity to reduce peak flows during extreme flood events by rerouting floodwaters into the Butte Basin through a new flood bypass. Such a bypass could divert water out of Thermalito Afterbay and the Feather River and into the Cherokee Canal.
4. **Oroville Reservoir**: Consider opportunities for reducing extreme flood events by reoperating the Oroville reservoir either to expand the flood reservation or improve real time operations during flood events.
5. **Oroville Wildlife Area Levee Modification**: Explore opportunities for reducing peak flood flows through planned modifications to levees adjacent to the Oroville Wildlife Area that would increase flooding of the OWA. Modifying levees along the OWA is required by Article A106 Riparian and Floodplain Improvement Program in the Settlement Agreement for the Relicensing of the Oroville Facilities, FERC Project 2100, executed by the Department of Water Resources and 52 other parties in March 2006.

The costs and benefits of all alternatives should be evaluated in light of the life cycle costs of maintaining and operating the project.

By examining the aforementioned potential project impacts and considering additional mitigation alternatives, the FRWLP can adopt a sustainable flood management vision and offer long-term public safety as well as ecological benefits to the communities of the Sutter/Butte region.

We hope that, in compiling the EIR/EIS and in moving forward with the project, the Sutter Butte Flood Control Agency and its collaborators will consider our comments and be part of the movement towards a safer, more sustainable future for California's Central Valley.

Respectfully,

John Cain,
Director of Conservation
California Flood Management

Megan Randall,
California Flood Management Fellow

From: Francis Coats [mailto:fecoats@msn.com]
Sent: Tuesday, June 28, 2011 12:34 PM
To: Norgaard, Ingrid; Matthew G. Davis
Subject: FW: Additional deaths in 1955 flood

Information on farmworkers who died on Shanghai Bend levee Christmas eve, 1955.

Date: Mon, 10 Jan 2011 15:44:32 -0800
From: mnewkom@yahoo.com
Subject: RE: Additional deaths in 1955 flood
To: fecoats@msn.com

> Frank, I'm sure that Oji could possibily have that info in their "archives" if they still have them. I know I still have my old ranch books and employment records from 1956 on. The early stuff is gone.

--- On **Mon, 1/10/11, Francis Coats <*fecoats@msn.com*>** wrote:

From: Francis Coats <fecoats@msn.com>
Subject: RE: Additional deaths in 1955 flood
To: "Roberta Fletcher" <rlf@syix.com>, "Nelson Anthoine" <nelsonanthoine@sbcglobal.net>, "Joe and Jackie Griffin" <leeann@syix.com>, "Jeet Bajwa" <jeetbaj@hotmail.com>, "Janet Baur" <edbaur@sbcglobal.net>, "Kurt Bonham" <bonhamcpa@citlink.net>, "Dick Boundy" <d.boundy@comcast.net>, "Karna Boyer" <boyerkar@syix.com>, "Stan Cleveland" <frypanman@excite.com>, "Suzanne Connelly" <misuzinca1@juno.com>, "Dan Cucchi" <dancucchi@yahoo.com>, "Bob Harlan" <bob@kubaradio.com>, "Mike Darnell" <mikeagle@yahoo.com>, "Narinder Dhaliwal" <ndhaliwal@sbcglobal.net>, "Angel Diaz" <brooklyngeek@yahoo.com>, "David and Pamela Geitner" <geitner@comcast.net>, "Jack and Maxine Elliott" <maxineelliott1695@yahoo.com>, "Diane Fales" <dfales@live.com>, "Darin Gale" <daringale@hotmail.com>, "James Gallagher" <jmgallagher21@hotmail.com>, "Barbara Gaudreau" <b.bilingual@syix.com>, "Richard von Geldern" <vongeldern_ric@sbcglobal.net>, "Ashley Gebb" <agebb@appealdemocrat.com>, "Roy and Miriam Hatamiya" <hatamiyas@yahoo.com>, "Ray Janssen" <rayjanssen@comcast.net>, "Don Kessel" <meccacol@comcast.net>, "Jeannie Klever" <cinnamongirls@sbcglobal.net>, "Rob Klotz" <rob.klotz@yahoo.com>, "Robert LaHue" <rlahue@appealdemocrat.com>, "Howard Yune" <hyune@appealdemocrat.com>, "Barbara LeVake" <blevake@syix.com>, "Jack Levine" <jlevine@c21selectgroup.com>, "Rick and Jerrie Libby" <rlibby@syix.com>, "Tej Maan" <tejmaan@hotmail.com>, "Bob Mackensen" <rmackensen@sbcglobal.net>, "Russell and Mary Mayfield" <marymay2@sbcglobal.net>, "Dee and Roy

Meli" <dmeli1@comcast.net>, "Eric Meyers" <ericbmeyers@cs.com>, "Elaine Miles" <elaine.miles@att.net>, "Chuck and Pat Miller" <chucknpat@comcast.net>, "Rick Nelson" <rrnels1@aol.com>, "Martin Newkom" <mnewkom@yahoo.com>, "Horacio Paras" <hparassr@hotmail.com>, "Kevin Perkins" <kpatcal@yahoo.com>, "Ron Reavis" <ron859@succeed.net>, "Joan Joaquin Wood" <joanwood@earthlink.net>, "Stephanie Ruscigno" <slruscigno@gmail.com>, "Sarvjit Sangha" <coldaqua01@yahoo.com>, "Gabrial Singh" <usafarm@jps.net>, "Paul Singh" <butter2000p@aol.com>, "Chuck Smith" <chucksmith57@hotmail.com>, "Leo and Marilyn Speth" <lfspeth@sbcglobal.net>, "Robert and Pam Stark" <stark@otnusa.com>, "Sarb Takhar" <sarb@sarb.com>, "Larry and Carla Virga" <emu@syix.com>, "Gregor Blackburn" <gregor.blackburn@dhs.gov>, "Bill Edgar" <bille@eanda.org>, "Kim Floyd" <kim@floydcommunications.com>, "Bill Hampton" <ld1@syix.com>, "Kimberly Hoover" <khoover@sutterbutteflood.org>, "Carlos Lazo" <carlos.j.lazo@usace.army.mil>, "Sean Minard" <sminard@mhm-inc.com>, "Al Montna" <almontna@montnafarms.com>, "Duane Oliveira" <duane@theoliveiralawfirm.com>, "Dan Peterson" <dwpeterson@co.sutter.ca.us>, "Michael Picker" <picker@lincolncrow.com>, "Scott Rice" <srice@water.ca.gov>, "Jeff Twitchell" <jtwitchell@geiconsultants.com>, "Steve Yuhas" <stephen.m.yuhas@usace.army.mil>, "Tyler Stalker" <tyler.m.stalker@usace.army.mil>, "Ron Southard" <ronald_southard@sbcglobal.net>, "Sally Serger" <sallyserger@yahoo.com>
Date: Monday, January 10, 2011, 3:26 PM

It seems likely that Oji Brothers might have their names, at least the ones from the Shanghai Bend crew.

Date: Fri, 7 Jan 2011 16:32:51 -0800
From: rlf@syix.com
To: nelsonanthoine@sbcglobal.net; leeann@syix.com; jeetbaj@hotmail.com; edbaur@sbcglobal.net; bonhamcpa@citlink.net; d.boundy@comcast.net; boyerkar@syix.com; frypanman@excite.com; fecoats@msn.com; misuzinca1@juno.com; dancucchi@yahoo.com; bob@kubaradio.com; mikeagle@yahoo.com; ndhaliwal@sbcglobal.net; brooklyngeek@yahoo.com; geitner@comcast.net; maxineelliott1695@yahoo.com; dfales@live.com; daringale@hotmail.com; jmgallagher21@hotmail.com; b.bilingual@syix.com; vongeldern_ric@sbcglobal.net; agebb@appealdemocrat.com; hatamiyas@yahoo.com; rayjanssen@comcast.net; meccacol@comcast.net; cinnamongirls@sbcglobal.net; rob.klotz@yahoo.com; rlahue@appealdemocrat.com; hyune@appealdemocrat.com; blevake@syix.com; jlevine@c21selectgroup.com; rlibby@syix.com; tejmaan@hotmail.com; rmackensen@sbcglobal.net; marymay2@sbcglobal.net; dmeli1@comcast.net; ericbmeyers@cs.com; elaine.miles@att.net; chucknpat@comcast.net; rrnels1@aol.com; mnewkom@yahoo.com; hparassr@hotmail.com; kpatcal@yahoo.com; ron859@succeed.net; joanwood@earthlink.net; slruscigno@gmail.com; coldaqua01@yahoo.com; usafarm@jps.net; butter2000p@aol.com; chucksmith57@hotmail.com; lfspeth@sbcglobal.net; stark@otnusa.com; sarb@sarb.com; emu@syix.com; gregor.blackburn@dhs.gov; BillE@eanda.org; kim@floydcommunications.com; Ld1@syix.com;

khoover@sutterbutteflood.org; carlos.j.lazo@usace.army.mil; sminard@mhm-inc.com; almontna@montnafarms.com; duane@theoliveiralawfirm.com; dwpeterson@co.sutter.ca.us; Picker@lincolncrow.com; srice@water.ca.gov; jtwitchell@geiconsultants.com; stephen.m.yuhas@usace.army.mil; Tyler.M.Stalker@usace.army.mil; ronald_southard@sbcglobal.net; sallyserger@yahoo.com
Subject: Additional deaths in 1955 flood

Additional unreported deaths in the Yuba City 1955 flood
by Roberta Fletcher

News reports state that thirty-eight people died in the Yuba City 1955 flood. What has not been reported is that many more lives were lost when the levee broke at Shanghai Bend on the Feather River. Burwell Ullrey, Sutter County Coroner at the time, documented thirty-eight flood-related deaths in Sutter County. The deaths of the men who were working on top of the levee at Shanghai Bend where it broke are not documented and are not included in the official count. This is Sutter County history that has never been made public.

In 1955 there were Mexican farm workers at Shanghai Bend and they died when the levee broke. It may seem hard for some people to believe that the deaths were not publicly reported and documented. But the 1950's were before the Civil Rights Movement and apparently no one in authority made the effort to document the deaths. It was easier at the time to just bury them and move on. We accepted the decisions that those in authority made. I believe there was no "conspiracy". It was just that people didn't talk about it.

My sources of information include:

Robert Fletcher (my husband) was volunteering on the levee at Shanghai Bend that night along with my father, Irving Pearce. My father worked a little farther down the levee with the English speaking people. Bob worked with the Mexicans because he knew a little Spanish. He said that Oji farms brought two bus-loads of "green card" Mexicans to work on the levee. He and my father left just before the levee broke. My husband always wondered what happened to the Mexicans.

Gabrial Singh's father and uncles were working that night down the levee from the Mexicans. When the levee broke they could hear the screams of the Mexican workers as they were being washed away.

Elaine Miles's father, after the flood, was working under the 5th Street Bridge. There were several bodies and by the way they were dressed he assumed they were Mexicans. They covered them with concrete.

Ben Mueck was a mechanic for Oji farms at the time and he verified the story of the farm workers.

A booklet on the 1955 flood that was written a year later by a person from the LDS church mentions buses and asks the question about who may have died.

Gerald Arnoldy said that the body of a Mexican worker was in a friend's swimming pool.

Jim Kimerer said his grandmother saw dead Mexicans in trees on Carlson Road. They apparently were washed down Gilsizer Slough. I asked him what happened to their bodies and he doesn't know.

I would like for those workers to be remembered for sacrificing their lives trying to keep the Feather River inside the levee. They will probably never be individually identified, but I want people to know the history.

Roberta Fletcher

From: Francis Coats [mailto:fecoats@msn.com]
Sent: Tuesday, July 05, 2011 9:25 AM
To: Norgaard, Ingrid; Matthew G. Davis
Subject: West (right descending bank) Feather River Levee and Sacramento side, Sutter County Levee project.

Please include me in all notices and disributions under CEQA and NEPA

Francis E. Coats, 3392 Caminito Avenue, Yuba City, CA 95991 (530) 701-6116, fecoats@msn.com

Please figure out and let us know the legal basis for the construction or improvement of levees, on each segment of levee, and include this in the documents.

Please figure out and let us know the extent to which the levee districts are obligated to provide for cross-levee access for private owners and the public; and, the extent to which the levee districts have a right to exclude underlying owners, owners of land on the wet side of the levee, and the public, from being on or crossing the levees.

So far as I know, the levee districts bought right-of-way for levees in the 1880 - 1900 era; and then, a another Valley wide entity bought right-of-way in the 1930's and 1940's.

Particlulary the first generation of acquisitions may not be where the levee sits today. Some of these are mere easements, allowing the construction and maintenance of the levee, but not granting the right to exclude other users. Also, though some of the first generation of deeds may appear to grant the whole ownership of the land, the courts may believe that these are still merely easements.

Most of the second generation documents are clearly on their faces merely easements, not authorizing the grantee to exclude anyone else. It seems likely that the larger entity does have real property records that would be of help in figuring out what the rights are relative to the land and the levee.

My experience with Levee District One is that they say they do not have real property records reflecting the acquisition and ownership of levees, although they assume they own the levee and have a right to exclude the public from travelling across or along the levee.
However, they say they have no records, so they really don't have any idea. I identified, say 30 deeds into LD1 between 1870 and 1906, and these seem to correspond to the published county tax maps, particularly Pennngton (1873??) and Punnett (1895). The records are there and accessible, but some one needs to work them up and do the necessary legal research to see what the effects of those documents are.

The county does not tax land under the levee, on the theory that it is close to worthless, so tax records are not much help in figuring out who owns the land the levee sits on.

As part of the planning process, please address the question of who owns the segments of land the levee sit on, on what basis the levee district claims the right to maintain a levee on each segment, to what extent the levee district may have the right to exclude land-owners and members of the public, to what extent it is the burden of the levee district to build and maintain ramps to allow private owners or the public to cross the levee.

I imagine this come out to a series of reference map identifying the location of each tract and cross eferenced to the instrument creating it, with an evaluation of the effect of the document - what rights granted, what rights retained.

Also, a discussion of the legal effect of the documents and general law on whether levee deeds are read

as fee grants or mere easements; who is obligated to maintain ramps providng access across the levee; under what circumstances might the levee district be obligated to construct or maintain a ramp; when may the levee district exclude the underlying owner, owners inside the levee, or the public from crossing the levee.

Also, within human memory, the tops of the levees were open for use apparently as public roads. What happened to rights which might have existed by dedication, grant, or county road action?

Francis E. Coats, 3392 Caminito Avenue, Yuba City, CA 95991 (530) 701-6116, fecoats@msn.com

This would involve both work in the county real property records, and any records held by the levee districts and or the other greater entity that took title to lots of levee land in the 1930s and 1940s. the creation of a map showing the segments of levee right of way acquired and relating them to recorded documents. Evaluation of the documents for legal effect. Legal research to come up with an opinion of the legal effect of the documents.

State of California -The Resources Agency
DEPARTMENT OF FISH AND GAME
1701 Nimbus Road, Suite A
Rancho Cordova, CA 95670
(916) 358-2900
http://www.dfg.ca.gov

EDMUND G. BROWN, Jr. Governor
JOHN McCAMMAN, Director

July 26, 2011

Ingrid Norgaard, Project Manager
Sutter Butte Flood Control Agency
c/o ICF International
630 K Street, Suite 400
Sacramento, CA 95814

Matt Davis, Environmental Resources Branch
Sacramento District
U.S. Army Corps of Engineers
1325 J Street
Sacramento, CA 95814

Dear Ms. Norgaard and Mr. Davis:

The Department of Fish and Game (DFG) has reviewed the Notices of Preparation (NOPs) and associated materials for the Sutter Basin and Feather River West Levee Projects (Projects) to be prepared pursuant to the California Environmental Quality Act (CEQA). Environmental Impact Statement/Environmental Impact Reports (EIS/EIRs) will be prepared for the Projects by the Sutter Butte Flood Control Agency (SBFCA) and the U.S. Army Corps of Engineers (USACE) to evaluate structural and non-structural flood-risk-management measures and address levee deficiencies in the Feather River's west levee. Because the Projects are being studied in coordination due to similar study areas, purpose, potential improvements, effects, and parties involved, the DFG has prepared this letter to comment on both Projects. The DFG appreciates the opportunity to provide initial comments on the Projects, and thanks SBFCA and USACE for granting the DFG's request for additional time to comment pursuant to CEQA Guidelines Section 15103.

The study area for the Projects is located in Butte and Sutter Counties, and encompasses approximately 285 square miles roughly bounded by the Feather River to the East; Sutter Bypass, Sutter Buttes, Wadsworth Canal to the West; and Cherokee Canal and Thermalito Afterbay to the North (study area). The Projects' purposes include evaluating structural and non-structural flood-risk-management measures including re-operation of existing reservoirs; improvements to existing levees; construction of new levees; and other storage, conveyance, and non-structural options. Flood waters potentially threatening the study area originate from the Feather River watershed and/or the upper Sacramento River watershed above Colusa Weir. The study area is essentially encircled by project levees and the high ground of Sutter Buttes. Geotechnical analysis and historical performance during past floods indicate that levees are at risk of failure due to underseepage and through-levee seepage.

Activities from the Projects may have significant impacts to fisheries, wildlife, habitats (both in natural and restoration areas), and to DFG lands which provide hunting, fishing, and other public use opportunities. The DFG is able to provide the recommendations included below based on the information provided in the NOPs and associated materials, and an understanding of the natural resources in the study area. The DFG would like to emphasize the critical importance of coordination with the DFG during the CEQA and regulatory processes and asks that SBFCA and USACE evaluate the DFG's comments closely to ensure that impacts are avoided, minimized and mitigated pursuant to CEQA and the appropriate regulations and statutes.

DFG's Authority

These initial comments are submitted under the DFG's authority as Trustee Agency with regard to the fish and wildlife of the State of California, designated rare or endangered native plants, game refuges, ecological reserves, and other areas administered by the DFG (CEQA Guidelines § 15386, subd. (a)). In addition, the DFG will likely be a Responsible Agency with regards to the Projects due to its discretionary approval power pursuant to the California Endangered Species Act (CESA) and/or Section 1603 of the Fish and Game Code (CEQA Guidelines § 15381). The DFG is also commenting as a landowner and conservation easement holder within the study area for the Projects.

CESA Species

The DFG has regulatory authority pursuant to CESA over projects that will result in the take[1] of any species of wildlife designated by the California Fish and Game Commission as an endangered, threatened, or candidate species. Based upon a preliminary review, the DFG has identified several such species with potential to occur within the study area that may be affected by the Projects. These species include giant garter snake (*Thamnophis gigas*), bank swallow (*Riparia riparia*), Swainson's hawk (*Buteo swainsoni*), and other species listed in the attachment to this letter. Take of species protected pursuant to CESA is prohibited (Fish and Game Code § 2080). The DFG, however, may authorize the take of these species by permit if the conditions set forth in Fish and Game Code Section 2081, subdivisions (b) and (c) are met. (See also Cal. Code Regs., tit. 14, § 783.4). If the Projects could result in the take of any species protected pursuant to CESA, an incidental take permit issued by the DFG should be obtained before the take can occur. If the DFG will issue an incidental take permit, the DFG must rely on the EIS/EIRs as prepared by SBFCA and USACE to prepare and issue its own findings regarding the Projects (CEQA Guidelines §§15096 and 15381). The DFG will use the EIS/EIRs if they adequately address the effects of those project activities which the DFG is required by law to carry out or approve.

If a CESA incidental take permit will be sought from the DFG for the Project(s), the DFG will require the EIS/EIRs to contain a detailed analysis of the take and other potential

[1]Pursuant to Fish and Game Code section 86, "'Take' means hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture or kill."

impacts to the species and its habitat, acreage of habitat affected or potentially affected, avoidance and minimization measures that will be implemented, and a detailed description of the mitigation measures that will be performed to reduce impacts to a level of less than significant and fully mitigate the impacts pursuant to CESA.

The DFG may only issue an incidental take permit if it is determined that impacts associated with the authorized take of the species are minimized, fully mitigated, and that adequate funding has been ensured to implement the mitigation measures (Fish and Game Code § 2081(b)(2) and (4)). Because take must be fully mitigated pursuant to CESA, a standard that is higher than the less than significance standard of CEQA, and because funding must be ensured to DFG standards for the minimization and full mitigation measures, the DFG suggests that if take will occur, SBFCA begin to examine and discuss potential strategies to fully mitigate and ensure adequate funding with the DFG now. The EIS/EIRs should include a discussion of the measures that will be required to minimize, fully mitigate and ensure adequate funding pursuant to CESA. The DFG must also determine that issuance of an incidental take permit will not jeopardize the continued existence of a CESA-listed species. The DFG will make this determination based on the best scientific information available and shall include consideration of the species capability to survive and reproduce, including the species known population trends and known threats to the species. The DFG requests that the EIS/EIRs include scientific information sufficient to justify such a determination if necessary.

Regardless of whether take of CESA-listed species is anticipated to occur or not, the EIS/EIRs should provide a comprehensive discussion of all CESA-listed species with a potential to be impacted by the Projects, their habitat, and a discussion of all species-specific mitigation measures that will reduce impacts to CESA-listed species and their habitat to below the level of significance. Any activity resulting in loss of habitat, decreased reproductive success, or other negative effects on population levels of species protected pursuant to CESA should be addressed. The DFG requests that sufficient technical data, thresholds of significance, best management practices, and similar information be included in the EIS/EIRs to permit a full assessment of all significant environmental impacts (CEQA Guidelines § 15147). Because the study area for the Projects is large, the DFG requests that the EIS/EIRs carefully examine the cumulative and landscape-level effects to CESA-listed species that may occur as a result of changes over such a broad landscape. General and specific plans, regional or local land management plans, as well as other closely related past, present, and reasonably foreseeable probable future projects, should be analyzed relative to their impacts on plant and animal communities, wildlife habitats and corridor use in the Sacramento Valley (CEQA Guidelines § 15130). The DFG also requests a careful examination of how the Projects may affect CESA-listed species dispersal in connection with the natural and artificial barriers in the study area. This analysis should include a discussion of adjacent habitats outside of the study area that support or could support species protected pursuant to CESA that may be impacted as a result of the Projects.

Giant Garter Snake

Giant garter snake is designated as threatened pursuant to CESA and occurs throughout the study area. Giant garter snake utilizes habitats associated with waterways and levees that may be directly altered by the Projects. The EIS/EIRs should include a detailed and careful discussion of the potential effects of the Projects on giant garter snake, particularly from any kind of vegetation removal, ground disturbing activities, temporary and permanent loss of habitat, changes in baseline conditions, and other forms of disturbance. The EIS/EIRs should include mitigation measures that will reduce these potential impacts to giant garter snake to below a level of significance. In addition, if take of giant garter snake is expected to occur as a result of the Projects, the EIS/EIRs should include an analysis of appropriate full mitigation measures, including, if necessary, measures to permanently protect and perpetually manage compensatory habitat. The DFG suggests that SBFCA and USACE begin examining locations that would be appropriate for giant garter snake mitigation.

Bank Swallow

Bank swallow is designated as threatened pursuant to CESA and occurs in the study area. Bank swallow utilizes naturally eroded river banks for nesting. Any loss of bank swallow nesting habitat could be considered a potentially significant impact pursuant to CEQA. The EIS/EIRs should identify all areas of existing and potential bank swallow nesting habitat that has the potential to be affected by the Projects. The EIS/EIRs should identify the Projects' potential impacts to bank swallow, and include mitigation measures that reduce these impacts to below a level of significance.

Swainson's Hawk

Swainson's hawk is designated as threatened pursuant to CESA and occurs throughout the study area. Swainson's hawk often utilizes trees in riparian areas for nesting and open landscapes for foraging. The DFG is concerned with potential impacts to raptor nesting behavior as a result of the Projects' activities, and potential loss of foraging and nesting habitat. The Projects' activities could potentially result in significant impacts to nesting raptors including nest abandonment, starvation of young, and/or reduced health and vigor of eggs or nestlings that could result in death. The EIS/EIRs should identify the Projects' potential impacts to Swainson's hawk, and include mitigation measures that reduce these impacts to below a level of significance, and fully mitigate them if necessary.

Chinook Salmon

The Feather River is located adjacent to the eastern border of the study area. The Feather River supports several fish species that utilize the river for immigration, emigration, spawning and/or rearing. These fish species include runs of Chinook salmon (*Oncorhynchus tshawytscha*). Winter-run Chinook salmon is designated as endangered and Spring-run Chinook salmon is designated as threatened pursuant to

CESA. The EIS/EIRs should analyze any potential impacts to these species that may occur as a result of the Projects, and include mitigation measures that reduce these impacts to below a level of significance.

Threatened and Endangered Plants

The EIS/EIRs should include a full impact assessment for plants that are designated as threatened or endangered pursuant to CESA and have the potential to occur in the study area. Numerous vernal pool endemic plant species that are protected pursuant to CESA are known to occur in the study area. The EIS/EIRs should evaluate, but not limit its evaluation, to impacts to the plant species included in the attachment to this letter. The EIS/EIRs should analyze any potential impacts to CESA-listed species that may occur as a result of the Projects, and include mitigation measures that reduce these impacts to below a level of significance.

Other Species Considerations

The regional setting and baseline habitat conditions are critical to an assessment of environmental impacts of the Projects. Therefore the EIS/EIRs should place special emphasis on describing and identifying the locations of existing resources within the study area that are rare or unique (CEQA Guidelines, § 15125 (a)).

The DFG recommends that appropriate surveys be conducted for CESA-listed and other species using standard protocols at the time of year when the species are both evident and identifiable. Field surveys should be scheduled to coincide with the appropriate breeding or other life history stages of animals, when they are likely to be evident. Full floristic surveys should be conducted for any parts of the study area where ground disturbance will occur or where significant changes such as new inundation will occur. Surveys should be scheduled to coincide with peak flowering periods and/or during periods of phonological development that are necessary to identify the plant species. A list of all plant and animal species encountered should be included with the EIS/EIRs.

In addition to species that are protected pursuant to CESA, the EIS/EIRs should evaluate in a similar manner impacts to species that are protected pursuant to other State or federal statutes or regulations, or that may otherwise be considered rare, endangered, or sensitive. This includes an evaluation of impacts to species protected pursuant to the federal endangered species act (16 U.S.C. § 1531)(ESA), plants that are listed with a California Rare Plant Rank, animals listed as a DFG species of special concern, birds of prey (Fish and Game Code § 3503.5), eagles (16 U.S.C. 668-668c), migratory birds (16 U.S.C. 703-712), species listed in the Fish and Game Code as fully protected (Fish and Game Code §§ 3511, 4700, 5050, and 5515), bird nests and eggs including heron rookeries (Fish and Game Code § 3503), and any species that meets the standard in Section 15380 of the CEQA Guidelines. The DFG suggests that the EIS/EIRs include separate thresholds of significance for each of the different species designations listed above that may be impacted by the Projects. The EIS/EIRs should also consider potentially significant cumulative impacts to other species in a manner similar to that described for CESA-listed species above.

Lake or Streambed Alteration Agreement

Pursuant to Section 1602(a) of the Fish and Game Code an entity may not substantially divert or obstruct the natural flow of, or substantially change or use any material from the bed, channel, or bank of, any river, stream, or lake, or deposit or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake unless the DFG receives written notification beforehand. If the activity may substantially adversely affect an existing fish or wildlife resource then an agreement with the DFG will be required which includes reasonable measures necessary to protect the resource. In general, potentially significant impacts to the environment that should be addressed pursuant to CEQA result whenever a project involves work undertaken in or near a river, stream, or lake that flows at least intermittently through a bed or channel, including ephemeral streams and water courses. Due to the nature of the Projects, the DFG anticipates that a Lake and Streambed Alteration Agreement (LSAA) will be required for the Projects. If DFG will issue an LSAA, the DFG must rely on the EIS/EIRs as prepared by SBFCA and USACE to prepare and issue its own findings regarding the Projects (CEQA Guidelines §15096 and 15381). The DFG will use the EIS/EIRs if they adequately address the effects of those project activities which the DFG is required by law to carry out or approve.

If a LSAA will be sought from the DFG pursuant to Section 1600 et seq. of the Fish and Game Code, the DFG requests that the EIS/EIRs contain specific and detailed descriptions of all fish[2] and wildlife[3] resources that may be substantially adversely affected by any alteration in the bed, channel, bank, natural flow, and the measures necessary to protect them. The EIS/EIRs should delineate and identify seasonally and permanently wetted channels, sloughs, depressions, ponds, etc. that will be filled and/or modified as a result of the Projects. These areas should be quantified by existing habitat type, management strategies and constraints, species presence, and ownership and/or agency responsible for the management and maintenance of the parcel. The DFG requests that the description and protection measures in the EIS/EIRs be supported by scientific information.

The Feather River EIP Preliminary Identification/Design Report (Kleinfelder 2009) states on page 85 Section 5.18.7 in the third mitigation proposal that the backfilling of a pond could be a solution to reducing levee permeability. If this is considered to be an option, the EIS/EIRs should identify the ponds proposed for filling and the measures that will be required to reduce such an impact to below a level of significance.

Other Habitat Considerations

In addition to potential impacts to the bed, channel, or bank of rivers, streams, or lakes, the Projects could also result in potentially significant impacts to associated riparian habitat and wetlands. The DFG recommends that the Projects be designed to avoid

[2]Pursuant to Fish and Game Code section 45, "'Fish' means wild fish, mollusks, crustaceans, invertebrates, or amphibians, including in part, spawn, or ova thereof."

[3]Pursuant to Fish and Game Code section 711.2(a), "'Wildlife' means and includes all wild animals, birds, plants, fish, amphibians, reptiles, and related ecological communities, including the habitat upon which the wildlife depends for its continued viability."

impacts to wetlands and riparian habitat as much as possible. Mitigation should be provided for unavoidable impacts to wetland and riparian habitat based upon the concept of no net loss of habitat values or acreage.

The EIS/EIRs should identify where any fill material (borrow) will come from, including who owns the property and/or mineral rights for the extraction, who will have management responsibility for borrow areas, and the management purpose of borrow area properties. The EIS/EIRs should quantify the number of old growth riparian trees that may be removed and or impacted by the Projects, and include appropriate mitigation.

The Projects may also contribute to habitat fragmentation and isolation of plant and animal populations. The EIS/EIRs should identify areas where habitat fragmentation or isolation of populations may occur as a result of the Projects, and discuss alternatives or potentially feasible mitigation measures that will avoid or substantially lessen these potential impacts to less than significant levels. Existing wildlife corridors and movement areas should be maintained, and access to undisturbed habitat in adjacent areas, should be provided or maintained. The EIS/EIRs should also analyze project impacts relative to their effects on off-site habitats, and populations. This should include nearby public lands, open space, adjacent natural habitats and riparian ecosystems.

Due to the collective changes to riparian and aquatic ecosystems brought about by agriculture, urbanization, flood risk management and water supply infrastructure, every opportunity to restore and protect existing natural resources should be taken whenever changes in these systems are being contemplated. Potential ecosystem restoration measures include restoration of floodplain function and habitat, and conserving lands with habitat connected to other protected lands. When considering how to mitigate for any potential impacts that could result from the Projects, the DFG encourages SBFCA and USACE to consider broader conservation efforts and goals in the area.

The EIS/EIRs should contain an evaluation of the Projects' consistency with applicable land use plans, such as General Plans, Specific Plans, Watershed Master Plans, and Habitat Conservation Plans, that are established or under development in the study area. The EIS/EIRs should also contain current information regarding any previous reports of sensitive species and habitats including Significant Natural Areas (Section 1930 et seq. of the Fish and Game Code), Significant Ecological Areas, or Environmentally Sensitive Habitat Areas that have been identified near or adjacent to the study area.

DFG Lands, Restoration Efforts and Public Use

The DFG strives to maintain and enhance hunting, fishing and other appropriate public use opportunities throughout the study area. The DFG owns and manages several wildlife and fishing access areas within the study area including the Feather River Wildlife Area (Nelson Slough, Lake of the Woods, O'Connor Lakes, Abbott Lake, and Shanghai Bend), Oroville Wildlife Area, Sutter Bypass, and Gray Lodge Wildlife Area.

These areas provide recreation opportunities (hunting, fishing, wildlife observation, etc.) and access points for the public. Some of these lands are areas that have been restored (especially along the Feather River), and are areas where creation and preservation of habitat is especially important.

The DFG considers impacts to lands owned or managed by the DFG and to public use opportunities to be potentially significant biological and recreational impacts. The DFG requests that the EIS/EIRs fully address potentially significant impacts to DFG lands and public use and recreation, and include appropriate measures to reduce such impacts to less than significant.

The routes and impact areas of the Projects should be clearly defined in the EIS/EIRs to fully evaluate potentially significant impacts. In Figure 2: "Feather River West Levee Project Study Area", the "Levees Proposed for Improvement" alignment shows the levee route approaching the Feather River and cutting through the southern portion of the Oroville Wildlife Area. The DFG is concerned with possible significant impacts to the Oroville Wildlife Area. The current flood control levee passes to the west of the Oroville Wildlife Area boundary. Any proposed new alignment of the levee system through a Wildlife Area should be discussed with the DFG extensively.

The EIS/EIRs should also identify and quantify the cumulative and other impacts of the Projects on existing restoration efforts, and habitats within inundation zones and floodplains that could potentially be impacted by the Projects.

SBFCA and USACE should work with the DFG to ensure that the Projects are consistent with the current efforts to restore floodplain connectivity and habitat corridors, and do not conflict with or inhibit existing restoration projects (e.g. at O'Connor Lakes, Gray Lodge), Management Plans or the goals of the overall Lower Feather River Corridor Management Strategy.

In addition, the Projects should be planned to avoid effects to existing DFG private lands conservation programs such as The California Waterfowl Habitat Program. This program is one of the few incentive based programs that provide private landowners with technical assistance and financial incentives to manage wetland habitat in a specific way for 10 years, and an easement program where landowners are required to follow a cooperatively developed wetland management plan.

SBFCA and USACE should identify lands subject to conservation easements in the study area and ensure that the Projects are implemented consistent with the conservation easement terms.

Other Considerations

The EIS/EIRs should identify clear windows of construction and other measures that will minimize impacts to wildlife as well as the recreating public.

In order to comply with Public Resources Code Section 21081.6, detailed monitoring programs should be developed for all mitigation measures required in the EIS/EIRs

relevant to DFG's jurisdiction. The monitoring programs should include specific criteria to measure effectiveness of mitigation measures, clear timelines for implementation, identification of responsible parties, annual monitoring of restored areas or mitigation lands if applicable, performance criteria for the mitigation measures, and annual monitoring reports submitted to the lead agency and the DFG which include corrective recommendations that shall be implemented in order to ensure that mitigation efforts are successful.

The EIS/EIRs will also be subject to CEQA filing fees pursuant to Fish and Game Code Section 711.4, which must be paid at the time the Notices of Determination for the final EIS/EIRs are filed.

If you have any questions regarding this letter please contact Jeb Bjerke, Environmental Scientist, at jbjerke@dfg.ca.gov or (916) 358-2956.

Sincerely,

Kent A. Smith
Regional Manager

Attachment

ec: Laura Whitney
United States Army Corps of Engineers

Tina Bartlett
Jeff Drongensen
Jennifer Navicky
Jeb Bjerke
Department of Fish and Game

Attachment

The DFG requests that the EIS/EIRs include, but not be limited to analyzing potentially significant impacts to the following species:

Scientific Name	Common Name
Plants	
Astragalus tener var. *ferrisiae*	Ferris' milk-vetch
Atriplex cordulata	heartscale
Atriplex minuscula	lesser saltscale
Atriplex subtilis	subtle orache
Balsamorhiza macrolepis var. *macrolepis*	big-scale balsamroot
Brasenia schreberi	watershield
California macrophylla	round-leaved filaree
Castilleja rubicundula ssp. *rubicundula*	pink creamsacs
Centromadia parryi ssp. *parryi*	pappose tarplant
Chamaesyce hooveri	Hoover's spurge
Clarkia biloba ssp. *brandegeeae*	Brandegee's clarkia
Delphinium recurvatum	recurved larkspur
Downingia pusilla	dwarf downingia
Fritillaria pluriflora	adobe-lily
Hibiscus lasiocarpos var. *occidentalis*	woolly rose-mallow
Juncus leiospermus var. *ahartii*	Ahart's dwarf rush
Juncus leiospermus var. *leiospermus*	Red Bluff dwarf rush
Layia septentrionalis	Colusa layia
Legenere limosa	legenere
Limnanthes floccosa ssp. *californica*	Butte County meadowfoam
Monardella douglasii ssp. *venosa*	veiny monardella
Navarretia leucocephala ssp. *bakeri*	Baker's navarretia
Neostapfia colusana	Colusa grass
Orcuttia pilosa	hairy Orcutt grass
Orcuttia tenuis	slender Orcutt grass
Paronychia ahartii	Ahart's paronychia
Pseudobahia bahiifolia	Hartweg's golden sunburst
Sagittaria sanfordii	Sanford's arrowhead
Silene verecunda ssp. *Verecunda*	San Francisco campion
Trichocoronis wrightii var. *wrightii*	Wright's trichocoronis
Trifolium jokerstii	Butte County golden clover
Tuctoria greenei	Greene's tuctoria
Wolffia brasiliensis	Brazilian watermeal
Animals	
Acipenser medirostris	green sturgeon
Agelaius tricolor	tricolored blackbird
Ambystoma californiense	California tiger salamander
Antrozous pallidus	pallid bat
Athene cunicularia	burrowing owl
Branchinecta lynchi	vernal pool fairy shrimp
Branta hutchinsii leucopareia	cackling goose

Buteo swainsoni	Swainson's hawk
Charadrius montanus	mountain plover
Circus cyaneus	northern harrier
Coccyzus americanus occidentalis	western yellow-billed cuckoo
Dendroica petechia brewsteri	yellow warbler
Desmocerus californicus dimorphus	Valley elderberry longhorn beetle
Dipodomys californicus eximius	Marysville California kangaroo rat
Elanus leucurus	white-tailed kite
Emys marmorata	western pond turtle
Eumops perotis californicus	western mastiff bat
Grus canadensis tabida	greater sandhill crane
Haliaeetus leucocephalus	bald eagle
Lampetra ayresii	river lamprey
Lanius ludovicianus	loggerhead shrike
Lasiurus blossevillii	western red bat
Laterallus jamaicensis coturniculus	California black rail
Lepidurus packardi	vernal pool tadpole shrimp
Mylopharodon conocephalus	hardhead
Oncorhynchus mykiss irideus	steelhead
Oncorhynchus tshawytscha	chinook salmon
Riparia riparia	bank swallow
Spea hammondii	western spadefoot
Taxidea taxus	American badger
Thamnophis gigas	giant garter snake

-----Original Message-----
From: David Neubert [mailto:dcneubert@gmail.com]
Sent: Tuesday, July 05, 2011 4:35 PM
To: Davis, Matthew G SPK
Subject: Sutter Basin and Feather River West Levee Project - Scoping Meeting Comments

Matthew,

The following are my comments on the 28 June Scoping Meeting that I attended in Gridley, CA, in regards to the Sutter Basin and Feather River West Levee Project.

First, let me say that I am encouraged that the Corps and its partners value the input of local citizens in the project area, and are considering ways to optimize both flood safety and riparian ecosystems under the two new projects.

Regarding the presentation given on the 28th, I (along with other citizens I talked with) found it to be rather vague and lacking enough detail for the audience to generate questions from. The opaque nature of the presentation did not help the people understand what the Corps is planning in the project areas, and what the various options are. In the future, it would be better if the Corps (or its consultants) actually presented ideas on the types of activities that are being planned. For example, the Corps could identify areas where levee setbacks may occur, identify areas where riparian habitat can be improved and conserved, identify areas where levees are weak or strong and specific actions that might take place at weak sites to remedy problems.
The format used at the Gridley meeting was probably not worth the time and money invested.

Following the presentation, I spoke with one of the consultants employed by the Corps (or one of its partners). I asked the consultant specifically where levee setbacks may occur on the Feather River West project. He said that there were four possible sites or sites under consideration. One of them (as I recall) was in Butte County near Almond Avenue. A second area identified was at the confluence of the Feather River and the Sutter Bypass (just south of Sacramento Avenue, Sutter County).

As a resident of south Sutter County, I would support any levee setback near the confluence of the Feather River and Sutter Bypass. By creating a wider floodplain in this area, I would think that peak flood levels could be reduced along the Nicolaus Reach. It is my understanding that this is one of the most flood-threatened reaches of the Feather River at the current time.
I hope the Corps aggressively researches the development of a levee setback area near the confluence. This land is currently only in agriculture and the Corps could minimize land acquisition costs by simply utilizing a flood easement rather than land purchase if the levee is moved north to widen the flood plan.

I look forward to seeing hydraulic models and your other findings of levee setback options and costs as they are developed.

Regards,
David Neubert

Classification: UNCLASSIFIED
Caveats: NONE

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June 29, 2011

File Ref: SCH #2011052062

Ingrid Norgaard
Sutter Butte Flood Control Agency
c/o ICF International
630 K Street
Sacramento, CA 95814

Subject: Notice of Preparation (NOP) for a Joint Environment Impact Report (EIR)/Environmental Impact Statement (EIS) for the Feather River West Levee Project, Sutter and Butte Counties

Dear Ms. Norgaard:

Staff of the California State Lands Commission (CSLC) have reviewed the subject NOP for a joint EIR/EIS for the Feather River West Levee Project (FRWLP or Project), which is being prepared by the U.S. Army Corps of Engineers (USACE) as the federal lead agency under the National Environmental Policy Act (NEPA) (42 United States Code [U.S.C.] § 4321 et seq.) and the Sutter Butte Flood Control Agency (SBFCA) as the state lead agency under the California Environmental Quality Act (CEQA) (Public Resources Code [PRC] § 21000 et seq.).

The FRWLP is being sponsored by the SBFCA and Central Valley Flood Protection Board (CVFPB) as a locally driven flood risk reduction project. USACE has authority through the Rivers and Harbors Act of 1899 (as amended) over modifications to federal flood control project levees, and any such alterations proposed by SBFCA are subject to approval by USACE.

The FRWLP is being studied in close coordination with the Sutter Basin Feasibility Study (SBFS), a separate but related project, because the FRWLP and the SBFS at least partially overlap in their study areas, purpose, potential improvements, potential effects, and involved parties.

The CSLC has prepared these comments as a trustee and responsible agency because of its trust responsibility for projects that could directly or indirectly affect sovereign lands, their accompanying Public Trust resources or uses, and the public easement in navigable waters.

CSLC Jurisdiction

The CSLC has jurisdiction and management authority over all ungranted tidelands, submerged lands, and the beds of navigable rivers, sloughs, lakes, etc. The CSLC has certain residual and review authority for tide and submerged lands legislatively granted in trust to local jurisdictions (PRC § 6301, § 6306). All tide and submerged lands, granted or ungranted, as well as navigable rivers, sloughs, etc., are impressed with the Common Law Public Trust.

As general background, the State of California acquired sovereign ownership of all tidelands and submerged lands and beds of navigable waterways upon its admission to the United States in 1850. The State holds these lands for the benefit of all people of the State for statewide Public Trust purposes, which include waterborne commerce, navigation, fisheries, water-related recreation, habitat preservation and open space. On tidal waterways, the State's sovereign fee ownership extends landward to the mean high tide line, except for fill or artificial accretion. On navigable non-tidal waterways, the State holds fee ownership of the bed landward to the ordinary low water mark and a Public Trust easement landward to the ordinary high water mark. Such boundaries may not be readily apparent from present day site inspections.

The location of the proposed Project may involve sovereign land in the Feather River under the jurisdiction of the Commission. However, information submitted in the NOP is insufficient for CSLC staff to determine the extent and location of the Project with respect to sovereign ownership interests of the State. We request that as the Project proceeds, the SBFCA submit additional information (e.g., detailed maps) to enable CLSC staff to determine if any components of the Project will require a lease or permit. We additionally request to be placed on any future distribution mailing list for the Project.

Proposed Project

The SBFCA proposes the FRWLP under the California Department of Water Resources (DWR) Early Implementation Program (EIP) to expeditiously complete flood risk reduction measures in advance of the Sutter Basin Project.

SPFCA is planning the FRWLP to address levee deficiencies in the west levee of the Feather River between Thermolito Afterbay and the Feather River/Sutter Bypass confluence to meet federal, state and local flood protection criteria and goals. Primary deficiencies of the levee include:

- through-seepage;
- under-seepage; and
- embankment instability (overly steepened slopes).

Alternatives considered for addressing levee deficiencies may include measures such as:

- slurry cut-off walls;
- seepage berms;
- stability berms;
- internal drains;
- relief wells;
- sheet-pile walls;
- slope flattening; and
- potential new levee alignments.

Environmental Review

A thorough Project description should be included in the EIR/EIS in order to facilitate meaningful environmental review of potential impacts, mitigation measures, and alternatives. The Project description should be as precise as possible in describing the details of all proposed activities (e.g., types of equipment or methods that may be used, maximum area of impact, seasonal work windows, locations for material disposal, etc.), as well as the details of the timing and length of activities. A thorough description will facilitate CSLC staff's determination of the extent and location of its leasing jurisdiction, make for a more robust analysis of the work that may be performed, and minimize the potential need for subsequent environmental analysis.

Biological Resources

1. Sensitive Species: SBFCA should conduct queries of the California Department of Fish and Game's (DFG) California Natural Diversity Database (CNDDB) and U.S. Fish and Wildlife Service's (USFWS) Special Status Species Database to identify any special-status plant or wildlife species that may occur in the Project area. Additionally, SBFCA should consult early in the process with appropriate staff at DFG to identify species of concern. The EIR/EIS should analyze the potential for such species to occur in the Project area and, if impacts to special-status species are found to be significant, identify feasible mitigation measures.

2. Invasive Species: One of the major stressors to the Sacramento-San Joaquin River Delta is introduction of non-native species. As the Feather River is a principal tributary of the Sacramento River, the EIR/EIS should consider a plan with a range of alternatives for prevention programs for terrestrial and aquatic invasive species (including quarantine, early detection, and early response) to slow the introduction of invasive species into high-traffic and sensitive areas. In developing these alternatives, the proposed plan should consider using current and proposed aquatic invasive species prevention programs in the area as models. In addition, in light of the recent decline of pelagic organisms and in order to protect at-risk fish species, the EIR/EIS should examine if the objectives of the plan would favor non-native fisheries within the Sacramento and San Joaquin River system and Delta.

3. Construction Noise: The EIR/EIS should evaluate noise and vibration impacts on fish and birds from construction, restoration or flood control activities in the water, on the levees, and for land-side supporting structures. Mitigation measures could include species-specific work windows as defined by DFG, USFWS, and the National Oceanographic and Atmospheric Administration's Fisheries Service (NOAA Fisheries). Again, staff recommends early consultation with these agencies to minimize the impacts of the Project on sensitive species.

Climate Change

A greenhouse gas (GHG) emissions analysis consistent with the California Global Warming Solutions Act (AB 32) and required by section 15064.4 of the State CEQA Guidelines[1] should be included in the EIR/EIS. This analysis should identify a threshold for significance for GHG emissions, calculate the level of GHGs that will be emitted as a result of construction and ultimate build-out of the Project, determine the significance of the impacts of those emissions, and, if impacts are significant, identify mitigation measures that would reduce or minimize them. The analysis should pay particular attention to the possibility of cumulative impacts of GHG emissions.

Cultural Resources

1. Submerged Resources: The EIR/EIS should evaluate the possibility of submerged cultural resources in the Project area. The CSLC maintains a shipwrecks database, available at http://shipwrecks.slc.ca.gov, that can assist with this analysis. The database includes known and potential vessels located on the State's tide and submerged lands; however, the locations of many shipwrecks remain unknown. Please note that any submerged archaeological site or submerged historic resource that has remained in state waters for more than 50 years is presumed to be significant.

2. Title to Abandoned Resources: The EIR/EIS should mention that the title to all abandoned shipwrecks, archaeological sites, and historic or cultural resources on or in the tide and submerged lands of California is vested in the State and under the jurisdiction of the CSLC. Mitigation measures should be developed to address any submerged cultural resources that may be affected by the proposed Project and any unanticipated discoveries during the Project's construction. CSLC staff would like to review the proposed mitigation measures and requests that SBFCA consult with CSLC staff, should any cultural resources be discovered during construction of the proposed Project.

Hydrology and Water Quality

SBFCA should disclose and analyze the Project's potential to adversely affect water quality. Such impacts are likely to include increased turbidity and sedimentation from

[1] The "State CEQA Guidelines" are found in Title 14 of the California Code of Regulations, commencing with section 15000.

construction disturbance, dredging, fill, and other in-water construction work, and potential pollution from worksite spills or mobilization of pollutants from the disturbed soils. For any effects found to be potentially significant, the EIR/EIS should identify feasible mitigation measures that would avoid or lessen such effects.

Recreation

As public access and recreation on State lands are key concerns of the Public Trust, CSLC staff requests that the EIR/EIS analyze the Project's short-term and long-term impacts on recreation resources, both during construction and for the life of the project. Any significant impacts will require mitigation measures that either minimize or reduce the impacts or otherwise compensate residents and visitors.

Mitigation and Monitoring

To avoid the improper deferral of mitigation, mitigation measures should either be presented as specific, feasible, enforceable obligations, or should be presented as formulas containing "performance standards which would mitigate the significant effect of the project and which may be accomplished in more than one specified way" (State CEQA Guidelines § 15126.4(b)).

It would also be helpful to provide a summary of the mitigation measures relied upon to avoid or reduce the identified impacts to less than significant, in addition to a monitoring program of these actions to ensure compliance and enforceability through permit conditions, agreements or other measures during Project implementation.

As a potential responsible agency, the CSLC may need to rely on this document for the issuance of a lease, therefore, we request that you consider our comments during preparation of the draft EIR/EIS.

If you have any questions concerning environmental review or where to send copies of future FRWLP-related notices and/or environmental documents, please contact Joan Walter, Environmental Scientist, at (916) 574-1310 or by e-mail at joan.walter@slc.ca.gov. If you have any questions concerning CSLC leasing jurisdiction, please feel free to contact Ninette Lee, Public Land Manager, at (916) 574-1869.

Sincerely,

Cy R. Oggins, Chief
Division of Environmental Planning
and Management

cc: Matt Davis, Environmental Resources Branch
Sacramento District
U.S. Army Corps of Engineers
1325 J Street
Sacramento, CA 95814

Office of Planning and Research
N. Lee, LMD, CSLC
J. Walter, DEPM, CSLC

From: Megan Randall [mailto:mrandall@americanrivers.org]
Sent: Wednesday, June 22, 2011 3:47 PM
To: Norgaard, Ingrid; Matthew.G.Davis@usace.army.mil
Subject: Feather River West Levee Project Information

Dear Ingrid and Matt,

I am writing to you in hopes of discussing the Feather River West Levee Project. I was hoping that you might be able to help me answer a couple questions or provide me with some helpful materials before the scoping period ends. American Rivers is interested in submitting comments, and we would like to get all the information possible before doing so.

Specifically, I would like to get some more in-depth information on exactly what is being proposed for the Feather River Levee system. Do you have any additional information or reports on the following that might help me become better informed?

a. Background information: Reports detailing the current flaws in the levee system. Technical background information identifying specific flaws and the need for improvements.
b. Details about what is being proposed currently:
    i. Detailed maps of which levees and regions are identified for repair, etc.
    ii. Detailed reports on the proposed design for repair. I am aware that the design process isn't expected to be completed until 2012. Do you know how far along the design process is and if there are any reports which would give insight into the most significant elements of the plan to date?
c. Lastly, are you aware of any information on the project's relationship to expanded urban development in the region? Do you know if there is any literature on proposed development projects, or if there is someone I can contact to get more information on this aspect of the project?

Thanks to both of you for your time and any help you can provide.

Best,
Megan Randall

From: Megan Randall [mailto:mrandall@americanrivers.org]
Sent: Monday, June 27, 2011 3:30 PM
To: Norgaard, Ingrid
Subject: RE: Feather River Levee Scoping Period

Dear Ingrid,

Thanks for your help and insights. I have a couple additional questions.

I am curious as to whether there are any existing maps which identify the location and boundaries of the Reaches outlined by the Preliminary Identification/Design Report. It would be nice to get a visual of the precise location of the proposed improvements.

Also, I am wondering if you (or anyone else) might be able to provide any information as to the relationship between the FRWLP and the Sutter Basin Feasibility Study. Do you know why these two projects were both included in the NOP?

Thanks so much! I really appreciate your time and help.

-Megan

From: Norgaard, Ingrid [mailto:INorgaard@icfi.com]
Sent: Monday, June 27, 2011 6:45 AM
To: admin@sutterbutteflood.org; Megan Randall
Subject: RE: Feather River Levee Scoping Period

Megan, I can see why that title on Attachment 1 is confusing, but the intent of that doc is only to provide additional information related to scoping for the Draft EIS/EIRs under preparation (none have been prepared to date). And to clarify, we are accepting comments through July 8, 2011.

Thanks,
Ingrid

From: SBFCA [mailto:admin@sutterbutteflood.org]
Sent: Friday, June 24, 2011 4:08 PM
To: Norgaard, Ingrid; mrandall@americanrivers.org
Subject: FW: Feather River Levee Scoping Period

Hi, Megan;

I've copied Ingrid Norgaard on this email as she will be able to answer your environmental questions below.

Ingrid;
Please see the email below re: enviro questions. Could you please review and respond to Megan (copied on this email)?

Thank you!
Sarah

Sutter Butte Flood Control Agency
530-755-9859 o

1227 Bridge Street, Suite C
Yuba City, CA 95991

admin@sutterbutteflood.org
www.SutterButteFlood.org

From: Megan Randall [mailto:mrandall@americanrivers.org]
Sent: Wednesday, June 22, 2011 3:37 PM
To: admin@sutterbutteflood.org
Subject: RE: Feather River Levee Scoping Period

Dear Sarah,

Thanks for the information. I have a couple additional questions that perhaps you can answer for me.

1. The PDF of the NOP which was provided on the website also includes a document labeled Attachment 1: DRAFT Environmental Impact Statements/Environmental Impact Reports. I found this a bit confusing since the document does not appear to be a comprehensive EIS/EIR and I wasn't aware that the draft EIR/EIS had been released yet. Could you clarify what Attachment 1 is meant to be?

Sorry for the long e-mail. Any help or insight would be very much appreciated!

Thanks for your time,
Megan Randall

From: SBFCA [mailto:admin@sutterbutteflood.org]
Sent: Wednesday, June 22, 2011 2:30 PM
To: Megan Randall
Subject: RE: Feather River Levee Scoping Period

Hi, Megan;

Thanks for your inquiry – and, good timing! Our public scoping meetings are next week; you can find information on our website here: http://sutterbutteflood.org/index.php/notices_documents and here: http://sutterbutteflood.org/index.php/news_events/events/. I hope this information is helpful to you. Should you have any additional questions, please don't hesitate to email me.

Thanks!
Sarah Modeste

Sutter Butte Flood Control Agency

1227 Bridge Street, Suite C
Yuba City, CA 95991

admin@sutterbutteflood.org
www.SutterButteFlood.org

From: Megan Randall [mailto:mrandall@americanrivers.org]
Sent: Tuesday, June 21, 2011 9:51 AM
To: info@sutterbutteflood.org
Subject: Feather River Levee Scoping Period

I wanted to inquire about the Feather River West Levee Rehabilitation Project. I was wondering if the scoping period for this project has closed, or if there is still time to comment.

Thanks for any insights.

Best,
Megan Randall

From: Megan Randall [mailto:mrandall@americanrivers.org]
Sent: Thursday, June 30, 2011 10:40 AM
To: admin@sutterbutteflood.org
Cc: Norgaard, Ingrid; Matthew.G.Davis@usace.army.mil
Subject: FRWLP Questin

Dear Sarah, Ingrid, and Matthew,

I have one additional question about the FRWLP that perhaps you might be able to help me with.

I have been browsing the Preliminary Problem Identification Report as well as the Preliminary Design Report on the SBFCA website, and I noticed that the levee project identified by these documents is only 27 miles long and runs from Yuba City north to Thermalito Afterbay.

On the website, however, the project maps and the NOP identify the FRWLP as running all the way from Thermalito Afterbay to the Sutter Bypass confluence, a total of 44 miles.

I am just curious as to why the information differs, and how the two projects are related (the levee project from Thermalito after to Yuba City, and then the project from Yuba City to the Sutter Bypass confluence). Will the SBFCA implement both of these projects? Does the approximate $300 million cost estimate cover improvements for the entire stretch, or just the 27 mile stretch? Is there any other information about the proposed Yuba-Sutter Bypass improvements available that might clarify some of my questions?

Thanks so much for all your help!

Best,
Megan

NATIVE AMERICAN HERITAGE COMMISSION
915 CAPITOL MALL, ROOM 364
SACRAMENTO, CA 95814
(916) 653-4082
(916) 657-5390 - Fax

July 15, 2011

Ingrid Norgaard
Sutter Butte Flood Control Agency
c/o ICF International
630 K Street, Suite 400
Sacramento, CA 95814

RE: SCH# 2011052062 Sutter Basin Feasibility Study and Feather River West Levee Project; Sutter and Butte Counties.

Dear Ms. Norgaard:

The Native American Heritage Commission (NAHC) has reviewed the Notice of Preparation (NOP) referenced above. The California Environmental Quality Act (CEQA) states that any project that causes a substantial adverse change in the significance of an historical resource, which includes archeological resources, is a significant effect requiring the preparation of an EIR (CEQA Guidelines 15064(b)). To comply with this provision the lead agency is required to assess whether the project will have an adverse impact on historical resources within the area of project effect (APE), and if so to mitigate that effect. To adequately assess and mitigate project-related impacts to archaeological resources, the NAHC recommends the following actions:

- ✓ Contact the appropriate regional archaeological Information Center for a record search. The record search will determine:
  - If a part or all of the area of project effect (APE) has been previously surveyed for cultural resources.
  - If any known cultural resources have already been recorded on or adjacent to the APE.
  - If the probability is low, moderate, or high that cultural resources are located in the APE.
  - If a survey is required to determine whether previously unrecorded cultural resources are present.
- ✓ If an archaeological inventory survey is required, the final stage is the preparation of a professional report detailing the findings and recommendations of the records search and field survey.
  - The final report containing site forms, site significance, and mitigation measurers should be submitted immediately to the planning department. All information regarding site locations, Native American human remains, and associated funerary objects should be in a separate confidential addendum, and not be made available for public disclosure.
  - The final written report should be submitted within 3 months after work has been completed to the appropriate regional archaeological Information Center.
- ✓ Contact the Native American Heritage Commission for:
  - A Sacred Lands File Check. . **USGS 7.5 minute quadrangle name, township, range and section required.**
  - A list of appropriate Native American contacts for consultation concerning the project site and to assist in the mitigation measures. **Native American Contacts List attached.**
- ✓ Lack of surface evidence of archeological resources does not preclude their subsurface existence.
  - Lead agencies should include in their mitigation plan provisions for the identification and evaluation of accidentally discovered archeological resources, per California Environmental Quality Act (CEQA) §15064.5(f). In areas of identified archaeological sensitivity, a certified archaeologist and a culturally affiliated Native American, with knowledge in cultural resources, should monitor all ground-disturbing activities.
  - Lead agencies should include in their mitigation plan provisions for the disposition of recovered artifacts, in consultation with culturally affiliated Native Americans.
  - Lead agencies should include provisions for discovery of Native American human remains in their mitigation plan. Health and Safety Code §7050.5, CEQA §15064.5(e), and Public Resources Code §5097.98 mandates the process to be followed in the event of an accidental discovery of any human remains in a location other than a dedicated cemetery.

Sincerely,

Katy Sanchez

Katy Sanchez
Program Analyst
(916) 653-4040

cc: State Clearinghouse

Native American Contact List
Sutter and Butte Counties
July 15, 2011

Berry Creek Rancheria of Maidu Indians
Cultural Resources Rep
#5 Tyme Way — Tyme Maidu
Oroville , CA 95966
gmix@berrycreekrancheria.com
(530) 534-3859
(530) 534-1151 FAX

Butte Tribal Council
Ren Reynolds
1693 Mt. Ida Road — Maidu
Oroville , CA 95966

(530) 589-1571

Mechoopda Indian Tribe of Chico Rancheria
Dennis E. Ramirez, Chairperson
125 Mission Ranch Blvd — Mechoopda Maidu
Chico , CA 95926 — Concow
dramirez@mechoopda-nsn.gov
(530) 899-8922 ext 215
(530) 899-8517 - Fax

Mooretown Rancheria of Maidu Indians
Gary Archuleta, Chairperson
#1 Alverda Drive — Maidu
Oroville , CA 95966 — KonKow / Concow
frontdesk@mooretown.org
(530) 533-3625
(530) 533-3680 Fax

Greenville Rancheria of Maidu Indians
Kyle Self, Chairperson
PO Box 279 — Maidu
Greenville , CA 95947
kself@greenvillerancheria.com
(530) 284-7990
(530) 284-6612 - Fax

United Auburn Indian Community of the Auburn Rancheria
David Keyser, Chairperson
10720 Indian Hill Road — Maidu
Auburn , CA 95603 — Miwok
530-883-2390
530-883-2380 - Fax

Maidu Nation
Clara LeCompte
P.O Box 204 — Maidu
Susanville , CA 96130

Maidu Cultural and Development Group
Lorena Gorbet
PO Box 426 — Maidu
Greenville , CA 95947
(530) 284-1601

This list is current only as of the date of this document.

Distribution of this list does not relieve any person of the statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resources Code and Section 5097.98 of the Public Resources Code.

This list is only applicable for contacting local Native Americans with regard to cultural resources for proposed SCH# 2011052062 Sutter Basin Feasibility Study and Feather River West Levee Project; Sutter and Butte Counties.

Native American Contact List
Sutter and Butte Counties
July 15, 2011

KonKow Valley Band of Maidu
Patsy Seek, Chairperson
1706 Sweem Street — KonKow / Concow
Oroville , CA 95965 — Maidu
(530) 533-1504

Berry Creek Rancheria of Maidu Indians
Jim Edwards, Chairperson
#5 Tyme Way — Tyme Maidu
Oroville , CA 95966
gmix@berrycreekrancheria.com
(530) 534-3859
(530) 534-1151 FAX

T si-Akim Maidu
Eileen Moon,Vice Chairperson
760 So. Auburn St. Ste 2-C — Maidu
Grass Valley , CA 95945
(530) 477-0711

Enterprise Rancheria of Maidu Indians
Art Angle, Vice Chairperson
3690 Olive Hwy — Maidu
Oroville , CA 95966
eranch@cncnet.com
(530) 532-9214
(530) 532-1768 FAX

Strawberry Valley Rancheria
Cathy Bishop, Chairperson
PO Box 667 — Maidu
Marysville , CA 95901 — Miwok
catfrmsac2@yahoo.com
916-501-2482

Enterprise Rancheria of Maidu Indians
Glenda Nelson, Chairperson
2133 Monta Vista Ave — Maidu
Oroville , CA 95966
eranch@cncnet.com
(530) 532-9214
(530) 532-1768 FAX

Mooretown Rancheria of Maidu Indians
James Sanders, Tribal Administrator
#1 Alverda Drive — Maidu
Oroville , CA 95966 — KonKow/Concow
(530) 533-3625
(530) 533-3680 FAX

United Auburn Indian Community of the Auburn Rancheria
Marcos Guerrero, Tribal Preservation Committee
10720 Indian Hill Road — Maidu
Auburn , CA 95603 — Miwok
mguerrero@auburnrancheria.com
530-883-2364
530-883-2320 - Fax

This list is current only as of the date of this document.

Distribution of this list does not relieve any person of the statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resources Code and Section 5097.98 of the Public Resources Code.

This list is only applicable for contacting local Native Americans with regard to cultural resources for proposed SCH# 2011052062 Sutter Basin Feasibility Study and Feather River West Levee Project; Sutter and Butte Counties.

Native American Contact List
Sutter and Butte Counties
July 15, 2011

Mechoopda Indian Tribe of Chico Rancheria
Mike DeSpain, Director - OEPP
125 Mission Ranch Blvd
Chico , CA 95926
mdespain@mechoopda-nsn.gov
(530) 899-8922 ext 219
(530) 899-8517 - Fax

Mechoopda Maidu
Concow

April Wallace Moore
19630 Placer Hills Road
Colfax , CA 95713
530-637-4279

Nisenan - So Maidu
Konkow
Washoe

United Auburn Indian Community of the Auburn Rancheria
Gregory S. Baker, Tribal Administrator
10720 Indian Hill Road
Auburn , CA 95603
gbaker@auburnrancheria.
530-883-2390
530-883-2380 - Fax

Maidu
Miwok

This list is current only as of the date of this document.

Distribution of this list does not relieve any person of the statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resources Code and Section 5097.98 of the Public Resources Code.

This list is only applicable for contacting local Native Americans with regard to cultural resources for proposed SCH# 2011052062 Sutter Basin Feasibility Study and Feather River West Levee Project; Sutter and Butte Counties.

FEATHER RIVER AIR QUALITY MANAGEMENT DISTRICT
Serving Sutter and Yuba Counties

1007 Live Oak Blvd. Suite B-3
Yuba City, CA 95991
(530) **634-7659**
FAX (530) **634-7660**
www.fraqmd.org

David A. Valler, Jr.
Air Pollution Control Officer

June 30, 2011

Ingrid Norgaard, Project Manager
Sutter Butte Flood Control Agency
c/o ICF International
630 K Street, Suite 400
Sacramento, CA 95814

Matt Davis, Environmental Resources Branch
Sacramento District
U.S. Army Corps of Engineers
1325 J Street
Sacramento, CA 95814

Re: Notice of Preparation of Draft Environmental Impact Statements/Environmental Impact Reports for the Sutter Basin Feasibility Study and Feather River West Levee Project.

Dear Ms. Norgaard and Mr. Davis,

The Feather River Air Quality Management District (District) appreciates the opportunity to review and comment on the above referenced project.

The project site is partially located in Sutter County, which is currently designated as nonattainment for Federal $PM_{2.5}$ ambient air quality standards, nonattainment-transitional for State 1-hour and 8-hour ozone standards, and nonattainment for State PM_{10} standards. The District would like to make the following recommendations regarding the scope and content of the environmental information for these two projects in regards to air quality and climate change:

Construction Phase

A project of this type is considered a Type 2 project under the District's CEQA Guidelines (http://www.fraqmd.org/PlanningTools.htm). This size project will likely generate construction-related air quality impacts that exceed the District's adopted thresholds of significance. An air quality analysis should be performed to determine the impact of the project. The District recommends the Roadway Construction Emissions Model (Version 6.3.2, July 2009) developed by the Sacramento Metropolitan Air Quality Management District, available at http://www.airquality.org/ceqa/index.shtml. If the impacts are found to be significant, the District recommends the measures listed on Attachment C Best Available Construction Phase Mitigation Measures, and the construction equipment mitigation measure on Attachment E.

Some special considerations for construction phase of this project may include an analysis of the impacts to sensitive receptors located within 1,000 feet of the project site, compliance with state regulations prohibiting the excessive idling of on-road and off-road diesel-fueled vehicles, and ensuring that all portable engines greater than 50 horsepower be registered with the California Air Resources Board or obtain a District permit. For information on obtaining a District permit, please contact Mr. Timothy Mitro, Air Quality Engineer, at (530) 634-7659 ext 208.

Operational Phase
Any air quality impacts from this project are likely to occur during the construction phase as this is a Type 2 project.

Greenhouse Gas and Climate Change Impacts
The District recommends the EIR/EIS include a discussion of greenhouse gas emissions and climate change impacts. Currently, the District has not adopted thresholds of significance for GHG emissions. However, the California Air Pollution Control Officers Association (CAPCOA) publication CAPCOA CEQA & Climate Change provides guidance on addressing a project's impact on climate change (www.capcoa.org). Other resources for addressing Climate Change under CEQA are listed in Chapter 8 of the District's Guidelines (http://www.fraqmd.org/PlanningTools.htm).

District Rules and Regulations
All projects are subject to District rules and regulations. Some rules and regulations that may apply to this project are:

- Rule 3.0 Visible Emissions
- Rule 3.16 Fugitive Dust Emissions
- Rule 4.1 Permit Requirements

A complete listing of District rules and regulations is available at http://www.arb.ca.gov/drdb/fr/cur.htm.

The project should also submit a Fugitive Dust Control Plan to the District prior to beginning work. The Fugitive Dust Control Plan and supporting documentation are included with this comment letter as Attachments A, B, & D.

If you need further information or assistance, please contact me at (530) 634-7659 x210. Air District staff will be available to assist the project proponent or Lead Agency as needed.

Sincerely,

Sondra Spaethe

Sondra Andersson Spaethe
Air Quality Planner

Enclosures: Attachments A, B, C, D & E

File: Chron

Attachment A:
Feather River Air Quality Management District
Fugitive Dust Control Plan

This plan, upon signature and submittal to the FRAQMD, will serve as an approved Fugitive Dust Control Plan to be implemented at the designated site. This plan must be submitted by the project proponent and received at the air district prior to start of work.

The approved plan serves as an acknowledgment by the project proponent of their duty to address state and local laws governing fugitive dust emissions and the potential for first offense issuance of a Notice of Violation by the air district where violations are substantiated by District staff. This plan (along with standard mitigation measures for all projects and best available mitigation measures where applicable) shall be made available to the contractors and construction superintendent on the project site.

- Site Location: _____
- Project Type (circle all that apply): Residential Commercial Industrial Transportation
- List of responsible persons:

  Company:_____

  Office (name, title, address, phone): _____

  _____

  Field (name, title, phone): _____

- Projected Start and End Dates: _____
  (Day/Month/Year)

Project Proponent: _____ _____
Printed Name Company/Phone

Signature: _____ Title: _____

By signing this document I acknowledge that I have read the accompanying literature regarding state and local fugitive dust emission laws and understand that it is my responsibility as the project proponent to ensure that appropriate materials and instructions are available to site employees to implement fugitive dust mitigation measures (Attachment B) appropriate for each development phase of this project.

I further acknowledge that it is my responsibility to ensure that site employees are made formally aware of fugitive dust control laws, requirements, and available mitigation techniques, and that appropriate measures are to be implemented at the site as necessary to prevent fugitive dust violations.

_____ FRAQMD – Effective 09/09/03 _____

Please Submit to: FRAQMD, 1007 Live Oak Blvd. Suite B-3, Yuba City, CA 95991 Attn: Planning
Phone: 530-634-7659 x210 FAX: 530-634-7660 Email: sspaethe@fraqmd.org

Attachment B
Feather River Air Quality Management District

Standard Construction Phase Mitigation Measures for All Projects

1. *Mandatory:* Implement the Fugitive Dust Control Plan

2. Construction equipment exhaust emissions shall not exceed FRAQMD Regulation III, Rule 3.0, Visible Emissions limitations (40 percent opacity or Ringelmann 2.0). Operators of vehicles and equipment found to exceed opacity limits shall take action to repair the equipment within 72 hours or remove the equipment from service. Failure to comply may result in a Notice of Violation.

3. The primary contractor shall be responsible to ensure that all construction equipment is properly tuned and maintained prior to and for the duration of onsite operation.

4. Minimize idling time to 5 minutes – saves fuel and reduces emissions. (State idling rule: commercial diesel vehicles- 13 CCR Chapter 10 Section 2485 effective 02/01/2005; off road diesel vehicles- 13 CCR Chapter 9 Article 4.8 Section 2449 effective 05/01/2008)

5. Utilize existing power sources (e.g., power poles) or clean fuel generators rather than temporary power generators.

6. 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.

7. 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 California Air Resources Board (ARB) Portable Equipment Registration with the State or a local district permit. The owner/operator shall be responsible for arranging appropriate consultations with the ARB or the District to determine registration and permitting requirements prior to equipment operation at the site.

Attachment C
Feather River Air Quality Management District
FUGITIVE DUST CONTROL - BEST AVAILABLE MITIGATION MEASURES
TO BE USED IN ADDITION TO STANDARD CONSTRUCTION PHASE MITIGATION MEASURES
Sources: FRAQMD Indirect Source Review Guidelines and Best Available Mitigation Measures compiled by the air districts of the Greater Sacramento Region and approved for implementation by the FRAQMD Board of Directors.

All grading operations on a project should be suspended when winds exceed 20 miles per hour or when winds carry dust beyond the property line despite implementation of all feasible dust control measures.

Construction sites shall be watered as directed by the Department of Public Works or Air Quality Management District and as necessary to prevent fugitive dust violations.

An operational water truck should be onsite at all times. Apply water to control dust as needed to prevent visible emissions violations and offsite dust impacts.

Onsite dirt piles or other stockpiled particulate matter should be covered, wind breaks installed, and water and/or soil stabilizers employed to reduce wind blown dust emissions. Incorporate the use of approved non-toxic soil stabilizers according to manufacturer's specifications to all inactive construction areas.

All transfer processes involving a free fall of soil or other particulate matter shall be operated in such a manner as to minimize the free fall distance and fugitive dust emissions.

Apply approved chemical soil stabilizers according to the manufacturers' specifications, to all-inactive construction areas (previously graded areas that remain inactive for 96 hours) including unpaved roads and employee/equipment parking areas.

To prevent track-out, wheel washers should be installed where project vehicles and/or equipment exit onto paved streets from unpaved roads. Vehicles and/or equipment shall be washed prior to each trip. Alternatively, a gravel bed may be installed as appropriate at vehicle/equipment site exit points to effectively remove soil buildup on tires and tracks to prevent/diminish track-out.

Paved streets shall be swept frequently (water sweeper with reclaimed water recommended; wet broom) if soil material has been carried onto adjacent paved, public thoroughfares from the project site.

Provide temporary traffic control as needed during all phases of construction to improve traffic flow, as deemed appropriate by the Department of Public Works and/or Caltrans and to reduce vehicle dust emissions. An effective measure is to enforce vehicle traffic speeds at or below 15 mph.

Reduce traffic speeds on all unpaved surfaces to 15 miles per hour or less and reduce unnecessary vehicle traffic by restricting access. Provide appropriate training, onsite enforcement, and signage.

Reestablish ground cover on the construction site as soon as possible and prior to final occupancy, through seeding and watering.

Disposal by Burning: Open burning is yet another source of fugitive gas and particulate emissions and shall be prohibited at the project site. No open burning of vegetative waste (natural plant growth wastes) or other legal or illegal burn materials (trash, demolition debris, et. al.) may be conducted at the project site. Vegetative wastes should be chipped or delivered to waste to energy facilities (permitted biomass facilities), mulched, composted, or used for firewood. It is unlawful to haul waste materials offsite for disposal by open burning.

Attachment D
Feather River Air Quality Management District
LOCAL AND STATE REGULATIONS APPLICABLE TO FUGITIVE DUST

I. FRAQMD Rules and Regulations

Note: The following District Rules and Regulations are enforced for each project regardless of lead agency or Board approved project CEQA mitigation requirements.

FRAQMD RULE 3.0 - VISIBLE EMISSIONS *(Adopted 6/91)*

As provided by Section 41701 of the California Health and Safety Code, a person shall not discharge into the atmosphere from any single source of emissions whatsoever, any air contaminants for a period or periods aggregating more than three minutes in any one hour which is:

a. As dark or darker in shade as that designated as No. 2 on the Ringlemen Chart, as published by the United States Bureau of Mines; or

b. Of such opacity as to obscure an observer's view to a degree equal to or greater than does smoke described in Subsection 'a' above.

Enforcement: The District has trained staff capable of performing a Visible Emissions Evaluation (VEE). VEE courses are offered to regulators and the regulated community (for a fee) at regular intervals by staff of the California Air Resources Board.

FRAQMD RULE 3.16 - FUGITIVE DUST EMISSIONS *(Adopted 4/11/94)*

A. PURPOSE
The purpose of this Rule is to reasonably regulate operations which periodically may cause fugitive dust emissions into the atmosphere.

B. DEFINITION
For the purpose of this Rule, the following definitions shall apply:

B.1 Fugitive Dust: Solid airborne matter emitted from any non-combustion source.
B.2 Emergency: Any act of God, but only if the owner of the property from which fugitive dust emissions originate establishes for the Feather River Air Quality Management District, by a preponderance of evidence, that he or she took reasonable precautions in light of the relevant facts and circumstances to minimize emissions.
B.3 Property Line: Adjacent properties which are owned by the same person shall be considered the same property for the purpose of determining the property line.

C. REQUIREMENTS
A person shall take every reasonable precaution not to cause or allow the emissions of fugitive dust from being airborne beyond the property line from which the emission originates, from any construction, handling or storage activity, or any wrecking, excavation, grading, clearing of land or solid waste disposal operation.

Reasonable precautions shall include, but are not limited to:

C.1 use, where possible, of water or chemicals for control of dust in the demolition of existing buildings or structures, construction operations, construction of roadways, or the clearing of land;
C.2 application of asphalt, oil, water, or suitable chemical on dirt roads, material stockpiles, and other surfaces which can give rise to airborne dusts;
C.3 other means approved by the Air Pollution Control Officer.

D. EXEMPTIONS
The provisions of this Rule shall not apply to the following:

D.1 Agricultural Operations
D.2 Currently unworked land designated as reclaimed for agriculture
D.3 An Emergency
D.4 Unpaved roads open to public travel (this inclusion shall not apply to industrial or commercial facilities).

II. State Laws

California Health and Safety Code

Section 41700. Except as otherwise provided in Section 41705, no person shall discharge from any source whatsoever such quantities of air contaminants or other material which cause injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public, or which endanger the comfort, repose, health, or safety of any such persons or the public, or which cause, or have a natural tendency to cause, injury or damage to business or property.

Section 41701. Except as otherwise provided in Section 41704, or Article 2 (commencing with Section 41800) of this chapter other than Section 41812, or Article 2 (commencing with Section 42350) of Chapter 4, no person shall discharge into the atmosphere from any source whatsoever any air contaminant, other than uncombined water vapor, for a period or periods aggregating more than three minutes in any one hour which is: (a) As dark or darker in shade as that designated as No. 2 on the Ringelmann Chart, as published by the United States Bureau of Mines, or (b) Of such opacity as to obscure an observer's view to a degree equal to or greater than does smoke described in subdivision (a).

California Vehicle Code

Section 23114 requires: No vehicle shall transport any aggregate material upon a highway unless the material is covered. Exception 23114(e)(4): Vehicles transporting loads of aggregate materials shall not be required to cover their loads if the load, where it contacts the sides, front, and back of the cargo container area, remains six inches from the upper edge of the container area, and if the load does not extend, at its peak, above any part of the upper edge of the cargo container area. For purposes of this section, "aggregate material" means rock fragments, pebbles, sand, dirt, gravel, cobbles, crushed base, asphalt, and other similar materials.

Attachment E:
Reducing ROG, NOx, & PM emissions from off-road diesel powered equipment

This mitigation measure may be used by projects to mitigate emissions of Reactive Organic Gases (ROG), Oxides of Nitrogen (NOx), and/or Particulate Matter (PM). The results of the Construction Mitigation Calculator shall be submitted and approved by the District PRIOR TO BEGINNING WORK.

The proponent shall assemble a comprehensive inventory list (i.e. 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 and apply the following mitigation measure:

The project shall provide a plan for approval by FRAQMD demonstrating that the heavy-duty (equal to or greater than 50 horsepower) **off-road equipment** to be used in the construction project, including owned, leased and subcontractor vehicles, will achieve a project wide fleet-average 5 percent ROG reduction, 20 percent NOx reduction and 45 percent particulate reduction compared to the most recent CARB fleet average at time of construction. A Construction Mitigation Calculator (MS Excel) may be downloaded from the SMAQMD web site to perform the fleet average evaluation http://www.airquality.org/ceqa/index.shtml .

Acceptable options for reducing emissions may include use of late model engines, low-emission diesel products, alternative fuels, engine retrofit technology (Carl Moyer Guidelines), after-treatment products, voluntary offsite mitigation projects, provide funds for air district offsite mitigation projects, and/or other options as they become available. The District should be contacted to discuss alternative measures.

Linda S. Adams
Acting Secretary for
Environmental Protection

California Regional Water Quality Control Board
Central Valley Region
Katherine Hart, Chair

11020 Sun Center Drive #200, Rancho Cordova, California 95670-6114
(916) 464-3291 • FAX (916) 464-4645
http://www.waterboards.ca.gov/centralvalley

Edmund G. Brown Jr.
Governor

20 June 2011

Ingrid Norgaard
Sutter Butte Flood Control Agency
c/o ICF International
630 K Street, Suite 400
Sacramento, CA 95814

CERTIFIED MAIL
7010 1670 0002 0652 8212

COMMENTS TO THE NOTICE OF PREPARATION OF THE DRAFT ENVIRONMENTAL IMPACT REPORT, SUTTER BASIN FEASIBILITY STUDY AND FEATHER RIVER WEST LEVEE PROJECT, SCH NO.2011052062, SUTTER COUNTY

Pursuant to the State Clearinghouse's 20 May 2011 request, the Central Valley Regional Water Quality Control Board (Central Valley Water Board) has reviewed the *Notice of Preparation of the Draft Environmental Impact Report* for the Sutter Basin Feasibility Study and Feather River West Levee Project, located in Sutter County.

Our agency is delegated with the responsibility of protecting the quality of surface and groundwaters of the state; therefore our comments will address concerns surrounding those issues.

Construction Storm Water General Permit

Dischargers whose project disturb one or more acres of soil or where projects disturb less than one acre but are part of a larger common plan of development that in total disturbs one or more acres, are required to obtain coverage under the General Permit for Storm Water Discharges Associated with Construction Activities (Construction General Permit), Construction General Permit Order No. 2009-009-DWQ. Construction activity subject to this permit includes clearing, grading, grubbing, disturbances to the ground, such as stockpiling, or excavation, but does not include regular maintenance activities performed to restore the original line, grade, or capacity of the facility. The Construction General Permit requires the development and implementation of a Storm Water Pollution Prevention Plan (SWPPP).

For more information on the Construction General Permit, visit the State Water Resources Control Board website at:
http://www.waterboards.ca.gov/water_issues/programs/stormwater/constpermits.shtml

Phase I and II Municipal Separate Storm Sewer System (MS4) Permits[1]

The Phase I and II MS4 permits require the Permittees reduce pollutants and runoff flows from new development and redevelopment using Best Management Practices (BMPs) to the maximum extent practicable (MEP). MS4 Permittees have their own development standards, also known as Low Impact Development (LID)/post-construction standards that include a hydromodification component. The MS4 permits also require specific design concepts for LID/post-construction BMPs in the early stages of a project during the entitlement and CEQA process and the development plan review process.

For more information on which Phase I MS4 Permit this project applies to, visit the Central Valley Water Board website at:
http://www.waterboards.ca.gov/centralvalley/water_issues/storm_water/municipal_permits/

Industrial Storm Water General Permit

Storm water discharges associated with industrial sites must comply with the regulations contained in the Industrial Storm Water General Permit Order No. 97-03-DWQ.

For more information on the Industrial Storm Water General Permit, visit the Central Valley Water Board website at:
http://www.waterboards.ca.gov/centralvalley/water_issues/storm_water/industrial_general_permits/index.shtml.

Clean Water Act Section 404 Permit

If the project will involve the discharge of dredged or fill material in navigable waters or wetlands, a permit pursuant to Section 404 of the Clean Water Act may be needed for the United States Army Corps of Engineers (USACOE). If a Section 404 permit is required by the USACOE, the Central Valley Water Board will review the permit application to ensure that discharge will not violate water quality standards. If the project requires surface water drainage realignment, the applicant is advised to contact the Department of Fish and Game for information on Streambed Alteration Permit requirements.

If you have any questions regarding the Clean Water Act Section 404 permits, please contact the Regulatory Division of the Sacramento District of USACOE at (916)557-5250.

Clean Water Act Section 401 Permit – Water Quality Certification

If an USACOE permit, or any other federal permit, is required for this project due to the disturbance of waters of the United States (such as streams and wetlands), then a Water Quality Certification must be obtained from the Central Valley Water Board prior to initiation of project activities. Water Quality Certification must be obtained prior to initiation of project activities. There are no waivers for 401 Water Quality Certifications.

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[1] Municipal Permits = The Phase I Municipal Separate Storm Water System (MS4) Permit covers medium sized Municipalities (serving between 100,000 and 250,000 people) and large sized municipalities (serving over 250,000 people). The Phase II MS4 provides coverage for small municipalities, including non-traditional Small MS4s, which include military bases, public campuses, prisons and hospitals.

Waste Discharge Requirements

If USACOE determines that only non-jurisdictional waters of the State (i.e., "non-federal" waters of the State) are present in the proposed project area, the proposed project will require a Waste Discharge Requirement (WDR) permit to be issued by Central Valley Water Board. Under the California Porter-Cologne Water Quality Control Act, discharges to all waters of the State, including all wetlands and other waters of the State including, but not limited to, isolated wetlands, are subject to State regulation.

For more information on the Water Quality Certification and WDR processes, visit the Central Valley Water Board website at:
http://www.waterboards.ca.gov/centralvalley/water_issues/water_quality_certification/

If you have questions regarding these comments, please contact me at (916) 464-4745 or gsparks@waterboards.ca.gov.

For Genevieve (Gen) Sparks
Environmental Scientist
401 Water Quality Certification Program

cc: State Clearinghouse Unit, Governor's Office of Planning and Research, Sacramento

Linda S. Adams
Acting Secretary for
Environmental Protection

California Regional Water Quality Control Board
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Edmund G. Brown Jr.
Governor

6 July 2011

Ingrid Norgaard
Sutter Butte Flood Control Agency
c/o ICF International
630 K Street, Suite 400
Sacramento, CA 95814

CERTIFIED MAIL
7010 3090 0001 4843 2695

COMMENTS TO THE NOTICE OF PREPARATION FOR THE DRAFT ENVIRONMENTAL IMPACT REPORT, SUTTER BASIN FEASIBILITY STUDY PROJECT, SCH NO. 2011052085, SUTTER AND BUTTE COUNTIES

Pursuant to the State Clearinghouse's 22 June 2011 request, the Central Valley Regional Water Quality Control Board (Central Valley Water Board) has reviewed the *Notice of Preparation for the Draft Environmental Impact Report* for the Sutter Basin Feasibility Study Project, located in Sutter and Butte Counties.

Our agency is delegated with the responsibility of protecting the quality of surface and groundwaters of the state; therefore our comments will address concerns surrounding those issues.

Construction Storm Water General Permit

Dischargers whose project disturb one or more acres of soil or where projects disturb less than one acre but are part of a larger common plan of development that in total disturbs one or more acres, are required to obtain coverage under the General Permit for Storm Water Discharges Associated with Construction Activities (Construction General Permit), Construction General Permit Order No. 2009-009-DWQ. Construction activity subject to this permit includes clearing, grading, grubbing, disturbances to the ground, such as stockpiling, or excavation, but does not include regular maintenance activities performed to restore the original line, grade, or capacity of the facility. The Construction General Permit requires the development and implementation of a Storm Water Pollution Prevention Plan (SWPPP).

For more information on the Construction General Permit, visit the State Water Resources Control Board website at:
http://www.waterboards.ca.gov/water_issues/programs/stormwater/constpermits.shtml

Phase I and II Municipal Separate Storm Sewer System (MS4) Permits[1]

The Phase I and II MS4 permits require the Permittees reduce pollutants and runoff flows from new development and redevelopment using Best Management Practices (BMPs) to the maximum extent practicable (MEP). MS4 Permittees have their own development standards, also known as Low Impact Development (LID)/post-construction standards that include a hydromodification component. The MS4 permits also require specific design concepts for LID/post-construction BMPs in the early stages of a project during the entitlement and CEQA process and the development plan review process.

For more information on which Phase I MS4 Permit this project applies to, visit the Central Valley Water Board website at:
http://www.waterboards.ca.gov/centralvalley/water_issues/storm_water/municipal_permits/

Industrial Storm Water General Permit

Storm water discharges associated with industrial sites must comply with the regulations contained in the Industrial Storm Water General Permit Order No. 97-03-DWQ.

For more information on the Industrial Storm Water General Permit, visit the Central Valley Water Board website at:
http://www.waterboards.ca.gov/centralvalley/water_issues/storm_water/industrial_general_permits/index.shtml.

Clean Water Act Section 404 Permit

If the project will involve the discharge of dredged or fill material in navigable waters or wetlands, a permit pursuant to Section 404 of the Clean Water Act may be needed for the United States Army Corps of Engineers (USACOE). If a Section 404 permit is required by the USACOE, the Central Valley Water Board will review the permit application to ensure that discharge will not violate water quality standards. If the project requires surface water drainage realignment, the applicant is advised to contact the Department of Fish and Game for information on Streambed Alteration Permit requirements.

If you have any questions regarding the Clean Water Act Section 404 permits, please contact the Regulatory Division of the Sacramento District of USACOE at (916)557-5250.

Clean Water Act Section 401 Permit – Water Quality Certification

If an USACOE permit, or any other federal permit, is required for this project due to the disturbance of waters of the United States (such as streams and wetlands), then a Water Quality Certification must be obtained from the Central Valley Water Board prior to initiation of project activities. Water Quality Certification must be obtained prior to initiation of project activities. There are no waivers for 401 Water Quality Certifications.

Waste Discharge Requirements

If USACOE determines that only non-jurisdictional waters of the State (i.e., "non-federal" waters of the State) are present in the proposed project area, the proposed project will require

[1] Municipal Permits = The Phase I Municipal Separate Storm Water System (MS4) Permit covers medium sized Municipalities (serving between 100,000 and 250,000 people) and large sized municipalities (serving over 250,000 people). The Phase II MS4 provides coverage for small municipalities, including non-traditional Small MS4s, which include military bases, public campuses, prisons and hospitals.

a Waste Discharge Requirement (WDR) permit to be issued by Central Valley Water Board. Under the California Porter-Cologne Water Quality Control Act, discharges to all waters of the State, including all wetlands and other waters of the State including, but not limited to, isolated wetlands, are subject to State regulation.

For more information on the Water Quality Certification and WDR processes, visit the Central Valley Water Board website at:
http://www.waterboards.ca.gov/centralvalley/water_issues/water_quality_certification/

If you have questions regarding these comments, please contact me at (916) 464-4745 or gsparks@waterboards.ca.gov.

Genevieve Sparks

Genevieve (Gen) Sparks
Environmental Scientist
401 Water Quality Certification Program

cc: State Clearinghouse Unit, Governor's Office of Planning and Research, Sacramento

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825-1846

In reply refer to:
81420-2011-TA-0619-01

JUN 30 2011

Mr. Matt Davis
Environmental Resources Branch
Sacramento District
U.S. Army Corps of Engineers
1325 J Street
Sacramento, CA 95814

Subject: Yuba-Sutter Habitat Conservation Plan/Natural Community Conservation Plan, Yuba and Sutter Counties, California

Dear Mr. Davis:

The U.S. Fish and Wildlife Service (Service) has received your Notice of Preparation of Draft Environmental Impact Statements/Environmental Impact Reports for the Sutter Basin Feasibility Study and Feather River West Levee Project dated May 20, 2011 (ER 11/464). The Service would like to assist you in your planning efforts, so we are providing this notification that Yuba and Sutter Counties are currently engaged in a Habitat Conservation Plan/Natural Community Conservation Plan (HCP/HCCP). The applicants currently are the counties of Yuba and Sutter, the city of Wheatland, the city of Live Oak, and Yuba City. This is a multi-year planning process that was initiated as a result of indirect effects from the Upgrade of State Route 70 project (Service file numbers 1-1-00-F-0224 and 1-1-02-F-0069) and it includes the majority of Yuba and Sutter Counties. We would be happy to provide you with additional information upon your request.

TAKE PRIDE IN AMERICA

The Service wishes to thank you for your continued efforts and dedication to the conservation of America's wildlife resources. Please contact Ellen R. McBride or Mike Thomas at (916) 414-6630 if you have questions regarding this response. Please refer to Service file number 81420-2011-TA-0619 in any future correspondence.

Sincerely,

Michael Thomas

for Eric Tattersall
Deputy Assistant Field Supervisor

cc:
Ms. Ingrid Norgaard, Sutter Butte Flood Control Agency, Sacramento, CA 95814
Mr. Steve Schoenberg, U.S. Fish and Wildlife Service, Sacramento, CA 95825
Ms. Loretta Sutton, Office of Environmental Policy and Compliance, Washington, DC 20240

California Regional Water Quality Control Board
Central Valley Region
Katherine Hart, Chair

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Edmund G. Brown Jr.
Governor

31 May 2011

Ingrid Norgaard
Sutter Butte Flood Control Agency
c/o ICF International
630 K Street, Suite 400
Sacramento, CA 95814

COMMENTS ON THE NOTICE OF PREPARATION FOR PROPOSED SUTTER BASIN FEASIBILITY STUDY & FEATHER RIVER WEST LEVEE PROJECT, BUTTE COUNTY

The Central Valley Regional Water Quality Control Board (Central Valley Water Board) is a responsible agency for this project, as defined by the California Environmental Quality Act (CEQA). On 23 May 2011, we received your request for comments on the Notice of Preparation for the Sutter Basin Feasibility Study & Feather River West Levee Project.

Sutter Butte Flood Control Agency has two efforts presently underway to study flood risk reduction improvements in Sutter and Butte Counties, one known as the Sutter Basin Feasibility Study, sponsored by the U.S. Army Corps of Engineers to determine federal interest in flood risk reduction projects, and one known as the Feather River West Levee Project, sponsored by the Sutter Butte Flood Control Agency as a locally driven flood risk reduction project.

USACE initiated the Sutter Basin project in 2001 and is conducting a feasibility study to evaluate flood damage reduction, ecosystem restoration, and recreation opportunities within the study area. The Central Valley Flood Protection Board and SBFCA, in their roles as non-federal local sponsors, are coordinating with USACE on the feasibility study. USACE, acting as the federal lead agency under NEPA, and SBFCA, acting as the state lead agency under CEQA, have determined that an EIS/EIR will be prepared to describe alternative, potential environmental effects, and mitigation measures.

SBFCA is planning the FRWLP to address levee deficiencies in the west levee of the Feather River from Thermalito Afterbay to the Sutter Bypass confluence to meet federal, state, and local flood protection criteria and goals. In 2010, an assessment district was enacted to provide local funding toward flood management improvements. These funds will be matched with those from the Disaster Preparedness and Flood Prevention Bond Act of 2006. The purpose of the FRWLP would be to construct improvements as quickly as possible in advance of and compatible with the Sutter Basin Feasibility Study.

Based on our review of the information submitted for the proposed project, we have the following comments:

Clean Water Act (CWA) Section 401, Water Quality Certification

The Central Valley Water Board has regulatory authority over wetlands and waterways under both the Federal Clean Water Act (CWA) and the California Water Code, Division 7 (CWC). Discharge of dredged or fill material to waters of the United States requires a CWA Section 401 Water Quality Certification from the Central Valley Water Board. Typical activities include any modifications to these waters, such as stream crossings, stream bank modifications, filling of wetlands, etc. 401 Certifications are issued in combination with CWA Section 404 Permits issued by the Army Corps of Engineers. The proposed project must be evaluated for the presence of jurisdictional waters, including wetlands and other waters of the State. Steps must be taken to first avoid and minimize impacts to these waters, and then mitigate for unavoidable impacts. Both the Section 404 Permit and Section 401 Water Quality Certification must be obtained prior to site disturbance.

Isolated wetlands and other waters not covered by the Federal Clean Water Act

Some wetlands and other waters are considered "geographically isolated" from navigable waters and are not within the jurisdiction of the Clean Water Act. (e.g., isolated wetlands, vernal pools, or stream banks above the ordinary high water mark). Discharge of dredged or fill material to these waters may require either individual or general waste discharge requirements from the Central Valley Water Board. If the U.S. Army Corps of Engineers determine that isolated wetlands or other waters exist at the project site, and the project impacts or has potential to impact these non-jurisdictional waters, a Report of Waste Discharge and filing fee must be submitted to the Central Valley Water Board. The Central Valley Water Board will consider the information provided and either issue or waive Waste Discharge Requirements. Failure to obtain waste discharge requirements or a waiver may result in enforcement action.

Any person discharging dredge or fill materials to waters of the State must file a report of waste discharge pursuant to Sections 13376 and 13260 of the CWC. Both the requirements to submit a report of waste discharge and apply for a Water Quality Certification may be met using the same application form, found at:

http://www.waterboards.ca.gov/centralvalley/water_issues/water_quality_certification/wqc_application.pdf

General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (CGP)

Construction activity, including demolition, resulting in a land disturbance of one acre or more must obtain coverage under the CGP. The Sutter Basin Feasibility Study & Feather River West Levee Project must be conditioned to implement storm water pollution controls during construction and post-construction as required by the CGP. To apply for coverage under the CGP the property owner must submit Permit Registration Documents electronically prior to construction. Detailed information on the CGP can be found on the State Water Board website: http://www.waterboards.ca.gov/water_issues/programs/stormwater/gen_const.shtml

Dewatering Alternative 1: Discharge to Storm Drains or Waters of the United States
A dewatering permit, *General Order for Dewatering and Other Low Threat Discharges to Surface Waters*, (Central Valley Water Board Order No. R5-2008-0082, adopted 12 June 2008) may be required for pump testing, pipeline dewatering and/or construction activities. This general NPDES (National Pollutant Discharge Elimination System) permit covers the discharge to waters of the United States of clean or relatively pollutant-free wastewater that poses little or no threat to water quality. The following categories are covered by the dewatering permit: well development water; construction dewatering; pump/well testing; pipeline/tank pressure testing; pipeline/tank flushing or dewatering; condensate discharges; water supply system discharges; miscellaneous dewatering/low threat discharges. The dewatering permit applies only to direct discharges to waters of the United States Failure to obtain a dewatering permit, when required, may result in enforcement action. An application form and a copy of the permit are available at this office.

Dewatering Alternative 2: Discharges to Land
Construction and system test dewatering discharges that are contained on land (i.e., will not enter waters of the United States) are allowed under Central Valley Water Board Resolution No. 2003-0003-DWQ provided the following conditions are met: (1) the dewatering discharge is of a quality as good as or better than underlying groundwater; and (2) there is a low risk of nuisance. Examples of dewatering discharges to land include a terminal basin, irrigation (with no return to waters of the United States), and dust control. You may request written confirmation from this office that the waiver is applicable.

If you have any questions or comments regarding this matter please contact me at (530) 224-4784 or by email at szaitz@waterboards.ca.gov.

Scott A. Zaitz

Scott A. Zaitz, R.E.H.S.
Environmental Scientist
Storm Water & Water Quality Certification Unit

SAZ: wrb/jmtm

cc: Mr. Will Ness, U.S. Army Corp of Engineers, Sacramento
Department of Fish and Game, Region 2, Rancho Cordova
State Clearing House Number (2011052062), Sacramento
State Water Resources Control Board, Sacramento

Appendix C

Flood Control and Geomorphic Conditions Supplemental Environmental Setting, Flood Control and Geomorphic Reports

Part C.1

Additional environmental setting information in support of Section 3.1, *Flood Control and Geomorphic Conditions*

Parts C.2, C.3, C.4, and C.5

William Lettis and Associate's Surficial Geologic Maps and Geomorphic Assessment of the Sutter Study Area, Urban Levee Geotechnical Evaluation, Sutter and Butte Counties, California

From URS Supplemental Geotechnical Data Report (2010), Appendix O, Volumes 2 through 5

Part C.1

Supplemental Environmental Setting

Part C.1
Supplemental Environmental Setting

This appendix provides additional environmental setting information in support of Section 3.1, *Flood Control and Geomorphic Conditions.*

C.1.1 Flooding

C.1.1.1 Flood Basins of the Sacramento Valley

The importance of natural flood basins to the Sacramento Valley river system was recognized by Gilbert as early as 1917 (Gilbert 1917; Water Engineering & Technology 1990:32–33). Flood basins in the Sacramento Valley were originally delineated by Gilbert. More recently, Ayres Associates (2008:16–17) divided the entire Sacramento River basin into potential flooded areas, based on the land that would be flooded if a levee failure occurs. The Sacramento River basin was divided into 26 sub-basins (Ayres Associates 2008:16–17, Figures 5 and 6).

Gilbert (1917) and discussed in Water Engineering & Technology (1990:32–33) described these flood basins as being inundated annually by floodwaters. The Sacramento River was separated from the flood basins by natural levees; however, at high water, these levees were easily overtopped. The lower 25 miles of the Feather River (approximately 18 miles of which are in the proposed project area) is also bounded by flood basins (Water Engineering & Technology 1990:32–33).

Hall (1880 as cited in Water Engineering & Technology 1990:32–34) describes the inundation of the flood basins during the flood of 1879:

> During the high water of March 1879, the low lands of the Sacramento Valley, to the extent of about 847 square miles, were covered with water; this area includes all flooded for a short period of time, as well as that upon which the water rested for several months. Above the mouth of the Feather River, in what may be called the upper flood region, the area covered was about 483 square miles; and below that point, in what is called the lower flood region, the flooded area was about 364 square miles in extent.

Gilbert (1917:15) emphasized the hydrologic significance of the natural flood basins:

> The lateral basins affected the channel characters in important ways. They conveyed a large part of the flood discharge and thus left for adjacent portions of the channel only a small part. They acted as reservoirs for the storage of floodwaters and fed them gradually to the lower course of the Sacramento, so that the channels in the delta region were only moderately taxed by the floods. The channels in consequence were adjusted for conveyance of only a fraction of the flood discharge; they were of moderate section and their meanders were of small radius. Between the town of Colusa and the mouth of the Feather River the Sacramento River grows gradually smaller downstream until its estimated capacity is only 10 per cent of the flood discharge.

Because the flood basins have been maintained as topographic lows even though there has been extensive overbank deposition, it is evident that the flood basins have been subsiding at a rate equal to or exceeding that of overbank deposition (Gilbert 1917; Water Engineering & Technology 1990:34; Water Engineering & Technology 1989 as cited in Water Engineering & Technology 1990:34; Harvey 1988 as cited in Water Engineering & Technology 1990:34). Such widespread

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subsidence perhaps is driven by ongoing structural deformation of the Sacramento Valley. Offset on the Willows fault could have generated an east-dipping topographic gradient on the eastern, upthrust block. Rotation of the downthrust block could have generated a similar gradient (Water Engineering & Technology 1990:34–35). See Section 3.3, *Geology, Soils, Seismicity, and Mineral Resources*, for further information about land subsidence in the proposed project area.

In brief, the Sacramento Valley flood basins play a key role in the fluvial geomorphology and hydrology of the Feather River. Most importantly, suspended sediment that historically has been deposited in the flood basins has produced a thick, cohesive stratigraphic assemblage, which adds to the bank stability of the lower Feather River. The significance of these flood basin deposits increases downstream as the topographic lows become more prevalent (Water Engineering & Technology 1990:35).

C.1.2 Geomorphic Conditions

C.1.2.1 Channel Network Classification

Valley morphology varies going downstream in most watersheds, such as the Feather River watershed. Because of this variation, watersheds are divided into valley segments and channel reaches. Valley segments are distinctive sections of the valley network that possess geomorphic properties and hydrologic transport characteristics that distinguish them from adjacent reaches (Bisson and Montgomery 1996:26).

Valley segments can be classified into three classes based on their position within the watershed and the relative ratios of transport capacity to sediment supply (Montgomery and Buffington 1998:23–24). Headwater source areas typically are transport-limited (often because of limited channel runoff) but do offer sediment storage that is intermittently initiated under large flow events, debris flows, or other gravitational events (e.g., landslides). Transport segments are composed of morphologically resilient, supply-limited reaches (e.g., bedrock, cascade, step-pool) that rapidly convey increased sediment inputs. Response segments consist of lower-gradient, more transport-limited depositional reaches (e.g., plane-bed, pool-riffle, step-pool sequences) where channel adjustments occur in response to changes in sediment supply delivered from upstream.

Based on field observations, literature review, and the stream classification methodologies described above, the Feather River in the proposed project area is an alluvial valley segment dominated by plane-bed and pool-riffle reaches. Plane-bed and pool-rifle reaches are transport-limited; therefore, the Feather River behaves as a response segment, theoretically adjusting its bed morphology to water and/or sediment. In general, it can be described as a sediment-laden, low-sinuosity stream.

C.1.2.2 Reach-Specific Geomorphic Conditions

From the Feather River's confluence with the Yuba River to river mile (RM) 7, levees confine the river within the Sutter Bypass. During flooding, overflow from the Sacramento River can enter the river through the Bypass and a backwater can form. The bed is made up of moving bars of sand, which can become mobile even during summer irrigation season (Foothill Associates 2010).

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From RM 7 to RM 12.5, the Feather River is characterized by the presence of alternate gravel bars on the channel margins and large sand waves within the channel. The frequency of these sand waves increases upstream from Nicolaus. From RM 12.5 to RM 17, near the confluence with the Bear River, the Feather River is relatively wide and straight, and the upper bank sediments are composed of highly erodible, non-cohesive hydraulic mining-derived sands (Water Engineering & Technology 1990:8). For the most part, the bank on one side of the river consists of floodplain silt and sand overlying slickens, while the opposite bank is made up of active point bar deposits of sand with some silt, which indicates that some bank erosion and channel migration is occurring (Foothill Associates 2010). Fluvial entrainment and dry gravel of upper bank sediments are common; however, the resistance of the toe bank, composed of fine-grained hydraulic mining debris (slickens), contributes to planform stability (Water Engineering & Technology 1990:8).

From RM 17 to RM 28, the resistant Pleistocene Modesto Formation commonly forms the channel banks of the Feather River so that channel planform is relatively stable. Several distinct bendways are present within this reach (Water Engineering & Technology 1990:8). These large meanders occur near the bottom of the reach. The banks are made up mostly of floodplain deposits and the beds mostly of sand. The Shanghai Bend, a bench-like outcrop that forms a rapid, with a near-vertical drop of several feet in places, occurs in this reach (Foothill Associates 2010).

Near the confluence with the Yuba River, the Feather River is influenced by backwater effects from the Yuba River, which cause the river to become relatively straight with minimal bank instability and fewer meanders. The floodplain here, confined by older natural levee terrace deposits and built levees, is typically less than 1 mile across. The bed is sand and the banks are made up of floodplain deposits. There are few point bars or other depositional features and only a single channel (Foothill Associates 2010).From RM 29 to RM 61 (near Oroville), the levee embankment system is set back and the river occupies a wide meander belt similar to the Sacramento River upstream of Colusa. In general, the Feather River is a sand- to fine gravel–dominated, high-sinuosity channel upstream of Marysville to about RM 56. Upstream of RM 56, sinuosity decreases, split flow around mid-channel gravel bars is common, and sediment is dominated by coarse gravel to cobble-sized sediment. The river is bordered by gold mining dredge spoils in this upper reach (Water Engineering & Technology 1991:139–140).

More specifically, from RM 29 to RM 45, the Feather River is a sinuous meandering channel whose bed material is dominated by sand to fine gravel–sized sediment. The sediment coarsens gradually upstream through the reach. The river is highly dynamic and contains large point bars and chute channels. Bank erosion is extensive; however, wide levee setback precludes direct levee threat. Where the channel flows close to the levees, the resistant Pleistocene Modesto Formation commonly composes the channel banks (Water Engineering & Technology 1991:139–140). This section of river is unlike the other reaches because of its high sinuosity, active bank erosion, and point bar formation. These point bars are made up primarily of sand and minor gravel and are not armored. Meander cutoffs have occurred here and will likely continue to occur. The instability of this reach is likely related to the relatively fine composition (sand to fine gravel) of the bed and banks (Foothill Associates 2010).

From RM 45 to 54, high-flow sinuosity is low, split flow is common, and bed and bar sediment is dominated by gravel to cobble-sized material. This reach has a very high sediment load because of the presence of dredge spoils upstream. From RM 54 to RM 61, the Feather River flows through gold mining dredge spoils. The channel banks generally are composed of the spoils, which are dominated by sand to cobble-sized sediment. The river has been controlled within linear spoils piles so that the

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spoils border the river directly for several miles. As a result, sinuosity is low in this uppermost reach (Water Engineering & Technology 1991:139–140).

C.1.2.2.1 Surficial Geology

Previous geologic mapping in the southern proposed project area along the Feather River and surrounding areas generalize the surficial deposits as: Quaternary Alluvium (map unit Qa) and Quaternary stream channel deposits (map unit Qsc) within and proximal to the modern Feather River channel, (Helley and Harwood 1985). These map units are considered Holocene age (less than 11,000 years old). Late Quaternary Modesto Formation (map units Qmu, Qml) is mapped along the western margin of the floodplain.

Previous geologic mapping along the northern Feather River and surrounding areas generalizes the surficial deposits as: Quaternary alluvium (map unit Qa) and Quaternary stream channel deposits (map unit Qsc), which are mapped within and proximal to the modern Feather River channel (Bussaca et al. 1989 as cited in Appendix O of Volume 4 of URS 2010:3 [included in this report as Appendix C, part C.4]; Creely 1965 as cited in Appendix O of Volume 4 of URS 2010:3; Helley and Harwood 1985). These map units are considered Holocene in age (less than 11,000 years old). Late Pleistocene Modesto Formation (map units Qmu, Qml) is present as an escarpment along the western margin of the floodplain.

These map units were delineated by Helley and Harwood (1985) at a regional scale (1:62,500). A more current analysis of the Feather River area by William Lettis & Associates uses this existing geologic framework as a basis for more detailed mapping of late Holocene alluvium and geomorphic features (see Plate 1 of Appendix O of Volumes 4 and 5 of URS 2010 [included in this report as Appendix C, parts C.4 and C.5, and Plate 3.3-1 of this document).

The surficial geologic map units in and adjacent to the Feather River are described in Appendix O, "Geomorphology Report," in Volumes 4 and 5 of the URS (2010) report (included in this report as Appendix B). Additionally, for a description of surficial geologic units, refer to Section 3.3, *Geology, Soils, Seismicity, and Mineral Resources*.

Lower Feather River

Published geologic maps of the lower Feather River identify a complex series of westward aggrading alluvial fans and terraces derived from the Sierra Nevada, identified as the Riverbank and Modesto Formations. The Riverbank Formation and Modesto Formation are semi-consolidated to unconsolidated deposits characterized by intra-formational paleochannels and lateral and vertical stratigraphic complexity related to past fluvial processes and buried paleo-topography. The Riverbank Formation unconformably overlies the Laguna Formation, which is a deeply dissected alluvial surface (Busacca et al. 1989 as cited in Appendix O of Volume 4 of URS 2010:5) (Appendix O of Volume 4 of URS 2010:5 [included in this report as Appendix B]).

Subsurface deposits about 150 feet beneath the ground surface rest on a resistant volcanic tuff capped by interbedded alluvial gravel, sand, and silt, interpreted as Pliocene-Pleistocene age Laguna Formation that represents a period of relatively stable landscape conditions (Helley and Harwood 1985). The Laguna Formation is overlain by the Pleistocene Riverbank Formation, (very dense gravel deposits), which are, in turn, overlain by a medium dense sand and gravelly sand assemblage of the latest Pleistocene Modesto Formation (Busacca et al. 1989 as cited in Appendix O of Volume 4 of URS 2010:5 [included in this report as Appendix B]). The upper member of the Modesto

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Formation is exposed at the ground surface adjacent to the western bank of the Feather River south of Marysville and Yuba City. The Modesto Formation is mantled by unconsolidated deposits of Holocene age that compose most of the surficial geologic deposits along the western side of the Feather River (Plate 1 of Appendix O of Volume 4 of URS 2010 [included in this report as Appendix B] and Plate 3.3-1 of this document) (Appendix O of Volume 4 of URS 2010:5).

Upper Feather River

Published geologic maps of the upper Feather River show a complex series of westward aggrading alluvial fans and terraces derived from erosion of the Sierra Nevada, identified as the Riverbank and Modesto Formations (Bussaca et al. 1989 as cited in Appendix O of Volume 5 of URS 2010:5 [included in this report as Appendix B]; Helley and Harwood 1985; Creely 1965 as cited in Appendix O of Volume 5 of URS 2010:5 [Appendix B]). The Riverbank Formation and Modesto Formation in general are semi-consolidated to unconsolidated deposits characterized by intra-formational paleochannels and lateral and vertical stratigraphic complexity related to past fluvial processes and buried paleo-topography. The oldest map unit, the Riverbank Formation unconformably overlies the Pliocene-Pleistocene age Laguna Formation, which consists of interbedded alluvial gravel, sand and silt (Busacca et al. 1989 as cited in Appendix O of Volume 5 of URS 2010:6 [Appendix B]; Helley and Harwood 1985). The overlying Pleistocene Riverbank Formation consists of very dense gravel deposits that are, in turn, overlain by a medium dense sand and gravelly sand package of the latest Pleistocene Modesto Formation (Busacca et al. 1989 as cited in Appendix O of Volume 5 of URS 2010:6 [included in this report as Appendix B]). The upper member of the Modesto Formation is exposed at the ground surface adjacent to the western bank of the Feather River. The Modesto Formation is locally mantled by unconsolidated, sand-rich Holocene deposits (Plate 1 of Appendix O of Volume 5 of URS 2010 [included in this report as Appendix B] and Plate 3.3-1 of this document). East of the Feather River, the older stratigraphic units are uplifted and dissected and younger deposits are inset into them with older deposits buried beneath younger deposits. West of the Feather River, the stratigraphic units are found in typical succession. This is the result of overall westward tilting and uplift of the Sierra Nevada, incision along the tributary drainages (i.e. Honcut creek), and progradational fan deposition west of the river (Appendix O of Volume 5 of URS 2010:5–6 [Appendix B]).

Surficial geologic mapping (Plate 1 of Appendix O of Volume 5 of URS 2010 [included in this report as Appendix B], and Plate 3.3-1 of this document) shows differences in deposit type and distribution from north to south along the northern Feather River proposed project area that primarily are associated with proximity to the Sierra Nevada mountain front near Thermalito Afterbay. These differences illustrate the diversity of past geomorphic processes along the river and, as a consequence, the type of geologic deposits at and near the ground surface. The surficial geologic map created by William Lettis & Associates allows the delineation of reaches along the river within which geomorphic processes and their associated deposits appear to be relatively consistent (Appendix O of Volume 5 of URS 2010:5–6 [included in this report as Appendix B]).

C.1.2.3 Channel Incision

Thalweg (channel centerline) profiles for the lower Feather River are shown in Figure 5.13 of Water Engineering & Technology (1990:81). The data sets incorporated in this figure represent 1911, 1924, and 1965 surveys. The profiles illustrate a degradational trend from 1911 to 1965, which is expected as channel incision into hydraulic mining debris has been documented (Meade 1982 as

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cited in Water Engineering & Technology 1990:80). The profiles show approximately 10 feet of degradation between 1924 and 1965 (Water Engineering & Technology 1990:80–81).

The Sutter Bypass has its confluence with the Feather River at RM 7.5 (the bottom of the proposed project area). From this point downstream, approximately 5 feet of incision occurred between 1911 and 1924 versus about 2 feet upstream during the same period. Increased flows introduced by the Sutter Bypass may have served to increase the rate of incision into hydraulic mining debris along this lower reach (Water Engineering & Technology 1990:80–81).

Thalweg profiles for the upper Feather River are shown in Figure 6.8 of Water Engineering & Technology 1991:155. The data sets incorporated in this figure represent 1909 and 1964 surveys. The profiles illustrate a significant degradational trend during this time period, which is expected as channel incision into hydraulic mining debris has been documented (Meade 1982 as cited in Water Engineering & Technology 1990:80). The profiles show the greatest amount degradation (approximately 10 feet) at the lower end of the upper proposed project area. The reason the Feather River in the upper proposed project area has not degraded in the upper reaches is attributable to the sediment supply that is maintained by lateral erosion of the dredge spoils that border the channels. In addition, flow regulation has affected the rate of incision. As only infrequent flows can entrain coarser material, channel incision into the debris is relatively slow. Farther downstream, the lower reaches have degraded because of the presence of finer materials (Water Engineering & Technology 1991:150–156).

C.1.2.4 Sinuosity, Channel Migration, and Bank Failure

In the lower proposed project area, historical observations and present-day channel sinuosity upstream of the Yuba River confluence suggest that the Feather River was more sinuous prior to hydraulic mining than it is today. In general, sinuosity increases with distance upstream. This increase in sinuosity reflects the increase in the upstream presence of the resistant Pleistocene Modesto Formation, which has helped to maintain the channel planform. Present-day sinuosity on the Feather River is not substantially different from that of the 1920s. The channel has incised into cohesive hydraulic mining debris (slickens), which has helped to maintain the channel planform. Additionally, flow regulation by upstream dams in the watershed has contributed to the maintenance of the channel planform. Whether sinuosity of the Feather River will increase back to pre-mining levels is unclear; such an increase is dependent on the depositional thickness of the cohesive toe sediment (slickens). If the river degrades through the slickens and less cohesive sediments compose the lower bank, channel migration rates and sinuosity may increase rapidly. Further evidence for the current planform stability is provided by the presence of the extensive riparian vegetation that is located near the water's edge (Water Engineering & Technology 1990:77–80).

In the upper proposed project area, modes of bank failure and thus channel migration are highly dependent on bank lithology and stratigraphy. Along the Feather River in the upper proposed project area, coarse-grained point bar deposits are commonly preserved in the channel banks; fluvial entrainment of these sediments is followed by cantilever failure of the more cohesive upper bank vertical accretion sediments. Abandoned channel fill deposits form resistant hard points on the channel bank; where these deposits are located in the lower bank, bank retreat over the top of the resistant abandoned channel fill deposits can occur (Water Engineering & Technology 1991:149).

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The greatest concentration of eroding banks is between RM 29 to RM 45, where the Feather River is a sinuous meandering channel whose bed material is dominated by sand to fine gravel–sized sediment. The river in this reach is highly dynamic and contains large point bars and chute channels. Bank erosion is extensive; however, as mentioned above, wide levee setback precludes direct levee threat in many locations.

Migration rates in the upper proposed project area are highly variable, reflecting the heterogeneity of materials present, and the range and stages of channel bend development (Harvey 1988 as cited in Water Engineering & Technology 1991:150). Although lateral migration rates are commonly high in the upper proposed project area, levee setback is sufficient so that very little direct levee threat exists (Water Engineering & Technology 1991:139–140).

C.1.2.4.1 Bank Retreat Rates: Feather River (RM 0–28)

Water Engineering & Technology (1990:172–173) conducted an analysis of migration rates for the lower Feather River bank lines. Bankline migration rates (for the west bank) averaged approximately 6 feet of migration per year, with a minimum value of 0 feet per year and a maximum value of 26.5 feet per year. At the time the study was conducted (1990), based on projected migration rates, the lower Feather River levees on the west bank were not anticipated to be threatened over a 15-year interval (Water Engineering & Technology 1990:172). Current-day field observations support this conclusion that bank retreat is slow on this reach, as erosion appears intermittent, the bank toe is cohesive, and mature vegetation is growing along the water's edge.

C.1.2.4.2 Bank Retreat Rates: Feather River (RM 28–61)

Water Engineering & Technology (1991:150–153) conducted an analysis of migration rates for the upper Feather River bank lines. Bankline migration rates (for the west bank) are commonly high (especially between RM 29 to RM 45), with an average of approximately 5 feet of migration per year, with a minimum value of 1.4 feet per year and a maximum value of 20.3 feet per year.

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Part C.2

URS Supplemental Geotechnical Data Report (2010), Appendix O, Volume 2

APPENDIX O

Geomorphology Report

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September 8, 2009

Mr. Juan Vargas
URS Corporation
2870 Gateway Oaks Drive, Suite 150
Sacramento, CA 95833

RE: Surficial geologic mapping and geomorphic assessment, California Department of Water Resources Urban Levees, Wadsworth Canal, Sutter County, California

Dear Mr. Vargas:

This memorandum presents the surficial geologic mapping and preliminary geomorphic assessment of the Wadsworth Canal area, for the California Department of Water Resources (DWR) Urban Project Levees geotechnical characterization. The goal of this mapping and geomorphic assessment is to provide information on the type and distribution of surface and shallow subsurface deposits that likely underlie the project levees along the canal, with respect to potential levee underseepage. This letter presents the technical approach, surficial geologic map, conceptual geomorphic model, and initial results based on map analysis and preliminary review of Phase 1 geotechnical data.

We appreciated the opportunity to provide these geomorphic and geologic data and preliminary interpretations of the shallow stratigraphic conditions in the Wadsworth Canal study area. Please do not hesitate to call either of the undersigned if there are any questions or comments.

Respectfully,

WILLIAM LETTIS & ASSOCIATES, INC.





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1.0 Approach

The approach to developing a surficial geologic map of the Wadsworth Canal area (Figure 1, Plate 1) consisted of analysis of the following data: Aerial photography (black and white stereo-pairs taken in 1937, ~1:20,000-scale); early topographic maps (USGS, 1911); published surficial geologic maps (Helley and Harwood, 1985); early and modern soil survey maps (Strahorn et al., 1911; Lytle, et al., 1988); field reconnaissance visit on June, 22, 2007, and other maps and documents (i.e., Chambers, 2002). Synthesis of these data allow for the development of a detailed surficial geologic map that provides an initial understanding of primary geomorphic processes that have acted in the study area during recent geologic and historical time. Through this mapping, primary geomorphic features and associated surficial geologic deposits are identified, such as abandoned paleochannels, marsh and basin deposits, and other features commonly associated with flood basins adjacent to large, active river systems.

The surficial geologic map was developed at the nominal scale of the aerial photography (1:20,000). This scale establishes the resolution of the map (Plate 1). The map unit contacts shown on the surficial geologic map should be considered approximate, and accurate to no more than about 30 feet on either side of the line shown on the map. The 1937 aerial photographs are the primary data set for interpreting the surficial geologic deposits because: (1) they are the oldest high-quality images available and pre-date much of the cultivation and landscape alteration within present-day Sutter County (Figure 2); and, (2) because these data represent a close approximation to the surficial deposits that were likely present at the ground surface prior to construction of the levees. The 1937 photographs generally were taken in later summer or early autumn (i.e., August). By 1937, the area had experienced moderate cultivation that locally obscures geomorphic conditions. However, integration of data from the 1937 photographs, old and recent topography, existing geologic maps, existing soil surveys and historical documents provides sufficient information to delineate many of the pre-historical and historical surficial deposits in detail. Taken together, these data provide key insights to the geomorphic processes and resulting deposits that may affect levee underseepage.

Additional floodplain deposition may have occurred after 1937, due to flood overflows, levee overtopping, or localized levee failure. A time series analysis that interprets successive aerial photographs taken after major flood events (i.e., 1955) or known local levee failures (i.e., 1986) may reveal additional information on surficial deposits in the Wadsworth Canal area. However, such analyses are beyond the scope of this project. The data and interpretations presented herein address the primary goal of characterizing the type and distribution of deposits likely present directly beneath the project levees.

1.1 Report Preparation Quality Control

The surficial geologic map data and geomorphic interpretations presented in this memorandum were subject to quality control and quality assurance procedures as required by the Levee Geotechnical Evaluation Project Management Plan (PMP). The surficial geologic map data developed by this study were reviewed for accuracy and completeness through an internal review and an independent technical review by Dr. Janet Sowers of WLA. Results of QA/QC

review were documented using PMP Exhibit 2.2-3 (Independent Technical Review Report) and are kept on file according filing control plan. Subsurface data shown on diagrams were provided as draft information, and were not verified for accuracy or completeness by this study.

2.0 Geologic Setting

The Wadsworth Canal (WC) study area is southeast of the Sutter Buttes, a presently in-active and dissected rhyolitic and andesitic volcanic neck, and between the Sacrametno River to the west and the Feather River to the east (Figure 1). The WC levee addressed in this study borders the southeastern side of Wadsworth Canal from just north of Butte House Road to the eastern Sutter Bypass levee. The WC levee trends northeast-southwest, and ties in to the eastern Sutter Bypass levee (Figure 1).

The WC levee lies northeast of Sutter Basin, a low-lying area east of the Sacramento River where overflow and floodwaters produce a seasonally marshy area. Except for the Sutter Buttes, the land regional surface is nearly flat, and along the WC area gently slopes southwest at an elevation of about 40 to 50 feet. Construction of the WC levee was completed by 1924, and was subsequently enlarged in 1942 (DWR, 1976). Prior to cultural modification, surface water runoff in the WC area was delivered to the Sutter Basin via intermittent, meandering creeks and sloughs from the northern Central Valley, including: Snake River, Snake Slough, Little Blue Creek, and ephemeral channels emanating from the eastern side of Sutter Buttes. Presently, many of the natural drainages and channels have been replaced by linear ditches, agricultural drains, and canals (Figure 2).

3.0 Surficial Geologic Mapping

Published surficial geologic maps within the WC study area generalized the surficial deposits primarily as Quaternary basin deposits, with localized units of Quaternary alluvium (map unit Qa) and Quaternary Modesto Formation (lower member, map unit Qml) (Helley and Harwood, 1985). These map units were delineated by Helley and Harwood (1985) at a regional scale (i.e., 1:62,500). The current analysis of the WC uses this existing geologic framework as a basis for more detailed mapping of late Holocene alluvium and geomorphic features (Plate 1). The surficial geologic map units in the Wadsworth Canal study area are described below, in order from oldest to youngest.

The oldest map unit exposed in the study area is the Pliocene-Pleistocene tuff breccia (map unit QTm). This rock primarily comprises a peripheral topographic ring around the relatively high relief Sutter Buttes, and consists of consolidated coarse material derived from the volcanic rocks of the Buttes. This bedrock is exposed in the northwest corner of the WC map area (plate 1).

The Quaternary Riverbank Formation (lower and upper members) is exposed at the ground surface adjacent to the tuff breccia (map unit Qrl and Qru, Plate 1). This map unit does not directly underlie the project levees in this study area, but is present in the shallow subsurface as

alluvial-fan deposits derived from the Sutter Buttes during the middle Pleistocene (about 400,000 to 200,000 years ago). The Riverbank Formation is semi-consolidated, and the top of the formation is marked by a hardpan (or, duripan) layer that is a product of soil-forming processes over substantial geologic time. This hardpan layer reflects an ancient land surface that is now buried by younger deposits. In WC area, the upper Riverbank formation is associated with the Sutter clay (Strahorn, et al., 1911), and Marcum clay loam with "siltstone" hardpan (Lytle, 1988).

The late Pleistocene Modesto Formation is exposed at the surface as alluvial-fan deposits emanating from southwestern Sutter Buttes, and is younger than, and inset into, the Riverbank Formation (Plate 1). This unit is divided into two members, a lower (older) unit that is about 42,000 to 29,000 years old (map unit Qml), and an upper member that is about 24,000 to 12,000 years old (map unit Qmu) (Helley and Harwood, 1985). The upper member in the map area is associated with sub-linear low ridges to the east of the WC that have not been completely covered by basin deposits. The Modesto Formation is locally associated with the Sutter sandy loam (Strahorn, et al., 1911), and the Olashes sandy loam (Lytle, et al., 1988); the sand consisting of volcanic lithologies indicating derivation from Sutter Buttes parent material. The latest Pleistocene Modesto Formation, in general, consists of unconsolidated sand, silt, and clay, and is associated with a moderate amount of secondary (pedogenic) clay accumulation that may form laterally continuous zones of low hydraulic conductivity.

Holocene deposits (less than 11,000 years old) in the WC map area consist of basin and alluvial deposits (Qb of Helley and Harwood [1985]; map unit Qn, Plate 1). These widespread basin deposits, about 4 to 8 feet thick, overlie the Modesto Formation. The soils developed on the basin deposits are generally the Gridley clay loam and Oswald clay (Stahorn et al., 1911; Lytle, et al., 1988), immature soils with fine-grained textures. Undifferentiated Quaternary alluvium (map unit Qa) is present near the western margin of the map area, deposited by pre-historic Butte Creek. Holocene alluvium is mapped at the surface as alluvial-fan deposits emanating from southwestern Sutter Buttes, and is younger than, and locally overlies the upper Modesto Formation. These deposits likely consist of poorly sorted mixtures of fine gravel, sand, and silt derived from the volcanic rocks of the Buttes. The Quaternary marsh deposits (map unit Qs, Plate 1) are present between the levees of the Sutter Bypass, and consist of fine grained deposits that are differentiated from basin deposits by generally being underwater or having standing water at the time when the 1937 photographs were taken.

Holocene alluvial channels (map unit Hch, Plate 1) are mapped as a network of moderately sinuous channels with southwesterly orientations. These channels appear to be mostly filled in with sediment on the 1937 photographs, and are not expressed as strong topographic lows in the ground surface. Many of these channels extend beyond, and therefore cross beneath, the eastern Sutter Bypass levee and WC levee (Plate 1). The infilling material in the basal portions of the channel consists of relatively loose, coarse material (i.e., sand), which fines upward into fine-grained, silt and clay. The channel deposits are tentatively associated with the Liveoak series, sandy clay loam soil (Lytle, et al., 1988).

Localized deposits related to the Holocene alluvial channels are in-stream bars (map unit Hb) that typically occur in the medial portions of the channels, and distributary fans (map unit Hdf)

that occur where the channel morphology tapers out and the channel has deposited sediment on the basin floor. These two types of deposits are uncommon in the study area, and have been mapped only distant from the WC levee.

Historical alluvial channels (map unit Rch, Plate 1) also are mapped as a network of moderately sinuous channels that have southwesterly orientations toward Sutter Basin. The term "historical" is applied to deposits that are estimated to be less than 150 years old. The historical channels are differentiated from the slightly older Holocene channels on the basis of cross-cutting relationships, relative degree of geomorphic expression, and correlation with mapped creek positions on the 1911 USGS topographic map. The Wadsworth Canal levee overlies the former locations of these alluvial channels in several locations throughout its length (Plate 1).

4.0 Conceptual Geomorphic Model

Based on synthesis of surficial geologic mapping, early topographic maps, soil surveys, geologic maps, and review of readily available subsurface geotechnical information, this section presents a preliminary conceptual model describing general relationships among surface and subsurface deposits in the Wadsworth Canal area. This conceptual model provides a consistent basis for understanding the type and distribution of surficial geologic deposits, primary geomorphic processes, and shallow subsurface stratigraphy in the area.

The geologic deposits present at the surface and in the shallow subsurface are derived from three general source areas: (1) material eroded from the Sutter Buttes and transported to the adjacent low-lying basin floor forming modest alluvial fans (i.e. Riverbank and Modesto Formations); (2) material deposited on the basin floor as fine silt and clay settled from standing or slow moving floodwaters of large rivers (i.e., basin deposits); and, (3) material transported to the basin by the ephemeral creeks and sloughs that traversed the valley floor prior to present day modification (i.e., channel fill).

The WC project levee trends southwest, and is primarily underlain by clayey basin deposits with some silt and sand (Plate 1, Figure 3). The basin deposits rest directly on the upper Modesto Formation, the upper boundary of which is characterized by a clay hardpan horizon associated with a buried soil. The hard pan layer is generally observed as a very stiff to hard, lean to fat clay, 10YR ¾ colors (Munsell color notation) associated with locally increased density (i.e., blow counts, CPT tip resistance), and likely very low permeability. Thus, the upper Modesto Formation mapped in northwest potion of the map area extends below ground, and dips southeasterly beneath the project levee in the shallow subsurface.

Fine-grained basin deposits overlie the upper Modesto Formation near the WC levees (Figure 3). These deposits accumulated on the valley floor over geologic time resulting from flooding of the major rivers (i.e., Sacramento and/or Feather Rivers), tributaries draining Sutter Buttes, and sheetwash from the generally flat valley floor. This resulted in inundation of the basin with standing water, and subsequent settlement of silt and clay from suspension. The thickness of the basin deposits is about 4 to 8 feet, but locally may be thicker. Review of available Phase 1 and other existing geotechnical data (i.e., Chambers 2002) indicate medium stiff to very stiff

relative density of the basin deposits. However, there is a substantial lateral and vertical variability in the hardness properties of the basin deposits.

Laterally cross-cutting, and vertically inset into the basin deposits, are the Holocene and Historical channel deposits (map units Hch and Rch, Plate 1). These southwest-trending alluvial channel deposits locally underlie the WC levee, and thus result in local differences in material textures beneath the levee (Figure 3). Field reconnaissance on June 22, 2007 reveals that the topographic expression of these channels has been obliterated by cultivation. However, sub-linear to curvilinear differences in ground color (i.e., darker strips) were observed in the cultivated fields in areas that potentially correlate with mapped channels, suggesting a contrast in materials in the shallow subsurface. Review of subsurface geotechnical data indicate that the channel fill deposits include a lower channel fill consisting of relatively loose, coarser material (i.e., sand), fining upward and grading into fine-grained silt and clay. Many of these channels extend across, and therefore continue beneath, the WC levees (Plate 1, Figure 3).

Figure 3 illustrates the relationships between the surficial channels, basin deposits, and shallow stratigraphy that underlie the WC project levee, wherein dense, semi-consolidated Pleistocene deposits are overlain by a layer of fine-grained basin deposits, locally cut by alluvial channel deposits.

5.0 Applications to the Urban Levee Project

Based on synthesis of the surficial geologic map with preliminary Phase 1 boring and cone penetrometer (CPT) data, and historical geotechnical subsurface exploration data (i.e., Chambers, 2002), the WC levee is underlain by relatively young fine-grained clay and sandy clay deposits that are laterally interrupted by local coarser channel fill deposits (Figure 3). Mud rotary borehole WSEWWC-002B penetrates a mapped surficial channel unit (Figure 3, Plate 1), and indicates the channel fill is silty sand that grades upward into clay, with an uncorrected SPT blow count of 5 blows per foot. This suggests locally loose and unconsolidated, and therefore likely permeable, material in the shallow subsurface. Initial review of subsurface boring profiles completed along the eastern landside of the Wadsworth Canal near the tie-in to the Sutter Bypass levee (Chambers, 2002) also shows relatively loose and soft sandy deposits (i.e., blow counts of 0 to 5) that are overlain by a layer of medium stiff clay-rich material.

Synthesis of the surficial mapping and geotechnical data indicate that subsurface stratigraphy the WC area locally may be conducive to levee underseepage. Shallow strata typically include denser and probably semi-cemented material (i.e., Modesto Formation) that likely contains a low-permeability hardpan horizon. The hardpan may or may not be laterally continuous, depending on post-depositional soil formation and erosional processes. The Modesto formation is overlain by about 4 to 6 feet of medium stiff to stiff clay (i.e., basin deposits). Surficial mapping indicates that the basin materials locally are cross-cut by relatively loose, sandy channel deposits; subsurface geotechnical data show lateral and vertical variations in texture and density that are probably related to buried channel deposits. Therefore, this shallow subsurface stratigraphy may promote levee underseepage along certain areas of the WC project

levees where geologically young, loose, sandy channel material lies between the dense Pleistocene deposits and relatively stiff, low-permeability clay-rich surface "blanket" layer.

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 underseepage, given certain hydraulic conditions. Further spatial analyses of the surficial geologic mapping and subsurface geotechnical exploration data are needed to better constrain and characterize areas that are most susceptible to underseepage in the study area.

6.0 Limitations

This geomorphic assessment and associated data interpretation have been performed in accordance with the standard of care commonly used as the state-of-practice in the geologic engineering profession. Standard of care is defined as the ordinary diligence exercised by fellow practitioners in this geographic area performing the same services under similar circumstances during the same time period.

Discussions of surface and subsurface conditions summarized in this technical memorandum are based on geologic interpretations of subsurface soil data at limited exploration locations available to this assessment through July of 2007. Variations in subsurface conditions may exist between exploration locations, and the project team may not be able to identify all adverse conditions in the levee and its foundation. This memorandum is for the use and benefit of DWR. Use by any other party is at their own discretion and risk.

7.0 References

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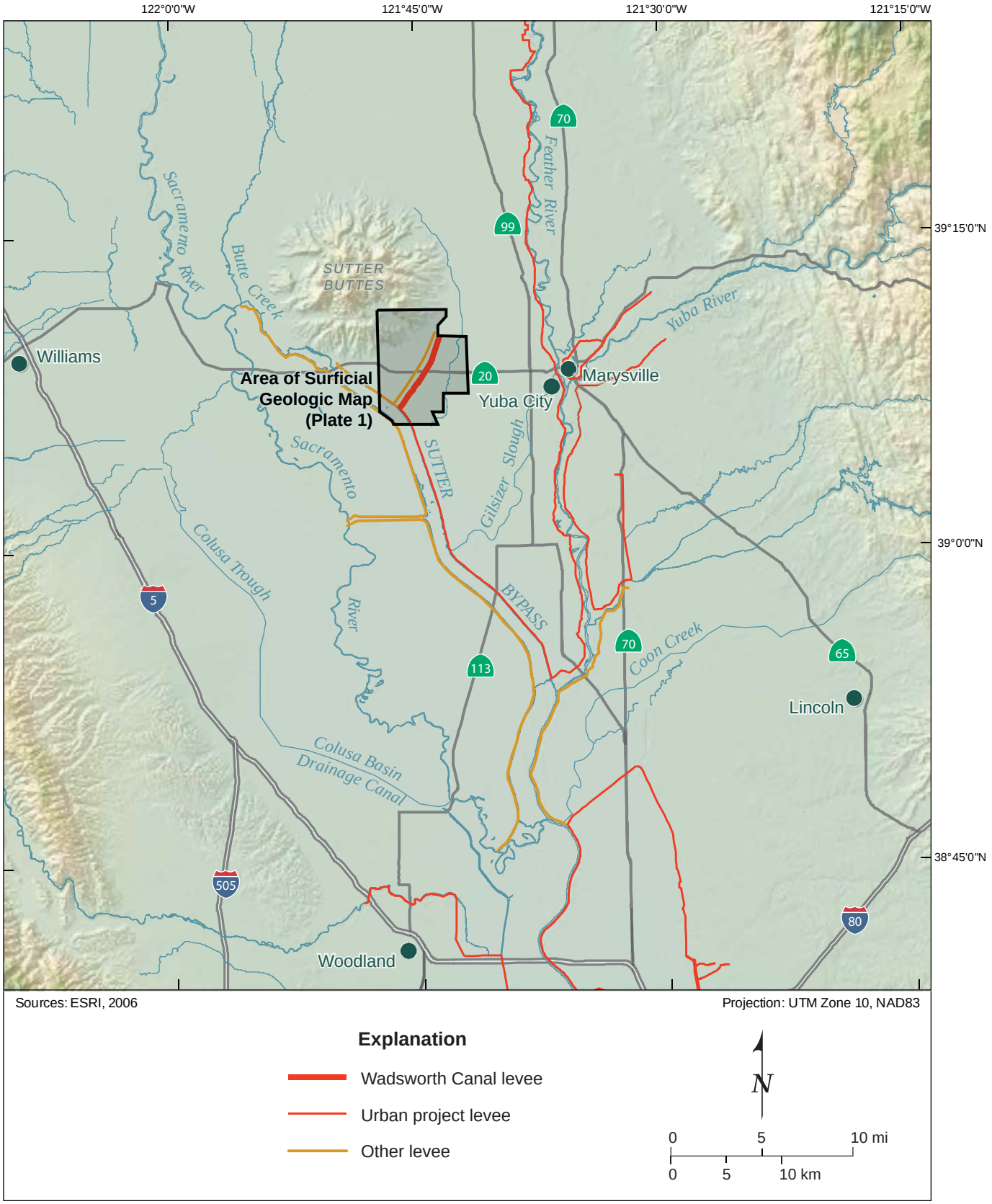


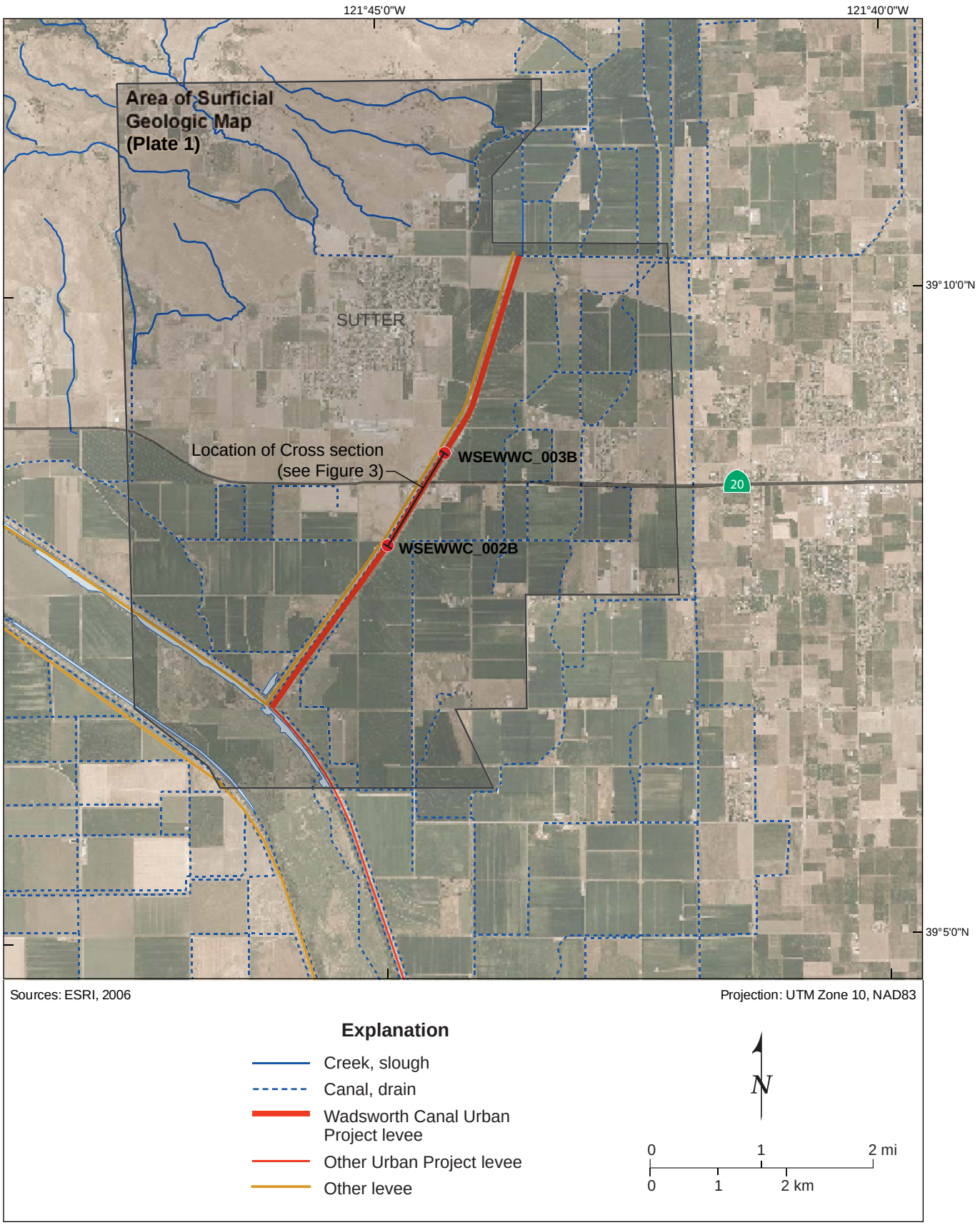
Map of Northern Central Valley, California

DWR URBAN LEVEE PROJECT

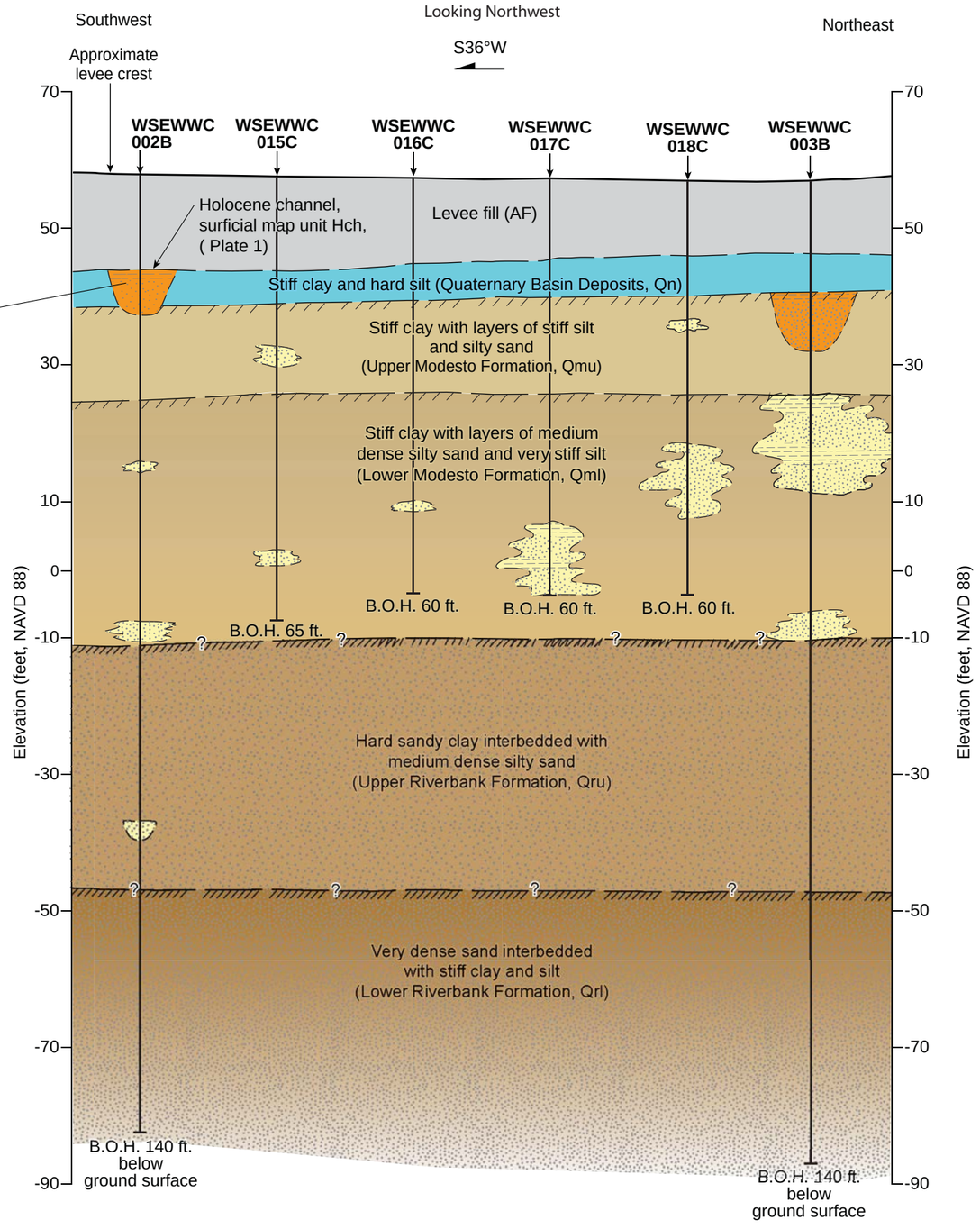
Figure 1

1881 Wadsworth Canal

Modified 09.03.09


121°45'0"W
121°40'0"W
39°10'0"N
39°5'0"N
Area of Surficial Geologic Map (Plate 1)
SUTTER
Location of Cross section (see Figure 3)
WSEWWC_003B
WSEWWC_002B
20
Sources: ESRI, 2006
Projection: UTM Zone 10, NAD83
Explanation
Creek, slough
Canal, drain
Wadsworth Canal Urban Project levee
Other Urban Project levee
Other levee
N
0
1
2 mi
0
1
2 km

WADSWORTH CANAL



Log description from borehole WSEWWC 002B

44.0 to 42.5 feet. Lean CLAY (CL) stiff; dark brown (10YR 3/3); moist; 90% medium plasticity; 10% fine sand

42.5 to 41.0 feet. SILT with SAND (ML) loose, dark yellowish brown (10YR 3/4); moist; 15% fine sand

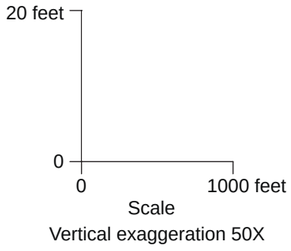
41.0 to 39.0 feet. SILTY SAND (SM) medium dense; dark yellowish brown (10YR 3/4); moist; 75% fine to medium sand; 25% fines

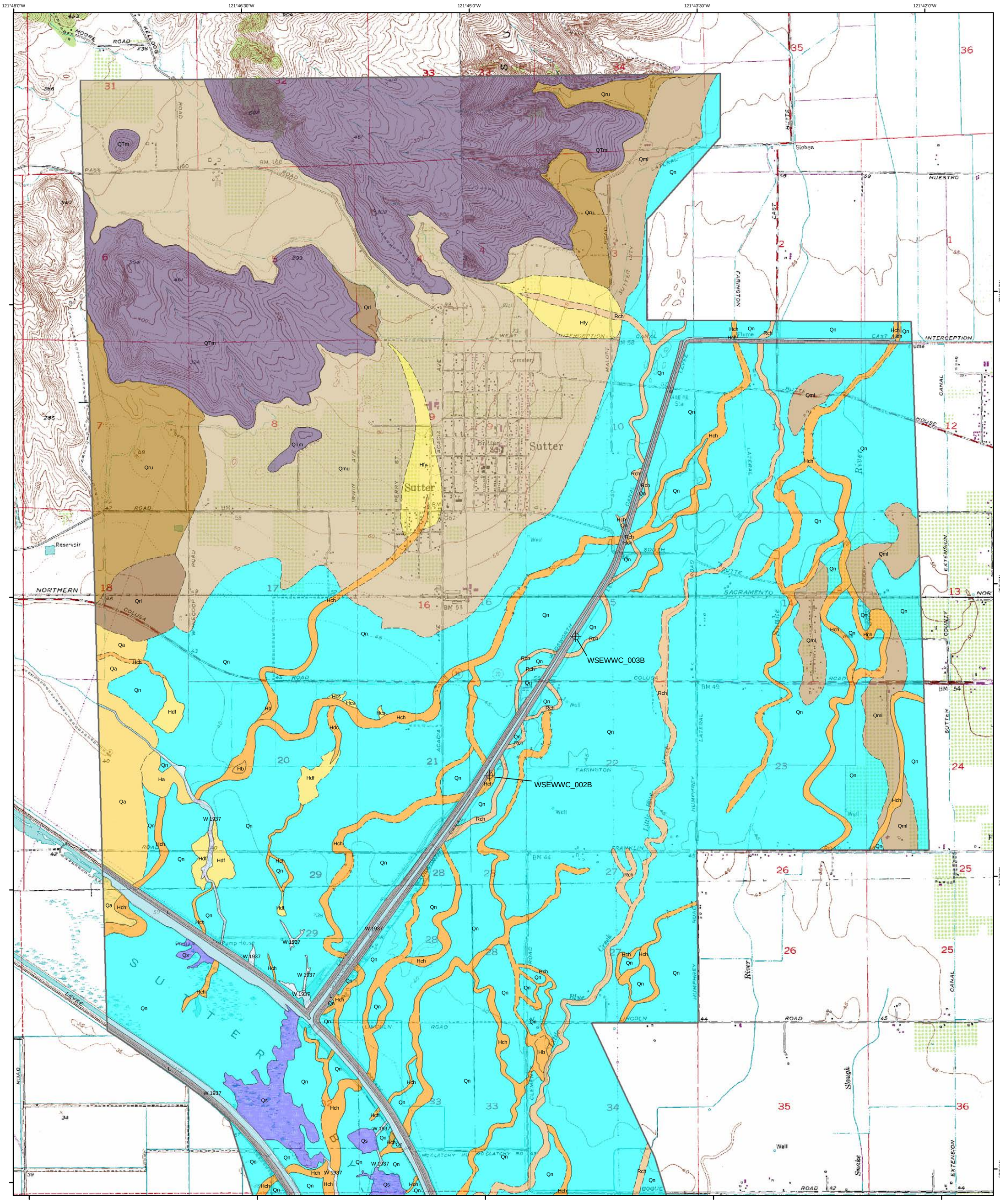
42.5 to 41.5 SPT = 5 blows/foot

Explanation

- Channel identified on surficial geologic map or as fining upward sequence of sediments in boreholes
- Localized sand and gravel; possible channel; interpreted from suburface borehole data
- Moderate paleosol (hardpan)
- Strong paleosol (hardpan)

Notes:
1. Borehole ground elevation values from Engeo, Inc. draft borehole logs as estimated from map (NAVD 88). Absolute elevations of geologic contacts could change if reported ground elevations of boreholes are revised.
2. CPT borehole surface elevations are approximate, placed on projected ground surface between continuous boreholes WSEWWC-002B and 003B.
3. All depths (vertical axis) shown as elevation values (NAVD88), as shown on Engeo, Inc. borehole logs.
4. Bottom of hole (B.O.H.) values shown as total depth below ground surface.
5. Borehole names and and horizontal distance shown above (from Engeo logs and location maps). Geologic relations could change if borehole locations are revised.
6. Drilling method indicated as last letter in borehole name:
   B = Mud Rotary borehole with SPT
   C = Cone Penetrometer Test
7. See Figure 2 for location of cross section.





Explanation

Geologic contact; dashed where approximate, dotted where concealed, queried where uncertain; solid contacts have a resolution no better than about 30'.

WSEWWC_003B — Geotechnical borehole, approximately located.

W — Water visible on 1937 aerial photography.

Geologic Units

HISTORICAL

- AF — Artificial fill; visible on 1937 aerial photography.
- Rch — Channel deposits; sorted sands and silty sand; fining upward.

HOLOCENE

- Hcs — Crevasse splay deposits; fine to coarse sand, silt and clay.
- Hdc — Distributary channels, sand, silt, and clay.
- Hdf — Distributary fan deposits; sand, silt and clay.
- Ha — Alluvial deposits; undifferentiated; sand, silt, and minor lenses of gravel; under cultivation in 1937.
- Hch — Channel deposits; sorted sands and silts; fining upward.
- Hb — Channel bar deposits; fine sand, and silt deposited in or along channel lateral margins.
- Hfy — Alluvial fan deposits, well graded gravel, sand, silt and clay; volcanic lithologies.
- Qa — Alluvial deposits, undifferentiated; sand, silt, and minor lenses of gravel; under cultivation in 1937.
- Qn — Basin deposits; fine sand, silt and clay, dark yellow to dark yellowish brown, under cultivation in 1937.
- Qs — Marsh deposits; silt and clay, likely organic-rich; perennially or seasonally submerged on 1937 photography.

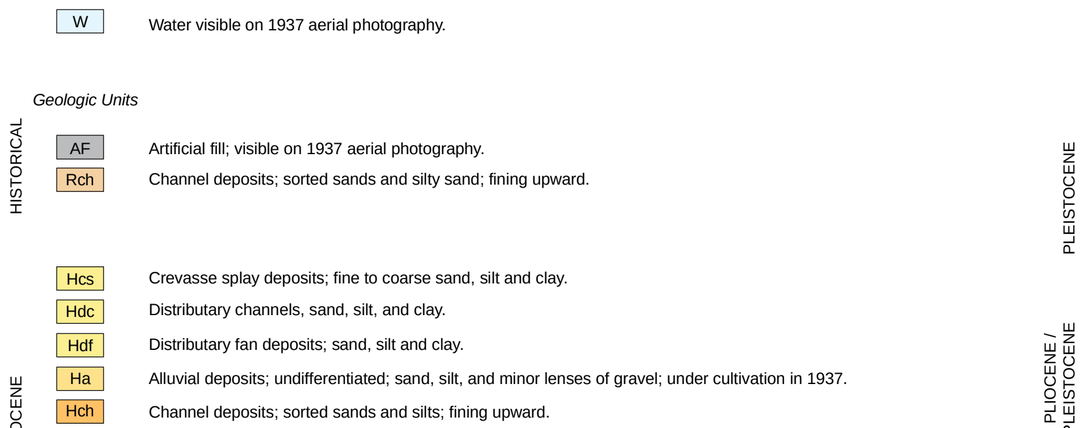
PLEISTOCENE

- Qmu — Modesto Formation; upper member; unconsolidated to semi-consolidated gravel, sand, silt, and clay.
- Qml — Modesto Formation; lower member; unconsolidated gravel, sand, silt and clay.
- Qru — Riverbank Formation; upper member, semi-consolidated to consolidated gravel, sand, silt and minor clay.
- Qrl — Riverbank Formation; lower member; consolidated gravel, sand, silt, and clay, generally associated with strong duripan horizon.

PLIOCENE / PLEISTOCENE

- QTm — Tuff Breccia; Volcanic tuff breccia (andesitic and rhyolitic) from Sutter Buttes, latest Pliocene.

Stratigraphic Correlation Chart



1:20,000

0 0.5 1 Miles

0 0.5 1 Kilometers

N

Map projection: UTM NAD83 Zone 10N
Topo base USGS quadrangles.

Plate 1 - Surficial Geologic Map of the Wadsworth Canal Area

WILLIAM LETTIS & ASSOCIATES, INC.
Walnut Creek, CA

Sutter_MGT_Plate1_Wadsworth.mxd 09/04/2009

Part C.3

URS Supplemental Geotechnical Data Report (2010), Appendix O, Volume 3

APPENDIX O

Geomorphology Report

WILLIAM LETTIS & ASSOCIATES, INC.
1777 Botelho Drive, Suite 262, Walnut Creek, California 94596
tel (925) 256-6070 fax (925) 256-6076

September 8, 2009

Mr. Juan Vargas
URS Corporation
2870 Gateway Oaks Drive, Suite 150
Sacramento, CA 95833

RE: Surficial geologic mapping and geomorphic assessment, California Department of Water Resources Urban Levees Project, Southern Feather River, Sutter County, California

Dear Mr. Vargas:

This memorandum presents the surficial geologic mapping and preliminary geomorphic assessment of the southern Feather River study area, for the California Department of Water Resources (DWR) Urban Levees Project geotechnical characterization. The goal of this mapping and geomorphic assessment is to provide information on the type and distribution of surface and shallow subsurface deposits that likely underlie the project levees along the western bank of the Feather River. The purpose of this study is to develop spatially-continuous geologic data and a conceptual model that provides a framework for stratigraphic interpretations between widely-spaced subsurface explorations. A primary goal is to provide a geologic framework for the geotechnical assessment of potential levee underseepage. This memo presents the technical approach, surficial geologic map, conceptual geomorphic model, and initial results based on map analysis and preliminary review of Phase 1 geotechnical data.

We appreciated the opportunity to provide these geomorphic and geologic data and preliminary interpretations of the shallow stratigraphic conditions in the southern Feather River study area. Please do not hesitate to call either of the undersigned if there are any questions or comments.

Respectfully,

WILLIAM LETTIS & ASSOCIATES, INC.



Justin Pearce, C.E.G. 2421
Senior Geologist



Ashley Streig
Senior Staff Geologist



Keith Kelson, C.E.G. 1610
Principal Geologist

1.0 Approach

The approach to developing a surficial geologic map of the southern Feather River project area (Figure 1, Plate 1) consisted of analysis of the following data: Aerial photography (black and white stereo-pairs taken in 1937, ~1:20,000-scale); early USGS topographic maps (i.e., 1911); published surficial geologic maps (Helley and Harwood, 1985); early and modern soil survey maps (Strahorn et al., 1909; Lytle, et al., 1988); and other maps and documents (Busacca et al., 1989). Synthesis of these data allow for the development of a detailed surficial geologic map that provides an initial understanding of primary geomorphic processes that have acted in the study area during recent and historical geologic time. Through this mapping, primary geomorphic features and associated surficial geologic deposits are identified, such as abandoned paleochannels, channel deposits, floodplain deposits, basin deposits and other features commonly associated with surficial deposits with large active river systems. Knowledge of fluvial processes and the ability to recognize depositional environments in the geologic record are key to identifying locations along levees where underseepage is most likely to occur (Llopis
et al., 2007).

The surficial geologic map was developed at the nominal scale of the aerial photography (1:20,000). This scale establishes the resolution of the map (Plate 1), such that analysis of the map data at a more detailed scale than 1:20,000 may introduce uncertainties beyond the original resolution of the data. The map unit boundaries shown on the surficial geologic map should be considered approximate, and accurate within 30 feet on either side of the line shown on the map. The 1937 aerial photographs are the primary data set for interpreting the surficial geologic deposits because: (1) they are the oldest high-quality images that pre-date much of the urbanization and landscape alteration within present-day Sutter County (i.e. Figure 2); and, (2) these data represent a close approximation to the surficial deposits that were likely present at the ground surface prior to the construction of the levees. The 1937 photographs generally were taken in late summer or early autumn (i.e., August). By 1937, the area had experienced moderate cultivation that locally obscures geomorphic conditions. However, integration of data from the 1937 photography, old and recent topographic maps, geologic maps, soil surveys and historical documents provides sufficient information to delineate many of the pre-historical and historical surficial deposits in detail. Taken together, these data provide key insights to the characteristics of shallow deposits beneath the levees, as well as the geomorphic processes responsible for their distribution.

Additional floodplain deposition may have occurred after 1937, due to flood overflows, levee overtopping, or localized levee failure. A time series analysis that interprets successive aerial photographs taken after major flood events (i.e., USDA, black and white stereo-pairs taken in 1958, ~1:20,000-scale) or known local levee failures (i.e., 1986) may reveal additional information on surficial deposits in the southern Feather River area. Such analyses are beyond the scope of this study. The data and interpretations presented herein address the primary goal of characterizing the type and distribution of deposits likely present directly beneath the project levees.

1.1 Report Preparation Quality Control

The surficial geologic map data and geomorphic interpretations presented in this memorandum were subject to quality control and quality assurance procedures as required by the Levee Geotechnical Evaluation Project Management Plan (PMP). The surficial geologic map data developed by this study were reviewed for accuracy and completeness through an internal review and an independent technical review by Dr. Janet Sowers of WLA. Results of QA/QC review were documented using PMP Exhibit 2.2-3 (Independent Technical Review Report) and are kept on file according filing control plan. Subsurface data shown on diagrams were provided as draft information, and were not verified for accuracy or completeness by this study.

2.0 Geologic Setting

The southern Feather River study area lies in the Central Sacramento Valley, between the Coast Ranges to the west and the Sierra Nevada foothills to the east. Feather River drains the western slope of the Sierra Nevada, and emerges from the mountains south of the Thermalito Afterbay (Figure 1). The river flows southward from the Thermalito Afterbay, over middle-to late Pleistocene dissected alluvium derived from the Sierra Nevada. The regional land surface is nearly flat, with a gentle west-southwest slope that flattens out south of the Sutter Buttes, in Sutter Basin. The Feather River is entrenched into middle to late Pleistocene semi-consolidated sediments. Holocene alluvium deposited by the Feather River is present between the present-day levees, inset to the older formations, as well as on the western floodplain as subdued natural levees. The river trends roughly south until its confluence with the Bear River, where it curves
to the southwest (Figure 1). The Feather River lies east of, and is a tributary to the Sacramento River, converging near the town of Nicolaus (Figure 1). A primary influence on the historic processes in the river system was the hydraulic mining that began in the 1850's. Mining occurred through the early 1900's in the Feather, Yuba and Bear River watersheds, and abruptly introduced large quantities of sediment, drastically changing the geomorphic characteristics of these river systems (DWR, 2004; Ellis, 1939). Aggradation within the stream channel was a primary response to the introduction of substantial mining debris (James, 1999), consequently young alluvial deposits are common throughout the study area.

3.0 Surficial Geologic Mapping

Previous geologic mapping in the study area along the Feather River and surrounding areas generalize the surficial deposits as: Quaternary Alluvium (Qa) and Quaternary stream channel deposits (Qsc) within and proximal to the modern Feather River channel, (Helley and Harwood, 1985). These map units are considered Holocene age (less than 11,000 years old). Late Quaternary Modesto Formation (Qmu, Qml) is mapped along the western margin of the floodplain. These map units were delineated by Helley and Harwood (1985) at a regional scale (i.e., 1:62,500). The current analysis of the Feather River uses this geologic framework as a basis for more detailed mapping of late Holocene alluvium and geomorphic features (Plate 1).

The surficial geologic map units within the southern Feather River study area are described below, in order from oldest to youngest. Surficial geologic mapping for this study subdivides these map units and delineates individual deposits based on relative age and depositional process or environment (Plate 1). The map units depicted on Plate 1 are based primarily on analysis of 1937-vintage photography, and thus the map essentially is a "snapshot" of geologic conditions at this time.

The oldest unit exposed along the Feather River is the lower member of the Riverbank Formation (Qrl) of Helley and Harwood (1985). This unit is a highly dissected alluvial surface with textures of weathered gravel, sand and silt with strong soil-profile development. The Riverbank Formation is semi-consolidated, and is associated with the presence of a well-developed hardpan (or, duripan) layer that is a product of soil-forming processes over substantial geologic time. This hardpan layer reflects an ancient land surface that locally is buried by younger deposits. The Riverbank Formation is late to middle Pleistocene in age, and is estimated to be 130,000 to 450,000 yrs old (Helley and Harwood, 1985). The upper member is unconsolidated dark brown to red alluvium consisting of gravel, sand, silt and minor clay (Busacca et al., 1989, Helley and Harwood, 1985).

The Modesto Formation is divided into two members, a lower (older) unit that is latest Pleistocene in age (about 29,000 to 49,000 years old), and consists of unconsolidated slightly weathered gravel, sand, silt and clay. The upper member, a younger unit, is latest Pleistocene age (circa 12,000 to 26,000 years old) (Helley and Harwood, 1985). This unit (Qmu) is composed of sand, silt, and some gravel, comprising river channel and floodplain deposits, and is associated with a moderate amount of secondary (pedogenic) clay accumulation. This clay-rich horizon may form laterally continuous zones of low hydraulic conductivity, and may extend across boundaries between coarse and fine-grained strata within the latest Pleistocene alluvium. Soils on the Modesto Formation deposits include the Gridley loam of Strahorn et al. (1909) and the Conejo complex of Lytle et al. (1988).

Latest Holocene deposits overlie or are inset into the Modesto Formation, and are categorized as channel, floodplain, and basin deposits (Plate 1). Channel deposits include Holocene channels (Hch), distributary channels (Hdc), overflow channels (Hofc), sloughs (Hsl), in-stream or lateral bars (Hb), and meander scrolls (Hms). These deposits likely consist of fine to coarse sand, silty sand, and clayey sand, with trace fine gravel. Holocene channel deposits (Hch), which are present along Gilsizer Slough and the western floodplain as secondary channels, contain fining-upward sequences of sand, silt and clay. Overflow channels (Hofc) transport water across the land surface during high flow stages toward Sutter Basin. Networks of sloughs wander across the distal floodplain, and are likely filled with a fining-upward sequence of silt and clay (map unit Hsl). These deposits are associated with former channels, and generally are present landside (outboard) of the present-day human-made levees.

Holocene floodplain deposits include crevasse splays (Hcs), distributary fans (Hdf), and overbank deposits (Hob). Crevasse splays (Hcs) are sandy deposits that form from breaching of river banks or natural levees. Distributary fan deposits (Hdf) occur when water and velocity within a distributary channel decreases, can no longer transport its sediment load, and sediment is laid down on the floodplain. Overbank sediments are formed by localized overtopping of

river banks or natural levees, subsequent deposition from shallow sheet flow or standing water. Basin deposits occur on the distal floodplain and include undifferentiated basin deposits (Qn), and marsh deposits (Qs). Basin and marsh deposits are present in the topographically low areas west of the present-day natural levees along the Feather River. These deposits consist of fine sand, silt, and clay laid down in a relatively low-energy depositional environment. Soils developed on these deposits are the Sacramento series silt loam, fine sandy loam, clay, Alamo clay loam adobe and Stockton clay adobe. Marsh deposits are generally saturated and are often underwater in the present-day environment. Undifferentiated Holocene and Quaternary alluvium (Ha and Qa, respectively) usually are proximal to the river channel, and this map unit is used in areas where geomorphic features are obscured or obliterated by historical (1937-era) agriculture or cultivation. The deposits within these agriculturally modified areas are assigned a relative age (Ha or Qa) based on overlapping and cross cutting relationships with the surrounding deposits as follows: Ha if the agriculture-modified area is mapped within or shown overlying Holocene deposits; or Qa where it is difficult to evaluate the surface age based on the nearby deposits. Soils associated with these, undifferentiated units (Qa) are the Sacramento silt loam and Sacramento fine sandy loam, (Strahorn et al., 1909), and the Columbia fine sandy loam of Lyle et al. (1988), which are weakly developed soils commonly developed on relatively young deposits.

Historical deposits mapped in the area include stream channel and floodplain deposits, as well as artificial fill deposits (L and SP) (Plate 1). Historical deposits are estimated to be less than 150 years old, dating from approximately 1800 to 1937. Historical stream channels (Rch), distributary channels (Rdc), and overflow channels (Rofc) within the floodplain are recently abandoned channels or reflect active channels with low water flow. Lateral bar deposits (Rb) and meander scrolls (Rms) are located adjacent to the present-day Feather River, and are generally present inboard (waterside) of the present-day Feather River levees. When the river overtops its banks, distributary channels (Rdc) and recent overflow channels (Rofc) transport water and sediment across the floodplain. These channel deposits likely consist of silt and sand with traces of gravel. The upper few feet of these deposits probably are filled with debris from upstream hydraulic mining activities. Historical sloughs transport low velocity water flow derived from distributary channels proximal to the Feather River onto the distal floodplain and into the Sutter Basin. Slough deposits (Rsl) likely consist of fining-upward silt and clay.

Historical flood plain deposits include crevasse splay (Rcs), distributary fan (Rdf), and overbank (Rob) deposits, which generally consist of a fining upward or episodic fining upward sequence of sand, silt, and clay. Historical overbank (Rob) deposits are slightly finer grained sand, silt, and clay deposited via sheet flow when the river is at flood-stage and overtops natural and artificial levees. These historical deposits are differentiated based on cross-cutting and superposition relationships relative to existing cultural deposits visible on the 1937 photographs. Historical alluvial deposits (Ra), generally located within the Feather River channel, consist of undifferentiated sand, silt, and minor lenses of gravel. Historical artificial fills (map units L and SP) are culturally-emplaced heterogeneous deposits, with varying amounts of clay, silt, sand, and gravel from local sources. These deposits include levee structures and canal levee systems (L), and some undifferentiated soil piles (SP), and are shown on the surficial geologic map where present and identifiable on the 1937 photography.

Mapping of historical and Holocene deposits shown on Plate 1 generally is consistent with early, less-detailed soil survey mapping along the western banks of the Feather River as areas of Gridley loam, Sacramento Series fine sand, sandy loam and silt loam soils (Strahorn et al., 1909). The Gridley loam occurs along the northern Feather River from Thermalito south to the confluence with the Bear River, and closely corresponds to the Modesto Formation of Helley and Harwood (1985). The relationship between the mapped surficial geologic units and the potential for underseepage is summarized below.

4.0 Geomorphic Conceptual Model

The preliminary conceptual model described here is based on general relationships among surface and subsurface geologic deposits along the Feather River, as described above and shown on Plate 1. This conceptual model provides a consistent basis for understanding the type and stratigraphy in the area.

Published geologic maps of the project area identify a complex series of westward aggrading alluvial fans and terraces derived from the Sierra Nevada, identified as the Riverbank and Modesto formations. The Riverbank Formation and Modesto Formation are semi-consolidated to unconsolidated deposits characterized by intraformational paleochannels and lateral and vertical stratigraphic complexity related to past fluvial processes and buried paleo-topography. The Riverbank Formation unconformably overlies the Laguna Formation, which is a deeply dissected alluvial surface (Busacca et al., 1989).

Subsurface deposits about 150 feet beneath the ground surface rest on a resistant volcanic tuff capped by interbedded alluvial gravel, sand and silt, interpreted as Pliocene-Pleistocene age Laguna Formation that represents a period of relatively stable landscape conditions (Helley and Harwood, 1985). The Laguna Formation is overlain by the Pleistocene Riverbank Formation, (very dense gravel deposits) that are, in turn, overlain by a medium dense sand and gravelly sand package of the latest Pleistocene Modesto Formation (Busacca et al., 1989). The upper member of the Modesto Formation is exposed at the ground surface adjacent to the western bank of the Feather River south of Marysville and Yuba City. The Modesto Formation is mantled by unconsolidated deposits of Holocene age that comprise most of the surficial geologic deposits along the western side of the Feather River (Plate 1).

Geomorphic evidence suggests that the Feather River system south of Yuba City may have been located west of its present course (Figure 3). The present-day Gilsizer Slough diverges from the modern Feather River directly north of Yuba City and trends southwestward toward the Sacramento River. Alluvial deposits of Gilsizer Slough are inset (i.e. incised) into the Modesto Formation from Yuba City southward. The ancestral Gilsizer Slough perhaps extended to as far as the Sacramento River (Figure 3), based on surficial mapping not included in this report, and inspection of topographic maps. The ancestral Gilsizer Slough deposits are related to discharges and sediment loads that were higher than present-day conditions, and perhaps is an ancestral course of the Feather River.

Surficial geologic deposits near the Yuba City airport indicate the Feather River occupied an intermediate position between ancestral and present locations. The river occupied an abandoned channel arm north of Shanghai Bend, located between Gilsizer Slough and the modern Feather River (Figure 3). From this point the river continued southward in nearly its present location. This paleochannel had a sharp, more exaggerated bend than the present-day channel at Shanghai Bend (Figure 2). The channel subsequently moved eastward, laterally backfilling and abandoning the meander above Shanghai Bend, and moved to the rivers' present location closer to Marysville. Today, Gilsizer Slough is a natural bypass for high water flow stages on the Feather River, in the area between Marysville and Yuba City (Ellis, 1939).

Surficial geologic mapping (Plate 1) shows differences in deposit type and distribution from north to south along the Feather River, which is associated with changes in watershed production of water and sediment, related geomorphic processes, soil profile development, and the underlying subsurface hardpan layer. These differences illustrate the diversity of past geomorphic processes along the river and, as a consequence, the type of geologic deposits at and near the ground surface. The surficial geologic map allows the delineation of reaches along the river within which geomorphic processes and their associated deposits appear to be relatively consistent.

Between Yuba City on the north to the confluence with the Sutter Bypass on the south, the southern Feather River consists of four major reaches, each having characteristic deposit types and distributions. The river reaches are numbered Southern Feather one through four (SF-I through SF-IV), sequentially from north to south (Plate 1, Figure 3). This report describes the surficial geologic characteristics of Reach SF-I, SF-II, SF-III and SF-IV of the southern part of the Feather River, extending from Yuba City, south to the confluence with the Sutter Bypass.

Reach SF-I, extends from the north end of Yuba City to the Yuba City airport, and is about 1.15 miles long (Plate 1, Figure 3). The Project levee along Reach SF-I trends roughly north-south, and overlies alluvial sediments deposited by the Feather River. In Yuba City the levee rests on Holocene deposits associated with Gilsizer Slough that are inset into the upper member of the Modesto Formation. The active Feather River channel is east of, and inset to these Holocene channel deposits (Figure 4).

The second reach of south Feather River project area, SF-II, extends from the Yuba City airport south to Shanghai Bend, and is about 2.9 miles long. Near the Yuba City airport, and south of the confluence of the Feather and Yuba Rivers, young channel deposits are inset against the Gilsizer Slough channel deposits (Plate 1). From the Yuba City airport, south to Epley Drive (about 1.5 miles), the levees overlie historical alluvium of mining debris origin, map unit Ra. From Epley Drive south to Shanghai Bend Road the levees (about 1.4 miles) overlie historical meander scrolls, map unit Rms, (Figure 2, Plate 1). The levee along this reach, SF-II, primarily overlies Holocene channel fill, historical alluvium and overbank deposits. These channels are likely filled with a fining-upward sequence of gravel, sand and silt, the upper few feet of these features are probably covered by a veneer of sediment derived from upstream hydraulic mining activities (Figure 4).

River Reach SF-III extends from Shanghai Bend on the north to just south of the confluence with Bear River, and is approximately 12 miles long (Plate 1). Along Reach SF-III, the active river floodplain is inset into the upper member of the Modesto Formation. Over geologic time, flooding has lead to the vertical accretion of overbank and crevasse splay deposits onto the Modesto Formation west of the Feather River. Overflow channels and related deposits (Rofc) are common along this reach of the river. Beginning at Shanghai Bend and continuing southward are seven overflow channels that range from approximately 100 to 200 feet wide. The Project levees overlie these channels in the area around Messick Road (Plate 1). A few overflow channels conduct water flow immediately landside of the levees, across a short distance between Shanghai Bend and Oswald Avenue, then converge with the Feather River. The overflow channels are slightly inset to the Modesto Formation, and based on borehole data from locations where these channels cross the Sutter Bypass, are probably 6 to 15 feet deep. These channels are likely filled with episodic fining upward sequences of silt, sand and gravel, representing multiple flood events on the Feather River. The upper few feet of these channels are probably filled with sediment from upstream historic hydraulic mining activities. The river channel widens considerably between Country Club Road (0.5 mile width) and Obanion Road (1 mile width), (Plate 1). Feather River meanders along the eastern edge of Abbott Lake, swings sharply southward into Star Bend, where the river is deflected eastward by a resistant knob of Modesto Formation (which forms Star Bend). Historical crevasse splay and overbank deposits overlie the Modesto Formation from Abbott Road to Star Bend Road, along the western edge of Abbot Lake (Figure 5). These crevasse splay deposits are likely filled with a fining-upward sequence of fine gravel, sand and silt, The upper few feet of these features are probably covered by a veneer of hydraulic mining sediment.

The southernmost reach, Reach SF-IV, extends from the area south of the confluence with the Bear River to the confluence of the Feather River and Sutter Bypass, and is roughly 4 miles long (Plate 1). The sediments underlying the levee along this reach are geomorphically complex, resulting from depositional convergence between the Feather River and Bear River. The Bear River channel deposits large amounts of sediment across the ground surface adjacent to the confluence. The Modesto and Riverbank Formations are exposed at the ground surface adjacent to natural levees immediately north of the Bear River confluence, and north of this reach (Plate 1). These formations are covered by historical alluvium, sourced from the Feather and Bear Rivers. Much of the historical activity along this reach is located near the levee at Laurel Avenue. Here, consisting eight distributary channels (Rdc), typically 90 feet wide but ranging from 45 to 190 feet wide, cross the floodplain in southwesterly orientations, terminating in geologically young distributary-fan sediments. These sediments, primarily consisting of fine to coarse sand and silt, probably were deposited as a result of increased sediment and water input contributed to the Feather River from the Bear River. Historically, the Feather River and the Bear River have aggraded from substantial mining debris input, thus reducing channel cross sectional area (i.e., James, 1999). This reduction of cross section area, coupled with the trajectory of flood flow from the Bear River watershed, resulted in water overtopping the Feather River channel banks, and depositing sediment onto the floodplain between the confluence of the Feather River and Sutter Bypass (Plate1).

5.0 Applications to the Urban Levee Project

Based on an initial analysis of surface geologic and geomorphic data, the levees bordering the western side of the Feather River from Yuba City to the Sutter Bypass, (Reaches SF-I, SF-II, SFIII and SF-IV) probably are underlain by a veneer of near-surface sandy deposits, or by buried channels that are inset into the Modesto Formation. The preliminary conceptual surface and subsurface geologic relationships as they relate to levee structures and potential underseepage along each reach of the river are described below. This study does not account for any existing seepage mitigation structures, i.e. slurry wall or cutoff wall, which may be present.

Reach SF-I contains the Gilsizer paleochannel deposits, this channel intersects the levees roughly 660 feet south of Lynn Way to Colusa Avenue (Plate 1). Along this length the levees are underlain by coarse channel deposits. These coarse grain deposits are likely laterally continuous and poorly consolidated and relatively highly permeable, and likely are susceptible to underseepage.

Levees along the reach SF-II are underlain by a Holocene paleochannel and historical meander scroll deposits (Figure 2, Plate 1). These deposits are coarse grained, laterally continuous and poorly consolidated, and likely are susceptible to underseepage. The presence of this paleochannel deposit suggests locally permeable material (channel fill) directly underlying the levees. Historical alluvium most likely of mining debris origin, blankets the Yuba City airport paleochannel and meander scroll deposits. The levees along this reach are underlain by a thick sequence of young, permeable alluvium of meander scroll deposits that are highly susceptible to seepage (Glynn and Kuszmaul, 2004).

Reach SF-III consists of coarse-grained avulsion deposits (overbank, crevasse splay and overflow channel deposits) overlying the Modesto Formation. Overflow channels (Rofc) are common along this reach, are relatively thin, slightly inset to the Modesto Formation and are filled with poorly consolidated sediments that may provide local pathways for underseepage. Individual shallow coarse deposits may be laterally discontinuous and may be separated by clayey interbeds (i.e. thin blankets). Local coarse deposits may be associated with higher likelihoods of levee underseepage. Deeper deposits probably consist of consolidated Modesto Formation with occasional small, but unconsolidated, overflow channel deposits incised into resistant strata.

Along Reach SF-IV the levee is underlain by laterally-continuous sandy deposits formed by distributary overbank fans and by the south flowing ancestral Feather River (Gilsizer Slough). These coarse-grained deposits likely are permeable and susceptible to underseepage. Near Laurel Avenue distributary channel deposits underlie the levees and may be relatively coarser than the surrounding alluvium.

6.0 Summary

Lateral and vertical variability in the shallow subsurface deposits has resulted from past geomorphic processes. Surficial geologic mapping along the south Feather River allows reach classifications within which conditions may be relatively consistent. The conceptual subsurface stratigraphic framework suggests that stratigraphic relationships may promote localized levee underseepage, given certain hydraulic conditions, particularly along reach SF-I and II. Further spatial analyses of the surficial geologic mapping and subsurface geotechnical exploration data are needed to better constrain and characterize areas that are most susceptible to underseepage in the study area.

7.0 Limitations

This geomorphic assessment and associated data interpretation have been performed in accordance with the standard of care commonly used as the state-of-practice in the geologic engineering profession. Standard of care is defined as the ordinary diligence exercised by fellow practitioners in this geographic area performing the same services under similar circumstances during the same time period.

Discussions of surface and subsurface conditions summarized in this technical memorandum are based on geologic interpretations of subsurface soil data at limited exploration locations available to this assessment through August of 2007. Variations in subsurface conditions may exist between exploration locations, and the project team may not be able to identify all adverse conditions in the levee and its foundation. This memorandum is for the use and benefit of DWR. Use by any other party is at their own discretion and risk.

8.0 References

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USGS, Gilsizer Slough topographic quadrangle, surveyed 1909, published 1911; map scale 1:31,680, five foot contour interval.

USGS, Marcuse topographic quadrangle, surveyed 1906, published 1910; map scale 1:31,680, five foot contour interval.

USGS, Nicolaus topographic quadrangle, surveyed 1908, published 1910; map scale 1:31,680, five foot contour interval.

USGS, Ostrom topographic quadrangle, surveyed 1909, published 1911; map scale 1:31,680, five foot contour interval.

USGS, Sutter topographic quadrangle, surveyed 1909, published 1911; map scale 1:31,680, five foot contour interval.

USGS, Yuba City topographic quadrangle, surveyed 1909, published 1911; map scale 1:31,680, five foot contour interval.

USGS, Gilsizer Slough topographic quadrangle, published 1952, photo revised 1973; map scale 1:24,000, five foot contour interval.

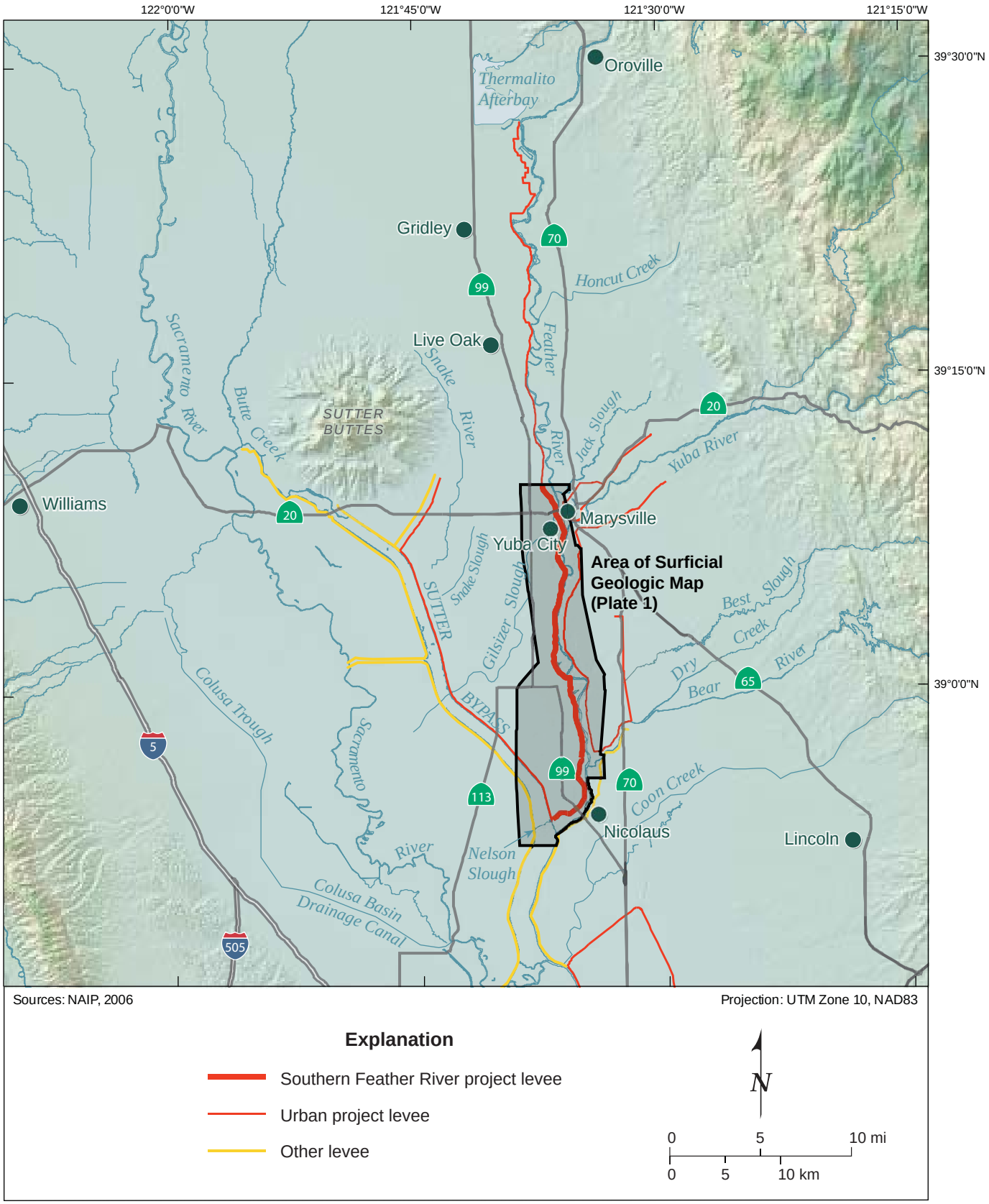
USGS, Nicolaus topographic quadrangle, published 1952, remapped 1992; map scale 1:24,000, five foot contour interval.

USGS, Olivehurst topographic quadrangle, published 1952, photo revised 1973; map scale 1:24,000, five foot contour interval.

USGS, Sutter topographic quadrangle, published 1952, photo revised 1973; map scale 1:24,000, five foot contour interval.

USGS, Sutter Causeway topographic quadrangle published 1952, photo revised 1973; map scale 1:24,000, five foot contour interval.

USGS, Yuba City topographic quadrangle, published 1952, photo revised 1973; map scale 1:24,000, five foot contour interval.

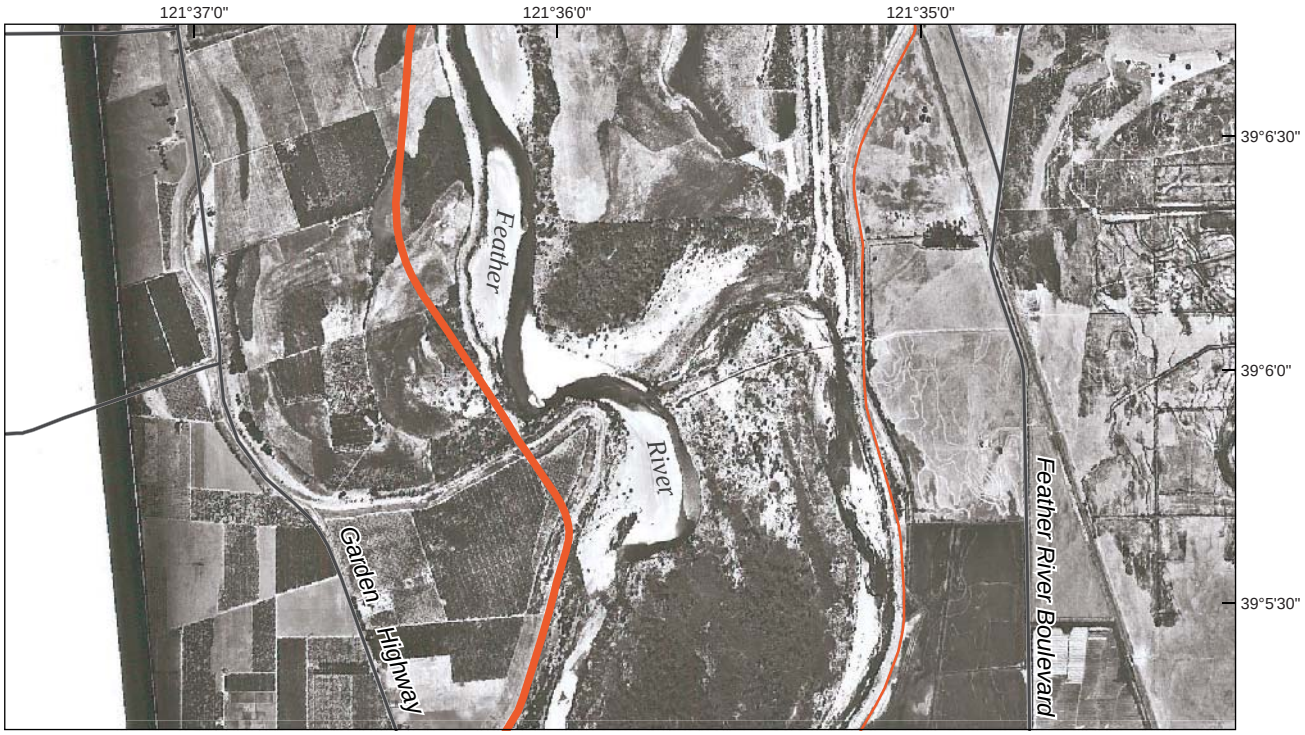


Map of Central Valley near Sutter Buttes, California

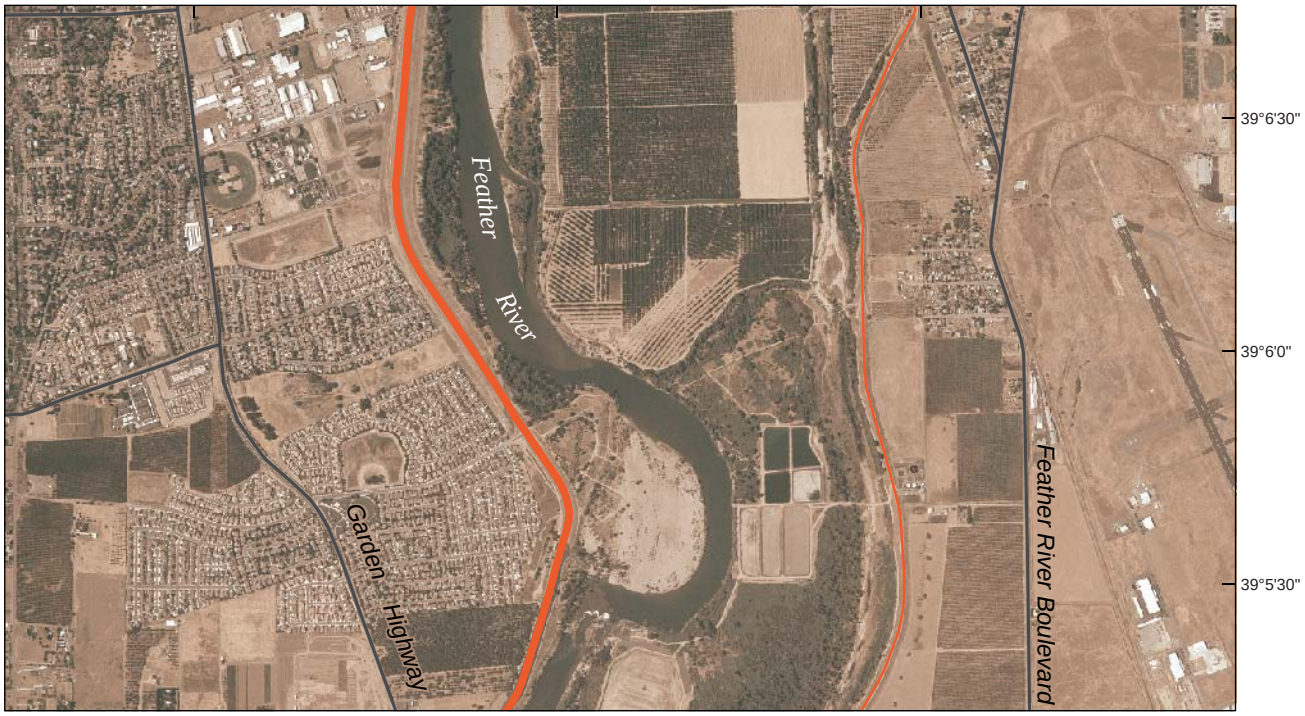
DWR URBAN LEVEE PROJECT
Figure 1

1881 South Feather River

Modified 09.03.09



A. 1937 USDA Air Photo



B. 2006 NAIP Ortho Imagery

Explanation

- Southern Feather River project levee
- Urban project levee
- Major road

N

0 5 10 mi

0 5 10 km

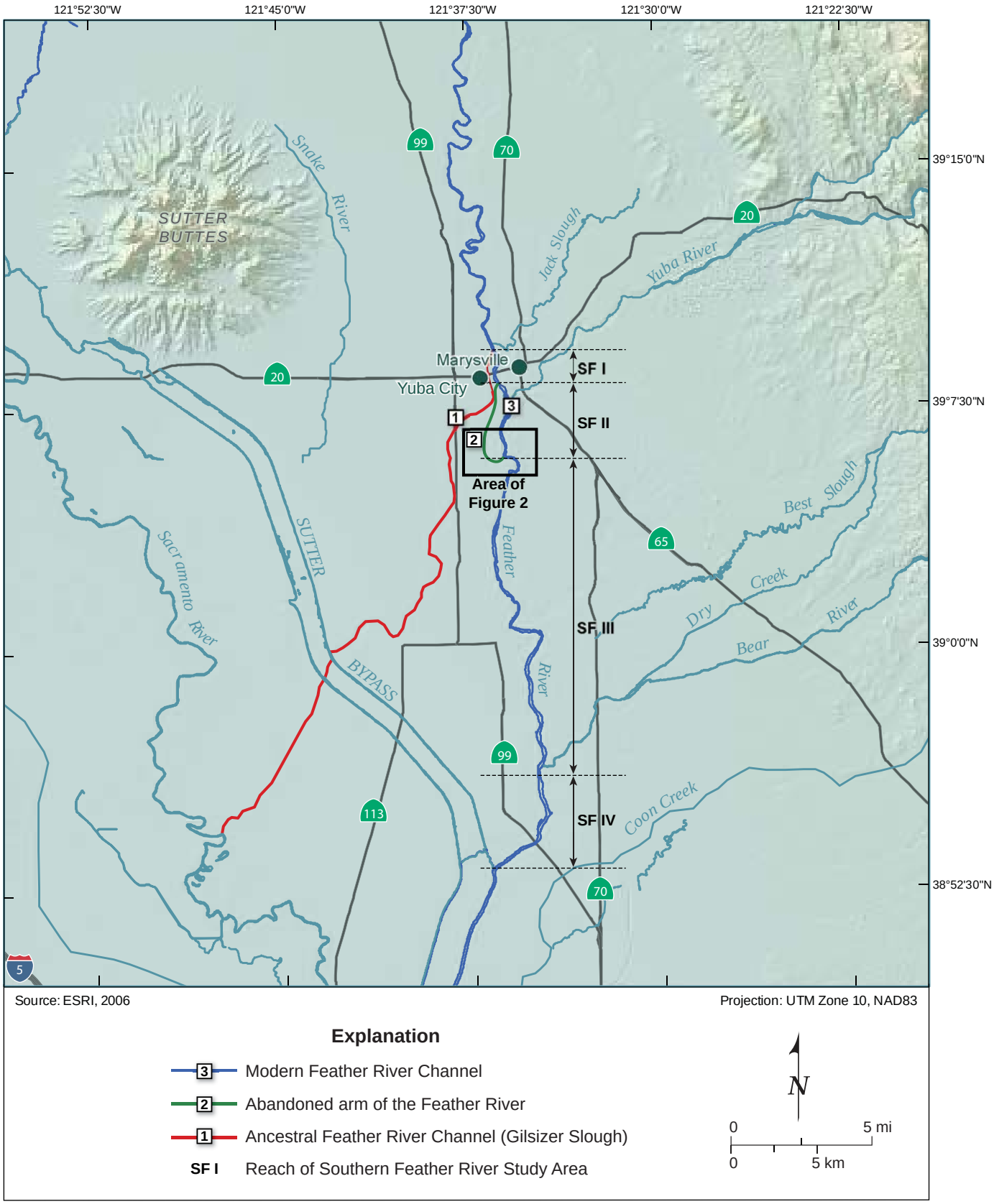
Aerial Imagery of the Feather River at Shanghai Bend

DWR URBAN LEVEE PROJECT

Figure 2

1881 South Feather River

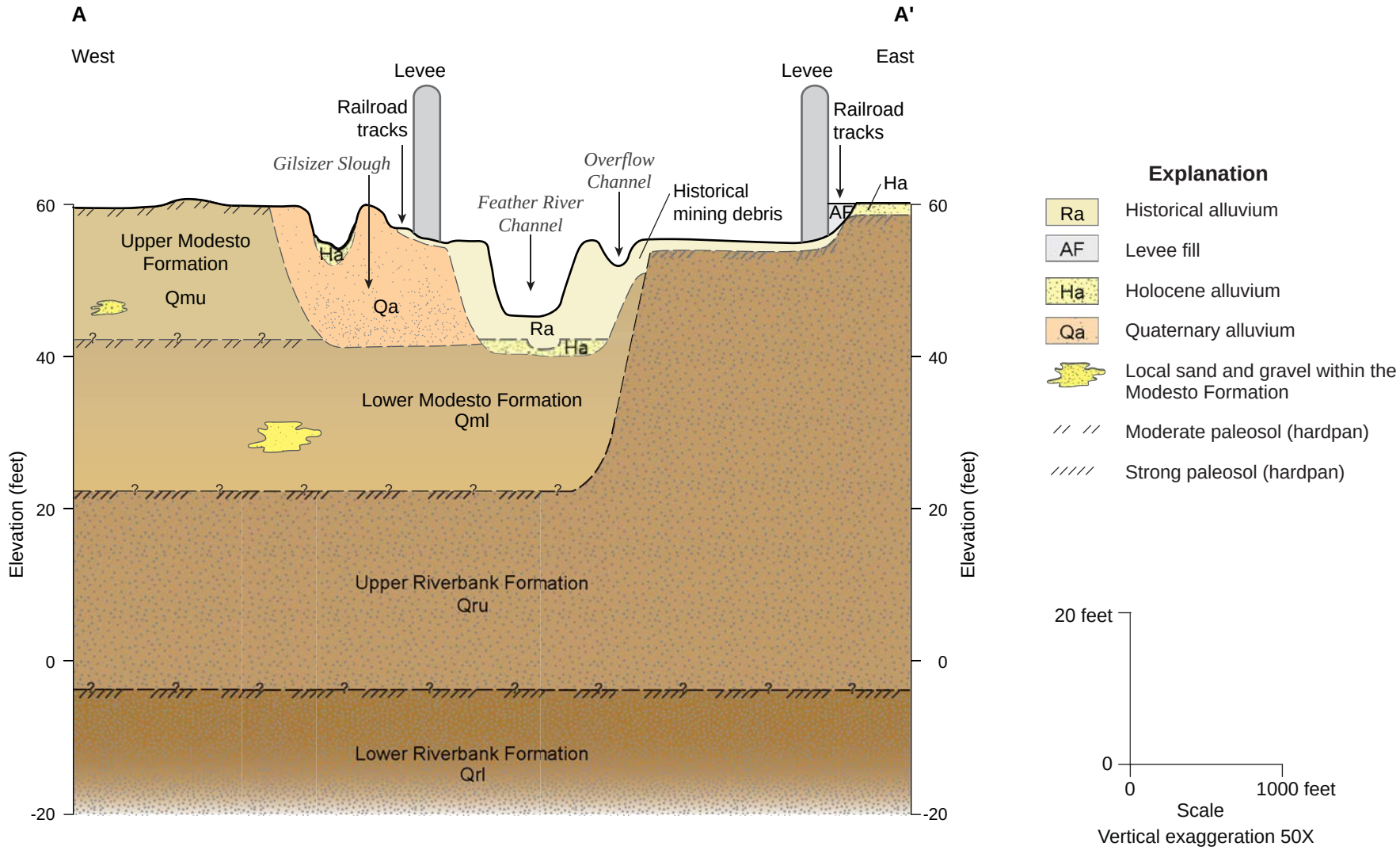
Modified 09.03.09



Map Showing the Eastern Migration of the Feather River

DWR URBAN LEVEE PROJECT

Figure 3



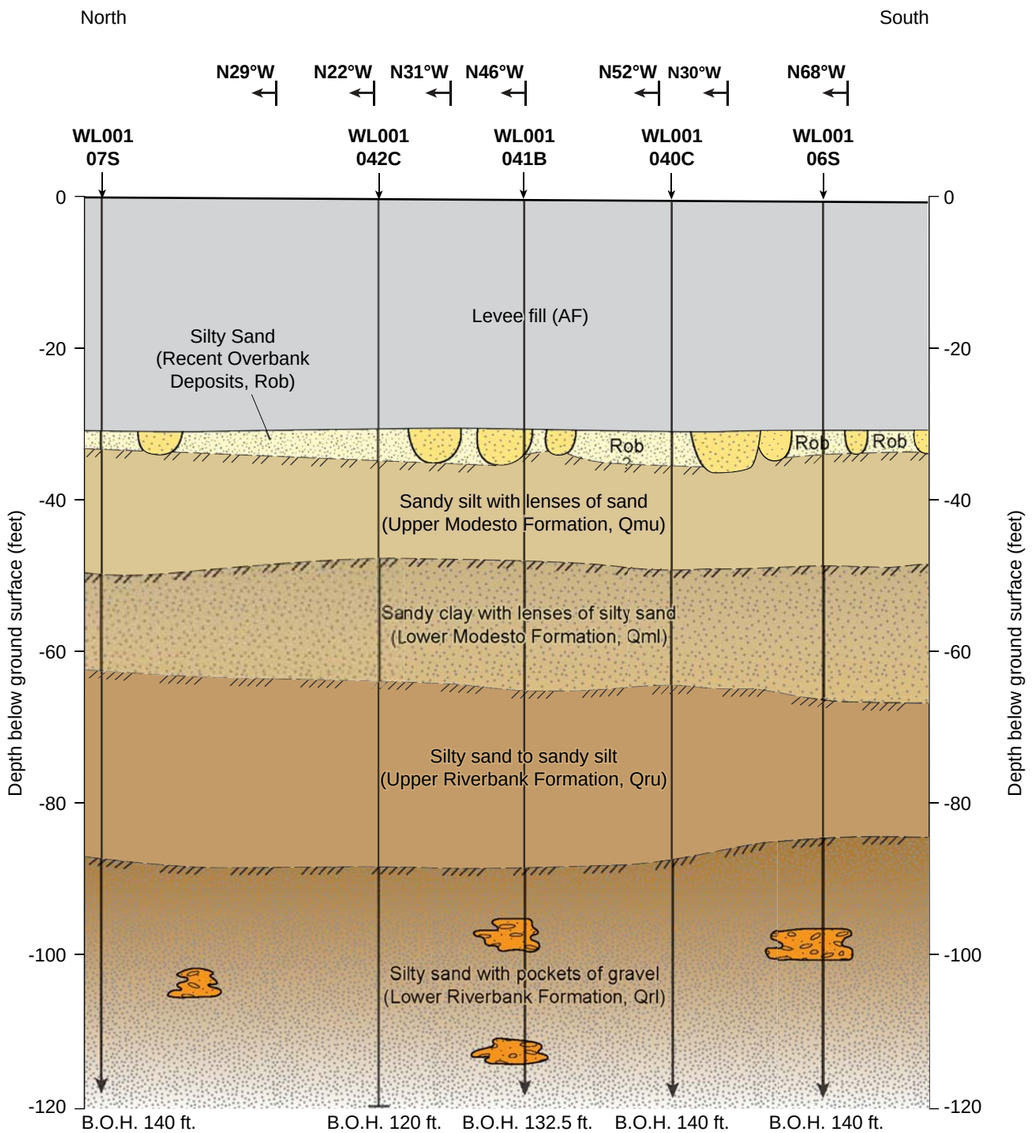
Conceptual Subsurface Diagram across the Feather River at Yuba City

DWR URBAN LEVEE PROJECT

Figure 4

1881 South Feather River

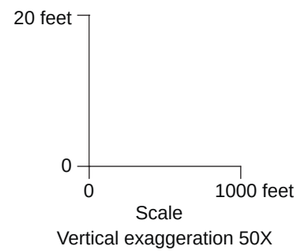
Modified 09.03.09



Explanation

- Recent crevasse splay, surficial geologic map unit Rcs
- Local sand and gravel within the Riverbank Formation
- Moderate paleosol (hardpan)
- Strong paleosol (hardpan)
- N46°W — Bend in Section

Notes:
1. See Plate 1 for location of cross section.
2. Surficial geologic units and contacts from this study and Helley and Harwood (1985).
3. Bottom of hole (BOH) values shown as total depth below ground surface.
4. Borehole names and horizontal distance shown above from draft URS logs and location maps. Geologic relations could change if borehole locations revised
5. Drilling method indicated as last letter in borehole names:
   S = Sonic Vibracore;
   C = Cone Penetrometer Test;
   B = Mud Rotary with SPT



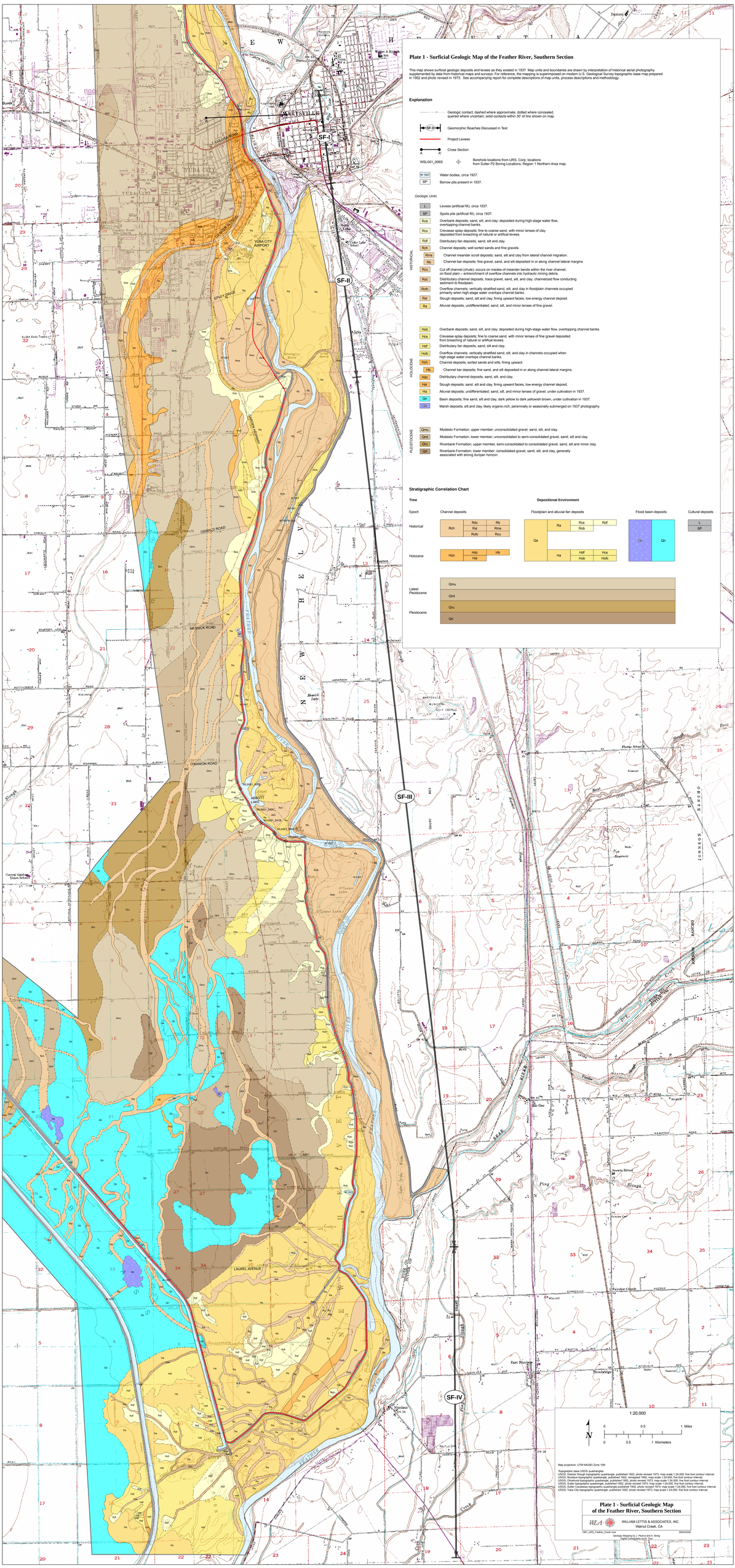


Plate 1 - Surficial Geologic Map of the Feather River, Southern Section
This map shows surficial geologic deposits and levees as they existed in 1937. Map units and boundaries are drawn by interpretation of historical aerial photography supplemented by data from historical maps and surveys. For reference, the mapping is superimposed on modern U.S. Geological Survey topographic base map prepared in 1952 and photo revised in 1973. See accompanying report for complete descriptions of map units, process descriptions and methodology.
Explanation
Geologic contact; dashed where approximate, dotted where concealed, queried where uncertain; solid contacts within 30' of line shown on map.
SF-II
Geomorphic Reaches Discussed in Text
Project Levees
A
A'
Cross Section
WSL001_006S
Borehole locations from URS, Corp; locations from Sutter P2 Boring Locations, Region 1 Northern Area map.
W 1937
Water bodies, circa 1937.
BP
Borrow pits present in 1937.
Geologic Units
HISTORICAL
L
Levees (artificial fill), circa 1937.
SP
Spoils pile (artificial fill), circa 1937.
Rob
Overbank deposits; sand, silt, and clay; deposited during high-stage water flow, overtopping channel banks.
Rcs
Crevasse splay deposits; fine to coarse sand, with minor lenses of clay deposited from breaching of natural or artificial levees.
Rdf
Distributary fan deposits; sand, silt and clay.
Rch
Channel deposits; well sorted sands and fine gravels.
Rms
Channel meander scroll deposits; sand, silt and clay from lateral channel migration.
Rb
Channel bar deposits; fine gravel, sand, and silt deposited in or along channel lateral margins.
Rcu
Cut off channel (chute); occurs on insides of meander bends within the river channel; on flood plain -- entrenchment of overflow channels into hydraulic mining debris.
Rdc
Distributary channel deposits, trace gravel, sand, silt, and clay; channelized flow conducting sediment to floodplain.
Rofc
Overflow channels; vertically stratified sand, silt, and clay in floodplain channels occupied primarily when high-stage water overtops channel banks.
Ral
Slough deposits; sand, silt and clay, fining upward facies, low-energy channel deposit.
Ra
Alluvial deposits, undifferentiated; sand, silt, and minor lenses of fine gravel.
HOLOCENE
Hob
Overbank deposits; sand, silt, and clay; deposited during high-stage water flow, overtopping channel banks.
Hcs
Crevasse splay deposits; fine to coarse sand, with minor lenses of fine gravel deposited from breaching of natural or artificial levees.
Hdf
Distributary fan deposits; sand, silt and clay.
Hofc
Overflow channels, vertically stratified sand, silt, and clay in channels occupied when high-stage water overtops channel banks.
Hch
Channel deposits; sorted sands and silts; fining upward.
Hb
Channel bar deposits; fine sand, and silt deposited in or along channel lateral margins.
Hdc
Distributary channel deposits, sand, silt, and clay.
Hal
Slough deposits; sand, silt and clay, fining upward facies, low-energy channel deposit.
Ha
Alluvial deposits; undifferentiated; sand, silt, and minor lenses of gravel; under cultivation in 1937.
Qa
Basin deposits; fine sand, silt and clay, dark yellow to dark yellowish brown, under cultivation in 1937.
Os
Marsh deposits; silt and clay, likely organic-rich; perennially or seasonally submerged on 1937 photography.
PLEISTOCENE
Qmu
Modesto Formation; upper member; unconsolidated gravel, sand, silt, and clay.
Qml
Modesto Formation; lower member; unconsolidated to semi-consolidated gravel, sand, silt and clay.
Qru
Riverbank Formation; upper member, semi-consolidated to consolidated gravel, sand, silt and minor clay.
Qrl
Riverbank Formation; lower member; consolidated gravel, sand, silt, and clay, generally associated with strong duripan horizon.
Stratigraphic Correlation Chart
Time
Epoch
Depositional Environment
Channel deposits
Floodplain and alluvial-fan deposits
Flood basin deposits
Cultural deposits
Historical
Holocene
Latest Pleistocene
Pleistocene
Rch
Rdc
Rb
Ral
Rms
Rofc
Rcu
Qa
Ra
Rcs
Rdf
Rob
Hch
Hdc
Hb
Hal
Ha
Hdf
Hcs
Hob
Hofc
Os
Qh
L
SP
Qmu
Qml
Qru
Qrl
1:20,000
0
0.5
1 Miles
0
0.5
1 Kilometers
N
Map projection: UTM NAD83 Zone 10N
Topographic base USGS quadrangles:
USGS, Gibson Slough topographic quadrangle, published 1952, photo revised 1973, map scale 1:24,000, five foot contour interval.
USGS, Marysville topographic quadrangle, published 1952, photo revised 1973, map scale 1:24,000, five foot contour interval.
USGS, Olivehurst topographic quadrangle, published 1952, photo revised 1973, map scale 1:24,000, five foot contour interval.
USGS, Sutter pumpingplant quadrangle, published 1952, photo revised 1973, map scale 1:24,000, five foot contour interval.
USGS, Sutter Causeway topographic quadrangle published 1952, photo revised 1973, map scale 1:24,000, five foot contour interval.
USGS, Yuba City topographic quadrangle, published 1952, photo revised 1973, map scale 1:24,000, five foot contour interval.
Plate 1 - Surficial Geologic Map of the Feather River, Southern Section
WLA
WILLIAM LETTIS & ASSOCIATES, INC.
Walnut Creek, CA
1801_URS_Feather_South.mxd
09/04/2009
Geologic Mapping by J. Perrine and A. Streig
Digital Cartography by M. York
SF-I
SF-II
SF-III
SF-IV
MARYSVILLE
YUBA CITY
YUBA CITY AIRPORT
COLLINS ROAD
GRAVES ROAD
EPLEY DRIVE
OSWALD ROAD
MESSICK ROAD
O'CONNOR ROAD
ABBOTT LAKE
LAUREL AVENUE
Munch Lake
O'Connor Lakes
Cedar Lake
Central Gas Union School
Plumas School
Riverside Cemetery
Feather River
Yuba River
Sutter Bypass
Gilsizer Slough
Honcut Creek
Dry Creek
Wadsworth Canal
Drainage Canal
Hallwood Blvd
Pennington Road
Kenyon Slough
Ellis Creek
Cranmore Road
Kenyon Road
Kenyon Levee
Riviera Levee
Riviera Drive
Riviera Cemetery
Riviera Heights
Riviera Lloyds
Kenyon Slough
Ping
Slough
Ella Gao
Bear Reservoir
East Nicolaus
Nicolaus
Nicolaus Cemetery
Nicolaus Creek
Wells
Ranch
Ranchito
Ranchette
Ranchetta
Ranchero
Rancho
Rancho Road
Rancho Avenue
Rancho Drive
Rancho Circle
Rancho Court
Rancho Lane
Rancho Way
Rancho Boulevard
Rancho Place
Rancho Terrace
Rancho Parkway
Rancho Plaza
Rancho Square
Rancho Center
Rancho Commons
Rancho Gardens
Rancho Heights
Rancho Hills
Rancho Meadows
Rancho Oaks
Rancho Park
Rancho Ridge
Rancho Valley
Rancho View
Rancho Vista
Rancho Woods
Rancho Creek
Rancho Canyon
Rancho Glen
Rancho Grove
Rancho Hollow
Rancho Knoll
Rancho Meadow
Rancho Mesa
Rancho Pines
Rancho Rise
Rancho Shadow
Rancho Springs
Rancho Summit
Rancho Terrace

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September 8, 2009

Mr. Juan Vargas
URS Corporation
2870 Gateway Oaks Drive, Suite 150
Sacramento, CA 95833

RE: Surficial geologic mapping and geomorphic assessment, California Department of Water Resources Urban Levees Project, Sutter Bypass, Sutter County, California

Dear Mr. Vargas:

This memorandum presents the surficial geologic mapping and preliminary geomorphic assessment of the eastern Sutter Bypass area, for the California Department of Water Resources (DWR) Urban Levees Project geotechnical characterization. The goal of this mapping and geomorphic assessment is to provide information on the type and distribution of surface and shallow subsurface deposits that likely underlie the project levees along the eastern part of the bypass. The purpose of this study is to develop spatially-continuous geologic data and a conceptual model that allows reasonable stratigraphic interpretations between widely-spaced subsurface explorations, with respect to potential levee underseepage (i.e., Llopis et al., 2007). This letter presents the technical approach, surficial geologic map, conceptual geomorphic model, and initial results based on map analysis and preliminary review of available Phase 1 geotechnical data.

We appreciate the opportunity to provide these geomorphic and geologic data and preliminary interpretations of the shallow stratigraphic conditions in the Sutter Bypass study area. Please do not hesitate to call either of the undersigned if there are any questions or comments.

Respectfully,

WILLIAM LETTIS & ASSOCIATES, INC.





Justin Pearce, C.E.G. 2421
Senior Geologist
(925) 256-6070

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1.0 Approach

The approach to developing a surficial geologic map of the Sutter Bypass area (Figure 1, Plate 1) consisted of analysis of the following data: Aerial photography (black and white stereo-pairs taken in 1937, ~1:20,000-scale); early USGS topographic maps (i.e., 1911); published surficial geologic maps (Helley and Harwood, 1985); early and modern soil survey maps (Strahorn et al., 1911; Lytle, et al., 1988); field reconnaissance visit on June 22, 2007; and other maps and documents. Synthesis of these data allow for the development of a detailed surficial geologic map that provides an initial understanding of primary geomorphic processes that have acted in the study area during recent and historical geologic time. Through this mapping, we identify primary geomorphic features and associated surficial geologic deposits, such as abandoned paleochannels, marsh and basin deposits, flood-basin deposits, and other features commonly associated with flood-basins adjacent to large, active river systems. Knowledge of fluvial processes and the ability to recognize depositional environments in the geologic record are key to identifying locations along levees where underseepage is most likely to occur (Llopis, 2007).

The surficial geologic map was developed at the nominal scale of the aerial photography (1:20,000). This scale establishes the resolution of the map (Plate 1). The map unit contacts shown on the surficial geologic map should be considered approximate, and accurate to no more than about 30 feet on either side of the line shown on the map. The 1937 aerial photographs are the primary data set for interpreting the surficial geologic deposits because: (1) they are the oldest high-quality images that pre-date much of the urbanization and landscape alteration within present-day Sutter County (Figure 2); and, (2) these data represent a close approximation to the surficial deposits that were likely present at the ground surface prior to the construction of the levees. The 1937 photographs generally were taken in late summer or early autumn (i.e., August). By 1937, the area had experienced moderate cultivation that locally obscures geomorphic conditions. However, integration of data from the 1937 photography, old and recent topographic maps, geologic maps, soil surveys and historical documents provides sufficient information to delineate many of the pre-historic and historic surficial deposits in detail. Taken together, these data provide key insights to the geomorphic processes and resulting deposits that may affect levee underseepage.

Additional flood-basin or floodplain deposition may have occurred after 1937, due to flood overflows, levee overtopping, or localized levee failure. A time series analysis that interprets successive aerial photographs taken after major flood events (i.e., 1955) or known local levee failures (i.e., 1986) may reveal additional information on surficial deposits in the Sutter Bypass area. Such analyses are beyond the scope of this study. The data and interpretations presented herein address the primary goal of characterizing the type and distribution of deposits likely present directly beneath the project levees.

1.1 Report Preparation Quality Control

The surficial geologic map data and geomorphic interpretations presented in this memorandum were subject to quality control and quality assurance procedures as required by the Levee

Geotechnical Evaluation Project Management Plan (PMP). The surficial geologic map data developed by this study were reviewed for accuracy and completeness through an internal review and an independent technical review by Dr. Janet Sowers of WLA. Results of QA/QC review were documented using PMP Exhibit 2.2-3 (Independent Technical Review Report) and are kept on file according filing control plan. Subsurface data shown on diagrams were provided as draft information, and were not verified for accuracy or completeness by this study.

2.0 Geologic Setting

The Sutter Bypass (Bypass) study area lies southeast of the volcanic Sutter Buttes, between the Sacramento and Feather Rivers. The project levee addressed in this study borders the eastern side of the Sutter Bypass, extending from the Wadsworth Canal southeast to the Feather River (Figure 1). The Bypass levee generally trends northwest-southeast, and ties in to the Feather River west bank levee.

The Bypass levee lies northeast of Sutter Basin, a low-lying area east of the Sacramento River and west of the Feather River, where overflow and floodwaters from Butte Basin (located northwest of the Sutter Buttes), the Sacramento River, and the Feather River produced a seasonally marshy area. Except for the Sutter Buttes area, the regional land surface is nearly flat, and along the Bypass area gently slopes southwest at an elevation of about 30 to 40 feet. Construction of the Sutter Bypass was completed in 1924 to serve as an overflow for Sacramento River floods in the winter, and a source of irrigation in the summer (DWR, 1976). The eastern levee was enlarged in 1942 (Corps of Engineers, 1953). Prior to cultural modification, surface water runoff in the Bypass area was delivered to the Sutter Basin via intermittent, meandering creeks and sloughs from the northern Central Valley, including: Snake River, Snake Slough, Gilsizer Slough, Nelson Slough, and flood overflow channels emanating from the western side of the Feather River. The construction of the Bypass levee blocks water from the east that normally drains to the Sutter Basin and Sacramento River (DWR, 1976). Presently, many of the natural drainages and channels have been replaced by linear ditches, agricultural drains, and canals (Figure 2).

3.0 Surficial Geologic Mapping

Published surficial geologic maps of the Sutter Bypass study area generalized the surficial deposits primarily as late Quaternary basin (map unit Qb) deposits, with localized units of late Quaternary alluvium, Quaternary Modesto Formation (lower member), and Quaternary Riverbank Formation (lower member) (Helley and Harwood, 1985). These map units were delineated at a regional scale (i.e., 1:62,500). The current analysis of the Bypass uses this geologic framework as a basis for more detailed mapping of late Holocene alluvium and geomorphic features (Plate 1). The surficial geologic map units within the Sutter Bypass study area are described below, in order from oldest to youngest.

The oldest map unit exposed in the study area is the late Quaternary Riverbank Formation (lower member), and is mapped in the south portion of the study area east of Nelson Slough,

where it likely directly underlies the project levee near the latitude of Laurel Avenue (Plate 1). This formation (map unit Qrl) is present in the shallow subsurface beneath much of the bypass area, and consists of alluvial-fan deposits derived from the Sierra Nevada during the middle Pleistocene (about 400,000 to 200,000 years ago). The Riverbank Formation is semi-consolidated, and is associated with the presence of a well-developed hardpan (or, duripan) layer that is a product of soil-forming processes over substantial geologic time. This hardpan layer reflects an ancient land surface that locally is buried by younger deposits. Soils developed on the Riverbank Formation in the Bypass area include the San Joaquin loam of Strahorn et al. (1911) and the Yuvas loam (Lytle et al., 1988), both of which document a strongly cemented hardpan at depths of about 1.5 to 3 feet below ground surface.

The late Pleistocene Modesto Formation is younger than the Riverbank Formation and is present in the map area primarily along the margin of Gilsizer Slough and directly east of Highway 113 (Plate 1). This unit is divided into two members, a lower (older) unit that is about about 42,000 to 29,000 years old (Qml), and an upper member that is about 24,000 to 12,000 years old (Qmu) (Helley and Harwood, 1985). The Modesto Formation, in general, consists of unconsolidated sand, silt, and clay, and is associated with a moderate amount of secondary (pedogenic) clay accumulation. This clay-rich horizon may form laterally continuous zones of low hydraulic conductivity. These soil horizons may extend across boundaries between coarse and fine-grained strata within the latest Pleistocene alluvium, and may form relatively continuous zones of low vertical hydraulic conductivity within the Modesto Formation. Soils developed on the Modesto Formation include the Gridley loam of Strahorn et al. (1911) and the Marcum clay loam with “siltstone” hardpan (Lytle, 1988).

Younger surficial deposits overlying the Riverbank and Modesto Formation include late Quaternary marsh, basin, and alluvial deposits (map units Qs, Qn, and Qa, respectively), which are considered Holocene age (i.e., less than 11,000 years old). The widespread basin deposits are about 4 to 8 feet thick and bury the gently southwest dipping Modesto Formation (Figure 3). The thickness of the basin deposits increases to the southwest, in the direction of Sutter Basin (Figure 3). The soils developed on the basin deposits generally are associated with the Stockton clay adobe and Marcuse clay of Strahorn et al. (1911) and the Oswald clay (Lytle et al., 1988), and thus represent immature soils with overall fine-grained textures. Undifferentiated alluvial deposits (map Qa, Plate 1) are present along Gilsizer Slough, and are inset (i.e., topographically lower) into the adjacent Modesto Formation. The Quaternary marsh deposits (map unit Qs, Plate 1) are present between the Sutter Bypass levees northwest of Gilsizer Slough, and are also fine-grained deposits that are differentiated from basin deposits by usually being underwater or having standing water at the time when the 1937 photographs were taken (usually late summer to early autumn).

Inset into the units described above are deposits of Holocene alluvial channels (map unit Hch, Plate 1), which are a network of moderately sinuous channels with southwesterly orientations. These channels appear to be mostly filled with sediment by the time of 1937 photographs, and are expressed only locally as subtle topographic lows in the ground surface. Many of these channels extend west of, and therefore cross beneath, the eastern Sutter Bypass levee (Plate 1). The alluvial channels west of Gilsizer Slough start on the alluvial plain as intermittent creeks, and are not directly connected to the Feather River (USGS Tisdale Weir quadrangle, 1911).

The channel deposits are tentatively associated with the Liveoak series, sandy clay loam soil (Lytle et al., 1988), and consist of a lower, sandy unit that fines-upward into an upper, silt and clay layer.

Subdivisions of the Holocene channels include sloughs (map unit Hsl, Plate 1), distributary channels (map unit Hdc), and overflow channels (map unit Hofc). These deposits, in general, also consist of a fining-upward sequence of sand, silt, and clay. The sloughs are present primarily east of Highway 113 (Plate 1) and have southwesterly orientations. The sloughs are ephemeral channels that drain the alluvial plain between Gilsizer Slough and the Feather River. The term "slough" in this study does not mean tidally-influenced channels, but instead channels that likely conveyed relatively slow-moving water from direct precipitation and sheet-flow runoff. The overflow channels convey flood flows that overtop the banks of the Feather River onto the floodplain, and are interpreted as higher-energy channel systems relative to the sloughs. The distributary channels route flow from and sediment onto the floodplain, and end at distributary-fan deposits. The overflow and distributary channel deposits are present in the southeastern portion of the Bypass area, south of the latitude of Laurel Avenue (Plate 1).

Localized deposits related to the Holocene alluvial channels are bars (map unit Hb) that typically occur in the medial and lateral portions of the channels, and distributary fan deposits (map unit Hdf) that occur where the channel becomes unconfined and has deposited sediment on the basin floor. Channel bars are relatively uncommon in the Sutter Bypass study area. Distributary fans are common in the southeast portion of the Bypass area, south of the latitude of Sacramento Avenue (Plate 1). The distributary-fan deposits likely consist of unconsolidated fine sand and silt (i.e., Strahorn et al., 1911).

Historical geologic deposits are present along the length of the Bypass study area (i.e., map unit Rch, map unit Rdf). The term "historical" is applied to deposits that are estimated to be less than 150 years old. These deposits share the same genetic origin as the Holocene deposits described above. The historical channel deposits are differentiated from the Holocene channel deposits on the basis of cross-cutting relationships with other map units, relative degree of geomorphic expression and/or dissection, and correlation with land surface expression on the early and modern topographic maps. The Bypass eastern levee overlies the former locations of Holocene and historical alluvial channels in several locations throughout its length (Plate 1).

Undifferentiated Holocene and historical alluvium (map units Ha and Ra) is mapped in the southeastern Bypass area, near the confluence of the Sutter Bypass and the Feather River, generally east of Sawtelle Road (Plate 1). The undifferentiated map unit is delineated where the morphology of these deposits is indistinguishable on 1937 photographs as a result of cultural modifications (i.e., agriculture). The soils developed on the undifferentiated historical alluvium generally correspond with the Sacramento series fine sandy loam and silt loam of Strahorn et al. (1911) and the Shanghai silt loam (Lytle et al., 1988). There is no hardpan layer associated with these soils, supporting the interpretation of geologically young deposits.

4.0 Conceptual Geomorphic Model

Based on synthesis of surficial geologic mapping, topographic maps, soil surveys, geologic maps, and review of readily available subsurface geotechnical information, we present a preliminary conceptual geomorphic model describing general relationships among surface and subsurface deposits along the Sutter Bypass study area. This conceptual model provides a consistent basis for understanding the type and distribution of surficial geologic deposits, primary geomorphic processes, and shallow subsurface stratigraphy in the area. Identification of subsurface stratigraphic formations is challenging, primarily because of a lack of distinctive and laterally extensive stratigraphic marker beds within late Quaternary deposits of the northern Central Valley (i.e., Page, 1986), and because there is little apparent difference in lithology between the late Quaternary formations (i.e., Helley and Harwood, 1985). This study relies heavily on the identification and local correlation of hardpan horizons and deposit color and density changes to delineate subsurface formations.

In a general sense, the Sutter Bypass levees traverse across the distal portions of ancient alluvial-fan deposits that were derived from the Sierra Nevada, and prograded westward onto the valley floor (i.e., Riverbank and Modesto Formations). These Pleistocene deposits are exposed at the ground surface northeast of the Bypass study area (Helley and Harwood, 1985; Page, 1986), dip to the southwest and are mantled by younger fine-grained basin deposits (Figure 3). In contrast, the Modesto Formation is exposed at the ground surface along Gilsizer Slough and directly east of Highway 113 (Plate 1). The surficial map pattern of the Modesto deposits in these locations suggests depositional lobes from an ancestral Gilsizer Slough. These deposits may have been related to discharges and sediment loads that were higher than present-day conditions. These deposits may, perhaps, represent an ancestral Feather River channel location that occupied the present-day Gilsizer Slough during the latest Pleistocene and was subsequently abandoned.

The surficial geologic mapping (Plate 1) shows differences in deposit type and distribution from northwest to southeast along the Bypass, which are associated with changes in watershed production of water and sediment, related geomorphic processes, soil profile development, and the underlying subsurface hardpan layer. These differences illustrate the diversity of past geomorphic processes along and near the Bypass and, as a consequence, the type of geologic deposits at and near the ground surface. The surficial geologic map allows the interpretation of "reaches" along the Bypass within which geomorphic processes and their associated deposits are likely to be relatively consistent. The Bypass study area consists of four general reaches, from northwest to southeast, each having characteristic deposit types and distributions (Plate 1).

The westernmost reach of the Bypass study area extends from the junction with the Wadsworth Canal to directly south of the Tisdale Weir ("Reach I", Plate 1). The levee along this reach, about 8.1 miles long, primarily overlies fine grained basin deposits accumulated on the valley floor over geologic time. This deposition resulted from flooding of the Sacramento and Feather Rivers, tributaries draining Sutter Buttes, and sheet flow from the generally flat valley floor. Holocene and historical channel deposits (map units Hch and Rch, Plate 1) are inset into the basin deposits. These southwest-trending alluvial channel deposits locally underlie the Bypass

levee, and result in local differences in material textures beneath the levee (Figure 4). About 27 abandoned channels traverse the levee along this reach (approximately 3 channels per levee mile). The channels are about 250 feet wide, but range from about 100 to 300 feet wide (Plate 1). In this area, the channels are about 6 to 8 feet deep, and are typically filled with sand, silt, and clay in a fining-upward sequence, i.e., coarser-grained sand overlain by about one to two feet of silt and clay. This sedimentary sequence may be conducive to seepage where relatively more-permeable channel sands are overlain by a relatively thin, fine-grained "blanket" layer.

The second reach along the Bypass, about 1.1 miles long, extends across Gilsizer Slough ("Reach II", Plate 1), where Modesto Formation deposits are present at the ground surface. Undifferentiated alluvium (map unit Qa, Plate 1) is present along the historically-active Gilsizer channel floor, and is inset to the Modesto Formation (Figure 5). The Gilsizer Slough alluvium extends beneath the eastern and western Bypass levee, and thus represents the progradation of younger deposits with respect to the Modesto Formation. Along this reach, the Bypass levee is underlain by younger Gilsizer Slough alluvium flanked by the relatively denser, semi-consolidated late Pleistocene Modesto deposits (Figure 5). Areas where the levee directly overlies the Modesto Formation may be relatively less conducive to underseepage, as the associated hardpan layer may form locally continuous zones of low hydraulic conductivity.

The third reach along the Bypass extends from the Gilsizer Slough to the latitude directly south of Laurel Avenue, and is about 6.6 miles long ("Reach III", Plate 1). This reach is generally similar to Reach I, except Reach III has Pleistocene deposits (i.e., lower Modesto and Riverbank Formations) exposed at or very near the ground surface, and has a sparser channel density (about 2 channels per levee mile) compared to Reach I. About 14 southerly-oriented sloughs are mapped across this reach and locally underlie the Bypass levee (Plate 1). The sloughs originate from the Feather River, near Star Bend and Shanghai Bend, extending southward toward the Bypass. The sloughs along Reach III are about 250 feet wide, but range from about 100 to 300 feet wide, similar to Reach I (Plate 1). In this area, the channels are also probably about 6 to 8 feet deep, and probably filled with sand fining-upward to silt and clay. These channel deposits may be conducive to underseepage because of the deposit stratigraphy that has coarser-grained sand overlain by about one to two feet of silt and clay. Late Quaternary Riverbank Formation is at the ground surface along the southwestern end of Reach III (Plate 1), and likely is not conducive to seepage due to the dense and strongly-developed hardpan clay layer that is usually at about 1.5 to 4 feet depth below ground surface.

The fourth reach along the Bypass extends from directly south of the latitude of Laurel Avenue to the confluence with the Feather River west bank levee ("Reach IV", Plate 1). Reach IV, about 1.9 miles long, has Holocene and historical alluvium at the ground surface along this reach of the Bypass, primarily because of the proximity to the Feather and Bear Rivers (Plate 1). About 8 distributary channels, usually 90 feet wide but ranging from 45 to 190 feet wide, cross the floodplain in southwesterly orientations, leading to geologically young distributary-fan sediments. These sediments, primarily consisting of fine to coarse sand and silt, probably were deposited as a result of increased sediment and water input contributed to the Feather River from the Bear River; the confluence located directly upstream from this reach of the Bypass (Figure 1). Historically, the Feather River and the Bear River have aggraded from substantial mining debris input, thus reducing channel cross sectional area (i.e., James, 1999).

This reduction of cross section area, coupled with the trajectory of floodflow from the Bear River watershed, resulted in water overtopping the Feather River channel banks, and depositing sediment onto the western floodplain where the Bypass levee is located (Plate 1).

5.0 Applications to the Urban Levee Project

Based on synthesis of the surficial geologic map with preliminary Phase 1 borehole and cone penetrometer (CPT) data, the Bypass levee generally is underlain by relatively young fine-grained clay and sandy clay deposits that are laterally interrupted by local coarser channel fill deposits (i.e., Figures 3, 4, 5, and 6).

The northernmost reach of the Bypass levee ("Reach I") is predominantly underlain in the shallow subsurface by relatively young fine-grained clay and sandy clay deposits. These basin deposits are laterally interrupted by coarser-grained deposits filling abandoned channels that are about 250 wide (Plate 1, Figure 4). Mud rotary borehole WSESBP_011B, which penetrated channel unit Rch norths of Gilsizer Slough (Plate 1), indicates the channel deposit is about four-feet thick, consisting of about 60% fine to coarse sand (medium dense) with clayey sand. The clayey sand grades upward into clay, of about 45% sand fraction. This suggests locally coarse and unconsolidated, and therefore likely permeable, material in the channel fill. Based on review of adjacent borehole data, the basin deposits (Figure 4) generally consist of stiff clay, with less than 10% fine sand. It is likely that most or all of the small channels mapped herein as unit Rch are similar in textural characteristics and depths, because of similar genetic origin and geomorphic process of channel development and infilling. These deposits underlie Reach I in at least 27 places between Wadsworth Canal and Gilsizer Slough (Plate 1).

Reach II crosses late Pleistocene and Holocene geologic deposits associated with Gilsizer Slough (Plate 1). Review of subsurface borehole and CPT data indicate that the basin deposits north of the slough consist of medium stiff to stiff clays (Figure 5). The channel fill deposits within Gilsizer Slough (map unit Qa, Plate 1) consist of alternating beds of sandy gravel and clay. These channel deposits are inset into the lower Modesto Formation which, in this area, consists of very stiff sandy clay interbedded with silty sand and localized dense sand. Directly south of Gilsizer Slough, the lower Modesto Formation is at the ground surface (Plate 1). Subsurface data suggest that a hardpan horizon is encountered at about 3 to 4 feet below the ground surface. The uppermost deposit above the hardpan consists of sand and silty sand, and probably is weathered and/or culturally re-worked materials of the lower Modesto Formation. Thus, north of Gilsizer Slough, potentially low-permeability basin materials blanket the Modesto, and are locally cut by channel deposits, whereas at and south of Gilsizer Slough the local channel deposits are inset directly into the dense Modesto Formation. Where the Bypass levee rests on the unconsolidated Qa deposits within Gilsizer Slough, these coarse deposits may be associated with higher probabilities of levee underseepage. In constrast, the sections of the levee underlain directly by the Modesto Formation containing consolidated (hardpan) horizons are much less likely to experience underseepage.

Reach III is similar in geomorphic nature to Reach I, except it has a lower frequency of channels as compared to Reach I (Plate 1). It is probable that the composition of these deposits

generally will be consistent with those along Reach I (i.e., coarse-grained channel fill with upper fine-grained layers). These channels are more likely to promote seepage beneath the levee compared to the basin deposits. Additionally, the Pleistocene materials that likely directly underlie the project levees along this reach (Plate 1) are relatively dense and the associated hardpan layer may form a relatively continuous zone of lower hydraulic conductivity. Where the levee directly overlies Modesto formation (NW ¼, Section 20; southeast of the Sutter Causeway), there is a lower likelihood of underseepage. There is also a lower likelihood of underseepage where the levee rests on the Riverbank Formation in lower length of Reach III (SW ½, Section 34).

Along Reach IV, geologically young Holocene and historical alluvium is beneath the Bypass levee (Plate 1). This uppermost layer, about five-feet thick, is locally cross-cut by channel deposits that also consist of silt and sand (Figure 6). Quaternary basin deposits do not directly underlie the Bypass levee along this reach. Review of Phase 1 subsurface geotechnical data indicates that these alluvial deposits consist of silty sand and sandy silt textures. Based on review of Phase 1 data in other Project areas (i.e., Marysville), the uppermost alluvium generally has low densities (i.e. loose to medium dense), and consequently relatively high permeability. The surficial mapping indicates that essentially all of this reach of the levee (about1.9 miles) is underlain by loose, unconsolidated sandy alluvium, which may be susceptible to substantial underseepage. The local recent channels (map units Ra and Rdc; Plate 1) may contain coarser deposits and may be more susceptible to underseepage.

Synthesis of the surficial mapping and geotechnical data indicate that subsurface stratigraphy along the Sutter Bypass area locally may be conducive to levee underseepage. Shallow strata typically include denser and probably semi-consolidated material (i.e., Modesto Formation) that likely contains a moderately developed low-permeability hardpan horizon. The hardpan may or may not be laterally continuous, depending on post-depositional soil formation and erosional processes. Along Reach I and III, the Modesto formation is overlain by about 4 to 6 feet of medium stiff to stiff clay (i.e., basin deposits). The basin materials locally are cross-cut by relatively loose, sandy channel deposits that have a thin fine-grained upper “blanket” layer. Therefore, this shallow subsurface stratigraphy may promote levee underseepage along certain areas of the Bypass project levees that overlie geologically young, loose, sandy channel material lies between the dense Pleistocene deposits and relatively thin, low-permeability clay-rich “blanket” layer. Along Reach IV, a layer Holocene and historical alluvium from the Feather River mantles the Modesto Formation, and also may promote levee underseepage.

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 underseepage, given certain hydraulic conditions. Further spatial analyses of the surficial geologic mapping and subsurface geotechnical exploration data are needed to better constrain and characterize areas that are most susceptible to underseepage in the study area.

6.0 Limitations

This geomorphic assessment and associated data interpretation have been performed in accordance with the standard of care commonly used as the state-of-practice in the geologic engineering profession. Standard of care is defined as the ordinary diligence exercised by fellow practitioners in this geographic area performing the same services under similar circumstances during the same time period.

Discussions of surface and subsurface conditions summarized in this technical memorandum are based on geologic interpretations of subsurface soil data at limited exploration locations available to this assessment through August of 2007. Variations in subsurface conditions may exist between exploration locations, and the project team may not be able to identify all adverse conditions in the levee and its foundation. This memorandum is for the use and benefit of DWR. Use by any other party is at their own discretion and risk.

7.0 References

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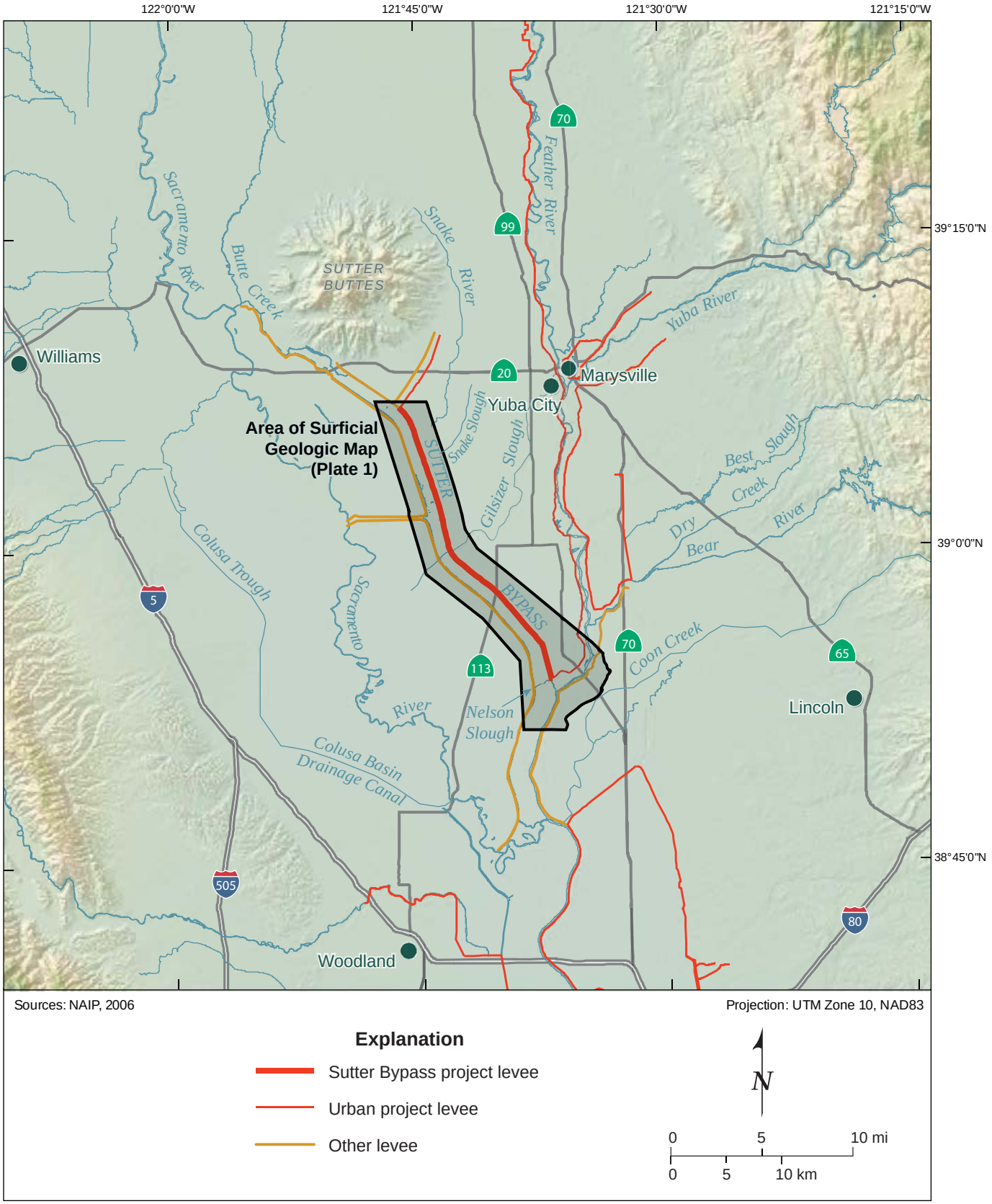


WLA

Map of Northern Central Valley, California

DWR URBAN LEVEE PROJECT

Figure 1

1881 Sutter Bypass

Modified 09.03.09

121°45'0" 121°40'0" 121°35'0"

39°5'0"

39°0'0"

38°55'0"

AREA OF MAPPING

AREA OF MAPPING

YUBA CITY

YUBA

Oswald Road

Cross section (see Figure 3)

WSESBP 013C

Cross section (see Figure 4)

WSESBP 012B

WSESBP 011B

Cross section (see Figure 5)

WSESBP 009C

WSESBP 001B

Cross section (see Figure 6)

WM0003 001S

Feather River

Gilsizer Slough

SUTTER BYPASS

Nelson Slough

Reclamation Road

99

113

Sources: NAIP, 2006

Projection: UTM Zone 10, NAD83

Explanation

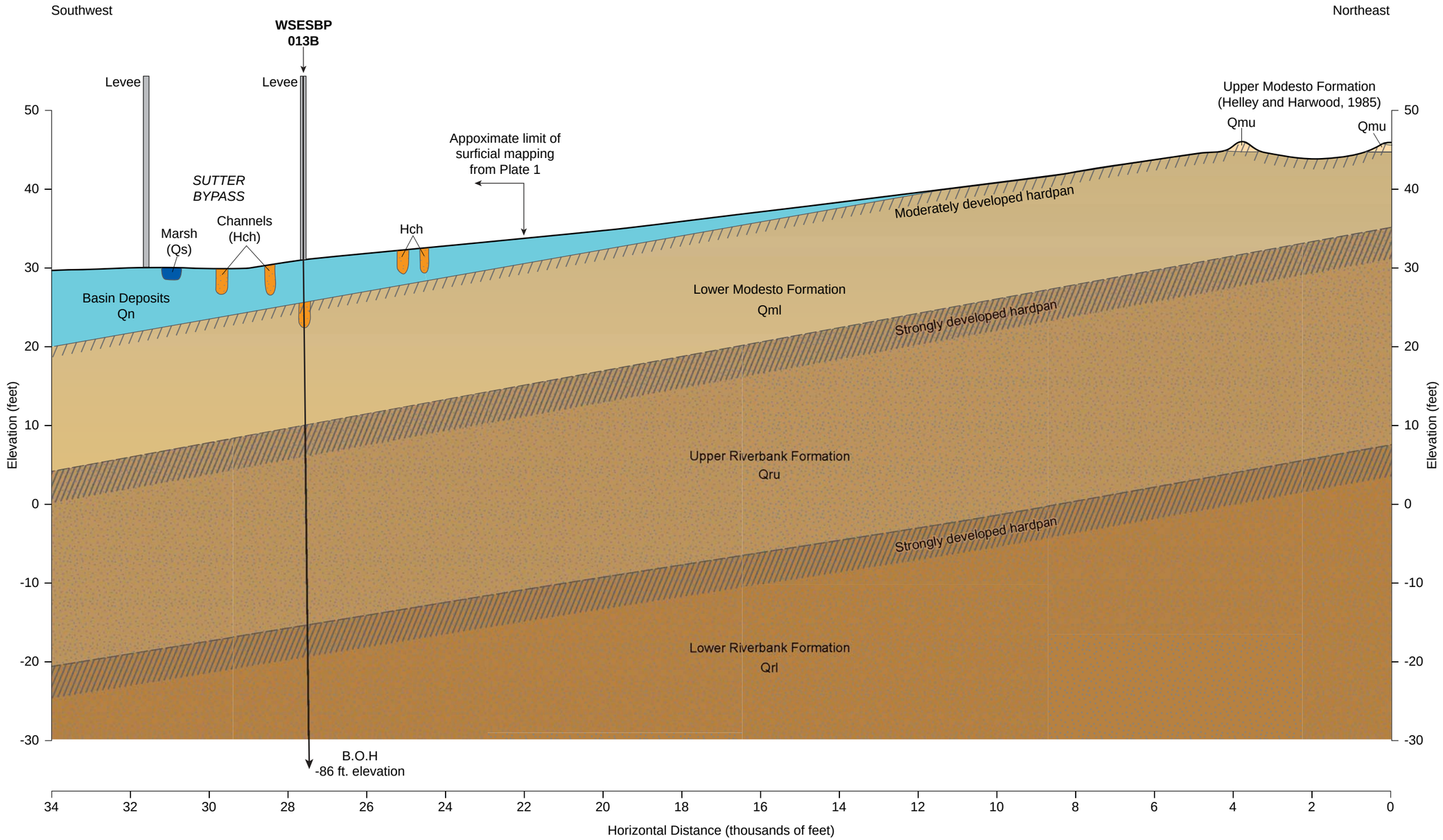
- Creek, slough
- Canal, drain
- Urban Project levee
- Other levee

WSESBP 001B — Location of subsurface geotechnical exploration

N

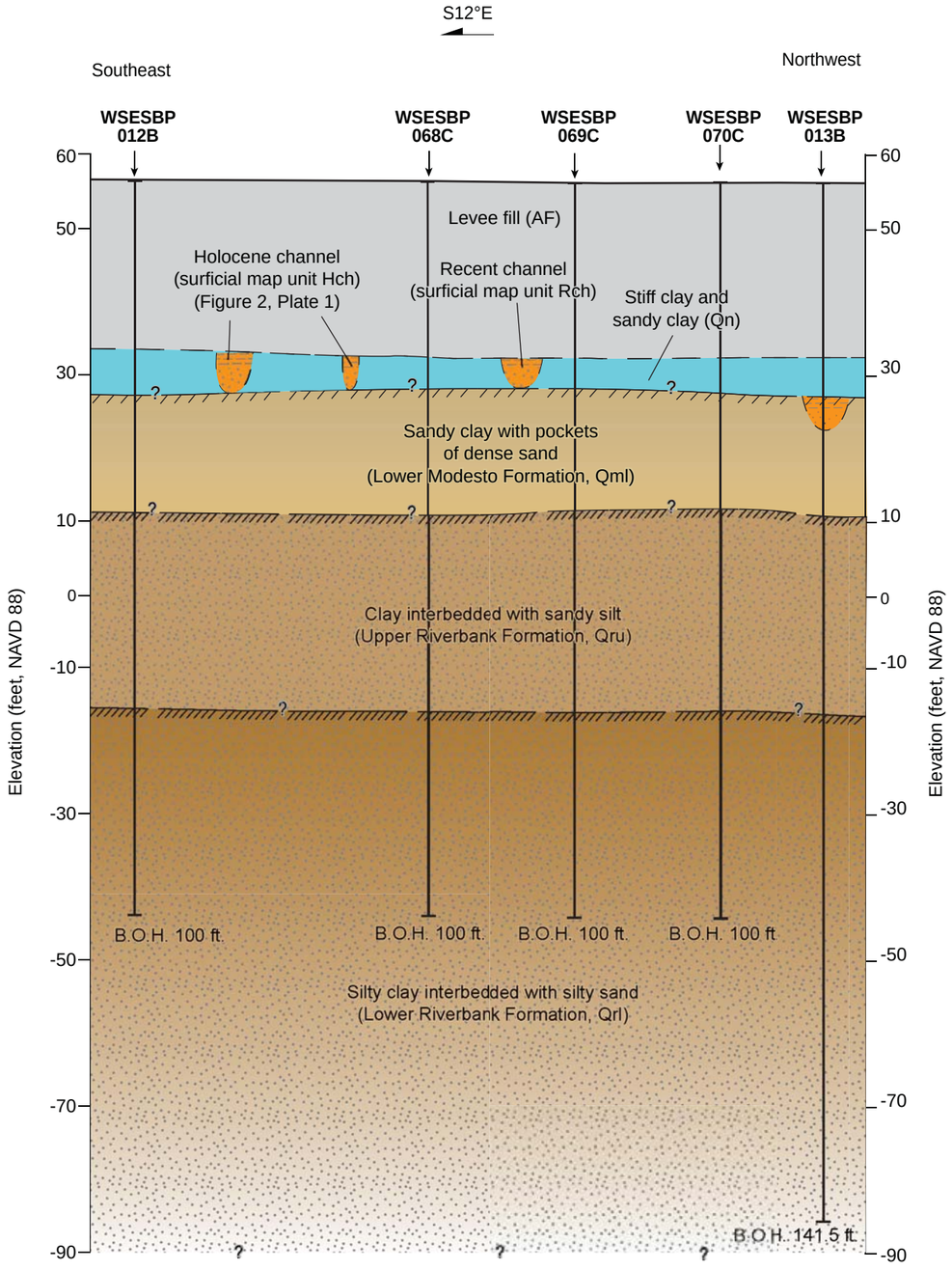
0 1 2 mi

0 1 2 km



Notes: 1. See Figure 2 for location of cross section.
2. Surficial geologic units and contacts from this study and Helley and Harwood (1985).
3. Ground surface elevation from USGS Gilsizer Slough topographic map, 5-foot contour interval.

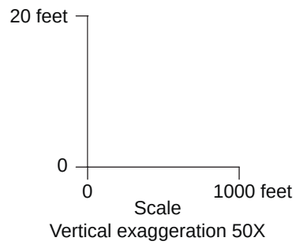
TISDALE WEIR



Explanation

- Channel identified on surficial geologic map or as fining upward sequence of sediments in boreholes
- Moderate paleosol (hardpan)
- Strong paleosol (hardpan)

Notes:
1. Borehole ground elevation values from URS Corp., and reported in the Boring Location Survey, DWR task #10. (NAVD 88).
2. CPT borehole surface elevations are approximate, placed on projected ground surface between boreholes WSESBP_012B and WSESBP_013B.
3. Bottom of hole (B.O.H.) values shown as total depth below ground surface.
4. Borehole names and horizontal distance shown above from draft URS logs and location maps. Geologic relations could change if borehole locations are revised.
5. Drilling method indicated as last letter in borehole names.
   B = Mud Rotary unit with SPT
   C = Cone Penetrometer Test.



GILSIZER SLOUGH

Looking South - Southwest

Southeast

Northwest

N44°W

N27°W

N15°W

WSESBP 009B

WSESBP 055C

WSESBP 056C

WSESBP 057C

WSESBP 058C

WSESBP 010B

WSESBP 059B

WSESBP 060C

WSESBP 061C

WSESBP 062C

WSESBP 011B

Levee fill (AF)

Holocene channel (surficial map unit Hch) (Figure 2, Plate 1)

Holocene channel

Gilsizer Slough (surficial map unit Qa) (see Figure 2, Plate 1)

Holocene channel

Stiff clay and sandy clay (Qn)

Recent channel

Recent channel (surficial map unit Rch) (Figure 2, Plate 1)

Very stiff sandy clay with interbeds of silty sand and localized dense sand (Lower Modesto Formation, Qml)

Hard clay with stiff silty sand and sandy silt interbeds (Upper Riverbank Formation, Qru)

Very dense sand interbedded with stiff clay and silt (Lower Riverbank Formation, Qrl)

B.O.H. 100 ft.

B.O.H. 100 ft.

B.O.H. 140 ft.

B.O.H. 140 ft.

B.O.H. 140 ft.

B.O.H. 140 ft.

B.O.H. 140 ft.

B.O.H. 140 ft.

B.O.H. 140 ft.

B.O.H. 140 ft.

Elevation (feet, NAVD 88)

60

50

30

10

0

-10

-30

-50

-70

-90

Explanation

- Channel identified on surficial geologic map or as fining upward sequence of sediments in boreholes
- Localized sand and gravel; possible channel interpreted from borehole logs
- Moderate paleosol (hardpan)
- Strong paleosol (hardpan)
- Bend in levee
- N16°W — Azimuth of levee segment

Notes:

1. Borehole ground elevation values from URS Corp., and reported in the Boring Location Survey, DWR task #10.(NAVD 88).
2. CPT borehole surface elevations are approximate, placed on projected ground surface between continuous boreholes WSESBP-009B, WSESBP-010B, and WSESBP-011B.
3. Bottom of hole (B.O.H.) values shown as total depth below ground surface.
4. Borehole names and horizontal distance shown above (from draft URS logs and location maps). Geologic relations could change if borehole locations are revised.
5. Drilling method indicated as last letter in borehole names.
   B = Mud Rotary unit with SPT
   C = Cone Penetrometer

20 feet

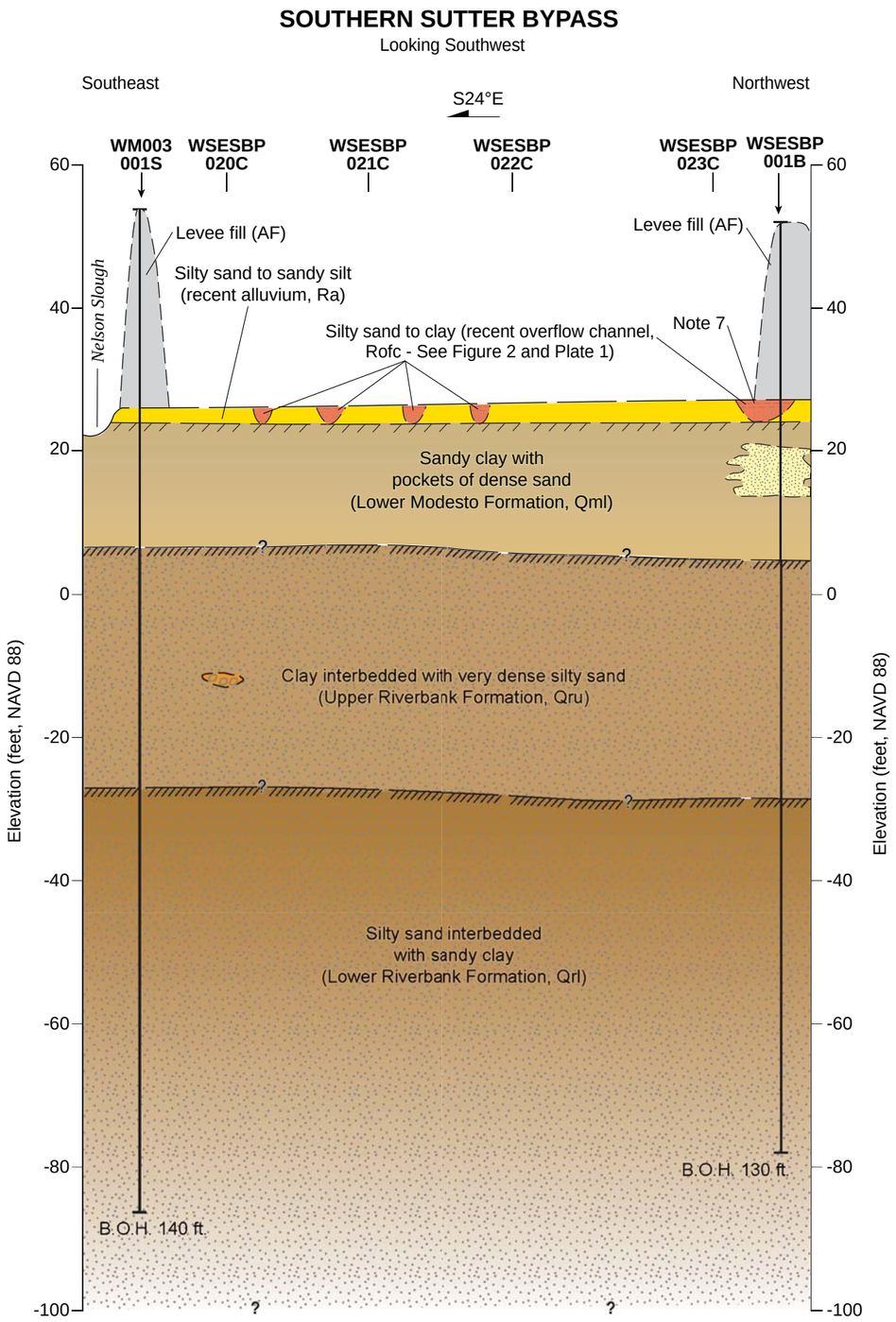
0

0 1000 feet

Scale

Vertical exaggeration 50X

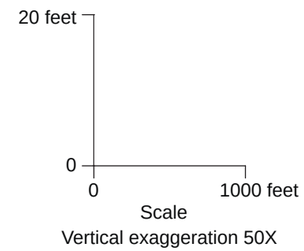
Conceptual Subsurface Diagram across Eastern Levee Crest at Gilsizer Slough



Explanation

- Channel identified on surficial geologic map or as fining upward sequence of sediments in boreholes
- Localized sand and gravel; possible channel interpreted from borehole logs
- Moderate paleosol (hardpan)
- Strong paleosol (hardpan)
- Levee widths and side slopes are schematically shown

Notes:
1. Borehole ground elevation values from URS Corp., and reported in the Boring Location Survey, DWR task #10. (NAVD 88).
2. CPT borehole surface elevations are approximate, placed on projected ground surface between boreholes WM00_001S and WSESBP_001B.
3. Bottom of hole (B.O.H.) values shown as total depth below ground surface.
4. Borehole names and horizontal distance shown above from draft URS logs and location maps. Geologic relations could change if borehole locations are revised.
5. Drilling method indicated as last letter in borehole names.
   - B = Mud Rotary unit with SPT
   - S = Sonic vibracore
   - C = Cone Penetrometer Test.
6. Cone penetrometer borehole locations projected to the trend of this cross section.
7. Recent over flow channel shown beneath the northwestern levee intersects the levee at a sub-orthogonal angle. This conceptual cross section intersects the levee and the over flow channel at an oblique angle, as shown in the channel asymmetry.



Conceptual Subsurface Diagram across the Eastern Levee of the Sutter Bypass Confluence with the Feather River

Explanation

Geologic contact; dashed where approximate, dotted where concealed, queried where uncertain; solid contacts have a resolution no better than about 30'.

Geomorphic Reaches Discussed in Text

Project Levee

WSESBP_001B — Geotechnical borehole, approximately located.

W — Water visible on 1937 aerial photography.

Geologic Units

	AF	Artificial fill; visible on 1937 aerial photography.
HISTORICAL	Rob	Overbank deposits; sand, silt, and clay; deposited during high-stage water flow, overtopping channel banks.
	Rcs	Crevasse splay deposits; fine to coarse sand, with minor lenses of clay deposited from breaching of natural or artifical levees.
	Rdf	Distributary fan deposits; sand, silt and clay.
	Rch	Channel deposits; well sorted sands and fine gravels.
	Rb	Channel bar deposits; fine gravel, sand, and silt deposited in or along channel lateral margins.
	Rdc	Distributary channel deposits, trace gravel, sand, silt, and clay; channelized flow conducting sediment to floodplain.
	Rofc	Overflow channels; vertically stratified sand, silt, and clay in floodplain channels occupied primarily when high-stage water overtops channel banks.
	Rsl	Slough deposits; sand, silt and clay, fining upward facies, low-energy channel deposit.
	Ra	Alluvial deposits, undifferentiated; sand, silt, and minor lenses of fine gravel.
HOLOCENE	Hdf	Distributary fan deposits; sand, silt and clay.
	Hch	Channel deposits; sorted sands and silts; fining upward.
	Hb	Channel bar deposits; fine sand, and silt deposited in or along channel lateral margins.
	Hdc	Distributary channel deposits, sand, silt, and clay.
	Hsl	Slough deposits; sand, silt and clay, fining upward facies, low-energy channel deposit.
	Ha	Alluvial deposits; undifferentiated; sand, silt, and minor lenses of gravel; under cultivation in 1937.
	Qa	Alluvial deposits, undifferentiated; sand, silt, and minor lenses of gravel; under cultivation in 1937.
	Qn	Basin deposits; fine sand, silt and clay, dark yellow to dark yellowish brown, under cultivation in 1937.
	Qs	Marsh deposits; silt and clay, likely organic-rich; perennially or seasonally submerged on 1937 photography.
PLEISTOCENE	Qmu	Modesto Formation; upper member; unconsolidated gravel, sand, silt, and clay.
	Qml	Modesto Formation; lower member; unconsolidated to semi-consolidated gravel, sand, silt and clay.
	Qru	Riverbank Formation; upper member, semi-consolidated to consolidated gravel, sand, silt and minor clay.
	Qrl	Riverbank Formation; lower member; consolidated gravel, sand, silt, and clay, generally associated with strong duripan horizon.

Stratigraphic Correlation Chart

Time — **Depositional Environment**

Epoch	Channel deposits	Floodplain and alluvial-fan deposits	Flood basin deposits	Cultural deposits
Historical	Rch; Rdc, Rsl, Rofc	Qa; Ra; Rcs, Rdf, Rob	Qs, Qn	AF
Holocene	Hch; Hdc, Hsl, Hb	Qa; Ha; Hdf	Qs, Qn	
Latest Pleistocene	Qmu			
Pleistocene	Qml, Qru, Qrl			

WSESBP_012B
WSESBP_013B
WSESBP_011B
WSESBP_010B
WSESBP_009B
WSESBP_001B

1:20,000
0 0.5 1 Miles
0 0.5 1 Kilometers

Map projection: UTM NAD83 Zone 10N
Topo base USGS quadrangles

Plate 1 - Surficial Geologic Map of the Sutter Bypass Area

WILLIAM LETTIS & ASSOCIATES, INC.
Walnut Creek, CA

Sutter_Bypass_MGT.mxd — 09/04/2009

Geologic Mapping by J. Pearce and A. Streig
Digital Cartography by M. Ticci

Part C.4

URS Supplemental Geotechnical Data Report (2010), Appendix O, Volume 4

APPENDIX O

Geomorphology Report

WILLIAM LETTIS & ASSOCIATES, INC.
1777 Botelho Drive, Suite 262, Walnut Creek, California 94596
tel (925) 256-6070 fax (925) 256-6076

September 8, 2009

Mr. Juan Vargas
URS Corporation
2870 Gateway Oaks Drive, Suite 150
Sacramento, CA 95833

RE: Surficial geologic mapping and geomorphic assessment, California Department of Water Resources Urban Levees Project, Southern Feather River, Sutter County, California

Dear Mr. Vargas:

This memorandum presents the surficial geologic mapping and preliminary geomorphic assessment of the southern Feather River study area, for the California Department of Water Resources (DWR) Urban Levees Project geotechnical characterization. The goal of this mapping and geomorphic assessment is to provide information on the type and distribution of surface and shallow subsurface deposits that likely underlie the project levees along the western bank of the Feather River. The purpose of this study is to develop spatially-continuous geologic data and a conceptual model that provides a framework for stratigraphic interpretations between widely-spaced subsurface explorations. A primary goal is to provide a geologic framework for the geotechnical assessment of potential levee underseepage. This memo presents the technical approach, surficial geologic map, conceptual geomorphic model, and initial results based on map analysis and preliminary review of Phase 1 geotechnical data.

We appreciated the opportunity to provide these geomorphic and geologic data and preliminary interpretations of the shallow stratigraphic conditions in the southern Feather River study area. Please do not hesitate to call either of the undersigned if there are any questions or comments.

Respectfully,

WILLIAM LETTIS & ASSOCIATES, INC.



Justin Pearce, C.E.G. 2421
Senior Geologist



Ashley Streig
Senior Staff Geologist



Keith Kelson, C.E.G. 1610
Principal Geologist

1.0 Approach

The approach to developing a surficial geologic map of the southern Feather River project area (Figure 1, Plate 1) consisted of analysis of the following data: Aerial photography (black and white stereo-pairs taken in 1937, ~1:20,000-scale); early USGS topographic maps (i.e., 1911); published surficial geologic maps (Helley and Harwood, 1985); early and modern soil survey maps (Strahorn et al., 1909; Lytle, et al., 1988); and other maps and documents (Busacca et al., 1989). Synthesis of these data allow for the development of a detailed surficial geologic map that provides an initial understanding of primary geomorphic processes that have acted in the study area during recent and historical geologic time. Through this mapping, primary geomorphic features and associated surficial geologic deposits are identified, such as abandoned paleochannels, channel deposits, floodplain deposits, basin deposits and other features commonly associated with surficial deposits with large active river systems. Knowledge of fluvial processes and the ability to recognize depositional environments in the geologic record are key to identifying locations along levees where underseepage is most likely to occur (Llopis
et al., 2007).

The surficial geologic map was developed at the nominal scale of the aerial photography (1:20,000). This scale establishes the resolution of the map (Plate 1), such that analysis of the map data at a more detailed scale than 1:20,000 may introduce uncertainties beyond the original resolution of the data. The map unit boundaries shown on the surficial geologic map should be considered approximate, and accurate within 30 feet on either side of the line shown on the map. The 1937 aerial photographs are the primary data set for interpreting the surficial geologic deposits because: (1) they are the oldest high-quality images that pre-date much of the urbanization and landscape alteration within present-day Sutter County (i.e. Figure 2); and, (2) these data represent a close approximation to the surficial deposits that were likely present at the ground surface prior to the construction of the levees. The 1937 photographs generally were taken in late summer or early autumn (i.e., August). By 1937, the area had experienced moderate cultivation that locally obscures geomorphic conditions. However, integration of data from the 1937 photography, old and recent topographic maps, geologic maps, soil surveys and historical documents provides sufficient information to delineate many of the pre-historical and historical surficial deposits in detail. Taken together, these data provide key insights to the characteristics of shallow deposits beneath the levees, as well as the geomorphic processes responsible for their distribution.

Additional floodplain deposition may have occurred after 1937, due to flood overflows, levee overtopping, or localized levee failure. A time series analysis that interprets successive aerial photographs taken after major flood events (i.e., USDA, black and white stereo-pairs taken in 1958, ~1:20,000-scale) or known local levee failures (i.e., 1986) may reveal additional information on surficial deposits in the southern Feather River area. Such analyses are beyond the scope of this study. The data and interpretations presented herein address the primary goal of characterizing the type and distribution of deposits likely present directly beneath the project levees.

1.1 Report Preparation Quality Control

The surficial geologic map data and geomorphic interpretations presented in this memorandum were subject to quality control and quality assurance procedures as required by the Levee Geotechnical Evaluation Project Management Plan (PMP). The surficial geologic map data developed by this study were reviewed for accuracy and completeness through an internal review and an independent technical review by Dr. Janet Sowers of WLA. Results of QA/QC review were documented using PMP Exhibit 2.2-3 (Independent Technical Review Report) and are kept on file according filing control plan. Subsurface data shown on diagrams were provided as draft information, and were not verified for accuracy or completeness by this study.

2.0 Geologic Setting

The southern Feather River study area lies in the Central Sacramento Valley, between the Coast Ranges to the west and the Sierra Nevada foothills to the east. Feather River drains the western slope of the Sierra Nevada, and emerges from the mountains south of the Thermalito Afterbay (Figure 1). The river flows southward from the Thermalito Afterbay, over middle-to late Pleistocene dissected alluvium derived from the Sierra Nevada. The regional land surface is nearly flat, with a gentle west-southwest slope that flattens out south of the Sutter Buttes, in Sutter Basin. The Feather River is entrenched into middle to late Pleistocene semi-consolidated sediments. Holocene alluvium deposited by the Feather River is present between the present-day levees, inset to the older formations, as well as on the western floodplain as subdued natural levees. The river trends roughly south until its confluence with the Bear River, where it curves
to the southwest (Figure 1). The Feather River lies east of, and is a tributary to the Sacramento River, converging near the town of Nicolaus (Figure 1). A primary influence on the historic processes in the river system was the hydraulic mining that began in the 1850's. Mining occurred through the early 1900's in the Feather, Yuba and Bear River watersheds, and abruptly introduced large quantities of sediment, drastically changing the geomorphic characteristics of these river systems (DWR, 2004; Ellis, 1939). Aggradation within the stream channel was a primary response to the introduction of substantial mining debris (James, 1999), consequently young alluvial deposits are common throughout the study area.

3.0 Surficial Geologic Mapping

Previous geologic mapping in the study area along the Feather River and surrounding areas generalize the surficial deposits as: Quaternary Alluvium (Qa) and Quaternary stream channel deposits (Qsc) within and proximal to the modern Feather River channel, (Helley and Harwood, 1985). These map units are considered Holocene age (less than 11,000 years old). Late Quaternary Modesto Formation (Qmu, Qml) is mapped along the western margin of the floodplain. These map units were delineated by Helley and Harwood (1985) at a regional scale (i.e., 1:62,500). The current analysis of the Feather River uses this geologic framework as a basis for more detailed mapping of late Holocene alluvium and geomorphic features (Plate 1).

The surficial geologic map units within the southern Feather River study area are described below, in order from oldest to youngest. Surficial geologic mapping for this study subdivides these map units and delineates individual deposits based on relative age and depositional process or environment (Plate 1). The map units depicted on Plate 1 are based primarily on analysis of 1937-vintage photography, and thus the map essentially is a "snapshot" of geologic conditions at this time.

The oldest unit exposed along the Feather River is the lower member of the Riverbank Formation (Qrl) of Helley and Harwood (1985). This unit is a highly dissected alluvial surface with textures of weathered gravel, sand and silt with strong soil-profile development. The Riverbank Formation is semi-consolidated, and is associated with the presence of a well-developed hardpan (or, duripan) layer that is a product of soil-forming processes over substantial geologic time. This hardpan layer reflects an ancient land surface that locally is buried by younger deposits. The Riverbank Formation is late to middle Pleistocene in age, and is estimated to be 130,000 to 450,000 yrs old (Helley and Harwood, 1985). The upper member is unconsolidated dark brown to red alluvium consisting of gravel, sand, silt and minor clay (Busacca et al., 1989, Helley and Harwood, 1985).

The Modesto Formation is divided into two members, a lower (older) unit that is latest Pleistocene in age (about 29,000 to 49,000 years old), and consists of unconsolidated slightly weathered gravel, sand, silt and clay. The upper member, a younger unit, is latest Pleistocene age (circa 12,000 to 26,000 years old) (Helley and Harwood, 1985). This unit (Qmu) is composed of sand, silt, and some gravel, comprising river channel and floodplain deposits, and is associated with a moderate amount of secondary (pedogenic) clay accumulation. This clay-rich horizon may form laterally continuous zones of low hydraulic conductivity, and may extend across boundaries between coarse and fine-grained strata within the latest Pleistocene alluvium. Soils on the Modesto Formation deposits include the Gridley loam of Strahorn et al. (1909) and the Conejo complex of Lytle et al. (1988).

Latest Holocene deposits overlie or are inset into the Modesto Formation, and are categorized as channel, floodplain, and basin deposits (Plate 1). Channel deposits include Holocene channels (Hch), distributary channels (Hdc), overflow channels (Hofc), sloughs (Hsl), in-stream or lateral bars (Hb), and meander scrolls (Hms). These deposits likely consist of fine to coarse sand, silty sand, and clayey sand, with trace fine gravel. Holocene channel deposits (Hch), which are present along Gilsizer Slough and the western floodplain as secondary channels, contain fining-upward sequences of sand, silt and clay. Overflow channels (Hofc) transport water across the land surface during high flow stages toward Sutter Basin. Networks of sloughs wander across the distal floodplain, and are likely filled with a fining-upward sequence of silt and clay (map unit Hsl). These deposits are associated with former channels, and generally are present landside (outboard) of the present-day human-made levees.

Holocene floodplain deposits include crevasse splays (Hcs), distributary fans (Hdf), and overbank deposits (Hob). Crevasse splays (Hcs) are sandy deposits that form from breaching of river banks or natural levees. Distributary fan deposits (Hdf) occur when water and velocity within a distributary channel decreases, can no longer transport its sediment load, and sediment is laid down on the floodplain. Overbank sediments are formed by localized overtopping of

river banks or natural levees, subsequent deposition from shallow sheet flow or standing water. Basin deposits occur on the distal floodplain and include undifferentiated basin deposits (Qn), and marsh deposits (Qs). Basin and marsh deposits are present in the topographically low areas west of the present-day natural levees along the Feather River. These deposits consist of fine sand, silt, and clay laid down in a relatively low-energy depositional environment. Soils developed on these deposits are the Sacramento series silt loam, fine sandy loam, clay, Alamo clay loam adobe and Stockton clay adobe. Marsh deposits are generally saturated and are often underwater in the present-day environment. Undifferentiated Holocene and Quaternary alluvium (Ha and Qa, respectively) usually are proximal to the river channel, and this map unit is used in areas where geomorphic features are obscured or obliterated by historical (1937-era) agriculture or cultivation. The deposits within these agriculturally modified areas are assigned a relative age (Ha or Qa) based on overlapping and cross cutting relationships with the surrounding deposits as follows: Ha if the agriculture-modified area is mapped within or shown overlying Holocene deposits; or Qa where it is difficult to evaluate the surface age based on the nearby deposits. Soils associated with these, undifferentiated units (Qa) are the Sacramento silt loam and Sacramento fine sandy loam, (Strahorn et al., 1909), and the Columbia fine sandy loam of Lyle et al. (1988), which are weakly developed soils commonly developed on relatively young deposits.

Historical deposits mapped in the area include stream channel and floodplain deposits, as well as artificial fill deposits (L and SP) (Plate 1). Historical deposits are estimated to be less than 150 years old, dating from approximately 1800 to 1937. Historical stream channels (Rch), distributary channels (Rdc), and overflow channels (Rofc) within the floodplain are recently abandoned channels or reflect active channels with low water flow. Lateral bar deposits (Rb) and meander scrolls (Rms) are located adjacent to the present-day Feather River, and are generally present inboard (waterside) of the present-day Feather River levees. When the river overtops its banks, distributary channels (Rdc) and recent overflow channels (Rofc) transport water and sediment across the floodplain. These channel deposits likely consist of silt and sand with traces of gravel. The upper few feet of these deposits probably are filled with debris from upstream hydraulic mining activities. Historical sloughs transport low velocity water flow derived from distributary channels proximal to the Feather River onto the distal floodplain and into the Sutter Basin. Slough deposits (Rsl) likely consist of fining-upward silt and clay.

Historical flood plain deposits include crevasse splay (Rcs), distributary fan (Rdf), and overbank (Rob) deposits, which generally consist of a fining upward or episodic fining upward sequence of sand, silt, and clay. Historical overbank (Rob) deposits are slightly finer grained sand, silt, and clay deposited via sheet flow when the river is at flood-stage and overtops natural and artificial levees. These historical deposits are differentiated based on cross-cutting and superposition relationships relative to existing cultural deposits visible on the 1937 photographs. Historical alluvial deposits (Ra), generally located within the Feather River channel, consist of undifferentiated sand, silt, and minor lenses of gravel. Historical artificial fills (map units L and SP) are culturally-emplaced heterogeneous deposits, with varying amounts of clay, silt, sand, and gravel from local sources. These deposits include levee structures and canal levee systems (L), and some undifferentiated soil piles (SP), and are shown on the surficial geologic map where present and identifiable on the 1937 photography.

Mapping of historical and Holocene deposits shown on Plate 1 generally is consistent with early, less-detailed soil survey mapping along the western banks of the Feather River as areas of Gridley loam, Sacramento Series fine sand, sandy loam and silt loam soils (Strahorn et al., 1909). The Gridley loam occurs along the northern Feather River from Thermalito south to the confluence with the Bear River, and closely corresponds to the Modesto Formation of Helley and Harwood (1985). The relationship between the mapped surficial geologic units and the potential for underseepage is summarized below.

4.0 Geomorphic Conceptual Model

The preliminary conceptual model described here is based on general relationships among surface and subsurface geologic deposits along the Feather River, as described above and shown on Plate 1. This conceptual model provides a consistent basis for understanding the type and stratigraphy in the area.

Published geologic maps of the project area identify a complex series of westward aggrading alluvial fans and terraces derived from the Sierra Nevada, identified as the Riverbank and Modesto formations. The Riverbank Formation and Modesto Formation are semi-consolidated to unconsolidated deposits characterized by intraformational paleochannels and lateral and vertical stratigraphic complexity related to past fluvial processes and buried paleo-topography. The Riverbank Formation unconformably overlies the Laguna Formation, which is a deeply dissected alluvial surface (Busacca et al., 1989).

Subsurface deposits about 150 feet beneath the ground surface rest on a resistant volcanic tuff capped by interbedded alluvial gravel, sand and silt, interpreted as Pliocene-Pleistocene age Laguna Formation that represents a period of relatively stable landscape conditions (Helley and Harwood, 1985). The Laguna Formation is overlain by the Pleistocene Riverbank Formation, (very dense gravel deposits) that are, in turn, overlain by a medium dense sand and gravelly sand package of the latest Pleistocene Modesto Formation (Busacca et al., 1989). The upper member of the Modesto Formation is exposed at the ground surface adjacent to the western bank of the Feather River south of Marysville and Yuba City. The Modesto Formation is mantled by unconsolidated deposits of Holocene age that comprise most of the surficial geologic deposits along the western side of the Feather River (Plate 1).

Geomorphic evidence suggests that the Feather River system south of Yuba City may have been located west of its present course (Figure 3). The present-day Gilsizer Slough diverges from the modern Feather River directly north of Yuba City and trends southwestward toward the Sacramento River. Alluvial deposits of Gilsizer Slough are inset (i.e. incised) into the Modesto Formation from Yuba City southward. The ancestral Gilsizer Slough perhaps extended to as far as the Sacramento River (Figure 3), based on surficial mapping not included in this report, and inspection of topographic maps. The ancestral Gilsizer Slough deposits are related to discharges and sediment loads that were higher than present-day conditions, and perhaps is an ancestral course of the Feather River.

Surficial geologic deposits near the Yuba City airport indicate the Feather River occupied an intermediate position between ancestral and present locations. The river occupied an abandoned channel arm north of Shanghai Bend, located between Gilsizer Slough and the modern Feather River (Figure 3). From this point the river continued southward in nearly its present location. This paleochannel had a sharp, more exaggerated bend than the present-day channel at Shanghai Bend (Figure 2). The channel subsequently moved eastward, laterally backfilling and abandoning the meander above Shanghai Bend, and moved to the rivers' present location closer to Marysville. Today, Gilsizer Slough is a natural bypass for high water flow stages on the Feather River, in the area between Marysville and Yuba City (Ellis, 1939).

Surficial geologic mapping (Plate 1) shows differences in deposit type and distribution from north to south along the Feather River, which is associated with changes in watershed production of water and sediment, related geomorphic processes, soil profile development, and the underlying subsurface hardpan layer. These differences illustrate the diversity of past geomorphic processes along the river and, as a consequence, the type of geologic deposits at and near the ground surface. The surficial geologic map allows the delineation of reaches along the river within which geomorphic processes and their associated deposits appear to be relatively consistent.

Between Yuba City on the north to the confluence with the Sutter Bypass on the south, the southern Feather River consists of four major reaches, each having characteristic deposit types and distributions. The river reaches are numbered Southern Feather one through four (SF-I through SF-IV), sequentially from north to south (Plate 1, Figure 3). This report describes the surficial geologic characteristics of Reach SF-I, SF-II, SF-III and SF-IV of the southern part of the Feather River, extending from Yuba City, south to the confluence with the Sutter Bypass.

Reach SF-I, extends from the north end of Yuba City to the Yuba City airport, and is about 1.15 miles long (Plate 1, Figure 3). The Project levee along Reach SF-I trends roughly north-south, and overlies alluvial sediments deposited by the Feather River. In Yuba City the levee rests on Holocene deposits associated with Gilsizer Slough that are inset into the upper member of the Modesto Formation. The active Feather River channel is east of, and inset to these Holocene channel deposits (Figure 4).

The second reach of south Feather River project area, SF-II, extends from the Yuba City airport south to Shanghai Bend, and is about 2.9 miles long. Near the Yuba City airport, and south of the confluence of the Feather and Yuba Rivers, young channel deposits are inset against the Gilsizer Slough channel deposits (Plate 1). From the Yuba City airport, south to Epley Drive (about 1.5 miles), the levees overlie historical alluvium of mining debris origin, map unit Ra. From Epley Drive south to Shanghai Bend Road the levees (about 1.4 miles) overlie historical meander scrolls, map unit Rms, (Figure 2, Plate 1). The levee along this reach, SF-II, primarily overlies Holocene channel fill, historical alluvium and overbank deposits. These channels are likely filled with a fining-upward sequence of gravel, sand and silt, the upper few feet of these features are probably covered by a veneer of sediment derived from upstream hydraulic mining activities (Figure 4).

River Reach SF-III extends from Shanghai Bend on the north to just south of the confluence with Bear River, and is approximately 12 miles long (Plate 1). Along Reach SF-III, the active river floodplain is inset into the upper member of the Modesto Formation. Over geologic time, flooding has lead to the vertical accretion of overbank and crevasse splay deposits onto the Modesto Formation west of the Feather River. Overflow channels and related deposits (Rofc) are common along this reach of the river. Beginning at Shanghai Bend and continuing southward are seven overflow channels that range from approximately 100 to 200 feet wide. The Project levees overlie these channels in the area around Messick Road (Plate 1). A few overflow channels conduct water flow immediately landside of the levees, across a short distance between Shanghai Bend and Oswald Avenue, then converge with the Feather River. The overflow channels are slightly inset to the Modesto Formation, and based on borehole data from locations where these channels cross the Sutter Bypass, are probably 6 to 15 feet deep. These channels are likely filled with episodic fining upward sequences of silt, sand and gravel, representing multiple flood events on the Feather River. The upper few feet of these channels are probably filled with sediment from upstream historic hydraulic mining activities. The river channel widens considerably between Country Club Road (0.5 mile width) and Obanion Road (1 mile width), (Plate 1). Feather River meanders along the eastern edge of Abbott Lake, swings sharply southward into Star Bend, where the river is deflected eastward by a resistant knob of Modesto Formation (which forms Star Bend). Historical crevasse splay and overbank deposits overlie the Modesto Formation from Abbott Road to Star Bend Road, along the western edge of Abbot Lake (Figure 5). These crevasse splay deposits are likely filled with a fining-upward sequence of fine gravel, sand and silt, The upper few feet of these features are probably covered by a veneer of hydraulic mining sediment.

The southernmost reach, Reach SF-IV, extends from the area south of the confluence with the Bear River to the confluence of the Feather River and Sutter Bypass, and is roughly 4 miles long (Plate 1). The sediments underlying the levee along this reach are geomorphically complex, resulting from depositional convergence between the Feather River and Bear River. The Bear River channel deposits large amounts of sediment across the ground surface adjacent to the confluence. The Modesto and Riverbank Formations are exposed at the ground surface adjacent to natural levees immediately north of the Bear River confluence, and north of this reach (Plate 1). These formations are covered by historical alluvium, sourced from the Feather and Bear Rivers. Much of the historical activity along this reach is located near the levee at Laurel Avenue. Here, consisting eight distributary channels (Rdc), typically 90 feet wide but ranging from 45 to 190 feet wide, cross the floodplain in southwesterly orientations, terminating in geologically young distributary-fan sediments. These sediments, primarily consisting of fine to coarse sand and silt, probably were deposited as a result of increased sediment and water input contributed to the Feather River from the Bear River. Historically, the Feather River and the Bear River have aggraded from substantial mining debris input, thus reducing channel cross sectional area (i.e., James, 1999). This reduction of cross section area, coupled with the trajectory of flood flow from the Bear River watershed, resulted in water overtopping the Feather River channel banks, and depositing sediment onto the floodplain between the confluence of the Feather River and Sutter Bypass (Plate1).

5.0 Applications to the Urban Levee Project

Based on an initial analysis of surface geologic and geomorphic data, the levees bordering the western side of the Feather River from Yuba City to the Sutter Bypass, (Reaches SF-I, SF-II, SFIII and SF-IV) probably are underlain by a veneer of near-surface sandy deposits, or by buried channels that are inset into the Modesto Formation. The preliminary conceptual surface and subsurface geologic relationships as they relate to levee structures and potential underseepage along each reach of the river are described below. This study does not account for any existing seepage mitigation structures, i.e. slurry wall or cutoff wall, which may be present.

Reach SF-I contains the Gilsizer paleochannel deposits, this channel intersects the levees roughly 660 feet south of Lynn Way to Colusa Avenue (Plate 1). Along this length the levees are underlain by coarse channel deposits. These coarse grain deposits are likely laterally continuous and poorly consolidated and relatively highly permeable, and likely are susceptible to underseepage.

Levees along the reach SF-II are underlain by a Holocene paleochannel and historical meander scroll deposits (Figure 2, Plate 1). These deposits are coarse grained, laterally continuous and poorly consolidated, and likely are susceptible to underseepage. The presence of this paleochannel deposit suggests locally permeable material (channel fill) directly underlying the levees. Historical alluvium most likely of mining debris origin, blankets the Yuba City airport paleochannel and meander scroll deposits. The levees along this reach are underlain by a thick sequence of young, permeable alluvium of meander scroll deposits that are highly susceptible to seepage (Glynn and Kuszmaul, 2004).

Reach SF-III consists of coarse-grained avulsion deposits (overbank, crevasse splay and overflow channel deposits) overlying the Modesto Formation. Overflow channels (Rofc) are common along this reach, are relatively thin, slightly inset to the Modesto Formation and are filled with poorly consolidated sediments that may provide local pathways for underseepage. Individual shallow coarse deposits may be laterally discontinuous and may be separated by clayey interbeds (i.e. thin blankets). Local coarse deposits may be associated with higher likelihoods of levee underseepage. Deeper deposits probably consist of consolidated Modesto Formation with occasional small, but unconsolidated, overflow channel deposits incised into resistant strata.

Along Reach SF-IV the levee is underlain by laterally-continuous sandy deposits formed by distributary overbank fans and by the south flowing ancestral Feather River (Gilsizer Slough). These coarse-grained deposits likely are permeable and susceptible to underseepage. Near Laurel Avenue distributary channel deposits underlie the levees and may be relatively coarser than the surrounding alluvium.

6.0 Summary

Lateral and vertical variability in the shallow subsurface deposits has resulted from past geomorphic processes. Surficial geologic mapping along the south Feather River allows reach classifications within which conditions may be relatively consistent. The conceptual subsurface stratigraphic framework suggests that stratigraphic relationships may promote localized levee underseepage, given certain hydraulic conditions, particularly along reach SF-I and II. Further spatial analyses of the surficial geologic mapping and subsurface geotechnical exploration data are needed to better constrain and characterize areas that are most susceptible to underseepage in the study area.

7.0 Limitations

This geomorphic assessment and associated data interpretation have been performed in accordance with the standard of care commonly used as the state-of-practice in the geologic engineering profession. Standard of care is defined as the ordinary diligence exercised by fellow practitioners in this geographic area performing the same services under similar circumstances during the same time period.

Discussions of surface and subsurface conditions summarized in this technical memorandum are based on geologic interpretations of subsurface soil data at limited exploration locations available to this assessment through August of 2007. Variations in subsurface conditions may exist between exploration locations, and the project team may not be able to identify all adverse conditions in the levee and its foundation. This memorandum is for the use and benefit of DWR. Use by any other party is at their own discretion and risk.

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USGS, Gilsizer Slough topographic quadrangle, surveyed 1909, published 1911; map scale 1:31,680, five foot contour interval.

USGS, Marcuse topographic quadrangle, surveyed 1906, published 1910; map scale 1:31,680, five foot contour interval.

USGS, Nicolaus topographic quadrangle, surveyed 1908, published 1910; map scale 1:31,680, five foot contour interval.

USGS, Ostrom topographic quadrangle, surveyed 1909, published 1911; map scale 1:31,680, five foot contour interval.

USGS, Sutter topographic quadrangle, surveyed 1909, published 1911; map scale 1:31,680, five foot contour interval.

USGS, Yuba City topographic quadrangle, surveyed 1909, published 1911; map scale 1:31,680, five foot contour interval.

USGS, Gilsizer Slough topographic quadrangle, published 1952, photo revised 1973; map scale 1:24,000, five foot contour interval.

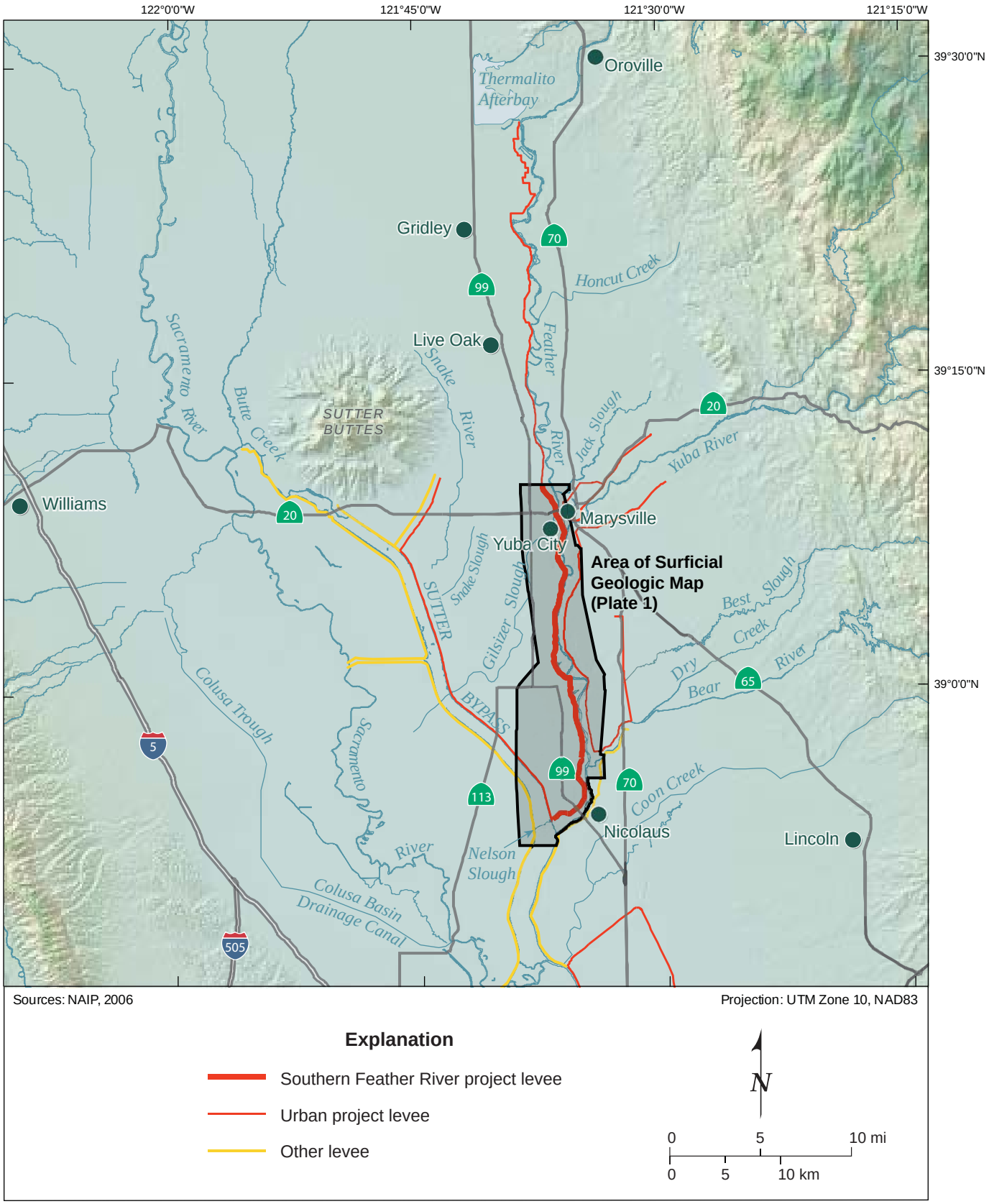
USGS, Nicolaus topographic quadrangle, published 1952, remapped 1992; map scale 1:24,000, five foot contour interval.

USGS, Olivehurst topographic quadrangle, published 1952, photo revised 1973; map scale 1:24,000, five foot contour interval.

USGS, Sutter topographic quadrangle, published 1952, photo revised 1973; map scale 1:24,000, five foot contour interval.

USGS, Sutter Causeway topographic quadrangle published 1952, photo revised 1973; map scale 1:24,000, five foot contour interval.

USGS, Yuba City topographic quadrangle, published 1952, photo revised 1973; map scale 1:24,000, five foot contour interval.

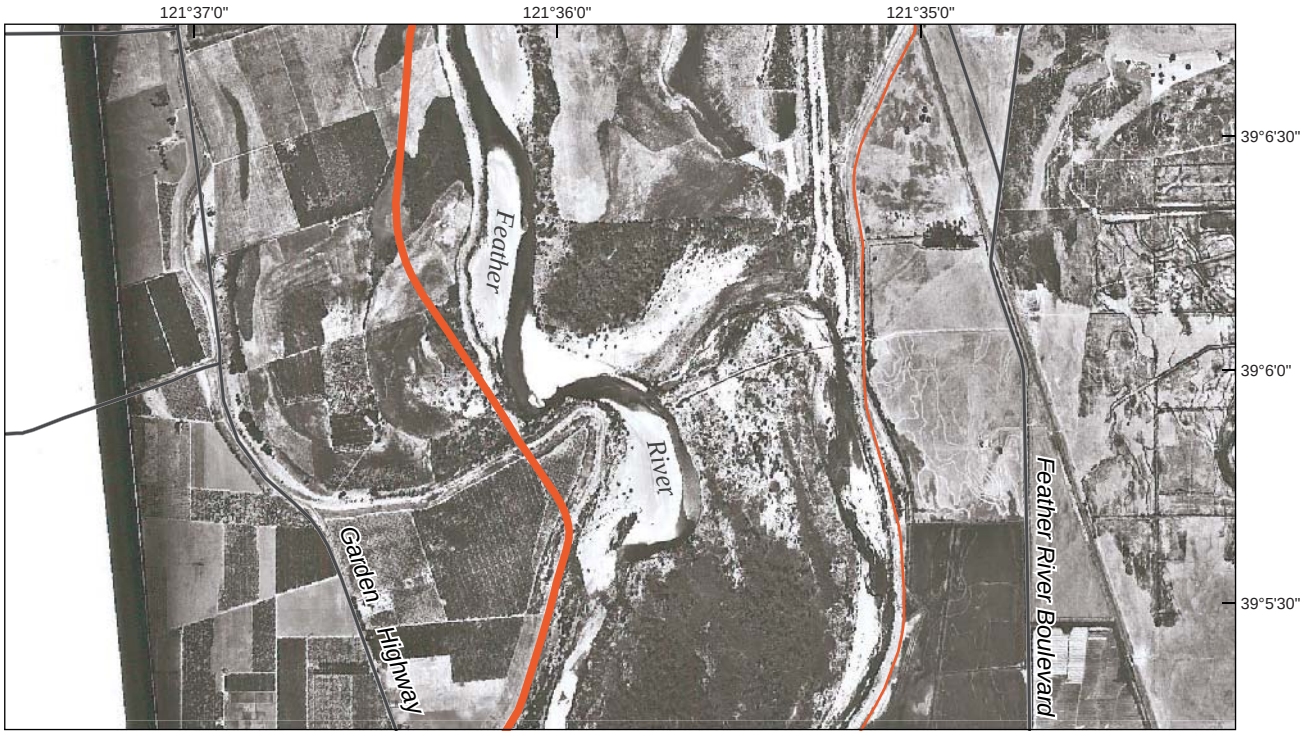


Map of Central Valley near Sutter Buttes, California

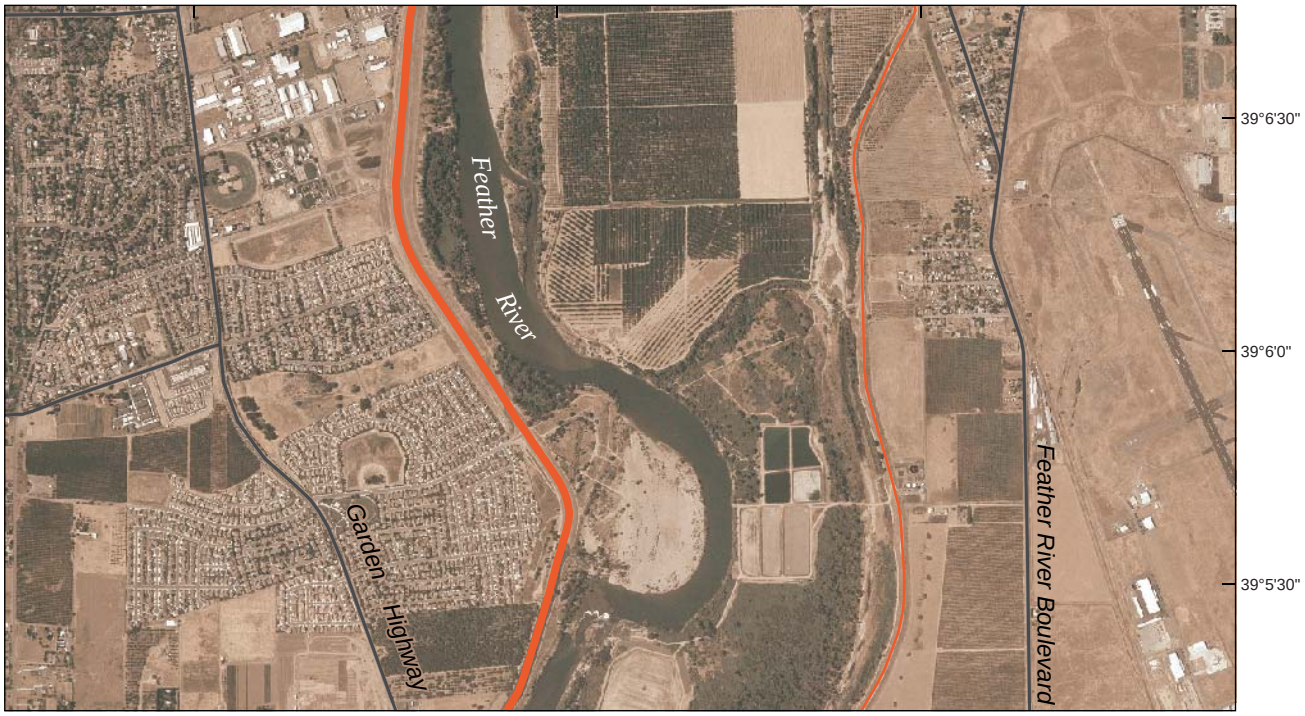
DWR URBAN LEVEE PROJECT
Figure 1

1881 South Feather River

Modified 09.03.09



A. 1937 USDA Air Photo



B. 2006 NAIP Ortho Imagery

Explanation

- Southern Feather River project levee
- Urban project levee
- Major road

N

0 5 10 mi

0 5 10 km

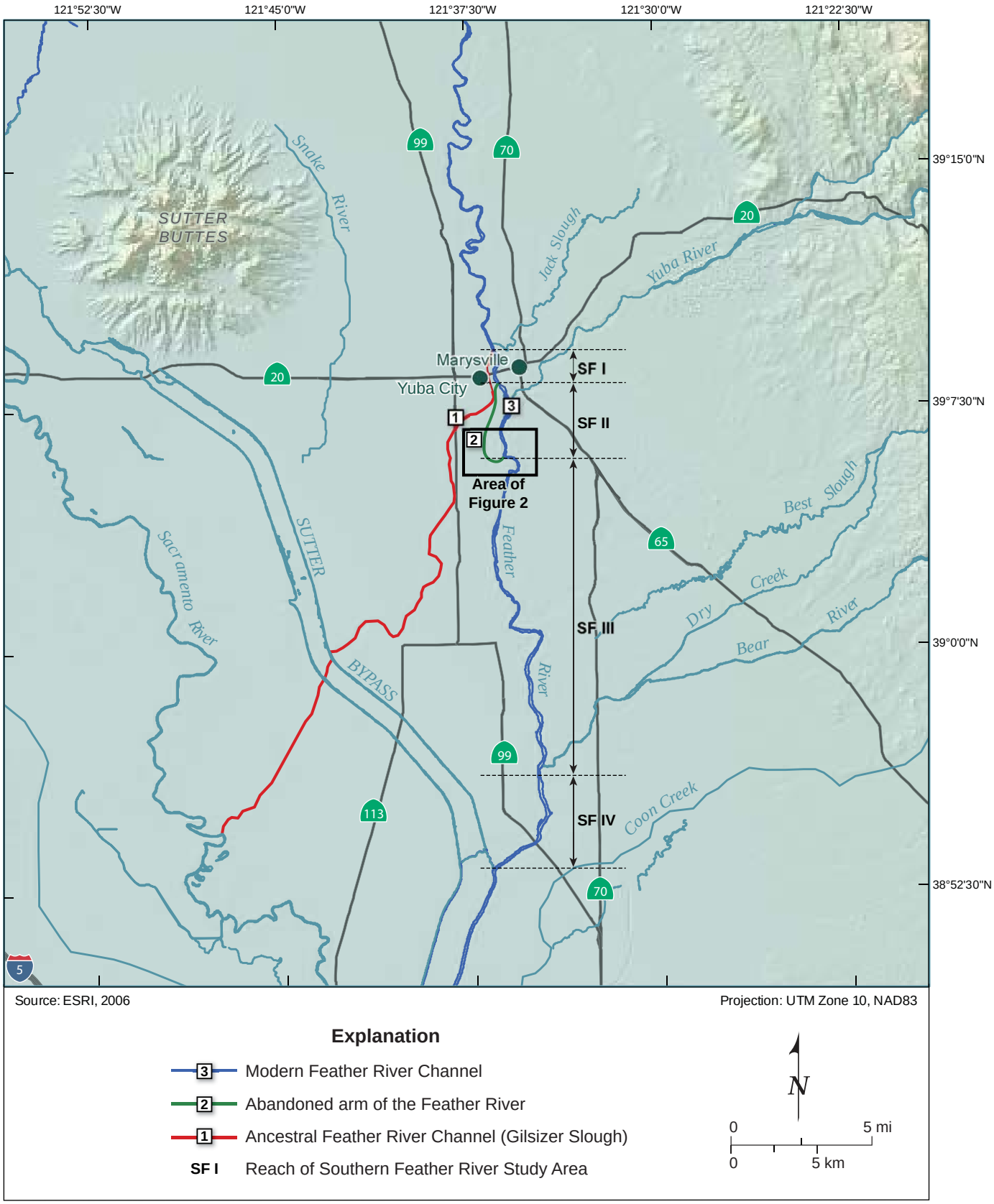
Aerial Imagery of the Feather River at Shanghai Bend

DWR URBAN LEVEE PROJECT

Figure 2

1881 South Feather River

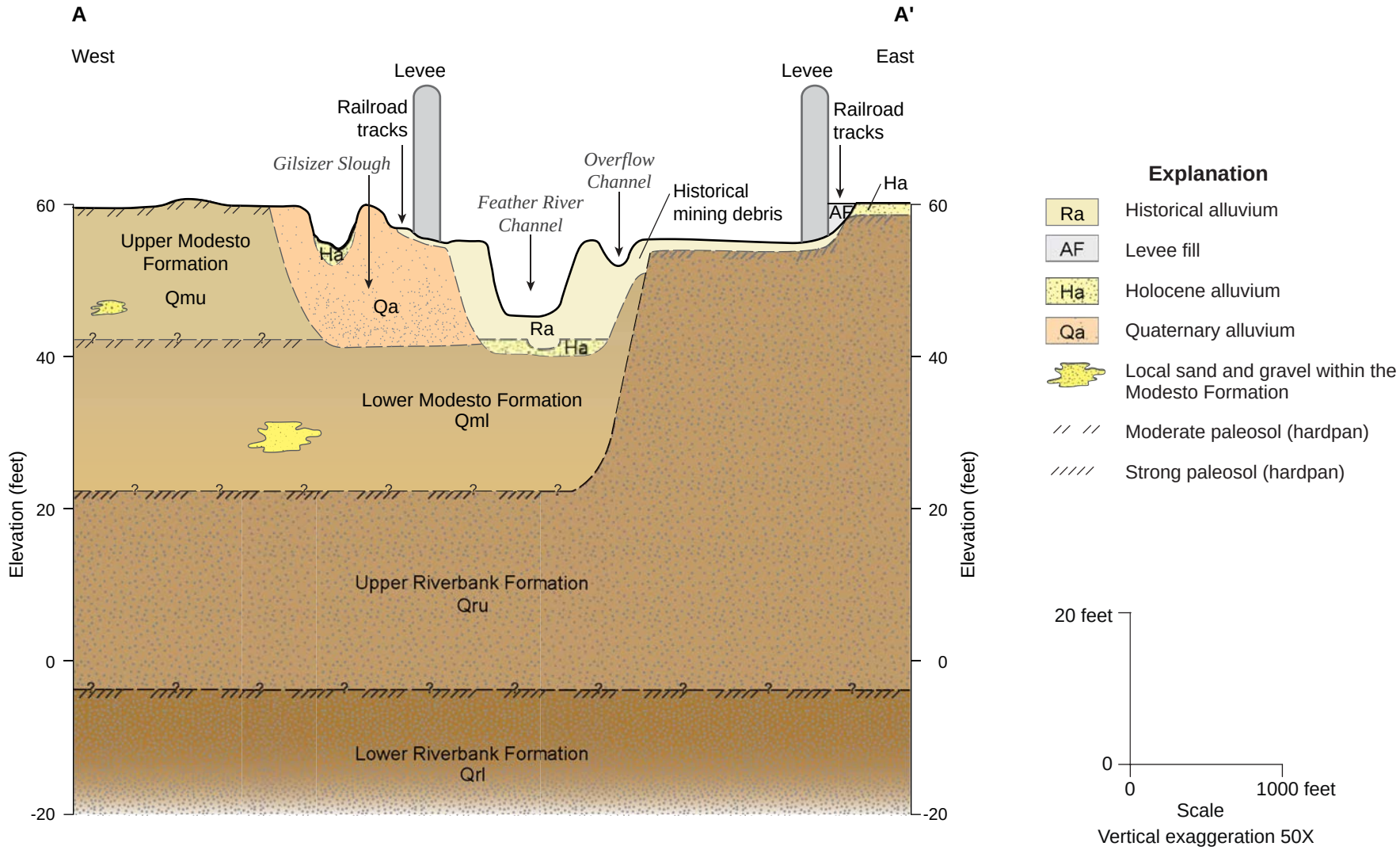
Modified 09.03.09



Map Showing the Eastern Migration of the Feather River

DWR URBAN LEVEE PROJECT

Figure 3



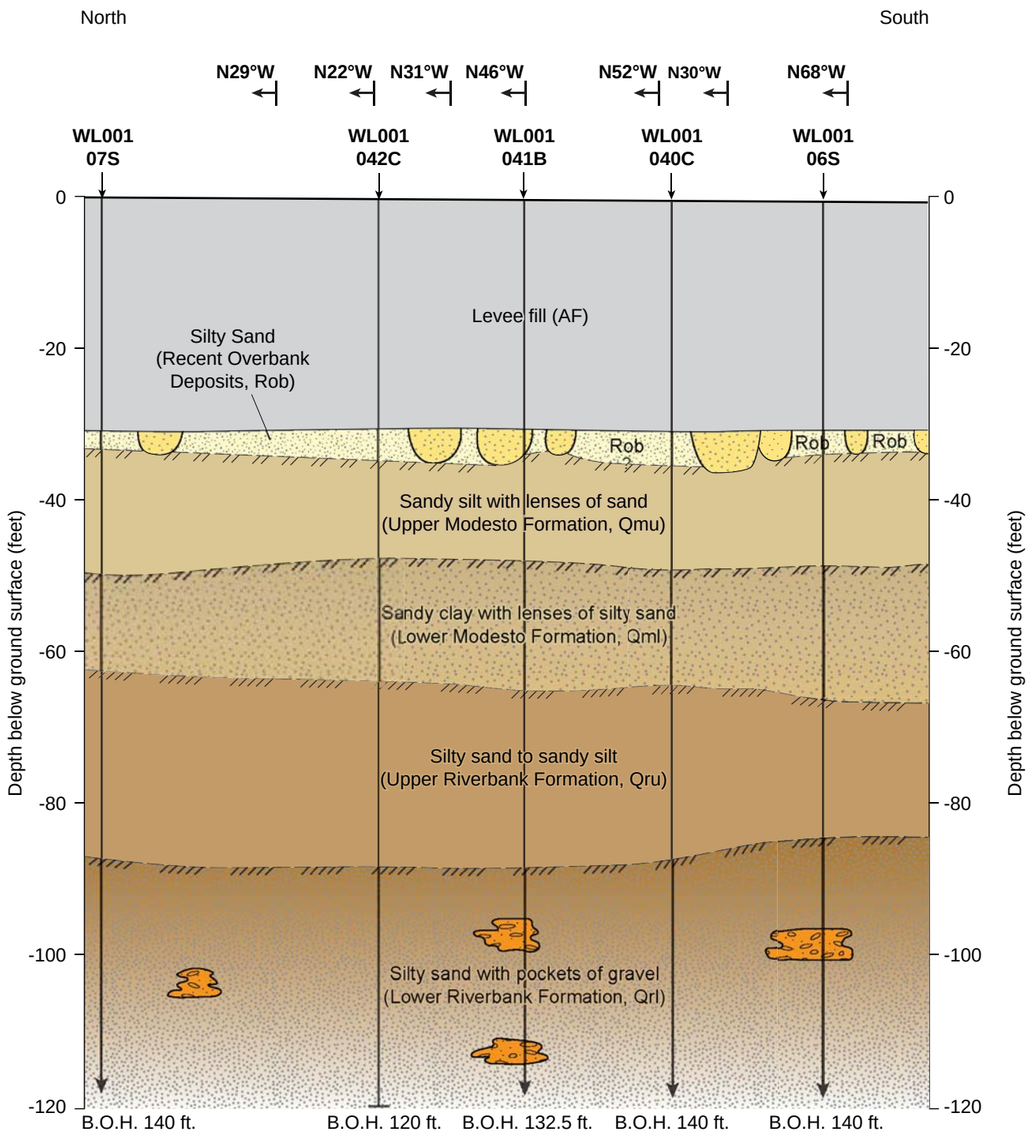
Conceptual Subsurface Diagram across the Feather River at Yuba City

DWR URBAN LEVEE PROJECT

Figure 4

1881 South Feather River

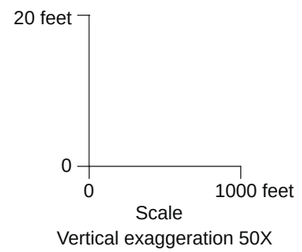
Modified 09.03.09



Explanation

- Recent crevasse splay, surficial geologic map unit Rcs
- Local sand and gravel within the Riverbank Formation
- Moderate paleosol (hardpan)
- Strong paleosol (hardpan)
- N46°W — Bend in Section

Notes:
1. See Plate 1 for location of cross section.
2. Surficial geologic units and contacts from this study and Helley and Harwood (1985).
3. Bottom of hole (BOH) values shown as total depth below ground surface.
4. Borehole names and horizontal distance shown above from draft URS logs and location maps. Geologic relations could change if borehole locations revised
5. Drilling method indicated as last letter in borehole names:
   S = Sonic Vibracore;
   C = Cone Penetrometer Test;
   B = Mud Rotary with SPT



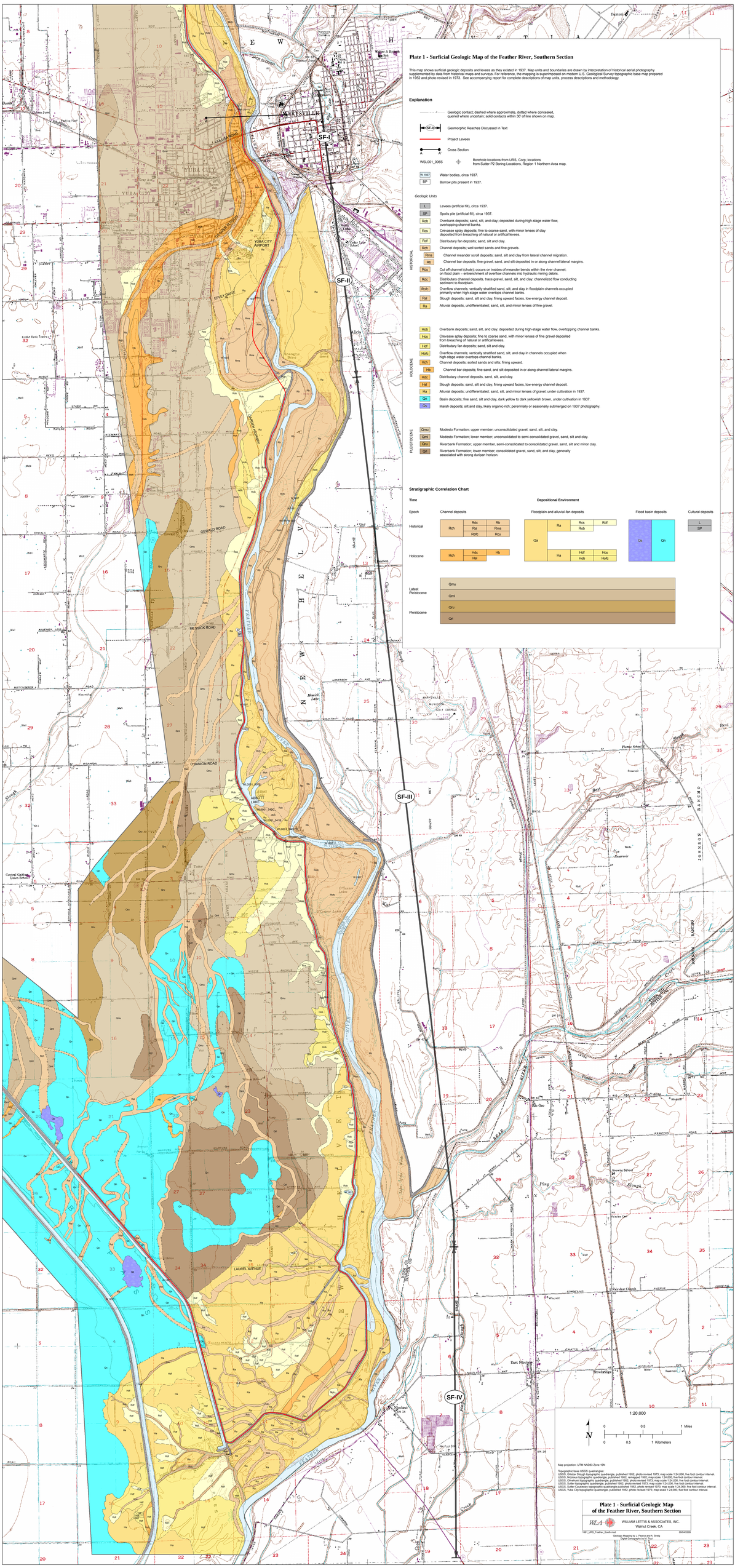


Plate 1 - Surficial Geologic Map of the Feather River, Southern Section
This map shows surficial geologic deposits and levees as they existed in 1937. Map units and boundaries are drawn by interpretation of historical aerial photography supplemented by data from historical maps and surveys. For reference, the mapping is superimposed on modern U.S. Geological Survey topographic base map prepared in 1952 and photo revised in 1973. See accompanying report for complete descriptions of map units, process descriptions and methodology.
Explanation
Geologic contact; dashed where approximate, dotted where concealed, queried where uncertain; solid contacts within 30' of line shown on map.
SF-II
Geomorphic Reaches Discussed in Text
Project Levees
A
A'
Cross Section
WSL001_006S
Borehole locations from URS, Corp; locations from Sutter P2 Boring Locations, Region 1 Northern Area map.
W 1937
Water bodies, circa 1937.
BP
Borrow pits present in 1937.
Geologic Units
HISTORICAL
L
Levees (artificial fill), circa 1937.
SP
Spoils pile (artificial fill), circa 1937.
Rob
Overbank deposits; sand, silt, and clay; deposited during high-stage water flow, overtopping channel banks.
Rcs
Crevasse splay deposits; fine to coarse sand, with minor lenses of clay deposited from breaching of natural or artificial levees.
Rdf
Distributary fan deposits; sand, silt and clay.
Rch
Channel deposits; well sorted sands and fine gravels.
Rms
Channel meander scroll deposits; sand, silt and clay from lateral channel migration.
Rb
Channel bar deposits; fine gravel, sand, and silt deposited in or along channel lateral margins.
Rcu
Cut off channel (chute); occurs on insides of meander bends within the river channel; on flood plain -- entrenchment of overflow channels into hydraulic mining debris.
Rdc
Distributary channel deposits, trace gravel, sand, silt, and clay; channelized flow conducting sediment to floodplain.
Rofc
Overflow channels; vertically stratified sand, silt, and clay in floodplain channels occupied primarily when high-stage water overtops channel banks.
Ral
Slough deposits; sand, silt and clay, fining upward facies, low-energy channel deposit.
Ra
Alluvial deposits, undifferentiated; sand, silt, and minor lenses of fine gravel.
HOLOCENE
Hob
Overbank deposits; sand, silt, and clay; deposited during high-stage water flow, overtopping channel banks.
Hcs
Crevasse splay deposits; fine to coarse sand, with minor lenses of fine gravel deposited from breaching of natural or artificial levees.
Hdf
Distributary fan deposits; sand, silt and clay.
Hofc
Overflow channels, vertically stratified sand, silt, and clay in channels occupied when high-stage water overtops channel banks.
Hch
Channel deposits; sorted sands and silts; fining upward.
Hb
Channel bar deposits; fine sand, and silt deposited in or along channel lateral margins.
Hdc
Distributary channel deposits, sand, silt, and clay.
Hal
Slough deposits; sand, silt and clay, fining upward facies, low-energy channel deposit.
Ha
Alluvial deposits; undifferentiated; sand, silt, and minor lenses of gravel; under cultivation in 1937.
Qa
Basin deposits; fine sand, silt and clay, dark yellow to dark yellowish brown, under cultivation in 1937.
Os
Marsh deposits; silt and clay, likely organic-rich; perennially or seasonally submerged on 1937 photography.
PLEISTOCENE
Qmu
Modesto Formation; upper member; unconsolidated gravel, sand, silt, and clay.
Qml
Modesto Formation; lower member; unconsolidated to semi-consolidated gravel, sand, silt and clay.
Qru
Riverbank Formation; upper member, semi-consolidated to consolidated gravel, sand, silt and minor clay.
Qrl
Riverbank Formation; lower member; consolidated gravel, sand, silt, and clay, generally associated with strong duripan horizon.
Stratigraphic Correlation Chart
Time
Epoch
Depositional Environment
Channel deposits
Floodplain and alluvial-fan deposits
Flood basin deposits
Cultural deposits
Historical
Holocene
Latest Pleistocene
Pleistocene
Rch
Rdc
Rb
Ral
Rms
Rofc
Rcu
Qa
Ra
Rcs
Rdf
Rob
Hch
Hdc
Hb
Hal
Ha
Hdf
Hcs
Hob
Hofc
Os
Qh
L
SP
Qmu
Qml
Qru
Qrl
1:20,000
0
0.5
1 Miles
0
0.5
1 Kilometers
N
Map projection: UTM NAD83 Zone 10N
Topographic base USGS quadrangles:
USGS, Gibson Slough topographic quadrangle, published 1952, photo revised 1973, map scale 1:24,000, five foot contour interval.
USGS, Marysville topographic quadrangle, published 1952, photo revised 1973, map scale 1:24,000, five foot contour interval.
USGS, Olivehurst topographic quadrangle, published 1952, photo revised 1973, map scale 1:24,000, five foot contour interval.
USGS, Sutter pumpingplant quadrangle, published 1952, photo revised 1973, map scale 1:24,000, five foot contour interval.
USGS, Sutter Causeway topographic quadrangle published 1952, photo revised 1973, map scale 1:24,000, five foot contour interval.
USGS, Yuba City topographic quadrangle, published 1952, photo revised 1973, map scale 1:24,000, five foot contour interval.
Plate 1 - Surficial Geologic Map of the Feather River, Southern Section
WLA
WILLIAM LETTIS & ASSOCIATES, INC.
Walnut Creek, CA
1801_URS_Feather_South.mxd
09/04/2009
Geologic Mapping by J. Perrine and A. Streig
Digital Cartography by M. York
SF-I
SF-II
SF-III
SF-IV
MARYSVILLE
YUBA CITY
YUBA CITY AIRPORT
COLLINS ROAD
GRAVES ROAD
EPLEY DRIVE
OSWALD ROAD
MESSICK ROAD
O'CONNOR ROAD
ABBOTT LAKE
LAUREL AVENUE
Munch Lake
O'Connor Lakes
Hallwood
Plumas School
Rivers Edge
Riverview Cem
Riverview Heights
Riverview Manor
Riverview Terrace
Riverview Lincoln
Riverview Estates
Riverview Tabernacle
Riverview Cemetery
Riverview Elementary School
Riverview Middle School
Riverview Christian School
Riverview Christian Church
Riverview Christian Fellowship
Riverview Christian Academy
Riverview Christian Preschool
Riverview Christian Daycare
Riverview Christian Youth
Riverview Christian Men's
Riverview Christian Women's
Riverview Christian Seniors
Riverview Christian Singles
Riverview Christian Couples
Riverview Christian Families
Riverview Christian Children's

Part C.5

URS Supplemental Geotechnical Data Report (2010), Appendix O, Volume 5

APPENDIX O

Geomorphology Report

Surficial Geologic Maps and Geomorphic Assessment of the Sutter Study Area, Urban Levee Geotechnical Evaluation, Sutter and Butte Counties, California

Prepared for:

URS Corporation
2870 Gateway Oaks Drive, Suite 150
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Prepared by:

William Lettis & Associates, Inc.
1777 Botelho Drive, Suite 262
Walnut Creek, CA 94596

September 8, 2009

WILLIAM LETTIS & ASSOCIATES, INC.
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September 8, 2009

Mr. Juan Vargas
URS Corporation
2870 Gateway Oaks Drive, Suite 150
Sacramento, CA 95833

RE: Surficial geologic mapping and geomorphic assessment, California Department of Water Resources Urban Levees Project, Northern Feather River, Sutter County, California

Dear Mr. Vargas:

This letter presents the surficial geologic mapping and preliminary geomorphic assessment of the northern Feather River study area, for the California Department of Water Resources (DWR) Urban Levees Project geotechnical characterization. The goal of this mapping and geomorphic assessment is to provide information on the type and distribution of surface and shallow subsurface deposits that likely underlie the project levees along the western bank of the Feather River between Thermalito Afterbay and Yuba City. The purpose of this study is to develop spatially continuous geologic map data and a conceptual model for stratigraphic interpretations between shallow boreholes. A primary goal is to provide a geologic framework for the geotechnical assessment of potential levee underseepage. This letter presents the technical approach, surficial geologic map, conceptual geomorphic model, and initial results based on map analysis and preliminary review of available Phase 1 geotechnical data.

We appreciated the opportunity to provide these geomorphic and geologic data and preliminary interpretations of the shallow stratigraphic conditions in the northern Feather River study area. Please do not hesitate to call any of the undersigned if there are any questions or comments.

Respectfully,

WILLIAM LETTIS & ASSOCIATES, INC.

Justin Pearce, C.E.G. 2421
Senior Geologist

Ashley Streig
Senior Staff Geologist

Keith Kelson, C.E.G. 1610
Principal Geologist

1.0 Introduction

This technical memorandum presents the results of surficial geologic mapping and geomorphic assessment along the north Feather River between Thermalito Afterbay and Yuba City, for the California Department of Water Resources Urban Levee program. The purpose of this study is to provide detailed information on the type and distribution of surface and shallow subsurface deposits that likely underlie the project levees, with respect to levee underseepage. This study involved integration and analysis of aerial photography, topographic, geologic, and soil maps, other historical documents, and review of readily available geotechnical exploration data. Synthesis of these data allowed us to assess the geomorphic processes responsible for the distribution of surficial deposits within the project area, and construct a preliminary conceptual model for stratigraphic interpretations. This technical memorandum is accompanied by the "Surficial Geologic Map of the Feather River, Northern Section".

1.1 Map and Report Preparation Quality Control

The surficial geologic map data and geomorphic interpretations presented in this memorandum were subject to quality control and quality assurance procedures as required by the Levee Geotechnical Evaluation Project Management Plan (PMP). The surficial geologic map data developed by this study were reviewed for accuracy and completeness through an internal review and an independent technical review by Dr. Janet Sowers of WLA. Results of QA/QC review were documented using PMP Exhibit 2.2-3 (Independent Technical Review Report) and are kept on file according filing control plan. Subsurface data shown on diagrams were provided as draft information, and were not verified for accuracy or completeness by this study.

2.0 Approach

The approach to developing a surficial geologic map of the northern Feather River project area (Figure 1, Plate 1) consisted of analysis of the following data:

- Aerial photography (black and white stereo-pairs taken in 1937, ~1:20,000-scale);
- early USGS topographic maps (i.e., 1911);
- published surficial geologic maps (Bussaca et al., 1989; Helley and Harwood, 1985; Creely, 1965);
- early and modern soil survey maps (Strahorn et al., 1909; Lytle, et al., 1988);
- other maps and documents (Page, 1985).

Synthesis of these data allow for the development of a detailed surficial geologic map that provides an initial understanding of primary geomorphic processes that have acted in the study area during recent and historical geologic time. Through this mapping, primary geomorphic features and associated surficial geologic deposits are identified, such as abandoned paleochannels, channel deposits, splay and overbank deposits and other deposits commonly associated with large active river systems. Knowledge of fluvial processes and the ability to recognize depositional environments in the geologic record are key to identifying locations along levees where underseepage is most likely to occur (Llopis et al., 2007).

The surficial geologic map was developed at the nominal scale of the aerial photography (1:20,000). This scale establishes the resolution of the map (Plate 1), such that display or analysis of the map data at a more detailed scale than 1:20,000 may introduce uncertainties beyond the original resolution of the data. The map unit boundaries shown on the surficial geologic map should be considered approximate, and accurate within 30 feet on either side of the line shown on the map. The 1937 aerial photographs are the primary data set for interpreting the surficial geologic deposits because: (1) they are the oldest high-quality images that pre-date much of the urbanization and landscape alteration within present-day Sutter and Butte Counties and, (2) these data represent a close approximation to the surficial deposits that were likely present at the ground surface prior to the construction of the levees. The 1937 photographs generally were taken in late summer or early autumn (i.e., August). By 1937, the area had experienced moderate cultivation that locally obscures geomorphic conditions. However, integration of data from the 1937 photography, old and recent topographic maps, geologic maps, soil surveys and historical documents provides sufficient information to delineate many of the pre-historical and historical surficial deposits in detail. Taken together, these data provide key insights to the characteristics of shallow deposits beneath the levees, as well as the geomorphic processes responsible for their distribution.

Additional floodplain deposition may have occurred after 1937, due to flood overflows, levee overtopping, or localized levee failure. A time series analysis that interprets successive aerial photographs taken after major flood events (i.e., USDA, black and white stereo-pairs taken in 1958, ~1:20,000-scale) or known local levee failures (i.e., 1986) may reveal additional information on surficial deposits in the northern Feather River area. Such analyses are beyond the scope of this study. The data and interpretations presented herein address the primary goal of characterizing the type and distribution of deposits likely present directly beneath the project levees that may be conducive to underseepage.

3.0 Geologic Setting

The northern Feather River study area lies in the central Sacramento Valley, between the Coast Ranges to the west and the Sierra Nevada foothills to the east. The Feather River drains the western slope of the Sierra Nevada, and emerges from the mountains south of Thermalito Afterbay (Figure 1). The river flows southward from Thermalito Afterbay, over middle –to late Pleistocene alluvium derived from the Sierra Nevada. The regional land surface is nearly flat, with a gentle west-southwest slope that flattens south of the Sutter Butte. The Feather River is entrenched into middle-to-late Pleistocene semi-consolidated sediments (i.e. Modesto Formation). Historical alluvium deposited by the Feather River is present between the modern levees, inset to the older geologic formations, and is present on the western floodplain as subdued natural levees that mantle the older geologic formations. In this study reach, west-flowing Honcut Creek is the only drainage tributary to the northern Feather River, with a confluence east of the town of Live Oak (Figure 1).

A primary influence on the historical processes in the river system was the hydraulic mining that began in the 1850's. Mining continued through the early 1900's in the Feather, Yuba and

Bear River watersheds, and abruptly introduced large quantities of sediment and drastically changed the geomorphic characteristics of these river systems (DWR, 2004; Ellis, 1939). Aggradation within the stream channels was a primary response to the introduction of substantial mining debris (James, 1999); consequently, post-1850 alluvial deposits are common throughout the study area.

4.0 Surficial Geologic Mapping

Previous geologic mapping along the northern Feather River and surrounding areas generalize the surficial deposits as: Quaternary alluvium (Qa) and Quaternary stream channel deposits (Qsc) are mapped within and proximal to the modern Feather River channel, (Bussaca et al., 1989; Helley and Harwood, 1985; Creely, 1965). These map units are considered Holocene in age (less than 11,000 years old). Late Pleistocene Modesto Formation (Qmu, Qml) is present as an escarpment along the western margin of the floodplain. These map units were delineated by Helley and Harwood (1985) at a regional scale (i.e., 1:62,500). The current analysis of the northern Feather River uses this geologic framework as a basis for more detailed mapping of Quaternary deposits and geomorphic features (Plate 1). The surficial geologic map units within the northern Feather River study area are described below, in order from oldest to youngest. Surficial geologic mapping for this study subdivides these general map units and delineates individual deposits based on relative age and depositional process or environment. The map units depicted on Plate 1 are primarily based on analysis of 1937 aerial photography, and thus the map essentially is a "snapshot" of geologic conditions at this time.

The oldest unit exposed along the Feather River is the lower member of the Riverbank Formation (Qrl) of Helley and Harwood (1985). The Riverbank Formation is a semi-consolidated, highly-dissected alluvial surface with textures of weathered gravel, sand and silt, and is associated with the presence of a well-developed hardpan (or, duripan) layer. This hardpan layer is a product of soil-forming processes over substantial geologic time, and reflects an ancient land surface that locally is buried by younger deposits. The Riverbank Formation is late to middle Pleistocene in age, and is estimated to be 130,000 to 450,000 yrs old (Helley and Harwood, 1985). The upper member (map unit Qru; Plate 1) is poorly consolidated dark brown to red alluvium consisting of gravel, sand, silt and minor clay (Busacca et al., 1989, Helley and Harwood, 1985). West of the Feather River, the Riverbank Formation is present near the town of East Biggs (Plate 1). Soils developed on the Riverbank formation are the Gridley clay loam and the Redding gravelly sandy loam (Carpenter et al., 1926).

The latest Pleistocene Modesto Formation is informally divided into two members: a lower (older) unit that is (about 29,000 to 49,000 years old), and consists of unconsolidated slightly weathered gravel, sand, silt and clay; and an upper member, a younger unit, that is about 12,000 to 26,000 years old (Helley and Harwood, 1985). The upper Modesto (map unit Qmu) consists of sand, silt, and some gravel, and is associated with a moderate amount of secondary (pedogenic) clay accumulation. This clay-rich horizon may form laterally continuous zones of low hydraulic conductivity, and may extend across boundaries between coarse and fine-grained strata within the latest Pleistocene alluvium. Soils developed on the Modesto Formation

include the Gridley loam of Strahorn et al. (1909) and the Conejo complex of Lytle et al. (1988), both of which are associated with a shallow "siltstone" horizon, or duripan (hardpan).

Latest Holocene deposits overlie or are inset into the Modesto Formation, and are categorized as channel, floodplain, and basin deposits (stratigraphic correlation chart; Plate 1). Channel deposits include Holocene channels (Hch), sloughs (Hsl), in-stream or lateral bars (Hb), and meander scrolls (Hms). These deposits likely consist of fine to coarse sand, silty sand, and clayey sand, with trace fine gravel. Holocene channel deposits (Hch) present along the western map area as secondary channels, contain fining-upward sequences of sand, silt and clay. These sloughs (map unit Hsl) are former channels associated with Live Oak and Morrison Sloughs (Plate 1), and are likely filled with a fining upward sequence of silt and clay.

Holocene floodplain deposits include crevasse splays (Hcs), and overbank deposits (Hob) and are typically deposited by non-channelized flow. Crevasse splays (Hcs) are from breaching of river banks or natural levees and are usually sand rich. Overbank deposits form by localized overtopping of river banks or natural levees, and subsequent deposition from shallow sheet flow or standing water.

Undifferentiated Holocene and Quaternary alluvium (Ha and Qa, respectively) usually occur proximal to or within the river channel, (Plate 1). The undifferentiated map unit is used in areas where geomorphic features are obscured or obliterated by historical (1937-era) agriculture. The deposits within these agriculturally modified areas are assigned a relative age (Ha or Qa) based on overlapping and cross cutting relationships with the surrounding deposits as follows: Ha if the agriculture-modified area is mapped within or shown overlying Holocene deposits; Qa where it is difficult to evaluate the age based on the relationship with nearby deposits. Soils associated with these undifferentiated units (Qa) are the Sacramento silt loam and Sacramento fine sandy loam, (Strahorn et al., 1909), and the Columbia fine sandy loam of Lyle et al. (1988), which are poorly-developed soils commonly associated with relatively young deposits (i.e. Shlemon, 1967).

Historical deposits mapped in the Northern Feather Study area include channel and floodplain deposits, as well as artificial fill deposits (Plate 1). Historical deposits are estimated to be less than about 150 years old, dating from approximately 1800 to 1937. Historical stream channels (Rch), and overflow channels (Rofc) transport high stage water flow across the ground surface outboard of the levees. These channel deposits likely consist of silt and sand with traces of gravel. The upper few feet of these deposits probably are filled with debris derived from upstream hydraulic mining activities. Lateral bar deposits (Rb) and meander scrolls (Rms) are located adjacent to the present-day Feather River, and are generally present inboard (waterside) of the present-day Feather River levees. In the northern part of the study area, directly south of Thermalito, are multiple anastomosing chutes (map unit Rcu; Plate 1). These chutes are similar to overflow channels in that they transport water flow during high river stage across the ground surface outboard of the levees. These chutes are entrenched into fluvially deposited hydraulic mining debris, and likely have filled with re-worked mining debris. Historical sloughs transport water collected from sheet flow and overland flow west of the Feather River southerly toward the Sutter Basin (i.e., Live Oak and Morrison Slough). Slough deposits (Rsl) likely consist of fining-upward silt and clay. Historical flood plain deposits include crevasse

splay (Rcs), and overbank (Rob) deposits, which generally consist of a gradational or abrupt fining upward sequence of sand, silt, and clay. Historical overbank (Rob) deposits are slightly finer grained sand, silt, and clay deposited via sheet flow. These historical deposits are differentiated from older deposits based on cross-cutting and superposition relationships relative to cultural features visible on the 1937 photographs.

Historical alluvial deposits (Ra), generally located between the Feather River channel levees, and on the land side of the levees in the area directly south of the Thermalito Afterbay, consist of undifferentiated sand, silt, and minor lenses of gravel. Soils associated with this sandy alluvium are the Columbia very fine sandy loam and Columbia loam, as shown on the Soil Survey Map of the Oroville Area (Carpenter et al., 1926). This series of soils has been correlated with Holocene age deposits by Shlemon (1967). Historical artificial fills are culturally-emplaced heterogeneous deposits, with varying amounts of clay, silt, sand, and gravel from local sources. These deposits include levee structures and canal levee systems (map unit L; Plate 1) and dredge tailings (map unit DT).

The distribution of historical and Holocene deposits shown on Plate 1 generally is consistent with early, less-detailed soil survey mapping along the western banks of the Feather River as areas of Marcuse clay loam, Gridley loam, Sacramento Series fine sand, sandy loam and silt loam and the Columbia very fine sandy loam soils (Strahorn et al., 1909; Carpenter et al., 1926). The Gridley loam occurs along the northern Feather River from the Thermalito Afterbay south to the confluence with the Bear River, and closely corresponds to the Modesto Formation of Helley and Harwood (1985). The relationship between the mapped surficial geologic units and the potential for underseepage is summarized below.

5.0 Geomorphic Conceptual Model

This section provides a preliminary geomorphic conceptual model based on general relationships among surface and subsurface geologic deposits along the western side of the Feather River, as described above and shown on Plate 1. This conceptual model provides a consistent basis for understanding the type and distribution surficial geologic deposits, primary geomorphic processes, and shallow subsurface stratigraphy in the study reach. This conceptual model does not address planform or gradient changes of the Feather River itself, nor the susceptibility of stream banks to erosion. Future studies of these changes would be valuable in understanding process response of the Feather River, and provide key data for estimating rates of channel changes (i.e. lateral migration). However, these analyses are not directly relevant to evaluating the possibility of underseepage with respect to levee stability.

Published geologic maps of the project area show a complex series of westward aggrading alluvial fans and terraces derived from erosion of the Sierra Nevada, identified as the Riverbank and Modesto Formations (Bussaca et al., 1989; Helley and Harwood, 1985; Creely, 1965). The Riverbank Formation and Modesto Formation in general are semi-consolidated to unconsolidated deposits characterized by intraformational paleochannels and lateral and vertical stratigraphic complexity related to past fluvial processes and buried paleo-topography. The oldest map unit, the Riverbank Formation unconformably overlies the Pliocene-Pleistocene

age Laguna Formation, which consists of interbedded alluvial gravel, sand and silt (Busacca et al., 1989; Helley and Harwood, 1985). The overlying Pleistocene Riverbank Formation consists of very dense gravel deposits that are, in turn, overlain by a medium dense sand and gravelly sand package of the latest Pleistocene Modesto Formation (Busacca et al., 1989). The upper member of the Modesto Formation is exposed at the ground surface adjacent to the western bank of the Feather River. The Modesto Formation is locally mantled by unconsolidated, sand rich Holocene deposits (Plate 1). East of the Feather River the older stratigraphic units are uplifted and dissected and younger deposits are inset into them with older deposits buried beneath younger deposits. West of the Feather River, the stratigraphic units are found in typical succession. This is the result of overall westward tilting and uplift of the Sierra Nevada, incision along the tributary drainages (i.e. Honcut creek), and progradational fan deposition west of the river.

Surficial geologic mapping (Plate 1) shows differences in deposit type and distribution from north to south along the northern Feather River study area, which are primarily associated with proximity to the Sierra Nevada mountain front near Thermalito Afterbay. These differences illustrate the diversity of past geomorphic processes along the river and, as a consequence, the type of geologic deposits at and near the ground surface. The surficial geologic map allows the delineation of reaches along the river within which geomorphic processes and their associated deposits appear to be relatively consistent.

The northern Feather River project area is divided into three reaches based on characteristic deposit types and distributions. The levee reaches are numbered Northern Feather one through three (NF-I through NF-III), sequentially from north to south (Figure 2, Plate 1). This section describes the surficial geologic characteristics of Reach NF-I, NF-II, and NF-III of the Feather River between Thermalito Afterbay and Yuba City.

5.1 Reach NF-I

Reach NF-I extends from the Thermalito Afterbay to Reimer Road and is about 11.1 levee miles long (Plate 1). Widespread deposits of historical alluvium (map unit Ra) blanket the area adjacent to the Feather River along the length of this reach where the river flows in the Sacramento Valley. Much of this unconsolidated historical alluvium contains clasts from many source lithologies and is derived from hydraulic mining debris (James, 1999). A complex pattern of anastomosing chutes or cut-off channels (map unit Rcu) eroded the historical alluvium by 1937 (Ra). These chutes underlie the project levees along the length of this reach (Plate 1). Project levees were built after 1937 along NF-I, from Thermalito Afterbay south to Ord Ranch Road.

Hardpan horizons were not identified in subsurface data along this reach, suggesting a substantial thickness of unconsolidated alluvial deposits unconformably overlying the Modesto Formation. Three alluvial units were identified in subsurface data overlying a semi-consolidated alluvial unit that we identified as the lower member of the Modesto Formation. Boreholes revealed an approximately 20-foot-thick package of young, unconsolidated silty sands and sandy clays, above a 10 to 16 foot thick silty sand, and 15-to 20-foot-thick gravel bed (Figure 3).

Hydraulic mining debris was dredged for its gold content along the northern half of the river banks along this reach, from Lapkin Road at Thermalito Afterbay to the area just south of Almond Avenue (Plate 1). Some dredge tailing spoils were apparent in 1937 aerial photography, though the majority of dredge tailing spoils post-date these air photos. The full extent of dredging tailing is apparent in modern USGS topographic maps (i.e. USGS, Biggs topographic quadrangle, 1:24,000 scale, 1970) and is shown on this surficial geologic map (map unit DT). Chutes (map unit Rcu) present in 1937 aerial images, though now obliterated by dredge operations are shown as dotted contacts in the Surficial Geologic Map (Plate 1). In this area project levees either overlie or bound the western edge of the Dredge Tailings (map unit DT). South of the dredged areas, the levee along Ord Ranch Road overlies deposits that fill an abandoned channel meander, map unit Hch (Plate 1). This abandoned meander matches the present river geometry and possibly reflects a southward migration of this meander within the active channel.

5.2 Reach NF-II

The second reach of the north Feather River project area, NF-II, extends from Reimer Road to Sanders Road, and has a length of about 9.4 levee miles. In this reach the project levee is typically perched at the top of a 5- to 15-foot-high east-facing escarpment cut into the Modesto Formation. The active meander belt of the Feather River with its flood plain, meander scrolls, and channel deposits, lies to the east of the levee at the base of the escarpment. West of the escarpment, historical overbank (Rob) and crevasse splay (Rcd) deposits locally overlie the Modesto. They represent locations where flooding of the Feather River overtopped the escarpment in the past and are assumed to pre-date the construction of the levee. An extensive continuous Holocene natural levee deposit has not built up along reach II, in contrast to reach I. The river may be incised too deeply below the surface of the Modesto Formation for floods to regularly overtop the escarpment.

Most of the Reach II levee sits directly on Modesto Formation with about 3.5 of the 9.4 miles of the levee sitting on the above-mentioned Holocene overbank and crevasse splay deposits that overlie Modesto Formation. Borehole WL0009_004S (Plate 1), located in the southern portion of this reach, shows project levee fill directly above the hard, consolidated Modesto Formation.

5.3 Reach NF-III

Levee reach NF-III extends from Sanders Road at the north to Yuba City at the south, and is about 4 miles in length (Plate 1). Along this reach the project levee almost entirely overlies Historical alluvial deposits that mantle, or crosscut the Modesto Formation. Crevasse splay (Rcs), overflow channels (Rofc), historical alluvium (Ra), channel deposits (Rch), and overbank deposits (Rob) are present along this reach. Crevasse splay deposits are present at the northern end of NF-III (Sanders Road, Plate 1), directly adjacent to a westerly bend of the Feather River. Aerial photography from 1937 shows multiple generations of crevasse splay deposits at this location. The levee appears to be constructed overtop these deposits. A pump station is noted on the 1970's topographic map, suggesting this location may have had seepage problems.

Immediately south of Sanders Road, an overflow channel (map unit Rofc) diverges from the Feather River, transporting flow outboard of the levees, and flowing back into the river about 1.5 miles south at Rednall Road (Plate 1). The overflow channel likely consists of a fining upward sequence of sand, silt, clay and some gravel, and could be slightly incised into the Modesto Formation. Undifferentiated historical alluvium (map unit Ra) underlies the levees within the area directly east of these overflow channels. This alluvium was laid down over the surface of the Modesto Formation by unchannelized flow of the Feather River (Plate 1). Historical channel deposits (map unit Rch) from the Feather River underlie about 0.7 miles of the levees north of Rednall Road (Plate 1). Overbank deposits are present near Pease Road (Plate 1) and continue along the levee for about 0.5 miles. Historical crevasse splay and overbank deposits likely consist of a massive to fining upward sequence of sand and silt derived from upstream hydraulic mining activities.

6.0 Applications to the Urban Levee Project

Based on an initial analysis of surface and subsurface geologic and geomorphic data, the levee bordering the western side of the Feather River from the Thermalito Afterbay to Yuba City, overlies three different types of deposits, Reach NF-I overlies a thick package of historical alluvium, NF-II directly overlies the Modesto Formation with local areas of historical alluvium, and Reach NF-III directly overlies a continuous blanket of sediment derived from historical crevasse splay (Rcs), overflow channel (Rofc), alluvium (Ra), channel (Rch) and overbank (Rob) deposits, above the Modesto Formation. The preliminary conceptual surface and subsurface geologic relationships as they relate to levee structures and potential underseepage along each reach of the river are described below. This study does not account for any existing seepage mitigation structures (i.e. cutoff walls) that may be present.

Along Reach NF-I the levees are underlain by a package of young coarse-grained fluvial sediment, most likely of mining debris origin, and chutes filled with coarse grained fining upward sequences of sediment also derived from hydraulic mining debris (Figure 3). This material is laterally extensive and poorly consolidated, with localized chute deposits (map unit Rcu). The chutes extend beneath the levee with an orientation that is roughly orthogonal to the levee crest, and may provide relatively high conductivity pathways for levee underseepage within the already very permeable fluvial sediments. The sediments along the northern half of reach NF-I were dredged for gold during the first half of the 20th century, well-graded dredge tailings remain in these areas. Dredge tailings are unconsolidated and consist of silt, sand, and gravel. At the north near Vance Avenue the project levees appear to overlie these highly permeable tailings, and everywhere else bound the western edge of the tailing spoils. Levees along this entire reach are judged to be highly susceptible to underseepage.

Levee reach NF-II is likely underlain by a combination of coarse grained, semi-consolidated alluvium of the Modesto Formation and localized areas of historical, poorly consolidated coarse-grained avulsion deposits (overbank and crevasse splay deposits) overlying the Modesto Formation. These avulsion deposits likely are permeable and may provide localized areas susceptible to underseepage. Project levees underlain by the Modesto Formation likely are less

susceptible to underseepage problems, however the natural variability within the Modesto may also provide local pathways for underseepage.

Levee reach NF-III generally consists of westward aggrading avulsion deposits overlying the Modesto Formation. The levee is underlain by coarse-grained, poorly consolidated silt, sand and gravel, blanketing the consolidated Modesto Formation and in some places incised into the Modesto Formation. These deposits likely are permeable and susceptible to underseepage.

In summary, lateral and vertical variabilities in the shallow subsurface deposits have resulted from past fluvial geomorphic processes. Surficial geologic mapping along the north Feather River allows reach classifications within which conditions may be relatively similar. The conceptual geomorphic framework suggests that stratigraphic relationships may promote localized levee underseepage, given certain hydraulic conditions throughout the Northern Feather River Study area, particularly along reach NF-I. Areas where levees may overlie historical or Holocene-age coarse grained deposits are of special concern. Further spatial analyses of the surficial geologic mapping and subsurface geotechnical exploration data are needed to better constrain and characterize areas that are most susceptible to underseepage in the study area. We anticipate that this conceptual model will be revised and updated as new information becomes available.

7.0 Limitations

This geomorphic assessment and associated data interpretation have been performed in accordance with the standard of care commonly used as the state-of-practice in the geologic engineering profession. Standard of care is defined as the ordinary diligence exercised by fellow practitioners in this geographic area performing the same services under similar circumstances during the same time period.

Discussions of surface and subsurface conditions summarized in this technical memorandum are based on geologic interpretations of subsurface soil data at limited exploration locations available to this assessment through September of 2007. Variations in subsurface conditions may exist between exploration locations, and the project team may not be able to identify all adverse conditions in the levee and its foundation. This memorandum is for the use and benefit of DWR. Use by any other party is at their own discretion and risk.

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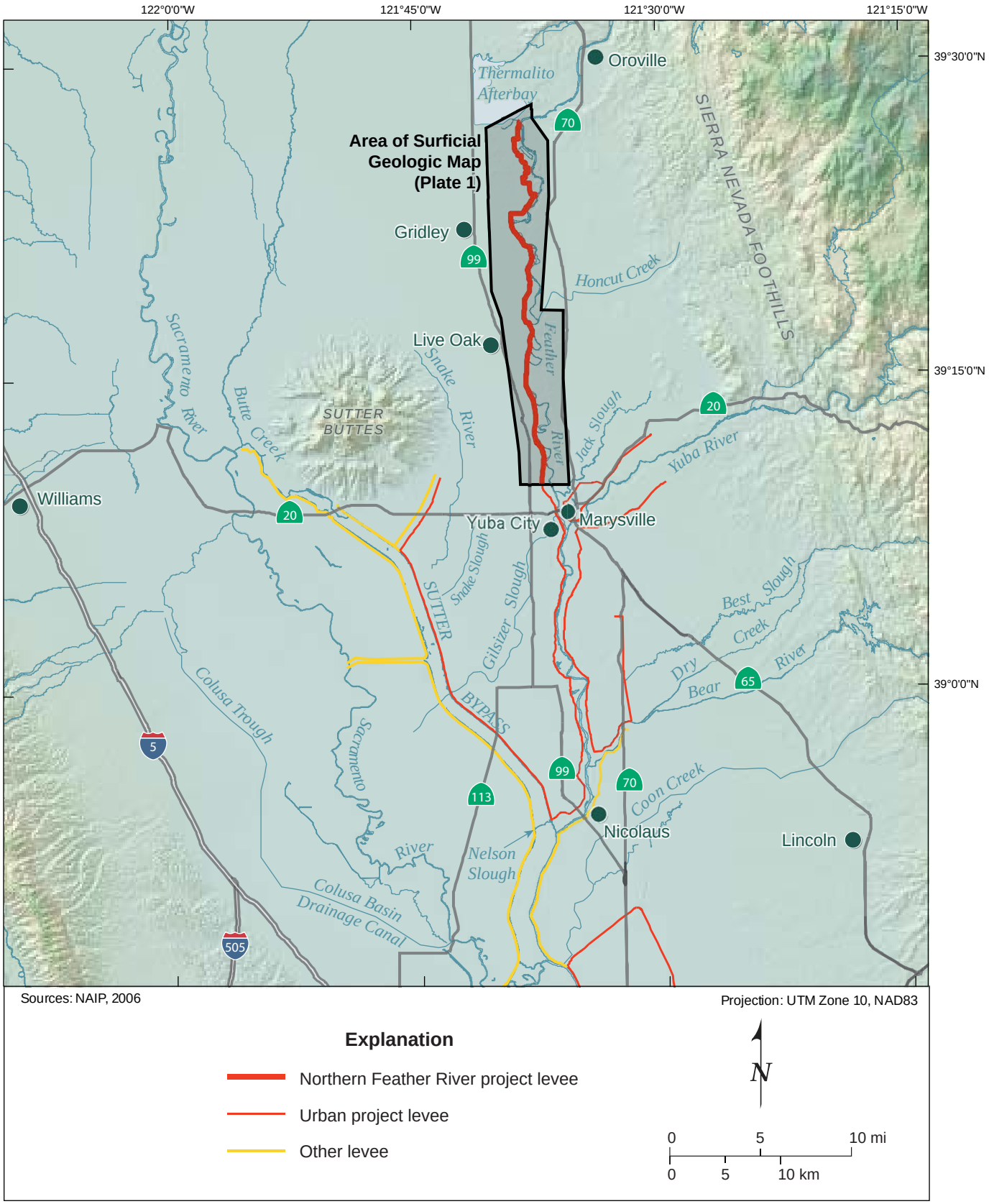
USGS, Palermo topographic quadrangle published 1952, remapped 1970; map scale 1:24,000, five foot contour interval.

USGS, Sutter topographic quadrangle, published 1952, photo revised 1973; map scale 1:24,000, five foot contour interval.

USGS, Yuba City topographic quadrangle, published 1952, photo revised 1973; map scale 1:24,000, five foot contour interval.



WLA

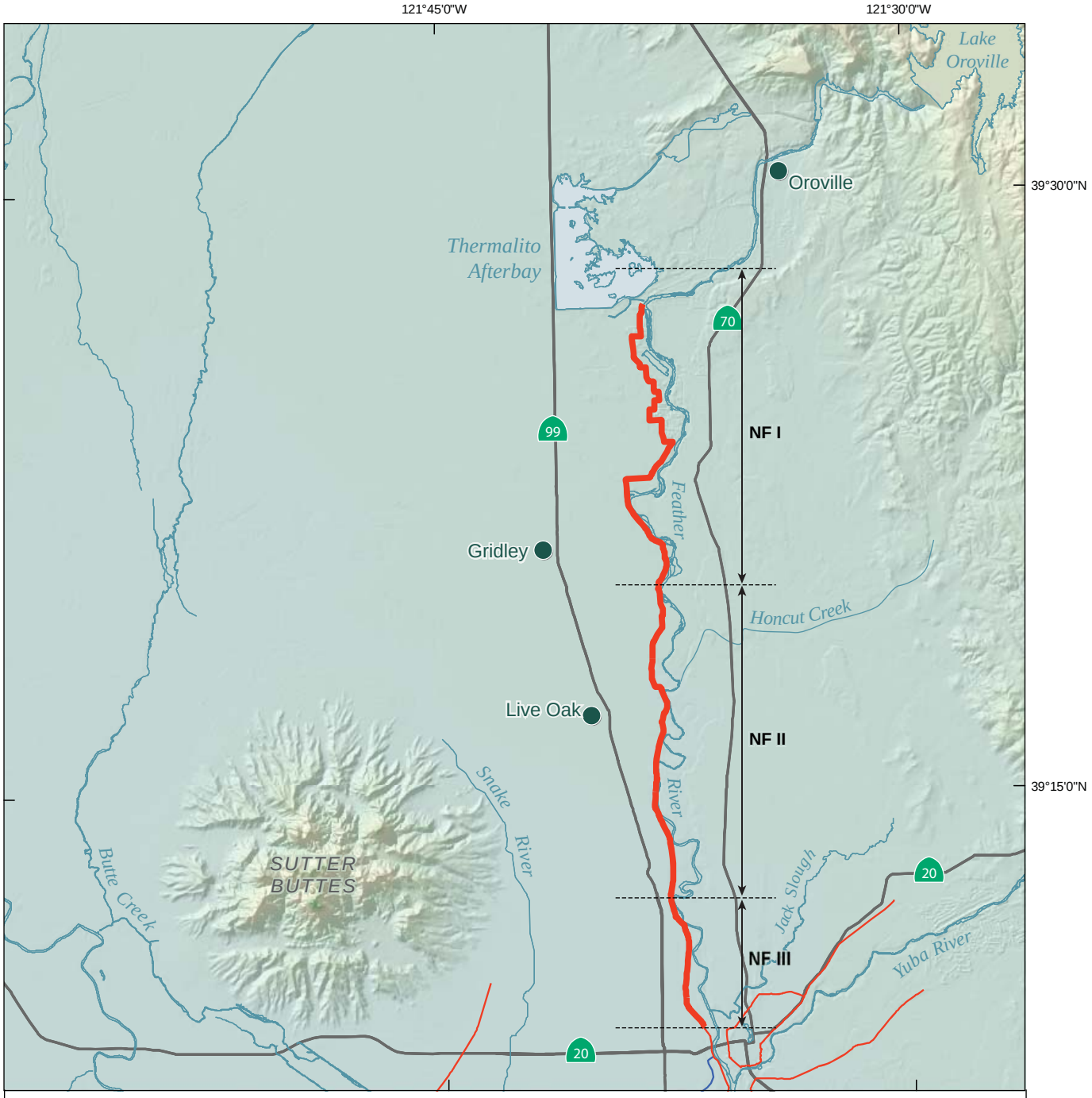
Map of Central Valley near Sutter Buttes, California

DWR URBAN LEVEE PROJECT

Figure 1

1881 North Feather River

Modified 09.03.09

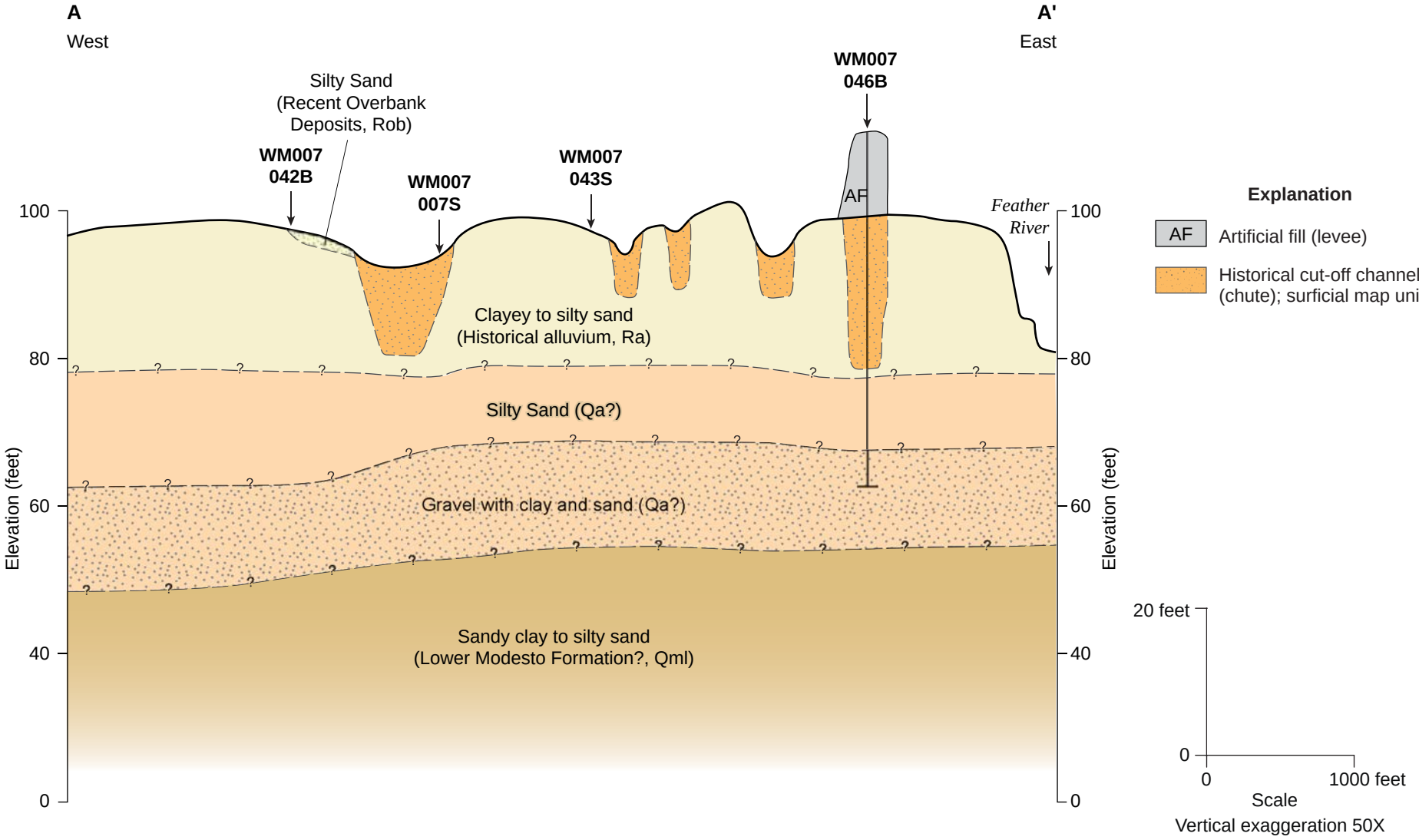


Map of the Reaches Identified along the Northern Feather River Study Area

DWR URBAN LEVEE PROJECT
Figure 2

1881 North Feather River

Modified 09.03.09



Conceptual Subsurface Diagram across the Northern Feather River, A-A'

DWR URBAN LEVEE PROJECT

Figure 3

1881 North Feather River

Modified 09.03.09

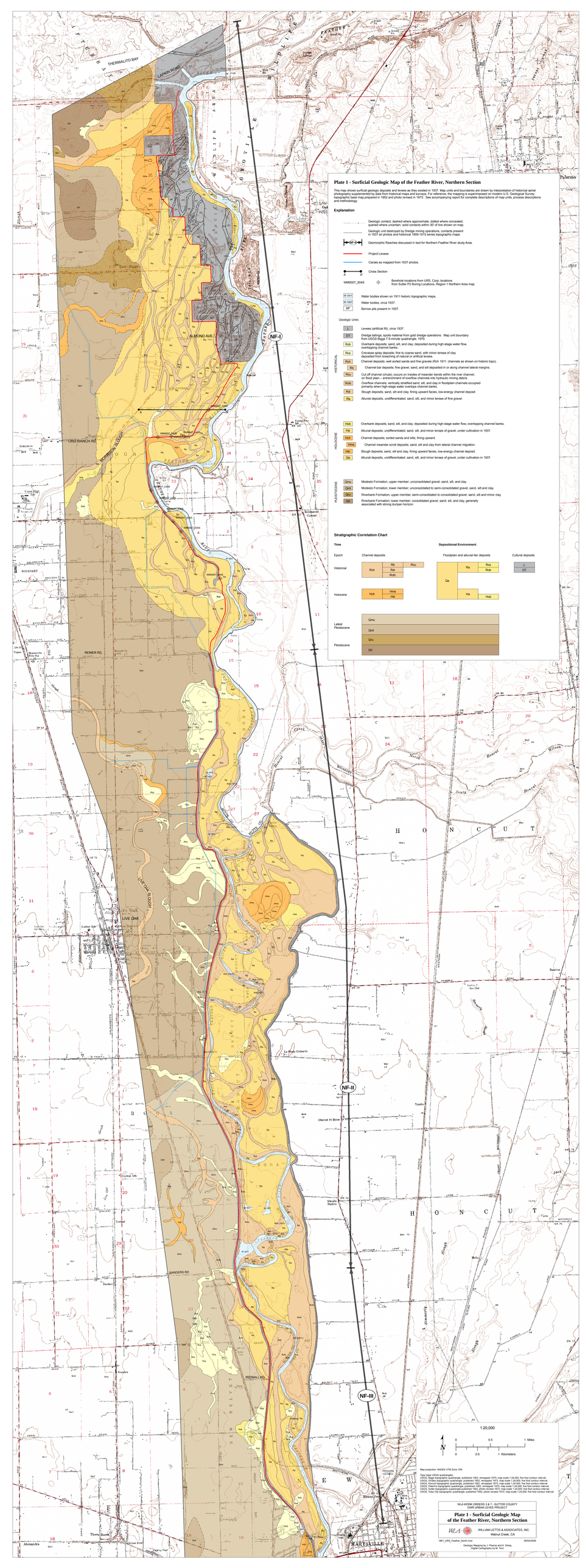


Plate 1 - Surficial Geologic Map of the Feather River, Northern Section
This map shows surficial geologic deposits and levees as they existed in 1937. Map units and boundaries are drawn by interpretation of historical aerial photography supplemented by data from historical maps and surveys. For reference, the mapping is superimposed on modern U.S. Geological Survey topographic base map prepared in 1952 and photo revised in 1973. See accompanying report for complete descriptions of map units, process descriptions and methodology.
Explanation
Geologic contact, dashed where approximate, dotted where concealed, queried where uncertain; solid contacts within 30' of line shown on map.
Geologic unit destroyed by Dredge mining operations, contacts present in 1937 air photos and historical 1909-1910 series topographic maps.
NF-I
Geomorphic Reaches discussed in text for Northern Feather River study Area.
Project Levees
Canals as mapped from 1937 photos.
A
A'
Cross Section
WIM0007_004S
Borehole locations from URS, Corp; locations from Sutter P2 Boring Locations, Region 1 Northern Area map.
W 1911
Water bodies shown on 1911 historic topographic maps.
W 1937
Water bodies, circa 1937.
BP
Borrow pits present in 1937.
Geologic Units
HISTORICAL
L
Levees (artificial fill), circa 1937.
DT
Dredge tailings; spoils material from gold dredge operations. Map unit boundary from USGS Biggs 7.5-minute quadrangle, 1970.
Hob
Overbank deposits; sand, silt, and clay; deposited during high-stage water flow, overtopping channel banks.
Hcs
Crevasse splay deposits; fine to coarse sand, with minor lenses of clay deposited from breaching of natural or artificial levees.
Hch
Channel deposits; well sorted sands and fine gravels (Rch 1911: channels as shown on historic topo).
Hb
Channel bar deposits; fine gravel, sand, and silt deposited in or along channel lateral margins.
Hcu
Cut-off channel (chute); occurs on insides of meander bends within the river channel; on flood plain — entrenchment of overflow channels into hydraulic mining debris.
Hoh
Overflow channels; vertically stratified sand, silt, and clay in floodplain channels occupied primarily when high-stage water overtops channel banks.
Hsl
Slough deposits; sand, silt and clay, fining upward facies, low-energy channel deposit.
Ha
Alluvial deposits, undifferentiated; sand, silt, and minor lenses of fine gravel.
HOLOCENE
Hob
Overbank deposits; sand, silt, and clay; deposited during high-stage water flow, overtopping channel banks.
Ha
Alluvial deposits; undifferentiated; sand, silt, and minor lenses of gravel; under cultivation in 1937.
Hch
Channel deposits; sorted sands and silts; fining upward.
Hma
Channel meander scroll deposits; sand, silt and clay from lateral channel migration.
Hsl
Slough deposits; sand, silt and clay, fining upward facies, low-energy channel deposit.
Qa
Alluvial deposits, undifferentiated; sand, silt, and minor lenses of gravel; under cultivation in 1937.
PLEISTOCENE
Qmu
Modesto Formation; upper member; unconsolidated gravel, sand, silt, and clay.
Qml
Modesto Formation; lower member; unconsolidated to semi-consolidated gravel, sand, silt and clay.
Qrs
Riverbank Formation; upper member; semi-consolidated to consolidated gravel, sand, silt and minor clay.
Qpl
Riverbank Formation; lower member; consolidated gravel, sand, silt, and clay, generally associated with strong duripan horizon.
Stratigraphic Correlation Chart
Time
Epoch
Channel deposits
Depositional Environment
Floodplain and alluvial-fan deposits
Cultural deposits
Historical
Holocene
Latest Pleistocene
Pleistocene
Rch
Rb
Rsu
Rul
Rofc
Hch
Hma
Hsl
Qa
Ra
Rcs
Rob
Hob
Ha
L
DT
Qmu
Qml
Qrs
Qpl
NF-I
NF-II
NF-III
THERMALITO BAY
LAYMON ROAD
ALMOND AVE
ORO RANCH RD
REIMER RD
LIVE OAK
SANDERS RD
REDNALL RD
MARYSVILLE
HONCUT
BOGA
1:20,000
0
0.5
1 Miles
0
0.5
1 Kilometers
N
Map projection: NAD83 UTM Zone 10N
Topo base USGS quadrangles:
Thermalito quadrangle, published 1952, remapped 1970; map scale 1:24,000, five foot contour interval.
USGS, Gridley topographic quadrangle, published 1952, remapped 1973; map scale 1:24,000, five foot contour interval.
USGS, Honcut topographic quadrangle, published 1952, remapped 1973; map scale 1:24,000, five foot contour interval.
USGS, Oroville topographic quadrangle, published 1952, photo revised 1973; map scale 1:24,000, five foot contour interval.
USGS, Sutter topographic quadrangle published 1952, photo revised 1973; map scale 1:24,000, five foot contour interval.
USGS, Yuba City topographic quadrangle, published 1952, photo revised 1973; map scale 1:24,000, five foot contour interval.
WLA WORK ORDERS 3 & 7 - SUTTER COUNTY
DWR LRBAN LEVEE PROJECT
Plate 1 - Surficial Geologic Map of the Feather River, Northern Section
WILLIAM LETTIS & ASSOCIATES, INC.
Walnut Creek, CA
1841_URS_Feather_North.mxd
09/04/2009
Geologic Mapping by J. Pearce and A. Streig
Digital Cartography by M. Tozo

Appendix D

Air Quality General Conformity Determination, Calculation Spreadsheets and Supporting Information

Attachment A
General Conformity Determination

A.1 Introduction

This appendix provides the general conformity determination for the Feather River West Levee Project (FRWLP, or project). A general conformity determination is required by Section 176 of the Clean Air Act (CAA). The CAA requires states to submit a state implementation plan (SIP) for areas in nonattainment for Federal standards. Section 176(c)(1) of the CAA prohibits Federal agencies from engaging in, supporting, or providing financial assistance for licensing, permitting, or approving any activities that do not conform to an approved SIP.

The U.S. Environmental Protection Agency (EPA) enacted the Federal general conformity regulation in 1993 (40 Code of Federal Regulations [CFR] Parts 5, 51, and 93). The purpose of the general conformity rule is to ensure that Federal actions do not generate emissions that interfere with state and local agencies' SIPs and emission-reduction strategies to ensure attainment of the national ambient air quality standards (NAAQS). Specifically, projects that receive Federal funding or require Federal approval must demonstrate that they would not cause or contribute to new violations of air quality standards, exacerbate existing violations, or interfere with timely attainment or required interim emissions reductions toward attainment. Because the project is receiving Federal funds and approvals from the U.S. Army Corps of Engineers (USACE), all direct and indirect emissions generated by the project are subject to the general conformity rule.

A.1.1 Regulatory Status of the Study Area

The study area is subject to air quality regulations developed and implemented at the Federal, state, and local levels. At the Federal level, the EPA is responsible for implementation of the 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. Within the study area, the Feather River Air Quality Management District (FRAQMD) has jurisdiction over local air quality in Sutter County, and the Butte County Air Quality Management District (BCAQMD) has jurisdiction over local air quality in Butte County.

Under the CAA, FRAQMD and BCAQMD are required to develop air quality plans for nonattainment criteria pollutants in their respective air districts. The 1994 Sacramento Area Regional Ozone Attainment Plan was prepared to address VOC and NO_X emissions following the region's serious nonattainment designation for the 1-hour ozone (O_3) NAAQS in November 1991. The Sacramento Regional 8-Hour Attainment and Reasonable Further Progress Plan has also been adopted to address the region's nonattainment status for the 8-hour O_3 NAAQS. Air districts within the Sacramento Federal Nonattaiment Area (SFNA) have submitted the O_3 plan to the EPA and are currently waiting for the agency to approve the document. Counties in the SFNA (Sacramento, Yolo, Placer, El Dorado, Solano, Sutter, and Butte) have also adopted the Northern Sacramento Valley

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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 particulate matter (PM).

A.1.2 General Conformity Requirements

The general conformity rule applies to all Federal actions located in nonattainment and maintenance areas that are not exempt from general conformity (are either covered by Transportation Conformity or listed in the rule), are not covered by a presumed-to-conform approved list[1], or do not have clearly *de minimis* emissions. In addition, the general conformity rule applies only to direct and indirect emissions associated with the portions of any Federal action that are subject to New Source Review (i.e., do not include stationary industrial sources requiring air quality permits from local air pollution control agencies) for which a Federal permitting agency has directly caused or initiated, has continued program responsibility for, or can practically control.

Federal projects must undertake an evaluation to determine whether all project emission sources are subject to the general conformity rule. The analysis includes a stepwise process in which the Federal agency determines the following.

1. **Is the project located in a Federal attainment area?** If yes, the project is not subject to general conformity and no future analysis is required. If no, document whether the project is located in a nonattainment or maintenance area and proceed to step 2.
2. **Does one or more of the specific exemptions apply to the project?** If yes, the project is exempt from general conformity and no further analysis is required. If no, proceed to step 3.
3. **Has the Federal agency included the action on its list of presumed-to-conform actions?** If yes, the project is presumed to conform to the applicable SIP and the requirements of general conformity are satisfied. If no, proceed to step 4.
4. **Are the total direct and indirect emissions below the *de minis* thresholds?** If yes, the project would not cause or contribute to new violations of air quality standards; the requirements of general conformity are satisfied. If no, the applicant must perform a conformity determination.

A general conformity determination is made by satisfying any of the following requirements.

- Showing that the emission increases caused by the Federal action are included in the SIP.
- Demonstrating that the state agrees to include the emission increases in the SIP.
- Offsetting the action's emissions in the same or nearby area.
- Mitigating to reduce the emission increase.
- Utilizing a combination of the above strategies.

The general conformity rule states that the applicability analysis can be (but is not required to be) completed concurrently with any analysis required under the National Environmental Policy Act

[1] Category of activities designated by a Federal agency as having emissions below *de minimis* levels or otherwise do not interfere with the applicable SIP or the attainment and maintenance of the NAAQS.

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(NEPA). The applicability analysis for the proposed project is described in Section A.8, *Applicability Analysis*.

A.2 Description of the Federal Action

The Federal lead agency is only required to conduct a general conformity evaluation for the specific Federal action associated with the selected alternative for a project or program (U.S. Environmental Project Agency 1994). The positive conformity determination must be submitted before the Federal action is approved. Each Federal agency is responsible for determining conformity of those proposed actions over which it has jurisdiction. Alternative 3 has been selected as the applicant-preferred alternative (APA). However, air quality modeling presented in the EIR/EIS indicates that Alternative 3 would not generate criteria pollutant emissions in excess of applicable *de minimis* thresholds. Accordingly, a general conformity determination for the APA is not required.

The general conformity determination presented in this appendix is related only to those activities included in the USACE's action pertaining to Alternative 2. As discussed in the EIR/EIS, Alternative 2 is the only project alternative that would exceed *de minimis* thresholds. Although Alternative 2 has not been identified as the APA, this general conformity determination is being issued in the event the project proponents should select Alternative 2 as the APA before finalization of the EIR/EIS. The project is described further in Section A.3 below.

A.3 Feather River West Levee Project

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. 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.

A.4 Air Quality Conditions in the Study Area

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.

A.4.1 Climate and Meteorology

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

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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).

A.4.2 Ambient Air Quality

The existing air quality conditions in the project area can also 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 1 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 Table 1, 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.

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Table 1. 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 O_3 (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 O_3 (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

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	Yuba City			Gridley		
Pollutant Standards	2007	2008	2009	2007	2008	2009
Number of days standard exceeded[a]						
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.
Notes:
[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.

A.4.3 Mass Emissions

The ARB compiles an emissions inventory for all sources of emissions within Butte and Sutter Counties. This inventory is used by the FRAQMD, BCAQMD, and ARB for regional air quality planning purposes and is the basis for the region's air quality plans, and includes such sources as stationary (e.g., landfills, electric utilities, mineral processes); area-wide (e.g., farming operations, construction/demolition activities, residential fuel combustion); and mobile sources (e.g., automobiles, aircraft, off-road equipment). Current emissions of criteria pollutants for 2008 (the most recent year for which inventory data are available) for Butte and Sutter Counties are summarized in Table 2 and 3, respectively.

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Table 2. Butte County Air Quality Emissions—2008

		Annual emissions (tons per day)					
Source type	Subcategory	ROG	CO	NO_X	SO_X	PM10	PM2.5
Stationary sources							
Fuel combustion							
Stationary	Electric utilities	0.02	4.97	0.42	0	0.17	0.15
Stationary	Cogeneration	0	0	0	0	0	0
Stationary	Manufacturing and industrial	0.01	0.06	0.28	0.01	0.01	0.01
Stationary	Food and agricultural processing	0.09	0.41	1.01	0.01	0.06	0.06
Stationary	Service and commercial	0.02	0.07	0.37	0	0.01	0.01
Stationary	Other (fuel combustion)	0.04	0.14	0.13	0	0.03	0.03
Total fuel combustion		*0.18*	*5.65*	*2.21*	*0.02*	*0.28*	*0.26*
Waste disposal							
Stationary	Sewage treatment	0	0	0	0	0	0
Stationary	Incinerators	0	0	0.01	0	0	0
Stationary	Other (waste disposal)	0	0	0	0	0	0
Total waste disposal		0	0	0.01	0	0	0
Cleaning and surface coatings							
Stationary	Laundering	0	0	0	0	0	0
Stationary	Degreasing	0.45	0	0	0	0	0
Stationary	Coatings and related process solvents	0.31	0.04	0.01	0	0	0
Stationary	Printing	0.01	0	0	0	0	0
Stationary	Adhesives and sealants	0.1	0	0	0	0	0
Total cleaning and surface coatings		0.87	0.04	0.01	0	0	0
Petroleum production and marketing							
Stationary	Oil and gas production	0.1	0.02	0.02	0	0	0
Stationary	Petroleum marketing	0.76	0	0	0	0	0
Total petroleum production and marketing		0.86	0.02	0.02	0	0	0
Industrial processes							
Stationary	Chemical	0	0	0	0	0	0

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Source type	Subcategory	Annual emissions (tons per day) ROG	CO	NO_X	SO_X	PM10	PM2.5
Stationary	Food and agriculture	0.03	0	0	0	1.53	0.7
Stationary	Mineral processes	0.01	0.01	0.01	0.01	0.58	0.15
Stationary	Metal processes	0	0	0	0	0	0
Stationary	Wood and paper	0.14	0	0.01	0	1.79	1.07
Stationary	Other (industrial processes)	0.15	0	0	0	0	0
Total industrial processes		0.33	0.01	0.02	0.01	3.9	1.92
Total stationary sources		2.24	5.72	2.27	0.03	4.18	2.18
Area-wide sources							
Solvent evaporation							
Area-wide	Consumer products	1.44	0	0	0	0	0
Area-wide	Architectural coatings and related process solvents	0.62	0	0	0	0	0
Area-wide	Pesticides/fertilizers	0.61	0	0	0	0	0
Area-wide	Asphalt paving/roofing	2.83	0	0	0	0	0
Total solvent evaporation		*18.71*	*0.00*	*0.00*	*0.00*	*0.01*	*0.01*
Miscellaneous processes							
Area-wide	Residential fuel combustion	1.27	18.13	0.67	0.05	2.74	2.64
Area-wide	Farming operations	0.38	0	0	0	5.35	0.8
Area-wide	Construction and demolition	0	0	0	0	1.09	0.11
Area-wide	Paved road dust	0	0	0	0	3.71	0.56
Area-wide	Unpaved road dust	0	0	0	0	7.62	0.76
Area-wide	Fugitive windblown dust	0	0	0	0	0.26	0.04
Area-wide	Fires	0.01	0.12	0	0	0.01	0.01
Area-wide	Managed burning and disposal	1.02	11.63	0.66	0.02	1.48	1.39
Area-wide	Cooking	0.04	0	0	0	0.11	0.07
Total miscellaneous processes		*2.72*	*29.88*	*1.33*	*0.07*	*22.37*	*6.38*
Total area-wide sources		10.46	35.6	3.6	0.1	26.55	8.56
Mobile sources							
On road mobile sources							
Mobile	Light duty passenger (LDA)	1.91	16.37	1.43	0.01	0.08	0.04

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		Annual emissions (tons per day)					
Source type	Subcategory	ROG	CO	NO_X	SO_X	PM10	PM2.5
Mobile	Light duty trucks - 1 (LDT1)	1.4	13.54	1.26	0.01	0.05	0.03
Mobile	Light duty trucks - 2 (LDT2)	1.01	9.89	1.23	0.01	0.06	0.04
Mobile	Medium duty trucks (MDV)	0.4	4.47	0.59	0	0.02	0.02
Mobile	Light heavy duty gas trucks - 1 (LHDV1)	0.18	1.36	0.19	0	0	0
Mobile	Light heavy duty gas trucks - 2 (LHDV2)	0.1	0.74	0.08	0	0	0
Mobile	Medium heavy duty gas trucks (MHDV)	0.24	1.9	0.13	0	0	0
Mobile	Heavy heavy duty gas trucks (HHDV)	0.08	1.12	0.12	0	0	0
Mobile	Light heavy duty diesel trucks - 1 (LHDV1)	0.01	0.07	0.32	0	0.01	0
Mobile	Light heavy duty diesel trucks - 2 (LHDV2)	0.01	0.04	0.2	0	0	0
Mobile	Medium heavy duty diesel trucks (MHDV)	0.02	0.16	0.74	0	0.02	0.02
Mobile	Heavy heavy duty diesel trucks (HHDV)	0.48	1.96	7.1	0.01	0.29	0.25
Mobile	Motorcycles (MCY)	0.36	2.73	0.09	0	0	0
Mobile	Heavy duty diesel urban buses (UB)	0	0.01	0.05	0	0	0
Mobile	Heavy duty gas urban buses (UB)	0	0.03	0.01	0	0	0
Mobile	School buses (SB)	0.01	0.1	0.1	0	0	0
Mobile	Other buses (OB)	0.02	0.26	0.05	0	0	0
Mobile	Motor homes (MH)	0.04	0.92	0.11	0	0	0
Total on road mobile sources		*6.27*	*55.67*	*13.8*	*0.04*	*0.53*	*0.4*
Other mobile sources							
Mobile	Aircraft	0.51	4.78	0.26	0.05	0.02	0.02
Mobile	Trains	0.16	0.5	2.32	0.02	0.07	0.06
Mobile	Recreational boats	1.49	5.28	0.26	0	0.1	0.08
Mobile	Off-road recreational vehicles	0.33	1.06	0.01	0	0	0
Mobile	Off-road equipment	1.22	9.04	2.7	0	0.18	0.16
Mobile	Farm equipment	0.52	2.78	2.56	0	0.15	0.14
Mobile	Fuel storage and handling	0.14	0	0	0	0	0
Total off road mobile sources		*4.37*	*23.44*	*8.11*	*0.07*	*0.52*	*0.46*
Total mobile sources		10.64	79.11	21.91	0.11	1.05	0.86
Butte County total		23.34	120.43	27.78	0.24	31.78	11.6

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Table 3. Sutter County Air Quality Emissions—2008

		Annual emissions (tons per day)					
Source type	Subcategory	ROG	CO	NO_X	SO_X	PM10	PM2.5
Stationary sources							
Fuel combustion							
Stationary	Electric utilities	0.04	0.07	0.6	0.01	0.1	0.1
Stationary	Cogeneration	0	0	0	0	0	0
Stationary	Oil and gas production (combustion)	0.25	0.43	1.76	0	0	0.05
Stationary	Manufacturing and industrial	0.01	0.06	0.33	0	0.02	0.02
Stationary	Food and agricultural processing	0.07	0.31	0.73	0	0.04	0.03
Stationary	Service and commercial	0.01	0.46	0.19	0	0.05	0.05
Stationary	Other (fuel combustion)	0	0.05	0.07	0	0	0.01
Total fuel combustion		*0.38*	*1.38*	*3.68*	*0.01*	*0.21*	*0.26*
Cleaning and surface coatings							
Stationary	Laundering	0	0	0	0	0	0
Stationary	Degreasing	0.14	0	0	0	0	0
Stationary	Coatings and related process solvents	0.13	0	0	0	0	0
Stationary	Printing	0.01	0	0	0	0	0
Stationary	Adhesives and sealants	0.02	0	0	0	0	0
Stationary	Other (cleaning and surface coatings)	0.01	0	0	0	0	0
Total cleaning and surface coatings		*0.31*	*0*	*0*	*0*	*0*	*0*
Petroleum production and marketing							
Stationary	Oil and gas production	2.54	0	0	0	0	0
Stationary	Petroleum refining	0.01	0	0	0	0	0
Stationary	Petroleum marketing	0.17	0	0	0	0	0
Stationary	Other (petroleum production and marketing)	0	0	0	0	0	0
Total petroleum production and marketing		*2.72*	*0*	*0*	*0*	*0*	*0*
Industrial processes							
Stationary	Food and agriculture	0.01	0	0	0	1.04	0.4
Stationary	Mineral processes	0	0	0	0	0.2	0.1

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		Annual emissions (tons per day)					
Source type	Subcategory	ROG	CO	NO_X	SO_X	PM10	PM2.5
Stationary	Wood and paper	0	0	0	0	0.13	0.07
Stationary	Other (industrial processes)	0	0	0	0	0.02	0.02
Total industrial processes		*0.01*	*0*	*0*	*0*	*1.39*	*0.59*
Total stationary sources		**3.42**	**1.38**	**3.68**	**0.01**	**1.6**	**0.85**
Area-wide sources							
Solvent evaporation							
Area-wide	Consumer products	0.59	0	0	0	0	0
Area-wide	Architectural coatings and related process solvents	0.27	0	0	0	0	0
Area-wide	Pesticides/fertilizers	0.85	0	0	0	0	0
Area-wide	Asphalt paving/roofing	0.13	0	0	0	0	0
Total solvent evaporation		*1.84*	*0*	*0*	*0*	*0*	*0*
Miscellaneous processes							
Area-wide	Residential fuel combustion	0.3	4.63	0.22	0.01	0.67	0.64
Area-wide	Farming operations	0.19	0	0	0	5.16	0.77
Area-wide	Construction and demolition	0	0	0	0	0.63	0.06
Area-wide	Paved road dust	0	0	0	0	1.66	0.25
Area-wide	Unpaved road dust	0	0	0	0	2.27	0.23
Area-wide	Fugitive windblown dust	0	0	0	0	1.06	0.18
Area-wide	Fires	0	0.02	0	0	0	0
Area-wide	Managed burning and disposal	0.51	5.83	0.44	0.08	0.68	0.64
Area-wide	Cooking	0.01	0	0	0	0.04	0.03
Total miscellaneous processes		*1.01*	*10.48*	*0.66*	*0.09*	*12.17*	*2.8*
Total area-wide sources		**2.85**	**10.48**	**0.66**	**0.09**	**12.17**	**2.8**
Mobile sources							
On road mobile sources							
Mobile	Light duty passenger (LDA)	0.69	6.2	0.54	0	0.03	0.02
Mobile	Light duty trucks - 1 (LDT1)	0.46	4.34	0.43	0	0.02	0.01
Mobile	Light duty trucks - 2 (LDT2)	0.37	3.66	0.47	0	0.02	0.02

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		Annual emissions (tons per day)					
Source type	Subcategory	ROG	CO	NO_X	SO_X	PM10	PM2.5
Mobile	Medium duty trucks (MDV)	0.16	1.86	0.25	0	0.01	0.01
Mobile	Light heavy duty gas trucks - 1 (LHDV1)	0.08	0.58	0.1	0	0	0
Mobile	Light heavy duty gas trucks - 2 (LHDV2)	0.03	0.21	0.03	0	0	0
Mobile	Medium heavy duty gas trucks (MHDV)	0.12	0.93	0.07	0	0	0
Mobile	Heavy heavy duty gas trucks (HHDV)	0.03	0.51	0.05	0	0	0
Mobile	Light heavy duty diesel trucks - 1 (LHDV1)	0.01	0.04	0.17	0	0	0
Mobile	Light heavy duty diesel trucks - 2 (LHDV2)	0	0.02	0.09	0	0	0
Mobile	Medium heavy duty diesel trucks (MHDV)	0.01	0.13	0.62	0	0.02	0.02
Mobile	Heavy heavy duty diesel trucks (HHDV)	0.42	1.72	6.29	0.01	0.25	0.22
Mobile	Motorcycles (MCY)	0.12	1	0.03	0	0	0
Mobile	Heavy duty diesel urban buses (UB)	0	0	0	0	0	0
Mobile	Heavy duty gas urban buses (UB)	0	0	0	0	0	0
Mobile	School buses (SB)	0	0.03	0.05	0	0	0
Mobile	Other buses (OB)	0.01	0.05	0.01	0	0	0
Mobile	Motor homes (MH)	0.01	0.2	0.03	0	0	0
Total on road mobile sources		*2.52*	*21.48*	*9.23*	*0.01*	*0.35*	*0.3*
Other mobile sources							
Mobile	Aircraft	0.51	4.78	0.26	0.05	0.02	0.02
Mobile	Trains	0.16	0.5	2.32	0.02	0.07	0.06
Mobile	Recreational boats	1.49	5.28	0.26	0	0.1	0.08
Mobile	Off-road recreational vehicles	0.33	1.06	0.01	0	0	0
Mobile	Off-road equipment	1.22	9.04	2.7	0	0.18	0.16
Mobile	Farm equipment	0.52	2.78	2.56	0	0.15	0.14
Mobile	Fuel storage and handling	0.14	0	0	0	0	0
Total off road mobile sources		*1.29*	*7.81*	*4.63*	*0*	*0.26*	*0.24*
Total mobile sources		**3.81**	**29.29**	**13.86**	**0.01**	**0.61**	**0.54**
Sutter County total		**10.08**	**41.15**	**18.2**	**0.11**	**14.38**	**4.19**

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A.4.4 Federal Nonattainment Status and Conformity Applicably

Local monitoring data (Table 1) are used to designate areas as nonattainment, maintenance, attainment, or unclassified for the NAAQS. Table 4 summarizes the attainment status of the project area within Butte and Sutter Counties with regard to the NAAQS.

Table 4. Federal Attainment Status of the Project Area within Butte and Sutter Counties

	Project Area in Butte County	Project Area in Sutter County
Pollutant	NAAQS	NAAQS
1-hour O_3	–	–
8-hour O_3	Marginal Nonattainment [a]	Severe Nonattainment [b] /Attainment Unclassified [c]
CO	Moderate Maintenance [a]	Attainment
PM2.5	Nonattainment [a]	Nonattainment [d]
PM10	Attainment	Attainment

Sources: U.S. Environmental Protection Agency 2012.
– = No applicable standard.
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.

The general conformity evaluation is made by comparing all emission sources (e.g., haul trucks, off-road equipment) to the applicable general conformity *de minimis* thresholds based on the regional nonattainment status. Table 5 summarizes the *de minimis* thresholds applicable to project activities.

Table 5. Federal General Conformity *de minimis* Thresholds

Threshold	Contract D			Contract A		Contracts A-D
	ROG	NO_X	CO	ROG	NO_X	PM2.5
Attainment Status	Marginal Nonattainment	Marginal Nonattainment	Moderate Maintenance	Severe Nonattainment	Severe Nonattainment	Nonattainment
Applicable Threshold	*100*	*100*	*100*	*25*	*25*	*100*

The analysis of construction-related emissions associated with Alternative 2 indicates that NO_X emissions generated by Contract A would exceed the general conformity *de minimis* threshold under all years of construction (2014–2015). There would be no violations of any other *de minimis* thresholds. As the SFNA is classified as a nonattainment area with regards to the Federal 8-hour O_3 standard, the FRWLP requires a general conformity determination to demonstrate how

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construction-related NO_X emissions associated with Contract A under Alternative 2 will conform to the SFNA SIP.

A.5 Relationship to Other Environmental Analyses

A Draft EIS/EIR will be published for public review and comment in December 2012 providing an analysis of the preferred alternative (Alternative 3), with publication of the Final EIS/EIR anticipated in summer 2013. The USACE is the lead Federal agency for the NEPA analysis documented in the EIS/EIR. The EIS/EIR was prepared to also be sufficient for purposes of CEQA.

NEPA requires an evaluation of air quality impacts associated with construction and operation of the proposed project. The analysis of impacts under CEQA were evaluated using the local thresholds of significance established by the FRAQMD and BCAQMD, while impacts under NEPA were made by evaluating whether the project would exceed general conformity *de minimis* thresholds. The Draft EIS/EIR presents the general conformity determination process and general findings in the general conformity determination for public and agency review, while the final general conformity determination will be published concurrent with the Record of Decision (ROD) for the Federal action.

A.6 Onsite Emission Reduction Measures

Mitigation measures to reduce onsite construction emissions were identified in Section 3.5.4, *Effects and Mitigation Measures* of the Draft EIS/EIR. These mitigation measures are consistent with NEPA and CEQA mitigation and minimization measures and will be required elements of the project, as they will be included in the project's Mitigation Monitoring and Reporting Program, as required under CEQA. The mitigation measures required in the EIS/EIR to reduce project-related emissions are described below.

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.

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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.

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- 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.

A.7 Regulatory Procedures

The general conformity regulations establish certain procedural requirements that must be followed when preparing a general conformity evaluation. The major applicable procedural issues associated with the general conformity demonstration and a description of how these requirements are met are presented in this section. As previously indicated, the Draft EIS/EIR presents the general conformity determination for public and agency review. The final general conformity determination will be published concurrent with the ROD for the Federal action pursuant to 40 CFR §93.156.

A.7.1 Use of Latest Planning Assumptions

the general conformity regulations require that the analysis use the latest planning assumptions based on data (e.g., population, employment, travel, and congestion) made available by the area's MPOs (40 CFR §93.159[a]).

As the analysis of emissions resulting from construction-related activities would not require the use of population, employment, travel, and congestion data, this section is not applicable to the project.

A.7.2 Use of Latest Emissions Estimation Techniques

The general conformity regulations require the use of the latest and most accurate emission estimation techniques available, unless such techniques are inappropriate (40 CFR §93.159[b]).

Per guidance from the FRAQMD, construction emissions were estimated using the SMAQMD's Sacramento Roadway Construction Emission Model (SacRCEM) (version 7.1.2) (Sacramento Metropolitan Air Quality Management District 2012). SacRCEM uses the most recent version of the ARB's emission factor program, EMission FACtors 2011 (EMFAC2011) and OFFROAD2007/2011 model, which are the emission models used in the preparation of the SIP.

A.7.3 Major Construction Phase Activities

Project-specific data, including construction equipment lists and the construction schedule, were used to forecast construction emissions associated with the project using construction activity data provided by HDR, SBFCA's professional engineering team. Where project-specific data were not available, SacRCEM default settings were used. Calculations were performed for each year of construction (2013–2015).

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A.7.4 Emissions Scenarios

The general conformity regulations require that the analysis reflect certain emission scenarios (40 CFR §93.159[d]). Specifically, these scenarios generally include the evaluation of the direct and indirect emissions from a proposed project for the following years.

(1) The year mandated in the CAA for attainment and for maintenance areas, the farthest year for which emissions are projected in the approved maintenance plan.

(2) The year during which the total of direct and indirect emissions for the Federal action are projected to be the greatest on an annual basis.

(3) Any year for which the applicable SIP specifies an emissions budget.

Question 1 is not applicable to the construction analysis, as construction years associated with Alternative 2(2013–2015) do not include the year in which attainment is designated for the region for the 8-hour O_3 standard. Question 2 is not applicable to the construction analysis, as there is currently no approved 8-hour O_3 SIP in which there is an approved emissions budget. The analysis of construction activities evaluates the construction period of 2013–2015, with maximum direct and indirect emissions expected in 2014 (see Table 8 below).

A.8 Applicability Analysis

The general conformity rule applies to all Federal actions located in nonattainment and maintenance areas that are not exempt from general conformity (are either covered by Transportation Conformity or listed in the rule), are not covered by a presumed-to-conform approved list[2], or do not have clearly *de minimis* emissions. The first step in a general conformity evaluation is to determine whether the project is located in a Federal nonattainment or a maintenance area.

A.8.1 Attainment Status of the Study Area

As previously indicated in Table 4, 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. Consequently, to fulfill general conformity requirements, an analysis must be undertaken to identify whether the proposed project's total emissions of O_3, PM2.5, and CO are below the appropriate general conformity *de minimis* levels indicated in Table 5.

A.8.2 Exemptions from General Conformity Requirements

As previously indicated, the general conformity rule applies to all Federal actions located in nonattainment and maintenance areas that are not exempt from general conformity (are either

[2] Category of activities designated by a Federal agency as having emissions below *de minimis* levels or otherwise do not interfere with the applicable SIP or the attainment and maintenance of the national ambient air quality standard.

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covered by Transportation Conformity or listed in the rule), are not covered by a presumed-to-conform approved list, or do not have clearly *de minimis* emissions. In addition, the general conformity rule applies only to direct and indirect emissions associated with the portions of any Federal action that are subject to New Source Review (i.e., do not include stationary industrial sources requiring air quality permits from local air pollution control agencies) for which a Federal permitting agency has directly caused or initiated, has continued program responsibility for, or can practically control. None of these exemptions from general conformity apply to the proposed project.

A.8.3 Applicability for Federal Action

If it is determined a project is not exempt from general conformity, the applicability of the general conformity requirements to the Federal action is evaluated by comparing total direct and indirect emissions for each calendar year of to the appropriate general conformity *de minimis* thresholds indicated in Table 5.

In the event that total direct and indirect emissions attributable to the Federal action are below the *de minimis* thresholds for a pollutant, that pollutant is excluded from general conformity requirements and no further analysis is required, as it is assumed these pollutants would conform to the SIP. Those pollutants that could not be excluded from applicability must undergo a general conformity evaluation.

If the general conformity evaluation indicates that total direct and indirect emissions attributable to the Federal action are in excess of any of the general conformity *de minimis* thresholds, the applicant must perform a conformity determination. A conformity determination is made by satisfying any of the following requirements.

- Showing that the emission increases caused by the Federal action are included in the SIP.
- Demonstrating that the State agrees to include the emission increases in the SIP.
- Offsetting the action's emissions in the same or nearby area.
- Mitigating to reduce the emission increase.
- Utilizing a combination of the above strategies.

A.8.4 *De minimis* Emissions Rates

General conformity *de minimis* thresholds applicable to the project are summarized in Table 5.

A.9 Construction Activities Considered

The project would rehabilitate 44 miles of existing levee within Sutter and Butte Counties. Operation of the new facilities would require periodic maintenance, although activities are expected to be less extensive than existing conditions and would only take place over a few days per year. Accordingly, long-term operational emissions are part of the existing environmental baseline and thus would not create a substantial source of new emissions. The general conformity determination therefore focuses exclusively on construction-related emissions because there would be no effect related to project operations.

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The EIS/EIR estimates construction-related emissions for each of the three alternatives currently being considered for the FRWLP. However, this conformity determination only includes an analysis of Alternative 2. A conformity determination is not required for the APA (Alternative 3) as air quality modeling indicates that criteria pollutants generated by the APA would not exceed applicable *de minimis* thresholds. For additional information on Alternatives 1 and 3, please refer to Chapter 3.5, *Air Quality*.

Construction of Alternative 2 would generate criteria pollutant emissions that would result in short-term impacts on ambient air quality in the study. Emissions would originate from mobile and stationary construction equipment exhaust, employee vehicle exhaust, haul truck exhaust, and dust from earthmoving and clearing the land. Construction-related emissions vary substantially depending on the level of activity, length of the construction period, specific construction operations, types of equipment, number of personnel, wind and precipitation conditions, and soil moisture content.

Emissions rates for major construction activities were calculated based on information provided by HDR (2012).

- Levee construction would occur in the years 2013 through 2015. The maximum daily and annual activity would take place in 2014, when portions of every project segment would undergo extensive construction.
- 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 HDR (2012). The forecast equipment usage is listed in the technical modeling portion of this appendix. 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 the 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).
- Default emission factors for non–road construction equipment, on-road delivery trucks, and on-road commute vehicles.

The following sections discuss the approach and methodology used to assess construction emissions associated with Alternative 2. A full description of construction analysis methodology can be found in the technical modeling portion of this appendix.

A.9.1 Construction Schedule

Construction of Alternative 2 is expected to occur between May 2013 and October 2015. Four construction contracts are anticipated (A through D). Each contract will be 2 years in duration and require ten separate phases. Table 6 outlines the expected construction schedule and phases associated with each construction contract.

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Table 6. Construction Schedule and Phasing (Alternative 2)

	Contract A		Contract B [a]		Contract C		Contract D	
Phase	Start	Days	Start	Days	Start	Days	Start	Days
Contract Year 1								
1. Clearing and Grubbing/ Stripping	5/15/2014	20	5/15/2014	20	5/15/2013	10	5/15/2014	20
2. Borrow Site Preparation	5/15/2014	22	5/15/2014	20	5/15/2013	30	5/15/2014	20
3. Levee Degrading/ Work Surface Construction	6/12/2014	10	6/12/2014	12	5/21/2013	10	-	-
4. Cutoff Wall Construction	6/26/2014	10	6/30/2014	30	5/30/2013	15	-	-
5. Levee Reconstruction/ Seepage Berm Construction	6/12/2014	90	6/12/2014	85	5/23/2013	110	6/12/2014	93
6. Borrow Site Excavation	6/16/2014	90	6/12/2014	92	5/23/2013	110	6/12/2014	93
7. Utility Reconstruction	7/14/2014	65	7/14/2014	65	6/24/2013	65	7/12/2014	65
8. Levee Resurfacing	-	-	-	-	10/3/2013	12		
9. Hydroseeding	10/20/2014	10	10/20/2014	8	10/3/2013	12	10/21/2014	12
10. Demobilization/ Cleanup	10/16/2014	12	10/9/2014	10	10/21/2013	10	10/21/2014	10
Contract Year 2								
1. Clearing and Grubbing/ Stripping	5/15/2015	20	5/15/2015	20	5/15/2014	20	4/29/2015	20
2. Borrow Site Preparation	5/15/2015	30	5/15/2015	30	5/15/2014	30	4/29/2015	30
3. Levee Degrading/ Work Surface Construction	-	-	6/12/2015	10	6/12/2014	10	-	-
4. Cutoff Wall Construction	-	-	6/26/2015	20	6/26/2014	10	-	-
5. Levee Reconstruction/	6/12/2015	90	6/12/2015	55	6/12/2014	70	5/27/2015	92

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	Contract A		Contract B [a]		Contract C		Contract D	
Phase	Start	Days	Start	Days	Start	Days	Start	Days
Seepage Berm Construction								
6. Borrow Site Excavation	6/26/2015	80	6/26/2015	55	6/26/2014	70	6/10/2015	92
7. Utility Reconstruction	7/14/2015	60	7/14/2015	55	7/14/2014	65	6/26/2015	65
8. Levee Resurfacing	-	-	-		10/2/2014	12	-	-
9. Hydroseeding	10/16/2015	10	9/11/2015	10	10/2/2014	12	10/16/2015	12
10. Demobilization/ Cleanup	10/16/2015	10	8/28/2015	10	10/20/2014	10	10/2/2015	10

- Phase does not exist under the particular contract.

[a] Contract B also includes a 40-day roadway construction phase, which is split between September 2014 and September 2015.

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A.9.2 Offroad Equipment

SacRCEM (version 7.1.2) was used to calculate exhaust emissions from heavy-duty construction equipment. HDR (2012) provided information on equipment types, number, and duration for each phase and contract. Equipment horsepower and load factor were based on SacRCEM default values. A conservative operating assumption of eight hours per day was assumed for all equipment. Additional information on offroad equipment included in the emissions modeling can be found in Appendix D.

A.9.3 Employee Vehicle Exhaust

Emissions from employee vehicle trips were estimated using the SacRCEM. Based on information provided by HDR (2012), the following crew sizes were assumed for Construction Contracts A thorough D. Workers were assumed to be present throughout all phases associated with each contract (i.e., there would be 132 individuals onsite during phases 1 through 10 for contract A).

- Contract A: 132.
- Contract B: 129.
- Contract C: 135.
- Contract D: 102.

All employees were assumed to make two trips to the project site per day. A conservative trip length of 30 miles was used in the emissions modeling.

A.9.4 Haul Truck Vehicle Exhaust

Heavy-duty haul trucks would be required for material hauling and soil movement. The majority of materials would be delivered during phases 4, 5, 8, and 10. Soil off-hauling would occur primarily during phases 1, 3, and 6. Table 7 summarizes the number of annual truck trips for each contract and phase. Criteria pollutant emissions associated with haul trucks were quantified using the information summarized in Table 7 and the SacRCEM. All trip lengths were assumed to be 7 miles, based on guidance provided by HDR (Kors pers. comm.).

Table 7. Annual Truck Trips by Contract and Phase (Alternative 2)

Material Type	Phase	Contract A	Contract B	Contract C	Contract D
Unsuitable Soil Disposal	1, 3	3	917	13,454	1,208
Bentonite	4	0	16	14	0
Aggregate Surfacing	8	0	113 [a]	600	0
Pipe Material	5	4	9	16	22
Demolition Debris	10	30	18	80	138
CLSM Backfill	5	13	18	52	38
Borrow Fill	6	67,833	97,271	111,717	25,063

[a] Assumed to occur during the "roadway construction" phase.

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A.9.5 Fugitive Dust from Land Clearing

Fugitive dust emissions from land disturbance were quantified using SacRCEM. Based on information provided by HDR (2012), the following disturbed areas were assumed for Construction Contracts A thorough D. Note that the estimates include all staging and easement areas. Approximately 85% of the total disturbed area would occur during phase 1 (Clearing and Grubbing/Stripping), whereas the remaining 15% would occur during phase 6 (Borrow Site Excavation) (Kors pers. comm.).

- Contract A: 92 acres per year (183 total contract).
- Contract B: 136 acres per year (272 total contract).
- Contract C: 172 acres per year (345 total contract).
- Contract D: 121 acres per year (241 total contract).

A.10 Estimated Emissions Rates and Comparison to *De minimis* Thresholds

As previously noted, this conformity determination only includes values associated with Alternative 2. An air quality determination is not required for Alternative 1 or the APA (Alternative 3) as air quality modeling indicates neither alternative would generate criteria pollutant emissions in excess of applicable *de minimis* thresholds.

Annual criteria pollutant emissions resulting from construction of Alternative 2 are presented in Table 8. Emissions estimates include implementation of onsite mitigation identified in the EIS/EIR (AQ-MM-1 through AQ-MM-4). Violations of the Federal *de minimis* thresholds are shown in underlined text.

Table 8. Annual Construction Emissions for Alternative 2 (2013, 2014, and 2015)

Analysis	Contract D			Contract A		Contracts A-D
	ROG	NOx	CO	ROG	NOx	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

NA = not applicable.

[a] Assumes a 20% reduction in NOx, a 55% reduction in PM exhaust, and a 75% reduction in fugitive dust.

[b] Threshold based on the regional nonattainment status.

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A.11 Regional Effects

As shown in Table 8, 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. NO_X is a precursor to O_3, for which Sutter and Butte Counties are in nonattainment for the NAAQS. 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 O_3 SIP for each year of construction (2014 –2015). No additional analyses are required for the other pollutants or contracts.

A.12 General Conformity Evaluation

As disused in Section A.1.2., *General Conformity Requirements*, a positive general conformity determination can be made through one of five criteria (project inclusion in the SIP, revision to the SIP, offsets, additional mitigation, and/or a combination of strategies). This section summarizes the findings that were used to make the determination for the FRWLP.

A.12.1 Conformity Requirements for the Alternative 2

As shown in Table 8, construction-related NO_X emissions generated by Contract A exceed the Federal *de minimis* threshold (25 tons per year) during both construction years. The highest annual emissions are 37 tons, which occur in 2014, while emissions in 2015 would amount to 35 tons. Because NO_X emissions exceed the Federal *de minimis* threshold, a conformity determination is required for construction-related NO_X emissions generated by Contract A for years 2014 and 2015.

A.12.2 Compliance with Conformity Requirements

USACE herein demonstrates that construction-related NO_X emissions generated by Contract A (Alternative 2) would not result in a net increase in regional NO_X emissions within the SFNA. This will be achieved by offsetting NO_X emissions generated during both years of construction (2014 and 2015) to net zero. Purchasing offsets is consistent with the general conformity rule, which states that a positive conformity determination may be reached if project-related emissions are offset to net zero for all years in which pollutants exceed applicable *de minimis* thresholds (refer to Section A.1.2).

In the event that Alternative 2 is selected as the APA, the project proponents (SBFCA) will enter into a development mitigation contract with FRAQMD and BCAQMD to reduce NO_X emissions generated by the construction of Contract A to net zero through the procurement of offsite mitigation fees. The requirement for the mitigation contract would be imposed on the project through the following mitigation measure from the EIS/EIR.

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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.

The development mitigation contract outlined in AQ-MM-5 is a legally-binding agreement by which the project proponent (SBFCA) will provide applicable mitigation fees for NO_X emissions that exceed general conformity thresholds. Fees will contribute to the FRAQMD's Carl Moyer program. The Carl Moyer program is designed to reduce ROG, NO_X, and PM from on- and offroad sources. The payment fee for the Carl Moyer Program is currently $17,080 per ton, in addition to a 5% administration fee. Fees collected by the FRAQMD are used to fund reduction projects within the SFNA.

The mitigation contract and the entirety of all applicable mitigation fees must be fully executed and binding on all parties 2 months prior to groundbreaking. In negotiating the terms of the mitigation contract, SBFCA, FRAQMD, and BCAQMD should seek clarification and agreement on air district responsibilities, including the following.

- Identification of appropriate offsite mitigation fees required for SBFCA.
- Processing of mitigation fees surrendered by SBFCA.
- Verification of emissions inventories submitted by SBFCA.
- Verification that offsite fees are applied to appropriate mitigation programs within the FRAQMD and BCAQMD.

The SBFCA will be required to quantify mitigation fees needed to satisfy the appropriate reduction amounts. 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. An administrative fee of 5% would also need to be paid by the SBFCA to the FRAQMD to implement the program. Payment fees may vary by year and are sensitive to the number of projects requiring reductions within the same air basin. The types of projects funded through project contributions to the Carl Moyer program will be based on the need and demand at the time of project construction.

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Prior projects funded through the Carl Moyer program include engine repowering, diesel catalyst retrofits, and engine electrification.

Daily and annual emissions monitoring will be required to ensure onsite emissions reductions are achieved and no additional mitigation payments are required. Annual reports will include, at a minimum the following components.

- Calculated or measured emissions from construction activities over the reporting year.
- Projects selected for funding during the reporting year.
- Total funds distributed to selected projects during the reporting year.
- Cumulative funds distributed since program inception.
- Emissions reductions achieved during the reporting year.
- Cumulative reductions since program inception.
- Total emissions reductions remaining to satisfy the requirements of AQ-MM-5.

Excess offsite funds can be carried from previous to subsequent years in the event that additional reductions are achieved by onsite mitigation. If applicable, any excess offsite funds paid to the FRAQMD remaining at the end of final project construction will be returned to SBFCA.

In the event that Alternative 2 is selected as the APA, SBFCA would negotiate the final terms of the mitigation contract with the FRAQMD and BCAQMD. Final approval and execution of the contract by SBFCA and the air districts would occur concurrent with final approval of this general conformity determination. FRAQMD and BCAQMD have verified that there are sufficient emissions reductions projects within the air basin to fully offset the Contract A's NO_x exceedances (71 tons) to net zero.

A.13 Reporting

USACE is issuing this general conformity determination for public and agency review for a 30-day period as required by 40 CFR §§93.155 and 93.156. Emissions from construction of the project have been assessed and quantified using standard and accepted tools, techniques, and emission factors. Additional technical details are provided in the EIS/EIR. The air quality analysis, including this draft conformity determination, is based on consultation with BCAQMD and FRAQMD.

A.13.1 General Conformity Determination

The general conformity determination will be available for a 45-day public review in conjunction with the circulation of the draft FRWLP EIS/EIR. USACE will provide copies of this general conformity determination to the appropriate regional offices of the EPA, ARB, FRAQMD, BCAQMD, and other coordinating agencies. The USACE will also announce the availability of the general conformity determination in the Chico Enterprise Record, Appeal-Democrat, and Gridley Herald. A copy of this conformity determination will be made available on USACE's and SBFCA's websites, as well as at local libraries.

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A.13.2 Revaluation and Redetermination of General Conformity

General conformity determinations are valid for a period of 5 years after the date of public notification for the final documentation (40 CFR §93.157(a)). Ongoing Federal activities at a given site that show continuous progress after a 5-year period do not require a redetermination so long as the activities are within the scope of the final conformity determination. Because construction of Contract A is expected to require no more than 2 years, the final general conformity determination will remain valid through completion of the Federal action.

A.14 Findings and Conclusions

Pursuant to 40 CFR Part 93 Subpart B, USACE has conducted a general conformity evaluation as part of the environmental review of the FRWLP. The project is subject to the general conformity rule because it is located an area that is designed nonattainment for the 8-hour O_3 standard (severe and moderate), nonattainment for PM2.5, and a (partial) moderate maintenance area for CO. USACE conducted the general conformity evaluation in consultation with air districts in the study area (BCAQMD and FRAQMD). Moreover, the emissions analyses are based on accepted standards and are in compliance with all applicable regulatory criteria and procedures.

Based on project-specific construction analysis, NO_X emissions generated by construction of Contract A under Alternative 2 would exceed the Federal *de minimis* threshold during all years of construction (2014 and 2015). USACE concluded that Contract A emissions 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, which requires the payment of offsite mitigation fees. Accordingly, USACE has determined that Alternative 2, as designed, will conform to the approved SIP, based on the findings below.

- A commitment from the SBFCA that Contract A NO_x emissions will be offset consistent with the applicable Federal regulations through a development mitigation contract with the FRAQMD and BCAQMD. In the event that Alternative 2 is selected as the APA, the following actions will be taken to execute the conformity determination contained herein.
    - SBFCA, FRAQMD and BCAQMD will enter into a contractual agreement to mitigate the Contract A's NO_x emissions to net zero.
    - SBFCA will surrender moneys to FRAQMD's Carl Moyer Project to fund grants for projects that achieve the necessary emission reductions.
    - FRAQMD will seek and implement the necessary emission reduction measures, using SBFCA funds.
    - FRAQMD will serve in the role of administrator of the emissions reduction projects and verifier of the successful mitigation effort.

Therefore, USACE herewith concludes that the Alternative 2, as designed, conforms to the purpose of the approved SIP and is consistent with all applicable requirements.

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A.15 References

California Air Resources Board. 2011. iADAM Air Quality Data Statistics. http://www.arb.ca.gov/adam/index.html. Accessed: June 17, 2011.

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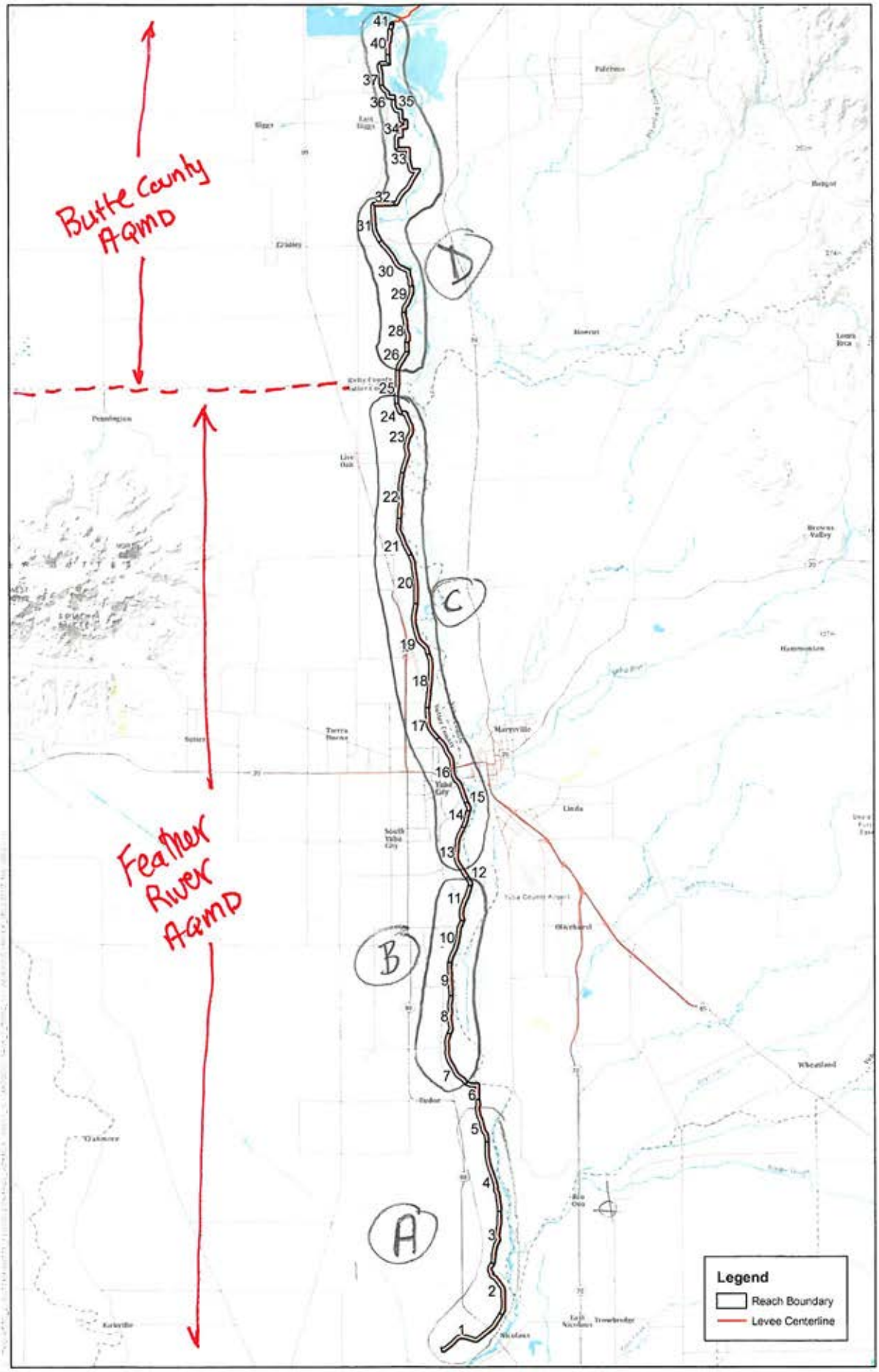
AIR QUALITY APPENDIX
CALCULATION SPREADSHEETS AND SUPPORTING INFORMATION



Project Reach Boundaries

MEMORANDUM

TO: Mr. Mike Inamine, Sutter Butte Flood Control Agency

FROM: HDR/Wood Rodgers Design Team

DATE: January 17, 2012

SUBJECT: SBFCA, Feather River West Levee Project, Project Description for CEQA/NEPA Analysis, Version 2.0

INTRODUCTION

In 2010, the Sutter Butte Flood Control Agency (SBFCA) embarked on the Feather River West Levee (FRWL) Project. The project seeks to rehabilitate 44 miles of existing levee along the west bank of the Feather River through Sutter and Butte Counties. A geotechnical assessment of the levees has been completed and the potential mitigation measures to address the deficiencies in each reach has been analyzed by the design team. These alternatives are outlined in detail in the Project Pre-design Formulation Report (Reference 1). The design of the project is currently approaching the 60-percent level.

The purpose of this Memorandum is to provide the information requested by ICF International (Reference 3), for the purpose of preparing project CEQA/NEPA Analyses. Estimates of the quantity and duration of equipment usage, labor workforce, and materials necessary to construct each of the three project alternatives are provided within this Memorandum. Other information, including power consumption, estimate of the disturbed area, and other information requested in Reference No. 3 is also included. Version 2.0 of this project description addresses additional information requested by ICF/Jones and Stokes as discussed on Monday, January 9, 2012.

REFERENCES

1. HDR, Wood Rodgers, URS, and MHM, "Pre-design Formulation Report, Feather River West Levee – Segments 1 through 7, Sutter Butte Levee Rehabilitation Program, Sutter and Butte Counties, California," February 2011.

2. PBI, "Technical Memorandum, SBFCA Feather River West Levee Project, Preliminary Construction Project Prioritization Analysis," July 11, 2011.

3. ICF International, "Revised Data Requests for the Feather River West Levee Project EIS/EIR," September 30, 2011.

4. Wood Rodgers, Inc., SBFCA, "Feather River West Levee Project, Preliminary Assessment of Borrow Requirements and Potential Borrow Sites," August 12, 2011.

CONSTRUCTION PHASING

Outlined in Reference 2 are four projects corresponding to the likely construction contracts for construction of the overall project. The four projects, or Construction Contracts as referenced herein, and their respective areas for construction of the FRWL project, are identified in Table 1 below.

Table 1 – Construction Contracts and FRWL Reaches

Construction Contract	FRWL Reaches
A	2 Through 5
B	7 Through 11
C	13 Through 24
D	26 Through 41

It is noted that Reaches 6, 12, and 25 are no work reaches on the project. At the south end of the project, the work begins at Station 202+50, within Reach 2. Reach 1 is not currently a part of the Phase 1 Project.

ALTERNATIVES DESCRIPTION

For each of the Construction Contracts identified, there are three alternatives under consideration. The first alternative (Alternative 1) rehabilitates the levee primarily using cutoff walls such that the overall footprint of the levee is not expanded. This alternative is referred to within this memorandum as the "Minimized Footprint" alternative. The second alternative (Alternative 2) rehabilitates the levee using primarily seepage and stability berms, expanding the overall footprint of the existing levee. This alternative is referred to as the "Expanded Footprint" alternative. The third alternative (Alternative 3), rehabilitates the levee by selecting the lowest cost rehabilitation measure (whether a cutoff wall or a seepage berm) such that the overall cost of the project is minimized. This alternative is referred to in this memorandum as the "Optimized Footprint" alternative.

CONSTRUCTION SCHEDULE

Construction of the Project is anticipated to occur beginning in 2013 and continue through 2015. A total of four construction contracts are anticipated, issued in a sequence to match the priority ranking identified in Reference 2. Each of the contracts will be two years in duration. Table 2 below outlines the construction priority and years identified for construction.

Table 2 – Construction Priority and Years of Construction

Construction Contract	Years for Construction
C	2013 through 2014
D	2013 through 2014
B	2014 through 2015
A	2014 through 2015

For each construction season, the maximum window of work is anticipated to be May 1st through November 1st. This start date of construction corresponds to the end of the Giant Garter Snake (GGS) activity period, while November 1st marks the beginning of the flood season for the Sacramento River Flood Control Project. It may be the case that additional construction window restrictions on account of nesting raptors or early season (October) GGS activity may occur and are not accounted for in this analysis.

The construction of each contract is anticipated to occur in single 10 hour shifts, six days a week. An exception to this schedule is cutoff wall construction, which is anticipated to occur in two 10 hour shifts, (24-hour construction) six days a week. While production work will not occur between the two 10 hour shifts, equipment maintenance and preparations for the upcoming work shift will occur.

A construction schedule for each of the alternatives relating of each construction contract is included in Appendix A.

EQUIPMENT AND MANPOWER ESTIMATES

Within each project description outlined below, there are summary Tables for the equipment type, duration, and sequencing for each construction project alternative. The supporting calculations for these estimates are included as Appendix B of this memorandum.

POTENTIAL BORROW SITES

Up to eight potential borrow sites are identified within Reference 4 above for the Project. Location maps for the borrow areas within Yuba City and Live Oak are provided as Figures 1 and 2. It may be the case that additional borrow sites not currently identified are eventually identified and used as sources of borrow for this Project. For the purposes of this memorandum, it is assumed any additional sites are a similar distance to the work areas and require similar equipment and manpower to excavate, borrow, and haul material to the levee rehabilitation sites. The acreage of the primary borrow sites included in Reference 4, are as follows in Table 3 below:

Table 3 – Borrow Site Acreage

Borrow Site	Area, Acres
Yuba City North	28
Yuba City South	70
Live Oak North	34
Live Oak South	28
Live Oak East	13
Live Oak West	7
Caltrans Property	26

RIGHT-OF-WAY AND EASEMENTS

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 right vary significantly throughout the project. One objective of the project is to upgrade these rights so that the State and local maintaining agencies have appropriate and consistent land rights throughout the length to operate and maintain the levee system. To this end, SBFCA has coordinated with the Central Valley Flood Protection Board (CVFPB) and Department of Water Resources (DWR) to acquire the following rights-of-way for the project:

- Waterside: 15 feet
- Landside: 30 feet minimum, 40 feet 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 will upgrade the rights to fee ownership.

For the waterside right-of-way, and the first 20 feet of the 30 feet to be obtained landward of the levee, existing trees and encroachments will be removed to the extent necessary to facilitate construction of the project and to support long term operation and maintenance of the project. It may be the case that some trees, structures, and other encroachments are not removed from the rights-of-way. These encroachments will be addressed on a case by case basis during final design of the project.

The outer ten feet of the landside easement will be granted in easement back to the existing landowner and will be allowed to be used for agricultural purposes following construction of the project.

Staging areas will only be provided within the right-of-way and easement limits described above. The contractor may reach agreements with landowners for additional staging locations outside of

these limits. Staging areas may be used by the contractor for storage of equipment and materials, project offices, employee parking, and other uses needed for construction of the project.

Cutoff wall construction requires temporary establishment of an on-site slurry batch plant that would occupy about 1 to 2 acres. Batch plants will be located at approximately 1-mile intervals along the levee. The batch plant site would likely contain tanks for water storage, bulk bag supplies of bentonite, bentonite and cement 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.

MATERIALS DELIVERY AND OFF HAULING

Typical deliveries and off hauling for each project includes bentonite powder, used for making cutoff wall trench slurry and backfill, pipe delivery for irrigation pipe relocation and replacement, aggregate road surfacing, and demolition debris off hauling. For backfill of new pipelines crossing the levee, Controlled Low Strength Material (CLSM), otherwise referred to as light-weight concrete, is required to be placed to the pipeline's spring line. A table is included for each project alternative summarizing the total number of materials deliveries and off hauling associated with the project. The calculations for deliveries and debris hauling for encroachments is included as Appendix C.

PROJECT A, REACHES 1 THROUGH 5

Project A of the FRWL begins at Levee Station 202+50 near the intersection of the FRWL 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 FRWL project is 27,618 linear feet.

Alternative 1 would construct a cutoff wall ranging between 30 feet and 127 feet in depth along the centerline of the levee. To facilitate construction of the cutoff wall and to maintain stability of the levee, the levee will be degraded approximately 50% of its overall height with 2,900 feet of the levee being fully degraded. The cutoff wall would be constructed of soil-bentonite by either the conventional, long-reach excavator or the deep soil mixing (DSM) method. After installation of the cutoff wall, the levee will be reconstructed to its original configuration. In addition to the cutoff wall, Alternative 1 would construct a 200-foot wide seepage berm for 2,268 feet. Work for this alternative is to include levee stripping, clearing and grubbing, borrow site preparation, levee degrading, cutoff wall installation, levee reconstruction and seepage berm

construction, borrow site excavation, utility relocation and reconstruction, levee resurfacing, hydroseeding, and demobilization and clean-up.

The total disturbed area for Alternative 1, including staging and construction easement areas, is 137.1 acres.

The crew size for Alternative 1 during the peak is estimated at 115-125 people working on two fronts, 10-hour shifts, 2 shifts per day, six days a week. For a listing of the anticipated equipment and construction durations for this work, see Table 4. The anticipated material quantities associated with this alternative is included in Table 5. The total number of anticipated trucks for materials delivery and off hauling is included in Table 6.

Table 4
Anticipated Equipment and Durations for Project A
Alternative 1 – Minimized Footprint Alternative

Construction Phase	Number of Each Equipment Type	Duration of Use
1. Clearing and Grubbing/ Stripping	(8) Elevating Scrapers	20 Days
	(2) Water Trucks	20 Days
	(4) Front-End Loaders	20 Days
	(2) Haul Trucks	20 Days
	(5) Pickup Trucks	20 Days
2. Borrow Site Preparation (Concurrent with 1.)	(2) Tractors with Discing Equipment	20 Days
	(2) Elevating Scrapers	20 Days
	(1) Water Truck	20 Days
3. Levee Degrading/ Work Surface Construction (Lags 1. by 15 days)	(3) Excavators	40 Days
	(15) Scrapers	40 Days
	(5) Vibratory Rollers	40 Days
	(3) Water Trucks	40 Days
	(7) Haul Trucks	40 Days
4. Cutoff Wall Construction (Lags 3. by 22 days)	(4) Hydraulic Excavators	60 Days
	(2) Front-End Loaders	60 Days
	(1) DSM Auger	60 Days
	(1) Extended Boom Pallet Loader	60 Days
	(3) 300 kW Generators	60 Days
	(2) Slurry Pumps	60 Days
	(5) Pickup Trucks	60 Days
	(3) Haul Trucks	60 Days
	(2) Water Trucks	60 Days

Construction Phase	Number of Each Equipment Type	Duration of Use
5. Levee Reconstruction/ Seepage Berm Construction (Lags 4. by 25 days)	(20) Scrapers	60 Days
	(2) Motor Graders	60 Days
	(5) Vibratory Rollers	60 Days
	(3) Water Trucks	60 Days
6. Borrow Site Excavation (Concurrent with 5.)	(2) Front-End Loaders	60 Days
	(2) Excavators	60 Days
	(2) Water Trucks	60 Days
	(50) Haul Trucks	60 Days
7. Utility Reconstruction	(2) Backhoes	100 Days
	(2) Front End Loaders	100 Days
	(2) Rubber Tire Crane	100 Days
	(3) Pickup trucks	100 Days
	(2) Water Trucks	100 Days
8. Levee Resurfacing (Follows 5.)	(2) Motor Graders	22 Days
	(2) Vibratory Rollers	22 Days
	(2) Haul Trucks	22 Days
	(1) Water Truck	22 Days
	(2) Motor Graders	22 Days
9. Hydroseeding (Concurrent with 8.)	(2) Hydroseeding Trucks	18 Days
10. Demobilization/Cleanup (Lags 9. by 5 days)	(1) Extended Boom Pallet Loader	18 Days
	(2) Haul Trucks	18 Days

Table 5
Anticipated Major Materials Quantities for Project A
Alternative 1 – Minimized Footprint Alternative

Description	Quantity
Clearing and Grubbing	83.5 Acres
Levee Embankment Degrade	602,400 Cubic Yards
SB Cutoff Wall	1,457,000 Square Feet
Levee Embankment Fill	782,000 Cubic Yards
Borrow Site Excavation	244,000 Cubic Yards
Unsuitable Material Export	31,500 Cubic Yards
Class 2 Aggregate Surfacing	13,100 Tons

Table 6
Number of Trucks for Materials Delivery and Off Hauling – Project A, Alternative 1

Bentonite	Aggregate Surfacing	Pipe Material	Demolition Debris	CLSM Backfill
89	425	8	60	26

Alternative 2 would construct an undrained seepage berm ranging between 100 feet and 300 feet in width along the landside toe of the levee. Additionally, an 8-foot high stability berm would be constructed along 20,817 feet of the project. Also, a shallow cutoff wall 20 feet in depth would be constructed along the levee centerline for 1,616 feet of the project. To facilitate construction of the cutoff wall and to maintain stability of the levee, the levee will be degraded approximately 50% of its overall height. The cutoff wall would be constructed of soil-bentonite by the conventional, long-reach excavator method. After installation of the cutoff wall, the levee will be reconstructed to its original configuration. Work for this alternative is to include levee stripping, clearing and grubbing, borrow site preparation, levee degrading, cutoff wall installation, levee reconstruction, seepage and stability berm construction, borrow site excavation, utility relocation and reconstruction, levee resurfacing, hydroseeding, and demobilization and clean-up.

The total disturbed area for Alternative 2, including staging and construction easement areas, is 259.1 acres.

The crew size for Alternative 2 during the peak is estimated at 195-205 people working one 10-hour shift, 2 shifts per day, six days a week. For a listing of the anticipated equipment and construction durations for this work, see Table 7. For a listing of the anticipated material quantities associated with this alternative, see Table 8. The total number of anticipated trucks for materials delivery and off hauling is included in Table 9.

Table 7
Anticipated Equipment and Durations for Project A,
Alternative 2 – Expanded Footprint Alternative

Construction Phase	Number of Each Equipment Type	Duration of Use
1. Clearing and Grubbing/ Stripping	(8) Elevating Scrapers	40 Days
	(2) Water Trucks	40 Days
	(4) Front-End Loaders	40 Days
	(2) Haul Trucks	40 Days
	(5) Pickup Trucks	40 Days
2. Borrow Site Preparation (Concurrent with 1.)	(4) Tractors with Discing Equipment	22 Days
	(4) Elevating Scrapers	22 Days
	(2) Water Truck	22 Days

Construction Phase	Number of Each Equipment Type	Duration of Use
3. Levee Degrading/ Work Surface Construction (Follows 1.)	(1) Excavators	10 Days
	(2) Scrapers	10 Days
	(2) Vibratory Rollers	10 Days
	(1) Water Trucks	10 Days
	(2) Haul Trucks	10 Days
4. Cutoff Wall Construction (Follows 3.)	(2) Hydraulic Excavators	10 Days
	(1) Front-End Loaders	10 Days
	(1) Extended Boom Pallet Loader	10 Days
	(2) 300 kW Generators	10 Days
	(1) Slurry Pumps	10 Days
	(3) Pickup Trucks	10 Days
	(2) Haul Trucks	10 Days
	(1) Water Trucks	10 Days
5. Levee Reconstruction/ Seepage and Stability Berm Construction (Lags 2. by 15 days)	(25) Scrapers	180 Days
	(5) Motor Graders	180 Days
	(2) Hydraulic Excavators	180 Days
	(5) Vibratory Rollers	180 Days
	(4) Water Trucks	180 Days
6. Borrow Site Excavation (Concurrent with 5.)	(4) Front-End Loaders	170 Days
	(4) Excavators	170 Days
	(4) Water Trucks	170 Days
	(85) Haul Trucks	170 Days
7. Utility Reconstruction	(2) Backhoes	115 Days
	(2) Rubber Tire Crane	115 Days
	(2) Front End Loaders	115 Days
	(3) Pickup trucks	115 Days
	(2) Water Trucks	115 Days
8. Levee Resurfacing (Follows 5.)	(1) Motor Graders	5 Days
	(1) Vibratory Rollers	5 Days
	(2) Haul Trucks	5 Days
	(1) Water Truck	5 Days
9. Hydroseeding (Follows 5.)	(2) Hydroseeding Trucks	20 Days
10. Demobilization/Cleanup (Lags 9. by 5 days)	(1) Extended Boom Pallet Loader	22 Days
	(2) Haul Trucks	22 Days

Table 8
Anticipated Major Materials Quantities for Project A,
Alternative 2 – Expanded Footprint Alternative

Description	Quantity
Clearing and Grubbing	183.1 Acres
Levee Embankment Degrade	16,500 Cubic Yards
SB Cutoff Wall	13,500 Square Feet
Levee Embankment Fill	1,373,000 Cubic Yards
Borrow Site Excavation	1,628,000 Cubic Yards
Unsuitable Material Export	75 Cubic Yards
Class 2 Aggregate Surfacing	1,425 Tons

Table 9
Number of Trucks for Materials Delivery and Off Hauling – Project A, Alternative 2

Bentonite	Aggregate Surfacing	Pipe Material	Demolition Debris	CLSM Backfill
1	50	8	60	26

Alternative 3 would construct a cutoff wall ranging between 20 feet and 127 feet in depth along the centerline of the levee. To facilitate construction of the cutoff wall and to maintain stability of the levee, the levee will be degraded approximately 50% of its overall height. The cutoff wall would be constructed of soil-bentonite by either the conventional, long-reach excavator or the deep soil mixing (DSM) method. After installation of the cutoff wall, the levee will be reconstructed to its original configuration. 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. Work for this alternative is to include levee stripping, clearing and grubbing, borrow site preparation, levee degrading, cutoff wall installation, levee reconstruction and seepage berm construction, borrow site excavation, utility relocation and reconstruction, levee resurfacing, hydroseeding, and demobilization and clean-up.

The total disturbed area for Alternative 3, including staging and construction easement areas, is 142.4 acres.

The crew size for Alternative 3 during the peak is estimated at 115-125 people working on two fronts, 10-hour shifts, 2 shifts per day, six days a week. For a listing of the anticipated equipment and construction durations for this work, see Table 10. For a listing of the anticipated material quantities associated with this alternative, see Table 11. The total number of anticipated trucks for materials delivery and off hauling is included in Table 12.

Table 10
Anticipated Equipment and Duration for Project A,
Alternative 3 – Optimized Footprint Alternative

Construction Phase	Number of Each Equipment Type	Duration of Use
1. Clearing and Grubbing/ Stripping	(8) Elevating Scrapers	40 Days
	(2) Water Trucks	40 Days
	(4) Front-End Loaders	40 Days
	(5) Pickup Trucks	40 Days
2. Borrow Site Preparation (Concurrent with 1.)	(2) Tractors with Discing Equipment	60 Days
	(2) Elevating Scrapers	60 Days
	(1) Water Truck	60 Days
3. Levee Degrading/ Work Surface Construction (Lags 1. by 15 days)	(3) Excavators	100 Days
	(15) Scrapers	100 Days
	(5) Vibratory Rollers	100 Days
	(3) Water Trucks	100 Days
	(7) Haul Trucks	100 Days
4. Cutoff Wall Construction (Lags 3. by 15 days)	(5) Hydraulic Excavators	60 Days
	(2) Front-End Loaders	60 Days
	(1) DSM Auger	30 Days
	(1) Extended Boom Pallet Loader	60 Days
	(4) 300 kW Generators	60 Days
	(2) Slurry Pumps	60 Days
	(5) Pickup Trucks	60 Days
	(3) Haul Trucks	60 Days
	(2) Water Trucks	60 Days
5. Levee Reconstruction/ Seepage and Stability Berm Construction (Lags 4. by 25 days)	(20) Scrapers	60 Days
	(2) Motor Graders	60 Days
	(5) Vibratory Rollers	60 Days
	(3) Water Trucks	60 Days
6. Borrow Site Excavation (Concurrent with 5.)	(2) Front-End Loaders	50 Days
	(2) Hydraulic Excavators	50 Days
	(2) Water Trucks	50 Days
	(50) Haul Trucks	50 Days
7. Utility Reconstruction	(2) Backhoes	130 Days
	(2) Rubber Tire Crane	130 Days
	(2) Front End Loaders	130 Days
	(3) Pickup trucks	130 Days
	(2) Water Trucks	130 Days

Construction Phase	Number of Each Equipment Type	Duration of Use
8. Levee Resurfacing (Follows 5.)	(2) Motor Graders	24 Days
	(2) Vibratory Rollers	24 Days
	(2) Haul Trucks	24 Days
	(1) Water Truck	24 Days
9. Hydroseeding (Concurrent with 8.)	(2) Hydroseeding Trucks	24 Days
10. Demobilization/Cleanup (Lags 9. by 5 days)	(1) Extended Boom Pallet Loader	24 Days
	(2) Haul Trucks	24 Days

Table 11
Anticipated Major Materials Quantities for Project A, Alternative 3 – Optimized Footprint Alternative

Description	Quantity
Clearing and Grubbing	87.2 Acres
Levee Embankment Degrade	548,000 Cubic Yards
SB Cutoff Wall	1,272,000 Square Feet
Levee Embankment Fill	759,700 Cubic Yards
Borrow Site Excavation	276,250 Cubic Yards
Unsuitable Material Export	25,750 Cubic Yards
Class 2 Aggregate Surfacing	10,000 Tons

Table 12
Number of Trucks for Materials Delivery and Off Hauling – Project A, Alternative 3

Bentonite	Aggregate Surfacing	Pipe Material	Demolition Debris	CLSM Backfill
78	350	8	60	26

PROJECT B, REACHES 7 THROUGH 11

Project B of the FRWL begins at Levee Station 510+37, the end of the improvements constructed as part of the Star Bend Setback Levee project, and continues north Levee Station 830+00. The total length of the levee in this portion of the FRWL project is 31,963 linear feet. Three alternatives have been reviewed as part of the Feather River West Levee Pre-Design Formulation Report. 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. 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. Alternative 3 is an optimized alternative, combining mitigation measures from both Alternative 1 and Alternative 2 to produce the most economically feasible project. For Project B, the most economically feasible project is

to construct a cutoff wall along the centerline of the existing levee. Therefore, Alternative 1 and Alternative 3 are the same for this project.

Alternative 1 would construct a cutoff wall ranging between 39 feet and 124 feet in depth along the centerline of the levee. To facilitate construction of the cutoff wall and to maintain stability of the levee, the levee will be degraded approximately 50% of its overall height with 1,900 feet of the levee being fully degraded. The cutoff wall would be constructed of soil-bentonite by either the conventional, long-reach excavator or the deep soil mixing (DSM) method. After installation of the cutoff wall, the levee will be reconstructed to its original configuration. Work for this alternative is to include levee stripping, clearing and grubbing, borrow site preparation, levee degrading, cutoff wall installation, levee reconstruction, borrow site excavation, utility relocation and reconstruction, levee resurfacing, hydroseeding, and demobilization and clean-up. SBFCA will 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 will be obtained where required for the relocation of existing utilities. The total disturbed area for Alternative 1, including staging and construction easement areas, is 155.1 acres.

The crew size for Alternative 1 during the peak is estimated at 110-120 people working on two fronts, 10-hour shifts, 2 shifts per day, six days a week. For a listing of the anticipated equipment and construction durations for this work, see Table 13. For a listing of the anticipated material quantities associated with this alternative, see Table 14. The total number of anticipated trucks for materials delivery and off hauling is included in Table 15.

Table 13
Anticipated Equipment and Duration for Project B,
Alternative 1 – Minimized Footprint Alternative

Construction Phase	Number of Each Equipment Type	Duration of Use
1. Clearing and Grubbing/ Stripping	(8) Elevating Scrapers	40 Days
	(2) Water Trucks	40 Days
	(4) Front-End Loaders	40 Days
	(5) Pickup Trucks	40 Days
2. Borrow Site Preparation (Concurrent with 1.)	(2) Tractors with Discing Equipment	60 Days
	(2) Elevating Scrapers	60 Days
	(1) Water Truck	60 Days
3. Levee Degrading/ Work Surface Construction (Lags 1. by 14 days)	(3) Excavators	80 Days
	(15) Scrapers	80 Days
	(5) Vibratory Rollers	80 Days
	(3) Water Trucks	80 Days
	(7) Haul Trucks	80 Days

Construction Phase	Number of Each Equipment Type	Duration of Use
4. Cutoff Wall Construction (Lags 3. by 14 days)	(4) Hydraulic Excavators	50 Days
	(2) Front-End Loaders	50 Days
	(2) DSM Auger	50 Days
	(1) Extended Boom Pallet Loader	50 Days
	(4) 300 kW Generators	50 Days
	(2) Slurry Pumps	50 Days
	(5) Pickup Trucks	50 Days
	(3) Haul Trucks	50 Days
	(2) Water Trucks	50 Days
5. Levee Reconstruction (Follows 4.)	(20) Scrapers	80 Days
	(2) Motor Graders	80 Days
	(5) Vibratory Rollers	80 Days
	(3) Water Trucks	80 Days
6. Borrow Site Excavation (Concurrent with 5.)	(2) Front-End Loaders	80 Days
	(2) Hydraulic Excavators	80 Days
	(2) Water Trucks	80 Days
	(50) Haul Trucks	80 Days
7. Utility Reconstruction	(2) Backhoes	130 Days
	(2) Rubber Tire Crane	130 Days
	(2) Front End Loaders	130 Days
	(3) Pickup trucks	130 Days
	(2) Water Trucks	130 Days
8. Levee Resurfacing (Follows 5.)	(2) Motor Graders	20 Days
	(2) Vibratory Rollers	20 Days
	(2) Haul Trucks	20 Days
	(1) Water Truck	20 Days
9. Hydroseeding (Concurrent with 8.)	(2) Hydroseeding Trucks	20 Days
10. Demobilization/Cleanup (Lags 9. by 10 days)	(1) Extended Boom Pallet Loader	15 Days
	(2) Haul Trucks	15 Days

Table 14
Anticipated Major Materials Quantities for FRWL, Project B,
Alternative 1 – Minimized Footprint Alternative

Description	Quantity
Clearing and Grubbing	94.1 Acres
Levee Embankment Degrade	931,900 Cubic Yards
SB Cutoff Wall	1,948,500 Square Feet
Levee Embankment Fill	1,086,500 Cubic Yards

Description	Quantity
Borrow Site Excavation	796,750 Cubic Yards
Unsuitable Material Export	520,250 Cubic Yards
Class 2 Aggregate Surfacing	12,000 Tons

Table 15
Number of Trucks for Materials Delivery and Off Hauling – Project B, Alternative 1

Bentonite	Aggregate Surfacing	Pipe Material	Demolition Debris	CLSM Backfill
119	400	17	36	36

Alternative 2 would construct an undrained seepage berm ranging between 110 feet and 300 feet in width along the landside toe of the levee. Additionally, 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. To facilitate construction of the cutoff wall and to maintain stability of the levee, the levee will be degraded approximately 50% of its overall height. The cutoff wall would be constructed of soil-bentonite by the conventional, long-reach excavator method. After installation of the cutoff wall, the levee will be reconstructed to its original configuration. A portion of the existing Garden Highway will need to be removed and reconstructed to allow construction of the seepage berm. Work for this alternative is to include levee stripping, clearing and grubbing, borrow site preparation, levee degrading, cutoff wall installation, levee reconstruction, seepage and stability berm construction, borrow site excavation, utility relocation and reconstruction, roadway reconstruction, levee resurfacing, hydroseeding, and demobilization and clean-up.

The total disturbed area for Alternative 2, including staging and construction easement areas, is 331.8 acres.

The crew size for Alternative 2 during the peak is estimated at 190-200 people working one 10-hour shift, 2 shifts per day, six days a week. For a listing of the anticipated equipment and construction durations for this work, see Table 16. For a listing of the anticipated material quantities associated with this alternative, see Table 17. The total number of anticipated trucks for materials delivery and off hauling is included in Table 18.

Table 16
Anticipated Equipment and Duration for Project B,
Alternative 2 – Expanded Footprint Alternative

Construction Phase	Number of Each Equipment Type	Duration of Use
1. Clearing and Grubbing/ Stripping	(8) Elevating Scrapers	40 Days
	(2) Water Trucks	40 Days
	(4) Front-End Loaders	40 Days
	(5) Pickup Trucks	40 Days
2. Borrow Site Preparation (Concurrent with 1.)	(4) Tractors with Discing Equipment	50 Days
	(4 Elevating Scrapers	50 Days
	(2) Water Truck	50 Days
3. Levee Degrading/ Work Surface Construction (Follows 1.)	(1) Excavators	22 Days
	(2) Scrapers	22 Days
	(2) Vibratory Rollers	22 Days
	(1) Water Trucks	22 Days
	(6) Haul Trucks	22 Days
4. Cutoff Wall Construction (Lags 3. by 15 days)	(4) Hydraulic Excavators	50 Days
	(1) Front-End Loaders	50 Days
	(1) Extended Boom Pallet Loader	50 Days
	(2) 300 kW Generators	50 Days
	(2) Slurry Pumps	50 Days
	(3) Pickup Trucks	50 Days
	(2) Haul Trucks	50 Days
	(1) Water Trucks	50 Days
5. Levee Reconstruction/ Seepage and Stability Berm Construction (Lags 2. by 15 days)	(25) Scrapers	145 Days
	(5) Motor Graders	145 Days
	(5) Vibratory Rollers	145 Days
	(4) Water Trucks	145 Days
6. Borrow Site Excavation (Concurrent with 5.)	(4) Front-End Loaders	145 Days
	(2) Hydraulic Excavators	145 Days
	(4) Water Trucks	145 Days
	(85) Haul Trucks	145 Days
7. Utility Reconstruction	(2) Backhoes	130 Days
	(2) Rubber Tire Crane	130 Days
	(2) Front End Loaders	130 Days
	(3) Pickup trucks	130 Days
	(2) Water Trucks	130 Days

Construction Phase	Number of Each Equipment Type	Duration of Use
8. Roadway Reconstruction (Follows 5.)	(2) Motor Graders	40 Days
	(1) Paving Machine	40 Days
	(2) Vibratory Rollers	40 Days
	(4) Haul Trucks	40 Days
	(1) Water Truck	40 Days
9. Levee Resurfacing (Follows 5.)	(2) Motor Graders	20 Days
	(1) Vibratory Rollers	20 Days
	(1) Haul Trucks	20 Days
	(1) Water Truck	20 Days
10. Hydroseeding (Concurrent with 8.)	(2) Hydroseeding Trucks	20 Days
11. Demobilization/Cleanup (Lags 9. by 10 days)	(1) Extended Boom Pallet Loader	15 Days
	(2) Haul Trucks	15 Days

Table 17
Anticipated Major Materials Quantities for Project B, Alternative 2 – Expanded Footprint Alternative

Description	Quantity
Clearing and Grubbing	272.3 Acres
Levee Embankment Degrade	484,000 Cubic Yards
SB Cutoff Wall	504,500 Square Feet
Levee Embankment Fill	2,406,000 Cubic Yards
Borrow Site Excavation	2,334,500 Cubic Yards
Unsuitable Material Export	22,000 Cubic Yards
Class 2 Aggregate Surfacing	6,500 Tons

Table 18
Number of Trucks for Materials Delivery and Off Hauling – Project B, Alternative 2

Bentonite	Aggregate Surfacing	Pipe Material	Demolition Debris	CLSM Backfill
31	225	17	36	36

Alternative 3 would construct a cutoff wall ranging between 39 feet and 124 feet in depth along the centerline of the levee. To facilitate construction of the cutoff wall and to maintain stability of the levee, the levee will be degraded approximately 50% of its overall height with 1,900 feet of the levee being fully degraded. The cutoff wall would be constructed of soil-bentonite by either the conventional, long-reach excavator or the deep soil mixing (DSM) method. After installation of the cutoff wall, the levee will be reconstructed to its original configuration. Work

for this alternative is to include levee stripping, clearing and grubbing, borrow site preparation, levee degrading, cutoff wall installation, levee reconstruction, borrow site excavation, utility relocation and reconstruction, levee resurfacing, hydroseeding, and demobilization and clean-up.

The total disturbed area for Alternative 3, including staging and construction easement areas, is 155.1 acres.

The crew size for Alternative 3 during the peak is estimated at 110-120 people working on two fronts, 10-hour shifts, 2 shifts per day, six days a week. For a listing of the anticipated equipment and construction durations for this work, see Table 19. For a listing of the anticipated material quantities associated with this alternative, see Table 20. The total number of anticipated trucks for materials delivery and off hauling is included in Table 21.

Table 19
Anticipated Equipment and Duration for Project B,
Alternative 3 – Optimized Footprint Alternative

Construction Phase	Number of Each Equipment Type	Duration of Use
1. Clearing and Grubbing/ Stripping	(8) Elevating Scrapers	40 Days
	(2) Water Trucks	40 Days
	(4) Front-End Loaders	40 Days
	(5) Pickup Trucks	40 Days
2. Borrow Site Preparation (Concurrent with 1.)	(2) Tractors with Discing Equipment	60 Days
	(2) Elevating Scrapers	60 Days
	(1) Water Truck	60 Days
3. Levee Degrading/ Work Surface Construction (Lags 1. by 14 days)	(3) Excavators	45 Days
	(15) Scrapers	45 Days
	(5) Vibratory Rollers	45 Days
	(3) Water Trucks	45 Days
	(7) Haul Trucks	45 Days
4. Cutoff Wall Construction (Lags 3. by 14 days)	(4) Hydraulic Excavators	80 Days
	(2) Front-End Loaders	80 Days
	(2) DSM Augers	30 Days
	(1) Extended Boom Pallet Loader	80 Days
	(4) 300 kW Generators	80 Days
	(2) Slurry Pumps	80 Days
	(5) Pickup Trucks	80 Days
	(3) Haul Trucks	80 Days
	(2) Water Trucks	80 Days

Construction Phase	Number of Each Equipment Type	Duration of Use
5. Levee Reconstruction (Lags 4. by 21 days)	(20) Scrapers	85 Days
	(2) Motor Graders	85 Days
	(5) Vibratory Rollers	85 Days
	(3) Water Trucks	85 Days
6. Borrow Site Excavation (Concurrent with 5.)	(2) Hydraulic Excavators	95 Days
	(2) Front-End Loaders	95 Days
	(2) Water Trucks	95 Days
	(50) Haul Trucks	95 Days
7. Utility Reconstruction	(2) Backhoes	130 Days
	(2) Rubber Tire Crane	130 Days
	(2) Front End Loaders	130 Days
	(5) Pickup trucks	130 Days
	(2) Water Trucks	130 Days
8. Levee Resurfacing (Lags 5. by 96 days)	(2) Motor Graders	22 Days
	(2) Vibratory Rollers	22 Days
	(2) Haul Trucks	22 Days
	(1) Water Truck	22 Days
9. Hydroseeding (Concurrent with 8.)	(2) Hydroseeding Trucks	20 Days
10. Demobilization/Cleanup (Lags 9. by 10 days)	(1) Extended Boom Pallet Loader	18 Days
	(2) Haul Trucks	18 Days

Table 20
Anticipated Major Materials Quantities for Project B,
Alternative 3 – Optimized Footprint Alternative

Description	Quantity
Clearing and Grubbing	94.1 Acres
Levee Embankment Degrade	931,900 Cubic Yards
SB Cutoff Wall	1,948,500 Square Feet
Levee Embankment Fill	1,086,500 Cubic Yards
Borrow Site Excavation	796,750 Cubic Yards
Unsuitable Material Export	520,250 Cubic Yards
Class 2 Aggregate Surfacing	12,000 Tons

Table 21
Number of Trucks for Materials Delivery and Off Hauling – Project B, Alternative 3

Bentonite	Aggregate Surfacing	Pipe Material	Demolition Debris	CLSM Backfill
119	400	17	36	36

PROJECT C, REACHES 13 THROUGH 24

Project C begins at Levee Station 845+00, near the north end of the Shanghai Bend Setback Levee, and continues north to Levee Station 1623+86 (corresponding to Reaches 13 through 24). The total length of the levee in this portion of the FRWL project is 77,886 linear feet.

Three alternatives have been reviewed as part of the Feather River West Levee Pre-Design Formulation Report. Alternative 1 would include the flattening of the waterside levee slope, the construction of a cutoff wall along the centerline of the existing levee to a varying depth, and the infilling of depressions and ditches at the landside levee toe. Alternative 2 would include a combination of seepage and stability berms along the landside toe of the levee, relief wells along the landside toe of the levee and shallow cutoff walls along the centerline of the levee for portions of the project. Alternative 3 is an optimized alternative, combining mitigation measures from both Alternative 1 and Alternative 2 to produce the most economically feasible project.

All three alternatives will require special consideration at the locations where the 5th Street bridge, State Highway 20 bridge, and the Union Pacific Railroad (UPRR) cross the levee. At these locations, soil-cement-bentonite cutoff walls will be constructed by either the Trench Remixing, Deep (TRD), jet grouting, or steel sheet pile method to a depth of approximately 31 to 53 feet. All three methods have similar crew sizes and equipment impacts, which are summarized in the cutoff wall section of the estimated equipment and duration table below.

Alternative 1 would construct a cutoff wall ranging between 21 and 105 feet in depth along the centerline of the levee. To facilitate construction of the cutoff wall and to maintain stability of the levee, the levee will be degraded approximately 50% of its overall height with approximately 2,600 feet of the levee being fully degraded. The cutoff wall would be constructed of soil-bentonite by either the conventional long-reach excavator or the deep mix method (DMM). After installation of the cutoff wall, the levee will be reconstructed to its original configuration. 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. Work for this alternative is to include levee stripping, clearing and grubbing, borrow site preparation, levee degrading, cutoff wall installation, levee reconstruction and seepage berm construction, relief well installation, borrow site excavation, utility relocation and reconstruction, levee resurfacing, hydroseeding, and demobilization and clean-up.

The total disturbed area for Alternative 1, including staging and construction easement areas, is 187.3 acres.

The crew size for Alternative 1 during the peak is estimated at 150-160 people working on three to four fronts, 10-hour shifts, 2 shifts per day for cutoff wall construction, and six days a week. For a listing of the anticipated equipment and construction durations for this work, see Table 22. For a listing of the anticipated material quantities associated with this alternative, see Table 23. The total number of anticipated trucks for materials delivery and off hauling is included in Table 24.

Table 22
Anticipated Equipment and Duration for Project C,
Alternative 1 – Minimized Footprint Alternative

Construction Phase	Number of Each Equipment Type	Duration of Use
1. Clearing and Grubbing/ Stripping	(4) Elevating Scrapers	40 Days
	(2) Water Trucks	40 Days
	(2) Front-End Loaders	40 Days
	(4) Pickup Trucks	40 Days
2. Borrow Site Preparation (Concurrent with 1.)	(2) Tractors with Discing Equipment	60 Days
	(2) Elevating Scrapers	60 Days
	(1) Water Truck	60 Days
3. Levee Degrading/ Work Surface Construction (Lags 1. by 7 days)	(3) Excavators	35 Days
	(14) Scrapers	35 Days
	(5) Vibratory Rollers	35 Days
	(4) Water Trucks	35 Days
	(7) Haul Trucks	35 Days
4. Cutoff Wall Construction (Lags 3. by 7 days)	(8) Hydraulic Excavators	60 Days
	(4) Front-End Loaders	60 Days
	(2) DSM Auger	60 Days
	(1) Extended Boom Pallet Loader	60 Days
	(6) 300 kW Generators	60 Days
	(4) Slurry Pumps	60 Days
	(6) Pickup Trucks	60 Days
	(3) Haul Trucks	60 Days
	(2) Water Trucks	60 Days
5. Levee Reconstruction/ Seepage Berm Construction (Lags 4. by 22 days)	(10) Scrapers	130 Days
	(2) Motor Graders	130 Days
	(5) Tractors with Discing Equipment	130 Days
	(5) Vibratory Rollers	130 Days
	(3) Water Trucks	130 Days

Construction Phase	Number of Each Equipment Type	Duration of Use
6. Borrow Site Excavation (Concurrent with 5.)	(2) Front-End Loaders	130 Days
	(2) Water Trucks	130 Days
	(75) Haul Trucks	130 Days
7. Utility Reconstruction	(1) Hydraulic Excavator	130 Days
	(1) Haul Trucks	130 Days
	(2) Pickup Trucks	130 Days
	(1) Water Trucks	130 Days
8. Levee Resurfacing (Follows 5.)	(2) Motor Graders	24 Days
	(2) Vibratory Rollers	24 Days
	(2) Haul Trucks	24 Days
	(1) Water Truck	24 Days
9. Hydroseeding (Concurrent with 8.)	(2) Hydroseeding Trucks	24 Days
	(2) Pickup Trucks	24 Days
10. Demobilization/Cleanup (Follows 9.)	(1) Extended Boom Pallet Loader	20 Days
	(2) Haul Trucks	20 Days

Table 23
Anticipated Major Materials Quantities for Project C, Alternative 1 – Minimized Footprint Alternative

Description	Quantity
Clearing and Grubbing	187.3 Acres
Levee Embankment Degrade	882,800 Cubic Yards
SB Cutoff Wall	3,137,100 Square Feet
Levee Embankment Fill	1,410,000 Cubic Yards
Borrow Site Excavation	531,300 Cubic Yards
Unsuitable Material Export	253,100 Cubic Yards
Class 2 Aggregate Surfacing	40,600 Tons

Table 24
Number of Trucks for Materials Delivery and Off Hauling – Project C, Alternative 1

Bentonite	Aggregate Surfacing	Pipe Material	Demolition Debris	CLSM Backfill
191	1500	31	160	104

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 will 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 will be degraded by approximately 50% of its overall height. The cutoff wall would be constructed of soil-bentonite by the conventional, long-reach excavator method. After installation of the cutoff wall, the levee will be reconstructed to its original configuration. Work for this alternative is to include levee stripping, clearing and grubbing, borrow site preparation, levee degrading, cutoff wall installation, levee reconstruction, seepage and stability berm construction, relief well construction, borrow site excavation, utility relocation and reconstruction, levee resurfacing, hydroseeding, and demobilization and clean-up.

The total disturbed area for Alternative 2, including staging and construction easement areas, is 344.9 acres.

The crew size for Alternative 2 during the peak is estimated at 200-210 people working on two fronts, 10-hour shifts, 2 shifts per day for cutoff wall construction, and six days a week. For a listing of the anticipated equipment and construction durations for this work, see Table 25. For a listing of the anticipated material quantities associated with this alternative, see Table 26. The total number of anticipated trucks for materials delivery and off hauling is included in Table 27.

Table 25
Anticipated Equipment and Duration for Project C,
Alternative 2 – Expanded Footprint Alternative

Construction Phase	Number of Each Equipment Type	Duration of Use
1. Clearing and Grubbing/ Stripping	(13) Elevating Scrapers	30 Days
	(7) Water Trucks	30 Days
	(7) Front-End Loaders	30 Days
	(13) Pickup Trucks	30 Days
2. Borrow Site Preparation (Concurrent with 1.)	(4) Tractors with Discing Equipment	60 Days
	(4) Elevating Scrapers	60 Days
	(2) Water Truck	60 Days
3. Levee Degrading/ Work Surface Construction (Lags 1. by 4 days)	(3) Excavators	20 Days
	(14) Scrapers	20 Days
	(5) Vibratory Rollers	20 Days
	(4) Water Trucks	20 Days
	(7) Haul Trucks	20 Days

Construction Phase	Number of Each Equipment Type	Duration of Use
4. Cutoff Wall Construction (Lags 3. by 7 days)	(4) Hydraulic Excavators	25 Days
	(2) Front-End Loaders	25 Days
	(1) DSM Auger	25 Days
	(1) Extended Boom Pallet Loader	25 Days
	(3) 300 kW Generators	25 Days
	(2) Slurry Pumps	25 Days
	(3) Pickup Trucks	25 Days
	(2) Haul Trucks	25 Days
	(1) Water Trucks	25 Days
5. Levee Reconstruction/ Seepage and Stability Berm Construction (Lags 4. by 2 days)	(10) Scrapers	180 Days
	(5) Motor Graders	180 Days
	(5) Tractors with Discing Equipment	180 Days
	(5) Vibratory Rollers	180 Days
	(3) Water Trucks	180 Days
6. Borrow Site Excavation (Concurrent with 5.)	(4) Front-End Loaders	180 Days
	(4) Water Trucks	180 Days
	(75) Haul Trucks	180 Days
7. Utility Reconstruction	(1) Hydraulic Excavator	130 Days
	(1) Haul Trucks	130 Days
	(2) Pickup Trucks	130 Days
	(1) Water Trucks	130 Days
8. Levee Resurfacing (Follows 5.)	(4) Motor Graders	24 Days
	(4) Vibratory Rollers	24 Days
	(2) Haul Trucks	24 Days
	(2) Water Truck	24 Days
9. Hydroseeding (Concurrent with 8.)	(2) Hydroseeding Trucks	24 Days
	(2) Pickup Trucks	24 Days
10. Demobilization/Cleanup (Follows 9.)	(1) Extended Boom Pallet Loader	20 Days
	(2) Haul Trucks	20 Days

Table 26
Anticipated Major Materials Quantities for Project C,
Alternative 2 – Expanded Footprint Alternative

Description	Quantity
Clearing and Grubbing	344.9 Acres
Levee Embankment Degrade	385,000 Cubic Yards
SB Cutoff Wall	451,200 Square Feet
Levee Embankment Fill	2,518,400 Cubic Yards
Borrow Site Excavation	2,681,200 Cubic Yards

Description	Quantity
Unsuitable Material Export	322,900 Cubic Yards
Class 2 Aggregate Surfacing	35,900 Tons

Table 27
Number of Trucks for Materials Delivery and Off Hauling – Project C, Alternative 2

Bentonite	Aggregate Surfacing	Pipe Material	Demolition Debris	CLSM Backfill
28	1,200	31	160	104

Alternative 3 would construct a cutoff wall ranging between 21 and 105 feet in depth along the centerline of the levee. To facilitate construction of the cutoff wall and to maintain stability of the levee, the levee will be degraded by approximately 50% of its overall height with approximately 2,600 feet of the levee being fully degraded. The cutoff wall would be constructed of soil-bentonite by either the conventional long-reach excavator or the deep mix method (DMM). After installation of the cutoff wall, the levee will be reconstructed to its original configuration. In addition to the cutoff wall, Alternative 3 would include relief wells for approximately, 8200 feet, approximately 11,150 feet of waterside slope flattening, approximately 5,100 feet of depression infill and approximately 1,500 feet of ditch lining. Work for this alternative is to include levee stripping, clearing and grubbing, borrow site preparation, levee degrading, cutoff wall installation, levee reconstruction and seepage berm construction, relief well installation, borrow site excavation, utility relocation and reconstruction, levee resurfacing, hydroseeding, and demobilization and clean-up.

The total disturbed area for Alternative 3, including staging and construction easement areas, is 187.3 acres.

The crew size for Alternative 3 during the peak is estimated at 150-160 people working on three to four fronts, 10-hour shifts, 2 shifts per day for cutoff wall construction, and six days a week. For a listing of the anticipated equipment and construction durations for this work, see Table 28. For a listing of the anticipated material quantities associated with this alternative, see Table 29. The total number of anticipated trucks for materials delivery and off hauling is included in Table 30.

Table 28
Anticipated Equipment and Duration for Project C,
Alternative 3 – Optimized Footprint Alternative

Construction Phase	Number of Each Equipment Type	Duration of Use
1. Clearing and Grubbing/ Stripping	(4) Elevating Scrapers	40 Days
	(2) Water Trucks	40 Days
	(2) Front-End Loaders	40 Days
	(4) Pickup Trucks	40 Days
2. Borrow Site Preparation (Concurrent with 1.)	(2) Tractors with Discing Equipment	60 Days
	(2) Elevating Scrapers	60 Days
	(1) Water Truck	60 Days
3. Levee Degrading/ Work Surface Construction (Lags 1. by 7 days)	(3) Excavators	35 Days
	(14) Scrapers	35 Days
	(5) Vibratory Rollers	35 Days
	(4) Water Trucks	35 Days
	(7) Haul Trucks	35 Days
4. Cutoff Wall Construction (Lags 3. by 7 days)	(8) Hydraulic Excavators	60 Days
	(4) Front-End Loaders	60 Days
	(2) DSM Auger	60 Days
	(1) Extended Boom Pallet Loader	60 Days
	(6) 300 kW Generators	60 Days
	(4) Slurry Pumps	60 Days
	(6) Pickup Trucks	60 Days
	(3) Haul Trucks	60 Days
	(2) Water Trucks	60 Days
5. Levee Reconstruction/ Seepage Berm Construction (Lags 4. by 22 days)	(10) Scrapers	130 Days
	(2) Motor Graders	130 Days
	(5) Tractors with Discing Equipment	130 Days
	(5) Vibratory Rollers	130 Days
	(3) Water Trucks	130 Days
6. Borrow Site Excavation (Concurrent with 5.)	(2) Front-End Loaders	130 Days
	(2) Water Trucks	130 Days
	(75) Haul Trucks	130 Days
7. Utility Reconstruction	(1) Hydraulic Excavator	130 Days
	(1) Haul Trucks	130 Days
	(2) Pickup Trucks	130 Days
	(1) Water Trucks	130 Days

Construction Phase	Number of Each Equipment Type	Duration of Use
8. Levee Resurfacing (Follows 5.)	(2) Motor Graders	24 Days
	(2) Vibratory Rollers	24 Days
	(2) Haul Trucks	24 Days
	(1) Water Truck	24 Days
9. Hydroseeding (Concurrent with 8.)	(2) Hydroseeding Trucks	24 Days
	(2) Pickup Trucks	24 Days
10. Demobilization/Cleanup (Follows 9.)	(1) Extended Boom Pallet Loader	20 Days
	(2) Haul Trucks	20 Days

Table 29
Anticipated Major Materials Quantities for Project C, Alternative 3 – Optimized Footprint Alternative

Description	Quantity
Clearing and Grubbing	187.3 Acres
Levee Embankment Degrade	882,800 Cubic Yards
SB Cutoff Wall	3,175,000 Square Feet
Levee Embankment Fill	1,410,000 Cubic Yards
Borrow Site Excavation	531,300 Cubic Yards
Unsuitable Material Export	253,100 Cubic Yards
Class 2 Aggregate Surfacing	40,600 Tons

Table 30
Number of Trucks for Materials Delivery and Off Hauling – Project C, Alternative 3

Bentonite	Aggregate Surfacing	Pipe Material	Demolition Debris	CLSM Backfill
193	1,500	31	160	104

PROJECT D, REACHES 26 THROUGH 41

Project 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 FRWL project is 69,363 linear feet.

Three alternatives have been reviewed as part of the Feather River West Levee Pre-Design Formulation Report. Alternative 1 would include the flattening of the waterside levee slope, the construction of a cutoff wall along the centerline of the existing levee to a varying depth, and the infilling of depressions and ditches at the landside levee toe. Alternative 2 would include a combination of seepage and stability berms along the landside toe of the levee, relief wells along the landside toe of the levee and shallow cutoff walls along the centerline of the levee for

portions of the project. In addition, Alternative 2 will include the filling of the existing canal adjacent to the levee in Reaches 26, 27, and 28 with water. This will require the construction of regulating structures within the canal to maintain the water level within the canal. Alternative 3 is an optimized alternative, combining mitigation measures from both Alternative 1 and Alternative 2 to produce the most economically feasible project.

All three alternatives will require construction of a cutoff wall at the East Gridley Road crossing. A 70-foot deep soil-cement-bentonite cutoff wall constructed by either the Trench Remixing, Deep (TRD), jet grouting, or steel sheet pile method. All three methods have similar crew sizes and equipment impacts, which are summarized in the cutoff wall section of the estimated equipment and duration table below.

Alternative 1 would construct a cutoff wall ranging between 18 feet and 97 feet in depth along the centerline of the levee. To facilitate construction of the cutoff wall and to maintain stability of the levee, the levee will be degraded by approximately 50% of its overall height. The cutoff wall would be constructed of soil-bentonite by either the conventional, long-reach excavator or the deep mix method (DSM). After installation of the cutoff wall, the levee will be reconstructed to its original configuration, with some areas including the flattening of the landside slope. Work for this alternative is to include levee stripping, clearing and grubbing, borrow site preparation, levee degrading, cutoff wall installation, levee reconstruction, borrow site excavation, utility relocation and reconstruction, levee resurfacing, hydroseeding, and demobilization and clean-up.

The total disturbed area for Alternative 1, including staging and construction easement areas, is 145.4 acres.

The crew size for Alternative 1 during the peak is estimated at 150-160 people working on three fronts, 10-hour shifts, 2 shifts per day for cutoff wall construction, and six days a week. For a listing of the anticipated equipment and construction durations for this work, see Table 31. For a listing of the anticipated material quantities associated with this alternative, see Table 32. The total number of anticipated trucks for materials delivery and off hauling is included in Table 33.

Table 31
Anticipated Equipment and Duration for Project D,
Alternative 1 – Minimized Footprint Alternative

Construction Phase	Number of Each Equipment Type	Duration of Use
1. Clearing and Grubbing/ Stripping	(3) Elevating Scrapers	40 Days
	(2) Water Trucks	40 Days
	(2) Front-End Loaders	40 Days
	(3) Pickup Trucks	40 Days

Construction Phase	Number of Each Equipment Type	Duration of Use
2. Borrow Site Preparation (Concurrent with 1.)	(4) Tractors with Discing Equipment	60 Days
	(4) Elevating Scrapers	60 Days
	(2) Water Truck	60 Days
3. Levee Degrading/ Work Surface Construction (Follows 1.)	(3) Excavators	25 Days
	(14) Scrapers	25 Days
	(5) Vibratory Rollers	25 Days
	(3) Water Trucks	25 Days
	(7) Haul Trucks	25 Days
4. Cutoff Wall Construction (Lags 3. by 14 days)	(6) Hydraulic Excavators	75 Days
	(3) Front-End Loaders	75 Days
	(2) DSM Auger	75 Days
	(1) Extended Boom Pallet Loader	75 Days
	(5) 300 kW Generators	75 Days
	(3) Slurry Pumps	75 Days
	(5) Pickup Trucks	75 Days
	(3) Haul Trucks	75 Days
	(2) Water Trucks	75 Days
5. Levee Reconstruction (Lags 4. by 22 days)	(10) Scrapers	90 Days
	(5) Motor Graders	90 Days
	(5) Tractors with Discing Equipment	90 Days
	(5) Vibratory Rollers	90 Days
	(3) Water Trucks	90 Days
6. Borrow Site Excavation (Concurrent with 5.)	(3) Front-End Loaders	90 Days
	(3) Water Trucks	90 Days
	(75) Haul Trucks	90 Days
7. Utility Reconstruction	(1) Hydraulic Excavator	130 Days
	(1) Haul Trucks	130 Days
	(2) Pickup Trucks	130 Days
	(1) Water Trucks	130 Days
8. Levee Resurfacing (Follows 5.)	(2) Motor Graders	24 Days
	(2) Vibratory Rollers	24 Days
	(2) Haul Trucks	24 Days
	(1) Water Truck	24 Days
9. Hydroseeding (Concurrent with 8.)	(2) Hydroseeding Trucks	24 Days
	(2) Pickup Trucks	24 Days
10. Demobilization/Cleanup (Follows 9.)	(1) Extended Boom Pallet Loader	20 Days
	(2) Haul Trucks	20 Days

Table 32
Anticipated Major Materials Quantities for Project D,
Alternative 1 – Minimized Footprint Alternative

Description	Quantity
Clearing and Grubbing	145.4 Acres
Levee Embankment Degrade	433,200 Cubic Yards
SB Cutoff Wall	3,239,100 Square Feet
Levee Embankment Fill	1,065,300 Cubic Yards
Borrow Site Excavation	330,100 Cubic Yards
Unsuitable Material Export	14,000 Cubic Yards
Class 2 Aggregate Surfacing	43,300 Tons

Table 33
Number of Trucks for Materials Delivery and Off Hauling – Project D, Alternative 1

Bentonite	Aggregate Surfacing	Pipe Material	Demolition Debris	CLSM Backfill
197	1,500	44	275	76

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 will need to be removed and reconstructed with a zoned filter at the base in combination with a seepage berm. Approximately 15,100 feet of canal will be infilled. Work for this alternative is to include levee stripping, clearing and grubbing, borrow site preparation, levee degrading, cutoff wall installation, levee reconstruction, seepage and stability berm construction, borrow site excavation, utility relocation and reconstruction, roadway reconstruction, levee resurfacing, hydroseeding, and demobilization and clean-up.

The total disturbed area for Alternative 2, including staging and construction easement areas, is 241.1 acres.

The crew size for Alternative 2 during the peak is estimated at 150-160 people working one 10-hour shift, six days a week. For a listing of the anticipated equipment and construction durations for this work, see Table 34. For a listing of the anticipated material quantities associated with this alternative, see Table 35. The total number of anticipated trucks for materials delivery and off hauling is included in Table 36.

Table 34
Anticipated Equipment and Duration for Project D,
Alternative 2 – Expanded Footprint Alternative

Construction Phase	Number of Each Equipment Type	Duration of Use
1. Clearing and Grubbing/ Stripping	(5) Elevating Scrapers	40 Days
	(3) Water Trucks	40 Days
	(3) Front-End Loaders	40 Days
	(5) Pickup Trucks	40 Days
2. Borrow Site Preparation (Concurrent with 1.)	(4) Tractors with Discing Equipment	60 Days
	(4) Elevating Scrapers	60 Days
	(2) Water Truck	60 Days
3. Levee Degrading/ Work Surface Construction (N/A	No Task	No Task
4. Cutoff Wall Construction (N/A)	No Task	No Task
5. Levee Reconstruction/ Seepage and Stability Berm Construction (Follows 2.)	(10) Scrapers	185 Days
	(2) Motor Graders	185 Days
	(2) Tractors with Discing Equipment	185 Days
	(5) Vibratory Rollers	185 Days
	(3) Water Trucks	185 Days
6. Borrow Site Excavation (Concurrent with 5.)	(2) Front-End Loaders	185 Days
	(2) Water Trucks	185 Days
	(75) Haul Trucks	185 Days
7. Utility Reconstruction	(1) Hydraulic Excavator	130 Days
	(1) Haul Trucks	130 Days
	(2) Pickup Trucks	130 Days
	(1) Water Trucks	130 Days
8. Levee Resurfacing (Follows 6.)	(2) Motor Graders	24 Days
	(2) Vibratory Rollers	24 Days
	(2) Haul Trucks	24 Days
	(1) Water Truck	24 Days
9. Hydroseeding (Concurrent with 8.)	(2) Hydroseeding Trucks	24 Days
	(2) Pickup Trucks	24 Days
10. Demobilization/Cleanup (Follows 9.)	(1) Extended Boom Pallet Loader	15 Days
	(2) Haul Trucks	15 Days

Table 35
Anticipated Major Materials Quantities for Project D,
Alternative 2 – Expanded Footprint Alternative

Description	Quantity
Clearing and Grubbing	241.1Acres
Levee Embankment Degrade	0 Cubic Yards
SB Cutoff Wall	0 Square Feet
Levee Embankment Fill	1,363,700 Cubic Yards
Borrow Site Excavation	601,500 Cubic Yards
Unsuitable Material Export	29,000 Cubic Yards
Class 2 Aggregate Surfacing	43,300 Tons

Table 36
Number of Trucks for Materials Delivery and Off Hauling – Project D, Alternative 2

Bentonite	Aggregate Surfacing	Pipe Material	Demolition Debris	CLSM Backfill
89	1,500	44	275	76

Alternative 3 would construct a cutoff wall ranging between 18 feet and 97 feet in depth along the centerline of the levee. To facilitate construction of the cutoff wall and to maintain stability of the levee, the levee will be degraded by approximately 50% of its overall height. The cutoff wall would be constructed of soil-bentonite by either the conventional, long-reach excavator or the deep mix method (DSM). After installation of the cutoff wall, the levee will be reconstructed to its original configuration except in those locations where the levee slopes will be flattened. Approximately 1,300 feet of levee would be degraded and reconstructed with a 5 to 1 slope (horizontal to vertical). Approximately 9,500 feet of the landside levee slope will be flattened where the existing canal is adjacent to the levee. Work for this alternative is to include levee stripping, clearing and grubbing, borrow site preparation, levee degrading, cutoff wall installation, levee reconstruction, borrow site excavation, utility relocation and reconstruction, levee resurfacing, hydroseeding, and demobilization and clean-up.

The total disturbed area for Alternative 3, including staging and construction easement areas, is 145.4 acres.

The crew size for Alternative 3 during the peak is estimated at 150-160 people working on three fronts, 10-hour shifts, 2 shifts per day cutoff wall construction only, and six days a week. For a listing of the anticipated equipment and construction durations for this work, see Table 37. For a listing of the anticipated material quantities associated with this alternative, see Table 38. The total number of anticipated trucks for materials delivery and off hauling is included in Table 39.

Table 37
Anticipated Equipment and Duration for Project D,
Alternative 3 – Optimized Footprint Alternative

Construction Phase	Number of Each Equipment Type	Duration of Use
1. Clearing and Grubbing/ Stripping	(3) Elevating Scrapers	40 Days
	(2) Water Trucks	40 Days
	(2) Front-End Loaders	40 Days
	(3) Pickup Trucks	40 Days
2. Borrow Site Preparation (Concurrent with 1.)	(4) Tractors with Discing Equipment	60 Days
	(4) Elevating Scrapers	60 Days
	(2) Water Truck	60 Days
3. Levee Degrading/ Work Surface Construction (Follows 1.)	(3) Excavators	25 Days
	(14) Scrapers	25 Days
	(5) Vibratory Rollers	25 Days
	(3) Water Trucks	25 Days
	(7) Haul Trucks	25 Days
4. Cutoff Wall Construction (Lags 3. by 14 days)	(6) Hydraulic Excavators	75 Days
	(3) Front-End Loaders	75 Days
	(2) DSM Auger	75 Days
	(1) Extended Boom Pallet Loader	75 Days
	(5) 300 kW Generators	75 Days
	(3) Slurry Pumps	75 Days
	(5) Pickup Trucks	75 Days
	(3) Haul Trucks	75 Days
	(2) Water Trucks	75 Days
5. Levee Reconstruction (Lags 4. by 22 days)	(10) Scrapers	90 Days
	(5) Motor Graders	90 Days
	(5) Tractors with Discing Equipment	90 Days
	(5) Vibratory Rollers	90 Days
	(3) Water Trucks	90 Days
6. Borrow Site Excavation (Concurrent with 5.)	(3) Front-End Loaders	90 Days
	(3) Water Trucks	90 Days
	(75) Haul Trucks	90 Days
7. Utility Reconstruction	(1) Hydraulic Excavator	130 Days
	(1) Haul Trucks	130 Days
	(2) Pickup Trucks	130 Days
	(1) Water Trucks	130 Days

Construction Phase	Number of Each Equipment Type	Duration of Use
8. Levee Resurfacing (Follows 5.)	(2) Motor Graders	24 Days
	(2) Vibratory Rollers	24 Days
	(2) Haul Trucks	24 Days
	(1) Water Truck	24 Days
9. Hydroseeding (Concurrent with 8.)	(2) Hydroseeding Trucks	24 Days
	(2) Pickup Trucks	24 Days
10. Demobilization/Cleanup (Follows 9.)	(1) Extended Boom Pallet Loader	20 Days
	(2) Haul Trucks	20 Days

Table 38
Anticipated Major Materials Quantities for Project D,
Alternative 3 – Optimized Footprint Alternative

Description	Quantity
Clearing and Grubbing	145.4 Acres
Levee Embankment Degrade	433,200 Cubic Yards
SB Cutoff Wall	3,239,100 Square Feet
Levee Embankment Fill	1,065,300 Cubic Yards
Borrow Site Excavation	330,100 Cubic Yards
Unsuitable Material Export	14,000 Cubic Yards
Class 2 Aggregate Surfacing	43,300 Tons

Table 39
Number of Trucks for Materials Delivery and Off Hauling – Project D Alternative 3

Bentonite	Aggregate Surfacing	Pipe Material	Demolition Debris	CLSM Backfill
197	1,500	44	275	76

CUTOFF WALL GAP CLOSURES 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 Highway 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 East Gridley Road at Station 1902+00.

As part of the technical memorandum titled "SBFCA, Fether River West Levee Rehabilitation Project, Alternatives Cost Analysis for Cutoff Walls at 5th Street, State Highway 20, UPRR, and

East Gridley Road," three alternatives have been reviewed for these locations. Alternative 1 would construct an SCB cutoff wall by the Trench Remixing, Deep (TRD) Method. Alternative 2 would construct a cutoff wall by jet grouting using a mixture of cement and bentonite. Alternative 3 would construct a cutoff wall utilizing sheet piling.

Alternative 1 would construct a cutoff wall ranging between 40 feet and 70 feet in depth along the centerline of the levee. To facilitate construction of the cutoff wall, the levee would be degraded to create an adequate working platform for the TRD machine. Additionally, the existing roadways and railroad tracks would be removed and the existing bases would be graded to provide a working platform. The cutoff wall would be constructed of soil-cement-bentonite utilizing the TRD machine. After installation of the cutoff wall, the existing levee, roadway, and railroad tracks would be reconstructed to their original configuration. Work for this alternative is to include levee stripping, clearing and grubbing, roadway demolition, railroad track removal, levee degrading, cutoff wall installation, levee reconstruction, roadway reconstruction, railroad track replacement, utility reconstruction, levee resurfacing, hydroseeding, and demobilization and clean-up.

The total disturbed area for Alternative 1, including staging and construction easement areas, is 1.1 acres.

The crew size for Alternative 1 during the peak is estimated at 25-30 people working on one front, 12-hour shift, 1 shift per day, and six days a week. For a listing of the anticipated equipment and construction durations for this work, see Table 40. For a listing of the anticipated material quantities associated with this alternative, see Table 41. The total number of anticipated trucks for materials delivery and off hauling is included in Table 42.

Table 40
Anticipated Equipment and Duration for Cutoff Wall Gap Closures and Special Crossings, Alternative 1 – SCB Cutoff Wall by TRD Method Alternative

Construction Phase	Number of Each Equipment Type	Duration of Use
1. Clearing and Grubbing/ Stripping	(2) Elevating Scrapers	4 Days
	(1) Water Trucks	4 Days
	(1) Front-End Loaders	4 Days
	(4) Haul Trucks	4 Days
	(2) Pickup Trucks	4 Days
2. Borrow Site Preparation (Concurrent with 1.)	(1) Tractors with Discing Equipment	1 Day
	(1) Elevating Scrapers	1 Day
	(1) Water Truck	1 Day

Construction Phase	Number of Each Equipment Type	Duration of Use
3. Levee Degrading/ Work Surface Construction (Lags 1. by 1 day)	(1) Excavators	4 Days
	(1) Scrapers	4 Days
	(2) Vibratory Rollers	4 Days
	(1) Water Trucks	4 Days
	(4) Haul Trucks	4 Days
4. Cutoff Wall Construction (Lags 3. by 1 day)	(1) Front-End Loaders	15 Days
	(1) TRD Machine	15 Days
	(1) Extended Boom Pallet Loader	15 Days
	(1) 300 kW Generators	15 Days
	(2) Pickup Trucks	15 Days
	(2) Haul Trucks	15 Days
	(1) Water Trucks	15 Days
5. Levee Reconstruction (Lags 4. by 25 days)	(1) Scrapers	15 Days
	(2) Motor Graders	15 Days
	(2) Vibratory Rollers	15 Days
	(1) Water Trucks	15 Days
6. Borrow Site Excavation (Concurrent with 5.)	(1) Scrapers	4 Days
	(1) Front-End Loaders	4 Days
	(1) Water Trucks	4 Days
	(4) Haul Trucks	4 Days
7. Utility Reconstruction	(2) Backhoes	10 Days
	(2) Front End Loaders	10 Days
	(2) Rubber Tire Crane	10 Days
	(3) Pickup trucks	10 Days
	(1) Water Trucks	10 Days
8. Levee Resurfacing (Follows 5.)	(2) Motor Graders	15 Days
	(2) Vibratory Rollers	15 Days
	(2) Haul Trucks	15 Days
	(1) Water Truck	15 Days
9. Hydroseeding (Follows 8.)	(1) Hydroseeding Trucks	1 Day
10. Demobilization/Cleanup (Follows 9.)	(1) Extended Boom Pallet Loader	1 Day
	(2) Haul Trucks	1 Day

Table 41
Anticipated Major Materials Quantities for
Cutoff Wall Gap Closures and Special Crossings,
Alternative 1 – SCB Cutoff Wall by TRD Method Alternative

Description	Quantity
Clearing and Grubbing	1.1 Acres
Levee Embankment Degrade	7,420 Cubic Yards
SB Cutoff Wall	58,140 Square Feet
Levee Embankment Fill	8,900 Cubic Yards
Borrow Site Excavation	1,490 Cubic Yards
Class 2 Aggregate Base	210 Tons
Asphalt Concrete Paving	50 Tons

Table 42
Number of Trucks for Materials Delivery and Off Hauling
Cutoff Wall Gap Closures and Special Crossings Alternative 1

Bentonite	Asphalt Concrete	Aggregate Surfacing	Pipe Material	Demolition Debris	CLSM Backfill
4	3	10	3	10	3

Alternative 2 would construct a cutoff wall ranging between 40 feet and 85 feet in depth along the centerline of the levee by jet grouting. A trench would be excavated to handle grouting spoils brought to the surface during the operation requiring removal of the existing roadway surfaces. The cutoff wall would be constructed using a mixture of cement and bentonite. After installation of the cutoff wall, the spoils trench would be backfilled and the existing roadway surface reconstructed. Work for this alternative is to include roadway demolition, trenching, cutoff wall installation, trench backfilling and compacting, roadway reconstruction, levee resurfacing, and demobilization and clean-up.

The total disturbed area for Alternative 2, including staging and construction easement areas, is 1.0 acres.

The crew size for Alternative 2 during the peak is estimated at 10-15 people working on one front, 12-hour shift, 1 shift per day, and six days a week. For a listing of the anticipated equipment and construction durations for this work, see Table 43. For a listing of the anticipated material quantities associated with this alternative, see Table 44. The total number of anticipated trucks for materials delivery and off hauling is included in Table 45.

Table 43
Anticipated Equipment and Duration for Cutoff Wall Gap Closures and Special Crossings, Alternative 2 – Jet Grouting Method Alternative

Construction Phase	Number of Each Equipment Type	Duration of Use
1. Roadway Demolition/ Levee Trenching	(1) Excavator	4 Days
	(1) Water Trucks	4 Days
	(2) Haul Trucks	4 Days
	(2) Pickup Trucks	4 Days
2. Cutoff Wall Construction (Lags 1. by 1 day)	(1) Front-End Loaders	50 Days
	(1) Jet Grouting Machine	50 Days
	(1) Extended Boom Pallet Loader	50 Days
	(1) 300 kW Generators	50 Days
	(2) Pickup Trucks	50 Days
	(2) Haul Trucks	50 Days
	(1) Water Trucks	50 Days
3. Levee Reconstruction (Lags 2. by 5 days)	(1) Excavator	4 Days
	(1) Pickup Truck	4 Days
	(1) Water Trucks	4 Days
4. Levee Resurfacing (Follows 3.)	(1) Vibratory Roller	4 Days
	(1) Water Trucks	4 Days
	(2) Haul Trucks	4 Days
5. Demobilization/Cleanup (Follows 4.)	(1) Extended Boom Pallet Loader	1 Day
	(2) Haul Trucks	1 Day

Table 44
Anticipated Major Materials Quantities for Cutoff Wall Gap Closures and Special Crossings, Alternative 1 – SCB Cutoff Wall by TRD Method Alternative

Description	Quantity
Levee Trenching	1,140 Feet
Jet Grout Cutoff Wall	65,320 Square Feet
Trench Backfill	460 Cubic Yards
Class 2 Aggregate Base	170 Tons
Asphalt Concrete Paving	20 Tons

Table 45
Number of Trucks for Materials Delivery and Off Hauling
Cutoff Wall Gap Closures and Special Crossings Alternative 2

Bentonite	Asphalt Concrete	Aggregate Surfacing
4	1	1

Alternative 1 Equipment Assumptions

Equipment	Project A										Project B										Project C										Project D									
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
Aerial Lifts																																								
Air Compressors																																								
Bore/Drill Rigs				1										1										2										2						
Cement and Mortar Mixers				2										2										4										3						
Concrete/Industrial Saws																																								
Cranes							2										2																							
Crawler Tractors																																								
Crushing/Proc. Equipment																																								
Excavators			3	4		2							3	4		2							3	8			1						3	6			1			
Forklifts																																								
Generator Sets				3										4										6										5						
Graders					2			4							2			2							2				2					5			2			
Off-Highway Tractors		2										2										2			5							4			5					
Off-Highway Trucks									2										2										2									2		
Other Construction Equipment				1																																				
Other General Industrial Equipment																																								
Other Material Handling Equipment																																								
Pavers																																								
Paving Equipment																																								
Plate Compactors																																								
Pressure Washers																																								
Pumps																																								
Rollers			5		5			2					5		5			2					5		4			2					5		5			2		
Rough Terrain Forklifts										1				1						1				1						1				1						1
Rubber Tired Dozers																																								
Rubber Tired Loaders	4			2	0	2	2				4			2		2	2				2			4		2					2			3		3				
Scrapers	8	2	15		20						8	2	15		20						4	2	14		10						3	4	14		10					
Signal Boards																																								
Skid Steer Loaders																																								
Surfacing Equipment																																								
Sweepers/Scrubbers																																								
Tractors/Loaders/Backhoes							2										2																							
Trenchers																																								
Welders																																								
Water Trucks	2	1	3	2	3	2	2	1	0	0	2	1	3	2	3	2	2	1	0	0	2	1	4	2	3	2	1	1	0	0	2	2	3	2	3	3	1	1	0	0

Workers (trips/day)	**A**	**B**	**C**	**D**	**P?**
Number	79.2	75.9	102.3	102.3	All
Distance (mi)	30	30	30	30	All

		Per Year				Per Day (yr 1)				Per Day (yr 2)			
Trucks (trips/2 years)	**P?**	**A**	**B**	**C**	**D**	**A**	**B**	**C**	**D**	**A**	**B**	**C**	**D**
Unsuitable Soil Disposal	1, 3	1312.5	21677	10542	583.33	33	361	264	17	33	361	301	19
Bentonite	4	44.5	59.5	95.5	98.5	1.3	1.2	2.7	2.2	1.8	1.7	3.8	3.3
Aggregate Surfacing	8	212.5	200	750	750	18	20	63	63	21	25	63	63
Pipe Material	5	4	8.5	15.5	22	0.1	0.2	0.2	0.5	0.2	0.2	0.2	0.5
Demolition Debirs	10	30	18	80	137.5	3	3	8	14	3	2	8	14
CLSM Backfill	5	13	18	52	38	0.4	0.5	1	1	1	0.5	1	1
Borrow Fill	6	10167	33198	22125	13750	290	830	340	306	407	830	340	306
Distance (mi)		7	7	7	7								

Grading	**A**	**B**	**C**	**D**
Acres (2 years)	84	94	187	145
Acres (1 year)	42	47	94	73
Acres (1 year Clearing Phase)	35	40	80	62
Acres (1 year Clearing Phase/day)	2	2	4	3

Acres (1 year Borrow Ex Phase)	6	7	14	11
Acres (1 year Borrow Ex Phase/day)	0.2	0.2	0.2	0.2

Alternative 2 Equipment Assumptions

Equipment	Project A										Project B										Project C										Project D									
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	Road	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
Aerial Lifts																																									
Air Compressors																																									
Bore/Drill Rigs				1																					1																
Cement and Mortar Mixers				1										2											2																
Concrete/Industrial Saws																																									
Cranes							2																																		
Crawler Tractors																																									
Crushing/Proc. Equipment																																									
Excavators			1	2	2	4							1	4		2	2							3	4			1									1				
Forklifts																																									
Generator Sets				2										2											3																
Graders					5										5			2								5			4												
Off-Highway Tractors		4										4											4			5							4			2				
Off-Highway Trucks									2											2										2									2		
Other Construction Equipment				1																																				
Other General Industrial Equipment																																								
Other Material Handling Equipment																																								
Pavers																																								
Paving Equipment																		1																							
Plate Compactors																																								
Pressure Washers																																								
Pumps																																								
Rollers			2		5								2		5			2						5		5			4												
Rough Terrain Forklifts										1				1							1				1						1										1
Rubber Tired Dozers											4																													
Rubber Tired Loaders	4	0		1		4	2							1		4	2					7			2		4					3					2			
Scrapers	8	4	2		25						8	4	2		25							13	4	14		10						5	4			10				
Signal Boards																																								
Skid Steer Loaders																																								
Surfacing Equipment																																								
Sweepers/Scrubbers																																								
Tractors/Loaders/Backhoes							2										2																							
Trenchers																																								
Welders																																								
Water Trucks	2	2	2	1	4	4	2		0	0	2	2	1	1	4	4	2	1		0	0	7	2	4	1	3	4	1	2	0	0	3	2			3	2	1		0	0

Workers (trips/day)	**A**	**B**	**C**	**D**	**P?**
Number	132	128.7	135.3	102.3	All
Distance (mi)	30	30	30	30	All

		Per Year				Per Day (yr 1)				Per Day (yr 2)				
Trucks (trips/2 years)	**P?**	**A**	**B**	**C**	**D**	**A**	**B**	**C**	**D**	**A**	**B**	**C**	**D**	
Unsuitable Soil Disposal	1, 3	6.25	1833.3	26908	2416.7	3	917	13454	1208	0.1	29	673	60	0	31	448	60	
Bentonite	4	1	31	28	197	0	16	14	0		0.5	0.9			0.8	1.4		
Aggregate Surfacing	8	50	225	1200	1500	0	113	600	0		6	50			6	50		Assigned to roadway
Pipe Material	5	8	17	31	44	4	9	16	22	0.0	0.1	0.1	0.2	0.0	0.2	0.2	0.2	
Demolition Debirs	10	60	36	160	275	30	18	80	138	3	2	8	14	3	2	8	14	
CLSM Backfill	5	26	36	104	76	13	18	52	38	0.1	0.2	0.5	0.4	0.1	0.3	1	0.4	
Borrow Fill	6	135667	194542	223433	50125	67833.3	97270.8	111717	25062.5	754	1057	1016	269	848	1769	1596	272	
Distance (mi)		7	7	7	7													

Grading	**A**	**B**	**C**	**D**
Acres (2 years)	183.1	272.3	344.9	241.1
Acres (1 year)	91.55	136.15	172.45	120.55
Acres (1 year Clearing Phase)	78	116	147	102
Acres (1 year Clearing Phase/day)	4	6	15	5

Acres (1 year Borrow Ex Phase)	14	20	26	18
Acres (1 year Borrow Ex Phase/day)	0.2	0.2	0.2	0.2

Alternative 3 Equipment Assumptions

Equipment	Project A										Project B										Project C										Project D									
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
Aerial Lifts																																								
Air Compressors																																								
Bore/Drill Rigs				1										2										2										2						
Cement and Mortar Mixers				2										2										4										3						
Concrete/Industrial Saws																																								
Cranes							2										2																							
Crawler Tractors																																								
Crushing/Proc. Equipment																																								
Excavators			3	5		2							3	4		2							3	8			1						3	6			1			
Forklifts																																								
Generator Sets				4										4										6										5						
Graders					2			2							2			2							2			2						5			2			
Off-Highway Tractors		2										2										2			5							4			5					
Off-Highway Trucks									2										2										2										2	
Other Construction Equipment				0																																				
Other General Industrial Equipment																																								
Other Material Handling Equipment																																								
Pavers																																								
Paving Equipment																																								
Plate Compactors																																								
Pressure Washers																																								
Pumps																																								
Rollers			5		5			2					5		5			2					5		5			2					5		5			2		
Rough Terrain Forklifts				1						1				1						1				1						1				1					1
Rubber Tired Dozers											4																													
Rubber Tired Loaders	4			2		2	2							2		2	2				2			4		2					2			3		3				
Scrapers	8	2	15		20						8	2	15		20						4	2	14		10	0					3	4	14		10					
Signal Boards																																								
Skid Steer Loaders																																								
Surfacing Equipment																																								
Sweepers/Scrubbers																																								
Tractors/Loaders/Backhoes							2										2																							
Trenchers																																								
Welders																																								
Water Trucks	2	1	3	2	3	2	2	1	0	0	2	1	3	2	3	2	2	1	0	0	2	1	4	2	3	2	1	1	0	0	2	2	3	2	3	3	1	1	0	0

Workers (trips/day)	**A**	**B**	**C**	**D**	**P?**
Number	79.2	75.9	102.3	102.3	All
Distance (mi)	30	30	30	30	All

		Per Year				Per Day (yr 1)				Per Day (yr 2)			
Trucks (trips/2 years)	**P?**	**A**	**B**	**C**	**D**	**A**	**B**	**C**	**D**	**A**	**B**	**C**	**D**
Unsuitable Soil Disposal	1, 3	1072.9	21677	10546	583.33	15	482	264	29	15	542	301	29
Bentonite	4	39	59.5	96.5	98.5	1	1	3	2	2	2	4	4
Aggregate Surfacing	8	175	200	750	750	15	17	63	63	15	20	63	63
Pipe Material	5	4	8.5	15.5	22	0.1	0.2	0.2	0.4	0.2	0.2	0.2	0.4
Demolition Debirs	10	30	18	80	137.5	2	2	8	14	2	2	8	14
CLSM Backfill	5	13	18	52	38	0.4	0.4	1	1	1	0.5	1	1
Borrow Fill	6	11510	33198	22138	13754	460	604	341	229	460	830	341	229
Distance (mi)		7	7	7	7								

Grading	**A**	**B**	**C**	**D**
Acres (2 years)	87.2	94.1	187.3	145.4
Acres (1 year)	43.6	47.05	93.65	72.7
Acres (1 year Clearing Phase)	37	40	80	62
Acres (1 year Clearing Phase/day)	2	2	4	6

Acres (1 year Borrow Ex Phase)	7	7	14	11
Acres (1 year Borrow Ex Phase/day)	0.3	0.1	0.2	0.2

Alternative 1 Construction Schedule and Daily Output

Construction Phase	Project A																										
	2014														2015												
	Schedule							PM10			PM2.5				Schedule							PM10			PM2.5			
	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2
1. Clearing and Grubbing/ Stripping	5/15/2014	6/4/2014	20	0.9	14.8	71.9	192.1	27.4	7.4	20.0	10.9	6.7	4.2	17314.0	5/15/2015	6/4/2015	20	0.9	14.57	71.67	186.8	27.2	7.211	20.0	10.7	6.577	4.2	17290
2. Borrow Site Preparation	5/15/2014	6/14/2014	30	1.4	6.3	46.4	50.8	2.5	2.5	0.0	2.1	2.1	0.0	8940.3	5/15/2015	6/14/2015	30	1.4	5.934	43.34	48.99	2.46	2.46	0	2.017	2.017	0	8939.98
3. Levee Degrading/ Work Surface Construction	6/12/2014	7/2/2014	20	0.9	26.7	126.2	330.7	13.9	13.9	0.0	12.7	12.7	0.0	29072.8	6/12/2015	7/2/2015	20	0.9	26.27	126	321.9	13.54	13.54	0	12.4	12.4	0	29045.5
4. Cutoff Wall Construction	7/14/2014	8/18/2014	35	1.6	6.0	34.7	63.6	3.1	3.1	0.0	2.9	2.9	0.0	6914.7	7/14/2015	8/8/2015	25	1.1	5.804	34.57	61.09	2.972	2.972	0	2.73	2.73	0	6938.25
5. Levee Reconstruction/ Seepage Berm Construction	8/13/2014	9/17/2014	35	1.6	35.0	159.8	422.7	18.0	18.0	0.0	16.5	16.5	0.0	35040.6	8/13/2015	9/7/2015	25	1.1	34.53	159.8	413.3	17.59	17.59	0	16.18	16.18	0	35065.2
6. Borrow Site Excavation	8/13/2014	9/17/2014	35	1.6	4.5	23.1	117.7	5.2	3.2	2.0	2.9	2.5	0.4	17846.0	8/13/2015	9/7/2015	25	1.1	5.05	25.48	141.8	5.8	3.774	2	3.2	2.787	0.4	23792.5
7. Utility Reconstruction	7/14/2014	9/17/2014	65	3.0	5.3	42.2	37.9	1.9	1.9	0.0	1.5	1.5	0.0	7961.5	7/14/2015	9/17/2015	65	3.0	5.491	39.16	40.91	2.308	2.308	0	1.876	1.876	0	7962.9
8. Levee Resurfacing	10/1/2014	10/13/2014	12	0.5	5.4	17.7	56.6	3.1	3.1	0.0	2.8	2.8	0.0	4225.8	9/17/2015	9/27/2015	10	0.5	5.37	17.69	56.39	3.091	3.091	0	2.807	2.807	0	4370.57
9. Hydroseeding	10/1/2014	10/13/2014	12	0.5	4.6	35.3	28.1	1.5	1.5	0.0	1.1	1.1	0.0	7548.1	9/17/2015	9/23/2015	6	0.3	4.268	32.33	26.93	1.427	1.427	0	1.067	1.067	0	7550.13
10. Demobilization/Cleanup	10/17/2014	10/27/2014	10	0.5	0.3	2.1	4.1	0.2	0.2	0.0	0.2	0.2	0.0	531.0	9/25/2015	10/5/2015	10	0.5	0.274	2.127	3.915	0.197	0.197	0	0.176	0.176	0	529.348

Construction Phase	Project B																										
	2014														2015												
	Schedule							PM10			PM2.5				Schedule							PM10			PM2.5			
	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2
1. Clearing and Grubbing/ Stripping	5/15/2014	6/4/2014	20	0.9	17.7	84.7	297.6	29.9	9.9	20.0	12.7	8.5	4.2	34654.3	5/15/2015	6/4/2015	20	0.9	17.06	82.67	282	29.5	9.482	20.0	12.3	8.115	4.2	34441.3
2. Borrow Site Preparation	5/15/2014	6/14/2014	30	1.4	6.2	45.2	50.7	2.5	2.5	0.0	2.1	2.1	0.0	8744.1	5/15/2015	6/14/2015	30	1.4	5.847	42.35	48.89	2.439	2.439	0	2.008	2.008	0	8743.77
3. Levee Degrading/ Work Surface Construction	6/12/2014	7/22/2014	40	1.8	29.6	139.0	436.2	16.4	16.4	0.0	14.5	14.5	0.0	46413.1	6/12/2015	7/22/2015	40	1.8	28.75	137	417.1	15.81	15.81	0	13.94	13.94	0	46196.7
4. Cutoff Wall Construction	7/14/2014	9/2/2014	50	2.3	6.2	36.1	63.2	3.2	3.2	0.0	3.0	3.0	0.0	7114.7	7/14/2015	8/18/2015	35	1.6	5.879	35.99	60.36	3.034	3.034	0	2.787	2.787	0	7138.32
5. Levee Reconstruction/ Seepage Berm Construction	8/13/2014	9/22/2014	40	1.8	35.0	159.9	422.8	18.0	18.0	0.0	16.5	16.5	0.0	35051.2	8/13/2015	9/22/2015	40	1.8	34.52	159.8	413.2	17.59	17.59	0	16.18	16.18	0	35039.1
6. Borrow Site Excavation	8/13/2014	9/22/2014	40	1.8	9.3	44.2	291.4	9.4	7.4	2.0	5.9	5.4	0.4	46376.7	8/13/2015	9/22/2015	40	1.8	8.253	39.66	264.5	6.7	6.7	2	5.2	4.769	0.4	45897.9
7. Utility Reconstruction	7/14/2014	9/17/2014	65	3.0	5.2	41.0	37.8	1.9	1.9	0.0	1.5	1.5	0.0	7765.4	7/14/2015	9/17/2015	65	3.0	5.403	38.17	40.8	2.287	2.287	0	1.867	1.867	0	7766.69
8. Levee Resurfacing	10/8/2014	10/18/2014	10	0.5	3.2	10.8	35.3	1.9	1.9	0.0	1.7	1.7	0.0	2986.8	10/8/2015	10/16/2015	8	0.4	3.177	10.85	35.81	1.896	1.896	0	1.702	1.702	0	3235.66
9. Hydroseeding	10/8/2014	10/18/2014	10	0.5	4.5	34.2	28.0	1.4	1.4	0.0	1.1	1.1	0.0	7352.0	10/8/2015	10/16/2015	8	0.4	4.181	31.34	26.83	1.406	1.406	0	1.059	1.059	0	7353.92
10. Demobilization/Cleanup	10/22/2014	10/28/2014	6	0.3	0.4	2.6	7.7	0.3	0.3	0.0	0.2	0.2	0.0	1112.2	10/20/2015	10/28/2015	8	0.4	0.357	2.495	7.105	0.273	0.273	0	0.228	0.228	0	1104.19

Construction Phase	Project C																										
	2013														2014												
	Schedule							PM10			PM2.5				Schedule							PM10			PM2.5			
	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2
1. Clearing and Grubbing/ Stripping	5/15/2013	6/4/2013	20	0.9	10.8	49.8	187.3	46.6	6.6	40.0	13.9	5.6	8.3	21795.4	5/15/2014	6/4/2014	20	0.9	9.894	47.04	187.7	45.91	5.915	40	13.25	4.934	8.32	23720.1
2. Borrow Site Preparation	5/15/2013	6/14/2013	30	1.4	7.5	58.5	54.7	2.8	2.8	0.0	2.3	2.3	0.0	10312.1	5/15/2014	6/14/2014	30	1.4	6.936	54.15	51.67	2.677	2.677	0	2.145	2.145	0	10313.3
3. Levee Degrading/ Work Surface Construction	5/24/2013	6/13/2013	20	0.9	29.2	132.2	408.0	16.4	16.4	0.0	14.6	14.6	0.0	39738.9	5/26/2014	6/10/2014	15	0.7	27.5	129.4	397.9	15.19	15.19	0	13.47	13.47	0	41659.8
4. Cutoff Wall Construction	6/4/2013	7/9/2013	35	1.6	11.7	64.4	123.1	6.2	6.2	0.0	5.7	5.7	0.0	12857.2	6/4/2014	6/29/2014	25	1.1	10.84	64.14	114.5	5.611	5.611	0	5.154	5.154	0	12903.8
5. Levee Reconstruction/ Seepage Berm Construction	7/4/2013	9/7/2013	65	3.0	36.3	160.0	441.8	18.8	18.8	0.0	17.3	17.3	0.0	35086.4	7/3/2014	9/6/2014	65	3.0	34.99	159.9	422.9	17.97	17.97	0	16.53	16.53	0	35077.6
6. Borrow Site Excavation	7/4/2013	9/7/2013	65	3.0	5.3	25.0	133.7	6.1	4.1	2.0	3.2	3.2	0.4	19379.3	7/3/2014	9/6/2014	65	3.0	5.344	24.95	133.7	6.146	4.146	2	3.658	3.242	0.416	19379.3
7. Utility Reconstruction	6/25/2013	8/29/2013	65	3.0	3.9	41.7	10.0	0.9	0.9	0.0	0.5	0.5	0.0	6678.1	6/25/2014	8/29/2014	65	3.0	3.467	37.33	8.989	0.897	0.897	0	0.507	0.507	0	6679.53
8. Levee Resurfacing	10/3/2013	10/15/2013	12	0.5	3.9	13.5	51.6	2.5	2.5	0.0	2.2	2.2	0.0	5267.2	10/2/2014	10/14/2014	12	0.5	3.562	12.47	49.12	2.229	2.229	0	1.944	1.944	0	5258.74
9. Hydroseeding	10/3/2013	10/15/2013	12	0.5	5.7	47.4	31.5	1.7	1.7	0.0	1.3	1.3	0.0	8918.8	10/2/2014	10/14/2014	12	0.5	5.234	43.12	28.97	1.609	1.609	0	1.163	1.163	0	8921.11
10. Demobilization/Cleanup	10/21/2013	10/31/2013	10	0.5	0.4	2.5	6.3	0.3	0.3	0.0	0.3	0.3	0.0	796.1	10/20/2014	10/30/2014	10	0.5	0.331	2.337	5.75	0.248	0.248	0	0.215	0.215	0	795.193

Construction Phase	Project D																										
	2013														2014												
	Schedule							PM10			PM2.5				Schedule							PM10			PM2.5			
	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2
1. Clearing and Grubbing/ Stripping	5/15/2013	6/4/2013	20	0.9	6.1	29.0	81.0	33.1	3.1	30.0	9.1	2.8	6.2	7108.7	5/15/2014	6/4/2014	20	0.9	5.879	28.8	77.9	32.95	2.949	30	8.92	2.68	6.24	7211.14
2. Borrow Site Preparation	5/15/2013	6/14/2013	30	1.4	11.6	78.1	105.1	5.0	5.0	0.0	4.2	4.2	0.0	14545.3	5/15/2014	6/14/2014	30	1.4	10.86	73.77	99.6	4.711	4.711	0	4.016	4.016	0	14546.2
3. Levee Degrading/ Work Surface Construction	6/12/2013	6/27/2013	15	0.7	26.1	118.6	321.6	13.7	13.7	0.0	12.6	12.6	0.0	26635.7	6/12/2014	6/22/2014	10	0.5	25.02	118.4	307.1	13	13	0	11.92	11.92	0	26734

4. Cutoff Wall Construction	7/2/2013	8/16/2013	45	2.0	9.4	52.3	99.4	5.0	5.0	0.0	4.6	4.6	0.0	10477.3	7/2/2014	8/1/2014	30	1.4	8.717	52.05	92.28	4.52	4.52	0	4.151	4.151	0	10524.1
5. Levee Reconstruction/ Seepage Berm Construction	8/1/2013	9/15/2013	45	2.0	25.9	110.5	300.4	13.9	13.9	0.0	12.8	12.8	0.0	23488.8	7/31/2014	9/14/2014	45	2.0	25.03	110.4	287.9	13.3	13.3	0	12.23	12.23	0	23482.2
6. Borrow Site Excavation	8/1/2013	9/15/2013	45	2.0	5.5	26.2	129.3	6.0	4.0	2.0	3.2	3.2	0.4	18268.7	7/31/2014	9/14/2014	45	2.0	4.324	21.32	119.9	5.104	3.104	2	2.756	2.34	0.416	18235
7. Utility Reconstruction	7/13/2013	9/16/2013	65	3.0	3.9	41.7	10.0	0.9	0.9	0.0	0.5	0.5	0.0	6678.1	7/14/2014	9/17/2014	65	3.0	3.467	37.33	8.989	0.897	0.897	0	0.507	0.507	0	6679.53
8. Levee Resurfacing	10/3/2013	10/15/2013	12	0.5	3.9	13.5	51.6	2.5	2.5	0.0	2.2	2.2	0.0	5267.2	10/2/2014	10/14/2014	12	0.5	3.467	37.33	8.989	0.897	0.897	0	0.507	0.507	0	6679.53
9. Hydroseeding	10/3/2013	10/15/2013	12	0.5	5.7	47.4	31.5	1.7	1.7	0.0	1.3	1.3	0.0	8918.8	10/2/2014	10/14/2014	12	0.5	5.234	43.12	28.97	1.609	1.609	0	1.163	1.163	0	8921.11
10. Demobilization/Cleanup	10/21/2013	10/31/2013	10	0.5	0.5	2.8	8.4	0.4	0.4	0.0	0.3	0.3	0.0	1113.7	10/20/2014	10/30/2014	10	0.5	0.384	2.571	7.679	0.295	0.295	0	0.247	0.247	0	1112.2

Alternative 2 Construction Schedule and Daily Output

Construction Phase	Project A																										
	2014														2015												
	Schedule							PM10			PM2.5				Schedule							PM10			PM2.5			
	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2
1. Clearing and Grubbing/ Stripping	5/15/2014	6/4/2014	20	0.9	14.5	70.6	181.6	47.1	7.1	40.0	14.9	6.6	8.3	15581.0	5/15/2015	6/4/2015	20	0.9	14.32	70.57	177.3	46.98	6.984	40	14.7	6.424	8.3	15576
2. Borrow Site Preparation	5/15/2014	6/6/2014	22	1.0	7.8	39.2	95.9	4.1	4.1	0.0	3.7	3.7	0.0	8465.8	5/15/2015	6/14/2015	30	1.4	7.666	39.22	92.89	3.929	3.929	0	3.6134	3.613	0.0	8462.1
3. Levee Degrading/ Work Surface Construction	6/12/2014	6/22/2014	10	0.5	4.3	20.4	50.6	2.3	2.3	0.0	2.1	2.1	0.0	4409.3													0.0	
4. Cutoff Wall Construction	6/26/2014	7/6/2014	10	0.5	3.9	22.5	41.0	2.0	2.0	0.0	1.9	1.9	0.0	4466.4													0.0	
5. Levee Reconstruction/ Seepage Berm Construction	6/12/2014	9/10/2014	90	4.1	46.9	212.2	561.6	24.2	24.2	0.0	22.2	22.2	0.0	46256.5	6/12/2015	9/10/2015	90	4.1	46.33	212.1	549.1	23.68	23.68	0	21.786	21.79	0.0	46241
6. Borrow Site Excavation	6/16/2014	9/14/2014	90	4.1	10.6	53.1	291.6	9.8399	7.8	2.0	6.4	5.9	0.4	44898.3	6/26/2015	9/14/2015	80	3.6	10.36	52.1	293.5	7.783	7.783	0	6.1	5.733	0.4	49362
7. Utility Reconstruction	7/14/2014	9/17/2014	65	3.0	3.0	15.4	35.1	1.4	1.4	0.0	1.3	1.3	0.0	3254.2	7/14/2015	9/12/2015	60	2.7	3.39	15.43	38.36	1.813	1.813	0	1.6658	1.666	0	3254
8. Levee Resurfacing																												
9. Hydroseeding	10/20/2014	10/30/2014	10	0.5	2.2	8.6	25.2	1.0	1.0	0.0	0.9	0.9	0.0	2840.8	10/16/2015	10/26/2015	10	0.5	2.167	8.602	24.39	0.932	0.932	0	0.857	0.857	0	2841.2
10. Demobilization/Cleanup	10/16/2014	10/28/2014	12	0.5	0.3	2.1	4.1	0.2	0.2	0.0	0.2	0.2	0.0	531.0	10/16/2015	10/26/2015	10	0.5	0.274	2.127	3.915	0.197	0.197	0	0.176	0.176	0	529.35

Construction Phase	Project B																										
	2014														2015												
	Schedule							PM10			PM2.5				Schedule							PM10			PM2.5			
	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2
1. Clearing and Grubbing/ Stripping	5/15/2014	6/4/2014	20	0.9	17.9	76.9	220.3	69.1	9.1	60.0	20.8	8.3	12.5	18242.1	5/15/2015	6/4/2015	20	0.9	17.67	76.83	215.8	519.7	8.921	60	20.6	8.153	12.5	18324
2. Borrow Site Preparation	5/15/2014	6/4/2014	20	0.9	7.8	39.2	95.9	4.1	4.1	0.0	3.7	3.7	0.0	8465.8	5/15/2015	6/14/2015	30	1.4	7.666	39.22	92.89	3.929	3.929	0	3.6134	3.613	0.0	8462.1
3. Levee Degrading/ Work Surface Construction	6/12/2014	6/24/2014	12	0.5	4.6	21.5	59.7	2.5	2.5	0.0	2.3	2.3	0.0	5909.8	6/12/2015	6/22/2015	10	0.5	4.478	21.38	58.13	2.469	2.469	0	2.2182	2.218	0.0	5996.3
4. Cutoff Wall Construction	6/30/2014	7/30/2014	30	1.4	4.0	23.1	40.5	2.1	2.1	0.0	2.0	2.0	0.0	4469.1	6/26/2015	7/16/2015	20	0.9	3.808	23.04	38.89	2.016	2.016	0	1.8523	1.852	0.0	4484.3
5. Levee Reconstruction/ Seepage Berm Construction	6/12/2014	9/5/2014	85	3.9	46.0	206.6	551.0	23.7	23.7	0.0	21.8	21.8	0.0	45042.3	6/12/2015	8/6/2015	55	2.5	45.44	206.5	539	23.19	23.19	0	21.336	21.34	0.0	45038
6. Borrow Site Excavation	6/12/2014	9/12/2014	92	4.2	12.4	59.4	378.8	11.695	9.7	2.0	7.6	7.1	0.4	59761.6	6/26/2015	8/20/2015	55	2.5	16.45	77.4	550.8	13.67	13.67	0	10.0	9.603	0.4	96346
7. Utility Reconstruction	7/14/2014	9/17/2014	65	3.0	2.3	15.0	27.2	1.1	1.1	0.0	1.0	1.0	0.0	3196.2	7/14/2015	9/7/2015	55	2.5	2.725	14.99	30.67	1.498	1.498	0	1.3761	1.376	0	3196
X. Roadway Construction	9/20/2014	10/10/2014	20	0.9	3.4	12.9	35.1	2.0	2.0	0.0	1.8	1.8	0.0	2673.3	9/11/2015	10/1/2015	20	0.9	3.385	12.9	34.36	1.963	1.963	0	1.7949	1.795	0	2668.9
8. Levee Resurfacing																												
9. Hydroseeding	10/20/2014	10/28/2014	8	0.4	2.2	8.6	25.2	1.0	1.0	0.0	0.9	0.9	0.0	2840.8	9/11/2015	9/21/2015	10	0.5	2.167	8.602	24.39	0.932	0.932	0	0.857	0.857	0	2841.2
10. Demobilization/Cleanup	10/9/2014	10/19/2014	10	0.5	0.3	2.1	3.8	0.2	0.2	0.0	0.2	0.2	0.0	478.2	8/28/2015	9/7/2015	10	0.5	0.267	2.093	3.625	0.19	0.19	0	0.1713	0.171	0	477.09

Construction Phase	Project C																										
	2013														2014												
	Schedule							PM10			PM2.5				Schedule							PM10			PM2.5			
	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2
1. Clearing and Grubbing/ Stripping	5/15/2013	5/25/2013	10	0.5	33.0	153.4	547.9	169.5	19.5	150.0	48.0	16.8	31.2	61385.5	5/15/2014	6/4/2014	20	0.9	27.78	133.8	443.2	165.2	15.22	150	44.4	13.25	31.2	49419
2. Borrow Site Preparation	5/15/2013	6/14/2013	30	1.4	8.2	39.3	100.9	4.3	4.3	0.0	4.0	4.0	0	8466.5	5/15/2014	6/14/2014	30	1.4	7.84	39.24	95.87	4.069	4.069	0	3.7418	3.742	0	8465.8
3. Levee Degrading/ Work Surface Construction	5/21/2013	5/31/2013	10	0.5	34.2	154.7	550.8	20.7	20.7	0.0	17.9	17.9	0	61392.3	6/12/2014	6/22/2014	10	0.5	28.79	135.1	445.2	16.34	16.34	0	14.273	14.27	0	49426
4. Cutoff Wall Construction	5/30/2013	6/14/2013	15	0.7	6.0	33.2	63.2	3.2	3.2	0.0	2.9	2.9	0	6591.0	6/26/2014	7/6/2014	10	0.5	5.546	33.07	58.66	2.894	2.894	0	2.6595	2.659	0	6611.8
5. Levee Reconstruction/ Seepage Berm Construction	5/23/2013	9/10/2013	110	5.0	25.9	110.5	300.1	13.9	13.9	0.0	12.8	12.8	0	23441.2	6/12/2014	8/21/2014	70	3.2	25.03	110.4	287.8	13.3	13.3	0	12.232	12.23	0	23466
6. Borrow Site Excavation	5/23/2013	9/10/2013	110	5.0	14.9	68.3	384.8	11.885	11.9	0.0	9.6	9.2	0.416	56547.1	6/26/2014	9/4/2014	70	3.2	16.21	74.77	541.9	15.38	13.38	2	10.0	9.63	0.416	87094
7. Utility Reconstruction	6/24/2013	8/28/2013	65	3.0	0.5	2.8	5.7	0.3	0.3	0.0	0.3	0.3	0.0	599.2	7/14/2014	9/17/2014	65	3.0	0.451	2.808	5.259	0.254	0.254	0	0.2333	0.233	0	599.19
8. Levee Resurfacing	10/3/2013	10/15/2013	12	0.5	6.8	22.8	76.5	4.1	4.1	0.0	3.7	3.7	0.0	6484.3	10/2/2014	10/14/2014	12	0.5	6.453	21.96	73.64	3.864	3.864	0	3.4701	3.47	0	6475.6
9. Hydroseeding	10/3/2013	10/15/2013	12	0.5	2.4	8.6	27.3	1.1	1.1	0.0	1.0	1.0	0.0	2839.9	10/2/2014	10/14/2014	12	0.5	2.218	8.601	25.24	0.967	0.967	0	0.8896	0.89	0	2840.8
10. Demobilization/Cleanup	10/21/2013	10/31/2013	10	0.5	0.4	2.5	6.3	0.3	0.3	0.0	0.3	0.3	0.0	796.1	10/20/2014	10/30/2014	10	0.5	0.331	2.337	5.75	0.248	0.248	0	0.2146	0.215	0	795.19

Construction Phase	Project D																										
	2013														2014												
	Schedule							PM10			PM2.5				Schedule							PM10			PM2.5			
	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2
1. Clearing and Grubbing/ Stripping	5/15/2013	6/4/2013	20	0.9	8.1	32.7	89.0	53.733	3.7	50.0	13.7	3.3	10.4	8872.9	4/29/2014	5/19/2014	20	0.9	7.416	31.43	84.37	53.38	3.382	50	13.4	3.008	10.4	8865.4
2. Borrow Site Preparation	5/15/2013	6/4/2013	20	0.9	8.2	39.3	100.9	4.3	4.3	0.0	4.0	4.0	0.0	8466.5	4/29/2014	5/29/2014	30	1.4	7.84	39.24	95.87	4.069	4.069	0	3.7418	3.742	0	8465.8

3. Levee Degrading/ Work Surface Construction																											
4. Cutoff Wall Construction																											
5. Levee Reconstruction/ Seepage Berm Construction	6/12/2013	9/13/2013	93	4.2	24.6	102.8	284.8	13.1	13.1	0.0	12.1	12.1	0.0	21960.8	5/27/2014	8/27/2014	92	4.2	23.77	102.8	273.5	12.57	12.57	0	11.559	11.56	0	21954
6. Borrow Site Excavation	6/12/2013	9/13/2013	93	4.2	4.5	21.1	108.9	3.387	3.4	0.0	3.1	2.7	0.4	15620.4	6/10/2014	9/10/2014	92	4.2	3.495	16.94	101.9	4.607	2.607	2	2.4	1.94	0.416	15763
7. Utility Reconstruction	7/12/2013	9/15/2013	65	3.0	0.5	2.8	5.7	0.3	0.3	0.0	0.3	0.3	0.0	599.2	6/26/2014	8/30/2014	65	3.0	0.451	2.808	5.259	0.254	0.254	0	0.2333	0.233	0	599.19
8. Levee Resurfacing																											
9. Hydroseeding	10/21/2013	11/2/2013	12	0.5	2.4	8.6	27.3	1.1	1.1	0.0	1.0	1.0	0.0	2839.9	10/16/2014	10/28/2014	12	0.5	2.218	8.601	25.24	0.967	0.967	0	0.8896	0.89	0	2840.8
10. Demobilization/Cleanup	10/21/2013	10/31/2013	10	0.5	0.5	2.8	8.4	0.4	0.4	0.0	0.3	0.3	0.0	1113.7	10/2/2014	10/12/2014	10	0.5	0.384	2.571	7.679	0.295	0.295	0	0.2474	0.247	0	1112.2

Alternative 3 Construction Schedule and Daily Output

Construction Phase	Project A																										
	2014														2015												
	Schedule							PM10			PM2.5				Schedule							PM10			PM2.5			
	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2
1. Clearing and Grubbing/ Stripping	5/15/2014	6/4/2014	20	0.9	14.6	71.2	186.4	27.3	7.3	20.0	10.8	6.7	4.2	16373.5	5/15/2015	6/4/2015	20	0.9	14.44	71.08	181.6	27.1	7.088	20.0	10.7	6.494	4.2	16359.8
2. Borrow Site Preparation	5/15/2014	6/14/2014	30	1.4	3.9	19.6	47.9	2.0	2.0	0.0	1.9	1.9	0.0	4232.9	5/15/2015	6/14/2015	30	1.4	3.833	19.61	46.45	2.2	1.965	0.0	2.0	1.807	0.0	4231.04
3. Levee Degrading/ Work Surface Construction	6/12/2014	8/1/2014	50	2.3	26.5	125.5	325.0	13.7	13.7	0.0	12.6	12.6	0.0	28132.3	6/12/2015	8/1/2015	50	2.3	26.13	125.4	316.8	16.4	13.42	0.0	14.6	12.32	0.0	28115.2
4. Cutoff Wall Construction	7/14/2014	8/18/2014	35	1.6	6.6	38.9	68.2	3.5	3.5	0.0	3.2	3.2	0.0	7676.9	7/14/2015	8/8/2015	25	1.1	6.321	38.79	65.35	6.2	3.279	0.0	5.7	3.011	0.0	7726.8
5. Levee Reconstruction/ Seepage Berm Construction	8/13/2014	9/17/2014	35	1.6	35.0	159.8	422.7	18.0	18.0	0.0	16.5	16.5	0.0	35040.6	8/13/2015	9/7/2015	25	1.1	34.53	159.8	413.3	12.0	17.59	0.0	11.1	16.18	0.0	35065.2
6. Borrow Site Excavation	8/13/2014	9/7/2014	25	1.1	6.0	29.9	172.6	7.6	4.6	3.0	4.1	3.4	0.6	26847.5	8/13/2015	9/7/2015	25	1.1	5.451	27.26	157.2	7.1	4.14	3.0	3.7	3.035	0.6	26562.2
7. Utility Reconstruction	7/14/2014	9/17/2014	65	3.0	3.0	15.4	35.1	1.4	1.4	0.0	1.3	1.3	0.0	3254.2	7/14/2015	9/17/2015	65	3.0	3.39	15.43	38.36	1.8125	1.813	0	1.666	1.666	0	3253.96
8. Levee Resurfacing	10/1/2014	10/13/2014	12	0.5	3.1	10.6	33.7	1.9	1.9	0.0	1.7	1.7	0.0	2722.7	9/17/2015	9/29/2015	12	0.5	3.141	10.6	33.69	1.8562	1.856	0	1.682	1.682	0	2722.67
9. Hydroseeding	9/17/2014	9/29/2014	12	0.5	2.2	8.6	25.2	1.0	1.0	0.0	0.9	0.9	0.0	2840.8	9/17/2015	9/29/2015	12	0.5	2.167	8.602	24.39	0.9315	0.932	0	0.857	0.857	0	2841.18
10. Demobilization/Cleanup	10/3/2014	10/18/2014	15	0.7	0.3	2.1	3.8	0.2	0.2	0.0	0.2	0.2	0.0	478.2	10/5/2015	10/20/2015	15	0.7	0.267	2.093	3.625	0.1898	0.19	0	0.171	0.171	0	477.089

Construction Phase	Project B																										
	2014														2015												
	Schedule							PM10			PM2.5				Schedule							PM10			PM2.5			
	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2
1. Clearing and Grubbing/ Stripping	4/29/2014	5/19/2014	20	0.9	21.8	94.6	365.9	32.6	12.6	20.0	15.0	10.8	4.2	42176.1	4/29/2015	5/19/2015	20	0.9	21.54	93.95	364	32.5	12.46	20.0	14.7	10.55	4.2	45027.9
2. Borrow Site Preparation	4/29/2014	5/29/2014	30	1.4	3.9	19.6	47.9	2.0	2.0	0.0	1.9	1.9	0.0	4232.9	4/29/2015	5/29/2015	30	1.4	3.833	19.61	46.45	2.2	1.965	0.0	2.0	1.807	0.0	4231.04
3. Levee Degrading/ Work Surface Construction	5/27/2014	6/21/2014	25	1.1	30.6	143.7	475.1	17.4	17.4	0.0	15.2	15.2	0.0	52806.1	5/27/2015	6/16/2015	20	0.9	30.12	143	469.6	16.4	17.06	0.0	14.6	14.78	0.0	55655.6
4. Cutoff Wall Construction	6/10/2014	7/30/2014	50	2.3	6.6	39.9	69.5	3.4	3.4	0.0	3.1	3.1	0.0	8049.3	6/26/2015	7/26/2015	30	1.4	6.288	39.8	66.5	6.2	3.218	0.0	5.7	2.955	0.0	8098.07
5. Levee Reconstruction/ Seepage Berm Construction	7/10/2014	8/24/2014	45	2.0	35.0	159.8	422.7	18.0	18.0	0.0	16.5	16.5	0.0	35045.9	7/28/2015	9/6/2015	40	1.8	34.53	159.8	413.3	12.0	17.59	0.0	11.1	16.18	0.0	35065.2
6. Borrow Site Excavation	7/10/2014	9/3/2014	55	2.5	7.3	35.4	218.8	6.7	5.7	1.0	4.4	4.2	0.2	34442.6	7/28/2015	9/6/2015	40	1.8	8.253	39.66	264.5	7.7	6.7	1.0	5.0	4.769	0.2	45897.9
7. Utility Reconstruction	6/26/2014	8/30/2014	65	3.0	3.0	15.4	35.1	1.4	1.4	0.0	1.3	1.3	0.0	3254.2	6/26/2015	8/30/2015	65	3.0	3.39	15.43	38.36	1.8125	1.813	0	1.666	1.666	0	3253.96
8. Levee Resurfacing	9/11/2014	9/23/2014	12	0.5	3.2	10.7	34.3	1.9	1.9	0.0	1.7	1.7	0.0	2828.3	9/22/2015	10/2/2015	10	0.5	3.139	10.68	34.36	1.8617	1.862	0	1.678	1.678	0	2974.36
9. Hydroseeding	9/25/2014	10/5/2014	10	0.5	2.2	8.6	25.2	1.0	1.0	0.0	0.9	0.9	0.0	2840.8	9/22/2015	10/2/2015	10	0.5	2.167	8.602	24.39	0.9315	0.932	0	0.857	0.857	0	2841.18
10. Demobilization/Cleanup	10/9/2014	10/19/2014	10	0.5	0.3	2.1	3.8	0.2	0.2	0.0	0.2	0.2	0.0	478.2	10/6/2015	10/14/2015	8	0.4	0.267	2.093	3.625	0.1898	0.19	0	0.171	0.171	0	477.089

Construction Phase	Project C																										
	2013														2014												
	Schedule							PM10			PM2.5				Schedule							PM10			PM2.5			
	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2
1. Clearing and Grubbing/ Stripping	5/15/2013	6/4/2013	20	0.9	10.8	49.8	187.3	46.6	6.6	40	13.9	5.6	8.32	21795.4	5/15/2014	6/4/2014	20	0.9	9.894	47.04	187.7	45.915	5.915	40	13.25	4.934	8.32	23720.1
2. Borrow Site Preparation	5/15/2013	6/14/2013	30	1.4	4.1	19.6	50.4	2.2	2.2	0	2.0	2.0	0	4233.2	5/15/2014	6/14/2014	30	1.4	3.92	19.62	47.93	2.0345	2.035	0	1.871	1.871	0	4232.91
3. Levee Degrading/ Work Surface Construction	5/24/2013	6/13/2013	20	0.9	29.2	132.2	408.0	16.4	16.4	0	14.6	14.6	0	39738.9	5/26/2014	6/10/2014	15	0.7	27.5	129.4	397.9	15.193	15.19	0	13.47	13.47	0	41659.8
4. Cutoff Wall Construction	6/4/2013	7/9/2013	35	1.6	11.7	64.4	123.2	6.2	6.2	0	5.7	5.7	0	12873.0	6/4/2014	6/29/2014	25	1.1	10.84	64.15	114.5	5.6121	5.612	0	5.155	5.155	0	12914.4
5. Levee Reconstruction/ Seepage Berm Construction	7/4/2013	9/7/2013	65	3.0	22.6	100.0	267.0	12.0	12.0	0	11.1	11.1	0	21454.3	7/3/2014	9/6/2014	65	3.0	21.68	99.95	255	11.457	11.46	0	10.54	10.54	0	21449.4
6. Borrow Site Excavation	7/4/2013	9/7/2013	65	3.0	5.4	25.0	134.1	6.2	4.2	2	3.7	3.3	0.416	19432.2	7/3/2014	9/6/2014	65	3.0	4.1	19.62	124.1	5.1431	3.143	2	2.733	2.317	0.416	19408.1
7. Utility Reconstruction	6/25/2013	8/29/2013	65	3.0	0.5	2.8	5.7	0.3	0.3	0.0	0.3	0.3	0.0	599.2	6/25/2014	8/29/2014	65	3.0	0.451	2.808	5.259	0.2545	0.254	0	0.233	0.233	0	599.187
8. Levee Resurfacing	10/3/2013	10/15/2013	12	0.5	3.9	13.5	51.6	2.5	2.5	0.0	2.2	2.2	0.0	5267.2	10/2/2014	10/14/2014	12	0.5	3.562	12.47	49.12	2.2294	2.229	0	1.944	1.944	0	5258.74
9. Hydroseeding	10/3/2013	10/15/2013	12	0.5	2.4	8.6	27.3	1.1	1.1	0.0	1.0	1.0	0.0	2839.9	10/2/2014	10/14/2014	12	0.5	2.218	8.601	25.24	0.967	0.967	0	0.89	0.89	0	2840.77
10. Demobilization/Cleanup	10/21/2013	10/31/2013	10	0.5	0.4	2.5	6.3	0.3	0.3	0.0	0.3	0.3	0.0	796.1	10/20/2014	10/30/2014	10	0.5	0.331	2.337	5.75	0.2479	0.248	0	0.215	0.215	0	795.193

Construction Phase	Project D																										
	2013														2014												
	Schedule							PM10			PM2.5				Schedule							PM10			PM2.5			
	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2
1. Clearing and Grubbing/ Stripping	5/15/2013	5/25/2013	10	0.5	6.3	29.7	85.2	63.3	3.3	60	15.4	2.9	12.48	7744.0	5/15/2014	5/25/2014	10	0.5	5.967	29.19	81.11	63.027	3.027	60	15.21	2.735	12.48	7739.48
2. Borrow Site Preparation	5/15/2013	6/14/2013	30	1.4	8.2	39.3	100.9	4.3	4.3	0	4.0	4.0	0	8466.5	5/15/2014	6/14/2014	30	1.4	7.84	39.24	95.87	4.069	4.069	0	3.742	3.742	0	8465.81
3. Levee Degrading/ Work Surface Construction	5/29/2013	6/8/2013	10	0.5	26.2	119.3	325.8	13.8	13.8	0	12.7	12.7	0	27271.0	5/29/2014	6/8/2014	10	0.5	25.1	118.8	310.3	13.074	13.07	0	11.98	11.98	0	27262.4

4. Cutoff Wall Construction	6/12/2013	7/27/2013	45	2.0	9.4	52.2	99.3	5.0	5.0	0	4.6	4.6	0	10466.7	6/12/2014	7/7/2014	25	1.1	8.723	52.08	92.5	4.5256	4.526	0	4.155	4.155	0	10561.1
5. Levee Reconstruction/ Seepage Berm Construction	7/11/2013	9/9/2013	60	2.7	25.9	110.5	300.4	13.9	13.9	0	12.8	12.8	0	23483.5	7/10/2014	9/8/2014	60	2.7	25.03	110.4	287.9	13.302	13.3	0	12.23	12.23	0	23476.9
6. Borrow Site Excavation	7/11/2013	9/9/2013	60	2.7	4.5	22.0	102.5	5.2	3.2	2	3.0	2.6	0.416	14192.1	7/10/2014	9/8/2014	60	2.7	3.663	18.4	95.26	4.5141	2.514	2	2.342	1.926	0.416	14179.8
7. Utility Reconstruction	6/28/2013	9/1/2013	65	3.0	0.5	2.8	5.7	0.3	0.3	0.0	0.3	0.3	0.0	599.2	6/30/2014	9/3/2014	65	3.0	0.451	2.808	5.259	0.2545	0.254	0	0.233	0.233	0	599.187
8. Levee Resurfacing	10/3/2013	10/15/2013	12	0.5	3.9	13.5	51.6	2.5	2.5	0.0	2.2	2.2	0.0	5267.2	10/2/2014	10/14/2014	12	0.5	3.562	12.47	49.12	2.2294	2.229	0	1.944	1.944	0	5258.74
9. Hydroseeding	10/3/2013	10/15/2013	12	0.5	2.4	8.6	27.3	1.1	1.1	0.0	1.0	1.0	0.0	2839.9	10/2/2014	10/14/2014	12	0.5	2.218	8.601	25.24	0.967	0.967	0	0.89	0.89	0	2840.77
10. Demobilization/Cleanup	10/21/2013	10/31/2013	10	0.5	0.5	2.8	8.4	0.4	0.4	0.0	0.3	0.3	0.0	1113.7	10/20/2014	10/30/2014	10	0.5	0.384	2.571	7.679	0.2945	0.295	0	0.247	0.247	0	1112.2

Appendix E

Greenhouse Gas Calculation Spreadsheets and Supporting Information

GREENHOUSE GAS APPENDIX

CACULATION SPREADSHEETS AND

SUPPORTING INFORMATION

Comparison of Project Total GHG Emissions

Emission Category	GHG Constituent Tons			GHG, CO2-Eq Tons			
	CO2	CH4	N2O	CO2	CH4	N2O	CO2-EQ
ALTERNATIVE 1							
Off-Road Equipment	15,076	3.0	0.20	15,076	63	0.20	15,139
On-Road Vehicles	9,131	0	--	9,131	7	--	9,137
Total	24,206	3.3	0.20	24,206	70	0.20	24,276
Levee Project Lifetime, years							50
Annualized GHG Emissions, tons CO2-eq per year							486
ALTERNATIVE 2							
Off-Road Equipment	18,930	3.8	0.25	18,930	79	0.25	19,010
On-Road Vehicles	19,022	1	--	19,022	12	--	19,034
Total	37,952	4.4	0.25	37,952	92	0.25	38,044
Levee Project Lifetime, years							50
Annualized GHG Emissions, tons CO2-eq per year							761
ALTERNATIVE 3							
Off-Road Equipment	16,788	3.4	0.22	16,788	71	0.22	16,859
On-Road Vehicles	9,547	0	--	9,547	7	--	9,554
Total	26,335	3.7	0.22	26,335	78	0.22	26,413
Levee Project Lifetime, years							50
Annualized GHG Emissions, tons CO2-eq per year							528

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Default Construction Equipment Factors from Sacramento Roadway Construction Emission Model

Equipment	d Factor Default Values			g/hp-hr	Vehicle	
	HP	Load Factor	Hrs/Day		CO2	CH4
Bore/Drill Rigs	291	0.75	8	427	N/A	N/A
Cement and Mortar Mixers	10	0.56	8	319	N/A	N/A
Cranes	399	0.43	8	245	N/A	N/A
Excavators	168	0.57	8	324	N/A	N/A
Generator Sets	549	0.74	8	421	N/A	N/A
Graders	174	0.61	8	347	N/A	N/A
Off-Highway Tractors	267	0.65	8	370	N/A	N/A
Off-Highway Trucks	479	0.57	8	324	N/A	N/A
Rollers	95	0.56	8	319	N/A	N/A
Rough Terrain Forklifts	93	0.60	8	336	N/A	N/A
Rubber Tired Dozers	357	0.59	8	336	N/A	N/A
Rubber Tired Loaders	157	0.54	8	307	N/A	N/A
Scrapers	313	0.72	8	410	N/A	N/A
Water Trucks	120	0.75	8	324	N/A	N/A
Commute Vehicles	N/A	N/A	N/A	N/A	426.7	0.018
Heavy Duty Trucks	N/A	N/A	N/A	N/A	1880	0.038

Alternative 1: Off-Road Equipment GHG Emissions and Annual Fuel Usage

	Project A										Project B										Project C										Project D										Project-Wide Fuel Usage					
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10						
Equipment	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	Days	Project Pieces*Days	Project HP-hr	CO2 EF g/hp-hr	Project CO2 Tons/yr	BSFC hp-hr/gal	Project Gallons
Aerial Lifts			0																																						20	0	0			20	0
Air Compressors																																									20	0	0			20	0
Bore/Drill Rigs				1										1										2										2							20	380	663,919	426.6	312	20	33,196
Cement and Mortar Mixers				2										2										4										3							20	685	31,674	318.5	11	20	1,584
Cranes							2										2																								20	460	631,535	244.6	170	20	31,577
Excavators			3	5		2	2						3	4		2	2						3	8			1						3	6			1			20	2,970	2,276,378	324.2	813	20	113,819
Generator Sets				4										4										6										5							20	1,175	3,820,263	420.9	1,771	20	191,013
Graders					2			2							2			2							2			2							5			2			20	1,170	991,817	346.9	379	20	49,591
Off-Highway Tractors		2										2										2			5			2				4			5					20	1,620	2,249,067	369.7	916	20	112,453
Off-Highway Trucks			7	3										3									7	3				2					7	3			1	2			20	1,661	3,627,557	324.2	1,295	20	181,378
Other Construction Equipment				1																																					20	60	22,228	352.7	9	20	1,111
Rollers			5		5			2					5		5				2				5		4			2					5			5			2			20	2,750	1,175,307	318.5	412	20	58,765
Rough Terrain Forklifts										1				1						1				1						1				1						1	20	258	115,676	335.6	43	20	5,784
Rubber Tired Dozers											2																														20	80	134,825	335.6	50	20	6,741
Rubber Tired Loaders	4	0		2		2	2							2		2					2			4		2					2			3						20	2,195	1,488,723	307.1	504	20	74,436
Scrapers	8	2	15		20						8	2	15		20						4	2	14		10	0					3	4	14		10						20	8,920	16,056,152	409.5	7,241	20	802,808
Water Trucks	2	1	3	2	3	2	2	1	2		2	1	3	2	3	2	2	1	2		2	1	4	2	3	2	1	1	2		2	2	3	2	3	3	1	1	2		20	4,477	3,223,440	324.2	1,151	20	161,172
Construction Days	20	20	40	60	60	60	100	22	18	18	40	60	80	50	80	80	130	20	20	15	40	60	35	60	130	130	130	24	24	20	40	60	25	75	90	90	130	24	24	20					15,076		1,825,428

Activity Codes:

1 - Clearing/Grubbing

2 - Borrow Site Preparation

3 - Levee Degrading

4 - Cutoff Wall Construction

5 - Levee Reconstruction

6 - Borrow Site Excavation and Hauling

7 - Utility Reconstruction

8 - Levee Resurfacing

9 - Hydorseeding

10 - Demobilization/Cleanup

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ALTERNATIVE 1: ON-ROAD VEHICLE EMISSIONS

Trip Type	Project A				Project B				Project C				Project D				Combined Projects				
Workers	79				76				102				102								
Duration, Days	418				575				653				578								
Round Trip Dist., miles	60				60				60				60								
Worker Vehicle Miles	1,986,336				2,618,550				4,008,114				3,547,764								
Vehicle Type	Total CY	Truck Load	Trips	Round Trip Miles	Total CY	Truck Load	Trips	Round Trip Miles	Total CY	Truck Load	Trips	Round Trip Miles	Total CY	Truck Load	Trips	Round Trip Miles	VMT	CO2 EF, g/mi	CO2 Tons	CH4 EF, g/mi	CH4 Tons
Worker Commute																	12,160,764	426.7	5,715	0.018	0.241
Unsuitable Soil Disposal, cy	31500	12	2625	3	520,250	12	43,354	3	253,000	12	21,083	3	14,000	12	1,167	3	204,688	1880	424	0.038	0.009
Bentonite			89	26			119	16			191	12			197	36	13,602	1880	28	0.038	0.001
Aggregate Surfacing			425	36			400	26			1,500	20			1,500	28	97,700	1880	202	0.038	0.004
Pipe Material			8	36			17	16			31	12			44	28	2,164	1880	4	0.038	0.000
Demolition Debris			60	36			36	16			160	12			275	28	12,356	1880	26	0.038	0.001
CLSM Backfill			26	36			36	16			104	12			76	28	4,888	1880	10	0.038	0.000
Borrow Fill, cy	244,000	12	20,333	6	796,750	12	66,396	6	531,000	12	44,250	8	330,000	12	27,500	16	1,314,375	1880	2,721	0.038	0.055
TOTALS																			9,131		0.310

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Alternative 2 Off-Road Equipment GHG Emissions and Fuel Usage

	Project A										Project B										Project C										Project D										Combined Projects GHG Emissions and Fuel Usage					
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	Project	Project	CO2 EF	Project CO2	Avg BSFC	Project
Equipment	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No*Days	HP-hr	g/hp-hr	Tons/yr	hp-hr/gal	Gallons
Bore/Drill Rigs				1																				1										0							35	61,150	426.6	29	20	3,058
Cement and Mortar Mixers				1										2										2										0							160	7,398	318.5	3	20	370
Cranes							2										2																	0							490	672,722	244.6	181	20	33,636
Excavators			1	2	2	4	2						1	4		2	2						3	4			1						0	0			1				2,492	1,910,012	324.2	682	20	95,501
Generator Sets				2										2										3										0							195	634,001	420.9	294	20	31,700
Graders					5			1							5			2	2						2			4							5			2			3,179	2,694,860	346.9	1,030	20	134,743
Off-Highway Tractors		4										4										4			5							4			2					2,038	2,829,382	369.7	1,152	20	141,469
Off-Highway Trucks			7	2									6	2					1				7	2			1	2				0	0			1	2			888	1,939,356	324.2	692	20	96,968
Other Construction Equipment				1																																				10	3,705	352.7	1	20	185
Rollers			2		5			1					2		5			3	1				5		5			4				0		5			2			3,903	1,668,081	318.5	585	20	83,404
Rough Terrain Forklifts										1				1						1				1						1				0					1	147	65,909	335.6	24	20	3,295
Rubber Tired Dozers											4																							0							160	269,650	335.6	100	20	13,483
Rubber Tired Loaders	4	0		1		4	2							1		4	2				7			2		4					3			0		2				3,510	2,380,600	307.1	805	20	119,030
Scrapers	8	4	2		25						8	4	2		25						13	4	14		10	0					5	4	0		10						14,247	25,644,843	409.5	11,566	20	1,282,242
Water Trucks	2	2	2	1	4	4	2	1	2		2	2	1	1	4	4	2	1	1	2	7	2	4	1	3	4	1	2	2		3	2	0	0	3	2	1	1	2		6,949	5,003,280	324.2	1,786	20	250,164
Construction Days	40	22	10	10	180	170	115	5	20	22	40	50	22	50	145	145	130	40	20	15	40	60	20	25	180	180	130	24	24	20	40	60	0	0	185	185	130	24	24	15				18,930		2,289,247

Activity Codes:

1 - Clearing/Grubbing

2 - Borrow Site Preparation

3 - Levee Degrading

4 - Cutoff Wall Construction

5 - Levee Reconstruction

6 - Borrow Site Excavation and Hauling

7 - Utility Reconstruction

8 - Levee Resurfacing

9 - Hydorseeding

10 - Demobilization/Cleanup

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ALTERNATIVE 2: ON-ROAD VEHICLE EMISSIONS

Trip Type	Project A					Project B					Project C					Project D					Combined Projects				
Workers	132					129					135					102									
Duration, Days	594					657					693					663									
Round Trip Dist., miles	60					60					60					60									
Worker Vehicle Miles	4,704,480					5,073,354					5,625,774					4,069,494									
Vehicle Type	Total CY	Truck Load	Trips	Round Trip Miles	Vehicle Miles	Total CY	Truck Load	Trips	Round Trip Miles	Vehicle Miles	Total CY	Truck Load	Trips	Round Trip Miles	Vehicle Miles	Total CY	Truck Load	Trips	Round Trip Miles	Vehicle Miles	VMT	2014 CO2 EF, g/mi	CO2 Tons	CH4 EF, g/mi	CH4 Tons
Worker Commute					4704480					5,073,354					5,625,774					4,069,494	19,473,102	426.7	9,151	0.018	0.386
Unsuitable Soil Disposal, cy	75	12	6.25	3	19	22,000	12	1,833	3	5,500	322,900	12	26,908	3	80,725	29,000	12	2,417	3	7,250	93,494	1880	194	0.038	0.004
Bentonite			1	26	26			31	16	496			28	12	336			197	36	7,092	7,950	1880	16	0.038	0.000
Aggregate Surfacing			50	18	900			225	26	5,850			1,200	20	24,000			1,500	28	42,000	72,750	1880	151	0.038	0.003
Pipe Material			8	36	288			17	16	272			31	12	372			44	36	1,584	2,516	1880	5	0.038	0.000
Demolition Debris			60	36	2,160			36	16	576			160	12	1,920			275	36	9,900	14,556	1880	30	0.038	0.001
CLSM Backfill			26	36	936			36	16	576			104	12	1,248			76	36	2,736	5,496	1880	11	0.038	0.000
Borrow Fill, cy	1,628,000	12	135,667	6	814,000	2,334,500	12	194,542	6	1,167,250	2,681,200	12	223,433	8	1,787,467	601,500	12	50,125	16	802,000	4,570,717	1880	9,464	0.038	0.191
TOTALS																							19,022		0.586

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Off-Road Equipment GHG Emissions: Alternative 3

	Project A										Project B										Project C										Project D										Project-Wide GHG Emissions					
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	Equipment	Project	Equip CO2 EF	Project CO2	Avg BSFC	Project
Equipment	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	Pieces*Days	HP-hr	g/hp-hr	Tons/yr	hp-hr/gal	Gallons
Bore/Drill Rigs				1										2										2										2							490	856,106	426.6	402	20	42,805
Cement and Mortar Mixers				2										2										4										3							745	34,449	318.5	12	20	1,722
Cranes							2										2																								520	713,909	244.6	192	20	35,695
Excavators			3	2		2	2						3	4		2	2						3	8			1						3	6			1				3,055	2,341,527	324.2	836	20	117,076
Generator Sets				4										4										6										5							1,295	4,210,417	420.9	1,952	20	210,521
Graders					2			2							2			2							2			2							5			2			1,188	1,007,076	346.9	385	20	50,354
Off-Highway Tractors		2										2										2			5							4			5					1,700	2,360,132	369.7	961	20	118,007
Off-Highway Trucks			7	3										3			2						7	3			1	2					7	3			1	2			2,345	5,121,385	324.2	1,829	20	256,069
Rollers			5		5			2					5		5		2						5		5			2					5		5			2			3,038	1,298,394	318.5	455	20	64,920
Rough Terrain Forklifts				1						1				1						1				1						1				1						1	357	160,064	335.6	59	20	8,003
Rubber Tired Dozers											4																														160	269,650	335.6	100	20	13,483
Rubber Tired Loaders	4	0		2		2	2							2		2	2				2			4		2					2			3		3				2,405	1,631,152	307.1	552	20	81,558
Scrapers	8	2	15		20						8	2	15		20						4	2	14		10	0					3	4	14		10					9,635	17,343,164	409.5	7,822	20	867,158
Water Trucks	2	1	3	2	3	2	2	1	2		2	1	3	2	3	2	2	1	2		2	1	4	2	3	2	1	1	2		2	2	3	2	3	3	1	1	2		4,793	3,450,960	324.2	1,232	20	172,548
Construction Period, Days	40	60	100	60	60	50	130	24	24	24	40	60	45	80	85	95	130	22	20	18	40	60	35	60	130	130	130	24	24	20	40	60	25	75	90	90	130	24	24	20	Project Total Emissions			16,788		2,039,919

Activity Codes:

1 - Clearing/Grubbing

2 - Borrow Site Preparation

3 - Levee Degrading

4 - Cutoff Wall Construction

5 - Levee Reconstruction

6 - Borrow Site Excavation and Hauling

7 - Utility Reconstruction

8 - Levee Resurfacing

9 - Hydorseeding

10 - Demobilization/Cleanup

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ON-ROAD VEHICLE EMISSIONS, ALTERNATIVE 3

Trip Type	Project A					Project B					Project C					Project D					Combined Project				
Workers	79.2					75.9					102.3					102.3									
Duration, Days	572					595					653					578									
Round Trip Dist., miles	60					60					60					60									
Worker Vehicle Miles	2,718,144					2,709,630					4,008,114					3,547,764									
Vehicle Type	Total CY	Truck Load	Trips	Round Trip Miles	Vehicle Miles	Total CY	Truck Load	Trips	Round Trip Miles	Vehicle Miles	Total CY	Truck Load	Trips	Round Trip Miles	Vehicle Miles	Total CY	Truck Load	Trips	Round Trip Miles	Vehicle Miles	VMT	2014 CO2 EF, g/mi	CO2 Tons	CH4 EF, g/mi	CH4 Tons
Worker Commute					2,718,144					2,709,630					4,008,114					3,547,764	12,983,652	426.7	6,101	0.018	0.26
Unsuitable Soil Disposal, cy	25,750	12	2,146	3	6,438	520,250	12	43,354	3	130,063	253,100	12	21,092	3	63,275	14,000	12	1,167	3	3,500	203,275	1880	421	0.038	0.009
Bentonite			78	26	2,028			119	16	1,904			193	12	2,316			197	36	7,092	13,340	1880	28	0.038	0.001
Aggregate Surfacing			350	36	12,600			400	26	10,400			1,500	20	30,000			1,500	28	42,000	95,000	1880	197	0.038	0.004
Pipe Material			8	26	208			17	16	272			31	12	372			44	36	1,584	2,436	1880	5	0.038	0.000
Demolition Debris			60	26	1,560			36	16	576			160	12	1,920			275	36	9,900	13,956	1880	29	0.038	0.001
CLSM Backfill			26	26	676			36	16	576			104	12	1,248			76	36	2,736	5,236	1880	11	0.038	0.000
Borrow Fill, cy	276,250	12	23,021	6	138,125	796,750	12	66,396	6	398,375	531,300	12	44,275	8	354,200	330,100	12	27,508	16	440,133	1,330,833	1880	2,755	0.038	0.056
TOTALS																							9,547		0.33

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Appendix F

Additional Resource Information for the Biological Study Area

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825

February 10, 2012

Document Number: 120210051632

Jennifer Haire
ICF International
630 K Street, Suite 400
Sacramento, CA 95814

Subject: Species List for Feather River West Levee Project

Dear: Ms. Haire

We are sending this official species list in response to your February 10, 2012 request for information about endangered and threatened species. The list covers the California counties and/or U.S. Geological Survey 7½ minute quad or quads you requested.

Our database was developed primarily to assist Federal agencies that are consulting with us. Therefore, our lists include all of the sensitive species that have been found in a certain area *and also ones that may be affected by projects in the area.* For example, a fish may be on the list for a quad if it lives somewhere downstream from that quad. Birds are included even if they only migrate through an area. In other words, we include all of the species we want people to consider when they do something that affects the environment.

Please read Important Information About Your Species List (below). It explains how we made the list and describes your responsibilities under the Endangered Species Act.

Our database is constantly updated as species are proposed, listed and delisted. If you address proposed and candidate species in your planning, this should not be a problem. However, we recommend that you get an updated list every 90 days. That would be May 10, 2012.

Please contact us if your project may affect endangered or threatened species or if you have any questions about the attached list or your responsibilities under the Endangered Species Act. A list of Endangered Species Program contacts can be found here.

Endangered Species Division

These buttons will not appear on your list.

Revise Selection

Print this page

Print species list before going on to letter.

Make Official Letter

U.S. Fish & Wildlife Service

Sacramento Fish & Wildlife Office

Federal Endangered and Threatened Species that Occur in or may be Affected by Projects in the Counties and/or U.S.G.S. 7 1/2 Minute Quads you requested

Document Number: 120210051632

Database Last Updated: September 18, 2011

Quad Lists

Listed Species

Invertebrates

- Branchinecta conservatio
  - Conservancy fairy shrimp (E)
- Branchinecta lynchi
  - vernal pool fairy shrimp (T)
- Desmocerus californicus dimorphus
  - valley elderberry longhorn beetle (T)
- Lepidurus packardi
  - vernal pool tadpole shrimp (E)

Fish

- Acipenser medirostris
  - green sturgeon (T) (NMFS)
- Hypomesus transpacificus
  - delta smelt (T)
- Oncorhynchus mykiss
  - Central Valley steelhead (T) (NMFS)

- Critical habitat, Central Valley steelhead (X) (NMFS)

- Oncorhynchus tshawytscha
  - Central Valley spring-run chinook salmon (T) (NMFS)
  - Critical Habitat, Central Valley spring-run chinook (X) (NMFS)
  - winter-run chinook salmon, Sacramento River (E) (NMFS)

Amphibians

- Ambystoma californiense
  - California tiger salamander, central population (T)

- Rana draytonii
  - California red-legged frog (T)

Reptiles

- Thamnophis gigas
  - giant garter snake (T)

Plants

- Orcuttia tenuis
  - slender Orcutt grass (T)

- Tuctoria greenei
  - Greene's tuctoria (=Orcutt grass) (E)

Candidate Species

Birds

- Coccyzus americanus occidentalis
  - Western yellow-billed cuckoo (C)

Quads Containing Listed, Proposed or Candidate Species:

NICOLAUS (529A)

YUBA CITY (544A)

SUTTER (544B)

OLIVEHURST (544D)

PALERMO (560A)

BIGGS (560B)

GRIDLEY (560C)

County Lists

No county species lists requested.

Key:

- (E) Endangered - Listed as being in danger of extinction.
- (T) Threatened - Listed as likely to become endangered within the foreseeable future.
- (P) Proposed - Officially proposed in the Federal Register for listing as endangered or threatened.
- (NMFS) Species under the Jurisdiction of the National Oceanic & Atmospheric Administration Fisheries Service. Consult with them directly about these species.
- Critical Habitat - Area essential to the conservation of a species.
- (PX) Proposed Critical Habitat - The species is already listed. Critical habitat is being proposed for it.
- (C) Candidate - Candidate to become a proposed species.
- (V) Vacated by a court order. Not currently in effect. Being reviewed by the Service.
- (X) Critical Habitat designated for this species

Important Information About Your Species List

How We Make Species Lists

We store information about endangered and threatened species lists by U.S. Geological Survey 7½ minute quads. The United States is divided into these quads, which are about the size of San Francisco.

The animals on your species list are ones that occur within, or may be affected by projects within, the quads covered by the list.

- Fish and other aquatic species appear on your list if they are in the same watershed as your quad or if water use in your quad might affect them.
- Amphibians will be on the list for a quad or county if pesticides applied in that area may be carried to their habitat by air currents.
- Birds are shown regardless of whether they are resident or migratory. Relevant birds on the county list should be considered regardless of whether they appear on a quad list.

Plants

Any plants on your list are ones that have actually been observed in the area covered by the list. Plants may exist in an area without ever having been detected there. You can find out what's in the surrounding quads through the California Native Plant Society's online Inventory of Rare and Endangered Plants.

Surveying

Some of the species on your list may not be affected by your project. A trained biologist and/or botanist, familiar with the habitat requirements of the species on your list, should determine whether they or habitats suitable for them may be affected by your project. We recommend that your surveys include any proposed and candidate species on your list.
See our Protocol and Recovery Permits pages.

For plant surveys, we recommend using the Guidelines for Conducting and Reporting Botanical Inventories. The results of your surveys should be published in any environmental documents prepared for your project.

Your Responsibilities Under the Endangered Species Act

All animals identified as listed above are fully protected under the Endangered Species Act of 1973, as amended. Section 9 of the Act and its implementing regulations prohibit the take of a federally listed wildlife species. Take is defined by the Act as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect" any such animal.

> Take may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or shelter (50 CFR §17.3).

Take incidental to an otherwise lawful activity may be authorized by one of two procedures:

- If a Federal agency is involved with the permitting, funding, or carrying out of a project that may result in take, then that agency must engage in a formal consultation with the Service.
- During formal consultation, the Federal agency, the applicant and the Service work together to avoid or minimize the impact on listed species and their habitat. Such consultation would result in a biological opinion by the Service addressing the anticipated effect of the project on listed and proposed species. The opinion may authorize a limited level of incidental take.
- If no Federal agency is involved with the project, and federally listed species may be taken as part of the project, then you, the applicant, should apply for an incidental take permit. The Service may issue such a permit if you submit a satisfactory conservation plan for the species that would be affected by your project.
- Should your survey determine that federally listed or proposed species occur in the area and are likely to be affected by the project, we recommend that you work with this office and the California Department of Fish and Game to develop a plan that minimizes the project's direct and indirect impacts to listed species and compensates for project-related loss of habitat. You should include the plan in any environmental documents you file.

Critical Habitat

When a species is listed as endangered or threatened, areas of habitat considered essential to its conservation may be designated as critical habitat. These areas may require special management considerations or protection. They provide needed space for growth and normal behavior; food, water, air, light, other nutritional or physiological requirements; cover or shelter; and sites for breeding, reproduction, rearing of offspring, germination or seed dispersal.

Although critical habitat may be designated on private or State lands, activities on these lands are not restricted unless there is Federal involvement in the activities or direct harm to listed wildlife.

If any species has proposed or designated critical habitat within a quad, there will be a separate line for this on the species list. Boundary descriptions of the critical habitat may be found in the Federal Register. The information is also reprinted in the Code of Federal Regulations (50 CFR 17.95). See our Map Room page.

Candidate Species

We recommend that you address impacts to candidate species. We put plants and animals on our candidate list when we have enough scientific information to eventually propose them for listing as threatened or endangered. By considering these species early in your planning process you may be able to avoid the problems that could develop if one of these candidates was listed before the end of your project.

Species of Concern

The Sacramento Fish & Wildlife Office no longer maintains a list of species of concern. However, various other agencies and organizations maintain lists of at-risk species. These lists provide essential information

for land management planning and conservation efforts. More info

Wetlands

If your project will impact wetlands, riparian habitat, or other jurisdictional waters as defined by section 404 of the Clean Water Act and/or section 10 of the Rivers and Harbors Act, you will need to obtain a permit from the U.S. Army Corps of Engineers. Impacts to wetland habitats require site specific mitigation and monitoring. For questions regarding wetlands, please contact Mark Littlefield of this office at (916) 414-6520.

Updates

Our database is constantly updated as species are proposed, listed and delisted. If you address proposed and candidate species in your planning, this should not be a problem. However, we recommend that you get an updated list every 90 days. That would be May 10, 2012.

California Department of Fish and Game
Natural Diversity Database
Special-status plants & sensitive natural communities
Biggs, Gridley, Nicolaus, Olivehurst, Palermo, Sutter, & Yuba City Quads

	Scientific Name/Common Name	Element Code	Federal Status	State Status	GRank	SRank	CDFG or CNPS
1	Astragalus tener var. ferrisiae Ferris' milk-vetch	PDFAB0F8R3			G1T1	S1	1B.1
2	Delphinium recurvatum recurved larkspur	PDRAN0B1J0			G3	S3	1B.2
3	Great Valley Cottonwood Riparian Forest	CTT61410CA			G2	S2.1	
4	Great Valley Mixed Riparian Forest	CTT61420CA			G2	S2.2	
5	Juncus leiospermus var. ahartii Ahart's dwarf rush	PMJUN011L1			G2T1	S1.2	1B.2
6	Monardella douglasii ssp. venosa veiny monardella	PDLAM18082			G5T1	S1.1	1B.1
7	Navarretia leucocephala ssp. bakeri Baker's navarretia	PDPLM0C0E1			G4T2	S2	1B.1
8	Northern Hardpan Vernal Pool	CTT44110CA			G3	S3.1	
9	Orcuttia tenuis slender Orcutt grass	PMPOA4G050	Threatened	Endangered	G2	S2	1B.1
10	Pseudobahia bahiifolia Hartweg's golden sunburst	PDAST7P010	Endangered	Endangered	G2	S2	1B.1
11	Sagittaria sanfordii Sanford's arrowhead	PMALI040Q0			G3	S3	1B.2
12	Tuctoria greenei Greene's tuctoria	PMPOA6N010	Endangered	Rare	G1	S1	1B.1

California Department of Fish and Game
Natural Diversity Database
Feather River West Levee Project - animals
Quads searched: Nicolaus, Yuba City, Sutter, Olivehurst, Biggs, Gridley, and Palermo

	Common Name/Scientific Name	Element Code	Federal Status	State Status	GRank	SRank	CDFG or CNPS
1	Antioch Dunes anthicid beetle *Anthicus antiochensis*	IICOL49020			G1	S1	
2	California black rail *Laterallus jamaicensis coturniculus*	ABNME03041		Threatened	G4T1	S1	
3	California linderiella *Linderiella occidentalis*	ICBRA06010			G3	S2S3	
4	Sacramento Valley tiger beetle *Cicindela hirticollis abrupta*	IICOL02106			G5TH	SH	
5	Sacramento anthicid beetle *Anthicus sacramento*	IICOL49010			G1	S1	
6	Sacramento splittail *Pogonichthys macrolepidotus*	AFCJB34020			G2	S2	SC
7	Swainson's hawk *Buteo swainsoni*	ABNKC19070		Threatened	G5	S2	
8	bald eagle *Haliaeetus leucocephalus*	ABNKC10010	Delisted	Endangered	G5	S2	
9	bank swallow *Riparia riparia*	ABPAU08010		Threatened	G5	S2S3	
10	burrowing owl *Athene cunicularia*	ABNSB10010			G4	S2	SC
11	chinook salmon - Central Valley spring-run ESU *Oncorhynchus tshawytscha*	AFCHA0205A	Threatened	Threatened	G5	S1	
12	giant garter snake *Thamnophis gigas*	ARADB36150	Threatened	Threatened	G2G3	S2S3	
13	greater sandhill crane *Grus canadensis tabida*	ABNMK01014		Threatened	G5T4	S2	
14	northern harrier *Circus cyaneus*	ABNKC11010			G5	S3	SC
15	silver-haired bat *Lasionycteris noctivagans*	AMACC02010			G5	S3S4	
16	tricolored blackbird *Agelaius tricolor*	ABPBXB0020			G2G3	S2	SC
17	valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	IICOL48011	Threatened		G3T2	S2	
18	vernal pool fairy shrimp *Branchinecta lynchi*	ICBRA03030	Threatened		G3	S2S3	
19	vernal pool tadpole shrimp *Lepidurus packardi*	ICBRA10010	Endangered		G3	S2S3	
20	western mastiff bat *Eumops perotis californicus*	AMACD02011			G5T4	S3?	SC
21	western pond turtle *Emys marmorata*	ARAAD02030			G3G4	S3	SC
22	western spadefoot *Spea hammondii*	AAABF02020			G3	S3	SC
23	western yellow-billed cuckoo *Coccyzus americanus occidentalis*	ABNRB02022	Candidate	Endangered	G5T3Q	S1	

Inventory of Rare and Endangered Plants

v7-12feb 2-21-12

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Basic Tools:
- All CNPS-listed plants
- Checkbox and Preset search
- Getting Started guide

Tech Tools:
- Query Builder
- Query by list of names
- Nine-quad search

Database indexes
- CNPS List
- State Status
- Federal Status
- Family
- County
- Life Form
- Topo Quad
- Common Name

Members and Friends:
- Request assistance
- Submit survey data
- Show your Plant Press

other things:
- Documentation and Resources
- Looking for common plants?
- Home of CNPS

Quick Search Form:

Search

• **more**

8th EDITION interface now available online!.....
Same data, but now includes GIS and many improvements. Not all 7th Edition features have been added yet - you can continue to use them here. To simplify access to the new features, such as GIS, each record in the 7th Edition now has a link to the corresponding details page in the 8th Edition.

INTRODUCTION to the 7th EDITION

The CNPS Inventory of Rare and Endangered Plants is now published on-line and updated quarterly. Along with the latest Inventory data from CNPS, you will find a variety of search tools, maps, thumbnail illustrations, and links to additional information.



CalPhotos archive
What rare plant is this?
(Click on image.)

The statewide CNPS website has extensive • **background information** about the Inventory. Since the publication of the last hardcopy 6th Edition in 2001, the review process and revisions have been ongoing. Stay informed and get involved!

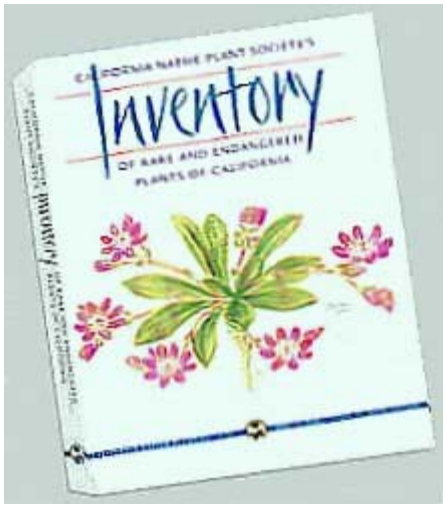
Users of the Inventory may find it helpful to read the • **FAQ**.
example: "Which search method should I use?" (answer)
New users might want to consult the • **Getting Started** guide.

The last hardcopy edition was August 2001, but much of the front matter remains useful and informative:

Rarity in Vascular Plants - Peggy L. Fiedler
Rare Bryophytes in California - James R. Shevock
Bibliography for Biology and Conservation of Rare Plants - Peggy L. Fiedler and James P. Smith, Jr.
Conserving Plants with Laws and Programs under the California Department of Fish and Game - Sandra Morey and Diane Ikeda
The California Natural Diversity Database- Roxanne L. Bittman
The Natural Communities Program - Todd Keeler-Wolf

The Federal Endangered Species Act and Rare Plant Protection in California - Jim A. Bartel, Jan C. Knight, and Diane Elam

Sensitive Plant Management on the National Forests and Grasslands in California - Bradley E. Howell



Rare Plant Conservation on Bureau of Land Management Lands - John Willoughby

History of the CNPS Rare Plant Program

CNPS Inventory of Rare and Endangered Plants

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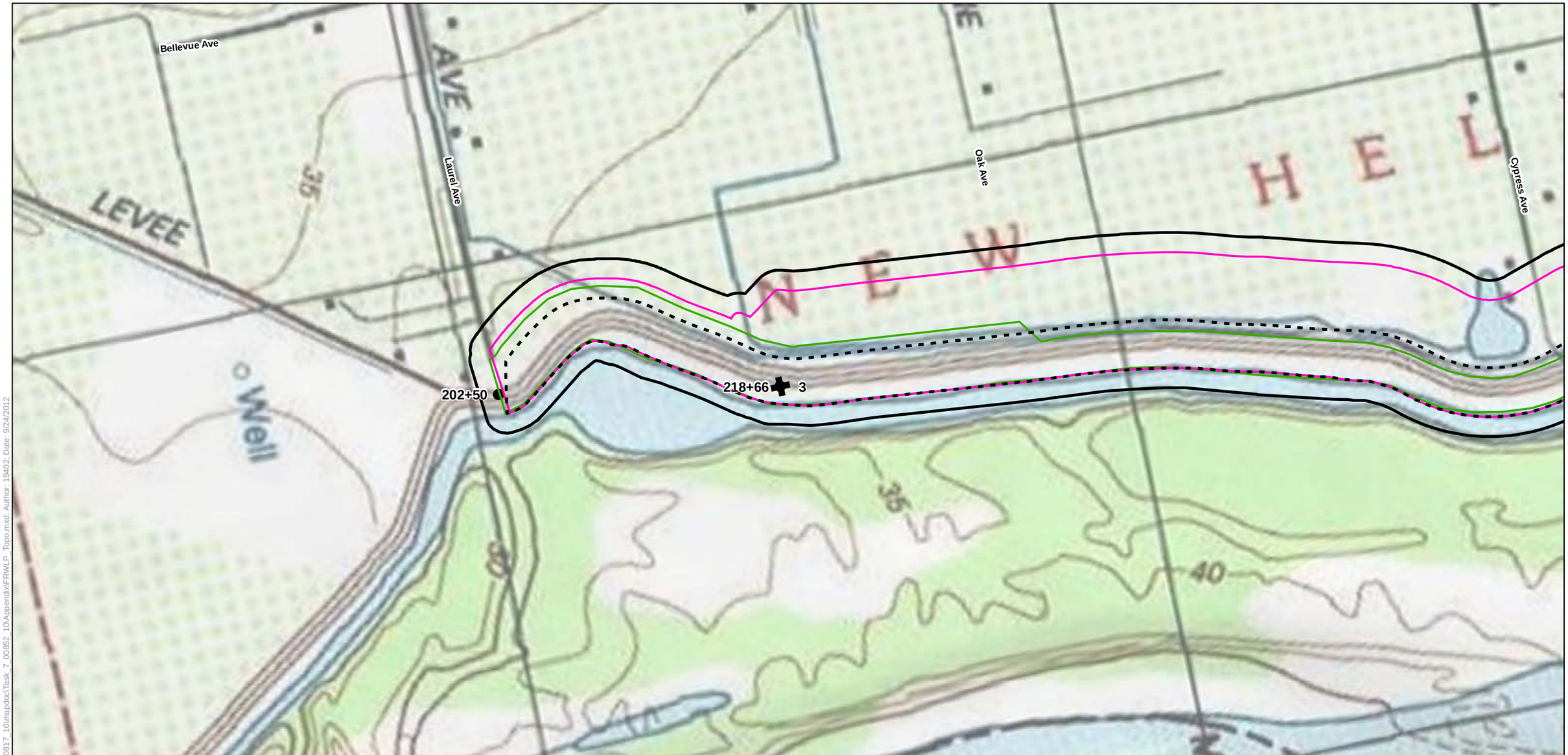
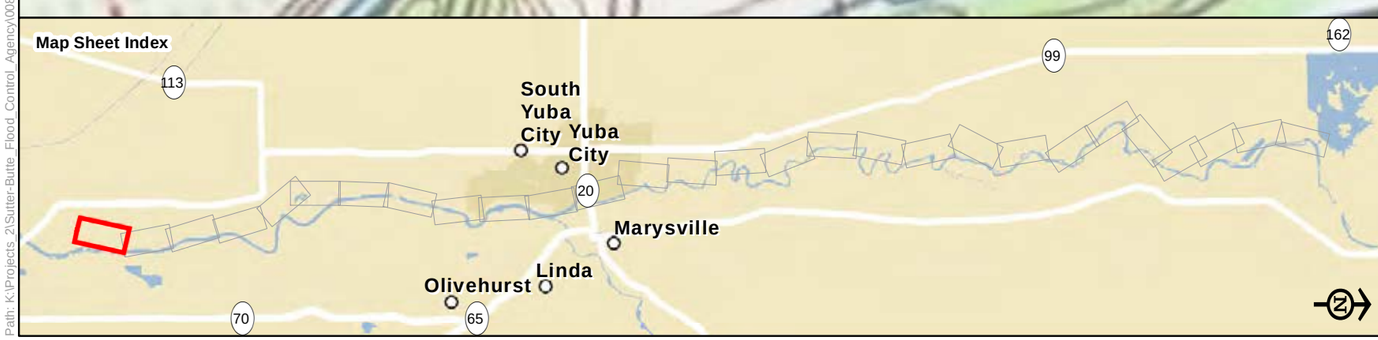
Reformat list as: Standard List - with Plant Press controls

ECOLOGICAL REPORT

scientific	family	life form	blooming	communities	elevation	CNPS
Astragalus tener var. ferrisiae	Fabaceae	annual herb	Apr-May	•Meadows and seeps (Medws)(vernally mesic) •Valley and foothill grassland (VFGrs)(subalkaline flats)	2 - 75 meters	List 1B.1
Delphinium recurvatum	Ranunculaceae	perennial herb	Mar-Jun	•Chenopod scrub (ChScr) •Cismontane woodland (CmWld) •Valley and foothill grassland (VFGrs)/alkaline	3 - 750 meters	List 1B.2
Juncus leiospermus var. ahartii	Juncaceae	annual herb	Mar-May	•Valley and foothill grassland (VFGrs)(mesic)	30 - 229 meters	List 1B.2
Monardella douglasii ssp. venosa	Lamiaceae	annual herb	May-Jul	•Cismontane woodland (CmWld) •Valley and foothill grassland (VFGrs)/heavy clay	60 - 410 meters	List 1B.1
Orcuttia tenuis	Poaceae	annual herb	May-Sep(Oct), Months in parentheses are uncommon.	•Vernal pools (VnPls)	35 - 1760 meters	List 1B.1
Pseudobahia bahiifolia	Asteraceae	annual herb	Mar-Apr	•Cismontane woodland (CmWld) •Valley and foothill grassland (VFGrs)/clay, often acidic	15 - 150 meters	List 1B.1
Sagittaria sanfordii	Alismataceae	perennial rhizomatous herb emergent	May-Oct	•Marshes and swamps (MshSw)(assorted shallow freshwater)	0 - 650 meters	List 1B.2
Tuctoria greenei	Poaceae	annual herb	May-Jul(Sep), Months in parentheses are uncommon.	•Vernal pools (VnPls)	30 - 1070 meters	List 1B.1





Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

USGS 7.5-minute Topographic Maps in the Vicinity of the Biological Study Area

Sheet 1

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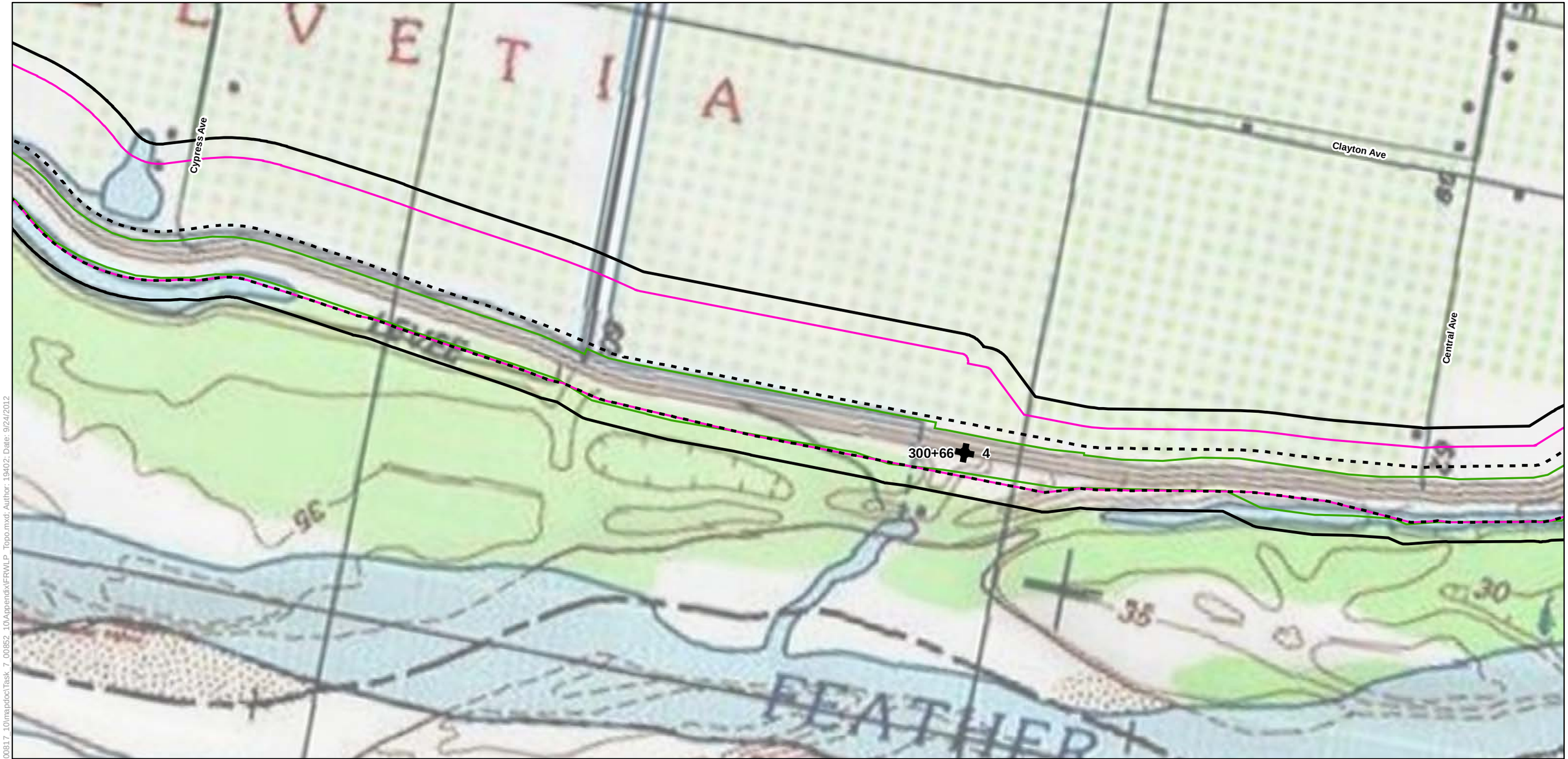

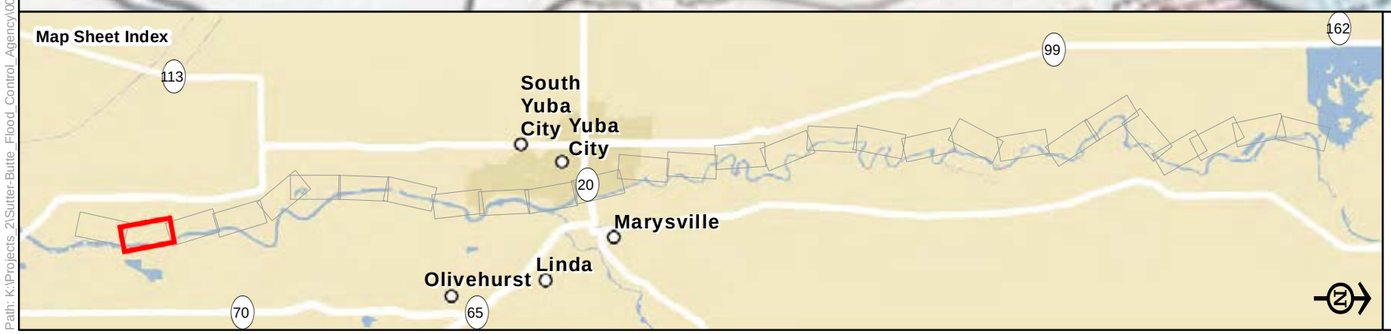

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USGS 7.5-minute Topographic Maps in the Vicinity of the Biological Study Area

Sheet 2

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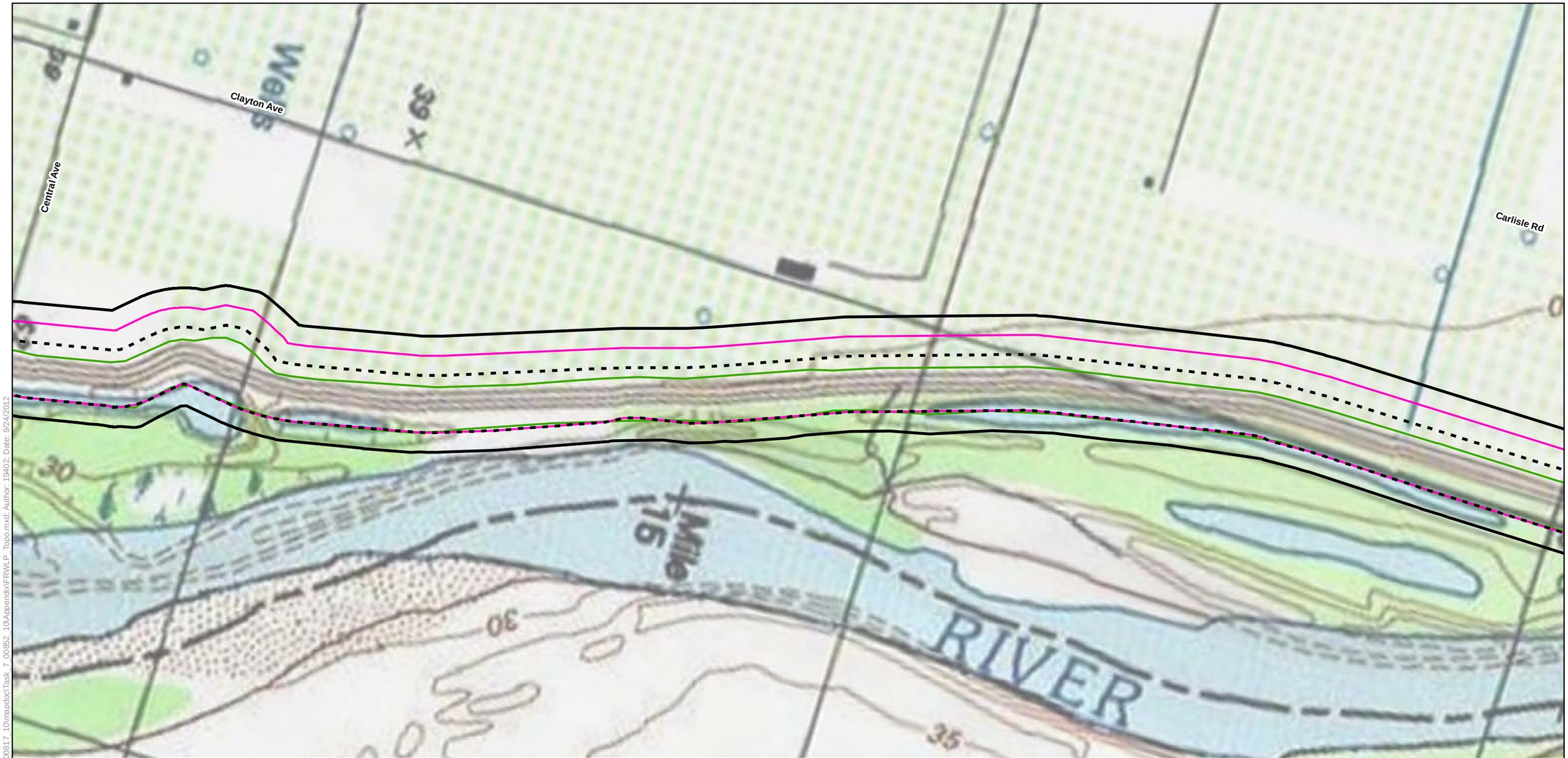

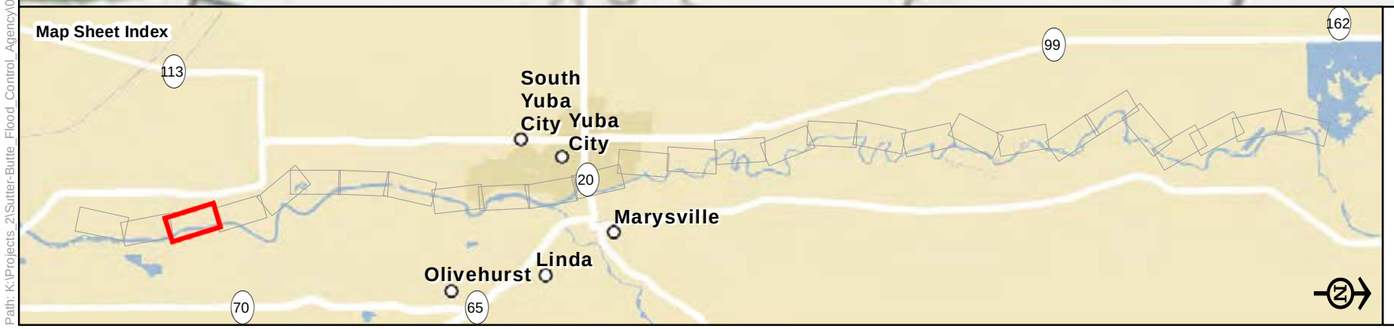

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Sheet 3

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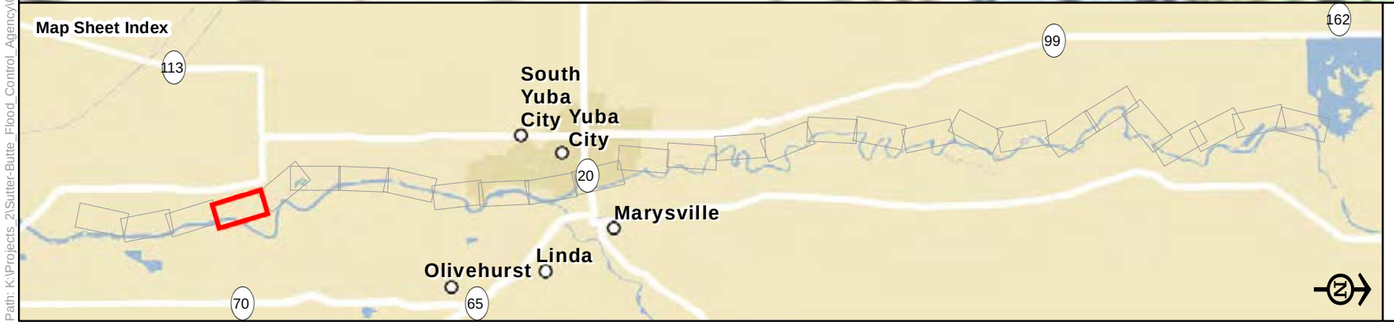
Wilkie Ave
Lyon Ave
Oconnor Ave
Peck Ave
Ashford Ave
LEVEE
410+67 5
478+68 6



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Sheet 4

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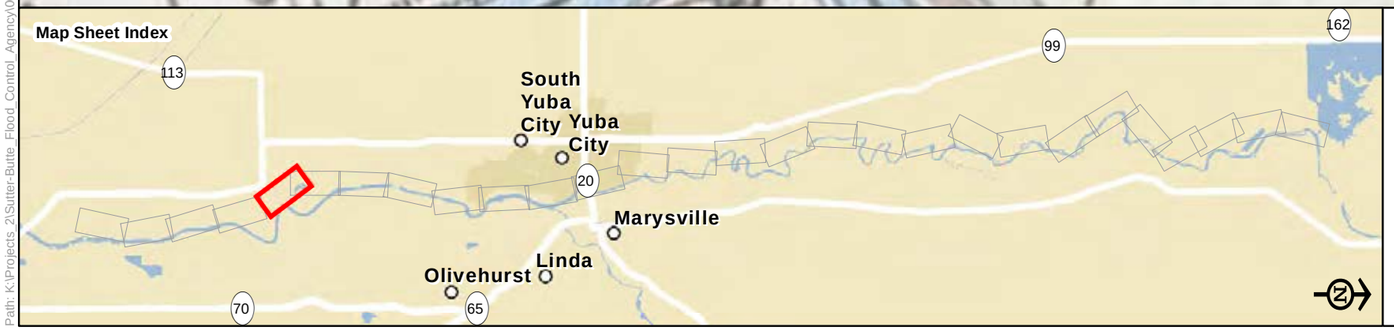
Garden Hwy

Shannon Rd

Star Bend Rd

510+37 7

Map Sheet Index



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USGS 7.5-minute Topographic Maps in the Vicinity of the Biological Study Area

Sheet 5

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GARDEN

Garden Hwy

Obanion Rd

Abbott Lake

596+00

8

Map Sheet Index

South Yuba City

Yuba City

Marysville

Linda

Olivehurst

113

99

162

20

70

65

Legend

- Biological Study Area
- Alternative 1
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USGS 7.5-minute Topographic Maps in the Vicinity of the Biological Study Area

Sheet 6

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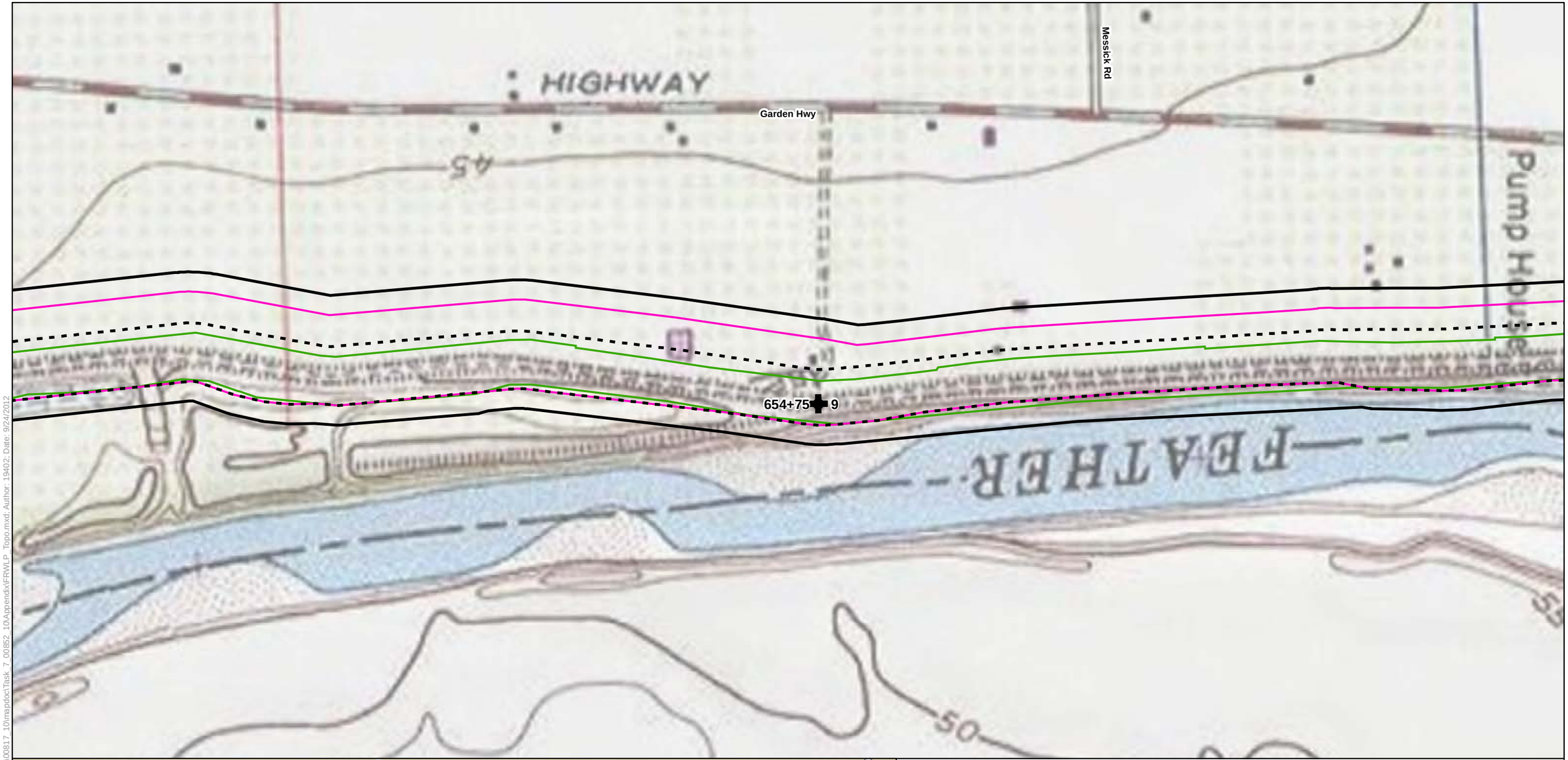

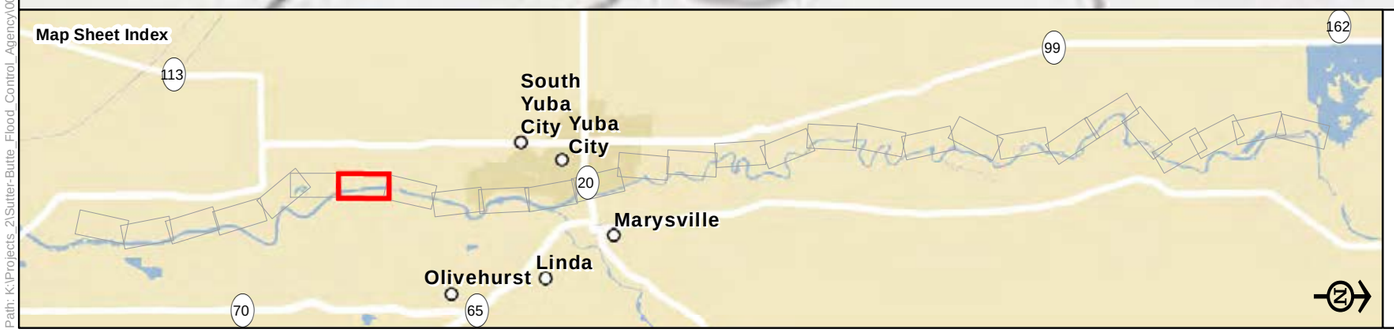

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USGS 7.5-minute Topographic Maps in the Vicinity of the Biological Study Area

Sheet 7

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Oswald Rd

Barry Rd

Garden Hwy

706+50 10

Levee Rd

Pump House

35

50

55

50

Map Sheet Index

113

99

162

South Yuba City

Yuba City

20

Marysville

Linda

Olivehurst

70

65

Legend

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USGS 7.5-minute Topographic Maps in the Vicinity of the Biological Study Area

Sheet 8

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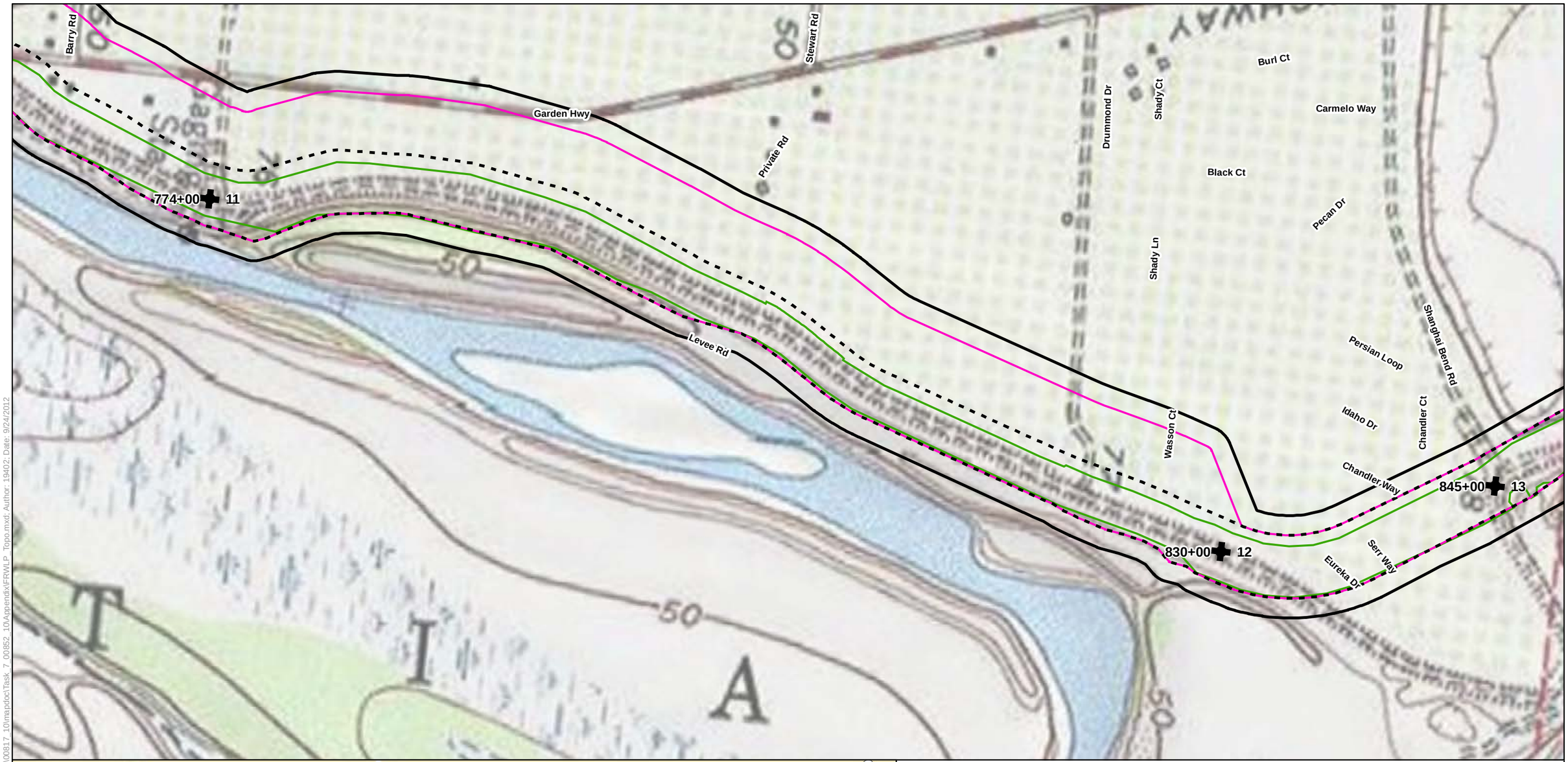

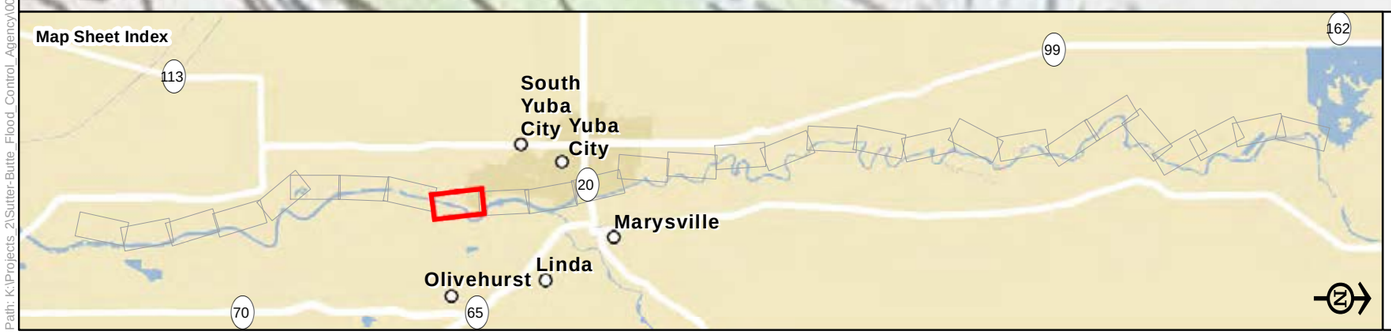

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USGS 7.5-minute Topographic Maps in the Vicinity of the Biological Study Area

Sheet 9

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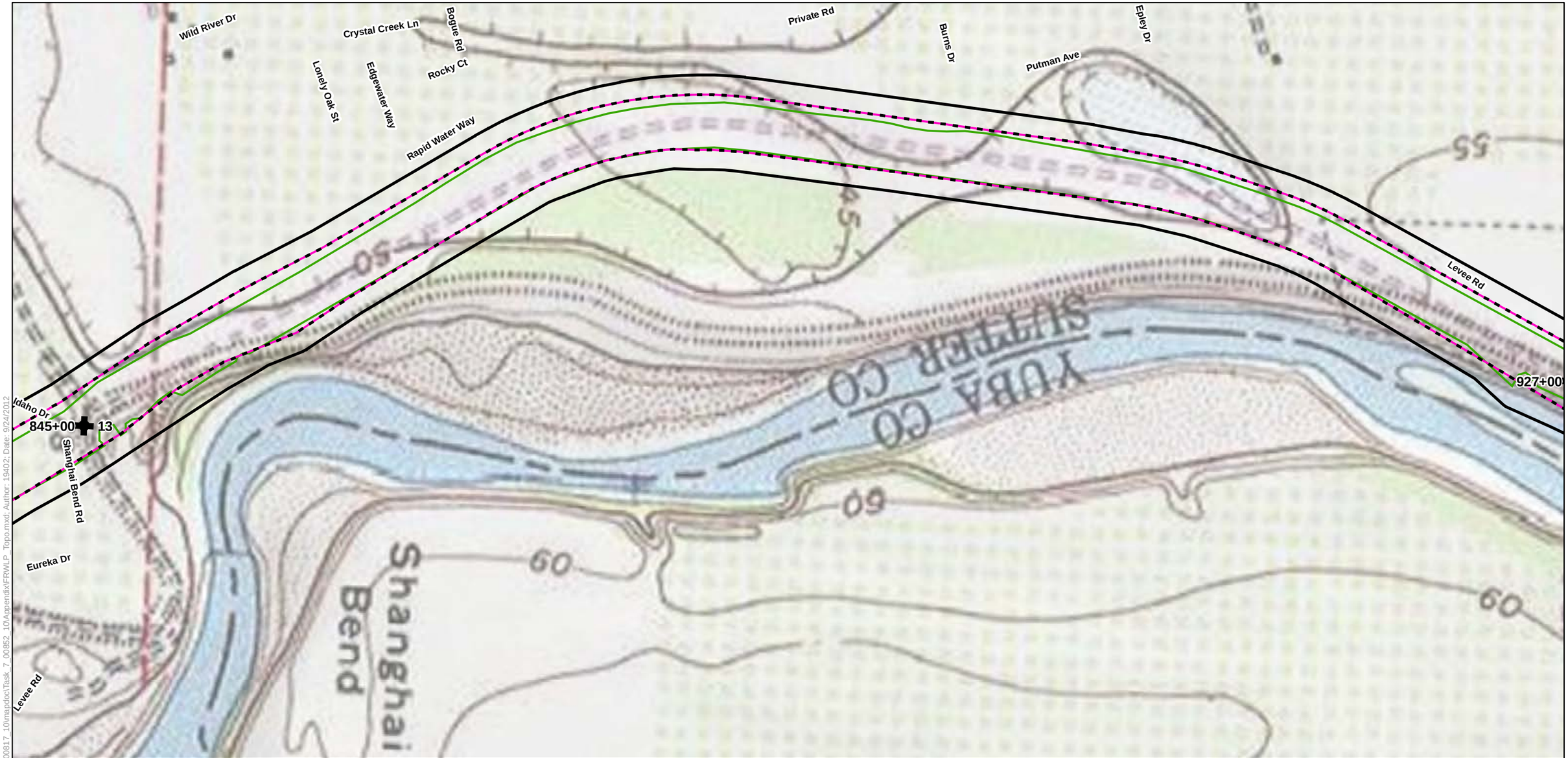



Legend

- Biological Study Area
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USGS 7.5-minute Topographic Maps in the Vicinity of the Biological Study Area

Sheet 10

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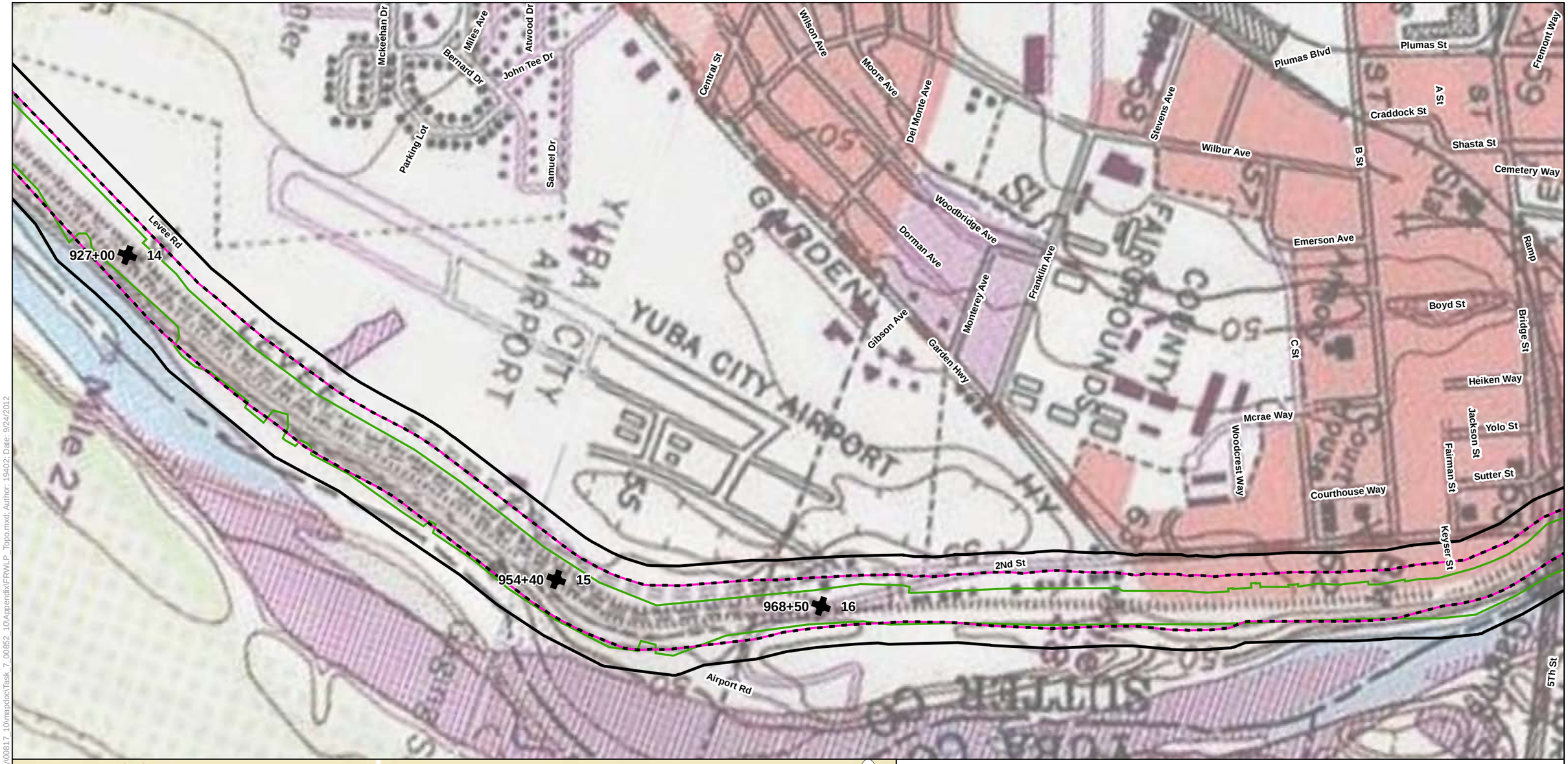



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USGS 7.5-minute Topographic Maps in the Vicinity of the Biological Study Area

Sheet 11

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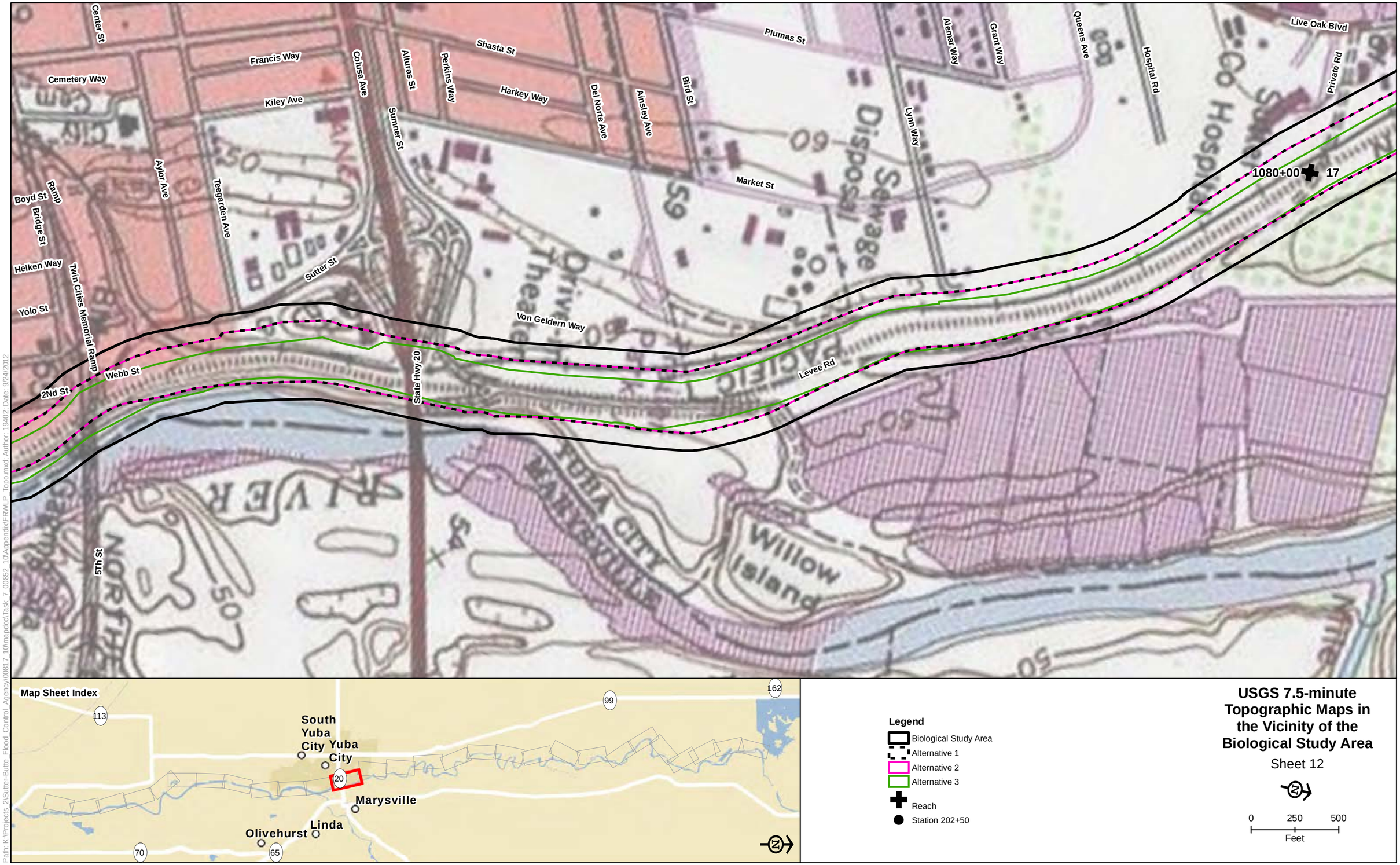

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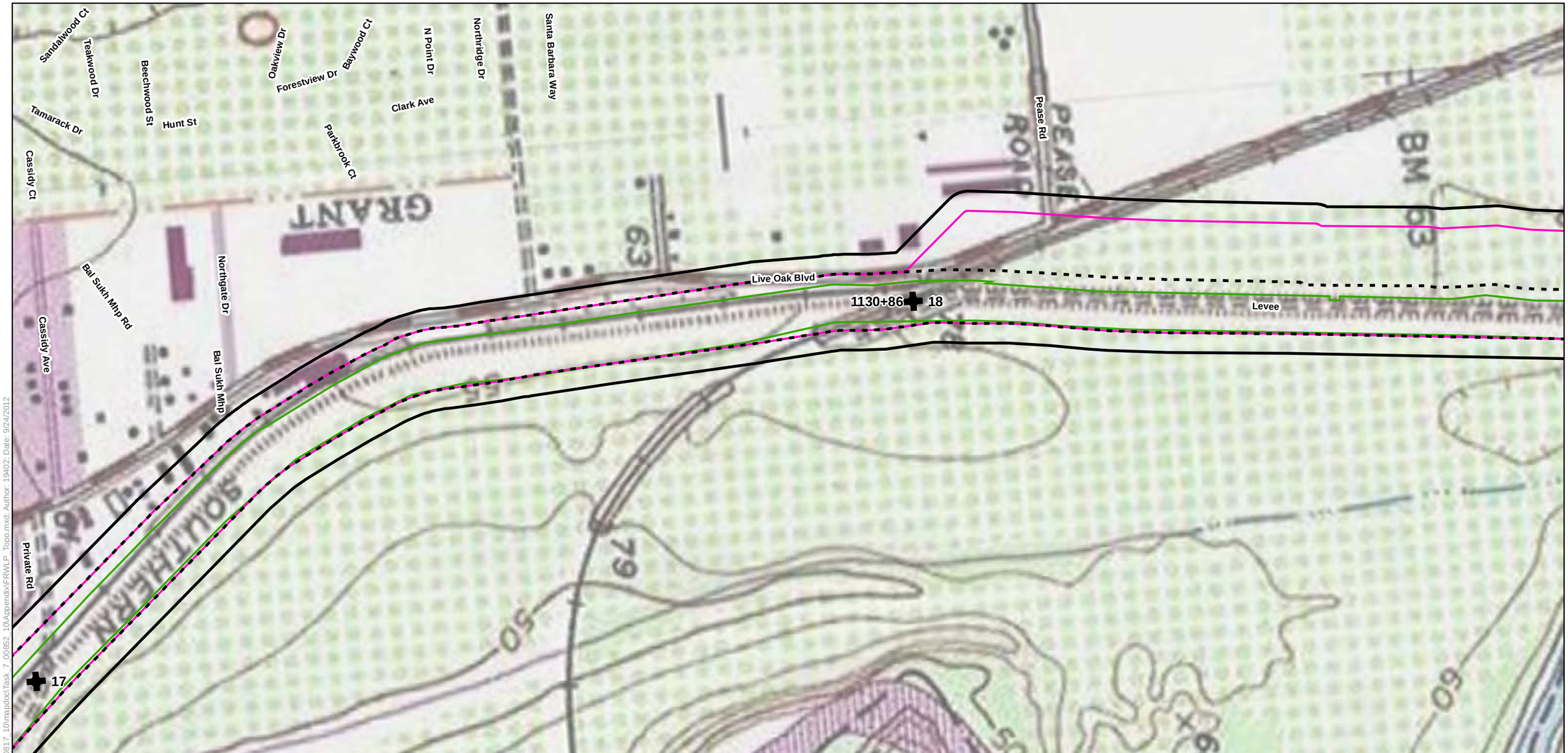



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USGS 7.5-minute Topographic Maps in the Vicinity of the Biological Study Area

Sheet 13

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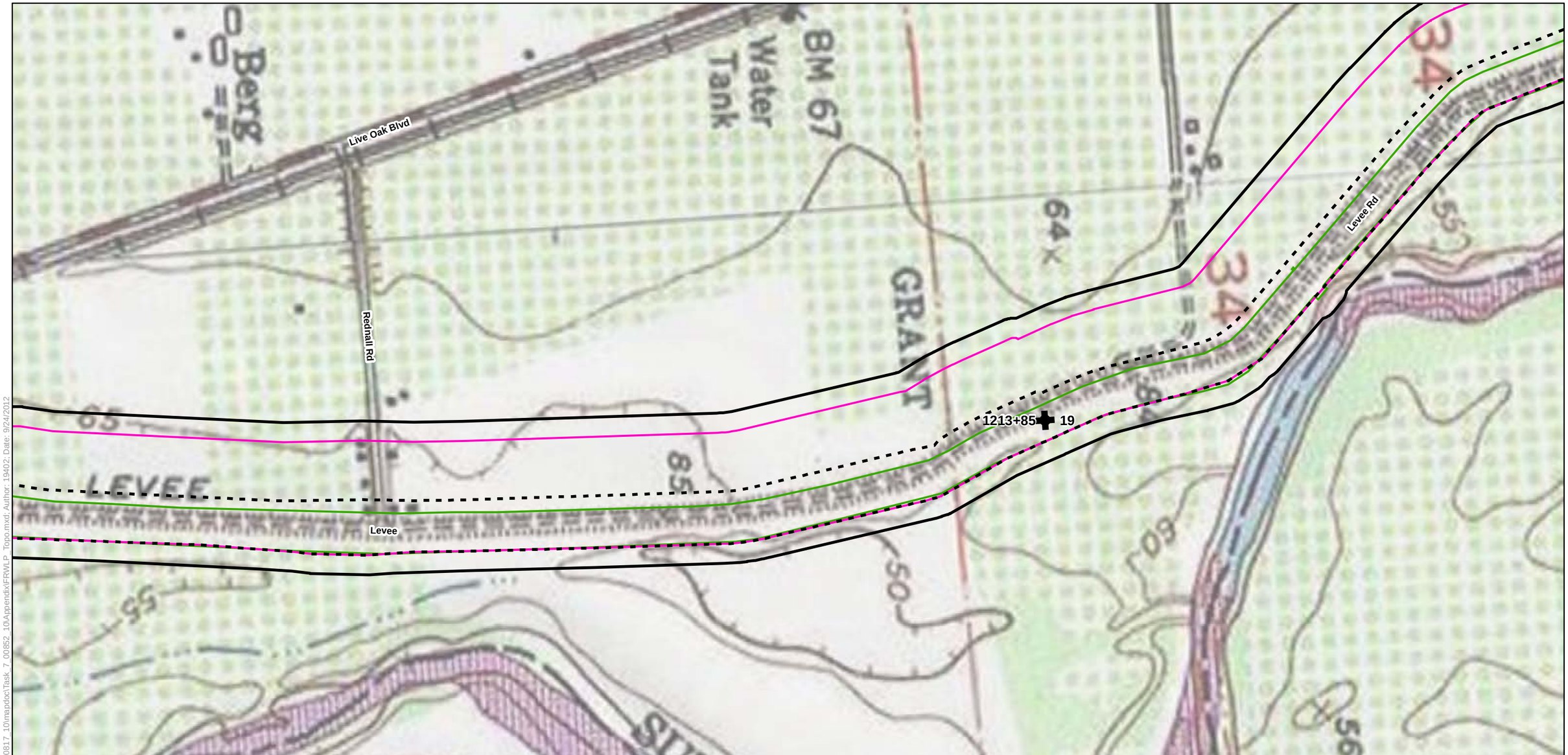

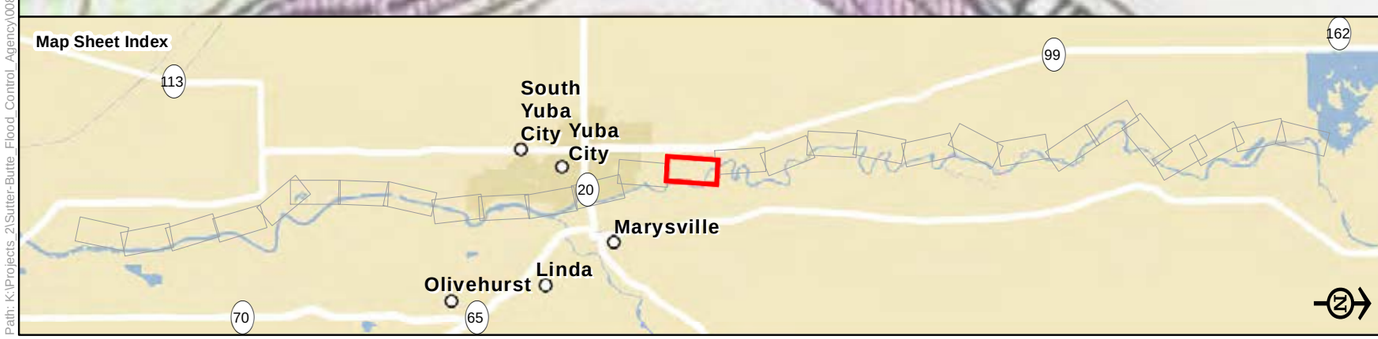

Legend

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USGS 7.5-minute Topographic Maps in the Vicinity of the Biological Study Area

Sheet 14

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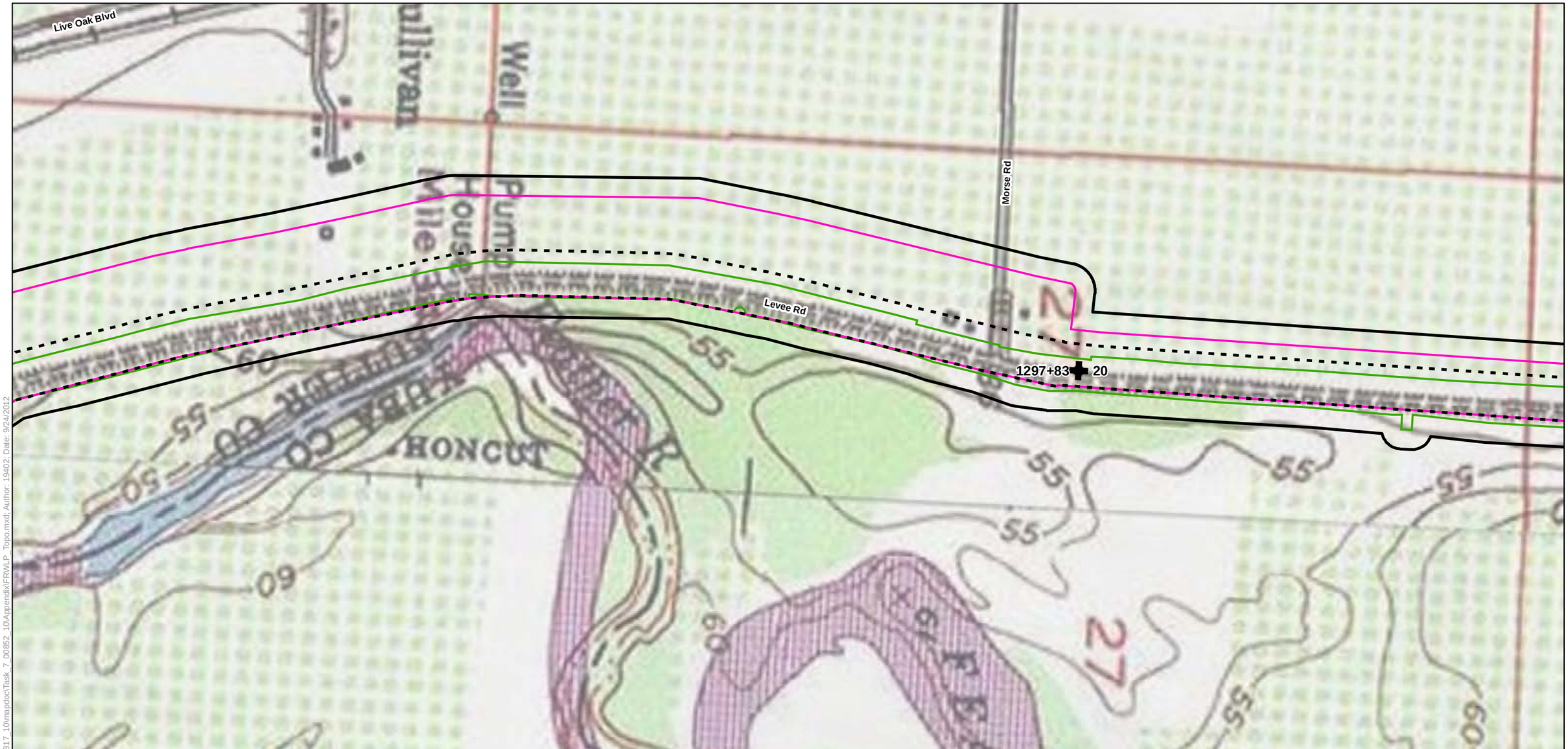

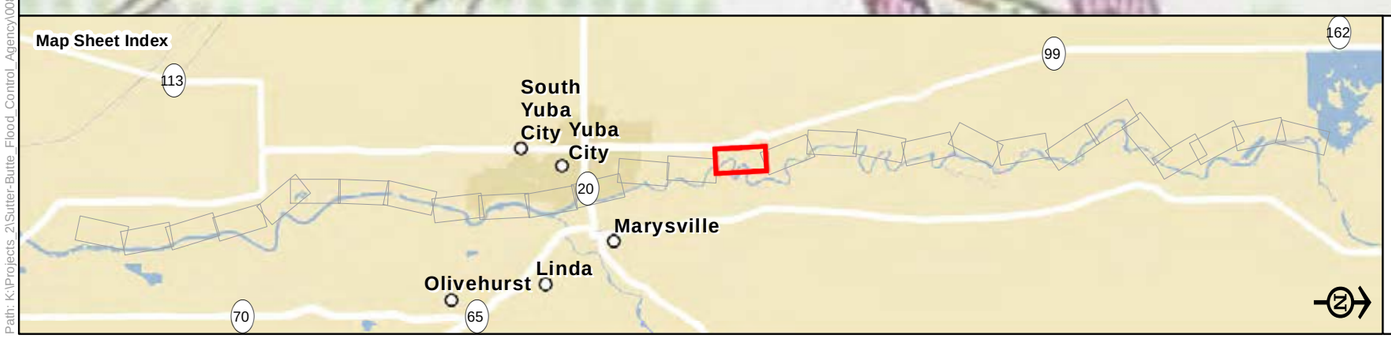

Legend

- Biological Study Area
- Alternative 1
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USGS 7.5-minute Topographic Maps in the Vicinity of the Biological Study Area

Sheet 15

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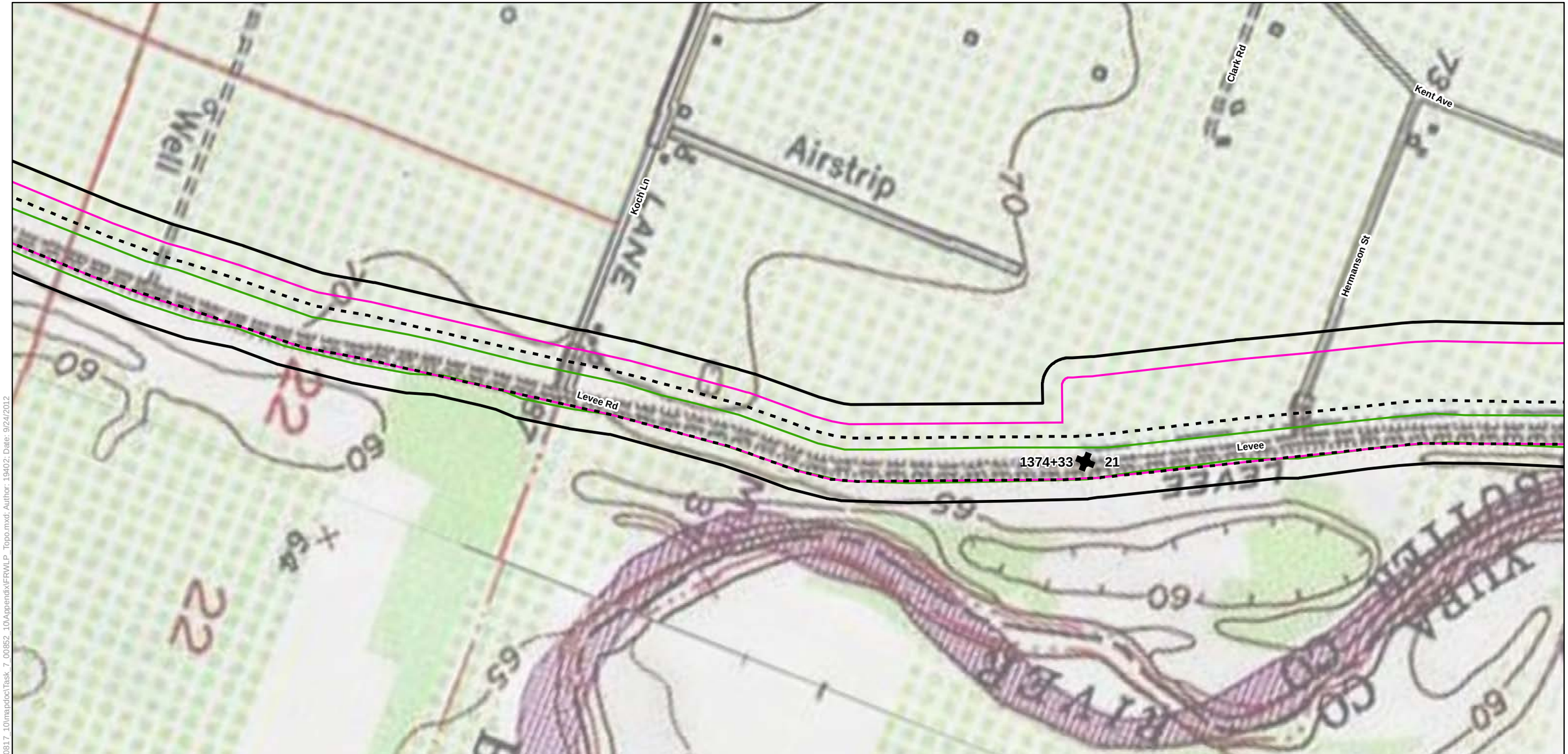

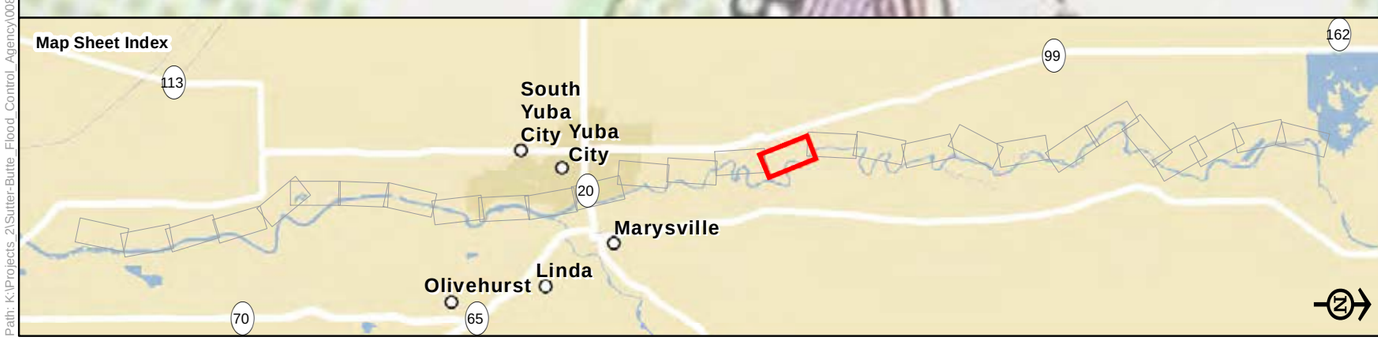

Legend

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USGS 7.5-minute Topographic Maps in the Vicinity of the Biological Study Area

Sheet 16

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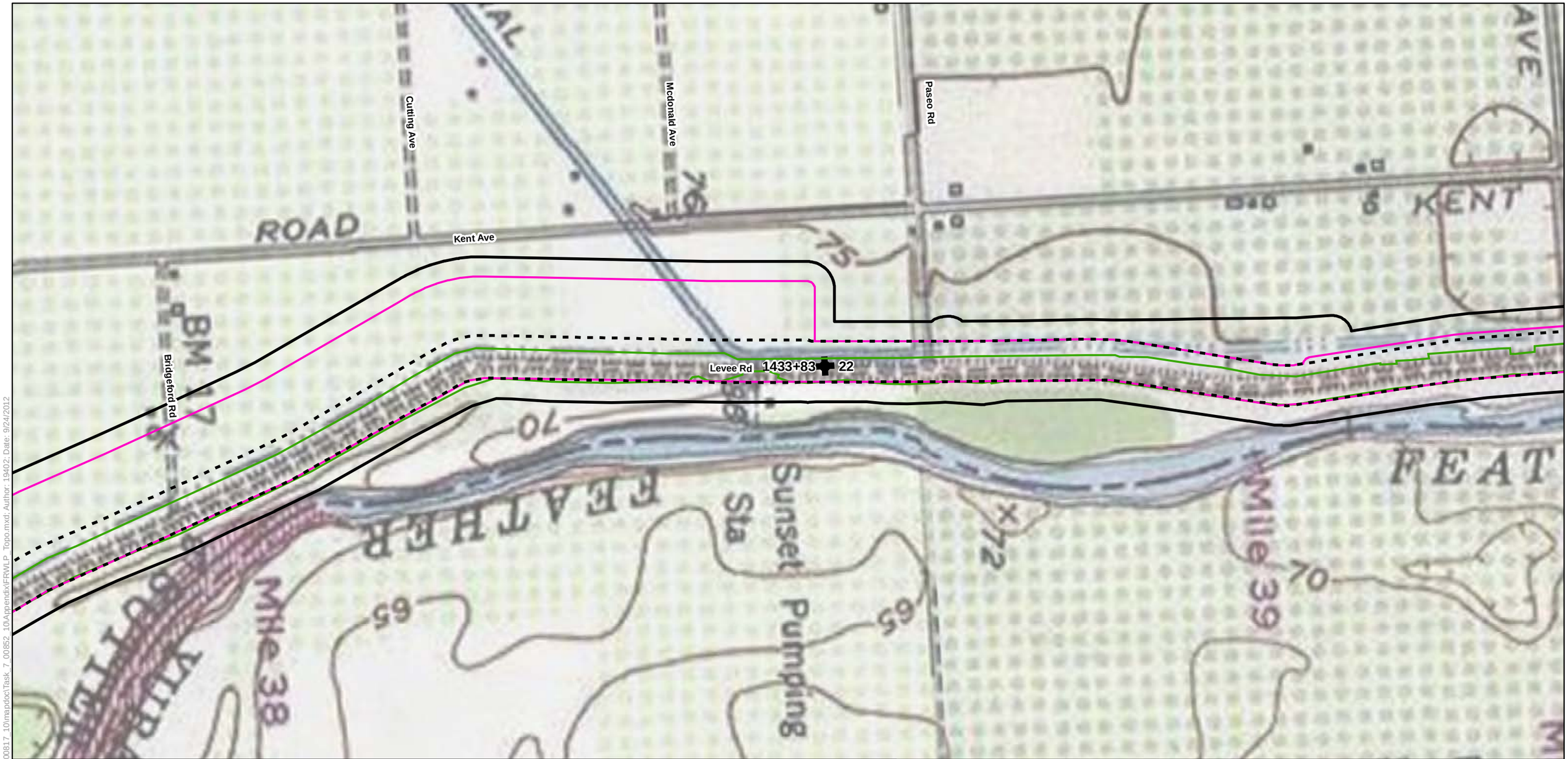

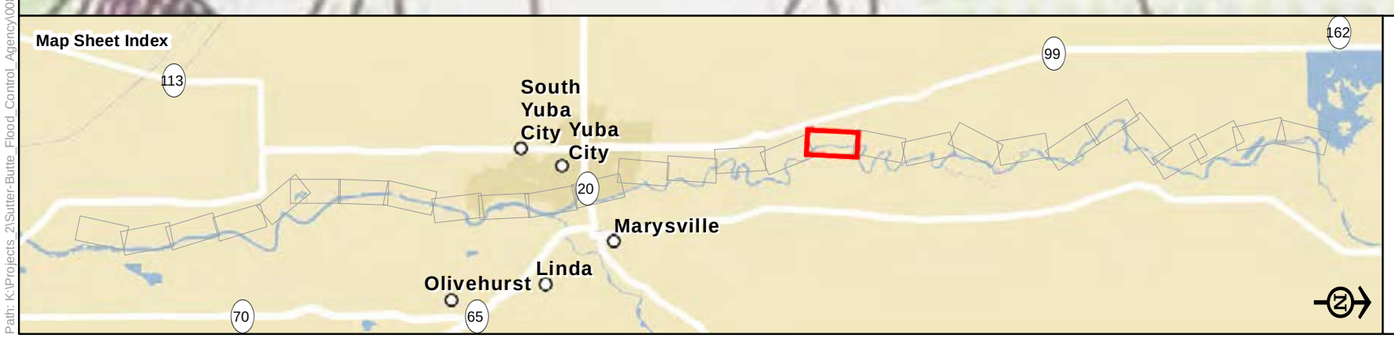

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USGS 7.5-minute Topographic Maps in the Vicinity of the Biological Study Area

Sheet 17

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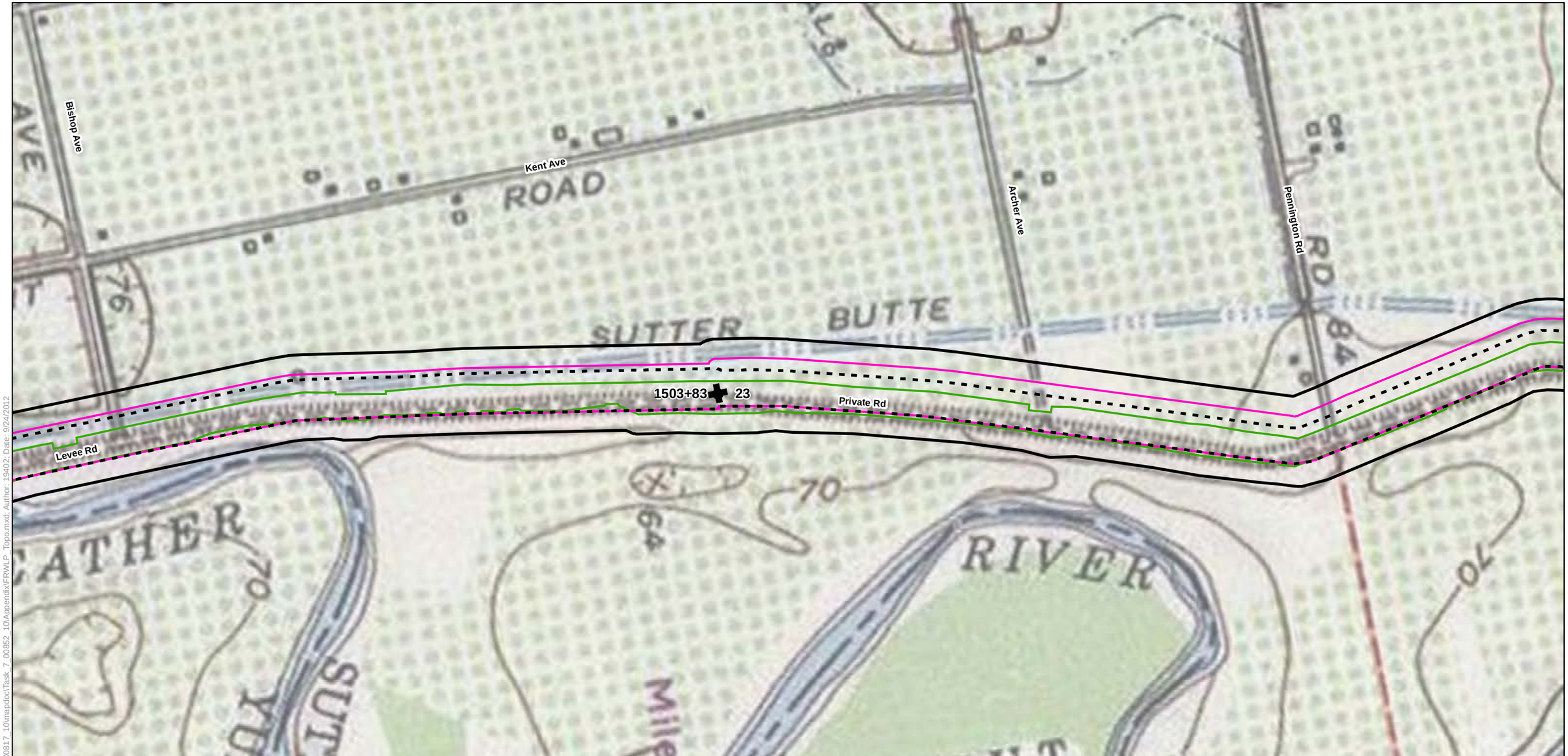



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- Reach
- Station 202+50

USGS 7.5-minute Topographic Maps in the Vicinity of the Biological Study Area

Sheet 18

0 250 500
Feet

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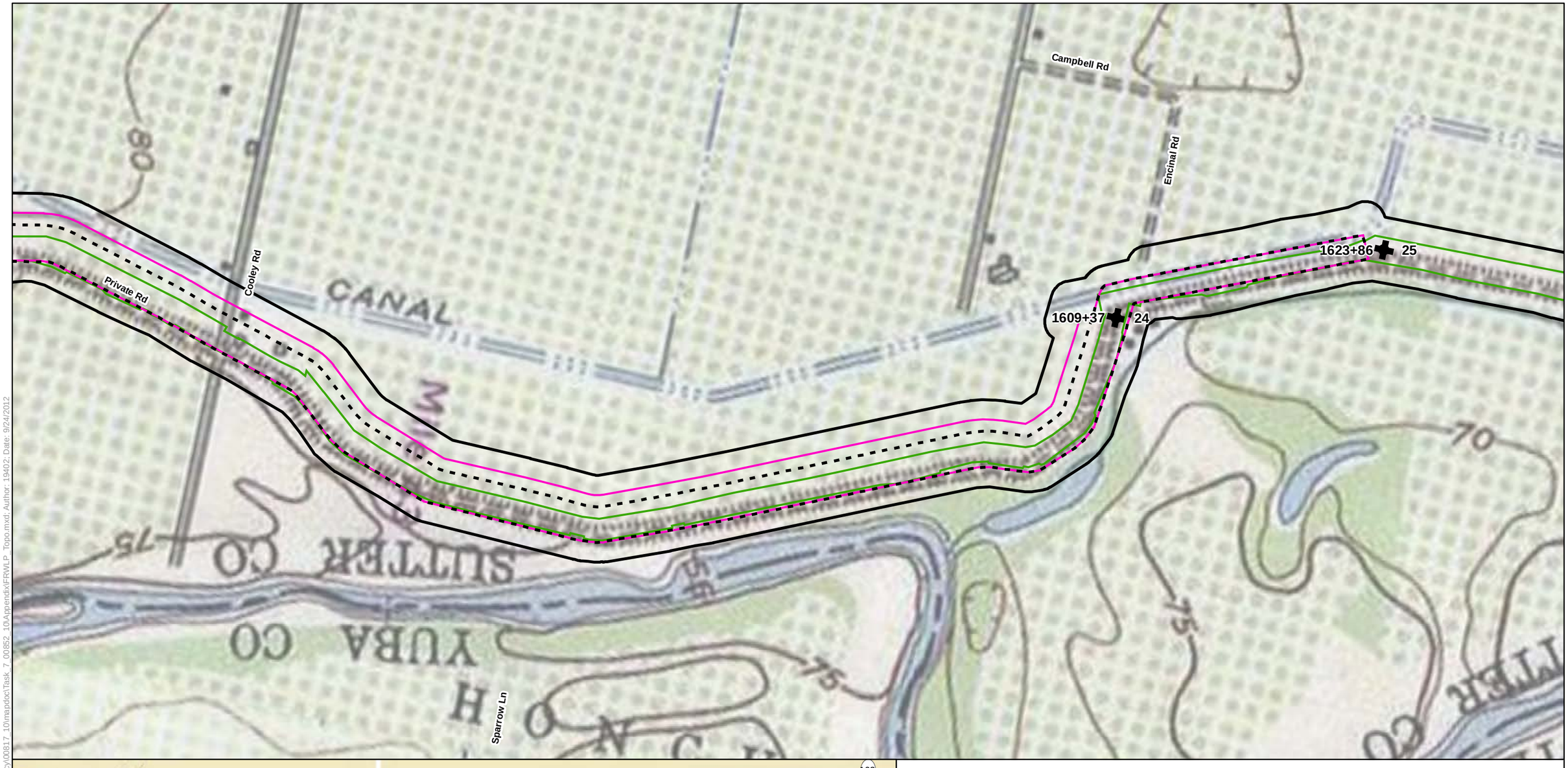

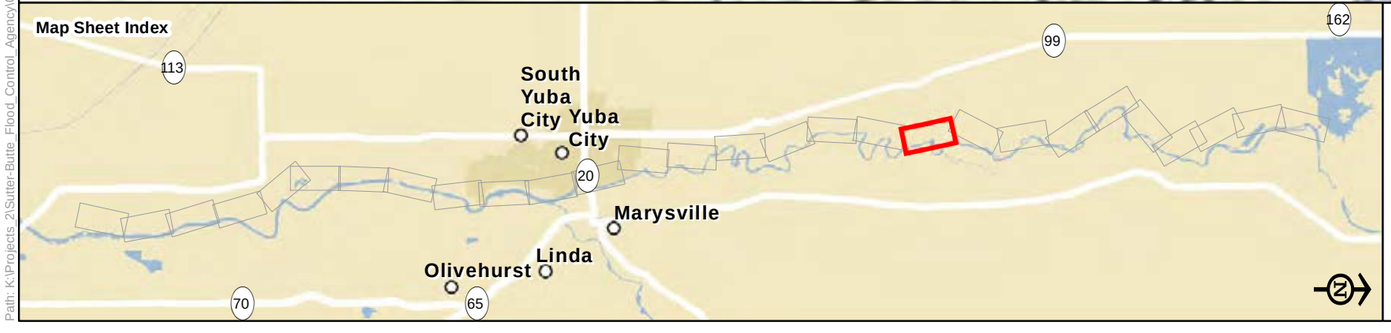

Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

USGS 7.5-minute Topographic Maps in the Vicinity of the Biological Study Area

Sheet 19

0 250 500

Feet

Path: K:\Projects_2\Sutter-Butte_Flood_Control_Agency\00817_10\mapdocTask_7_00852_10\AppendixIFRWLP_Topo.mxd; Author: 19402; Date: 9/24/2012

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Metteer Rd

Chandon Ave

Levee Rd

1674+37

26

1707+11

27

Private Rd

75

RIVER

Map Sheet Index

113

South Yuba City

Yuba City

20

Marysville

Linda

Olivehurst

70

65

99

162

21

Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

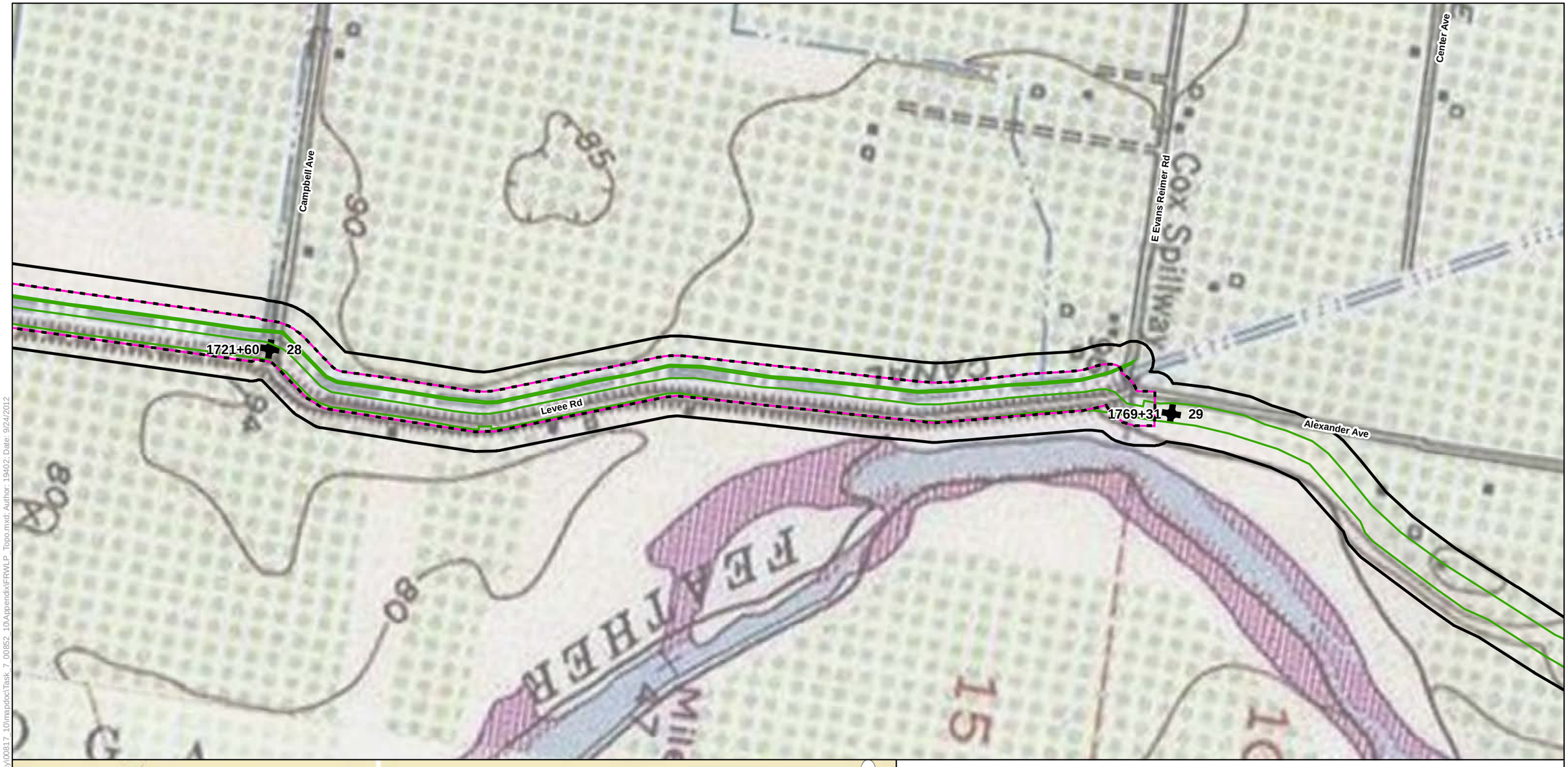
USGS 7.5-minute Topographic Maps in the Vicinity of the Biological Study Area

Sheet 20

21

0 250 500

Feet





Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

USGS 7.5-minute Topographic Maps in the Vicinity of the Biological Study Area

Sheet 21

0 250 500

Feet

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Alexander Ave

Richards Ave

1813+33 30

RIVER

Map Sheet Index

South Yuba City

Yuba City

Marysville

Linda

Olivehurst

113 99 162 20 70 65

Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

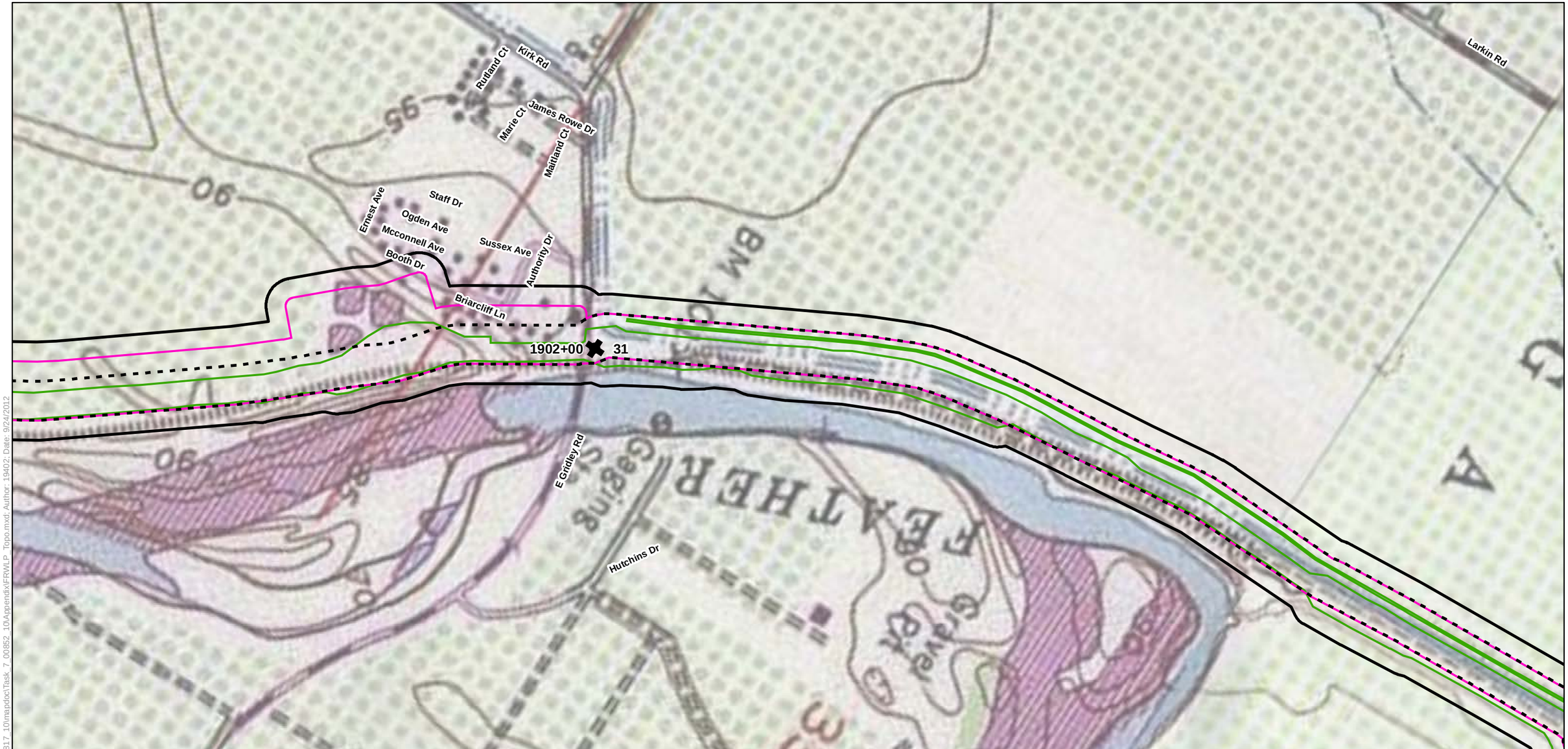
USGS 7.5-minute Topographic Maps in the Vicinity of the Biological Study Area

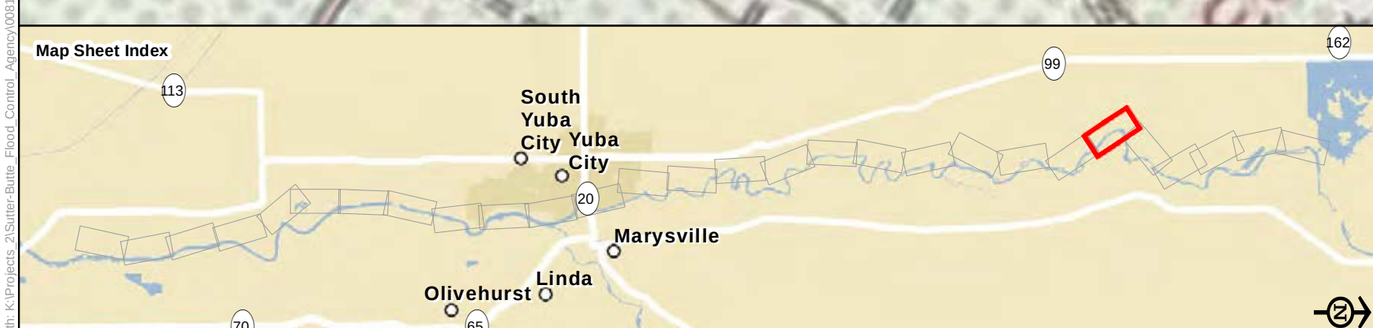
Sheet 22

0 250 500

Feet

Path: K:\Projects_2\Sutter-Butte_Flood_Control_Agency\00817_10\mapdoc\Task_7_00852_10\Appendix\FRWLP_Topo.mxd; Author: 19402; Date: 9/24/2012





Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

USGS 7.5-minute Topographic Maps in the Vicinity of the Biological Study Area

Sheet 23

0 250 500
Feet

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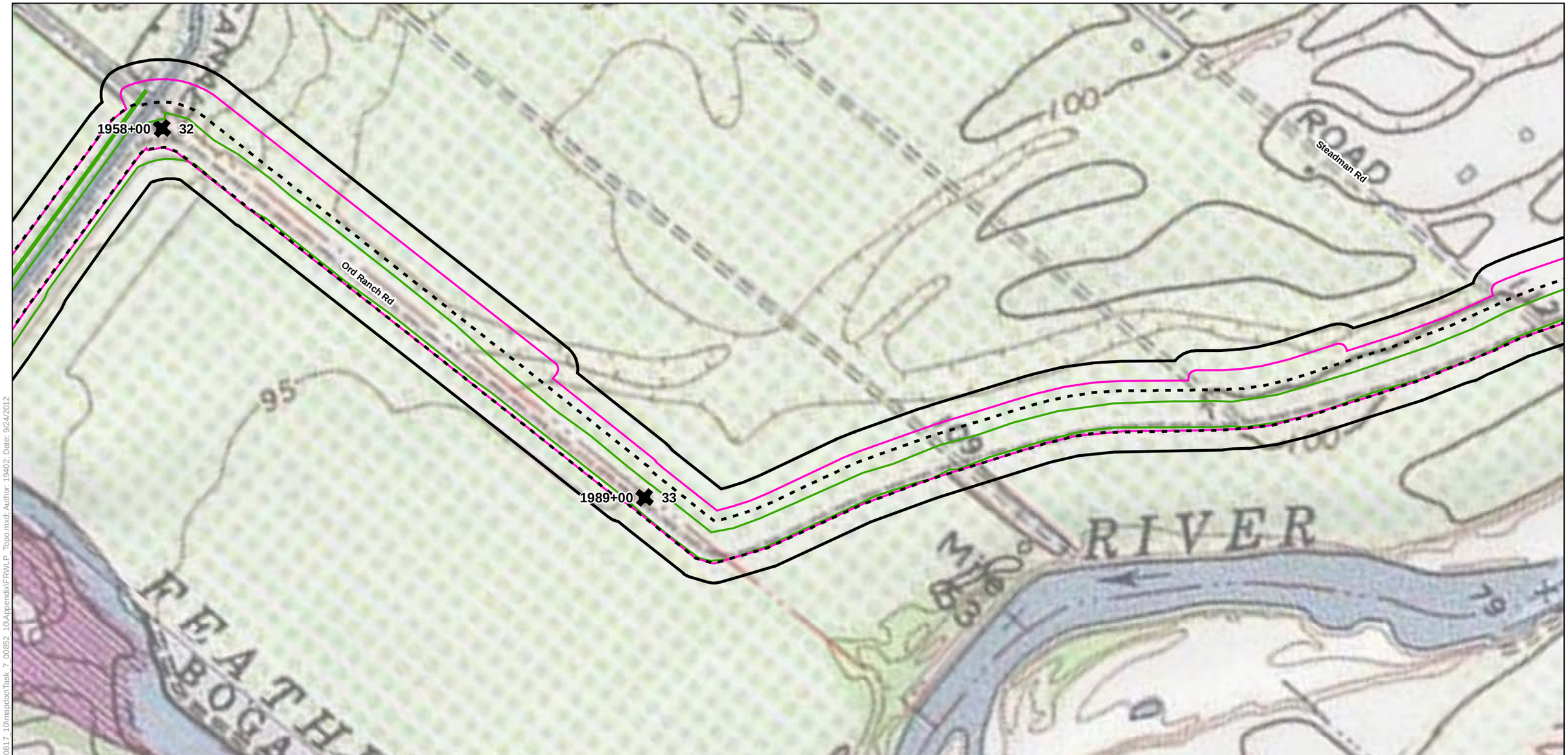



Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

USGS 7.5-minute Topographic Maps in the Vicinity of the Biological Study Area

Sheet 24

0 250 500
Feet

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Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

USGS 7.5-minute Topographic Maps in the Vicinity of the Biological Study Area

Sheet 25

0 250 500

Feet

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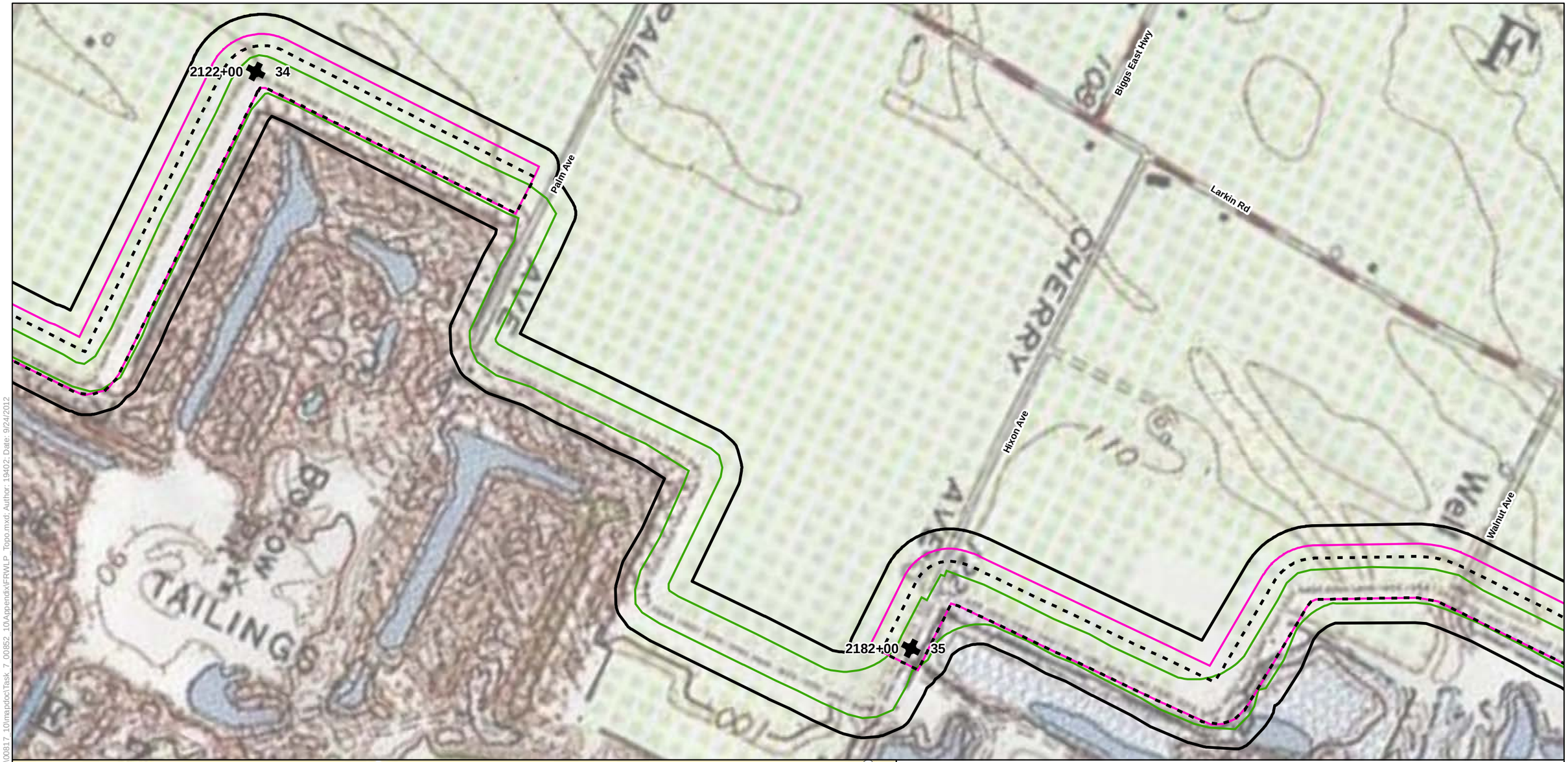
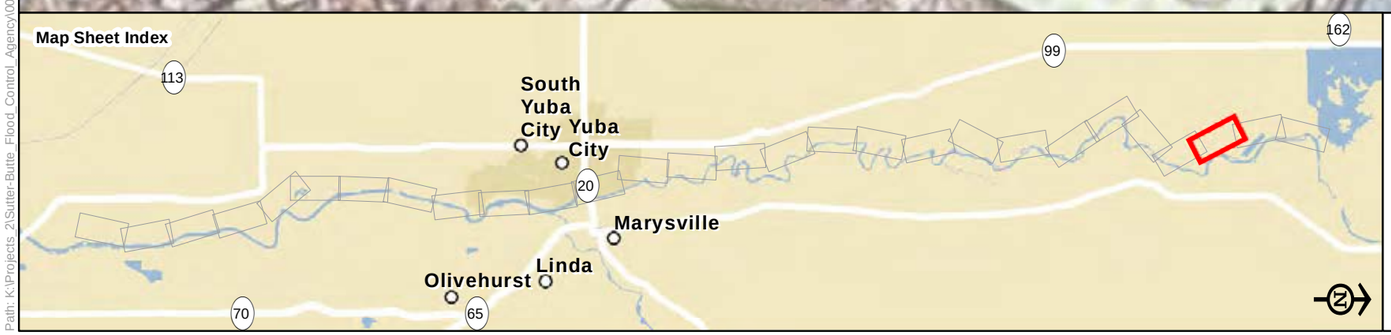




Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

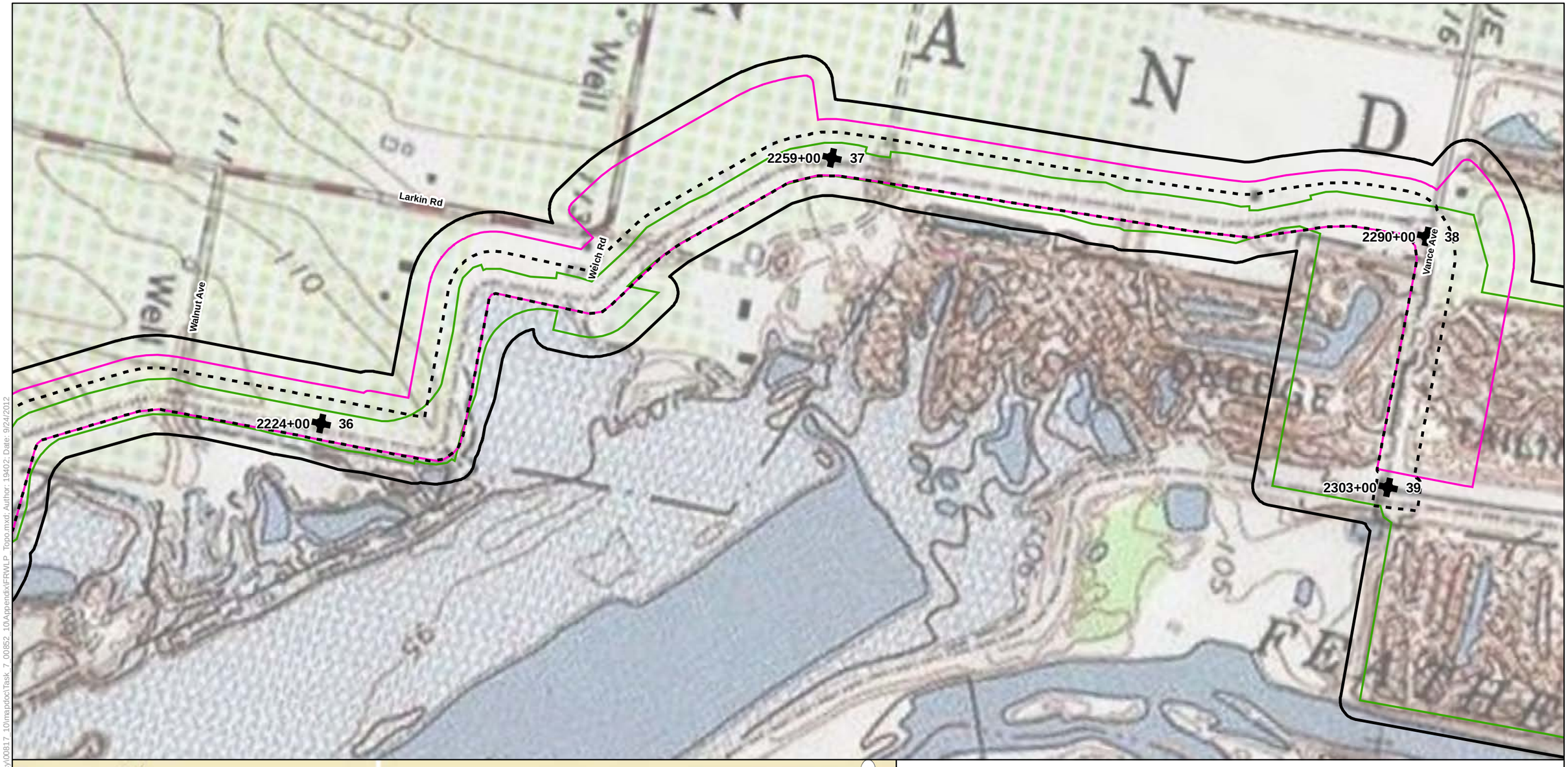
USGS 7.5-minute Topographic Maps in the Vicinity of the Biological Study Area

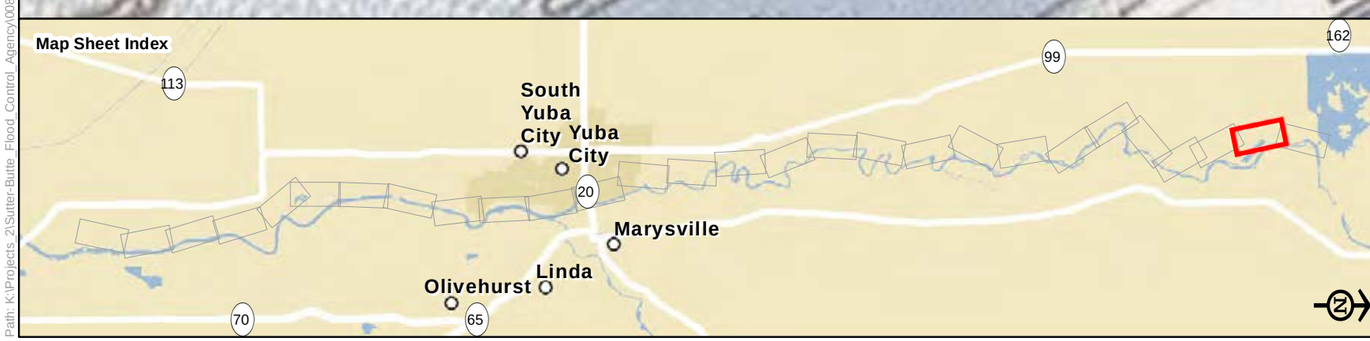
Sheet 26

0 250 500

Feet

Path: K:\Projects_2\Sutter-Butte_Flood_Control_Agency\00817_10\mapdocs\Task_7_00852_10\Appendix\FRWLP_Topo.mxd; Author: 19402; Date: 9/24/2012





Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

USGS 7.5-minute Topographic Maps in the Vicinity of the Biological Study Area

Sheet 27

0 250 500
Feet

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Haselbush Ln

Vance Ave

39

2319+00 40

2359+00 41

Larkin Rd

Map Sheet Index

113 99 162 20 70 65

South Yuba City

Yuba City

Marysville

Linda

Olivehurst

Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

USGS 7.5-minute Topographic Maps in the Vicinity of the Biological Study Area

Sheet 28

0 250 500

Feet

Path: K:\Projects_2\Sutter-Butte_Flood_Control_Agency\00817_10\mapdoc\Task_7_00852_10\Appendix\FRWLP_Topo.mxd; Author: 19402; Date: 9/24/2012

Bellevue Ave

Laurel Ave

Oak Ave

Cypress Ave

202+50

218+66

3

Map Sheet Index

113

South Yuba City

Yuba City

20

Marysville

Linda

Olivehurst

70

65

99

162

Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Soil Map Unit

- Columbia Fine Sandy Loam, Channeled, 0 To 2 Percent Slopes
- Conejo Loam, 0 To 2 Percent Slopes

Soil Map Units in the Biological Study Area

Sheet 1

0 250 500

Feet

Path: K:\Projects_2\Sutter-Butte_Flood_Control_Agency\00817_10\mapdoc\Task_7_00852_10\AppendixIFRWLP_SSURGO_Soils.mxd; Author: 19402; Date: 9/22/2012

Cypress Ave

Clayton Ave

Central Ave

300+66

4

Map Sheet Index

113

99

162

South Yuba City

Yuba City

20

Marysville

Linda

Olivehurst

70

65

Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Soil Map Unit

- Columbia Fine Sandy Loam, Channeled, 0 To 2 Percent Slopes
- Conejo Loam, 0 To 2 Percent Slopes

Soil Map Units in the Biological Study Area

Sheet 2

0 250 500

Feet

Path: K:\Projects_2\Sutter-Butte_Flood_Control_Agency\00817_10\mapdoc\Task_7_00852_10\Appendix\FRWLP_SSURGO_Soils.mxd; Author: 19402; Date: 9/22/2012

Clayton Ave

Central Ave

Carlisle Rd

Map Sheet Index

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99

162

South Yuba City

Yuba City

20

Marysville

Linda

Olivehurst

70

65

Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Soil Map Unit

- Columbia Fine Sandy Loam, Channeled, 0 To 2 Percent Slopes
- Conejo Loam, 0 To 2 Percent Slopes

Soil Map Units in the Biological Study Area

Sheet 3

0 250 500

Feet

Path: K:\Projects_2\Sutter-Butte_Flood_Control_Agency\00817_10\mapdoc\Task_7_00852_10\AppendixFRWLP_SSURGO_Soils.mxd; Author: 19402; Date: 9/23/2012

Carlisle Rd
Wilkie Ave
Lyon Ave
Oconnor Ave
Peck Ave
Ashford Ave
410+67
5
478+68
6

Map Sheet Index
113
South Yuba City
Yuba City
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99
162
Marysville
Linda
Olivehurst
70
65

Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Soil Map Unit

- Columbia Fine Sandy Loam, 0 To 2 Percent Slopes
- Conejo Loam, 0 To 2 Percent Slopes
- Holillipah Loamy Sand, Channeled, 0 To 2 Percent Slopes
- Shanghai Fine Sandy Loam, Channeled, 0 To 2 Percent Slopes
- Water

Soil Map Units in the Biological Study Area

Sheet 4

0 250 500
Feet

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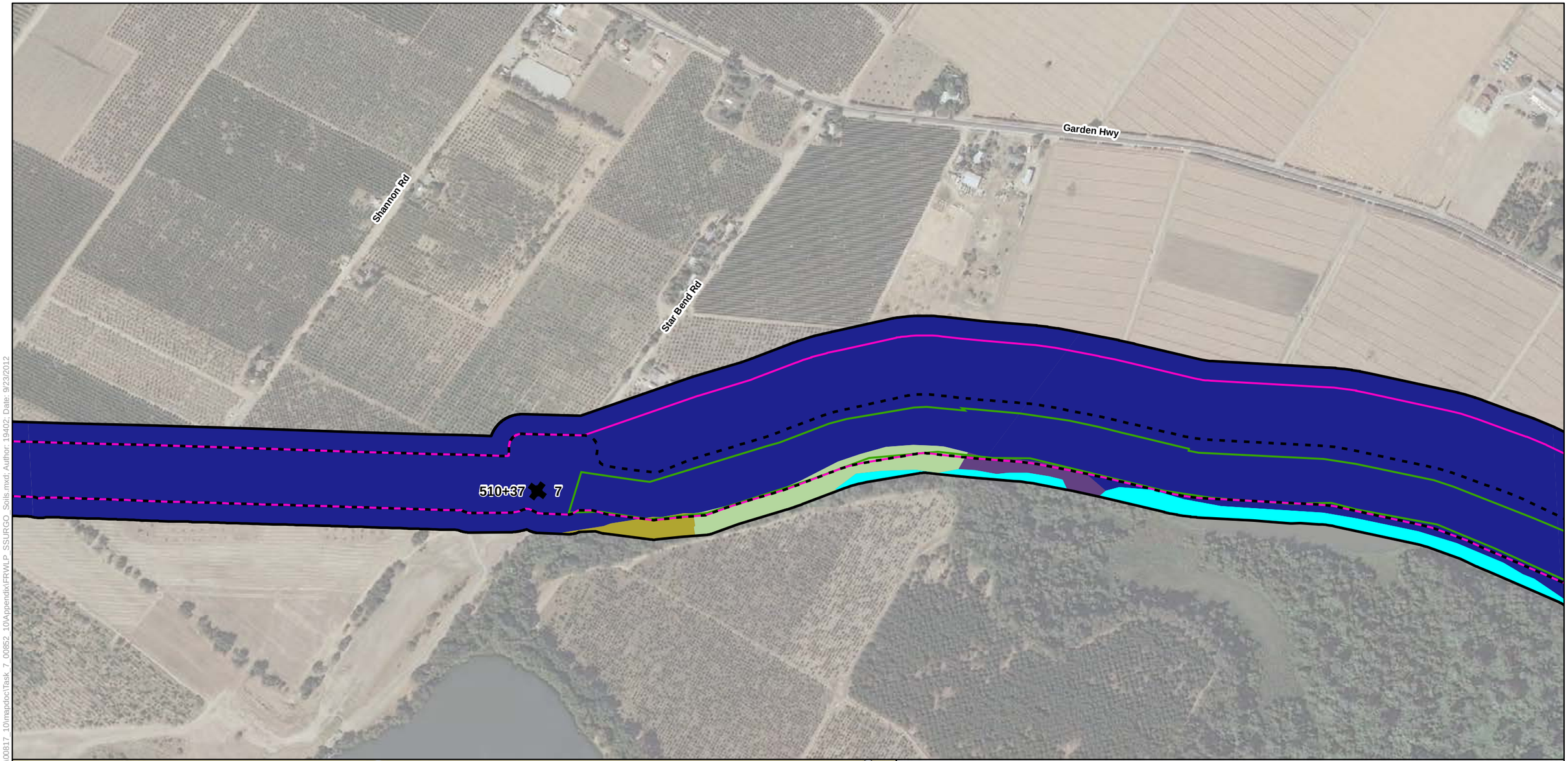

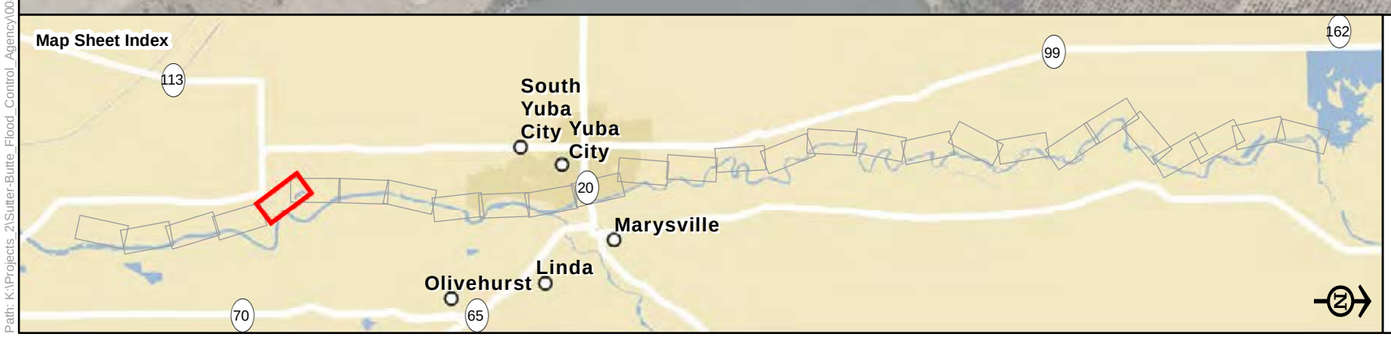

Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Soil Map Unit

- Columbia Fine Sandy Loam, Channeled, 0 To 2 Percent Slopes
- Conejo Loam, 0 To 2 Percent Slopes
- Holillipah Loamy Sand, Channeled, 0 To 2 Percent Slopes
- Shanghai Silt Loam, Frequently Flooded, 0 To 2 Percent Slopes
- Water

Soil Map Units in the Biological Study Area

Sheet 5

0 250 500

Feet

Path: K:\Projects_2\Sutter-Butte_Flood_Control_Agency\00817_10\mapdoc\Task_7_00852_10\Appendix\FRWLP_SSURGO_Soils.mxd Author: 19402; Date: 9/23/2012

Garden Hwy

Obanion Rd

596+00

8

Map Sheet Index

113

South Yuba City

Yuba City

20

Marysville

Linda

Olivehurst

70

65

99

162

Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Soil Map Unit

- Columbia Fine Sandy Loam, Channeled, 0 To 2 Percent Slopes
- Conejo Loam, 0 To 2 Percent Slopes
- Holillipah Loamy Sand, Frequently Flooded, 0 To 2 Percent Slopes
- Water

Soil Map Units in the Biological Study Area

Sheet 6

0 250 500

Feet

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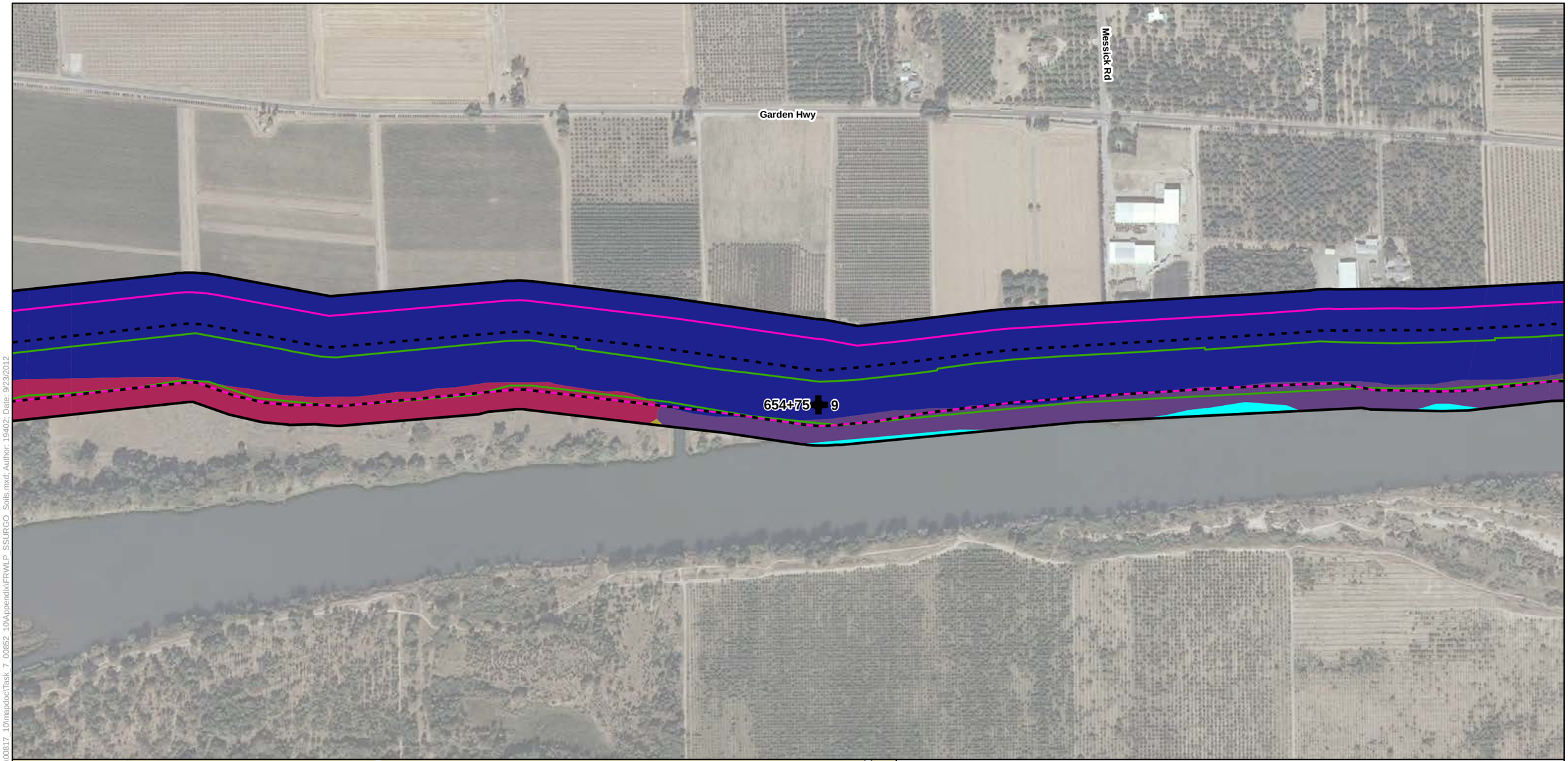

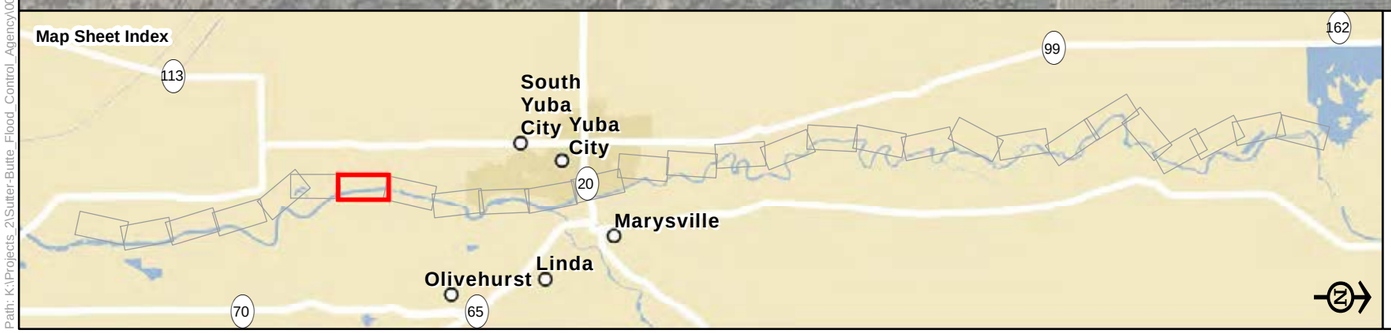

Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Soil Map Unit

- Columbia Fine Sandy Loam, Channeled, 0 To 2 Percent Slopes
- Conejo Loam, 0 To 2 Percent Slopes
- Holillipah Loamy Sand, Channeled, 0 To 2 Percent Slopes
- Holillipah Loamy Sand, Frequently Flooded, 0 To 2 Percent Slopes
- Water

Soil Map Units in the Biological Study Area

Sheet 7

0 250 500

Feet

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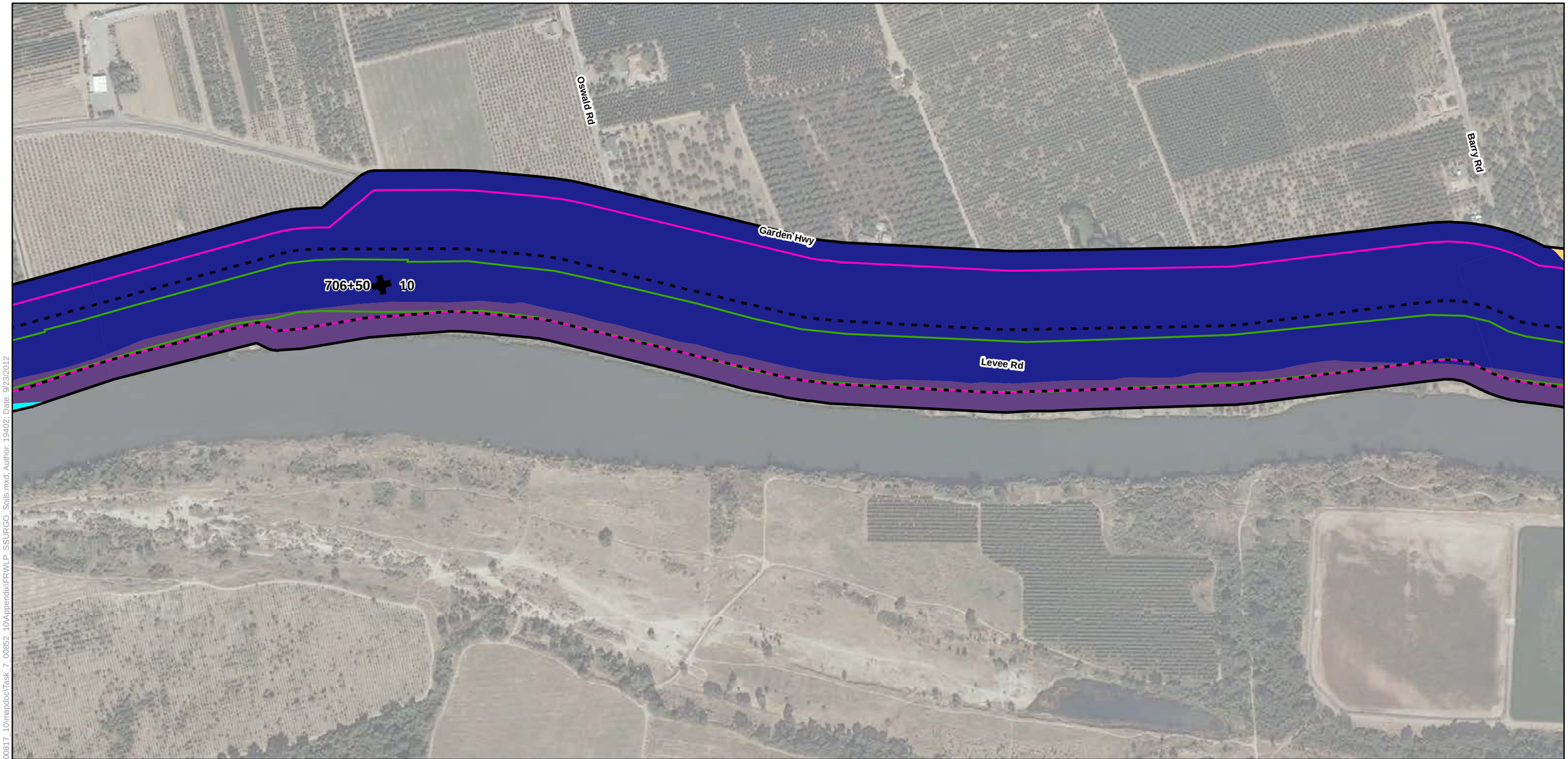
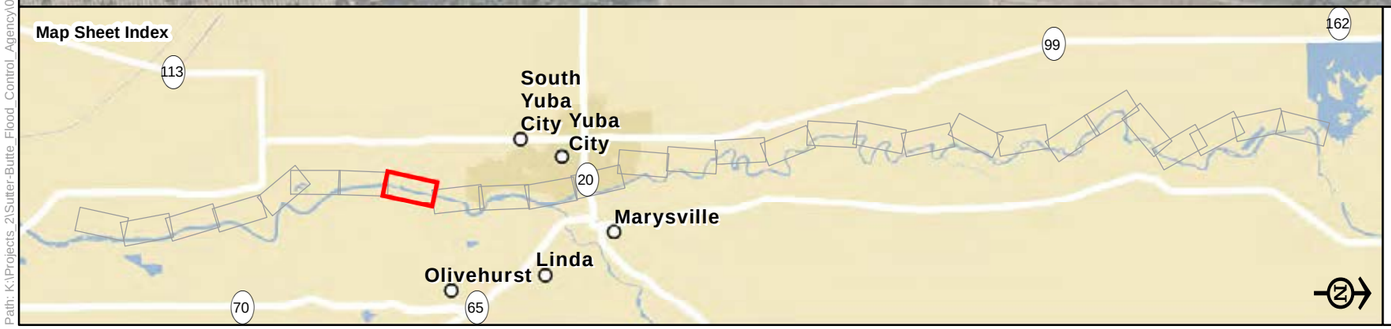




Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Soil Map Unit

- Columbia Fine Sandy Loam, Channeled, 0 To 2 Percent Slopes
- Conejo Loam, 0 To 2 Percent Slopes
- Conejo-Tisdale Complex, 0 To 2 Percent Slopes
- Water

Soil Map Units in the Biological Study Area

Sheet 8

0 250 500

Feet

Path: K:\Projects_2\Sutter-Butte_Flood_Control_Agency\00817_10\mapdoc\Task_7_00852_10\Appendix\FRWLP_SSURGO_Soils.mxd; Author: 19402; Date: 9/23/2012

Barry Rd
Stewart Rd
Garden Hwy
Private Rd
Drummond Dr
Shady Ct
Burl Ct
Carmelo Way
Black Ct
Pecan Dr
Shady Ln
Levee Rd
Persian Loop
Shanghai Bend Rd
Wasson Ct
Idaho Dr
Chandler Ct
Chandler Way
Serr Way
Eureka Dr
774+00 11
845+00 13
830+00 12

Map Sheet Index



Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Soil Map Unit

- Columbia Fine Sandy Loam, Channeled, 0 To 2 Percent Slopes
- Conejo Loam, 0 To 2 Percent Slopes
- Conejo-Tisdale Complex, 0 To 2 Percent Slopes
- Shanghai Silt Loam, 0 To 2 Percent Slopes
- Water

Soil Map Units in the Biological Study Area

Sheet 9

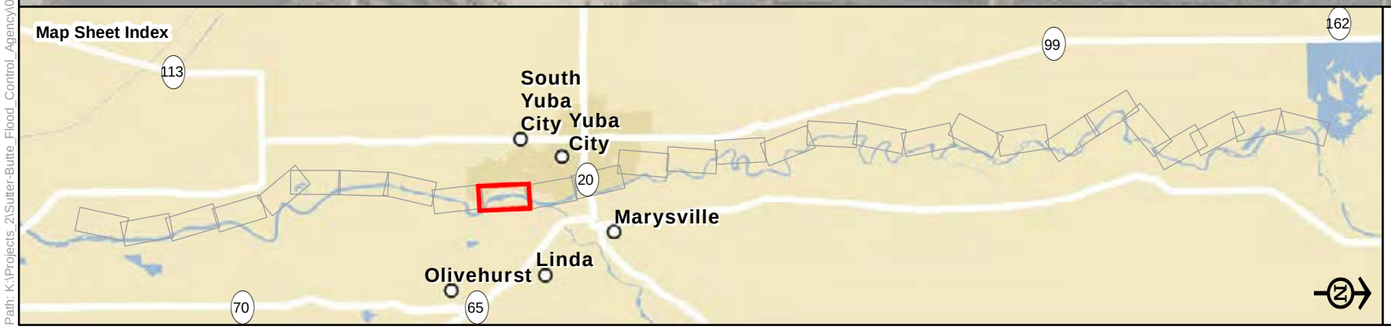
0 250 500
Feet

Path: K:\Projects_2\Sutter-Butte_Flood_Control_Agency\00817_10\mapdoc\Task_7_00852_10\Appendix\FRWLP_SSURGO_Soils.mxd; Author: 19402; Date: 9/23/2012

Wild River Dr
Crystal Creek Ln
Bogue Rd
Private Rd
Burns Dr
Epley Dr
Putman Ave
Lonely Oak St
Edgewater Way
Rocky Ct
Rapid Water Way
Levee Rd
927+00
Idaho Dr
845+00
13
Shanghai Bend Rd
Eureka Dr
Levee Rd

Path: K:\Projects_2\Sutter-Butte_Flood_Control_Agency\00817_10\mapdoc\Task_7_00852_10\Appendix\FRWLP_SSURGO_Soils.mxd; Author: 19402; Date: 9/23/2012

Map Sheet Index



Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Soil Map Unit

- Columbia Fine Sandy Loam, 0 To 2 Percent Slopes
- Columbia Fine Sandy Loam, Channeled, 0 To 2 Percent Slopes
- Conejo-Tisdale Complex, 0 To 2 Percent Slopes
- Shanghai Silt Loam, 0 To 2 Percent Slopes
- Holillipah Loamy Sand, 0 To 2 Percent Slopes
- Water

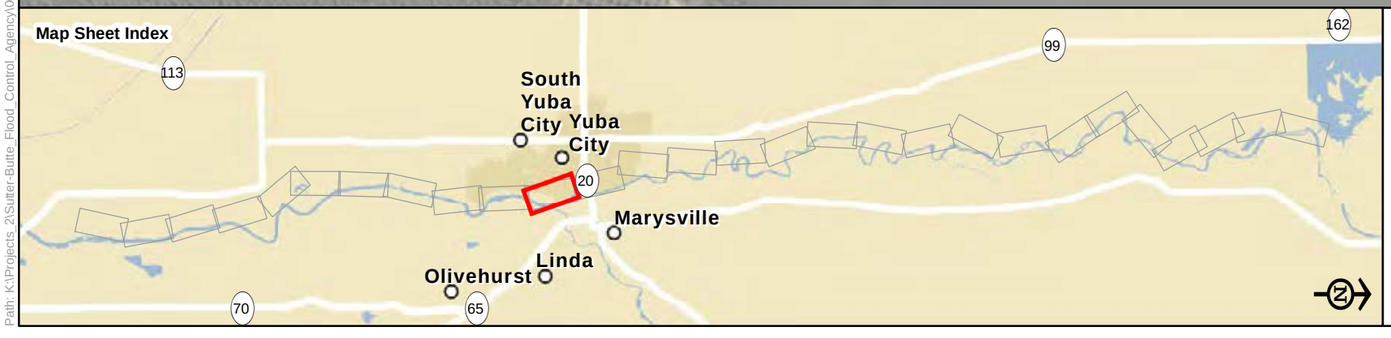
Soil Map Units in the Biological Study Area

Sheet 10

0 250 500

Feet





Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Soil Map Unit

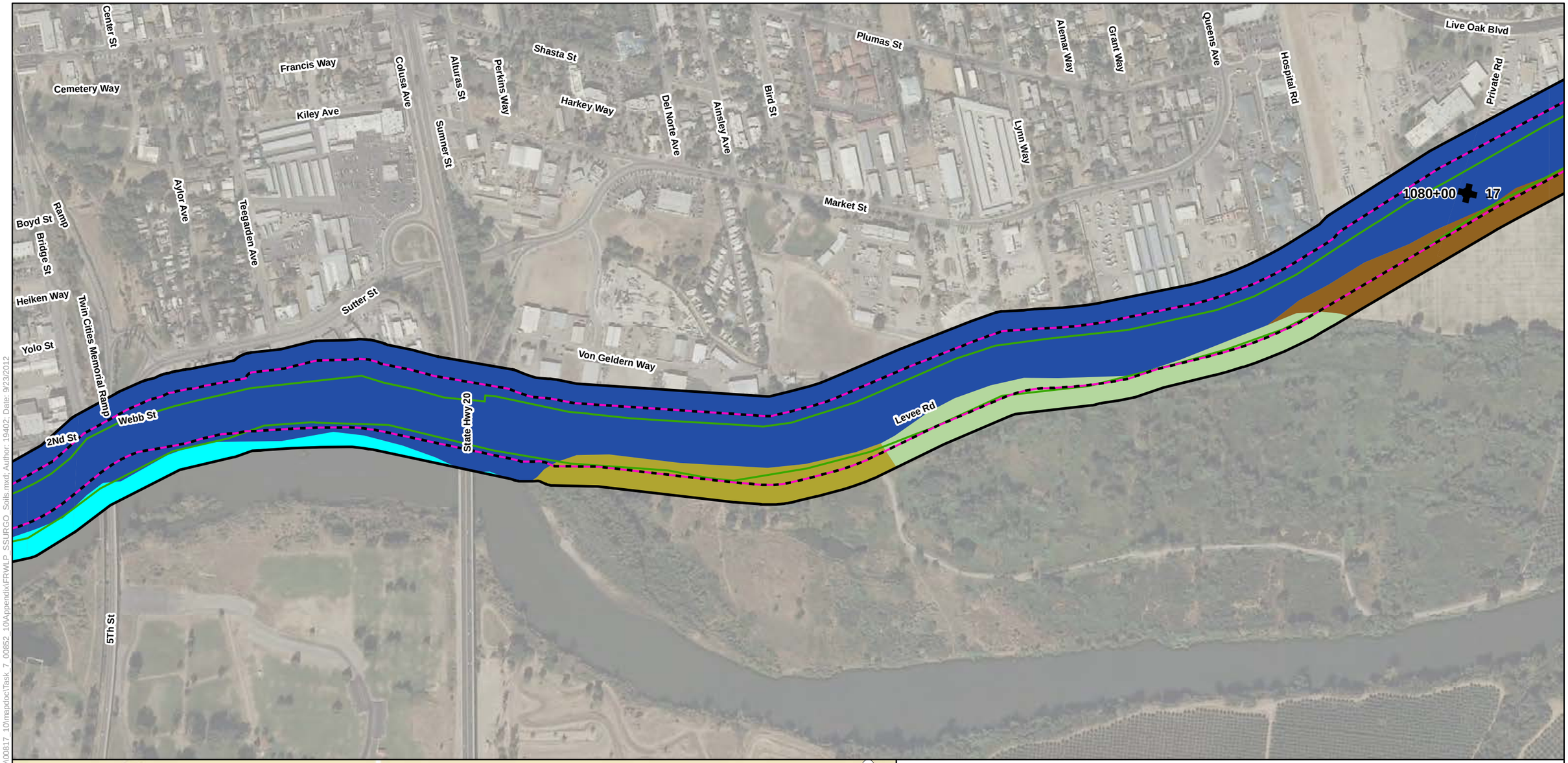
- Columbia Fine Sandy Loam, 0 To 2 Percent Slopes
- Columbia Fine Sandy Loam, Channeled, 0 To 2 Percent Slopes
- Conejo-Urban Land Complex, 0 To 2 Percent Slopes
- Riverwash
- Water

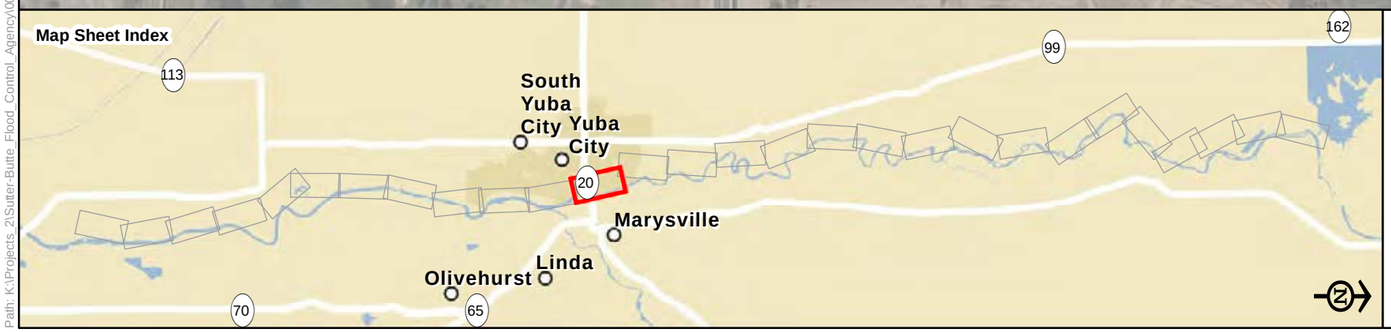
Soil Map Units in the Biological Study Area

Sheet 11

0 250 500
Feet

Path: K:\Projects_2\Sutter-Butte_Flood_Control_Agency\00817_10\mapdoc\Task_7_00852_10\Appendix\FRWLP_SSURGO_Soils.mxd; Author: 19402; Date: 9/23/2012





Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Soil Map Unit

- Conejo-Urban Land Complex, 0 To 2 Percent Slopes
- Holillipah Loamy Sand, Channeled, 0 To 2 Percent Slopes
- Nueva Loam, Occasionally Flooded, 0 To 1 Percent Slopes
- Shanghai Silt Loam, Frequently Flooded, 0 To 2 Percent Slopes
- Water

Soil Map Units in the Biological Study Area

Sheet 12

0 250 500

Feet

Path: K:\Projects_2\Sutter-Butte_Flood_Control_Agency\00817_10\mapdoc\Task_7_00852_10\Appendix\FRWLP_SSURGO_Soils.mxd; Author: 19402; Date: 9/23/2012

Sandalwood Ct
Teakwood Dr
Beechwood St
Oakview Dr
Forestview Dr
Baywood Ct
N Point Dr
Northridge Dr
Santa Barbara Way
Pease Rd
Tamarack Dr
Hunt St
Clark Ave
Parkbrook Ct
Cassidy Ct
Bal Sukh Mhp Rd
Northgate Dr
Cassidy Ave
Bal Sukh Mhp
Live Oak Blvd
1130+86
18
Levee
Private Rd
17

Map Sheet Index

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South Yuba City
Yuba City
20
Marysville
Olivehurst
Linda
70
65
99
162

Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Soil Map Unit

- Conejo Loam, 0 To 2 Percent Slopes
- Conejo-Urban Land Complex, 0 To 2 Percent Slopes
- Nueva Loam, Occasionally Flooded, 0 To 1 Percent Slopes

Soil Map Units in the Biological Study Area

Sheet 13

0 250 500
Feet

Path: K:\Projects_2\Sutter-Butte_Flood_Control_Agency\00817_10\mapdoc\Task_7_00852_10\Appendix\FRWLP_SSURGO_Soils.mxd; Author: 19402; Date: 9/23/2012

Live Oak Blvd

Rednall Rd

Levee Rd

1213+85 19

Levee

Map Sheet Index

113

South Yuba City

Yuba City

20

Marysville

Linda

Olivehurst

70

65

99

162

Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Soil Map Unit

- Columbia Fine Sandy Loam, Frequently Flooded, 0 To 2 Percent Slopes
- Conejo Loam, 0 To 2 Percent Slopes
- Nueva Loam, Occasionally Flooded, 0 To 1 Percent Slopes
- Shanghai Silt Loam, Frequently Flooded, 0 To 2 Percent Slopes

Soil Map Units in the Biological Study Area

Sheet 14

0 250 500

Feet

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Live Oak Blvd

Morse Rd

Levee Rd

1297+83

20

Path: K:\Projects_2\Sutter-Butte_Flood_Control_Agency\00817_10\mapdoc\Task_7_00852_10\AppendixIFRWLP_SSURGO_Soils.mxd; Author: 19402; Date: 9/24/2012

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South Yuba City

Yuba City

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Marysville

Linda

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Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Soil Map Unit

- Columbia Fine Sandy Loam, Frequently Flooded, 0 To 2 Percent Slopes
- Conejo Loam, 0 To 2 Percent Slopes
- Conejo-Tisdale Complex, 0 To 2 Percent Slopes
- Shanghai Silt Loam, Frequently Flooded, 0 To 2 Percent Slopes
- Water

Soil Map Units in the Biological Study Area

Sheet 15

0 250 500

Feet

Koch Ln

Clark Rd

Kent Ave

Hermanson St

Levee Rd

Levee

1374+33

21

Map Sheet Index

113

99

162

South Yuba City

Yuba City

20

Marysville

Linda

Olivehurst

70

65

Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Soil Map Unit

- Columbia Fine Sandy Loam, Channeled, 0 To 2 Percent Slopes
- Conejo Loam, 0 To 2 Percent Slopes
- Conejo-Tisdale Complex, 0 To 2 Percent Slopes
- Marcum-Gridley Clay Loams, 0 To 1 Percent Slopes
- Shanghai Silt Loam, Frequently Flooded, 0 To 2 Percent Slopes

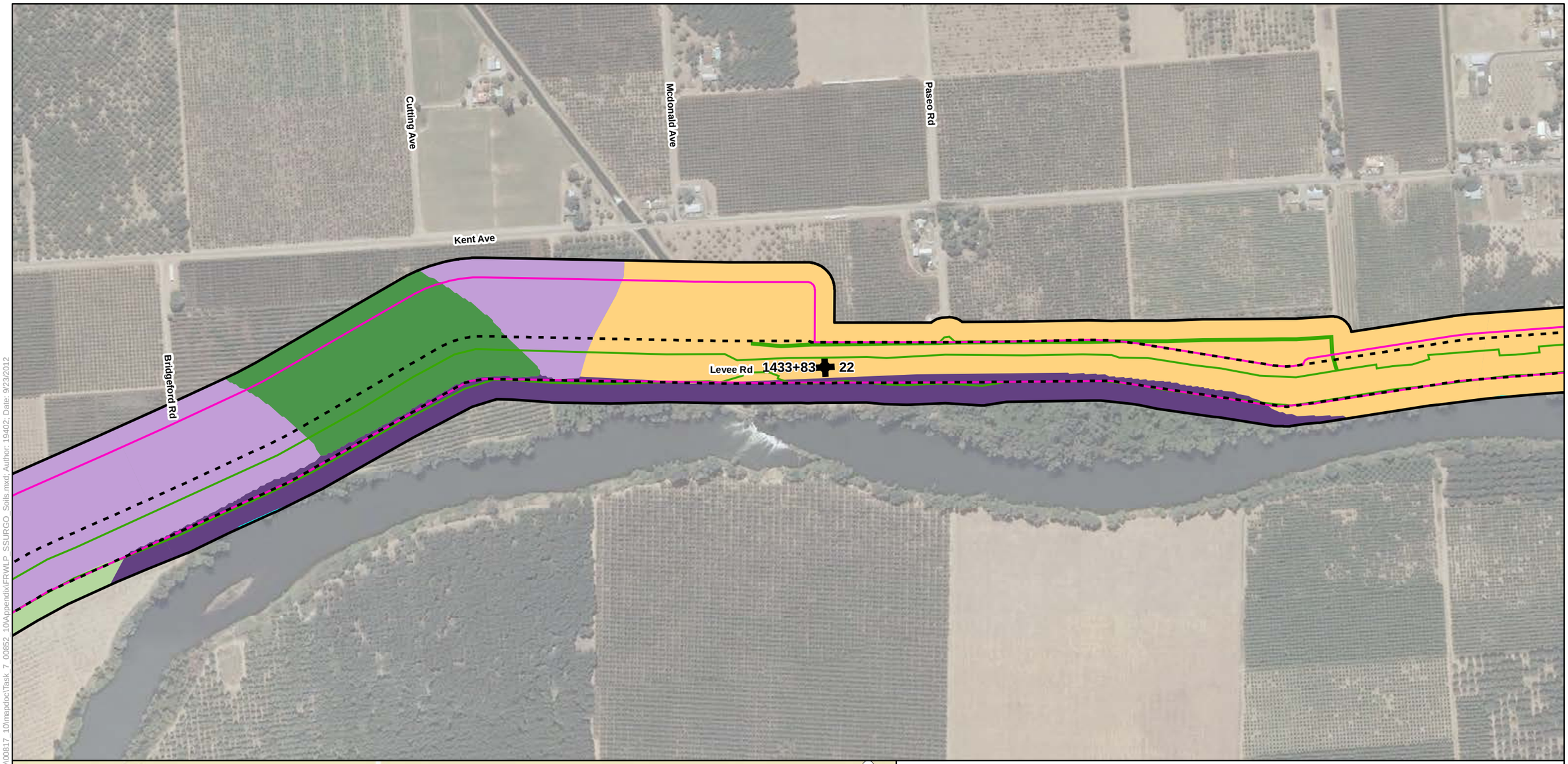
Soil Map Units in the Biological Study Area

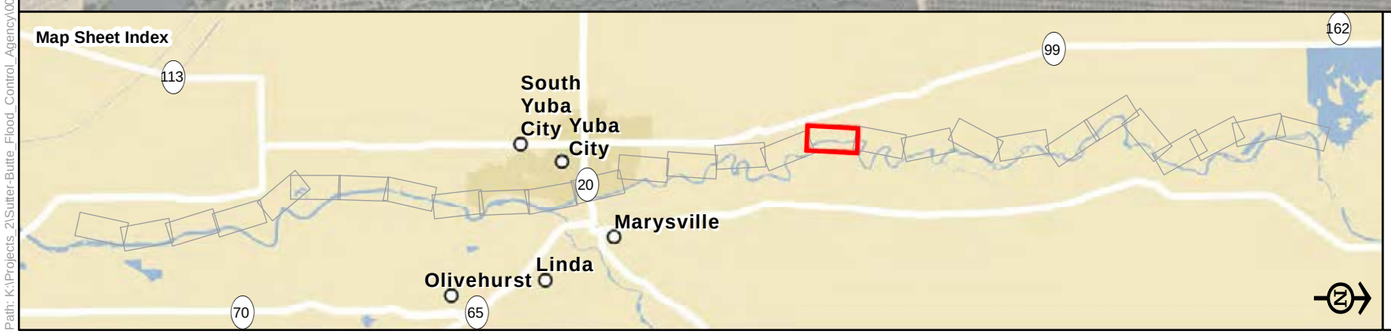
Sheet 16

0 250 500

Feet

Path: K:\Projects_2\Sutter-Butte_Flood_Control_Agency\00817_10\mapdoc\Task_7_00852_10\Appendix\FRWLP_SSURGO_Soils.mxd; Author: 19402; Date: 9/23/2012





Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Soil Map Unit

- Columbia Fine Sandy Loam, Channeled, 0 To 2 Percent Slopes
- Conejo-Tisdale Complex, 0 To 2 Percent Slopes
- Liveoak Sandy Clay Loam, 0 To 2 Percent Slopes
- Marcum-Gridley Clay Loams, 0 To 1 Percent Slopes
- Shanghai Silt Loam, Frequently Flooded, 0 To 2 Percent Slopes
- Water

Soil Map Units in the Biological Study Area

Sheet 17

0 250 500

Feet

Path: K:\Projects_2\Sutter-Butte_Flood_Control_Agency\00817_10\mapdoc\Task_7_00852_10\Appendix\FRWLP_SSURGO_Soils.mxd: Author: 19402; Date: 9/23/2012

Bishop Ave

Kent Ave

Archer Ave

Pennington Rd

1503+83

23

Private Rd

Levee Rd

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South Yuba City

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Legend

- Biological Study Area
- Alternative 1
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- Station 202+50

Soil Map Unit

- Columbia Fine Sandy Loam, Channeled, 0 To 2 Percent Slopes
- Columbia Fine Sandy Loam, Frequently Flooded, 0 To 2 Percent Slopes
- Conejo-Tisdale Complex, 0 To 2 Percent Slopes
- Liveoak Sandy Clay Loam, 0 To 2 Percent Slopes
- Water

Soil Map Units in the Biological Study Area

Sheet 18

0 250 500

Feet

Path: K:\Projects_2\Sutter-Butte_Flood_Control_Agency\00817_10\mapdoc\Task_7_00852_10\Appendix\FRWLP_SSURGO_Soils.mxd: Author: 19402: Date: 9/23/2012

Campbell Rd

Encinal Rd

Cooley Rd

Private Rd

1623+86 25

1609+37 24

Sparrow Ln

Map Sheet Index



Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Soil Map Unit

- Columbia Fine Sandy Loam, Channeled, 0 To 2 Percent Slopes
- Columbia Fine Sandy Loam, Frequently Flooded, 0 To 2 Percent Slopes
- Conejo-Tisdale Complex, 0 To 2 Percent Slopes
- Liveoak Sandy Clay Loam, 0 To 2 Percent Slopes
- Shanghai Silt Loam, Frequently Flooded, 0 To 2 Percent Slopes
- Water

Soil Map Units in the Biological Study Area

Sheet 19

0 250 500

Feet

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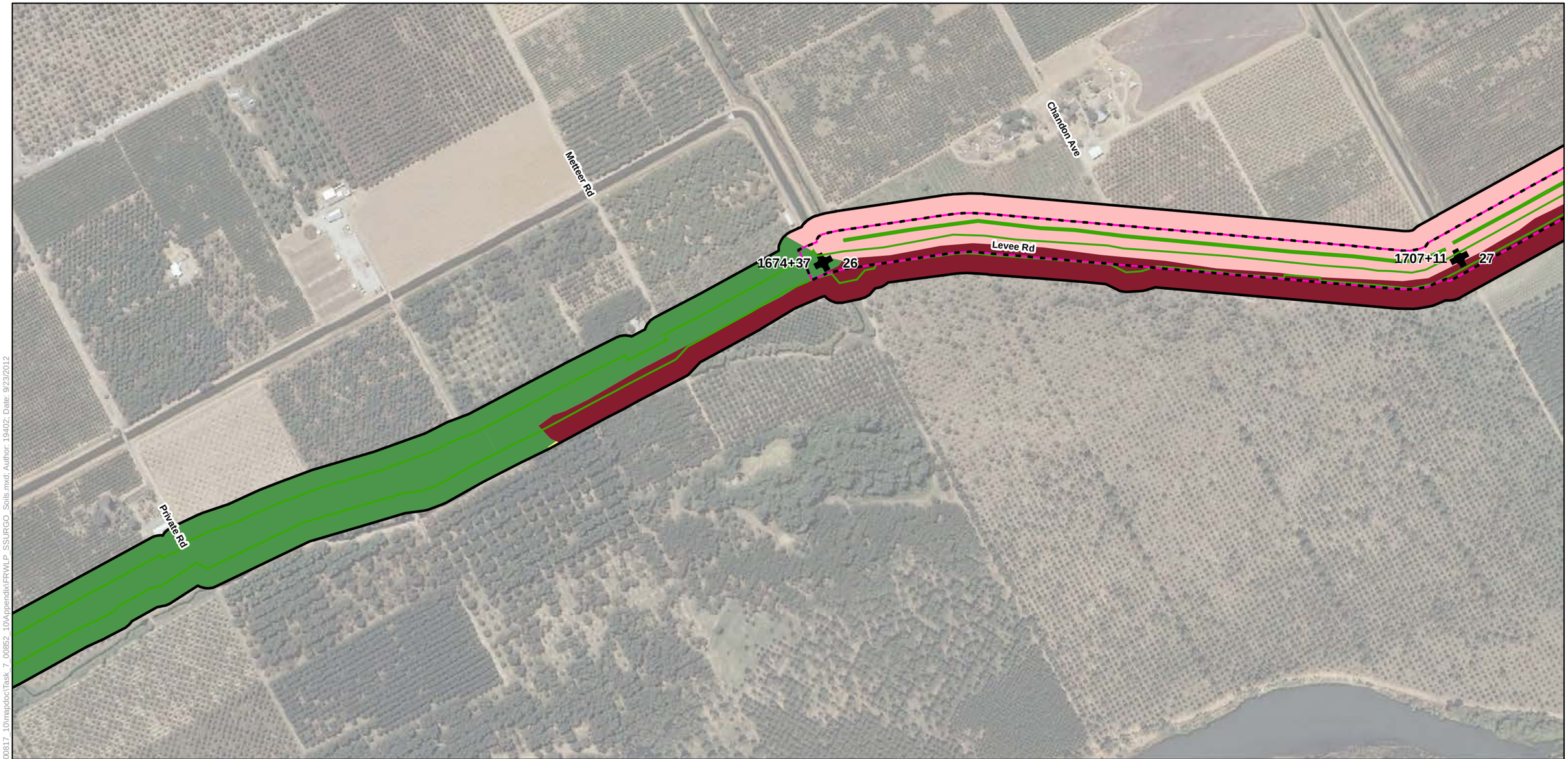
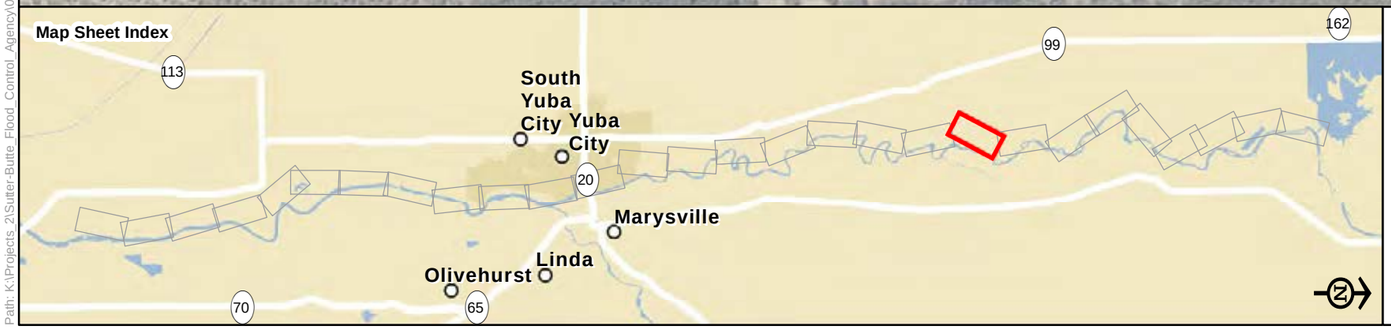




Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Soil Map Unit

- Boga-Loemstone Complex, 0 To 1 Percent Slopes
- Liveoak Sandy Clay Loam, 0 To 2 Percent Slopes
- Columbia Fine Sandy Loam, 0 To 2 Percent Slopes, Frequently Flooded
- Gianella Fine Sandy Loam, 0 To 1 Percent Slopes, Frequently Flooded

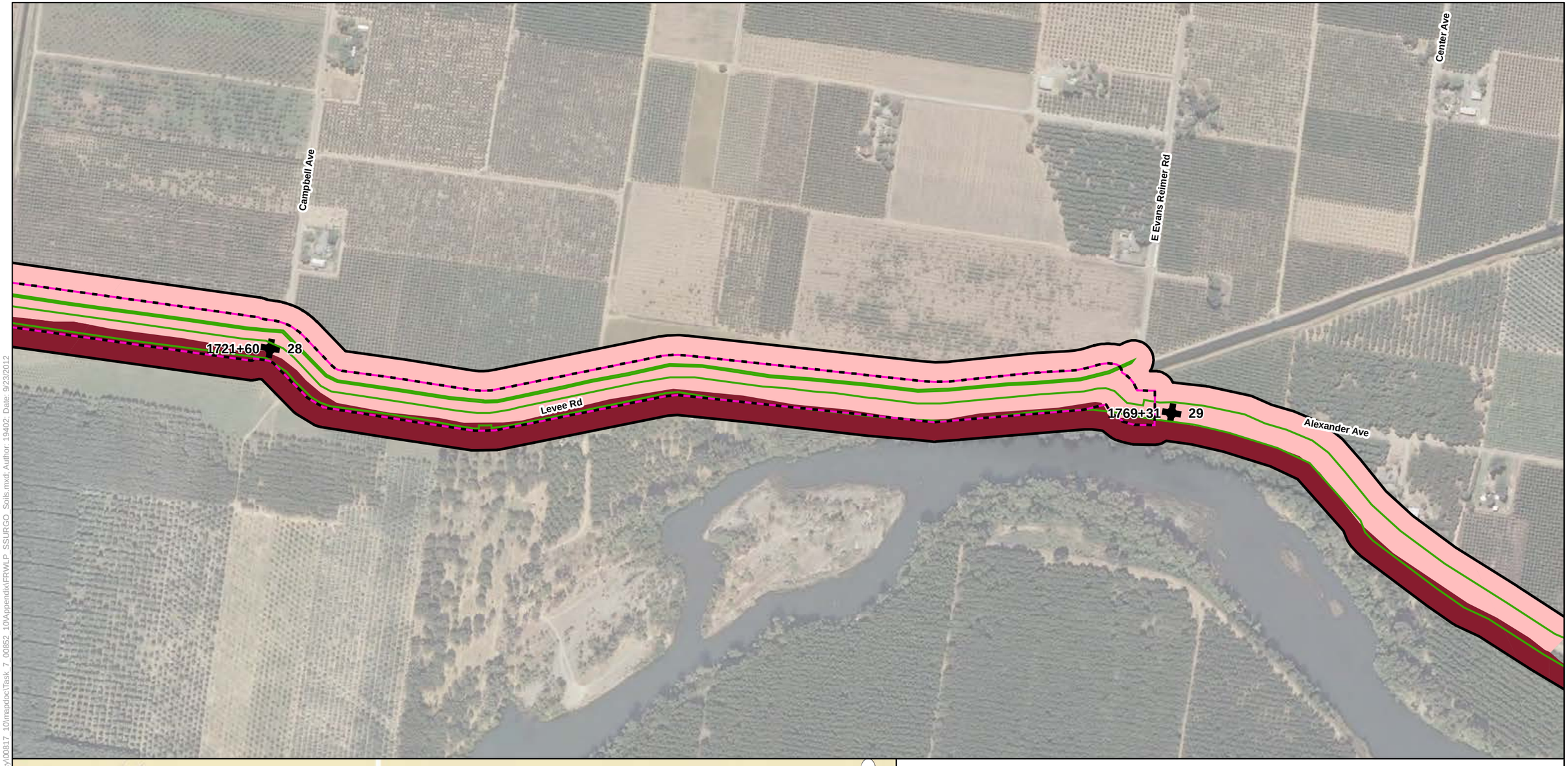
Soil Map Units in the Biological Study Area

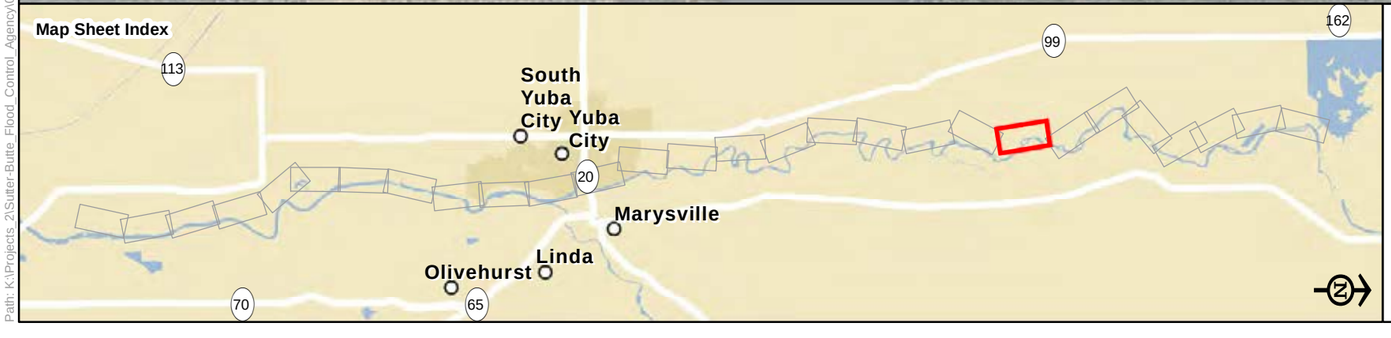
Sheet 20

0 250 500

Feet

Path: K:\Projects_2\Sutter-Butte_Flood_Control_Agency\00817_10\mapdoc\Task_7_00852_10\Appendix\FRWLP_SSURGO_Soils.mxd; Author: 19402; Date: 9/23/2012





Legend

- Biological Study Area
- Alternative 1
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- Alternative 3
- Reach
- Station 202+50

Soil Map Unit

- Boga-Loemstone Complex, 0 To 1 Percent Slopes
- Gianella Fine Sandy Loam, 0 To 1 Percent Slopes, Frequently Flooded
- Water

Soil Map Units in the Biological Study Area

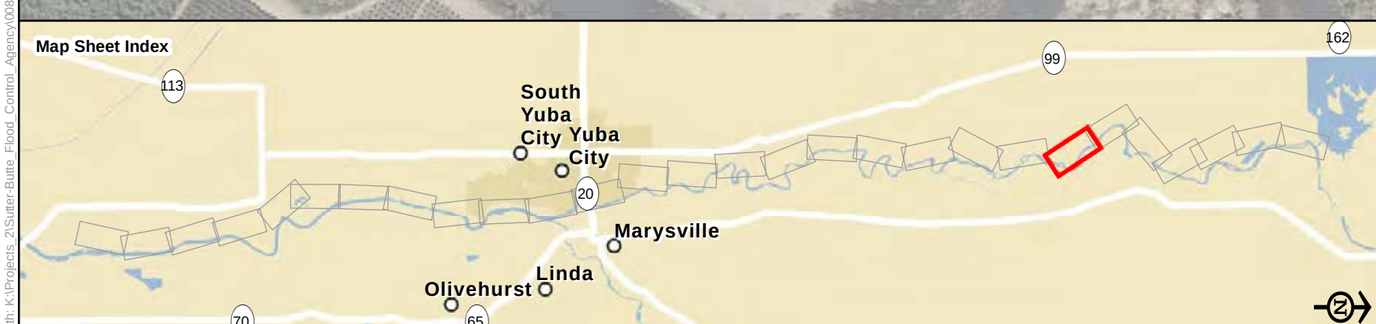
Sheet 21

0 250 500

Feet

Path: K:\Projects_2\Sutter-Butte_Flood_Control_Agency\00817_10\mapdoc\Task_7_00852_10\Appendix\FRWLP_SSURGO_Soils.mxd; Author: 19402; Date: 9/23/2012





Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Soil Map Unit

- Boga-Loemstone Complex, 0 To 1 Percent Slopes
- Gianella Fine Sandy Loam, 0 To 1 Percent Slopes, Frequently Flooded
- Gianella Fine Sandy Loam, 0 To 1 Percent Slopes, Rarely Flooded
- Liveoak Sandy Clay Loam, 0 To 2 Percent Slopes
- Liveoak Sandy Loam, 0 To 2 Percent Slopes
- Water

Soil Map Units in the Biological Study Area

Sheet 22

0 250 500
Feet

Path: K:\Projects_2\Sutter-Butte_Flood_Control_Agency\00817_10\mapdoc\Task_7_00852_10\Appendix\FRWLP_SSURGO_Soils.mxd; Author: 19402; Date: 9/23/2012

Rutland Ct
Kirk Rd
Marie Ct
James Rowe Dr
Maitland Ct
Larkin Rd
Ernest Ave
Staff Dr
Ogden Ave
Mcconnell Ave
Booth Dr
Sussex Ave
Authority Dr
Briarcliff Ln
1902+00
31
E Gridley Rd
Hutchins Dr

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Legend

- Biological Study Area
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- Reach
- Station 202+50

Soil Map Unit

- Boga-Loemstone Complex, 0 To 1 Percent Slopes
- Columbia, 0 To 2 Percent Slopes, Frequently Flooded
- Gianella Fine Sandy Loam, 0 To 1 Percent Slopes, Frequently Flooded
- Gianella Fine Sandy Loam, 0 To 1 Percent Slopes, Occasionally Flooded
- Gianella Fine Sandy Loam, 0 To 1 Percent Slopes, Rarely Flooded
- Gianella Loam, 0 To 1 Percent Slopes, Rarely Flooded
- Water

Soil Map Units in the Biological Study Area

Sheet 23

0 250 500
Feet

Path: K:\Projects_2\Sutter-Butte_Flood_Control_Agency\00817_10\mapdoc\Task_7_00852_10\Appendix\FRWLP_SSURGO_Soils.mxd; Author: 19402; Date: 9/23/2012

1958+00 32

1989+00 33

Ord Ranch Rd

Steadman Rd

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South Yuba City

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Legend

- Biological Study Area
- Alternative 1
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- Station 202+50

Soil Map Unit

- Gianella Fine Sandy Loam, 0 To 1 Percent Slopes, Occasionally Flooded
- Gianella Fine Sandy Loam, 0 To 1 Percent Slopes, Rarely Flooded
- Gianella Loam, 0 To 1 Percent Slopes, Rarely Flooded

Soil Map Units in the Biological Study Area

Sheet 24

0 250 500

Feet

Path: K:\Projects_2\Sutter-Butte_Flood_Control_Agency\00817_10\mapdoc\Task_7_00852_10\Appendix\FRWLP_SSURGO_Soils.mxd; Author: 19402; Date: 9/23/2012

Steadman Rd

Almond Ave

2122+00

34

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South Yuba City

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Legend

- Biological Study Area
- Alternative 1
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- Reach
- Station 202+50

Soil Map Unit

- Gianella Fine Sandy Loam, 0 To 1 Percent Slopes, Occasionally Flooded
- Gianella Fine Sandy Loam, 0 To 1 Percent Slopes, Rarely Flooded
- Xerorthents, Tailings, 0 To 50 Percent Slopes

Soil Map Units in the Biological Study Area

Sheet 25

0 250 500

Feet

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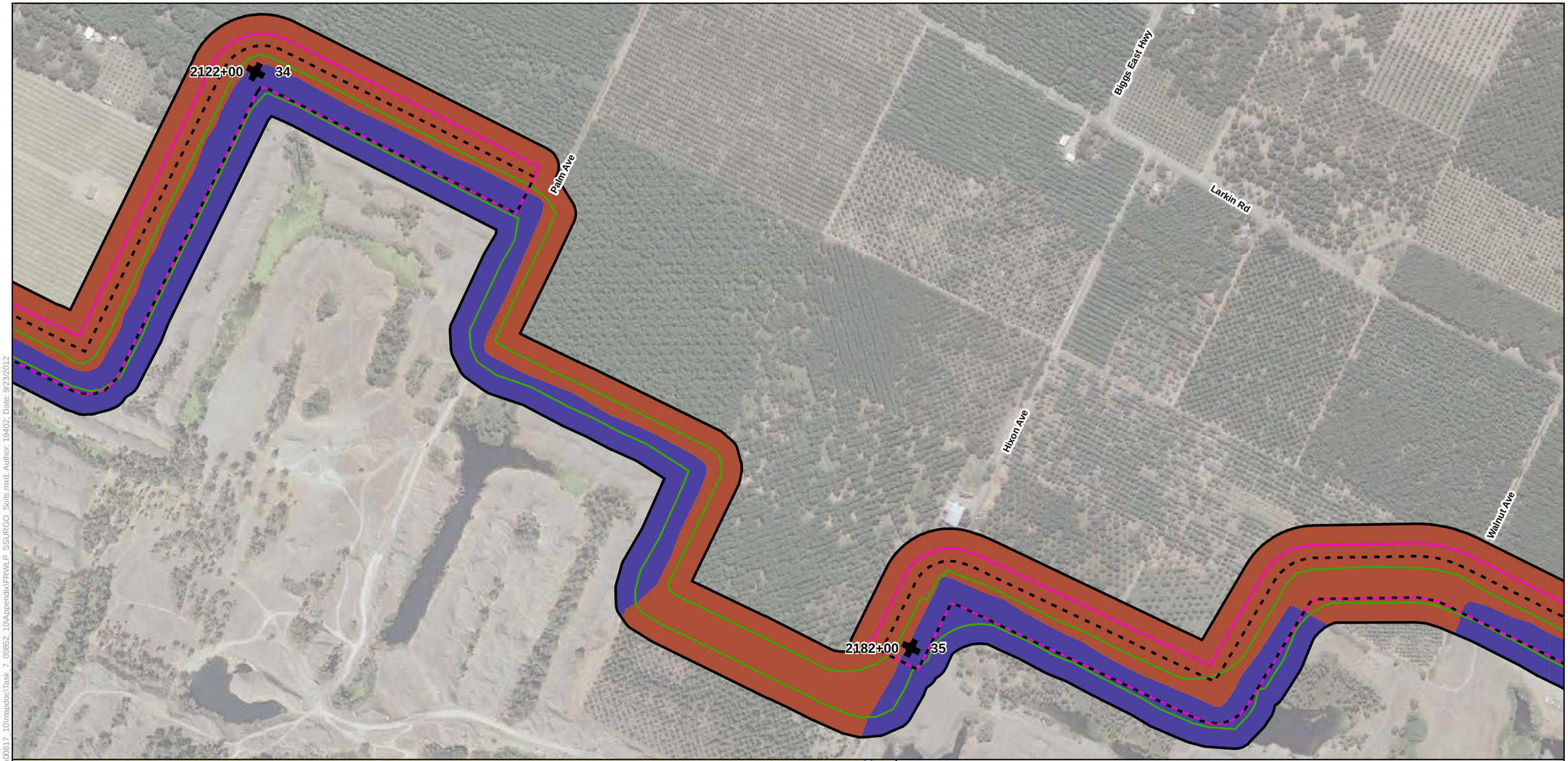
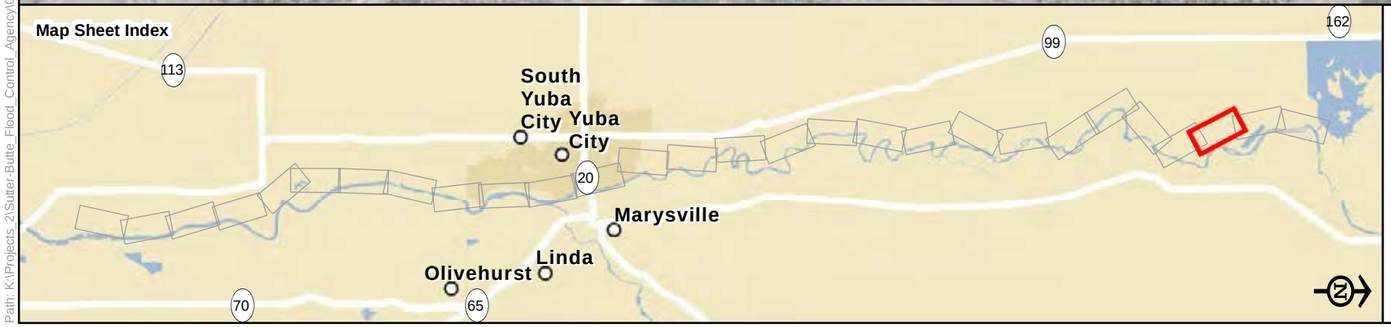




Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Soil Map Unit

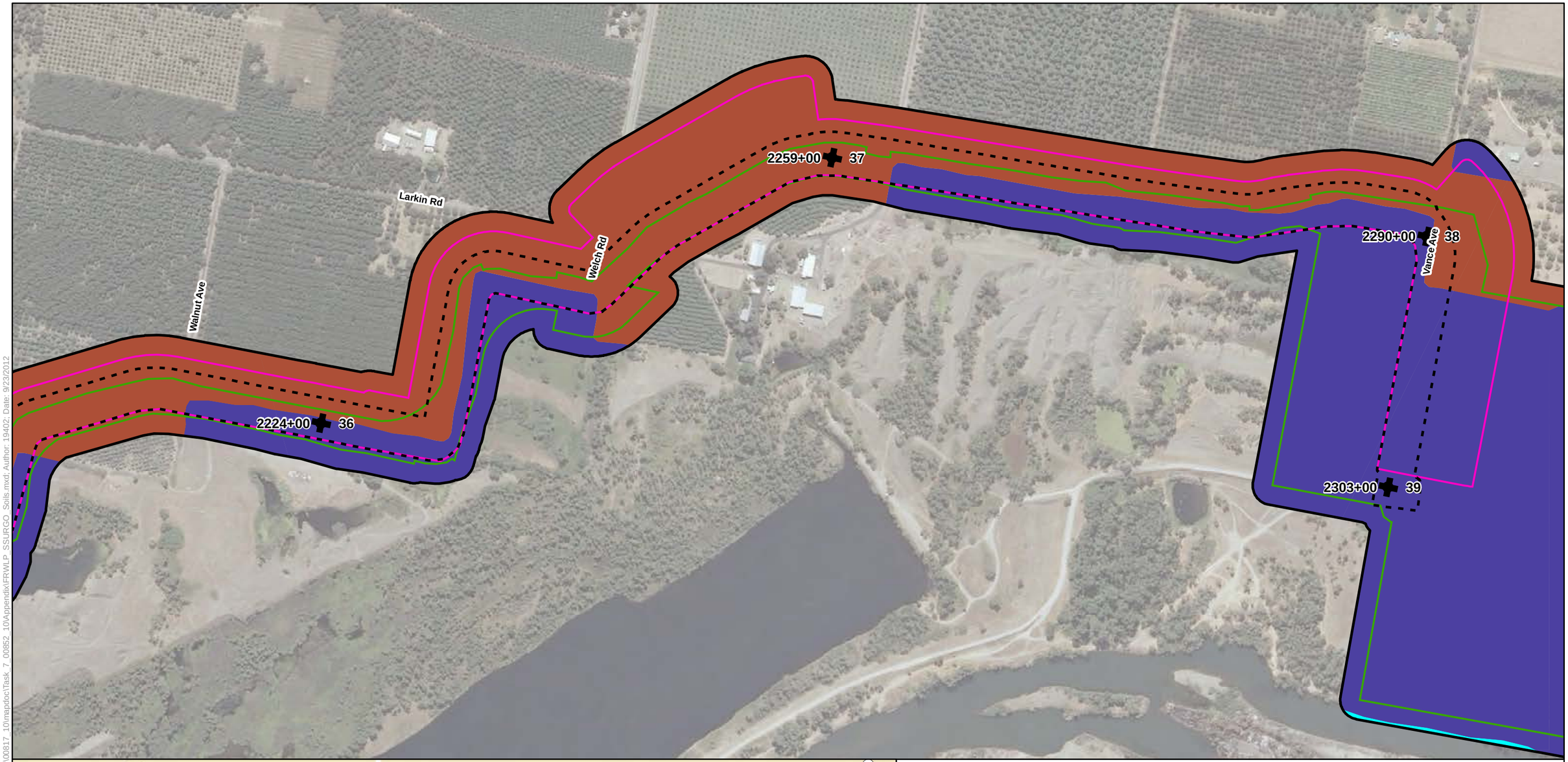
- Gianella Fine Sandy Loam, 0 To 1 Percent Slopes, Rarely Flooded
- Xerorthents, Tailings, 0 To 50 Percent Slopes

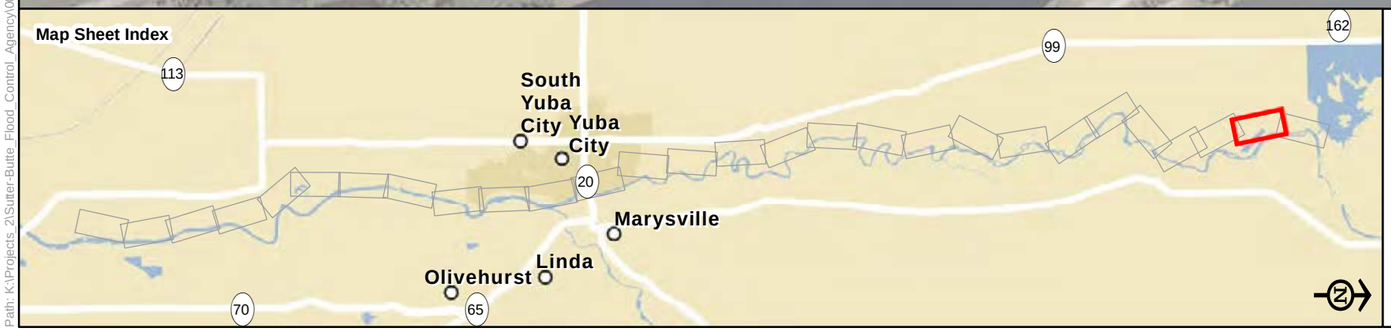
Soil Map Units in the Biological Study Area

Sheet 26

0 250 500
Feet

Path: K:\Projects_2\Sutter-Butte_Flood_Control_Agency\00817_10\mapdoc\Task_7_00852_10\AppendixFRWLP_SSURGO_Soils.mxd; Author: 19402; Date: 9/23/2012





Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Soil Map Unit

- Gianella Fine Sandy Loam, 0 To 1 Percent Slopes, Rarely Flooded
- Xerorthents, Tailings, 0 To 50 Percent Slopes
- Water

Soil Map Units in the Biological Study Area

Sheet 27

0 250 500

Feet

Path: K:\Projects_2\Sutter-Butte_Flood_Control_Agency\00817_10\mapdoc\Task_7_00852_10\Appendix\FRWLP_SSURGO_Soils.mxd: Author: 19402: Date: 9/23/2012

Haselbush Ln

Larkin Rd

Vance Ave

2319+00 40

2359+00 41

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Legend

- Biological Study Area
- Alternative 1
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- Alternative 3
- Reach
- Station 202+50

Soil Map Unit

- Gianella Fine Sandy Loam, 0 To 1 Percent Slopes, Rarely Flooded
- Xerorthents, Tailings, 0 To 50 Percent Slopes
- Water

Soil Map Units in the Biological Study Area

Sheet 28

0 250 500

Feet

Path: K:\Projects_2\Sutter-Butte_Flood_Control_Agency\00817_10\mapdoc\Task_7_00852_10\Appendix\FRWLP_SSURGO_Soils.mxd; Author: 19402; Date: 9/23/2012

Bellevue Ave

Laurel Ave

Oak Ave

Cypress Ave

202+50

218+66

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South Yuba City

Yuba City

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Olivehurst

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Legend

Biological Study Area

Alternative 1

Alternative 2

Alternative 3

Reach

Station 202+50

Wetland Type

Freshwater Emergent Wetland

Freshwater Forested/Shrub Wetland

Freshwater Pond

Lake

Riverine

Source: Wetlands - U.S. Fish and Wildlife Service, Nationional Wetlands Inventory (2012).

National Wetlands Inventory Mapping in the Biological Study Area

Sheet 1

0 250 500

Feet

Path: K:\Projects_2\Sutter-Butte_Flood_Control_Agency\00817_10\mapdoc\Task_7_00852_10\Appendix\FRWLP_Wetlands.mxd: Author: 19402: Date: 9/24/2012

Cypress Ave

Clayton Ave

Central Ave

300+66 4

Map Sheet Index

South Yuba City

Yuba City

Marysville

Linda

Olivehurst

113 99 162 20 70 65

Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Wetland Type

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Riverine

Source: Wetlands - U.S. Fish and Wildlife Service, Nationional Wetlands Inventory (2012).

National Wetlands Inventory Mapping in the Biological Study Area

Sheet 2

0 250 500

Feet

Path: K:\Projects_2\Sutter-Butte_Flood_Control_Agency\00817_10\mapdoc\Task_7_00852_10\Appendix\FRWLP_Wetlands.mxd; Author: 19402; Date: 9/24/2012

Clayton Ave

Central Ave

Carlisle Rd

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South Yuba City

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Legend

Biological Study Area

Alternative 1

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Reach

Station 202+50

Wetland Type

Freshwater Emergent Wetland

Freshwater Forested/Shrub Wetland

Freshwater Pond

Lake

Riverine

Source: Wetlands - U.S. Fish and Wildlife Service, Nationional Wetlands Inventory (2012).

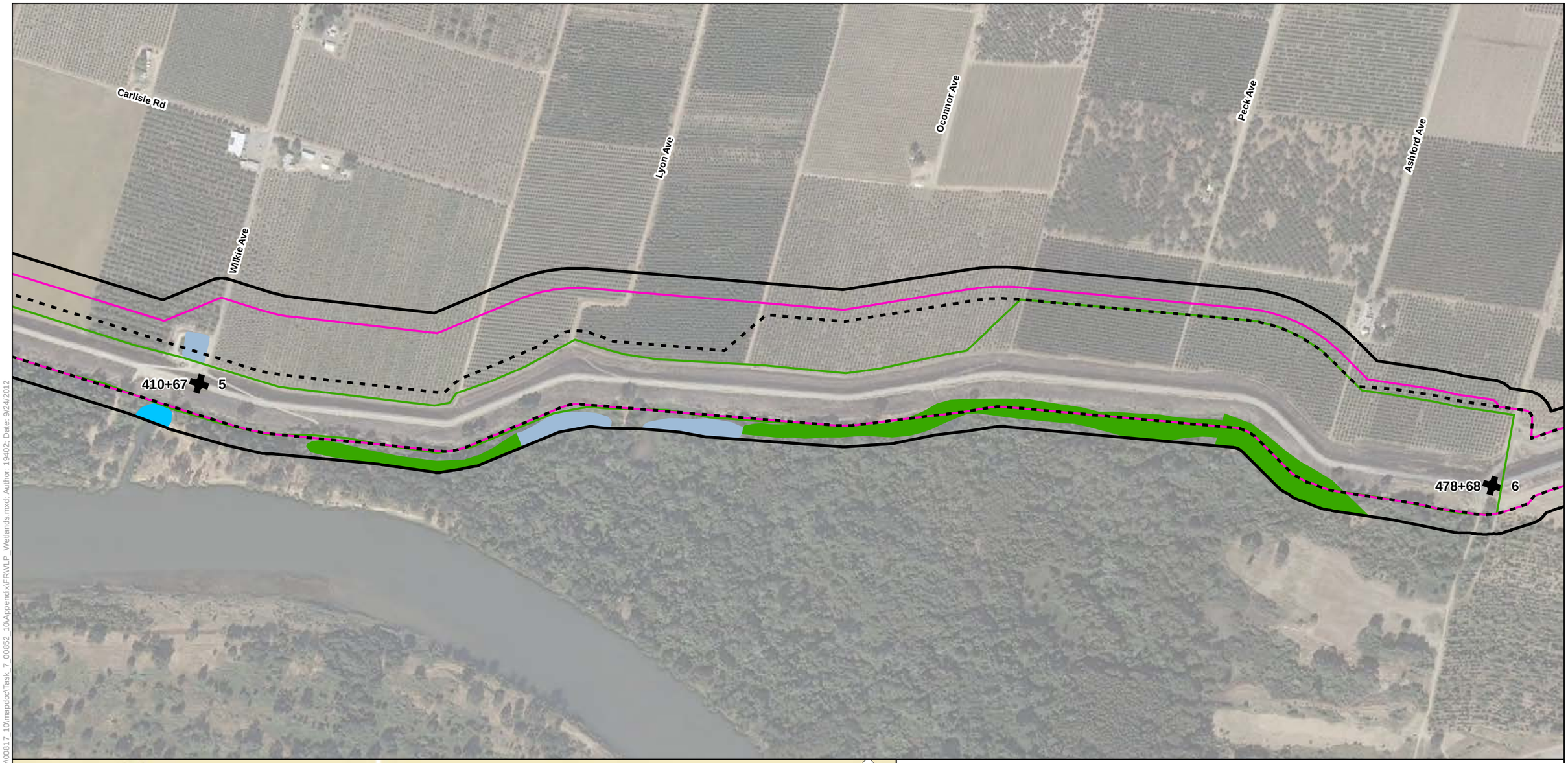
National Wetlands Inventory Mapping in the Biological Study Area

Sheet 3

0 250 500

Feet

Path: K:\Projects_2\Sutter-Butte_Flood_Control_Agency\00817_10\mapdoc\Task_7_00852_10Appendix\FRWLP_Wetlands.mxd; Author: 19402; Date: 9/24/2012





Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Wetland Type

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Riverine

Source: Wetlands - U.S. Fish and Wildlife Service, Nationional Wetlands Inventory (2012).

National Wetlands Inventory Mapping in the Biological Study Area

Sheet 4

0 250 500
Feet

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Garden Hwy

Shannon Rd

Star Bend Rd

510+37 7

Map Sheet Index

113 99 162 South Yuba City Yuba City 20 Marysville Linda Olivehurst 70 65

Legend

Biological Study Area
Alternative 1
Alternative 2
Alternative 3
Reach
Station 202+50

Wetland Type

Freshwater Emergent Wetland
Freshwater Forested/Shrub Wetland
Freshwater Pond
Lake
Riverine

Source: Wetlands - U.S. Fish and Wildlife Service, Nationional Wetlands Inventory (2012).

National Wetlands Inventory Mapping in the Biological Study Area

Sheet 5

0 250 500
Feet

Path: K:\Projects_2\Sutter-Butte_Flood_Control_Agency\00817_10\mapdoc\Task_7_00852_10\Appendix\FRWLP_Wetlands.mxd: Author: 19402: Date: 9/24/2012

Garden Hwy

Obanion Rd

596+00

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South Yuba City

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Legend

Biological Study Area

Alternative 1

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Reach

Station 202+50

Wetland Type

Freshwater Emergent Wetland

Freshwater Forested/Shrub Wetland

Freshwater Pond

Lake

Riverine

Source: Wetlands - U.S. Fish and Wildlife Service, Nationional Wetlands Inventory (2012).

National Wetlands Inventory Mapping in the Biological Study Area

Sheet 6

0 250 500

Feet

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Garden Hwy

Messick Rd

654+75 9

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South Yuba City

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Legend

Biological Study Area

Alternative 1

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Reach

Station 202+50

Wetland Type

Freshwater Emergent Wetland

Freshwater Forested/Shrub Wetland

Freshwater Pond

Lake

Riverine

Source: Wetlands - U.S. Fish and Wildlife Service, Nationional Wetlands Inventory (2012).

National Wetlands Inventory Mapping in the Biological Study Area

Sheet 7

0 250 500

Feet

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Oswald Rd

Barry Rd

Garden Hwy

706+50 10

Levee Rd

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South Yuba City

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Legend

Biological Study Area

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Reach

Station 202+50

Wetland Type

Freshwater Emergent Wetland

Freshwater Forested/Shrub Wetland

Freshwater Pond

Lake

Riverine

Source: Wetlands - U.S. Fish and Wildlife Service, Nationional Wetlands Inventory (2012).

National Wetlands Inventory Mapping in the Biological Study Area

Sheet 8

2

0 250 500

Feet

Path: K:\Projects_2\Sutter-Butte_Flood_Control_Agency\00817_10\mapdoc\Task_7_00852_10\Appendix\FRWLP_Wetlands.mxd: Author: 19402; Date: 9/24/2012

Barry Rd
Garden Hwy
Stewart Rd
Private Rd
Levee Rd
Drummond Dr
Shady Ct
Burl Ct
Carmelo Way
Black Ct
Pecan Dr
Shady Ln
Persian Loop
Shanghai Bend Rd
Wasson Ct
Idaho Dr
Chandler Ct
Chandler Way
Ser Way
Eureka Dr
774+00 11
845+00 13
830+00 12

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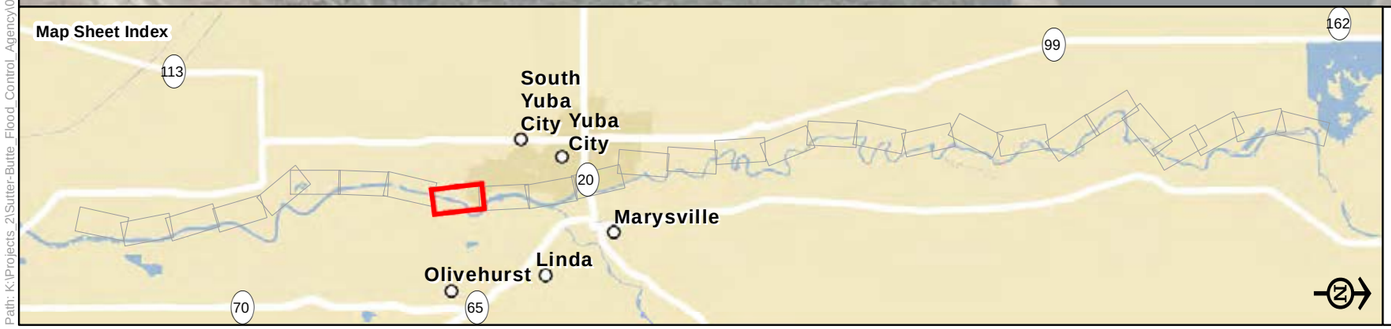

Legend

- Biological Study Area
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- Station 202+50

Wetland Type

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Riverine

Source: Wetlands - U.S. Fish and Wildlife Service, Nationional Wetlands Inventory (2012).

National Wetlands Inventory Mapping in the Biological Study Area

Sheet 9

0 250 500
Feet

Path: K:\Projects_2\Sutter-Butte_Flood_Control_Agency\00817_10\mapdoc\Task_7_00852_10\Appendix\FRWLP_Wetlands.mxd; Author: 19402; Date: 9/24/2012

Wild River Dr
Crystal Creek Ln
Bogue Rd
Lonely Oak St
Edgewater Way
Rocky Ct
Rapid Water Way
Private Rd
Burns Dr
Putman Ave
Epley Dr
Levee Rd
927+00
Idaho Dr
845+00
13
Shanghai Bend Rd
Eureka Dr
Levee Rd

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- Reach
- Station 202+50

Wetland Type

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Riverine

Source: Wetlands - U.S. Fish and Wildlife Service, Nationional Wetlands Inventory (2012).

National Wetlands Inventory Mapping in the Biological Study Area

Sheet 10

0 250 500
Feet

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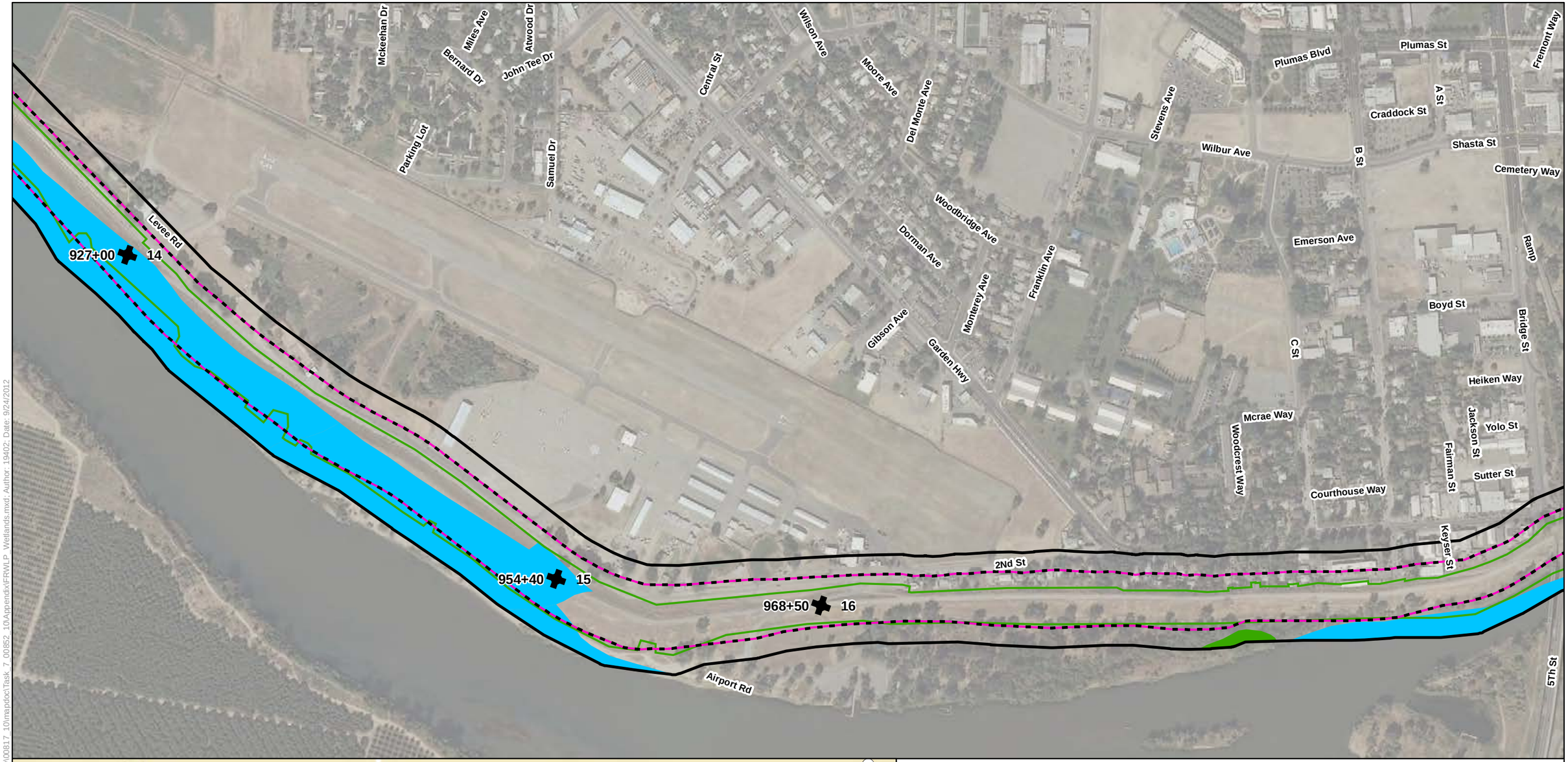

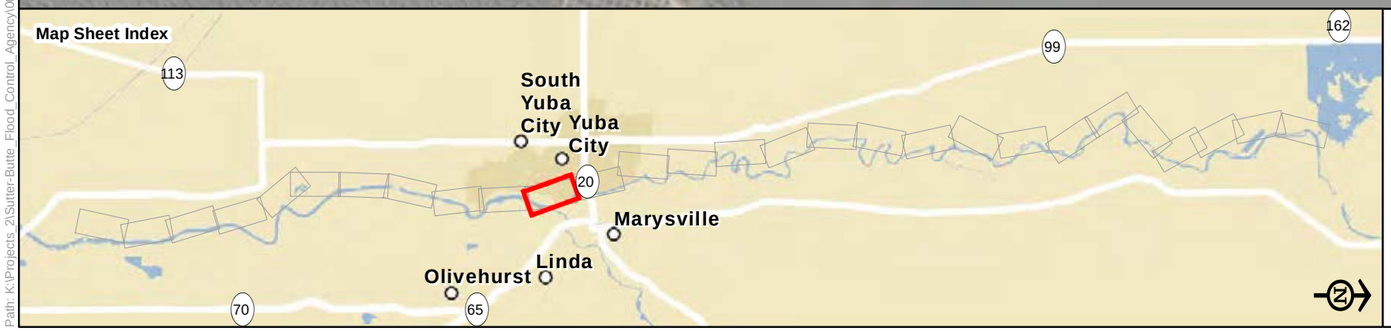

Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Wetland Type

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Riverine

National Wetlands Inventory Mapping in the Biological Study Area

Sheet 11

0 250 500
Feet

Source: Wetlands - U.S. Fish and Wildlife Service, Nationional Wetlands Inventory (2012).

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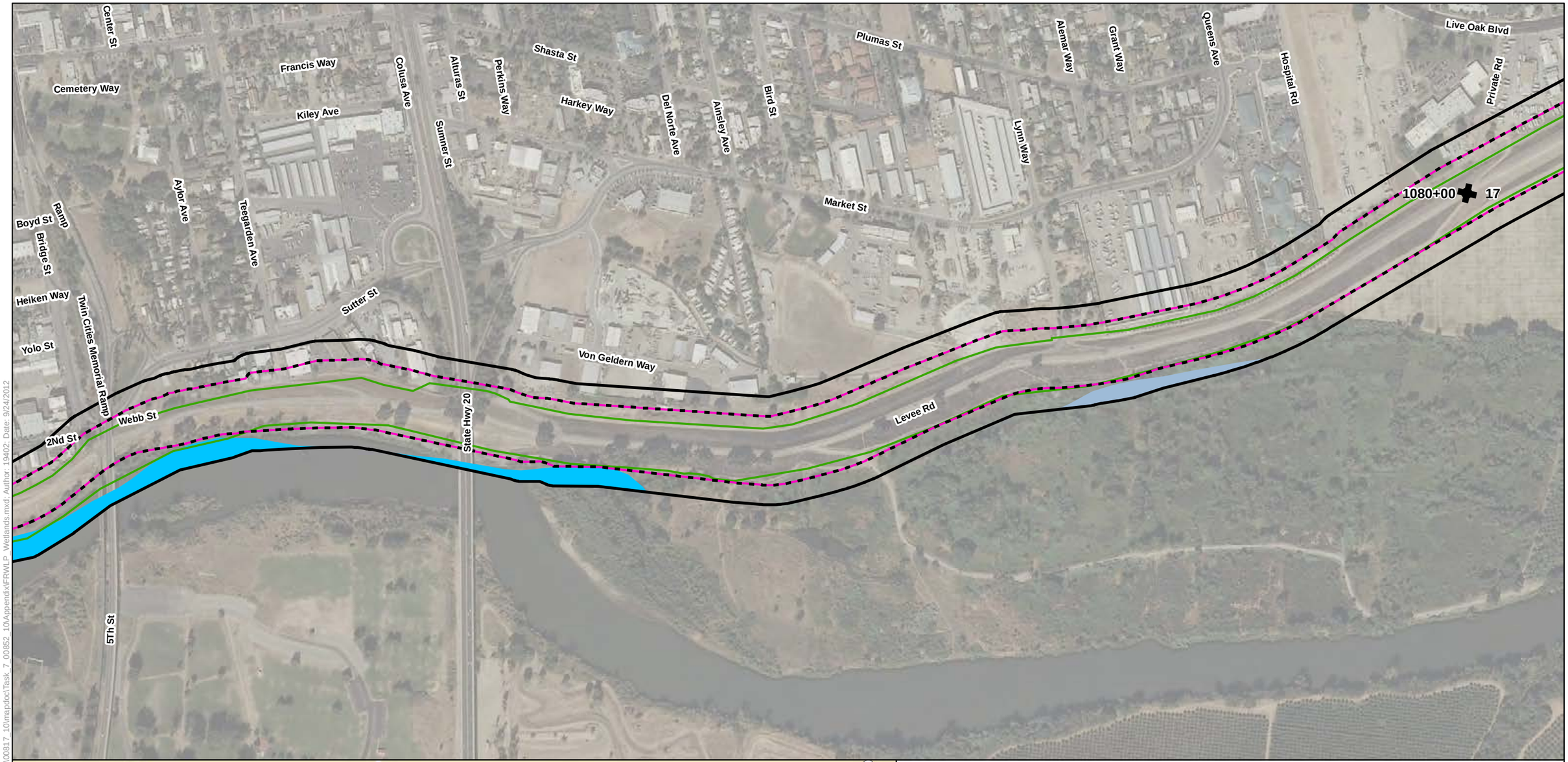

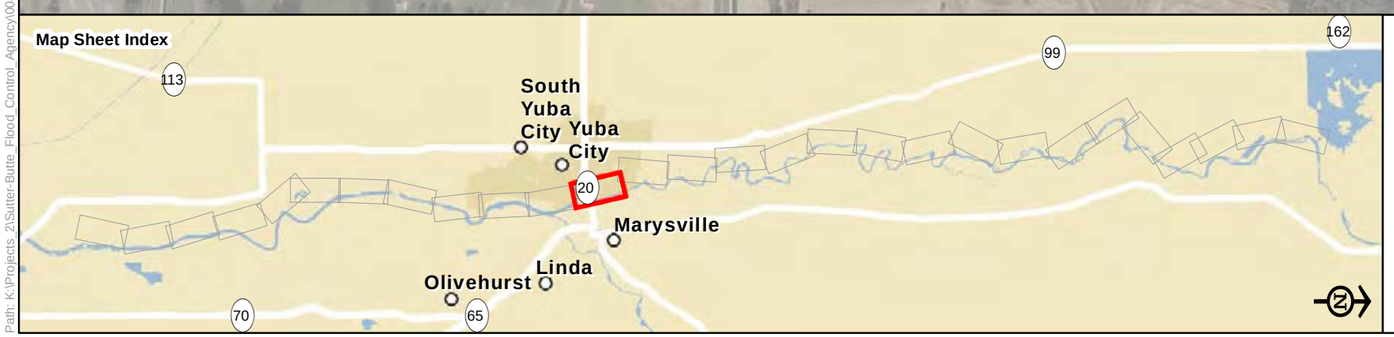

Legend

- Biological Study Area
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- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Wetland Type

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- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Riverine

Source: Wetlands - U.S. Fish and Wildlife Service, Nationional Wetlands Inventory (2012).

National Wetlands Inventory Mapping in the Biological Study Area

Sheet 12

0 250 500

Feet

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Sandalwood Ct
Teakwood Dr
Beechwood St
Oakview Dr
Forestview Dr
Baywood Ct
N Point Dr
Northridge Dr
Santa Barbara Way
Pease Rd
Tamarack Dr
Hunt St
Clark Ave
Parkbrook Ct
Cassidy Ct
Bal Sukh Mhp Rd
Northgate Dr
Cassidy Ave
Bal Sukh Mhp
Live Oak Blvd
1130+86
18
Levee
Private Rd
17

Map Sheet Index

113
South Yuba City
Yuba City
20
Marysville
Linda
Olivehurst
70
65
99
162

Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Wetland Type

- Freshwater Emergent Wetland
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- Freshwater Pond
- Lake
- Riverine

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National Wetlands Inventory Mapping in the Biological Study Area

Sheet 13

0 250 500
Feet

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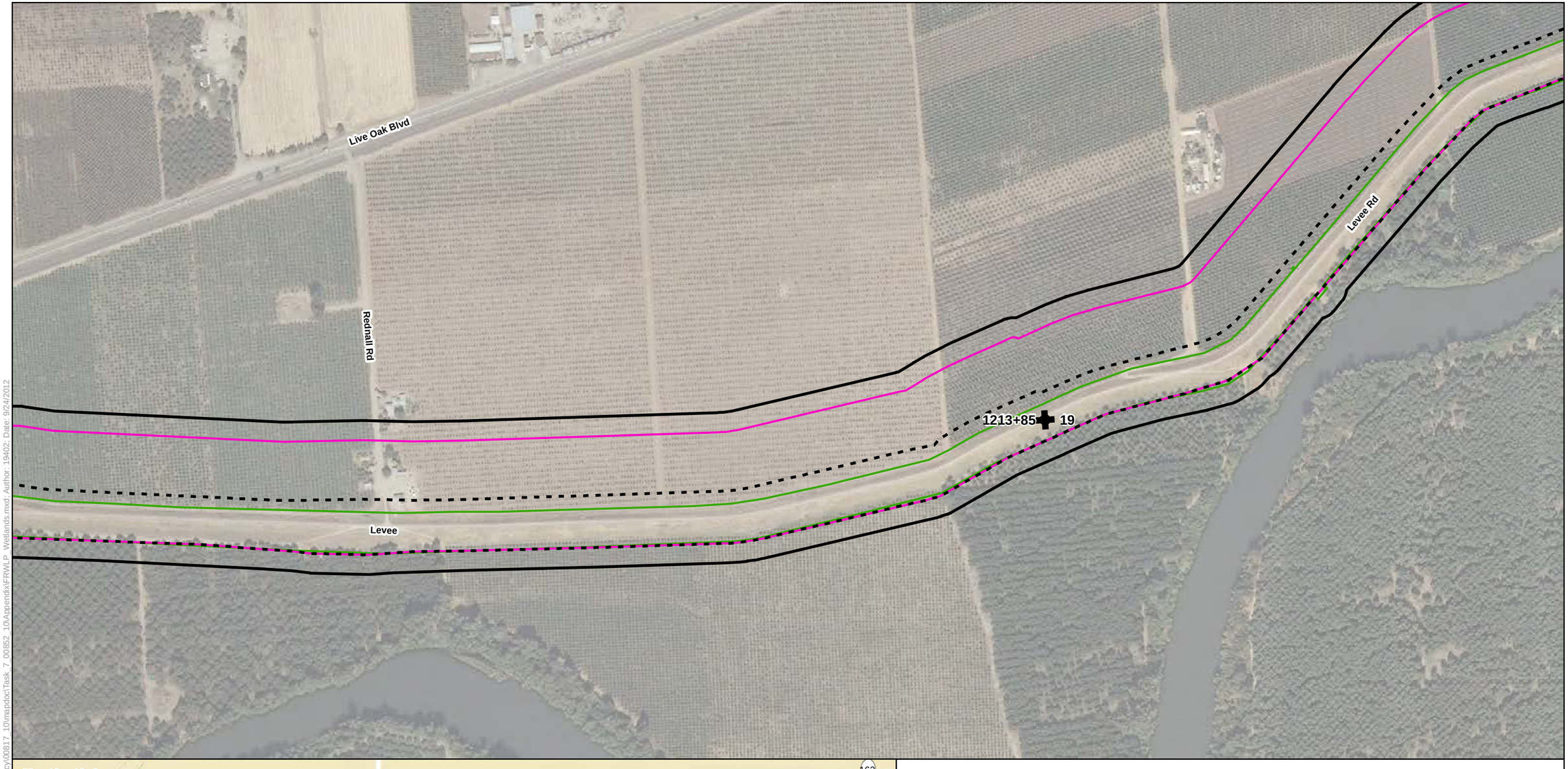



Legend

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- Alternative 3
- Reach
- Station 202+50

Wetland Type

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- Freshwater Pond
- Lake
- Riverine

Source: Wetlands - U.S. Fish and Wildlife Service, Nationional Wetlands Inventory (2012).

National Wetlands Inventory Mapping in the Biological Study Area

Sheet 14

0 250 500

Feet

Path: K:\Projects_2\Sutter-Butte_Flood_Control_Agency\00817_10\mapdoc\Task_7_00852_10\Appendix\FRWLP_Wetlands.mxd: Author: 19402; Date: 9/24/2012

Live Oak Blvd

Morse Rd

Levee Rd

1297+83 20

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Map Sheet Index

113 99 162 20 70 65

South Yuba City Yuba City

Marysville

Olivehurst Linda

Legend

Biological Study Area
Alternative 1
Alternative 2
Alternative 3
Reach
Station 202+50

Wetland Type

Freshwater Emergent Wetland
Freshwater Forested/Shrub Wetland
Freshwater Pond
Lake
Riverine

Source: Wetlands - U.S. Fish and Wildlife Service, Nationional Wetlands Inventory (2012).

National Wetlands Inventory Mapping in the Biological Study Area

Sheet 15

0 250 500
Feet

Koch Ln

Clark Rd

Kent Ave

Hermanson St

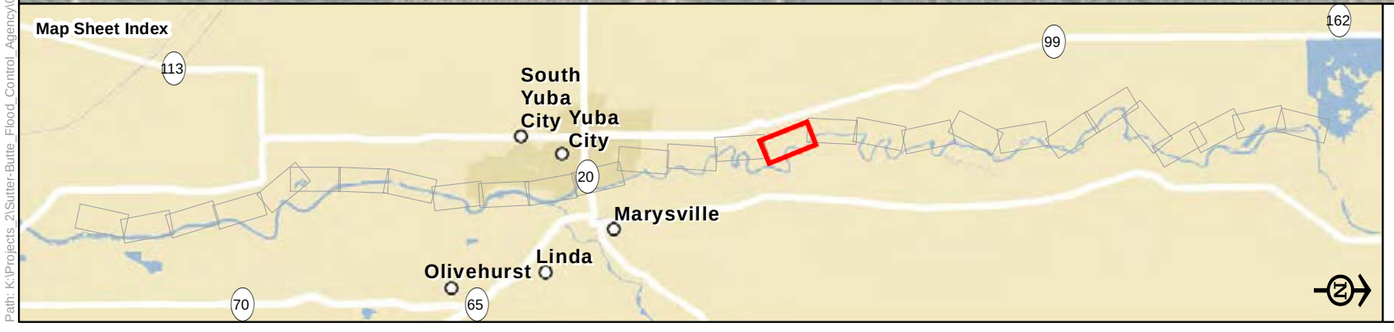
Levee Rd

Levee

1374+33

21

Map Sheet Index



Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Wetland Type

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Riverine

Source: Wetlands - U.S. Fish and Wildlife Service, Nationional Wetlands Inventory (2012).

National Wetlands Inventory Mapping in the Biological Study Area

Sheet 16

0 250 500

Feet

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Cutting Ave

Mcdonald Ave

Paseo Rd

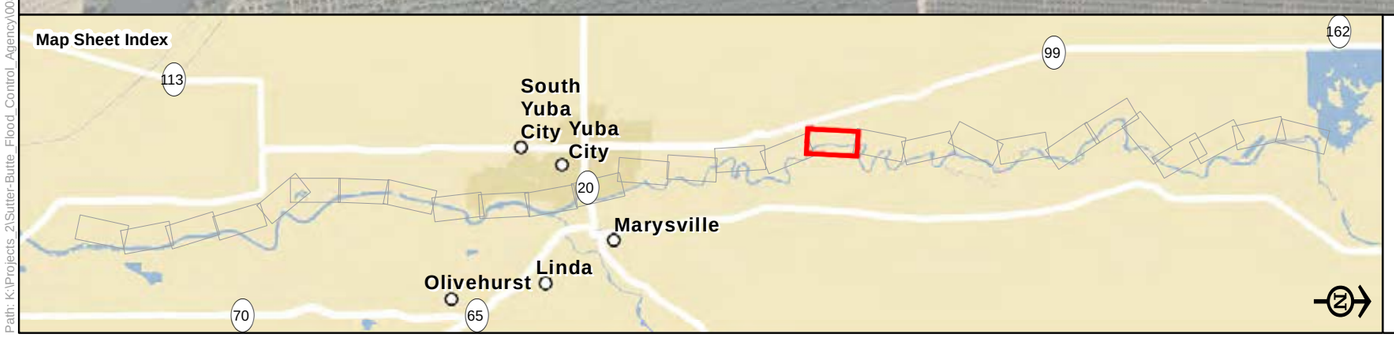
Kent Ave

Bridgeford Rd

Levee Rd

1433+83 22

Map Sheet Index



Legend

Biological Study Area
Alternative 1
Alternative 2
Alternative 3
Reach
Station 202+50

Wetland Type

Freshwater Emergent Wetland
Freshwater Forested/Shrub Wetland
Freshwater Pond
Lake
Riverine

Source: Wetlands - U.S. Fish and Wildlife Service, Nationional Wetlands Inventory (2012).

National Wetlands Inventory Mapping in the Biological Study Area

Sheet 17

0 250 500

Feet

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Bishop Ave

Kent Ave

Archer Ave

Pennington Rd

1503+83

23

Private Rd

Levee Rd

Map Sheet Index

113

South Yuba City

Yuba City

20

Marysville

Olivehurst

Linda

70

65

99

162

Legend

Biological Study Area

Alternative 1

Alternative 2

Alternative 3

Reach

Station 202+50

Wetland Type

Freshwater Emergent Wetland

Freshwater Forested/Shrub Wetland

Freshwater Pond

Lake

Riverine

Source: Wetlands - U.S. Fish and Wildlife Service, Nationional Wetlands Inventory (2012).

National Wetlands Inventory Mapping in the Biological Study Area

Sheet 18

0 250 500

Feet

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Campbell Rd

Encinal Rd

Cooley Rd

Private Rd

1623+86 25

1609+37 24

Sparrow Ln

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Map Sheet Index

113 99 162 20 70 65

South Yuba City Yuba City

Marysville

Olivehurst Linda

Legend

Biological Study Area

Alternative 1

Alternative 2

Alternative 3

Reach

Station 202+50

Wetland Type

Freshwater Emergent Wetland

Freshwater Forested/Shrub Wetland

Freshwater Pond

Lake

Riverine

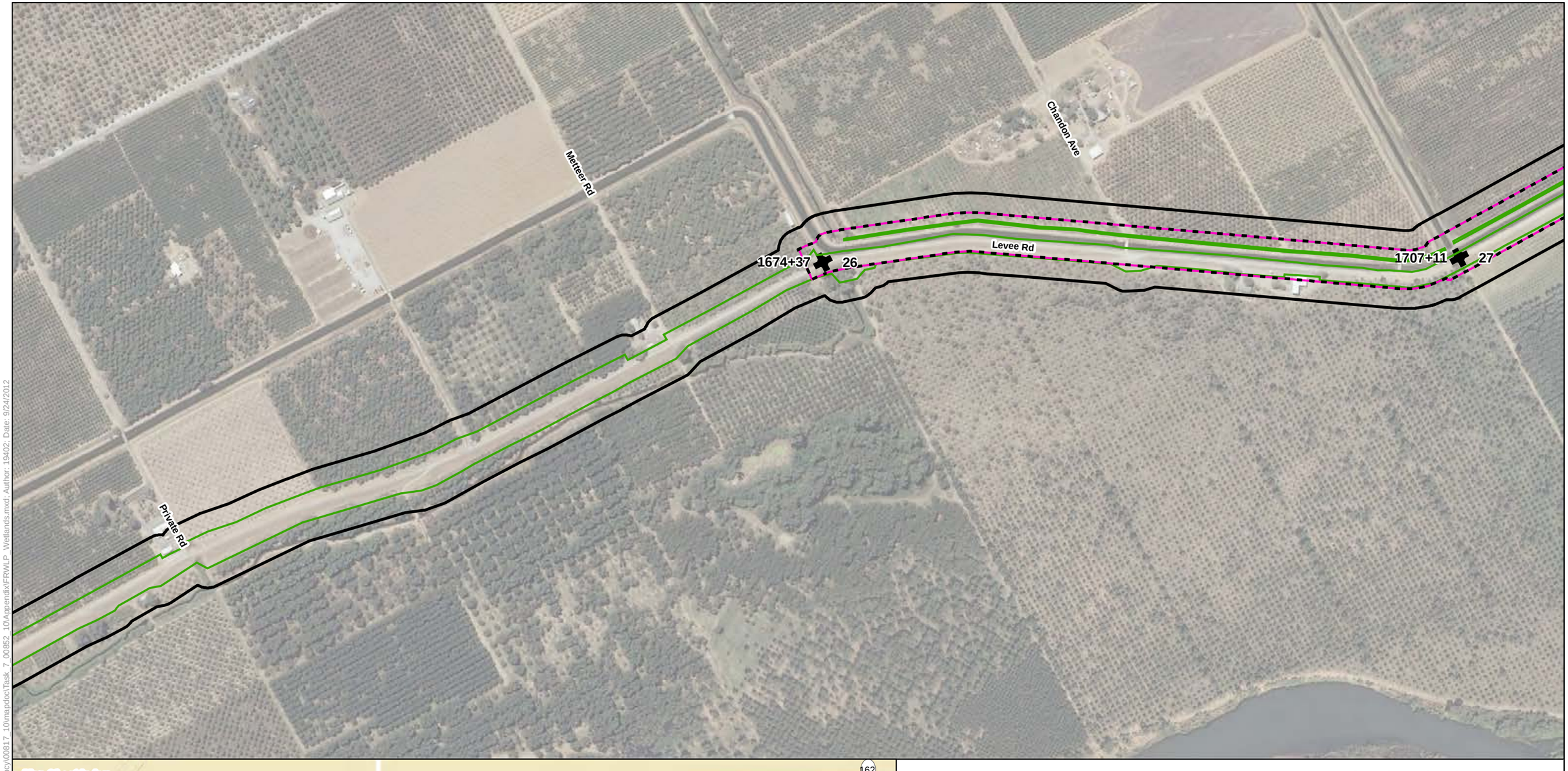
Source: Wetlands - U.S. Fish and Wildlife Service, Nationional Wetlands Inventory (2012).

National Wetlands Inventory Mapping in the Biological Study Area

Sheet 19

0 250 500

Feet





Legend

- Biological Study Area
- Alternative 1
- Alternative 2
- Alternative 3
- Reach
- Station 202+50

Wetland Type

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- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Riverine

Source: Wetlands - U.S. Fish and Wildlife Service, Nationional Wetlands Inventory (2012).

National Wetlands Inventory Mapping in the Biological Study Area

Sheet 20

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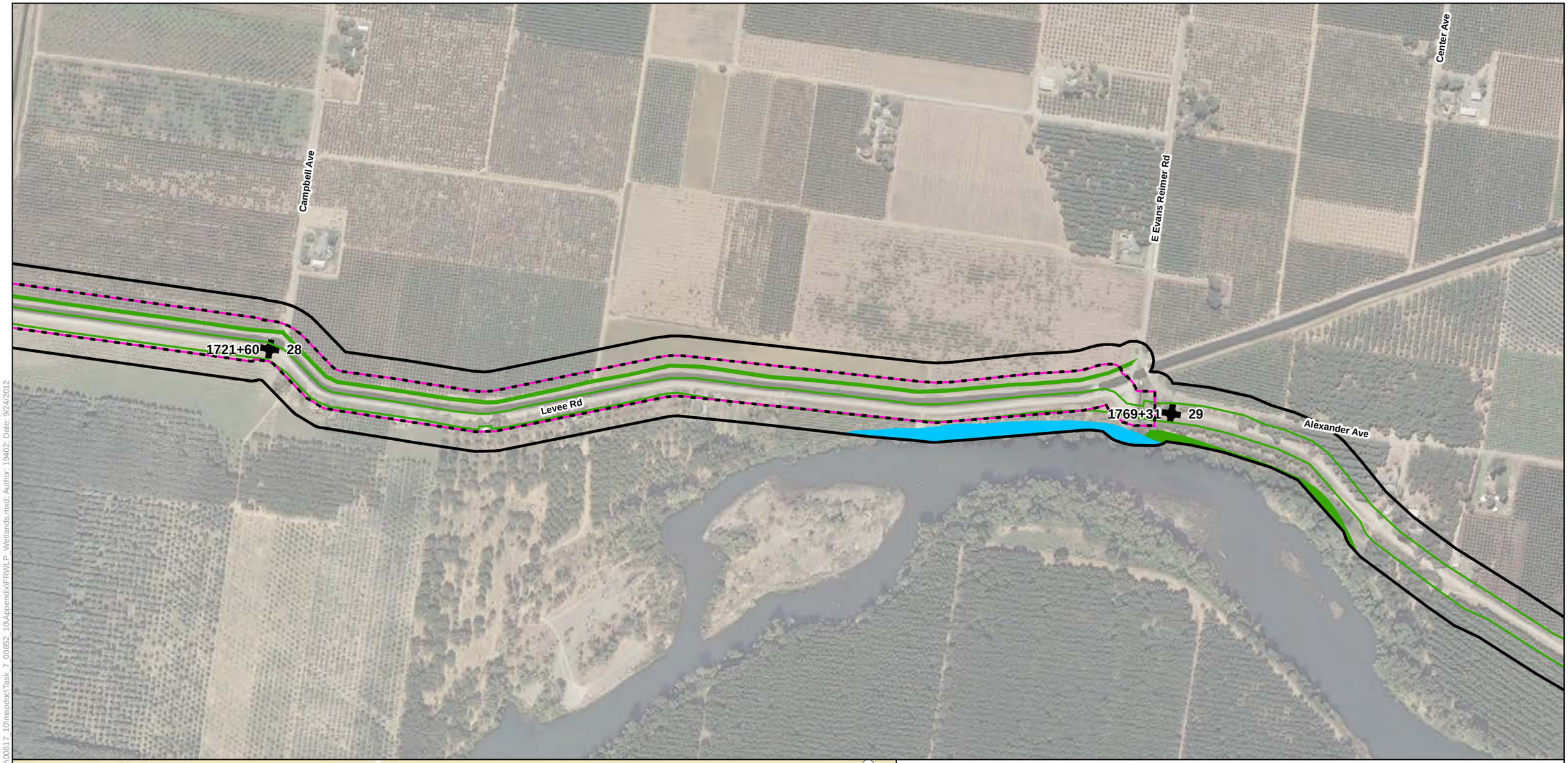



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National Wetlands Inventory Mapping in the Biological Study Area

Sheet 21

0 250 500
Feet

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Alexander Ave

Richards Ave

1813+33 30

Map Sheet Index

113 99 162 South Yuba City Yuba City 20 Marysville Linda Olivehurst 70 65

Legend

Biological Study Area
Alternative 1
Alternative 2
Alternative 3
Reach
Station 202+50

Wetland Type

Freshwater Emergent Wetland
Freshwater Forested/Shrub Wetland
Freshwater Pond
Lake
Riverine

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National Wetlands Inventory Mapping in the Biological Study Area

Sheet 22

0 250 500
Feet

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Rutland Ct
Kirk Rd
Marie Ct
James Rowe Dr
Maitland Ct
Larkin Rd
Ernest Ave
Staff Dr
Ogden Ave
Mcconnell Ave
Booth Dr
Sussex Ave
Authority Dr
Briarcliff Ln
1902+00
31
E Gridley Rd
Hutchins Dr

Map Sheet Index

113
99
162
20
70
65
South Yuba City
Yuba City
Marysville
Linda
Olivehurst

Legend

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Sheet 23

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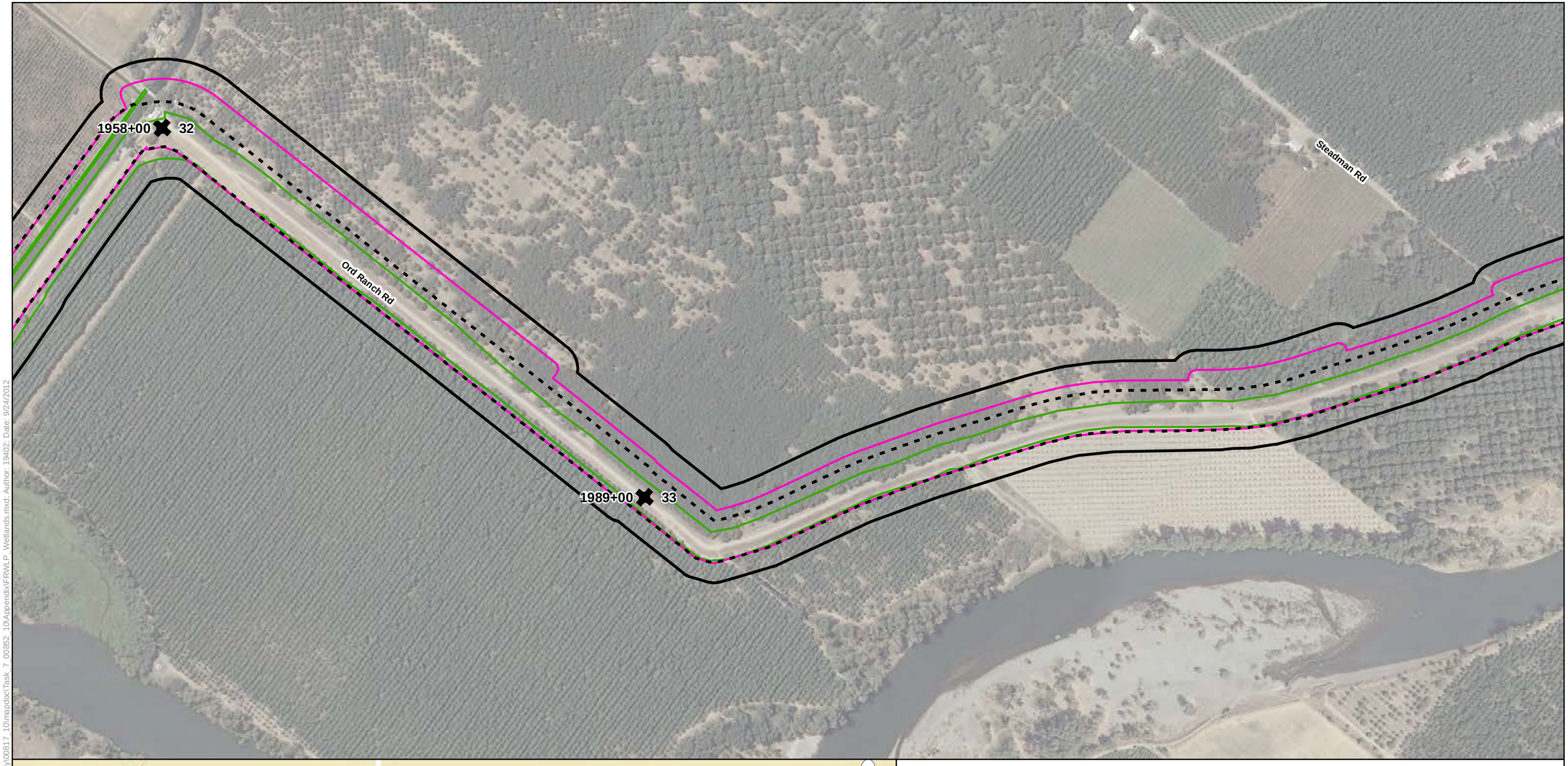



Legend

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National Wetlands Inventory Mapping in the Biological Study Area

Sheet 24

0 250 500

Feet

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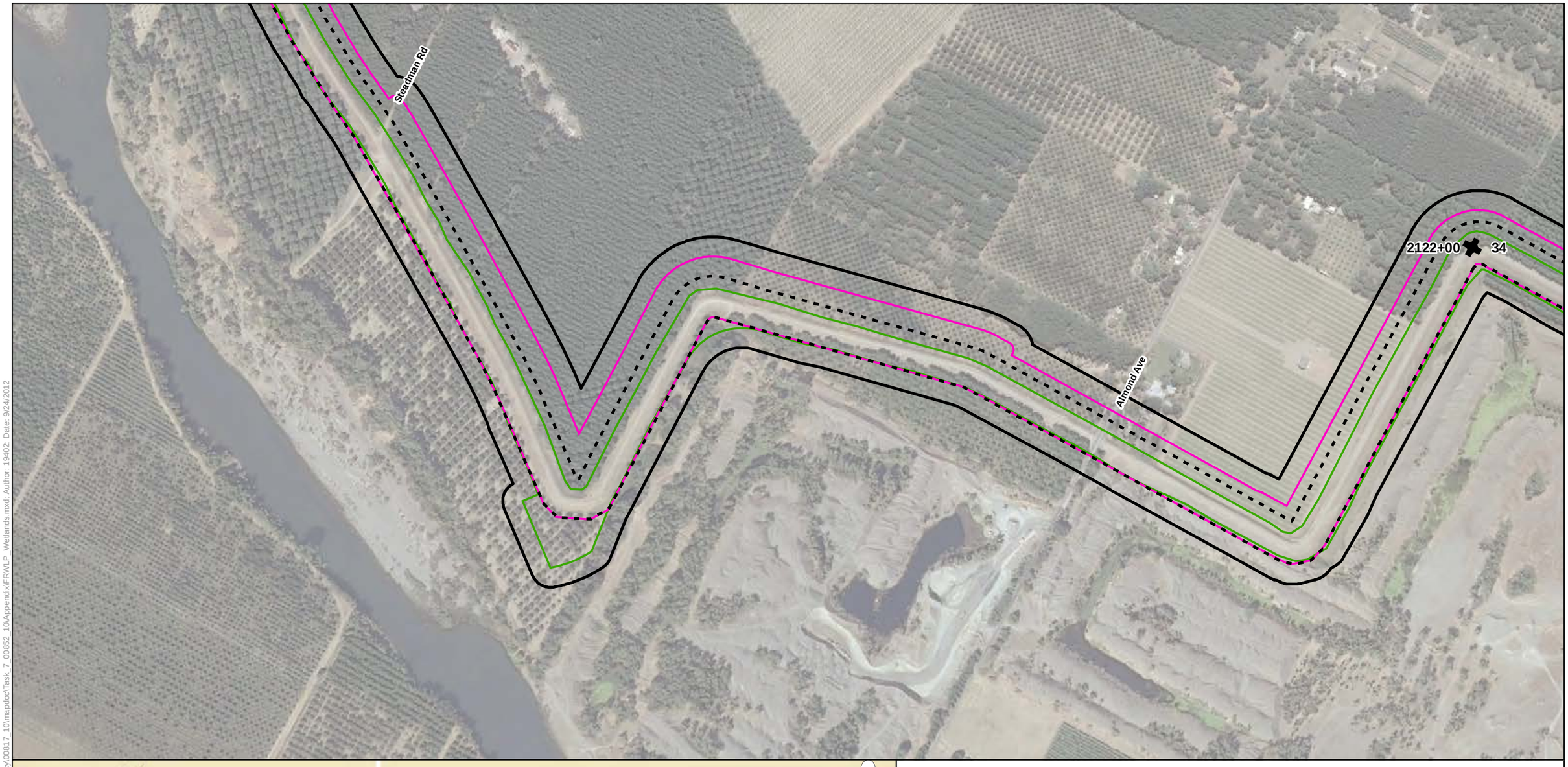



Legend

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National Wetlands Inventory Mapping in the Biological Study Area

Sheet 25

0 250 500
Feet

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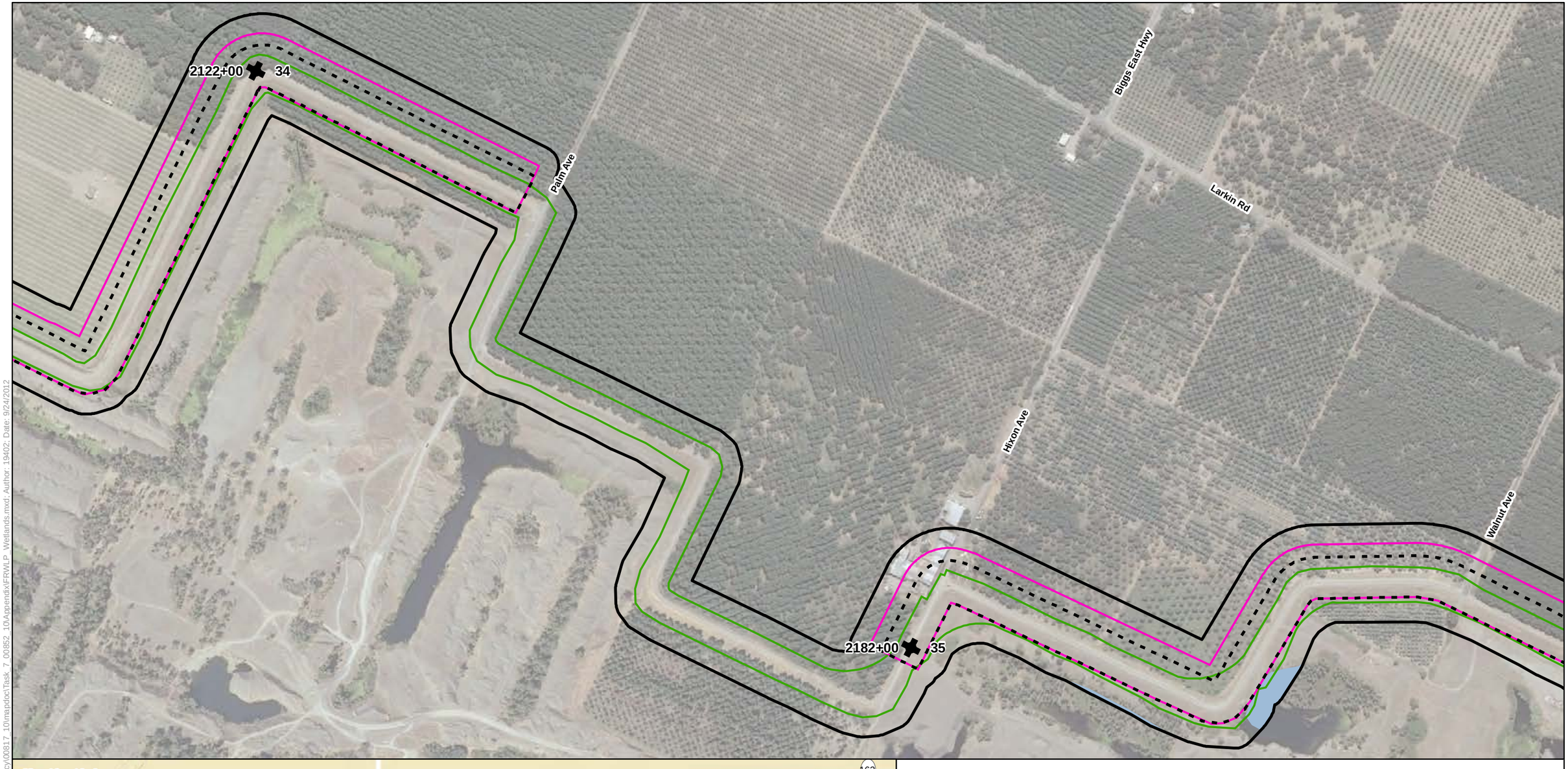



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- Station 202+50

Wetland Type

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Source: Wetlands - U.S. Fish and Wildlife Service, Nationional Wetlands Inventory (2012).

National Wetlands Inventory Mapping in the Biological Study Area

Sheet 26

0 250 500
Feet

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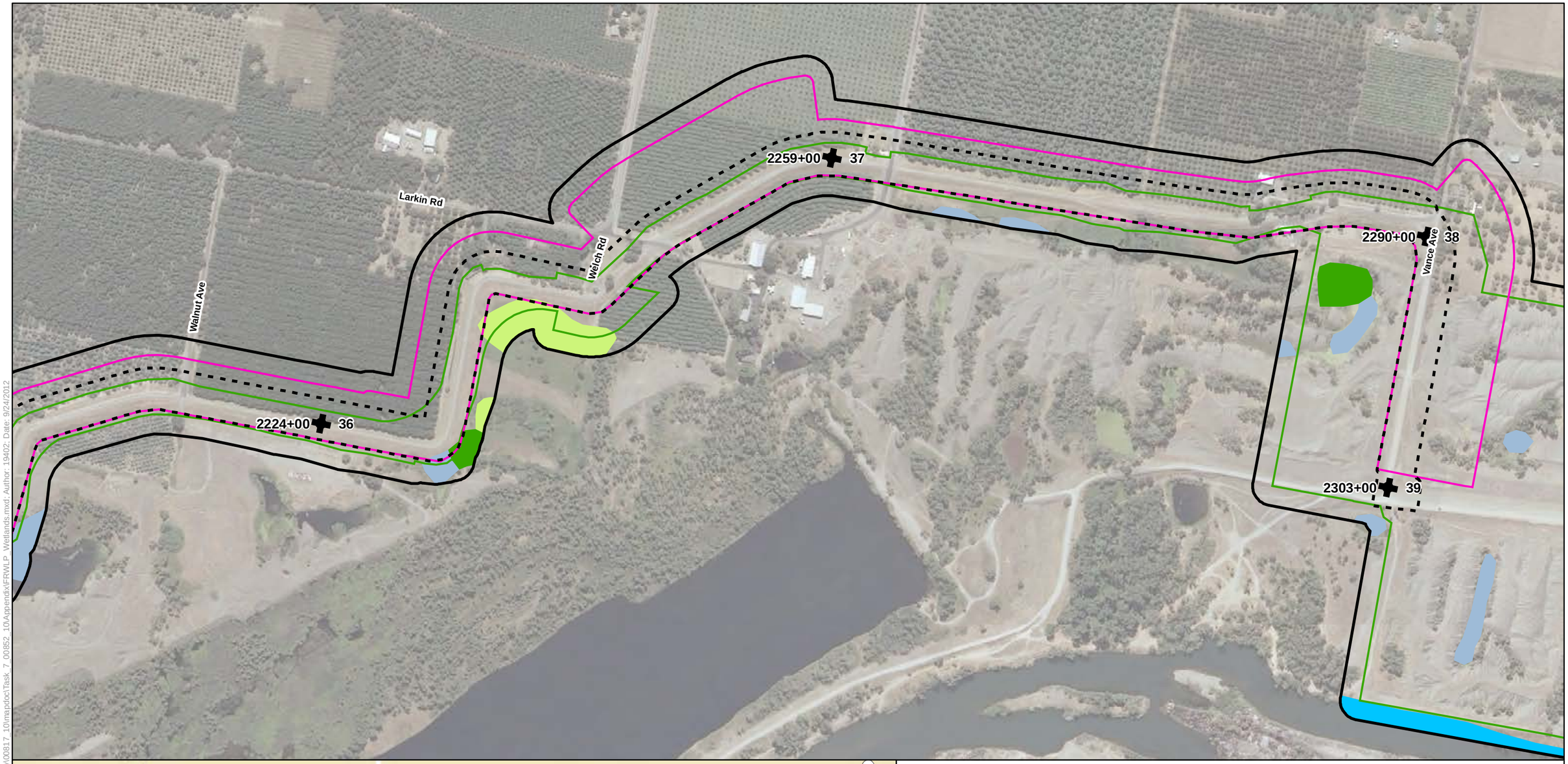

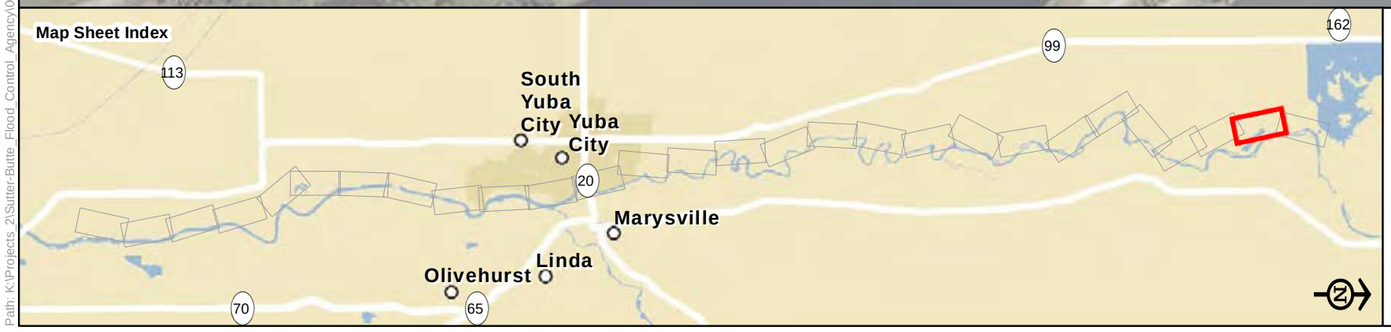

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National Wetlands Inventory Mapping in the Biological Study Area

Sheet 27

0 250 500
Feet

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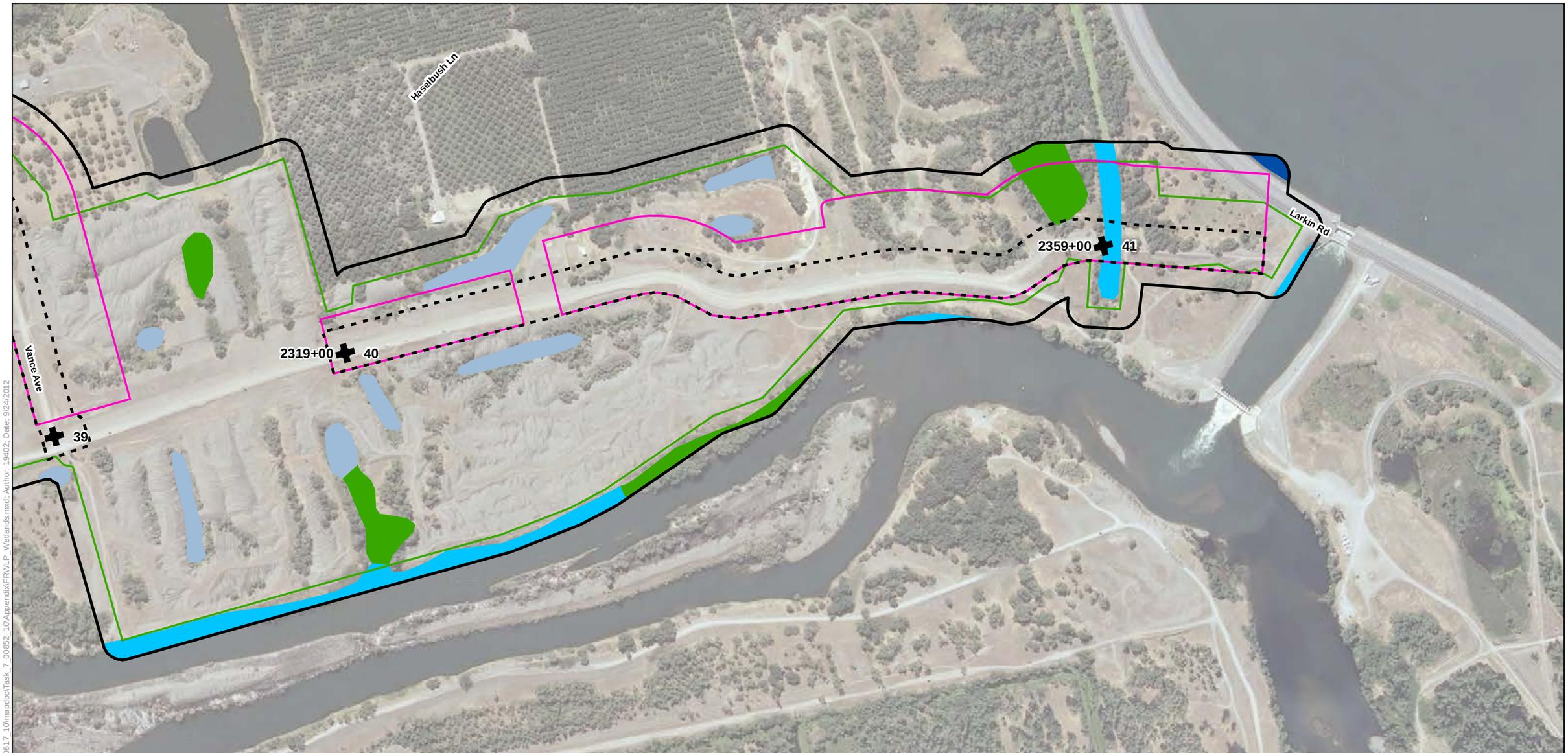



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- Riverine

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National Wetlands Inventory Mapping in the Biological Study Area

Sheet 28

0 250 500
Feet

Path: K:\Projects_2\Sutter-Butte_Flood_Control_Agency\00817_10\mapdoc\Task_7_00852_10\Appendix\FRWLP_Wetlands.mxd; Author: 19402; Date: 9/24/2012

Appendix G

SBFCA, FRWLP Approach for Addressing Existing Levee Encroachments

WOOD RODGERS

MEMORANDUM – DRAFT

TO: Mr. Chris Krivanec, P.E., G.E., HDR, Inc.

FROM: Jonathan Kors, P.E., PMP

DATE: January 13, 2012

SUBJECT: SBFCA, Feather River West Levee Project, Approach for Addressing Existing Levee Encroachments

INTRODUCTION

In 2010, the Sutter Butte Flood Control Agency (SBFCA) embarked on the Feather River West Levee (FRWL) Project. The project seeks to rehabilitate 44 miles of existing levee along the west bank of the Feather River through Sutter and Butte Counties. A geotechnical assessment of the levees has been completed and the potential mitigation measures to address the deficiencies in each reach have been analyzed by the design team. The alternatives are outlined in detail in the Project Pre-design Formulation Report (PFR) (Reference 1). The design of the project is currently approaching the 65 percent level. For construction, the project is broken up into four contract packages, as described in Reference 2 below. The construction packages, listed in priority order, are as follows: Project C, Project D, Project B, and Project A. The limits of each project are shown on Figure 1. Project C and Project D will be constructed in 2013 and 2014, while Project A and Project B will be constructed in 2014 and 2015.

The levee in each project possesses numerous encroachments which will need to be addressed by the work because they either: a) present a threat to the stability of the levee system, b) do not currently comply with levee encroachment criteria; or c) will be disrupted or otherwise impacted by the levee rehabilitation work. Some of the encroachments have been reviewed and permitted by the Central Valley Flood Protection Board (CVFPB), while others pre-date the establishment of the State Reclamation Board (now the CVFPB), and have been "grandfathered" into the system. The permit status of others remains to be determined. 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 as discussed below.

The purpose of this Memorandum is to provide a complete listing of the encroachments (as complete as possible based upon available information), outline the approach to handling project encroachments in general, and outline the approach to handling specific encroachments located within Project areas C and D.

REFERENCES

1. HDR, Wood Rodgers, URS, and MHM, "Pre-design Formulation Report, Feather River West Levee – Segments 1 through 7, Sutter Butte Levee Rehabilitation Program, Sutter and Butte Counties, California," February 2011.

2. Peterson Brustad, Inc., "Preliminary Construction Ordering Analysis," July 11, 2011.

3. Wood Rodgers and HDR, 30-Percent Design Drawings, February 2011.

MASTER ENCROACHMENTS LIST

MHM Engineers, the HDR design team member assigned primary design responsibility for utilities disrupted by the project, has developed a Master Encroachments List for identifying all utilities and encroachments on the project. To build the list, MHM performed a field review of the levee, listing all encroachments that were identifiable in the field. The physical location of encroachments identified were captured using GPS equipment. In addition, CVFPB encroachment logs were reviewed by MHM and compared with the encroachments identified in the field. Other sources of information included the U.S. Army Corps of Engineer's (USACE) Periodic Inspection Report and as-built documentation of various projects located along the alignment. The Master Encroachments List represents the most comprehensive source of information on encroachments impacted by the project. The list continues to be maintained by MHM and is updated as additional information becomes available. The current version of the list is included as Appendix A.

ENCROACHMENT NOMENCLATURE AND CATEGORIZATION

Given the number of encroachments the project must address and the variable nature of how each will be addressed, it was determined that a means to describe and categorize the encroachments was necessary to efficiently coordinate the work with regulatory agencies, utility owners, and the public. For this purpose, Wood Rodgers developed the outline presented on Figure 2. The outline divides all levee encroachments into two categories, those that only encroach on the levee right-of-way, and those that encroach on the levee prism itself. From this distinction, the categories are divided into three subcategories: Structural Encroachments, Wet Utility Encroachments, and Dry Utility Encroachments. These subcategories divide the encroachments in a manner that describes how the project will address them in general. In general, for levee Right-of-Way encroachments, all three categories will not be addressed by the project, but by SBFCA or the local maintaining agency over time. For Levee Prism encroachments, Structure and Wet Utility encroachments will be addressed by the levee improvement contractor. Levee prism dry utility encroachments will be addressed in advance of the levee improvement contractor's work to clear the way for the levee improvements.

PROJECT-SPECIFIC ENCROACHMENTS HANDLING

Wood Rodgers has reviewed the Master Encroachment List and the construction drawings (Reference 3), and has developed project specific listings for encroachments. The intent of these lists is to inform the reader how each individual encroachment will be handled by the project. The lists incorporate the nomenclature outlined in Figure 2. It is noted that the lists present some encroachments that are treated in a manner different than the general rules described above. In many cases, these encroachments fall into the exceptions described in the notes section of Figure 2. In addition, there are encroachments that either fully comply with all levee safety and encroachment criteria already, or are located in areas of the levee where work is not being performed (no work reaches). These encroachments also generally require treatment in a manner other than general case.

To determine how each specific encroachment is being treated, the Project-specific lists for Project C and Project D are included as Figure 2 and Figure 4, respectively. These lists are color coded to show how each encroachment will be addressed (or not addressed) by the project. Those addressed by the levee rehabilitation contractor during construction are coded blue. Those addressed by a separate contractor (or utility company) prior to the levee rehabilitation contractor are coded red, and those that will be addressed by SBFCA or the local levee maintaining agency (Levee District 1, Levee District 9, or MA 3, 12, or 16) over time, are coded green.

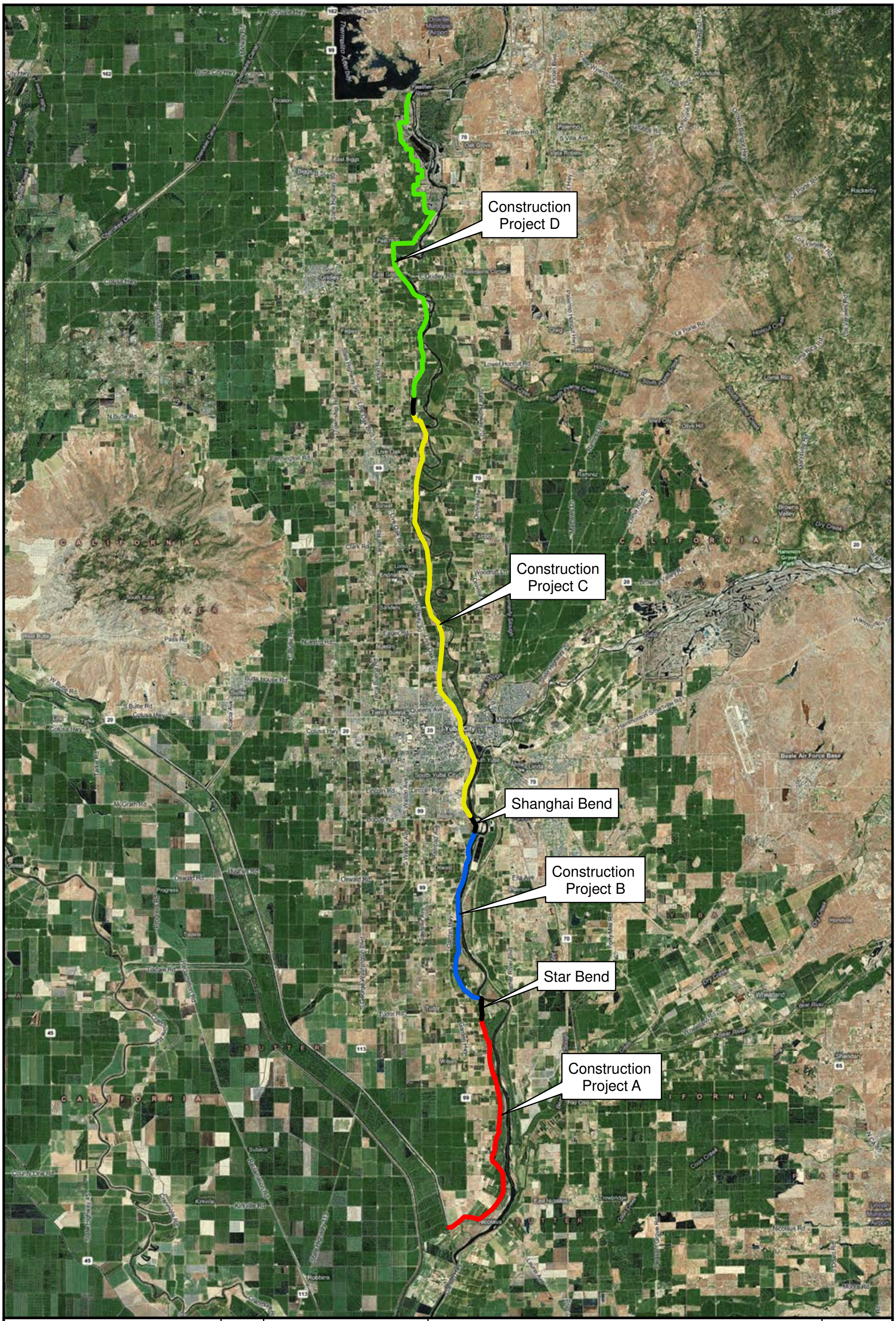
CONCLUSIONS AND RECOMMENDATIONS

It is proposed that these project-specific lists (and this Memorandum) be shared with the Department of Water Resources, CVFPB, and USACE, as well as affected members of the public, to communicate SBFCA's intentions for handling each encroachment encountered on the project. When this coordination has occurred, the design team should begin coordinating with the affected utility owners to advance the design of utility relocations on the project.

The final version of this Memorandum will address the handling of project encroachments for all Projects (A, B, C, and D).

Attachments

FIGURES



PETERSON . BRUSTAD . INC
ENGINEERING . CONSULTING
1180 Iron Point Rd., Suite 260
Folsom, CA 95630
Phone: (916) 608-2212
Fax: (916) 608-2232

N

0 1 2 3 Miles

1" = 3 mi.

JUNE 24, 2011

SUTTER COUNTY

CONSTRUCTION PROJECTS

FIGURE

1

FIGURE 2

SUTTER BUTTE FLOOD CONTROL AGENCY
FEATHER RIVER WEST LEVEE PROJECT
PROPOSED NOMENCLATURE AND PROJECT APPROACH TO LEVEE ENCROACHMENTS

Levee Encroachment

All Utilities and Structures Within the Levee Footprint or Project Right-of-Way (ROW) Limits

Levee Prism Encroachment[1]

Encroachment Located Within the Levee Prism

Levee Prism Structure Encroachment[3]

- Retaining Wall
- Railroad Tracks
- Home
- Shed
- Roadway/Bridge

Levee Prism Wet Utility Encroachment[3]

- Pump Discharge Line
- Gravity Drainage Pipeline
- Sewer Outfall
- Natural Gas Pipeline
- Ag Turnout

Levee Prism Dry Utility Encroachment[3]

- Telephone Cable
- Overhead Power
- Fiber Optic Cable

ROW Encroachment[1]

Encroachment Located Within Project ROW Limits[2] Only

ROW Structure Encroachment

- Home
- Shed
- Roadway
- Railroad Tracks

ROW Wet Utility Encroachment

- Ag or Drainage Canal[4]
- Water Supply Pipeline
- Sewer Pipeline
- Natural Gas Pipeline
- Ag well
- Ag Turnout

ROW Dry Utility Encroachment

- Telephone Cable
- Overhead Utility[4]
- Fiber Optic Cable

Notes:

1. All utilities running parallel to the levee, unless located within the levee prism, are considered ROW Encroachments. All utilities running perpendicular to the levee are considered Levee Prism Encroachments, with the exception of overhead utilities, which are **ONLY** a levee prism encroachment if a supporting pole is located within the levee prism.

2. ROW Encroachments are those encroachments that fall within the limits of the Project ROW, 20 feet from landside levee toe, and 15 feet from waterside levee toe.

3. In general, levee prism structure and wet utility encroachments will be relocated or otherwise modified as part of the levee improvement contract. Levee prism dry utility encroachments will be addressed where expeditious or necessary to do so in advance of the levee improvement contract.

4. ROW wet or dry utility encroachments will be relocated prior to the levee improvement contract if they are deemed an impediment to construction access.

FIGURE 3
SUTTER BUTTE FLOOD CONTROL AGENCY
FEATHER RIVER WEST LEVEE PROJECT
ENCROACHMENTS COORDINATION LIST - PROJECT C (STATION 845+00 TO 1623+86)

Color Coding Key-

Green: Addressed by SBFCA or Local Maintaining Agency over time	Blue: Addressed by the levee rehabilitation contractor
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STATION	TYPE	DESCRIPTION	OWNER	UTILITY DISRUPTED BY LEVEE WORK?	REMOVAL, RELOCATION, OR RETROFIT REQUIRED?	PERMITTED?
856+08	LP_WUE	24" seepage interceptor pump discharge line	City of Yuba City	Y	N	Y
856+23	LP_WUE	24" storm drain pump discharge line	City of Yuba City	Y	N	Y
881+41	LP_WUE	6" and 14" relief well pump station	LD1 of Sutter County	Y	N	N
893+84	LP_WUE	12" storm drain pipe	City of Yuba City	Y	N	Y
893+84	LP_WUE	16" pump station discharge pipe (Burns Drive Pump Station)	City of Yuba City	Y	N	Y
894+22	LP_DUE	24 kV underground cable	PG&E	Y	N	Y
894+22	ROW_DUE	Utility pole at levee toe	PG&E	N	Y	Y
899+45	LP_WUE	12" pipe crossing	TBD	Y	N	Y
912+94	LP_DUE	2 (16") gas lines	PG&E	Y	N	N
959+00 to 972+00	ROW_DUE	Overhead powerline, utility poles in close proximity to levee toe	TBD	N	Y	?
971+70	LP_DUE	Utility pole in levee slope	TBD	Y	Y	?
972+50 To 993+50	ROW_SE	Homes and outbuildings along 2nd Street	Various	N	Y	Y
989+40	LP_SE	Outbuilding at 2nd Street	TBD	N	Y	Y
990+55	LP_SE	Outbuilding at 2nd Street	TBD	N	Y	Y
990+75	LP_SE	Outbuilding at 2nd Street	TBD	N	Y	Y
992+45	LP_SE	Outbuilding at 2nd Street	TBD	N	Y	Y
992+75	LP_SE	Outbuilding at 2nd Street	TBD	N	Y	Y
995+75	LP_SE	County Courthouse storage building	Sutter County	N	Y	
998+50 to 1000+40	ROW_SE	Buildings at levee toe	TBD	N	Y	?
1003+72	LP_DUE	Utility pole in levee slope	PG&E	N	Y	N
1005+25	ROW_SE	Building at levee toe	TBD	N	Y	?
1006+07	LP_DUE	Utility pole in levee slope	PG&E	Y	Y	Y
1006+93	LP_DUE	Utility and anchor pole	PG&E	Y	Y	Y
1007+46	LP_DUE	Light pole for bike path on evee crown	City of Yuba City	N	N	N
1008+00 To 1025+00	ROW_DUE	Overhead power running parallel to LS levee toe	PG&E	N	Y	Y
1008+00 To 1014+00	LP_SE	Short retaining wall at LS levee slope, holds levee back from power poles	TBD	N	Y	?
1008+75	LS_DUE	Utility pole in waterside levee slope	PG&E	Y	Y	Y
1012+00	ROW_SE	Building at levee toe	TBD	N	Y	?
1014+00 to 1018+00	ROW_SE	Buildings at levee toe	TBD	N	Y	?
1019+00	LP_WUE	4" Pipe abandoned in place above existing cutoff wall	TBD	N	N	N
1019+82	LP_DUE	Light pole for bike path on levee crown	TBD	N	N	N
1020+30	LP_DUE	Emergency telephone call box at levee waterside toe	Pac Bell	N	N	N
1022+15	LP_DUE	Light pole for bike path on levee crown	TBD	N	N	N
1025+00	LP_DUE	Utility pole in levee slope and parallel OH crossing (impacts gap closure)	PG&E	Y	Y	?
1026+78	LP_DUE	10" communications conduit beneath levee and river	TBD	Y	N	Y
1028+09	LP_DUE	Utility pole at levee crown	TBD	N	N	N

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STATION	TYPE	DESCRIPTION	OWNER	UTILITY DISRUPTED BY LEVEE WORK?	REMOVAL, RELOCATION, OR RETROFIT REQUIRED?	PERMITTED?
1036+87	LP-DUE	Telephone conduit	Pac Bell	N	N	Y
1037+90	LP-DUE	Telephone conduit	Pac Bell	N	N	Y
1038+50	LP-DUE	8" gas line abandoned in place	TBD	N	Y	N
1043+20	LP_WUE	Gilziser Slough drainage pump station - 4 pipes total	City of Yuba City	N	N	Y
1043+40	LP_WUE	Abandoned Gilziser Slough Sewer Pipe	City of Yuba City	N	N	Y
1054+75	LP_DUE	Emergency telephone call box at levee landside slope	Pac Bell	N	N	N
1055+00	LP_DUE	Light pole for bike path in levee slope	TBD	N	N	N
1073+41	LP_DUE	16-inch gas line	PG&E	N	N	N
1094+40	LP_DUE	3" steel pipe crossing - abandoned	TBD	Y	Y	?
1096+75	LP_WUE	Yuba City raw water intake facility (3 Pipes)	City of Yuba City	Y	N	Y
1097+00	ROW_DUE	Utility pole in close proximity to levee toe	PG&E	N	Y	Y
1107+82	LP_DUE	Utility and Anchor Pole	PG&E	Y	Y	N
1111+50	LP_WUE	Yuba City north area drainage pipe	City of Yuba City	Y	N	Y
1126+00 to 1131+30	ROW_DUE	Overhead powerline, utility poles in close proximity to levee toe	TBD	N	Y	?
1131+00	LP_SE	Union Pacific railroad tracks	UPRR	Y	Y	Y
1131+50	LP_DUE	Fuel line	UPRR	Y	Y	Y
1132+61	LP_DUE	Underground fiber optic cable marker	TBD	Y	Y	?
1135+40	LP_WUE	16" gas line	PG&E	Y	N	Y
1139+25	LP_DUE	Utility pole and anchor pole	PG&E	Y	Y	?
1152+40	ROW_DUE	Twin 110kV utility tower at levee toe	PG&E	N	Y	Y
1170+05	LP_DUE	Utility pole and anchor pole	PG&E	Y	Y	?
1174+00	ROW_WUE	Ag well in close proximity to levee toe	Private	N	Y	?
1174+35	ROW_DUE	Utility pole at levee toe	PG&E	N	Y	N
1176+90	ROW_DUE	Utility pole at levee toe	PG&E	N	Y	N
1179+05	ROW_DUE	Utility pole and guy wire at levee toe	PG&E	N	Y	?
1179+05 to 1201+25	ROW_DUE	Overhead power running parallel to LS levee toe	PG&E	N	Y	?
1180+75	LP_WUE	12" pipe crossing - abandoned	TBD	N	Y	?
1181+00	LP_WUE	3" irrigation pipe crossing - abandoned	TBD	N	Y	?
1182+15	LP_WUE	8" drainage pipe crossing - abandoned	TBD	N	Y	?
1182+75	LP_WUE	20" irrigation pipeline (may not be in place at this time)	Private	Y	N	Y
1200+60	ROW_WUE	Pump station at levee toe	Private	N	Y	N
1200+68	LP_WUE	10" irrigation pipeline - abandoned	Private	Y	N	N
1222+15	ROW_DUE	Utility pole and guy wire at levee toe	PG&E	N	Y	N
1223+80	ROW_DUE	Utility pole at levee toe	PG&E	N	Y	N
1225+90	LP_DUE	Utility pole at levee crown	PG&E	Y	Y	N
1229+43	ROW_WUE	Pump station within 10' of toe	Private	N	Y	Y
1229+43	LP_WUE	16" pump station discharge pipe	Private	Y	Y	Y
1265+55	LP_WUE	18" pump station discharge pipe - abandoned	Private	N	Y	Y
1266+80	ROW_DUE	Utility pole and guy wire at levee toe	PG&E	N	Y	N
1284+91 to 1293+66	ROW_WUE	Concrete lined ditch	Private	N	Y	N
1289+50 to 1291+50	ROW_SE	Farm structures and out buildings in close proximity to levee toe	Private	N	Y	N
1293+66	ROW_DUE	Utility pole and guy wire at levee toe	PG&E	N	Y	

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STATION	TYPE	DESCRIPTION	OWNER	UTILITY DISRUPTED BY LEVEE WORK?	REMOVAL, RELOCATION, OR RETROFIT REQUIRED?	PERMITTED?
1298+60 to 1315+02	ROW_WUE	Seepage interceptor trench	LD9	N	N	N
1314+80	LP_WUE	20" pump station discharge pipeline	Private	Y	N	Y
1327+00	ROW_DUE	Utility pole and guy wire at levee toe	PG&E	N	Y	N
1347+06	LP_DUE	Telecommunication line	TBD	Y	Y	N
1375+75 To 1430+50	ROW_WUE	Sutter Extension Sunset Lateral Ditch	Sutter Extension	N	N	Y
1429+80	ROW_WUE	Overhead powerlines, utility poles at waterside levee toe	PG&E	Y	Y	N
1430+50	ROW_SE	Pump station and electrical equipment at landside toe	Sutter Extension	N	N	Y
1430+50	LP_WUE	36", and (2) 60" pump station discharge pipes (Sunset Pump Station)	Sutter Extension	Y	Y	Y
1430+50 To 1490+00	ROW_WUE	Sutter Extension Main Canal	Sutter Extension	N	N	N
1460+65	LP_WUE	6" PVC irrigation pipeline	Private	Y	Y	N
1463+00	ROW_SE	Reisdence in close proximity to levee toe	Private	N	Y	N
1470+00	LP_SE	Ramp to residence on landside at levee crown	Private	Y	Y	N
1470+00	ROW_SE	Residence on pile foundation at landside levee toe	Private	N	Y	N
1473+50	LP_SE	Fence at waterside levee toe	Private	Y	Y	N
1479+98	LP_SE	Private gate across levee	Private	Y	Y	N
1482+00 To 1486+00	ROW_SE	Private residences in close proximity to levee landside toe	Private	N	Y	N
1518+50 To 1520+50	ROW_SE	Large shop structure at landside levee toe	Private	N	Y	N
1520+25	ROW_DUE	Utility pole in levee slope	TBD	N	Y	N
1528+35	LP_WUE	6" steel pipe crossing	Private	Y	Y	Y
1532+86	LP_WUE	6" steel pipe crossing	Private	Y	Y	Y
1536+00	ROW_DUE	Utility pole and guy wire at levee toe	PG&E	N	Y	N
1536+15	LP_WUE	36" pipe crossing	RD 777	Y	Y	Y
1549+70	LP_WUE	12" pipe crossing	TBD	Y	Y	Y
1556+00 To 1558+00	ROW_SE	Residences at landside levee toe	Private	N	Y	N
1556+35	ROW_DUE	Utility pole in close proximity to levee toe	PG&E	N	Y	Y
1556+50	LP_WUE	8" pipe crossing through levee	Private	Y	Y	Y
1585+60	LP_WUE	12" pipe crossing through levee	Private	Y	Y	Y
1610+91	LP_WUE	18" CM pipe crossing	RD 777	Y	Y	Y
1611+50	ROW_SE	Residence at levee waterside toe and driveway at levee crown	Private	Y	Y	N
1610+50 To 1623+86	ROW_WUE	Sutter Butte Main Canal at landside toe	Sutter Extension	Y	N	Y

FIGURE 4
SUTTER BUTTE FLOOD CONTROL AGENCY
FEATHER RIVER WEST LEVEE PROJECT
ENCROACHMENTS COORDINATION LIST - PROJECT D (STATION 1623+86 TO 2368+00)

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STATION	TYPE	DESCRIPTION	OWNER	UTILITY DISRUPTED BY LEVEE WORK?	REMOVAL, RELOCATION, OR RETROFIT REQUIRED?	PERMITTED?
1635+50	ROW_SE	Farm structure in close proximity to levee toe	Private	N	Y	N
1637+60 to 1638+50	ROW_SE	Farm structure and fence in close proximity to levee toe	Private	N	Y	N
1638+99	LP_WUE	(2) 24" steel pipe crossing	RD 777	N	Y	Y
1651+80	LP_DUE	Utility pole in levee slope	PG&E	N	Y	N
1654+20	LP_DUE	Utility pole at levee toe	PG&E	N	Y	N
1663+80 to 1664+90	ROW_SE	House and outbuilding at landside toe	Private	N	Y	N
1665+30 to 1674+50	ROW_DUE	Utility poles and overhead powerlines at landside toe	PG&E	N	Y	N
1674+50 to 1766+00	ROW_WUE	Sutter Butte Main Canal at landside toe	Sutter Extension	N	N	Y
1675+27	LP_WUE	60"x72" RCP culvert	Butte County Drainage District No.1	N	Y	Y
1675+96	ROW_DUE	Utility pole in levee slope	TBD	N	Y	N
1675+96 to 1705+00	ROW_DUE	Utility poles and overhead powerlines at landside toe	TBD	N	Y	?
1697+95	ROW_DUE	Utility pole at levee toe	AT&T	N	Y	Y
1698+50	ROW_SE	Farm structure in close proximity to levee toe	Private	N	Y	N
1699+62	ROW_WUE	Propane tanks at levee toe	Private	N	Y	N
1706+82 to 1724+82	ROW_SE	Fence at waterside levee toe	Private	N	Y	Y
1722+60 to 1734+10	ROW_DUE	Overhead powerlines, utility poles in waterside slope	TBD	N	Y	N
1728+29	ROW_DUE	Utility pole at levee toe	PG&E	N	Y	Y
1730+00	ROW_SE	Residence in close proximity to levee toe	Private	N	Y	N
1734+00	ROW_DUE	Utility pole at levee toe	TBD	N	Y	?
1738+10	ROW_SE	Residence at waterside levee toe and driveway at levee crown	Private	N	Y	N
1741+32	LP_WUE	16" drainage pipe crossing	Butte County Drainage District No.1	N	Y	N
1756+27	LP_WUE	12" CM pipe crossing - abandoned	TBD	N	Y	N
1765+15	LP_WUE	12" steel pipe crossing	TBD	N	Y	N
1765+33	LP_WUE	12" plastic sleeved concrete irrigation pipe	Private	N	Y	Y
1767+60	LP_WUE	(2) 60" drainage pipes	Butte Water District, Sutter Extension Water District	N	Y	Y
1777+00	LP_WUE	24" CM drainage pipe	TBD	N	Y	Y
1781+50	ROW_SE	Farm structure in close proximity to levee toe	TBD	N	Y	N
1782+50	ROW_DUE	Utility pole at levee toe	TBD	N	Y	?
1784+70	LP_WUE	24" CM drainage pipe crossing	TBD	N	Y	Y
1785+25	LP_WUE	24" CM drainage pipe crossing	TBD	N	Y	Y

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STATION	TYPE	DESCRIPTION	OWNER	UTILITY DISRUPTED BY LEVEE WORK?	REMOVAL, RELOCATION, OR RETROFIT REQUIRED?	PERMITTED?
1786+00 to 1787+40	ROW_SE	Residence and outbuilding in close proximity to levee toe	TBD	N	Y	?
1792+96	LP_WUE	24" CM drainage pipe crossing - abandoned	TBD	N	Y	Y
1799+43	LP_WUE	8" irrigation pipe crossing	Private	N	Y	Y
1809+65	LP_WUE	24" CM drainage pipe crossing	TBD	N	Y	Y
1813+70	LP_WUE	24" CM pipe crossing	TBD	Y	Y	Y
1816+63 to 1823+20	ROW_SE	Chain link fence at waterside and landside levee toe	City of Gridley	N	Y	Y
1816+63 to 1823+00	ROW_WUE	Sewer ponds in close proximity to waterside and landside levee toe	City of Gridley	N	Y	N
1818+72	LP_WUE	24" CM pipe crossing	City of Gridley	Y	Y	Y
1823+05	LP_WUE	12" cement coated and lined steel pipe through 24" CM pipe crossing	City of Gridley	Y	Y	Y
1834+41	LP_WUE	12" pipe through 24" CM pipe crossing	TBD	Y	Y	Y
1850+02	LP_WUE	18" cast iron sewer pipe crossing	City of Gridley	Y	Y	Y
1868+17	LP_WUE	18" drainage pipe crossing	Butte County Drainage District	Y	Y	N
1888+52	LP_WUE	8" steel pipe crossing	City of Gridley	Y	Y	Y
1889+97	ROW_DUE	Utility pole at levee toe	PG&E	N	Y	Y
1892+00	ROW_DUE	Utility pole in close proxitmity to levee toe	PG&E	N	Y	?
1893+70	LP_WUE	3/4" galvanized iron water pipe crossing	TBD	Y	Y	Y
1895+10	ROW_DUE	Utility pole at levee toe	PG&E	N	Y	?
1896+90 to 1900+20	ROW_SE	Residences in close proximity to landside levee toe	TBD	N	Y	?
1900+82 to 1906+60	ROW_DUE	Overhead powerlines, utility poles in landside slope	PG&E	Y	Y	N
1903+00 to 1957+00	ROW_WUE	Sutter Butte Main Canal at landside toe	Sutter Extension	N	N	Y
1903+96	LP_DUE	Guy wire over levee, guy pole at waterside of levee crown	PG&E	Y	Y	N
1906+50	LP_SE	Structure on levee crown	TBD	Y	Y	?
1906+58	LP_DUE	Utility pole at waterside of levee crown	PG&E	Y	Y	Y
1934+52	LP_WUE	36" CM pipe crossing	TBD	Y	Y	N
1947+33	LP_DUE	Utility pole at levee toe, 3" steel conduit crossing	TBD	Y	Y	N
1955+79	LP_SE	Residence on levee crown	Private	Y	Y	Y
1956+00 to 1958+50	LP_SE	Farm structures on levee slopes and at levee toes	TBD	Y	Y	N
1957+10	ROW_DUE	Utility pole on levee slope	TBD	Y	Y	N
1957+90	LP_WUE	24" CM irrigation pipe crossing - abandoned	TBD	Y	Y	Y
1961+11	LP_WUE	(2) 60" CM drainage pipe crossing	TBD	Y	Y	Y
2014+00	LP_WUE	7" steel pipe through 12" steel pipe crossing	Private	Y	Y	Y
2017+80	LP_WUE	22" reinforced concrete encased steel irrigation pipe crossing	TBD	Y	Y	Y
2020+81	ROW_SE	Large steel tank at levee toe	TBD	N	Y	N
2026+00	LP_WUE	12" reinforced concrete encased steel irrigation pipe crossing	TBD	Y	Y	Y
2032+50	LP_WUE	12" reinforced concrete encased steel irrigation pipe crossing	TBD	Y	Y	Y
2038+15	ROW_SE	Farm structure at levee toe	TBD	N	Y	?
2092+20	ROW_DUE	Utility pole in close proxitmity to levee toe	TBD	N	Y	?
2092+69	LP_DUE	Underground telephone cable crossing	TBD	Y	Y	N
2092+70	LP_WUE	5" irrigation pipe crossing - aluminum pipe	Private	Y	Y	Y
2038+00	ROW_DUE	Utility pole in levee slope	PG&E	N	Y	Y
2138+80	LP_WUE	2" galvanized steel irrigation pipe crossing	Private	N	Y	Y

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STATION	TYPE	DESCRIPTION	OWNER	UTILITY DISRUPTED BY LEVEE WORK?	REMOVAL, RELOCATION, OR RETROFIT REQUIRED?	PERMITTED?
2142+00	ROW_DUE	Utility pole at levee toe	PG&E	N	Y	Y
2178+20 to 2185+50	ROW_DUE	Overhead telephone line, utility pole at levee toe	PT&T	N	Y	Y
2178+37	LP_WUE	16" steel irrigation pipe crossing	TBD	N	Y	Y
2185+20	ROW_SE	Farm structures at levee toe	Private	N	Y	?
2201+92	LP_WUE	10" reinforced concrete encased steel pipe crossing - abandoned	TBD	Y	Y	Y
2208+56	ROW_WUE	Ag well in close proximity to levee toe	Private	N	Y	N
2208+56 to 2215+00	ROW_DUE	Overhead powerline, utility pole in close proximity to levee toe	PG&E	N	Y	?
2239+50 to 2241+00	ROW_SE	Residence and outbuilding in close proximity to levee toe	Private	N	Y	N
2239+56	LP-WUE	24" CM drainage pipe crossing	TBD	Y	Y	Y
2243+75	ROW_SE	Outbuilding in close proximity to levee toe	Private	N	Y	N
2244+80	LP_WUE	24" CM drainage pipe crossing	TBD	Y	Y	Y
2248+70	LP_DUE	Underground telephone cable crossing	TBD	Y	Y	N
2250+11	ROW_SE	Concrete structure in levee slope	TBD	N	Y	N
2250+76	LP_WUE	24" CM irrigation pipe crossing	TBD	Y	Y	Y
2256+61	LP_WUE	24" reinforced concrete encased CM irrigation pipe crossing	TBD	Y	Y	Y
2257+15	LP_WUE	24" CM pipe crossing	TBD	Y	Y	Y
2260+90 to 2261+90	ROW_SE	Residence at levee toe	Private	N	Y	?
2260+95	LP_WUE	24" CM pipe crossing	TBD	Y	Y	Y
2261+11	ROW_DUE	Propane tank at levee toe	Private	N	Y	N
2261+56	ROW_DUE	Propane tank at levee toe	Private	N	Y	N
2261+60	ROW_SE	Retaining wall at levee toe	Private	N	Y	N
2262+65	LP_WUE	24" CM drainage pipe crossing	TBD	Y	Y	Y
2264+70 to 2268+45	ROW_DUE	Overhead powerline, utility poles at levee toe	PG&E	N	Y	N
2268+27	LP_WUE	24" reinforced concrete encased CM irrigation pipe crossing	TBD	Y	Y	Y
2274+56	LP_WUE	24" CM pipe crossing	TBD	Y	Y	N
2274+86	LP_WUE	24" reinforced concrete encased CM drainage pipe crossing	TBD	Y	Y	Y
2281+00 to 2282+50	ROW_SE	Residence and driveway in close proximity to levee toe	Private	N	Y	?
2282+25	ROW_SE	Farm structure at levee toe	Private	N	Y	?
2282+80	ROW_DUE	Utility pole at levee toe	PG&E	N	Y	N
2283+42	LP_WUE	24" reinforced concrete encased CM irrigation pipe crossing	TBD	Y	Y	Y
2283+62	LP_WUE	24" CM pipe crossing	TBD	Y	Y	Y
2352+96	LP_WUE	24" CM pipe crossing	TBD	Y	Y	Y
2353+04	LP_WUE	24" CM pipe crossing	TBD	Y	Y	Y
2359+05 to 2359+58	LP_SE	Sutter Butte Head Works structure	Biggs West Gridley Water District	Y	Y	Y
2367+90	LP_DUE	Utility pole in levee crown	TBD	Y	Y	?
2368+00 to 2369+70	LP_SE	Chain link fence on levee crown	TBD	Y	Y	?

APPENDIX

LEVEE ENCROACHMENT LIST

APPENDIX A

	Levee Mile	SBFCA Phase	SBFCA Reach	SBFCA STA	Location (NAD 83) Northing	Location (NAD 83) Easting	Location (WGS 84) Latitude	Location (WGS 84) Longitude	Encroachment	Proposed Levee Improvement	Required Improvement Work	Type	cover	Elevations (NGVD 1988) Invert of Pipe	Top of Pipe	Top of Levee	Water Surface Elevation (NGVD 1988) 100 Yr	200 Yr	500 Yr	DWR 1957	CVFPB Permit Information Permit No.	Require Permittee to Relocate	Year	Owner Information Name	Address	verified	Picture Taken
				2371+00					Hamilton Bend Levee Transition																		
		D	41	2368+00					End Reach 41																		
1		D	41	2365+00			Not Verified		To construct After bay River Outlet and dredge tailing training dike.	Cutoff Wall		Struc									3930 and 5041	yes, cond 5	1965	Department of Water Resources		no	no
2		D	41	2359+58	2,291,802.63	6,663,263.33	39°27'16.849"N	121°38'24.675"W	Old Sutter Butte Head Works Levee North	Cutoff Wall	Appears the structure will need to be removed and levee constructed through the area. MHM will include demo plan and levee civil will prepare plans for new levee.	IR(G)				138.88							part of orig O&M 1955	Biggs West Gridley Water District	1713 West Gridley Road, Gridley, CA	yes	yes
3		D	41	2359+57	2,291,800.70	6,663,265.27	39°27'16.830"N	121°38'24.650"W	Old Sutter Butte Head Works North	Cutoff Wall		IR(G)				135.34	130.32	131.97	137.27	132.14			part of orig O&M 1955	Biggs West Gridley Water District	1713 West Gridley Road, Gridley, CA	yes	yes
4		D	41	2359+07	2,291,752.42	6,663,249.77	39°27'16.353"N	121°38'24.550"W	Old Sutter Butte Head Works South	Cutoff Wall		IR(G)				135.30							part of orig O&M 1955	Biggs West Gridley Water District	1713 West Gridley Road, Gridley, CA	yes	yes
5		D	41	2359+05	2,291,752.84	6,663,244.36	39°27'16.358"N	121°38'24.919"W	Old Sutter Butte Head Works Levee South	Cutoff Wall		IR(G)				138.69							part of orig O&M 1955	Biggs West Gridley Water District	1713 West Gridley Road, Gridley, CA	yes	yes
		D	40/41	2359+00					Reach 40/41 Transition																		
6		D	40	2352+90	2,291,166.67	6,663,263.09	39°27'10.563"N	121°38'24.710"W	12 kv overhead electrical power line crossing	Cutoff Wall		EL	OH			139.23								Pacific Gas & Electric	One Tower, Spear Tower, San Francisco, CA 94105	yes	yes
7		D	40	2352+80	Not Verified		Not Verified		24 Inch CM pipe through levee. Concrete saddle and apron with Calco Slide gate.	Cutoff Wall	Not sure if the pipeline meets the elevation requirement over 200 year WSEL. The type of pipe may or may not meet Title 23. Could not find, need to pothole to verify.	SD(G)		122.7 (USED)			130.08	131.75	137.03	131.86	pre-1955		part of orig O&M 1955			no	no
8		D	40	2345+79	2,290,475.75	6,663,109.16			10 inch Iron Pipe through levee that appears to be abandoned	Cutoff Wall	Not sure if the pipeline meets the elevation requirement over 200 year WSEL. The type of pipe may or may not meet Title 23. Could not find, need to pothole to verify.	IR(P)	12.7	126.37	127.20	139.90	129.30	130.94	136.34	131.14						yes	yes
		D	39/40	2319+00					Reach 39/40 Transition																		
9		D	39	2312+05	Not Verified		Not Verified		24 Inch CM pipe through levee. Concrete saddle and apron with Calco automatic drainage gate.	Cutoff Wall	Not sure if the pipeline meets the elevation requirement over 200 year WSEL. The type of pipe may or may not meet Title 23. Could not find, need to pothole to verify.	SD(G)		124.0 (USED)			124.25	125.63	132.37	127.85	pre-1955		part of orig O&M 1955			no	no
		D	38/39	2303+00					Reach 38/39 Transition																		
10	0.0-0.3	D	38	2301+00	Not Verified		Not Verified		To excavate dredger tailings from the right bank of the Feather River. The tailings are to be excavated from an area approximately 100 feet landward of the landward levee toe. **The application was deemed incomplete on 8-4-98**	Cutoff Wall		Struc									16006	no issued	1992	Mathews Ready-mix, Inc	P.O. Box 386, Gridley, CA 95948		
		D	37/38	2290+00					Reach 37/38 Transition																		
		D	37	2285+00					Maintenance Area 07 / Hamilton Bend Levee Transition																		
1	11.68	D	37	2283+65	2,285,659.90	6,661,586.51			24 Inch CM pipe through levee. Concrete saddle and apron with Calco automatic drainage gate.	Cutoff Wall	Not sure if the pipeline meets the elevation requirement over 200 year WSEL. The type of pipe may or may not meet Title 23. Could not find, need to pothole to verify.	SD(G)	15.0	115.70	117.70	132.70	121.35	122.59	128.94	126.23	pre-1955		part of orig O&M 1955			no	no
2	11.68	D	37	2283+44	2,285,640.25	6,661,593.28	39°26'15.978"N	121°38'46.270"W	24 Inch reinforced concrete encased CM irrigation pipe through levee. Slide Gate in 36 inch CM pipe riser on the waterside slope. 8 inch Irrigation pipe ran through existing pipe, pipe ends not exposed	Cutoff Wall	The pipeline does not meet title 23 requirements and will need a positive shut-off structure installed and automatic drainage gate on waterside of levee. Pumping up and over levee does not appear to be feasible. Should be part of 30 percent but not included.	IR(P)	17.3	113.40	115.40	132.70	121.34	122.58	128.93	126.22	pre-1955		part of orig O&M 1955			yes	yes
3	11.66	D	37	2282+57	2,285,558.49	6,661,622.35	39°26'15.196"N	121°38'45.906"W	12 kv overhead electrical power line crossing	Cutoff Wall		EL	OH			132.97								Pacific Gas & Electric	One Tower, Spear Tower, San Francisco, CA 94105	yes	yes
4	11.52	D	37	2274+95	2,284,812.04	6,661,741.46	39°26'07.730"N	121°38'44.408"W	24 Inch CM pipe through levee. Automatic drainage gate on waterside outlet, headwall on land side inlet. Both ends of the pipe have been cleared to operate.	Cutoff Wall	The pipeline does not meet title 23 requirements and will need a positive shut-off structure installed and automatic drainage gate on waterside of levee. Pumping up and over levee does not appear to be feasible. Should be part of 30 percent but not included.	SD(G)	17.8	112.30	114.30	132.11	120.83	122.04	128.24	125.98	pre-1955		part of orig O&M 1955			yes	yes
5	11.52	D	37	2274+86	2,284,802.77	6,661,742.00			24 Inch CM reinforced concrete encased drainage pipe through levee. Slide Gate in 36 inch CM pipe riser on the waterside slope. Neither pipe end located or exposed.	Cutoff Wall	Not sure if the pipeline meets the elevation requirement over 200 year WSEL. The type of pipe may or may not meet Title 23. Could not find, need to pothole to verify.	SD(G)	21.8	108.30	110.30	132.10	120.83	122.04	128.24	125.97	pre-1956		part of orig O&M 1956			no	no
6	11.39	D	37	2268+27	2,284,144.45	6,661,772.03	39°26'01.214"N	121°38'44.047"W	24 Inch reinforced concrete encased CM irrigation pipe through levee. Slide Gate in 36 inch CM pipe riser on the waterside slope with waterside outlet broken off and plugged.	Cutoff Wall	The pipeline does not meet title 23 requirements and will need a positive shut-off structure installed and automatic drainage gate on waterside of levee. Pumping could be option. Should be part of 30 percent but not included.	IR(G)	18.4	111.30	113.30	131.70	120.44	121.62	127.71	125.78	pre-1955		part of orig O&M 1955			yes	yes
7	11.33	D	37	2265+50	2,283,868.22	6,661,784.45	39°25'58.464"N	121°38'43.916"W	12 kv overhead electrical power line crossing	Cutoff Wall		EL	OH			131.39								Pacific Gas & Electric	One Tower, Spear Tower, San Francisco, CA 94105	yes	yes
8	11.28	D	37	2262+69	2,283,587.31	6,661,797.10	39°25'55.665"N	121°38'43.763"W	24 Inch CM drain pipe through levee with landside headwall. Automatic Drainage Gate on the waterside end with splash pan and saddle headwall.	Cutoff Wall	The pipeline does not meet title 23 requirements and will need a positive shut-off structure installed and automatic drainage gate on waterside of levee. Pumping up and over levee does not appear to be feasible. Should be part of 30 percent but not included.	SD(G)	18.0	110.85	112.85	130.80	120.21	121.39	127.42	125.62	pre-1955		part of orig O&M 1955			yes	yes
9	11.27	D	37	2262+14	2,283,532.17	6,661,800.26	39°25'55.162"N	121°38'43.739"W	Road Across Levee North	Cutoff Wall		Road				131.10								County of Butte	7 County Center Drive, Oroville, CA 95965	yes	yes
10	11.27	D	37	2261+90	2,283,505.66	6,661,801.21	39°25'54.900"N	121°38'43.729"W	Road Across Levee South	Cutoff Wall		Road				131.20								County of Butte	7 County Center Drive, Oroville, CA 95965	yes	yes
11	11.26	D	37	2261+56	2,283,474.37	6,661,801.73	39°25'54.590"N	121°38'43.723"W	Propane tank at landside toe	Cutoff Wall						130.73										yes	yes
12	11.25	D	37	2261+11	2,283,429.45	6,661,804.82	39°25'54.146"N	121°38'43.686"W	Propane tank at landside toe	Cutoff Wall						130.31										yes	yes
13	11.24	D	37	2260+55	2,283,374.22	6,661,809.27			24 Inch CM pipe through levee. Concrete saddle and apron with Calco automatic drainage gate.	Cutoff Wall	Not sure if the pipeline meets the elevation requirement over 200 year WSEL. The type of pipe may or may not meet Title 23. Could not find, need to pothole to verify.	SD(G)	18.1	110.20	112.20	130.30	120.17	121.35	127.37	125.57	pre-1955		part of orig O&M 1955			no	no
	11.22	D	36/37	2259+00					Reach 36/37 Transition																		
14	11.18	D	36	2256+94	2,283,026.77	6,661,894.43			24 Inch CM pipe through levee. Concrete saddle and apron with Calco automatic drainage gate.	Cutoff Wall	Not sure if the pipeline meets the elevation requirement over 200 year WSEL. The type of pipe may or may not meet Title 23. Could not find, need to pothole to verify.	SD(G)	17.1	111.00	113.00	130.10	120.10	121.29	127.29	125.47	pre-1955		part of orig O&M 1955			no	no
15	11.17	D	36	2256+71	2,283,007.16	6,661,905.92	39°25'49.881"N	121°38'42.345"W	24 Inch reinforced concrete encased CM irrigation pipe through levee. Slide Gate in 36 inch CM pipe riser on the waterside slope. Neither pipe end located or exposed.	Cutoff Wall	The pipeline does not meet title 23 requirements and will need a positive shut-off structure installed and automatic drainage gate on waterside of levee. Pumping could be option but not enough information available of the pump system. Should be part of 30 percent but not included.	IR(G)	19.1	109.00	111.00	130.10	120.09	121.29	127.29	125.46	pre-1955		part of orig O&M 1955			yes	yes
16	11.17	D	37	2270+00			Not Verified		To construct a 50 x 100 foot walnut processing building in the right overflow area of the Feather River	Cutoff Wall		Struc									12787	yes, cond. 13	1979	Rio Bonito Ranch	Route 1, Box 111, Biggs, CA 95917	no	no
17	11.05	D	36	2250+76	2,282,559.01	6,662,297.09	39°25'45.524"N	121°38'37.456"W	24 Inch CM irrigation pipe through levee. Slide gate in 36 inch CM pipe riser on the waterside slope and slide gate in 48 inch RCP standpipe on landside toe.	Cutoff Wall	The pipeline does not meet title 23 requirements and will need a positive shut-off structure installed and automatic drainage gate on waterside of levee. Pumping could be option but not enough information available of the pump system. Should be part of 30 percent but not included.	IR(G)	16.4	111.50	113.50	129.90	119.97	121.18	127.15	125.29	pre-1955		part of orig O&M 1955			yes	yes
18	11.04	D	36	~~2250+10~~	~~2,282,509.99~~	~~6,662,339.63~~	~~39°25'45.038"N~~	~~121°38'36.916"W~~	~~Concrete structure in waterside slope of levee Removed~~	Cutoff Wall		?				130.18										yes	yes

LEVEE ENCROACHMENT LIST

APPENDIX A

	Levee Mile	SBFCA Phase	SBFCA Reach	SBFCA STA	Location (NAD 83) Northing	Location (NAD 83) Easting	Location (WGS 84) Latitude	Location (WGS 84) Longitude	Encroachment	Proposed Levee Improvement	Required Improvement Work	Type	cover	Elevations (NGVD 1988) Invert of Pipe	Elevations (NGVD 1988) Top of Pipe	Elevations (NGVD 1988) Top of Levee	Water Surface Elevation (NGVD 1988) 100 Yr	Water Surface Elevation (NGVD 1988) 200 Yr	Water Surface Elevation (NGVD 1988) 500 Yr	Water Surface Elevation (NGVD 1988) DWR 1957	CVFPB Permit Information Permit No.	CVFPB Permit Information Require Permittee to Relocate	CVFPB Permit Information Year	Owner Information Name	Owner Information Address	verified	Picture Taken
19	11.02	D	36	2248+30	2,282,389.90	6,662,473.42	39°25'44.066"N	121°38'35.638"W	Underground telephone cable through levee at south side of paved road over levee	Cutoff Wall	Not sure if the conduit meets title 23 or 200 WSEL requirements.	TL				130.10	119.92	121.14	127.10	125.23						yes	yes
20	10.96	D	36	2245+52	2,282,232.77	6,662,702.59			24 Inch CM drain pipe through levee. Automatic Drainage Gate on the waterside end buried and not located.	Cutoff Wall	Not sure if the pipeline meets the elevation requirement over 200 year WSEL. The type of pipe may or may not meet Title 23. Could not find, need to pothole to verify.	SD(G)	15.1	112.99	114.99	130.10	119.87	121.09	127.04	125.15	pre-1955		part of orig O&M 1955			no	no
21	10.84	D	36	2239+66	2,281,676.83	6,662,766.65	39°25'36.688"N	121°38'31.483"W	24 Inch CM drain pipe through levee. Concrete headwall at both toes and automatic Drainage Gate in 36 inch concrete standpipe on berm. House near land toe, land end not located it could possibly be in house back yard.	Cutoff Wall	The pipeline does not meet title 23 requirements and will need a positive shut-off structure installed and automatic drainage gate on waterside of levee. Pumping up and over levee does not appear to be feasible. Should be part of 30 percent but not included.	SD(G)	15.8	111.90	113.90	129.70	119.75	120.99	126.91	124.98	pre-1955		part of orig O&M 1955			yes	yes
	10.29	D	35/36	2224+00					Reach 35/36 Transition																		
22	10.15	D	35	2216+71	2,280,223.64	6,663,692.84	39°25'22.387"N	121°38'19.785"W	12 Kv power line crossing of levee. One pole 215 feet water ward of levee toe with overhead clearance of 27 feet.	Cutoff Wall		EL	OH			127.30					6221	yes, cond 5	1968	Pacific Gas & Electric	One Tower, Spear Tower, San Francisco, CA 94105	yes	yes
23	10.24	D	35	2208+56	2,279,495.37	6,664,025.97	39°25'15.175"N	121°38'15.577"W	Pump on the landside setup to pump only to land side of levee, no standpipe, no permanent pipe over levee	Cutoff Wall		IR(G)				125.50	118.36	119.67	125.53	122.99						yes	yes
24	10.12	D	35	2201+87	2,279,440.81	6,664,690.55	39°25'14.617"N	121°38'07.169"W	Abandoned 10 inch reinforced concrete encased steel irrigation pipe through levee. Slide gate in 24 inch concrete standpipe at the waterside toe. Pipe ends not located or exposed.	Cutoff Wall	Not sure if the abandonment meets title 23 requirements. Pipe may need to be properly abandoned or completely removed.	IR(G)	13.1	111.97	112.80	125.90	117.36	118.68	124.42	122.10	pre-1955		part of orig O&M 1955			yes	yes
25	9.82	D	35	2182+45	2,277,864.11	6,665,182.53	39°24'59.006"N	121°38'00.922"W	Power pole at land side toe	Cutoff Wall		EL	OH			124.34										yes	yes
		D	34/35	2182+00					Reach 34/35 Transition																		
26	9.67 - 9.81	D	34	2178+48	2,277,831.66	6,665,565.26	39°24'58.671"N	121°37'56.047"W	To replace an existing buried telephone cable with aerial cable crossing of the right bank of the Feather River at the end of Cherry Road. The aerial telephone will be placed on an existing PG&E poles. Due to two right angle bends in the levee, the overhead cable will cross the levee crown at two locations within the extension	2138+00 to 2182+00, No Rehabilitation Required		EL	OH			125.00					9076 and 12663	yes, cond 13	1979 and 1979	Pacific Telephone and Telegraph Company	1426 Howe Avenue, Suite 50, Sacramento, CA 95825	no	no
27	9.66	D	34	2178+39	2,277,825.68	6,665,571.75	39°24'58.571"N	121°37'56.003"W	16 inch steel irrigation pipe through levee. Slide gate in 36 inch concrete standpipe at the waterside toe. Concrete distribution box at the landside toe.	2138+00 to 2182+00, No Rehabilitation Required	The pipeline does not meet title 23 requirements and will need a positive shut-off structure installed and automatic drainage gate on waterside of levee. Pumping could be option but not enough information available on pump	IR(G)	13.2	110.07	111.40	124.60	114.66	115.80	120.42	119.64	pre-1955		part of orig O&M 1955			yes	yes
28	8.75	D	34	2138+22	2,275,157.46	6,664,140.19	39°24'32.295"N	121°38'14.342"W	Power line crossing of levee and guy wire	2122+00 to 2138+00, Cutoff Wall		EL	OH			123.64					5865	yes, cond 5	1969	Pacific Gas & Electric	One Tower, Spear Tower, San Francisco, CA 94105	yes	yes
29	8.73	D	34	2127+33	Not Verified		Not Verified		To authorize an existing 2 inch irrigation pipeline through the right bank of the Feather Rivers. Removable pipe over levee found at 2120+50	2122+00 to 2138+00, Cutoff Wall	Not sure if the pipeline meets the elevation requirement over 200 year WSEL. The type of pipe may or may not meet Title 23. Could not find, need to pothole to verify.	IR(P)	2.0	122.1 (USED)			109.61	110.62	114.58	113.41	14200	yes, cond 13	1985	Clinton W. Moffitt	2770 Larkin Road, Biggs, CA 95917	no	no
	8.41	D	33/34	2122+00					Reach 33/34 Transition																		
30	8.10	D	33				Not Verified		To plant a Kiwi vineyard parallel to the direction of river flow with a minimum row spacing of 4.9 meters and 2.4 meters spacing within each row.	Cutoff Wall		Trees									13504	yes, cond 13	1982	Benjamin L. Couberly	7240 Suretre Lane, Loomis, CA 95650	no	no
31	7.85	D	33	2092+90	2,272,415.47	6,665,972.41	39°24'04.914"N	121°37'51.140"W	Underground telephone cable through levee on north side of paved road over the top of the levee.	Cutoff Wall		TL				120.52	109.60	110.60	114.56	113.40						yes	yes
32	7.85	D	34	2092+37					Power line crossing of levee on south side of road	2122+00 to 2138+00, Cutoff Wall		EL	OH			123.64								Pacific Gas & Electric	One Tower, Spear Tower, San Francisco, CA 94105	yes	yes
33	7.81	~~D~~	~~33~~	~~2092+70~~	~~Not Verified~~		~~Not Verified~~		~~5" aluminum irrigation pipe through levee.~~ **~~Pipeline has been removed~~**	~~Cutoff Wall~~	~~Not sure if the pipeline meets the elevation requirement over 200 year WSEL. The type of pipe may or may not meet Title 23. Could not find, need to pothole to verify.~~	~~IR(P)~~									5520	permit denied	1966	John Kucek	1118 Almond Avenue, Biggs, CA 95917	n/a	n/a
34	7.69	D	33	2084+03	2,271,531.48	6,666,011.72			5" x 0.25" wall steel irrigation line through levee	Cutoff Wall	Not sure if the pipeline meets the elevation requirement over 200 year WSEL. The type of pipe may or may not meet Title 23. Could not find, need to pothole to verify.	IR(P)	2.2	116.28	116.70	118.90	108.96	109.98	113.96	112.72	17895 and 17895-A	yes, cond 20	2005	John Kucek	1118 Almond Avenue, Biggs, CA 95917	no	no
35	6.75	D	33	2037+15	2,268,425.64	6,666,455.64	39°23'25.666"N	121°37'45.190"W	115 kv pole crossing of levee.	Cutoff Wall		EL	OH			114.41					12901		1980	Pacific Gas & Electric	One Tower, Spear Tower, San Francisco, CA 94105	yes	yes
36	6.88	D	33	2032+90	Not Verified		Not Verified		12 inch reinforced concrete encased steel irrigation pipe through levee. Slide gate in 24 inch concrete standpipe at waterside toe.	Cutoff Wall	Not sure if the pipeline meets the elevation requirement over 200 year WSEL. The type of pipe may or may not meet Title 23. Could not find, need to pothole to verify.	IR(G)	14.0				105.35	106.23	109.77	109.67	pre-1955		part of orig O&M 1955			no	no
37	6.74	D	33	2026+40	Not Verified		Not Verified		12 inch reinforced concrete encased steel irrigation pipe through levee. Slide gate in 24 inch concrete standpipe at waterside toe.	Cutoff Wall	Not sure if the pipeline meets the elevation requirement over 200 year WSEL. The type of pipe may or may not meet Title 23. Could not find, need to pothole to verify.	IR(G)	13.5				104.72	105.59	109.10	109.36	pre-1955		part of orig O&M 1955			no	no
38	6.63	D	33	2020+81	2,267,049.65	6,665,590.75	39°23'12.100"N	121°37'56.278"W	Large steel tank on land side at toe of levee	Cutoff Wall						114.01										yes	yes
39	6.59	D	33	2018+00			Not Verified		To retain a spur levee between the right bank project levee and the bank of the low water channel, a distance of approximately 600 feet. The spur levee is normal to the project levee and to the direction of the overbank flow. The levee varies from 3 to 6 feet above ground surface	Cutoff Wall		Struc									9626	no	1974	Jack Mariani Farms, Inc.	25000 El Camino Real, Santa Clara, CA 95051	no	no
40	6.58	D	33	2017+78	2,266,812.83	6,665,317.53	39°23'09.770"N	121°37'59.770"W	22 inch reinforced concrete encased steel irrigation pipe through levee. Slide gate in 36 inch concrete standpipe at waterside toe.	Cutoff Wall	The pipeline does not meet title 23 requirements and will need a positive shut-off structure installed and automatic drainage gate on waterside of levee. Pumping could be option but not enough information available of the pump system. Should be part of 30 percent but not included.	IR(G)	13.9	97.87	99.70	113.60	104.08	104.92	108.35	109.09	pre-1955		part of orig O&M 1955			yes	yes
41	6.34	D	33	2005+20	Not Verified		Not Verified		7 inch steel pipe sleeved through the existing 12 inch steel pipe through levee. The annular space between the two pipes is plugged with concrete on both ends. Slide gate in concrete risers on both ends.	Cutoff Wall	Not sure if the pipeline meets the elevation requirement over 200 year WSEL. The type of pipe may or may not meet Title 23. Could not find, need to pothole to verify.	IR(G)	AG	101.1 (USED)			103.36	104.17	107.50	108.61	Pre-1955 and 4591	yes, cond 5	Pre-1955 for original pipe and 1965 for sleeve	Jack Mariani Farms, Inc.	Route 1, Box 54, Larkin Road, Biggs, CA 95917	no	no
42	6.14	D	33	2007+00			Not Verified		To construct 1255 feet of spur levee from west project levee to the Feather River west bank.	Cutoff Wall		Struc									4963	yes, cond 5	1974	Boeger River Ranch	Route 1, Box 265, Gridley, CA	no	no
43	5.10-6.15	D	33	1995+00			Not Verified		To authorize an existing walnut orchard on the right bank overflow area of the Feather River/	Cutoff Wall											15613	no	1991	William H. Cilker	16075 Matilija Drive, Los Gatos, CA 95030		
	5.93	D	32/33	1989+00					Reach 32/33 Transition																		
44	5..60-6.15	D	32	1970+00			Not Verified		To interplant trees in an existing pear orchard on the right bank overflow area of the Feather River	Cutoff Wall		Struc									6004 and 6053	yes, cond 5	1968	W.H. Cilker	16075 Matilija Drive, Los Gatos, CA 95030	no	no
45	5.50	D	32	1961+03	2,264,727.12	6,660,794.20	39°22'49.332"N	121°38'57.487"W	Two 60 inch CM drainpipes through levee. Automatic drainage gates on waterside end and concrete headwalls on both ends.	Cutoff Wall	The pipeline does not meet title 23 requirements and will need a positive shut-off structure installed and automatic drainage gate on waterside of levee. Pumping up and over levee does not appear to be feasible. Should be part of 30 percent but not included.	SD(G)	20.0	85.70	90.70	110.70	101.68	102.54	105.86	106.12	pre-1955		part of orig O&M 1955			yes	yes
	5.38	D	31/32	1958+00					Reach 31/32 Transition																		
46	5.44	D	31	1957+75	2,264,471.77	6,660,429.36	39°22'46.822"N	121°39'02.146"W	To construct a earthen Berm, equipment storage shed, labor apartment and multiple-purpose building on the landward berm of the levee. The 32 foot by 34 foot building will be located adjacent to an existing shop building. The proposed building will be located on an existing earth fill located on landward slope of the levee and will be 10 feet from the toe of the levee	Cutoff Wall		Struc				110.67					5392 and 5709, 5709A	yes, cond 5	1966 and 1967	William H. Cilker	16075 Matilija Drive, Los Gatos, CA 95030	yes	yes

LEVEE ENCROACHMENT LIST

APPENDIX A

	Levee Mile	SBFCA Phase	SBFCA Reach	SBFCA STA	Location (NAD 83) Northing	Location (NAD 83) Easting	Location (WGS 84) Latitude	Location (WGS 84) Longitude	Encroachment	Proposed Levee Improvement	Required Improvement Work	Type	cover	Elevations (NGVD 1988) Invert of Pipe	Top of Pipe	Top of Levee	Water Surface Elevation (NGVD 1988) 100 Yr	200 Yr	500 Yr	DWR 1957	CVFPB Permit Information Permit No.	Require Permittee to Relocate	Year	Owner Information Name	Address	verified	Picture Taken
47	5.40	D	31	1956+20	2,264,512.56	6,660,422.66			24 inch CM irrigation pipe through levee. Slide gate in concrete riser pipe on landside berm. Pipe runs under mobile home.	Cutoff Wall	Not sure if the pipeline meets the elevation requirement over 200 year WSEL. The type of pipe may or may not meet Title 23. Could not find, need to pothole to verify.	IR(G)	11.0	97.00	99.00	110.00	101.64	102.50	105.81	105.96	pre-1955		part of orig O&M 1955			no	no
48	5.40	D	31	1956+10					Modular Home Located on the Levee Top	Cutoff Wall																	
49	5.10	D	31	1947+33	2,263,626.47	6,660,477.81	39°22'38.465"N	121°39'01.570"W	Service pole 10' from water side toe with 3" steel conduit through top of levee	Cutoff Wall		EL				110.18										yes	yes
50	4.98	D	31	1934+54	2,262,349.20	6,660,521.29	39°22'25.839"N	121°39'01.079"W	24 inch steel pipe through levee. Slide gate in concrete box on the water side slope. (Corps list pipe as 36 inch CMP)	Cutoff Wall	The pipeline does not meet title 23 requirements and will need a positive shut-off structure installed and automatic drainage gate on waterside of levee. Pumping up and over levee does not appear to be feasible. Should be part of 30 percent but not included.	SD(G)	17.5	89.90	91.90	109.40	101.42	102.28	105.57	105.14						yes	yes
51	4.44	D	31	1906+58			Not Verified		To authorize construction of stream gauging station on the right bank levee of the Feather River	Cutoff Wall		Struc				109.76					5730	yes, cond 5	1967	Department of Water Resources	P.O. 9137, Sacramento, CA 95816	no	no
52	4.44	D	31	1906+58	2,259,711.16	6,661,315.13	39°21'59.734"N	121°38'51.100"W	12 kv Pole line over levee. One pole 10 foot landward and one pole on levee for DWR and service electrical to water side building	Cutoff Wall		EL	OH			109.76					5857	yes, cond 5	1967	Pacific Gas & Electric	One Tower, Spear Tower, San Francisco, CA 94105	yes	yes
53	4.32	D	31	1903+96	2,259,482.14	6,661,442.38	39°21'57.465"N	121°38'49.491"W	To extend 3 phase No. 4 ACSR 12 kv pole line across right bank levee of the Feather River. Line to provide power to new pump for Roy Mathews	Cutoff Wall		EL	OH			107.72					5351	yes, cond 5	1966	Pacific Gas & Electric	One Tower, Spear Tower, San Francisco, CA 94105	yes	yes
54	4.30	D	31	1902+19	2,259,338.81	6,661,543.33	39°21'56.045"N	121°38'48.213"W	Oroville-Gridley Highway Bridge Upstream	Cutoff Wall		Bridge				111.65					4123		1964	County of Butte	7 County Center Drive, Oroville, CA 95965	yes	yes
55	4.3-5.3	D	31				Not Verified		Open channel on land side of levee at toe	Cutoff Wall		IR(G)														yes	yes
	4.30	D	30/31	1902+00					Reach 30/31 Transition																		
56	4.30	D	30	1901+79	2,259,317.57	6,661,574.18	39°21'55.834"N	121°38'47.821"W	Oroville-Gridley Highway Bridge Downstream	Cutoff Wall		Bridge				110.16					4123	yes, cond 5	1964	County of Butte	7 County Center Drive, Oroville, CA 95965	yes	yes
57	4.25	D	30	1900+82	2,259,239.50	6,661,630.24	39°21'55.060"N	121°38'47.111"W	Power pole at land side toe	Cutoff Wall		EL	OH			106.55								Pacific Gas & Electric	One Tower, Spear Tower, San Francisco, CA 94105	yes	yes
58	4.17	D	30	1893+60	Not Verified		Not Verified		3/4 inch galvanized iron waterline through levee	Cutoff Wall	Not sure if the abandonment meets title 23 requirements. Pipe may need to be properly abandoned or completely removed. Could not find to verify.	WL	3.1 rd	103.0 (USED)			98.34	99.40	103.31	102.01	pre-1955		part of orig O&M 1955			no	no
59	4.16	D	30	~~1893+20~~	~~Not Verified~~		~~Not Verified~~		~~6 inch concrete encased cast iron sewer pipe through levee~~	Cutoff Wall	plans indicate they have been removed	WW	13.9 rd	92.5 (USED)							pre-1955		part of orig O&M 1955				
60	4.15	D	30	~~1892+60~~	~~Not Verified~~		~~Not Verified~~		~~6 inch concrete encased cast iron sewer pipe through levee~~	Cutoff Wall	plans indicate they have been removed	WW	13.8 rd	92.5 (USED)							pre-1955		part of orig O&M 1955				
61	4.14	D	30	~~1892+20~~	~~Not Verified~~		~~Not Verified~~		~~Two 4 inch concrete encased cast iron sewer lines through the levee. The Discharge end connected to the CM pump house at the landside toe of the bow levee.~~	Cutoff Wall	plans indicate they have been removed	WW(P)	1.5 rd	93.0 (USED)							pre-1955		part of orig O&M 1955				
62	4.11	D	30	1892+89	2,258,542.19	6,662,052.68	39°21'49.413"N	121°38'42.751"W	Pole line over the levee.	Cutoff Wall		EL	OH			106.57								Pacific Gas & Electric	One Tower, Spear Tower, San Francisco, CA 94105	yes	yes
63	4.10	D	30	1891+25	2,258,506.36	6,662,137.72	39°21'48.132"N	121°38'42.351"W	Pole line over the levee.	Cutoff Wall		EL	OH			106.06										yes	yes
64	4.10	D	30	1888+70	2,258,285.10	6,662,367.26	39°21'46.416"N	121°38'39.013"W	Pole Line over the levee. 1 pole 10 feet from toe.	Cutoff Wall		EL	OH			106.32					5351		1966	Pacific Gas & Electric	One Tower, Spear Tower, San Francisco, CA 94105	yes	yes
65	3.38-4.25	D	30	1888+50	2,258,298.89	6,662,410.71	39°21'45.734"N	121°38'37.237"W	To expand an existing waste water treatment facility on the left bank of the Feather River and to install a 6 inch force main along the right bank levee of the Feather River/	Cutoff Wall	Not sure if the abandonment meets title 23 requirements. Pipe may need to be properly abandoned or completely removed. Could not find to verify.	WW(P)	2.5 rd	103.0 (USED)		106.44	98.12	99.11	103.00	101.70	12103A	yes, cond 13	1979	City of Gridley	685 Kentucky Street, Gridley, CA 95948	yes	yes
66	3.95	D	30	1887+29	2,258,210.65	6,662,463.86	39°21'44.858"N	121°38'36.548"W	12 kv power line crossing of levee	Cutoff Wall		EL	OH			106.57										yes	yes
67	3.80	D	30	1868+17	Not Verified		Not Verified		Butte County Drainage District No. 1. An 18-Inch pipe through Levee.	Cutoff Wall	Not sure if the abandonment meets title 23 requirements. Pipe may need to be properly abandoned or completely removed. Should be part of 30 percent but not included.	SD(G)					96.11	97.09	101.11	100.10				Butte County Drainage District	7 County Center Drive, Oroville, CA 95965	yes	yes
68	3.35	D	30	1849+80	2,255,332.08	6,664,793.22	39°21'16.403"N	121°38'07.290"W	18 inch cast iron sewer pipe through levee. Concrete thrust block for cutoff walls on both shoulders. Siphon breaker in concrete pipe riser on the waterside shoulder.	Cutoff Wall	Not sure if the abandonment meets title 23 requirements. Pipe may need to be properly abandoned or completely removed. Should be part of 30 percent but not included.	WW(P)	2.8 rd			103.50	94.96	95.93	100.03	99.20	5722	yes, cond 5	1967	City of Gridley	685 Kentucky Street, Gridley, CA 95948	yes	yes
69	3.04	D	30	1834+42	2,254,466.85	6,665,951.72	39°21'07.717"N	121°37'52.331"W	24 inch CM drainage pipe through levee. Automatic drainage gate on waterside toe. 12 inch pipe sleeved through 24 inch pipe.	Cutoff Wall	The pipeline does not meet title 23 requirements and will need a positive shut-off structure installed and automatic drainage gate on waterside of levee. Pumping up and over levee does not appear to be feasible. Should be part of 30 percent but not included.	IR (G)	12.5	88.00	90.00	102.50	93.69	94.66	98.93	97.61	pre-1955		part of orig O&M 1955			yes	yes
70	2.82	D	30	1823+01	2,253,380.39	6,666,199.22	39°20'56.968"N	121°37'49.236"W	24 Inch CM pipe through levee. 36 inch RCP riser on the waterside slope. Same pipe as below	Cutoff Wall	The pipeline does not meet title 23 requirements and will need a positive shut-off structure installed and automatic drainage gate on waterside of levee. Pumping up and over levee does not appear to be feasible. Should be part of 30 percent but not included.	SD(G)	21.8	77.60	79.60	101.40	93.46	94.43	98.68	96.94	pre-1955		part of orig O&M 1955			yes	yes
71	2.82	D	30	1823+01	2,253,380.39	6,666,199.22	39°20'56.968"N	121°37'49.236"W	12 Inch cement coated and lined steel sewer pipe sleeved through the existing 24 inch CM pipe. Annular space pressure grouted.	Cutoff Wall	The pipeline does not meet title 23 requirements and will need a positive shut-off structure installed and automatic drainage gate on waterside of levee. Pumping up and over levee does not appear to be feasible.	WW(G)	21.8	77.60	79.60	101.40	93.46	94.43	98.68	96.94	5722	yes, cond 5	1967	City of Gridley	685 Kentucky Street, Gridley, CA 95948	yes	yes
72	2.74	D	30	1818+72	2,252,948.28	6,666,209.81	39°20'52.697"N	121°37'49.258"W	24 Inch CM pipe through levee. Slide gate in 36 inch CM riser on the waterside slope.	Cutoff Wall	The pipeline does not meet title 23 requirements and will need a positive shut-off structure installed and automatic drainage gate on waterside of levee. Pumping up and over levee does not appear to be feasible. Should be part of 30 percent but not included.	WW(G)	25.2	74.10	76.10	101.30	93.36	94.33	98.59	96.69	pre-1955		part of orig O&M 1955	City of Gridley	685 Kentucky Street, Gridley, CA 95948	yes	yes
73	2.7-2.82	D	30				Not Verified		Sewer Ponds located within 30' of both toes of the levee	Cutoff Wall																yes	yes
74	2.70	D	30	1816+63	2,252,738.86	6,666,205.04	39°20'50.627"N	121°37'49.195"W	City of Gridley. To install approximately 660 feet of chain link fence on the waterside toe and to authorize approximately 600 feet of 6 foot high chain link fence on the landside toe of the right bank levee of the Feather River.	Cutoff Wall		Fence				101.58					16912	yes, cond 17	1999	City of Gridley	685 Kentucky Street, Gridley, CA 95948	yes	yes
75	2.63-2.75	D	30	1815+00			Not Verified		City of Gridley. To operate a sand borrow pit and gravel borrow pit within the Feather River Designated Floodway, located on the right bank overflow of the Feather River.	Cutoff Wall		Struc									12614	yes, cond 13	1987	City of Gridley	685 Kentucky Street, Gridley, CA 95948	yes	yes
76	2.60	D	30	1813+70	Not Verified		Not Verified		24 Inch CM pipe through levee. Concrete saddle and apron with Calco Slide gate.	Cutoff Wall	Not sure if the pipeline meets the elevation requirement over 200 year WSEL. The type of pipe may or may not meet Title 23. Could not find, need to pothole to verify.	SD(G)		93.5 (USED)			93.25	94.22	98.48	96.39			part of orig O&M 1955				
		D	29/30	1813+33					Reach 29/30 Transition																		

LEVEE ENCROACHMENT LIST

APPENDIX A

					Location (NAD 83)		Location (WGS 84)						Elevations (NGVD 1988)			Water Surface Elevation (NGVD 1988)				CVFPB Permit Information			Owner Information				
	Levee Mile	SBFCA Phase	SBFCA Reach	SBFCA STA	Northing	Easting	Latitude	Longitude	Encroachment	Proposed Levee Improvement	Required Improvement Work	Type	cover	Invert of Pipe	Top of Pipe	Top of Levee	100 Yr	200 Yr	500 Yr	DWR 1957	Permit No.	Require Permittee to Relocate	Year	Name	Address	verified	Picture Taken
77	2.55	D	29	1809+65	2,252,095.81	6,666,415.94	39°20'44.262"N	121°37'46.526"W	24 Inch CM pipe through levee. Automatic drainage gate on waterside propped open and concrete headwall on land side.	No Rehabilitation Required	The pipeline is appears to be very close to meeting the elevation requirement over 200 year WSEL. type of pipe might not meet Title 23. We will need a positive shut-off structure installed and automatic drainage gate on waterside of levee. Pumping up and over levee does not appear to be feasible. Should be part of 30 percent but not included.	SD(G)	4.5	94.90	96.90	101.40	93.15	94.12	98.39	96.15	pre-1955		part of orig O&M 1955			yes	yes
78	2.50-2.70	D	29	1809+00			Not Verified		Existing Prune and Walnut Orchard on right bank overflow area of the Feather River	No Rehabilitation Required		Trees								7782	yes, cond 13	1971	W.L. Boyd	Route 1, Box 578, Gridley, CA 95948	no	no
79	2.35	D	29	1799+44	2,251,083.54	6,666,333.91	39°20'34.260"N	121°37'47.640"W	8"x .25" thick wall with exterior taped wrapped to a minimum thickness of 30 mil. The irrigation pipeline irrigation pipeline through levee	No Rehabilitation Required	Not sure if the pipeline meets the elevation requirement over 200 year WSEL. The type of pipe may or may not meet Title 23. Need to pothole to verify.	IR(P)	2.1	97.83	98.50	100.60	92.87	93.83	98.12	95.58	17213	yes, cond 35	2000	Robert C. Waller	585 Cowee Avenue, Gridley, CA 95948	yes	yes
80	2.20	D	29	1792+96	2,250,482.00	6,666,094.79	39°20'28.324"N	121°37'50.715"W	Abandoned 24 inch CM drainage pipe through levee. Automatic drainage gate on waterside and concrete distribution box at waterside toe. Land side end of the pipe is not located	No Rehabilitation Required	Not sure if the abandonment meets title 23 requirements. Pipe may need to be properly abandoned or completely removed. Meets 30 percent design criteria not included.	SD(G)	10.2	87.40	89.40	99.60	92.50	93.47	97.81	95.17	pre-1955		part of orig O&M 1955			yes	yes
81	2.11-2.50	D	29	1790+00			Not Verified		To authorize leveling and planting walnut and peach orchard on right overflow area of Feather River	No Rehabilitation Required		Trees								6622	no	1973	Robert C. Waller	585 Cowee Avenue, Gridley, CA 95948	no	no
82	2.10	D	29	1785+55	Not Verified		Not Verified		24 Inch CM drain pipe through levee. Concrete Headwall at land side. Automatic Drainage Gate on waterside with splash pad.	No Rehabilitation Required	The pipeline is appears to be very close to meeting the elevation requirement over 200 year WSEL. type of pipe might not meet Title 23. We will need a positive shut-off structure installed and automatic drainage gate on waterside of levee. Pumping up and over levee does not appear to be feasible. Should be part of 30 percent but not included.	SD(G)				100.00	92.05	93.04	97.50	94.89	pre-1955		part of orig O&M 1955			yes	yes
83	2.10	D	29	1785+24	2,249,771.67	6,665,793.11			24 Inch CM drain pipe through levee. Concrete Headwall at land side. Automatic Drainage Gate on waterside with splash pad.	No Rehabilitation Required	Not sure if the pipeline meets the elevation requirement over 200 year WSEL. The type of pipe may or may not meet Title 23. Could not find, need to pothole to verify.	SD(G)	5.7	92.30	94.30	100.00	92.04	93.03	97.49	94.88	pre-1955		part of orig O&M 1955			no	no
84	1.94	D	29	1777+00	2,249,094.57	6,665,330.01	39°20'14.641"N	121°38'00.521"W	24 Inch CM drain pipe through levee. Concrete Headwall at land side. Automatic Drainage Gate on Waterside.	No Rehabilitation Required	The pipeline is appears to meet the elevation requirement over 200 year WSEL. type of pipe might not meet Title 23. We will need a positive shut-off structure installed and automatic drainage gate on waterside of levee. Pumping up and over levee does not appear to be feasible. Should be part of 30 percent but not included.	SD(G)	4.5	93.40	95.40	99.90	91.71	92.71	97.27	94.72	pre-1955		part of orig O&M 1955			yes	yes
85	1.77-2.12	D	28	1770+00			Not Verified		To authorize existing walnut trees, located on the right bank of the Feather River.	Address Sutter Butte Main Canal. Rehabilitation Work TBD		Trees								12388	yes, cond 13	1978	Robert Waller	Route 1, Box 920, Gridley, CA 95948	no	no
	1.79	D	28/29	1769+31					Reach 28/29 Transition																	
86	1.76	D	28	1767+67	2,248,176.53	6,665,251.10	39°20'05.570"N	121°38'01.573"W	Cox Spillway. North 60 Inch drain pipes through Levee. Slide Gates in 78 inch CM pipe wells on the waterside slope. Concrete bulkhead on both ends. Reinforced concrete spillway at the waterside end.	Address Sutter Butte Main Canal. Rehabilitation Work TBD	The pipeline does not meet title 23 requirements and will need a positive shut-off structure installed and automatic drainage gate on waterside of levee. Pumping up and over levee does not appear to be feasible. Should be part of 30 percent but not included.	SD(G)	8.4	86.70	91.70	100.10	91.31	92.33	97.02	94.54	pre-1955		part of orig O&M 1955	Butte Water District, Sutter Extension Water District	735 Virginia Street, Gridley, CA 95948	yes	yes
87	1.76	D	28	1767+57	2,248,167.22	6,665,252.49	39°20'05.478"N	121°38'01.556"W	Cox Spillway. South 60 Inch drain pipes through Levee. Slide Gates in 78 inch CM pipe wells on the waterside slope. Concrete bulkhead on both ends. Reinforced concrete spillway at the waterside end.	Address Sutter Butte Main Canal. Rehabilitation Work TBD	The pipeline does not meet title 23 requirements and will need a positive shut-off structure installed and automatic drainage gate on waterside of levee. Pumping up and over levee does not appear to be feasible. Should be part of 30 percent but not included.	SD(G)	8.4	86.70	91.70	100.10	91.31	92.33	97.02	94.53	pre-1955		part of orig O&M 1955	Butte Water District, Sutter Extension Water District	735 Virginia Street, Gridley, CA 95948	yes	yes
88	1.72-1.75	D	28	1767+30	2,248,140.77	6,665,254.84	39°20'05.217"N	121°38'01.527"W	To construct an 12kv aerial power line crossing of the right bank levee of the Feather River. The power line will extend from an existing pole located landward of the project levee to a new 50 foot pole located at least 20 feet water ward of the water ward toe of the levee/ The shall be 34 feet of clearance between the levee crown and the power line. The length of the span shall be 201 feet. The power line will extend from the 50 foot poles to a 30 foot pole to be located 135 downstream. This power line shall serve a pump covered by permit 11987 b Cox Brothers.	Address Sutter Butte Main Canal. Rehabilitation Work TBD		EL	OH			100.33					12020	yes, cond 13	1977	Pacific Gas and Electric Company	One Tower, Spear Tower, San Francisco, CA 94105	yes	yes
89	1.71	D	28	1766+00			Not Verified		To construct, operate, and maintain a 12kv aerial power line extension across the right bank levee, channel, and left bank overflow of the Feather River. A 55 foot pole will be installed 31 feet water ward of the water ward shoulder of levee. The overhead conductors will extend from an existing pole, located 138 feet landward of the landward toe of levee, the proposed 55 pole. The span between the two poles will be 212 feet. A minimum clearance of 35 feet will be provided between the overhead conductors and the top of the levee. The proposed extension will extend across the river and floodway for an additional 3,165.5 feet and will consist of	Address Sutter Butte Main Canal. Rehabilitation Work TBD		EL	OH			100.33					12241	yes, cond 13	1977	Pacific Gas and Electric Company	One Tower, Spear Tower, San Francisco, CA 94105	yes	yes
90	1.71	D	28	1765+33	2,247,975.94	6,665,181.76	39°20'03.574"N	121°38'02.510"W	12-inch CM pipe through the Levee. Slide Gate on the landside end and concrete distribution box on waterside.	Address Sutter Butte Main Canal. Rehabilitation Work TBD	The pipeline does not appear to meet the elevation requirement over 200 year WSEL. Type of pipe appears to meet Title 23. We will need a positive shut-off structure installed and automatic drainage gate on waterside of levee.	IR(G)	4.5	94.50	95.50	100.00	91.03	92.09	96.90	94.55			1979	Cox Bros	Route 1, Box 926, Gridley, CA 95948	yes	yes
91	1.70	D	28	1765+15	2,247,960.44	6,665,189.22	39°20'03.424"N	121°38'02.404"W	To install an irrigation pump on the right bank of the Feather River with a 12 inch steel pipe across the berm, levee, and the Sutter Butte Canal to existing orchards on the right bank downstream from Evans-Reimer Road. Concrete headwall at the waterside toe	Address Sutter Butte Main Canal. Rehabilitation Work TBD	The pipeline is appears to meet the elevation requirement over 200 year WSEL. Type of pipe might not meet Title 23. We will need a positive shut-off structure installed and automatic drainage gate on waterside of levee.	IR(P)	0.7	98.50	99.50	100.20	91.02	92.08	96.90	94.55	11987	yes, cond 13				yes	yes
92	1.55	D	28	1756+27	2,247,101.40	6,665,410.42	39°19'54.940"N	121°37'59.617"W	Abandoned 12-inch CM pipe through the Levee. Slide Gate on the landside end and concrete distribution box on waterside.	Address Sutter Butte Main Canal. Rehabilitation Work TBD	Not sure if the abandonment meets title 23 requirements. Pipe may need to be properly abandoned or completely removed.	SD(G)	7.1	90.67	91.67	98.80	90.74	91.82	96.71	94.29						yes	yes
93	1.5-1.60	D	28	1753+50			Not Verified		To plant approximately 1.13 hectares of kiwi plants and install an irrigation system supplied by an existing water well.	Address Sutter Butte Main Canal. Rehabilitation Work TBD		Trees								13410	yes, cond 13	1982	Edwin Roach	955 East Evans Reimer Road, Gridley, CA 95948	no	no
94	1.45-1.50	D	28	1753+50			Not Verified		To install a n electrical pole line service extension to a new agricultural pump on the right bank overflow area of the Feather River.	Address Sutter Butte Main Canal. Rehabilitation Work TBD		EL	OH							13436	yes, cond 13	1982	Pacific Gas & Electric	5555 Florin-Perkins Road, Sacramento, CA 95826	no	no
95	1.30	D	28	1745+00			Not Verified		To retain a newly constructed barn on the right bank overflow area of the Feather River, approximately 150 feet water ward of the right bank levee of the Feather River	Address Sutter Butte Main Canal. Rehabilitation Work TBD		EL	OH							10823	no	1975	W.W. Alexander	Route 1, Box 718, Gridley, CA 95948	no	no
96	1.27	D	28	1741+32	2,245,620.98	6,665,550.58	39°19'40.299"N	121°37'57.893"W	Butte County Drainage District No. 1. A 16-Inch pipe through Levee. Emergency Repair Work on Pipe 3/5/02. Pipe not physically located	Address Sutter Butte Main Canal. Rehabilitation Work TBD	The pipeline does not meet title 23 requirements and will need a positive shut-off structure installed and automatic drainage gate on waterside of levee. Pumping up and over levee does not appear to be feasible.	SD(G)	9.0	87.00	89.00	97.77	90.28	91.38	96.38	93.85				Butter County Drainage District No. 1	7 County Center Drive, Oroville, CA 95965	yes	yes
97	1.00	D	28	1728+33	2,244,365.98	6,665,826.21	39°19'27.883"N	121°37'54.450"W	To install a 12kv pole line westerly across the right bank levee of the Feather River and the Sutter Butte Canal, then northerly approximately 180 meters for service to well pump.	Address Sutter Butte Main Canal. Rehabilitation Work TBD		EL	OH							13359	yes, cond. 13	1982	Pacific Gas & Electric Company	5555 Florin-Perkins Road, Sacramento, CA 95826	yes	yes
98	0.94	D	28	1724+61	2,244,008.46	6,665,796.35	39°19'24.351"N	121°37'54.848"W	12 kv overhead electrical power line and telephone line crossing	Address Sutter Butte Main Canal. Rehabilitation Work TBD		EL	OH			97.77									yes	yes
99	0.62-1.00	D	28						1800 feet of 4.5 foot tall barbed wire fence located at waterside toe of levee.	Address Sutter Butte Main Canal. Rehabilitation Work TBD										17271			Peckema Bros			
	0.90	D	27/28	1721+60					Reach 27/28 Transition																	
100	0.90	D	27	1721+20	2,243,713.99	6,665,636.50	39°19'21.446"N	121°37'56.897"W	End 18" wide, 12-25 feet deep cutoff wall on crown with monitoring system 2000 lineal feet.	Address Sutter Butte Main Canal. Rehabilitation Work TBD						96.10								The Research Foundation of CSU Chico		yes	yes

LEVEE ENCROACHMENT LIST

APPENDIX A

					Location (NAD 83)		Location (WGS 84)						Elevations (NGVD 1988)			Water Surface Elevation (NGVD 1988)				CVFPB Permit Information			Owner Information			
	Levee Mile	SBFCA Phase	SBFCA Reach	SBFCA STA	Northing	Easting	Latitude	Longitude	Encroachment	Proposed Levee Improvement	Required Improvement Work	Type	cover	Invert of Pipe	Top of Pipe	Top of Levee	100 Yr	200 Yr	500 Yr	DWR 1957	Permit No.	Require Permittee to Relocate	Year	Name	Address	verified	Picture Taken
101	0.78	D	27	1707+34	2,242,329.23	6,665,666.71	39°19'07.758"N	121°37'56.584"W	Begin 18" wide, 12-25 feet deep cutoff wall on crown with monitoring system 2000 lineal feet.	Address Sutter Butte Main Canal. Rehabilitation Work TBD						96.80								The Research Foundation of CSU Chico		yes	yes
	0.77	D	26/27	1707+11					Reach 26/27 Transition																		
102	0.46	D	26	1699+62	2,241,637.34	6,665,378.46	39°19'00.931"N	121°38'00.288"W	Propane storage tanks at waterside toe of levee	Address Sutter Butte Main Canal. Rehabilitation Work TBD		G				97.13										yes	yes
103	0.44	D	26	1697+96	2,241,496.45	6,665,289.21	39°18'59.542"N	121°38'01.430"W	To retain a telephone line aerial crossing of the right bank levee of the Feather River. The aerial telephone line extends from a pole located landward of the Sutter Butte Main Canal to a pole located near water ward toe of the levee	Address Sutter Butte Main Canal. Rehabilitation Work TBD		TL	OH			97.58					10422	no	1975	Pacific Telephone and Telegraph Co.	1426 Howe Avenue, Suite 50, Sacramento, CA 95825	yes	yes
104	0.40	D	26	1695+85			Not Verified		To construct a caretaker/ranch office and remove an existing structure on the right bank designated floodway of the Feather River.	Address Sutter Butte Main Canal. Rehabilitation Work TBD		Struc									15891	no	1992	J.F. Desmond	P.O. Box 211, Gridley, California 95948		
105	0.30	D	26	1691+00			Not Verified		To authorize farm buildings (a walnut processing plant and shop) on the water ward toe of the right bank levee on the Feather River, 200 feet north of Chandon Avenue. The buildings are a 30 x 80 foot walnut dehydrator and a 40 x 40 shed.	Address Sutter Butte Main Canal. Rehabilitation Work TBD		Struc									11963	yes, cond. 13	1977	J.F. Desmond	P.O. Box 211, Gridley, California 95948		
106	0.00-0.53	D	26	1690+00			Not Verified		To level and plant 160 acres of land between right bank levee and Feather River, off end of Chandon Avenue and opposite mouth of Honcut Creek.	Address Sutter Butte Main Canal. Rehabilitation Work TBD		Trees									6566	yes, cond 5	1969	Butte Farms, Inc.	P.O. Box 338, Gridley, CA 95948		
107	0.01	D	26	1675+98	2,239,584.22	6,664,224.05	39°18'40.683"N	121°38'15.081"W	12 kv power line crossing of levee	Address Sutter Butte Main Canal. Rehabilitation Work TBD		EL	OH			96.20					3692	yes, cond 5	1961	Pacific Gas and Electric Company	530 E Street, Marysville, CA 95901	yes	yes
	0.00	D	26	1675+50					Maintenance Area 16/ Maintenance Area 7 Transition																		
1	4.09	D	26	1675+27	2,239,518.21	6,664,204.12	39°18'40.036"N	121°38'15.340"W	Butte County Drainage District No. 1. 60" x 72" RCP culvert through levee. Slide gate in concrete well on waterside slope.	Address Sutter Butte Main Canal. Rehabilitation Work TBD	The pipeline does not meet title 23 requirements and will need a positive shut-off structure installed and automatic drainage gate on waterside of levee. Pumping up and over levee does not appear to be feasible.	SD(G)	17.0	73.90	78.90	95.90	87.76	89.02	94.62	91.42	pre-1955		part of orig O&M 1955	Butter County Drainage District No. 1	7 County Center Drive, Oroville, CA 95965	yes	yes
		D	25/26	1674+37					Reach 25/26 Transition																		
2	3.9-3.94		25	1670+00			Not Verified		To plant kiwi plants in place of fruit and nut trees on the right bank overflow of the Feather River south of Chandon Avenue near Live Oak.	No Rehabilitation Required		Trees									12200	yes, cond 13	1981	Lois Scoonmaker	1424 Mirada, Yuba City, CA 95991	no	no
3	3.90		25	1667+00			Not Verified		To clear the overflow area of brush and construct a foot bridge over an old channel that meanders across the overflow area. To install a septic tank and leach lines, electric service, drill a well and park a mobile home in the overflow area.	No Rehabilitation Required		Struc									7438	yes, cond 13	1971	Grover James	925 N. Rancho Road, El Sobrante, CA 94803	no	no
4	3.85		25	1665+32	2,238,525.15	6,664,192.56	39°18'30.216"N	121°38'15.536"W	To construct a 12 kv aerial power line extension across the levee and into the floodway of the Feather River. An existing pole on the landside of the levee will be replaced with a new 55 foot pole to be located 13 feet from the landward toe of the levee. The overhead conductors will extend across the levee to a 55 foot pole located in the floodway 140 feet from the waterside toe of the levee. The span between the 2 poles will be 233 feet. A minimum clearance of 31	No Rehabilitation Required		EL	OH			95.67					7101	yes, cond 5	1970	Pacific Gas and Electric Company	530 E Street, Marysville, CA 95901	yes	yes
5	3.65		25	1653+15	2,237,309.20	6,664,181.79	39°18'18.198"N	121°38'15.734"W	12 Kv overhead power line crossing and along levee	No Rehabilitation Required		EL	OH			95.17								Pacific Gas & Electric	One Tower, Spear Tower, San Francisco, CA 94105	yes	yes
6	3.41-3.73		25	1650+00			Not Verified		To retain a walnut orchard on the right bank overflow area of the Feather River. The orchard is located a narrow strip of ground between the project levee and Drainage District No. 1's drain ditch.	No Rehabilitation Required		Trees									11855	yes, cond 13	1976	Madsen Ranch	P.O. Box 134, Live Oaks, CA 95953	no	no
7	3.39		25	1639+00	2,235,906.77	6,664,006.17	39°18'04.327"N	121°38'17.999"W	RD 777 Lateral 11. There are 2-24 inch steel pipes through levee. Automatic drainage gates on waterside end of pipe.	No Rehabilitation Required	The pipeline does not meet title 23 requirements and will need a positive shut-off structure installed and automatic drainage gate on waterside of levee. Pumping up and over levee does not appear to be feasible.	SD(G)	16.2	78.40	80.40	94.60	87.19	88.46	94.09	90.91	pre-1955		part of orig O&M 1955	Reclamation District No. 777	P.O. Box 876, Gridley, CA 95948	yes	no
8	3.38		25						Construction of Waterside Approach Ramp 500 feet north of Campbell Road and Meader Road	No Rehabilitation Required											3019	yes, cond 4	1959	Peder Pederson	Route 1, Box 33, Live Oak, CA	yes	no
9	3.38		25	1638+72	2,235,879.28	6,664,006.22	39°18'04.071"N	121°38'18.040"W	12 Kv overhead power line crossing and along levee	No Rehabilitation Required						94.50										yes	yes
10	3.14-3.39		25	1635+00			Not Verified		To plant a prune orchard on the right bank overflow area of the Feather River at the end of Riviera Road	No Rehabilitation Required											8616	yes, cond 13	1973	James Eva	11751 Meteer Road, Live Oak, CA 95953	no	no
		C	24/25	1623+86					Reach 24/25 Transition																		
11	2.87	C	24	1610+92	2,233,196.84	6,664,513.54	39°17'37.519"N	121°38'11.755"W	RD 777 Lateral 12. An 18 inch CM pipe through levee. Automatic drainage gate on waterside end of pipe.	Cutoff Wall and excavate and place 4.5 feet of compacted clay in bottom of Sutter Butte Main Canal	The pipeline does not meet title 23 requirements and will need a positive shut-off structure installed and automatic drainage gate on waterside of levee. Pumping up and over levee does not appear to be feasible.	SD(G)	17.3	76.50	78.00	93.80	87.00	88.28	93.90	90.69	pre-1955		part of orig O&M 1955	Reclamation District No. 777	P.O. Box 876, Gridley, CA 95948	yes	yes
	2.83	C	23/24	1609+37					Reach 23/24 Transition																		
12	2.38	C	23	1585+05	Not Verified		Not Verified		Abandoned 12 inch CM pipe through levee. Automatic drainage gate on waterside end of pipe	Cutoff Wall	Not sure if the abandonment meets title 23 requirements. Pipe may need to be properly abandoned or completely removed. Could not find pipe	?		86.4 (USED)			86.21	87.54	93.24	89.74	pre-1955		part of orig O&M 1955			no	no
13	1.83	C	23	1557+00			Not Verified		To add approximately 575 feet of 12 kv line to an existing power line on Cooley Road and within the overflow area of the Feather River	Cutoff Wall		EL	OH			92.80				12792	yes, cond. 13	1971	Pacific Gas and Electric Company	5555 Florin-Perkins Road, Sacramento, CA 95826	no	no
14	1.83	C	23	1556+58	2,228,785.42	6,665,751.32	39°16'53.885"N	121°37'56.205"W	To extend a 12 kv pole line from the intersection of Cooley Road and the right bank levee of the Feather across the levee and continue for 1500 feet easterly along Cooley Road. The pole line will serve a 25 HP river pump	Cutoff Wall		EL	OH			92.80				7336	yes, cond. 13	1971	Pacific Gas and Electric Company	5555 Florin-Perkins Road, Sacramento, CA 95826	yes	yes
15	1.83	C	23	1556+22	2,228,750.17	6,665,741.92			8 inch CM pipe through levee. Automatic drainage gate on waterside end of pipe.(No gate found, ARV on land side by structure. Line may be to the north pump plant from permit 7380)	Cutoff Wall	Not sure if the abandonment meets title 23 requirements. Pipe may need to be properly abandoned or completely removed. Could not find to verify.	IR(P)	8.0	81.0 (USED)		92.80	85.09	86.54	92.64	89.01	pre-1955		part of orig O&M 1955			no	no
16	1.80	C	23	1555+00			Not Verified		To install pumping plants at two locations on the right bank of the Feather River	Cutoff Wall		IR(P)									7380	yes, cond 13	1971	William Filter, Jr.	Route 2, Box 9, Chico, CA 95926	no	no
17	1.71	C	23	1549+63	2,228,117.97	6,665,558.67			12 inch CM pipe through levee. Automatic drainage gate on waterside end of pipe. Pipe partially plugged	Cutoff Wall	Not sure if the abandonment meets title 23 requirements. Pipe may need to be properly abandoned or completely removed. Could not find pipe	SD(G)	12.5	79.05	80.05	92.50	85.05	86.51	92.61	88.91	pre-1955		part of orig O&M 1955			no	no
18	1.30-1.83	C	23	1548+00			Not Verified		To level and plant walnuts and either peaches or prunes on the right bank overflow area of the Feather River upstream from Live Oak Park.	Cutoff Wall		Trees									6997	yes, cond 5	1970	William Filter, Jr.	Route 2, Box 9, Chico, CA 95926	no	no
19	1.50	C	23	1539+00			Not Verified		To install 25 HP pumping plants at two locations on the right bank of the Feather River	Cutoff Wall		IR(P)									7380	yes, cond 13	1971	William Filter, Jr.	Route 2, Box 9, Chico, CA 95926	no	no
20	1.45	C	23	1536+12	2,226,796.70	6,665,666.06	39°16'34.268"N	121°37'57.407"W	RD 777 Lateral 7. There is a 36 inch CM pipe through levee. Automatic drainage gate on waterside end of pipe.	Cutoff Wall	The pipeline does not meet title 23 requirements and will need a positive shut-off structure installed and automatic drainage gate on waterside of levee. Pumping up and over levee does not appear to be feasible.	SD(G)	13.7	75.65	78.65	92.32	84.94	86.40	92.52	88.68	pre-1955		part of orig O&M 1955	Reclamation District No. 777	P.O. Box 876, Gridley, CA 95948	yes	yes
21	1.45	C	23	1535+95	2,226,780.47	6,665,668.20	39°16'34.070"N	121°37'57.365"W	To extend a 12 kv pole line 410 feet northerly to supply a 25 HP pump located in the river. The pump is pump referenced in permit 7380.	Cutoff Wall		EL	OH			92.39				7335	yes, cond 13	1971	Pacific Gas and Electric Company	5555 Florin-Perkins Road, Sacramento, CA 95826	yes	yes
22	1.44	C	23	1535+64	2,226,750.14	6,665,678.35	39°16'33.770"N	121°37'57.237"W	To widen access road to Live Oak Recreation Area at the east end of Pennington Road on the right bank levee and berm of the Feather River	Cutoff Wall		Struc									7294	yes, cond 5	1971	County of Sutter	1160 Civic Center Blvd, Yuba City, CA 95993	yes	yes
23	1.40	C	23	1535+00			Not Verified		To Install 2500 lf of 2 inch diameter Sch 40 PVC water pipe and 600 lf of 1 inch Sch 40 PVC pipe within the west bank overflow. (Permit number has been changed to 7440-D)	Cutoff Wall		W(P)									18256	yes, cond 24	2007	County of Sutter	1130 Civic Center Blvd, Yuba City, CA 95993		

LEVEE ENCROACHMENT LIST

APPENDIX A

					Location (NAD 83)		Location (WGS 84)						Elevations (NGVD 1988)			Water Surface Elevation (NGVD 1988)				CVFPB Permit Information			Owner Information				
	Levee Mile	SBFCA Phase	SBFCA Reach	SBFCA STA	Northing	Easting	Latitude	Longitude	Encroachment	Proposed Levee Improvement	Required Improvement Work	Type	cover	Invert of Pipe	Top of Pipe	Top of Levee	100 Yr	200 Yr	500 Yr	DWR 1957	Permit No.	Require Permittee to Relocate	Year	Name	Address	verified	Picture Taken
24	1.36-1.39	C	23	1534+00			Not Verified		To construct a water supply system, a sanitary disposal system and restrooms for the Live Oak Recreational Area	Cutoff Wall		Struc									6855	yes, cond 5	1969	County of Sutter	1130 Civic Center Blvd, Yuba City, CA 95993		
25	1.36	C	23	1532+40	Not Verified		Not Verified		Potential Pipe Crossing. 6" Steel through levee	Cutoff Wall	Not sure about the elevation criteria being met. The pipeline does not meet title 23 requirements and will need a positive shut-off structure installed and automatic drainage gate on waterside of levee.	?		82.2 (USED)		91.91	84.80	86.27	92.41	88.56	pre-1955		part of orig O&M 1955			yes	yes
26	1.36	C	23	1532+45	2,225,437.02	6,665,722.95	39°16'20.789"N	121°37'56.738"W	Pump Station adjacent to Levee	Cutoff Wall		IR(P)									7380	yes, cond 13	1971	William Filter, Jr.	Route 2, Box 9, Chico, CA 95926	yes	yes
27	1.33-1.43	C	23	1530+00			Not Verified		Live Oak Park to authorize trailer site, a porch, a metal storage building, fence across the waterside berm and waterside slope of the levee, on the right bank of the overflow area of the Feather River.	Cutoff Wall		Struc									7440	yes, cond 13	1973	County of Sutter	1160 Civic Center Blvd, Yuba City, CA 95993	no	no
28	1.17	C	23	1524+35	Not Verified		Not Verified		Potential Pipe Crossing. 6" Steel through levee	Cutoff Wall	Not sure about the elevation criteria being met. The pipeline does not meet title 23 requirements and will need a positive shut-off structure installed and automatic drainage gate on waterside of levee.	?		80.1 (USED)		91.67	84.27	85.80	92.05	87.89	pre-1955		part of orig O&M 1955			yes	yes
	0.75	C	22/23	1503+83					Reach 22/23 Transition																		
29	0.50-1.10	C	22	1530+00			Not Verified		To authorize existing pear orchard and plant 10 additional acres on the right bank overflow of the Feather River downstream of Archer Road	Cutoff Wall		Trees									12672	yes, cond 13	1980	Elvyn Denny	2034 Fir Street, Live Oak, CA 95953	no	no
30	0.70-1.14	C	22	1520+25			Not Verified		To extend approximately 1,950 feet of 12kv electric service line in the right bank overflow area of the Feather River downstream from Archer Avenue crossing	Cutoff Wall		EL	OH								12824	yes, cond 13	1979	Pacific Gas and Electric Company	P.O. Box 7444, Sacramento, CA 95826	no	no
31	0.64	C	22	1493+88	2,222,717.57	6,664,731.41			Location of gate with no access	Cutoff Wall		Fence				91.44					17139	yes, cond 16				yes	yes
32	0.47	C	22	1492+00			Not Verified		To construct an aerial telephone crossing of the right bank levee of the Feather River	Cutoff Wall		structure									6256	yes, cond 5	1969	Pacific Telephone and Telegraph Company	3675 "T" Street, Sacramento, CA	no	no
33	0.42-.47	C	22	1482+00			Not Verified		To authorize a 4 x 17 foot wooden walkway on the landside shoulder; two tool sheds, four walnut trees, a barbed wire and wooden fence within 10 feet landward of the landside toe, and an electrical gate across the crown of the right bank levee of the Feather River	Cutoff Wall		structure									17139	yes, cond 15	1999	Wayne Sue	P.O. Box 213, Live Oak, California 95953	yes	yes
34	0.38	C	22	1479+98	2,221,343.18	6,664,540.45	39°15'40.364"N	121°38'09.549"W	Location of electric gate with no access	Cutoff Wall		Fence				91.44					17139	yes, cond 16				yes	yes
35	0.19	C	22	1470+15	2,220,360.26	6,664,561.50	39°15'30.656"N	121°38'11.766"W	To authorize a 4 x 17 foot wooden walkway on the landside shoulder and a 6 x 300 foot wooden lattice fence within 10 feet landward of the landside toe and parallel to the right bank of levee of Feather River	Cutoff Wall		structure									17168	yes, cond 15	1999	Mariko Gushi	1320 Bishop Road, Live Oak, CA 95953	yes	yes
36	0.15	C	22	1468+70			Not Verified		To authorize four trees (oleander, pines, cherry, and birch) on the landside slope and a 5 foot high, 170 foot long wire fence within 7 feet of landward of the landside toe of the right bank levee of the Feather River	Cutoff Wall		structure									17129	yes, cond 14	1999	Kevin and Mary Ann McCool	1210 Bishop Road, Live Oak, CA 95953	no	no
37	0.10	C	22	1466+02	2,219,947.02	6,664,564.97	39°15'26.570"N	121°38'11.743"W	Transformer located 40'± from land side toe	Cutoff Wall		EL				95.06										yes	yes
38	0.10	C	22	1465+50			Not Verified		To construct access ramp across the right bank levee of the Feather River	Cutoff Wall		Struc									4741	yes, cond 5	1964	Edward J. Heinrich	2434 Archer Avenue, Live Oak, CA 95953	no	no
39	0.10	~~C~~	~~22~~	~~1465+50~~			~~Not Verified~~		~~The existing 36 inch CMP installed in 1913 failed on March 1964. The permit was for repair of levee and removal of the pipe prior to November 1964.~~	~~Cutoff Wall~~		~~IR(G)~~		~~57.7 (USED, Waterside) 70.0, USED, landward)~~							4556 and 4719	yes, cond 5	1964 and 1965	Butte Water District, Sutter Extension Water District	735 Virginia Street, Gridley, CA 95948	no	no
40	0.00-0.25	C	22	1461+00			Not Verified		To maintain existing your walnut orchards on the right bank of the Feather River, downstream from Bishop Avenue.	Cutoff Wall		Trees									11762	yes, cond 13	1976	Edward J. Heinrich	2434 Archer Avenue, Live Oak, CA 95953	no	no
		C	22	1460+00					Levee District No. 9 Levees /Maintenance Area 16 Transition																		
	5.73	C	21/22	1433+83					Reach 21/22 Transition																		
41	5.67	C	21	1430+55	2,216,425.27	6,664,383.06	39°14'51.685N	121°38'14.253"W	Sunset Pump Station owned an operated by Sutter Extension Main Pump Station. This is the 60 Inch steel pipe a through the levee. Pump end has gate valves on structure. Automatic drainage gates on the landside end.	Cutoff Wall	The pipeline does not meet title 23 requirements and will need a positive shut-off structure installed and proper check valves at pump. Pumping up and over levee does not appear to be feasible.	IR(P)	15.6	80.61	85.61	91.16	81.70	83.63	90.27	85.74	pre-1955 and 3610	yes, cond 5 (for pumps)	part of orig O&M 1955 and 1961	Sutter Extension Water District	4525 Franklin Road, Yuba City, CA 95993-9316	yes	yes
42	5.67	C	21	1430+47	2,216,417.64	6,664,382.64	39°14'51.614N	121°38'14.261"W	Sunset Pump Station owned an operated by Sutter Extension Main Pump Station. This is the 60 Inch steel pipe a through the levee. Pump end has gate valves on structure. Automatic drainage gates on the landside end.	Cutoff Wall	The pipeline does not meet title 23 requirements and will need a positive shut-off structure installed and proper check valves at pump. Pumping up and over levee does not appear to be feasible.	IR(P)	15.6	80.42	85.42	91.13	81.70	83.63	90.27	85.74	pre-1955 and 3610	yes, cond 5 (for pumps)	part of orig O&M 1955 and 1961	Sutter Extension Water District	4525 Franklin Road, Yuba City, CA 95993-9316	yes	yes
43	5.67	C	21	1430+40	2,216,410.86	6,664,382.27	39°14'51.758N	121°38'14.247"W	Sunset Pump Station owned an operated by Sutter Extension Main Pump Station. This is the 36 inch steel pipe through the levee. Pump end has gate valves on structure. Automatic drainage gates on the landside end.	Cutoff Wall	The pipeline does not meet title 23 requirements and will need a positive shut-off structure installed and proper check valves at pump. Pumping up and over levee does not appear to be feasible.	IR(P)	15.6	82.92	85.92	91.18	81.70	83.63	90.27	85.74	pre-1955 and 3611	yes, cond 5 (for pumps)	part of orig O&M 1955 and 1961	Sutter Extension Water District	4525 Franklin Road, Yuba City, CA 95993-9316	yes	yes
44	5.67	C	21	1430+40			Not Verified		To construct and operate a vertical-perforated plate fish screen with a power operated brush on the right bank of Feather River. Located at Sunset Pump Plant.	Cutoff Wall		IR									13381	yes, cond 13	1982	Department of Fish and Game	1701 Nimbus Road, Ranch Cordova, CA 95670	no	no
45	5.67	C	21		Not Verified		Not Verified		36" CM pipe crossing through levee	Cutoff Wall	Not sure if the abandonment meets title 23 requirements. Pipe may need to be properly abandoned or completely removed. Could not find pipe. Should be part of 30 percent but not included	IR									pre-1955		part of orig O&M 1955			no	no
46	5.67	C	21	1429+98	2,216,368.25	6,664,376.98	39°14'51.204"N	121°38'14.314"W	12 KV OH Power	Cutoff Wall		EL	OH			91.19								Pacific Gas & Electric	One Tower, Spear Tower, San Francisco, CA 94105	yes	yes
47	5.67	C	21	1429+68	2,216,338.71	6,664,376.58	39°14'50.912"N	121°38'14.321"W	12 KV OH Power	Cutoff Wall		EL	OH			91.18								Pacific Gas & Electric	One Tower, Spear Tower, San Francisco, CA 94105	yes	yes
48	5.65	C	21	1429+50			Not Verified		Existing rubble coffer dam constructed with Rec Board Permit 3610. Repair coffer dam.	Cutoff Wall		IR									3610 and 7762	no	1961 and 1971	Sutter Extension Water District	4525 Franklin Road, Yuba City, CA 95993-9316	yes	no
49		C	21	1428+50					Sutter Butte Main Canal Begin (Station 1428+50 to 1433+83) - Main Irrigation Canal approx 420 cfs	Cutoff Wall		IR															
49	5.20	C	21				Not Verified		12 kv pole line crossing of levee 30 feet from waterside toe for 792 feet	Cutoff Wall		EL	OH								8533		1973	Pacific Gas and Electric Company	5555 Florin-Perkins Road, Sacramento, CA 95826	no	no
50	5.08	C	21	1399+27	2,213,450.77	6,664,966.80	39°14'22.343"N	121°38'06.965"W	To install a 12 kv pole line across and along the right bank levee of the Feather River.	Cutoff Wall		EL	OH			90.49					7439	yes, cond 13	1971	Pacific Gas and Electric Company	5555 Florin-Perkins Road, Sacramento, CA 95826	yes	yes
51	4.91	C	21				Not Verified		End Seepage Interceptor Trench located on landside toe of levee	Cutoff Wall		SEEP									15201	no	1991	Levee District No. 9	1190 Civic Center Blvd., Yuba City, CA 95991	no	no
52	4.91-5.08	C	21				Not Verified		Plant 9 acres of Kiwi plants on waterside of levee between Bridgeford and Hermanson Avenues	Cutoff Wall		Trees									12589	yes, cond 13	1978	Tom-A-Hay Farms, Inc.	P.O. Box 461, Live Oak, CA 95953		
53	4.83-4.91	C	21				Not Verified		Plant 14 acres of Kiwi plants on waterside of levee upstream of Hermanson Avenue	Cutoff Wall		Trees									12623	yes, cond 13	1979	John Tomlinson and Anthony Hess	P.O. Box 461, Live Oak, CA 95953		
54	4.73-4.81	C	21				Not Verified		To construct a well and septic tanks for 2 mobile homes and to extend electrical service to well on right bank overflow area of Feather River	Cutoff Wall		Struc									7994	yes, cond 13	1972	Johnny McReyonlds	2650 The Alameda, Santa Clara, CA 95050	no	no
55	4.76-4.83	C	21				Not Verified		To plant 8 acres of kiwi plants, a submersible pump, and underground sprinkler system on the right bank overflow area of the Feather River	Cutoff Wall		Trees									12816	yes, cond 13	1979	Tom-A-Hay Farms, Inc.	8935 Sinnard Avenue, Live Oak, CA 95953	no	no

LEVEE ENCROACHMENT LIST

APPENDIX A

	Levee Mile	SBFCA Phase	SBFCA Reach	SBFCA STA	Location (NAD 83) Northing	Location (NAD 83) Easting	Location (WGS 84) Latitude	Location (WGS 84) Longitude	Encroachment	Proposed Levee Improvement	Required Improvement Work	Type	cover	Elevations (NGVD 1988) Invert of Pipe	Elevations (NGVD 1988) Top of Pipe	Elevations (NGVD 1988) Top of Levee	Water Surface Elevation (NGVD 1988) 100 Yr	Water Surface Elevation (NGVD 1988) 200 Yr	Water Surface Elevation (NGVD 1988) 500 Yr	Water Surface Elevation (NGVD 1988) DWR 1957	CVFPB Permit Information Permit No.	CVFPB Permit Information Require Permittee to Relocate	CVFPB Permit Information Year	Owner Information Name	Owner Information Address	verified	Picture Taken
56	~~4.81~~	~~C~~	~~21~~				~~Not Verified~~		~~To pump storm water from landward drainage ditch over the right bank levee of the Feather River from one separate location for approximately size at the end of Hermansen Road.~~ **~~Pipe has been removed~~**	~~Cutoff Wall~~		~~SD(P)~~										13611	yes, cond 13	1983	Sundown Farms, Inc.	1350 Hermansen Avenue, Live Oak, CA 95953	n/a	n/a
57	4.80	C	21	1391+96	2,212,767.43	6,665,226.86	39°14'15.579"N	121°38'03.695"W	To extend a 12 kv pole line out into the right bank levee and overflow area of the Feather River	Cutoff Wall		EL	OH			89.77					8533	yes, cond 13		Pacific Gas & Electric	One Tower, Spear Tower, San Francisco, CA 94105	yes	yes
58	4.50	C	21	1375+35	2,211,296.56	6,665,998.34	39°14'01.009"N	121°37'53.965"W	Sutter Extension Sunset Lateral Begin (Station 1375+35 to 1428+50) Open irrigation ditch 15 feet from landside toe	Cutoff Wall		IR				89.42								Sutter Extension Water District	4525 Franklin Road, Yuba City, CA 95993-9316	yes	yes
59	4.48	C	21	1374+94	2,211,260.36	6,666,016.66	39°14'00.651"N	121°37'53.734"W	Begin Seepage Interceptor Trench located on landside toe of levee	Cutoff Wall		SEEP									15201	no	1991	Levee District No. 9	1190 Civic Center Blvd., Yuba City, CA 95991	no	no
60	4.10-4.38	C	21	1375+00			Not Verified		To level and plant 13 acres Peach Orchard on the right bank overflow area of the Feather River	Cutoff Wall		Trees									9846	yes, cond 13	1975	Bruce Jenlins	7035 Kent Avenue, Live Oaks, CA 95953	no	no
	4.47	C	20/21	1374+33					Reach 20/21 Transition																		
61	4.10-4.38	C	20	1350+00			Not Verified		To plant peach trees and to establish two wells and install pumping plants in right bank overflow of the Feather River	Cutoff Wall		EL	OH								6380	yes, cond 5	1969	James Eager	7245 Larkin Road, Yuba City, CA 95953	no	no
62	4.10-4.38	C	20	1350+00			Not Verified		To extend 12 kv pole line parallel to the water ward toe of levee for a distance of approximately 1,500 feet north from Koch Lane, on the right bank overflow area of the Feather River/	Cutoff Wall		EL	OH								10749	yes, cond 13	1975	Pacific Gas and Electric Company	5555 Florin-Perkins Road, Sacramento, CA 95826	no	no
63	4.10	C	20	1347+37	2,208,612.74	6,666,676.45	39°13'34.454"N	121°37'45.485"W	To install a 60 foot pole 86 feet from the landward toe of the levee, a 60 foot pole 10 feet from the water ward toe of the levee and 6 additional poles on the right bank overflow of the Feather River. The 12kv electrical service will be extend across the levee to serve a pump installed under Permit 6380. The span across the levee will be 234 feet. The clearance between the overhead wires and the top of the levee will be 21 feet.	Cutoff Wall		EL	OH				89.77					6515	yes, cond 13	1969	Pacific Gas and Electric Company	5555 Florin-Perkins Road, Sacramento, CA 95826	yes	yes
64	4.10	C	20	1347+00	2,208,582.82	6,666,680.19	39°13'34.158"N	121°37'45.487"W	Underground communication cable through levee	Cutoff Wall		TL	4.0			89.58	79.98	82.33	88.93	84.39						yes	yes
65	4.00	C	20	1345+00			Not Verified		To plant prune orchard on the right bank overflow area of the Feather River, downstream from Koch Road	Cutoff Wall		Trees									9278	yes, cond 13	1974	Justin Micheli	6005 Highway 99, Live Oak, CA 95993	yes	yes
66	4.00	C	20	1345+00			Not Verified		To retain walnut orchard on the right bank overflow area of the Feather River, downstream from Koch Road	Cutoff Wall		Trees									9277	no	1974	Justin Micheli	6005 Highway 99, Live Oak, CA 95993	yes	yes
67	~~3.72~~	~~C~~	~~20~~	~~1328+10~~	~~Not Verified~~		~~Not Verified~~		~~To pump storm water from landward drainage ditch over the right bank levee of the Feather River from three separate location for approximately size at the end of Hermansen Road.~~ **~~Pipe has been removed~~**	~~Cutoff Wall~~		~~SD(P)~~									13603	yes, cond 13	1983	Justin Micheli	6005 Highway 99, Live Oak, CA 95993	no	no
68	3.71	C	20	1328+00			Not Verified		To construct a 12 kv aerial power line on the right bank overflow area of the Feather River	Cutoff Wall		EL	OH								11593, 11593A	yes, cond 13	1976	Pacific Gas and Electric Company	One Tower, Spear Tower, San Francisco, CA 94105	yes	no
69	3.71	C	20	1327+00	2,206,597.56	6,666,928.33	39°13'14.525"N	121°37'42.389"W	12KV overhead power line crossing	Cutoff Wall		EL	OH			89.71								Pacific Gas and Electric Company	One Tower, Spear Tower, San Francisco, CA 94105	yes	no
70	3.53	C	20	1317+15	Not Verified		Not Verified		Temporary storm discharge pipe through levee	Cutoff Wall	Not sure if the abandonment meets title 23 requirements. Pipe may need to be properly abandoned or completely removed. Could not find nine	SD(P)									13603		1983	Justin Micheli	6005 Highway 99, Live Oak, CA 95993	no	no
71	3.49	C	20	1315+03	2,205,398.45	6,666,943.63	39°13'02.672"N	121°37'42.272"W	End Seepage Interceptor Trench located on landside toe of levee	Cutoff Wall		SEEP									15201		1991	Levee District No. 9	1471 Coats Drive, Yuba City, CA 95991	yes	no
72	3.48	C	20	1314+80	2,205,375.80	6,666,944.25	39°13'2.438"N	121°37'42.272"W	Micheli Storm Drainage Pump Station. To install a pump with 20 Inch steel discharge pipe through the right bank of the Feather River for the removal of stormwater.	Cutoff Wall	Not sure whether pipeline meets the elevation criteria. The pipeline appears to meet title 23 requirements . Pumping could be option but not enough information available of the pump system. Should be part of 30 percent but not included	SD(P)	2.0	84.73	86.40	88.20	79.00	81.65	88.28	83.94	13657	yes, cond 13	1983	Micheli	6005 Highway 99, Live Oak, CA 95993	yes	yes
73	3.45-3.75	C	19	1312+08			Not Verified		To plant an orchard and grade the land on the right bank overflow area of the Feather River. The project is located north of Yuba City approximately 5.5miles.	Cutoff Wall		Trees									3688	no	1961	Micheli	6005 Highway 99, Live Oak, CA 95993		
73	~~3.30~~	~~C~~	~~20~~	~~1305+30~~	~~Not Verified~~		~~Not Verified~~		~~To pump storm water from landward drainage ditch over the right bank levee of the Feather River from one separate location for approximately size at the end of Hermansen Road.~~ **~~Pipe has been removed~~**	~~Cutoff Wall~~		~~SD(P)~~									13610	yes, cond 13	1983	Wilmax Farms, Inc	1857 Encinal Road, Live Oak, CA 95953	n/a	n/a
	3.18	C	19/20	1297+83					Reach 19/20 Transition																		
74	3.0-3.3	C	19	1295+00			Not Verified		To plant an orchard and grade the land on the right bank overflow area of the Feather River. The project is located north of Yuba City approximately 1.3 miles upstream (north) of the intersection of Eager Road and Live Oak Boulevard	Cutoff Wall		Trees									16298	no	1995	Timothy and Lori Filter	1010 Morse Road, Live Oak, CA 95953		
75	3.10	C	19	1293+66	2,203,266.22	6,666,867.99	39°12'41.599"N	121°37'43.329"W	End Concrete Lined Ditch on landside toe of levee	Cutoff Wall		SEEP				89.14								USACE?	1325 J Street, Sacramento, CA	yes	yes
76	3.08	C	19	1293+66	2,203,266.22	6,666,867.99	39°12'41.599"N	121°37'43.329"W	12 KV Overhead Power line crossing of levee. One pole 6 foot from levee toe.	Cutoff Wall		EL	OH			89.14					4584	yes, cond 5	1964	Pacific Gas & Electric	One Tower, Spear Tower, San Francisco, CA 94105	yes	yes
77	3.00	C	19						Begin Seepage Interceptor Trench located on landside toe of levee	Cutoff Wall		SEEP									15201	no	1991	Levee District No. 9	1471 Coats Drive, Yuba City, CA 95991	no	no
78	2.90	C	19	1284+91	2,202,406.27	6,666,705.08	39°12'33.105"N	121°37'45.443"W	Begin Concrete Lined Ditch on landside toe of levee	Cutoff Wall		SEEP				88.65								USACE?	1325 J Street, Sacramento, CA	yes	yes
79	2.56	C	19	1266+71	2,200,600.09	6,666,626.50	39°11'40.511"N	121°37'23.859"W	12KV overhead power line crossing	Cutoff Wall		EL	OH			88.28								Pacific Gas & Electric	One Tower, Spear Tower, San Francisco, CA 94105	yes	yes
80	2.54	C	19	1265+59	2,200,487.69	6,666,648.86	39°12'14.101"N	121°37'46.217"W	Sullivan Pump Station. 18 inch steel pipe through the levee. Pump and Gate valve in pump house on the channel bank. Concrete well on the bank. Siphon breaker in CMP riser on landside slope. (Sullivan Pump Station)	Cutoff Wall	The pipeline does not meet title 23 requirements and will need a positive shut-off structure installed and automatic drainage gate on waterside of levee. Pumping up and over levee does not appear to be feasible. Pump does not appear to be used any longer and could remove as part of project. Should be part of	IR(P)	18.3	70.05	71.55	88.30	78.41	81.22	87.80	82.99	pre-1955		0			yes	yes
81	1.86	C	19	1229+41	2,197,325.05	6,668,184.53	39°11'42.843"N	121°37'26.919"W	Kewall Singh IR PS. A 16 inch steel pipe through levee. Pump in pump house on channel bank. Gate valve on the waterside end. Concrete standpipe.	Cutoff Wall	The pipeline is appears to meet the elevation requirement over 200 year WSEL based on the record information. Type of pipe might not meet Title 23. We will need a positive shut-off structure installed and automatic drainage gate on waterside of levee.	IR(P)	3.0 or deeper through levee?			87.52	77.96	80.90	87.42	82.61	pre-1955		part of orig O&M 1955			yes	yes
82	1.80	C	19	1226+06	2,197,092.42	6,668,425.95	39°11'40.511"N	121°37'23.859"W	12 KV power pole located in landside slope	Cutoff Wall		EL	OH			87.29										yes	yes
		C	18/19	1213+85					Reach 18/19 Transition																		
83	1.32	~~C~~	~~18~~	~~1200+69~~	~~2,194,694.58~~	~~6,669,169.33~~	~~39°11'16.779"N~~	~~121°37'14.543"W~~	~~Abandoned 10 inch steel pipe through levee. Waterside end open. Steel Plate welded on landward end. Pump and Standpipe at the landside end.~~	~~Cutoff Wall~~	~~Not sure if the abandonment meets title 23 requirements. Pipe may need to be properly abandoned or completely removed.~~	~~IR(P)~~	~~2.8~~		84.55	87.80							removed	2011	Wilbur Rev & 1994 Trust Etal	P.O. Box 3730, Yuba City, CA 95992	yes	yes
84	1.20	C	18						12 KV power line in overflow and levee crossing north of Rednall Road	Cutoff Wall		EL	OH								11960, 11960A	yes, cond 13	1979	Pacific Gas & Electric	One Tower, Spear Tower, San Francisco, CA 94105		

LEVEE ENCROACHMENT LIST

APPENDIX A

	Levee Mile	SBFCA Phase	SBFCA Reach	SBFCA STA	Location (NAD 83) Northing	Location (NAD 83) Easting	Location (WGS 84) Latitude	Location (WGS 84) Longitude	Encroachment	Proposed Levee Improvement	Required Improvement Work	Type	cover	Elevations (NGVD 1988) Invert of Pipe	Elevations (NGVD 1988) Top of Pipe	Elevations (NGVD 1988) Top of Levee	Water Surface Elevation (NGVD 1988) 100 Yr	200 Yr	500 Yr	DWR 1957	CVFPB Permit Information Permit No.	Require Permittee to Relocate	Year	Owner Information Name	Address	verified	Picture Taken
85	0.98	C	18	1182+75	Not Verified		Not Verified		20 Inch steel pipeline through levee **(not installed) -** Plans prepared by MHM Job No. 78-158	Cutoff Wall	The pipeline is appears to meet the elevation requirement over 200 year WSEL based on the record information. Type of pipe might not meet Title 23. Could not find pipeline in the field. Should be part of 30 percent but not included.	IR(A)	3.0								12634	yes, cond 13	1979	Favero Farms	600 Rednall Road, Yuba City, CA 95991	no	no
86	0.97	C	18	1181+50	Not Verified		Not Verified		Abandoned 8 inch steel pipe through levee. Pipe plugged on the waterside toe.	Cutoff Wall	Not sure if the abandonment meets title 23 requirements. Pipe may need to be properly abandoned or completely removed. Could not find in field.	IR(A)	4.0	76.6 (USED)			77.08	80.24	86.59	81.90	pre-1955		part of orig O&M 1955			no	no
87	0.96	C	18	1180+98	2,192,727.96	6,669,163.92	39°10'57.338"N	121°37'14.737"W	3 inch steel pipe through levee crown	Cutoff Wall	The pipeline is appears to meet the elevation requirement over 200 year WSEL based on the record information. Type of pipe might not meet Title 23. Could not find pipeline in the field.	IR(?)	1.0	86.05	86.30	87.30	77.07	80.24	86.58	81.89						yes	yes
88	0.95	C	18	1180+50	Not Verified		Not Verified		One 12 inch steel pipe through levee. Pipe exposed on landside slope	Cutoff Wall	The pipeline is appears to meet the elevation requirement over 200 year WSEL based on the record information. Type of pipe might not meet Title 23. Could not find pipeline in the field.	IR(A)	1.0				77.06	80.23	86.57	81.89						no	no
89	~~0.98~~	~~C~~	~~18~~	~~1182+75~~	~~Not Verified~~		~~Not Verified~~		~~To install an irrigation pump and a buried pipeline landward over the right bank levee of the Feather River, upstream Rednall Road. **Not install per Reclamation Board**~~	~~Cutoff Wall~~		~~IR(P)~~									12634	yes, cond 13	1981	Favero Farms	600 Rednall Road, Yuba City, CA 95991	n/a	n/a
90	0.80	C	18	1174+05	2,192,034.01	6,669,096.85	39°10'50.484"N	121°37'15.605"W	Water Well and Pump 20 feet from Landside toe	Cutoff Wall						87.29										yes	yes
91	0.75	C	18	1170+04	2,191,638.99	6,669,057.61	39°10'46.581"N	121°37'16.124"W	12KV overhead power line crossing	Cutoff Wall		EL	OH			87.18								Pacific Gas and Electric Company	5555 Florin-Perkins Road, Sacramento, CA 95826	yes	yes
92	0.40	C	18	1152+55	2,189,899.09	6,668,879.71	39°10'29.390"N	121°37'18.475"W	Twin 110 KV Tower line across Feather River	Cutoff Wall		EL	OH			86.95					3365	yes, cond 4	1960	Pacific Gas and Electric Company	5555 Florin-Perkins Road, Sacramento, CA 95826	yes	yes
93	0.18	C	18	1138+22	2,188,574.27	6,668,732.99	39°10'16.301"N	121°37'20.408"W	12 KV and 40/60 KV power pole located in landside slope	Cutoff Wall		EL	OH			86.71								Pacific Gas and Electric Company	5555 Florin-Perkins Road, Sacramento, CA 95826	yes	yes
94	0.08	C	18	1135+31	2,188,188.41	6,668,676.43	39°10'12.536"N	121°37'21.138"W	16 inch gas line through the levee. Marker post on the waterside shoulder	Cutoff Wall	The pipeline is appears to meet the elevation requirement over 200 year WSEL based on the record information. Type of pipe might not meet Title 23. We will need a positive shut-off structure installed and automatic drainage gate on waterside of levee.	GL	3.5			86.50	76.15	79.58	85.73	81.27				Pacific Gas and Electric Company	5555 Florin-Perkins Road, Sacramento, CA 95826	yes	yes
95	16.52-16.65 and 0.00-0.10	C	17	1133+00			Not Verified		To construct 1,180 feet of 12 kv line in the right bank overflow area of the Feather River	Cutoff Wall		EL	OH								12750	yes, cond. 13	1979	Pacific Gas and Electric Company	5555 Florin-Perkins Road, Sacramento, CA 95826	no	no
		C	18	1132+61					Levee District No. 1 Levees /Levee District No. 9 Transition																		
1	16.65	C	18	1132+09	2,187,967.19	6,668,647.98	39°10'09.827"N	121°37'21.468"W	8-5/8" steel pipeline within railroad right-of-way parallel to tracks	Cutoff Wall	The pipeline is appears to meet the elevation requirement over 200 year WSEL based on the record information. Type of pipe might not meet Title 23. We will need a positive shut-off structure installed and automatic drainage gate on waterside of levee.	GL				84.80	76.09	79.54	85.67	81.07	3823	yes, cond 5	1961	Southern Pacific Pipe Line Co.	610 South Main Street, Los Angeles, CA	yes	yes
2	16.65	C	18	1131+82	2,187,840.25	6,668,647.20	39°10'09.827"N	121°37'21.468"W	Fiber optic warning sign	Cutoff Wall	The fiber optic most likely does not meet the elevation requirement over 200 year WSEL becuase the cable appears to run adjacent to rail which is barely above the 200 year. Type of wire might not meet Title 23.	TL				84.80	76.09	79.54	85.67	81.07						yes	yes
		C	17/18	1130+86					Reach 17/18 Transition																		
3	16.65	C	17	1130+47	2,187,705.38	6,668,643.93	39°10'07.716"N	121°37'21.585"W	Union Pacific Railroad Crossing. There is no stop log structure.	Cutoff Wall	The railroad crossing does not include any structure. There is not a stop log structure and is simply a low area within the levee.	RR	6.0			81.32								Union Pacific RR	1400 Douglas Stop #1640, Omaha, NE 68179	yes	yes
4	16.60	C	17	1128+00			Not Verified		To construct a ramp on the waterside slope of the right bank levee on the Feather River adjacent to the SPRR.	Cutoff Wall		Struc									10525	yes, cond. 13	1975	Keith Boone	P.O. Box 95, Live Oak, CA 95953	no	no
5	16.60	C	17	1127+48	2,187,405.84	6,668,629.29	39°10'04.756"N	121°37'21.787"W	Village Green Trailer Park - To install a 10 inch outfall pipe through the right bank levee of the Feather River to provide storm drainage for a mobile home park.	Cutoff Wall	Not sure whether pipeline meets the elevation criteria or title 23 requirements but newer permit . Pumping could be option but not enough information available of the pump system.	SD(P)				87.90	76.02	79.48	85.59	81.01	13754	yes, cond 13	1984	Village Green Mobile Homes Park c/o Sargent and Morton	1155 Pease Road, Yuba City, CA 95991-8814	yes	yes
6	16.56	C	17	1125+00			Not Verified		To retain an existing irrigation well in the right bank overflow area of the Feather River.	Cutoff Wall		Well									12759	yes, cond. 13	1979	DiFiore Ranches	5028 Carlson Road, Yuba City, CA 95991	no	no
7	16.29	C	17	1111+46	2,185,808.02	6,668,723.59	39°09'48.957"N	121°37'20.672"W	North Yuba City Drainage Area. 16 Inch welded steel 7 GA asphalt coated storm drain discharge pipe over levee connected to 24 inch pipe in overflow area, outfall ditch, and pipes in floodway	Cutoff Wall	The pipeline is appears to meet the elevation requirement over 200 year WSEL based on the record information and type of pipe might appears to meet Title 23. Appears no work required. We have as-built drawings.	SD(P)	1.1	83.17	84.50	85.60	75.75	79.21	85.29	80.77	14420	no	1986	City of Yuba City	1201 Civic Center Blvd., Yuba City, CA 95991	yes	yes
8	16.20	C	17	1107+82	2,185,444.63	6,668,754.75	39°09'45.365"N	121°37'20.297"W	12 KV crossing & power pole located in landside slope	Cutoff Wall		EL	OH			86.09								Pacific Gas & Electric	One Tower, Spear Tower, San Francisco, CA 94105	yes	yes
9	16.01	C	17				39°09'35.29"N	121°37'15.71"W	To install an intertie to an existing waste water line and abandon approximately 40 feet of 24 inch diameter pipe on the right bank of the Feather River.	Cutoff Wall		RW(P)	4.0								15331	no	1989	City of Yuba City	1201 Civic Center Blvd., Yuba City, CA 95991	yes	yes
10	16.01	C	17	1096+81	2,184,404.96	6,669,131.69	39°09'35.073"N	121°37'15.566"W	Yuba City Water Treatment Plant 28" (29 25/32" OD) 7 GA welded steel waterline pipe crossing of levee. New permit included installation of automatic drainage gates on pipelines. (copy of record drawings)	Cutoff Wall	The pipeline is appears to meet the elevation requirement over 200 year WSEL based on the record information and type of pipe might appears to meet Title 23. Appears no work required. We have as-built drawings.	RW(P)	5.0	81.05 rd	83.6 est	87.70	75.61	79.08	85.16	80.62	5758 & 6016 & 13957 & 13593 & 15330	yes, cond 13	1967 & 1968 & 1984 & 1983 & 1989	City of Yuba City	1201 Civic Center Blvd., Yuba City, CA 95991	yes	yes
11	16.01	C	17	1096+71	2,184,406.70	6,669,130.73	39°09'35.090"N	121°37'15.578"W	Yuba City Water Treatment Plant 24" 7 GA welded steel waterline pipe crossing of levee. New permit included installation of automatic drainage gates on pipelines. (copy of record drawings)	Cutoff Wall	The pipeline is appears to meet the elevation requirement over 200 year WSEL based on the record information and type of pipe might appears to meet Title 23. Appears no work required. We have as-built drawings.	RW(P)	4.7	81.80 rd	83.8 est	87.80	75.61	79.08	85.16	80.62	5758 & 6016 & 13957 & 13593 & 15330	yes, cond 13	1967 & 1968 & 1984 & 1983 & 1989	City of Yuba City	1201 Civic Center Blvd., Yuba City, CA 95991	yes	yes
12	16.01	C	17	1096+62	2,184,416.62	6,669,124.90	39°09'35.189"N	121°37'15.652"W	Yuba City Water Treatment Plant 42"cement mortar lined and coated welded steel pipe waterline crossing of levee (copy of record drawings)	Cutoff Wall	The pipeline is appears to meet the elevation requirement over 200 year WSEL based on the record information and type of pipe might appears to meet Title 23. Appears no work required. We have as-built drawings.	RW(P)	2.5	82.50 rd	86.1 est	88.40	75.61	79.08	85.16	80.61	17977	yes, cond 28	2005	City of Yuba City	1201 Civic Center Blvd., Yuba City, CA 95991	yes	yes
13	16.00	C	17	1096+74	2,184,416.62	6,669,124.90	39°09'35.189"N	121°37'15.652"W	To install a 12 kv aerial pole line extension across the right bank levee of the Feather River. The pole line shall serve the Yuba City Water treatment Plant intake pump station	Cutoff Wall		EL	OH			88.30					6067	yes, cond 5	1968	Pacific Gas & Electric	One Tower, Spear Tower, San Francisco, CA 94105	yes	yes
		C	16/17	1080+00					Reach 16/17 Transition																		
14	15.68	C	16	1079+91	2,183,133.99	6,670,212.82			8 inch Gas Line	Flatten Waterside Slope	The pipeline is appears to meet the elevation requirement over 200 year WSEL based on the record information and type of pipe may or may not meet Title 23. Appears no work required but need to	GL	3.5				75.51	78.99	85.03	80.36				Pacific Gas & Electric	One Tower, Spear Tower, San Francisco, CA 94105	yes	yes
15	15.56	C	16	1073+41	2,182,671.85	6,670,670.15	39°09'17.878"N	121°36'56.126"W	16 inch Gas Line (PG&E Map shows the gas main as 12 inch)	Flatten Waterside Slope	The pipeline is appears to meet the elevation requirement over 200 year WSEL based on the record information and type of pipe may or may not meet Title 23. Appears no work required but need to	GL	3.5			85.65	75.51	78.99	85.03	80.21				Pacific Gas & Electric	One Tower, Spear Tower, San Francisco, CA 94105	yes	yes
16	15.15	C	16	1054+75	2,181,074.23	6,671,588.96	39°09'02.048"N	121°36'44.548"W	Telephone Call box on landside hinge point	Flatten Waterside Slope		TL				86.66										yes	yes
17	14.98	C	16	1043+52	not verified		not verified		Abandon 36 inch pipe	Flatten Waterside Slope	Not sure if the abandonment meets title 23 requirements. Pipe may need to be properly abandoned or completely removed.	SS(A)									pre-1955		part of orig O&M 1955			no	no

LEVEE ENCROACHMENT LIST

APPENDIX A

	Levee Mile	SBFCA Phase	SBFCA Reach	SBFCA STA	Location (NAD 83) Northing	Location (NAD 83) Easting	Location (WGS 84) Latitude	Location (WGS 84) Longitude	Encroachment	Proposed Levee Improvement	Required Improvement Work	Type	cover	Elevations (NGVD 1988) Invert of Pipe	Top of Pipe	Top of Levee	Water Surface Elevation (NGVD 1988) 100 Yr	200 Yr	500 Yr	DWR 1957	CVFPB Permit Information Permit No.	Require Permittee to Relocate	Year	Owner Information Name	Address	verified	Picture Taken
18	14.98	C	16	1043+52	2,180,149.57	6,672,223.24			Abandoned 27 inch Centrifugal Spun Concrete Pipe. City of Yuba City Drawing 214-D per 1949 plans	Flatten Waterside Slope	Not sure if the abandonment meets title 23 requirements. Pipe may need to be properly abandoned or completely removed.	SS(A)	38.6	45.45	47.70	86.30	75.17	78.56	84.45	79.61	pre-1955	no	1949	City of Yuba City	1120 Civic Center Blvd., Yuba City, CA 95991	no	no
19	14.98	C	16	1043+45	2,180,137.11	6,672,230.51	39°08'52.758"N	121°36'36.455"W	To install a 36 Inch discharge pipe through right bank of Feather River.	Flatten Waterside Slope	Not sure if the pipeline meets the elevation requirement over 200 year WSEL. The type of pipe may or may not meet Title 23. Need to pothole to verify. Working on obtaining as-built drawings.	SD(P)	5.0	80.0 rd	83.0 rd	86.40	75.17	78.56	84.45	79.61	13930	yes, cond 13	1984	Gilsizer Drainage County Drainage District	701 Bogue Road, Yuba City, CA 95991	yes	yes
20	14.98	C	16	1043+27	2,180,126.23	6,672,235.13			To install a 24 inch wrapped steel pipe through the right bank levee of the Feather River	Flatten Waterside Slope	Not sure if the pipeline meets the elevation requirement over 200 year WSEL. The type of pipe may or may not meet Title 23. Need to pothole to verify. Working on obtaining as-built drawings.	SD(P)	2.0	81.3 rd	83.0 rd	86.30	75.17	78.56	84.45	79.61	12074	yes, cond 13	1977	Gilsizer Drainage County Drainage District	701 Bogue Road, Yuba City, CA 95991	yes	yes
21	14.98	C	16	1043+22	2,180,121.72	6,672,237.88	39°08'52.605"N	121°36'36.362"W	To construct a 24 inch steel pipe storm drainage discharge pipe crossing the west levee of the Feather River	Flatten Waterside Slope	Not sure if the pipeline meets the elevation requirement over 200 year WSEL. The type of pipe may or may not meet Title 23. Need to pothole to verify. Working on obtaining as-built drawings.	SD(P)	4.0	81.3 rd	83.3 rd	86.20	75.17	78.56	84.45	79.61	7019	yes, cond 5	1970	Gilsizer Drainage County Drainage District	701 Bogue Road, Yuba City, CA 95991	yes	yes
22	14.98	C	16	1043+03	2,180,106.36	6,672,244.70	39°08'52.453"N	121°36'36.276"W	Gilsizer Slough Storm Drain Facilities. A 16 inch welded steel discharge pipe crossing of levee. (copy of record drawings)	Flatten Waterside Slope	The pipeline is appears to meet the elevation requirement over 200 year WSEL based on the record information and type of pipe appears to meet Title 23. The cover over pipe is questionable. Appears no work required but need to pothole to verify.	SD(P)	1.3	83.30 rd	84.7 est	85.90	75.17	78.56	84.44	79.61	3112	yes, cond 4	1959	City of Yuba City	1201 Civic Center Blvd., Yuba City, CA 95991	yes	yes
23	14.88	~~C~~	~~16~~	~~1037+50~~	~~Not Verified~~		~~Not Verified~~		~~Abandoned 8 inch gas line through levee. Removed per Permit 1445A~~	~~Flatten Waterside Slope~~	~~Not sure if the abandonment meets title 23 requirements. Pipe may need to be properly abandoned or completely removed.~~	~~GL~~					75.08	78.46	84.30	79.41	pre-1955 (installed) and 1445A (removed)	yes, cond 13	part of orig O&M 1955 and 1974 (abandon)	Pacific Gas & Electric	One Tower, Spear Tower, San Francisco, CA 94105	no	no
24	14.43-15.26	C	16						4,400 lineal feet of Blanket Drain on landside slope of levee starting approx 0.20 miles downstream of 10th Street Bridge extending north	Flatten Waterside Slope											15034		1988	Levee District No. 1	243 Second Street, Yuba City, CA 95991	no	no
25	14.67	C	16	1028+11	2,178,636.47	6,672,461.02	39°08'37.915"N	121°36'33.611"W	Power pole in waterside slope	Flatten Waterside Slope		EL				82.67										yes	yes
26	14.73	C	16	1029+10	2,179,608.80	6,672,356.03	39°08'47.530"N	121°36'34.890"W	To bury existing two submarine telephone cables into two parallel trenches 100 feet apart in the channel of the Feather River. Both cables were installed per Permit 1334 in September 15, 1948.	Flatten Waterside Slope		TL	5.0			84.71					1334 and 11851	yes, cond. 13	1948 and 1977	Pacific Telephone and Telegraph Company	1426 Howe Avenue, Suite 50, Sacramento, CA 95825	yes	yes
27	14.71	C	16	1028+10	2,179,506.59	6,672,370.16	39°08'46.519"N	121°36'34.717"W	To bury existing two submarine telephone cables into two parallel trenches 100 feet apart in the channel of the Feather River. Both cables were installed per Permit 1334 in September 15, 1948.	Flatten Waterside Slope		TL	2.0			84.77					1334 and 11851	yes, cond. 13	1948 and 1977	Pacific Telephone and Telegraph Company	1426 Howe Avenue, Suite 50, Sacramento, CA 95825	yes	yes
28	14.68	C	16	1026+71	21,784,783.54	6,672,514.29	39°08'36.643"N	121°36'33.928"W	10" Drain line in levee water side slope for bridge area drainage	Flatten Waterside Slope	Not sure if the conduit meets the elevation requirement over 200 year WSEL. The type of conduit may or may not meet Title 23 but it is newer encroachment permit. Need to pothole to verify.	TL				89.72					16995					yes	yes
29	14.64	C	16	1026+58	2,178,488.35	6,672,429.49	39°08'36.452"N	121°36'34.019"W	40 foot long retaining wall landside of levee just upstream of the Feather River Bridge	Flatten Waterside Slope		Road									15133	no	1988	Levee District No. 1	243 Second Street, Yuba City, CA 95991	yes	yes
30	14.63	C	16	1026+22	2,178,451.96	6,672,425.20	39°08'36.093"N	121°36'34.075"W	Feather River Bridge (SR 20) upstream side	Flatten Waterside Slope		Bridge				94.25					pre-1955			Caltrans		yes	yes
31	14.62	C	16	1025+32	2,178,375.92	6,672,443.76	39°08'35.340"N	121°36'33.844"W	Feather River Bridge (SR 20) downstream side	Flatten Waterside Slope		Bridge				93.90					pre-1955			Caltrans		yes	yes
32	14.62	C	16						Seismic Retro of Feather River Bridge	Flatten Waterside Slope		Bridge									16324		1995	Caltrans			
33	14.62	C	16	1024+95	2,178,319.03	6,672,456.34	39°08'34.777"N	121°36'33.687"W	12 kv power line across levee	Flatten Waterside Slope		EL	OH			88.17										yes	yes
34	14.61	C	16	1024+70			Not Verified		Backfill Community Swimming Pool located near the base of the Feather River Bridge (10th Street Bridge)	Flatten Waterside Slope											7599	yes, cond 13	1971	City of Yuba City	1201 Civic Center Blvd., Yuba City, CA 95991	no	no
35	14.60	C	16	1024+48	2,178,296.55	6,672,470.53	39°08'34.556"N	121°36'33.508"W	40 foot long retaining wall landside of levee just downstream of the Feather River Bridge	Flatten Waterside Slope		Road									15133	no	1988	Levee District No. 1	243 Second Street, Yuba City, CA 95991	yes	yes
36	14.56	C	16	1021+95	2,178,044.07	6,672,487.29	39°08'32.058"N	121°36'33.310"W	12 kv power line across levee	Flatten Waterside Slope		EL	OH			84.48								Pacific Gas & Electric	One Tower, Spear Tower, San Francisco, CA 94105	yes	yes
37	14.55	C	16				Not Verified		Telephone line on river slope of levee 260 feet downstream of Feather River Bridge (10th Street Bridge)	Flatten Waterside Slope		TL									2703		1957	AT&T			
38	14.55	C	16	1020+85	Not Verified		Not Verified		Abandon 4 inch pipe	Flatten Waterside Slope	Not sure if the abandonment meets title 23 requirements. Pipe may need to be properly abandoned or completely removed.		1.3	77.72			74.85	78.16	83.90	78.75						yes	yes
39	14.52	C	16	1020+30	2,177,879.35	6,672,496.38	39°08'30.430"N	121°36'33.203"W	Telephone Call box on waterside hinge point	Flatten Waterside Slope		TL				84.09										yes	yes
40	14.51	C	16	1019+82	2,177,832.15	6,672,504.71	39°08'29.963"N	121°36'33.100"W	Power pole in waterside slope	Flatten Waterside Slope		EL	OH			84.09										yes	yes
41	14.43 to 15.26	C	16	1013+00			Not Verified		To place approximately 4,000 feet of blanket drain and filter trench on the right bank of levee of the Feather River upstream and downstream of the SR 20 Bridge	Flatten Waterside Slope		Struc									15034	no	1988	Levee District No. 1	243 Second Street, Yuba City, CA 95991	yes	yes
42	14.36	C	16	1010+75	2,176,773.87	6,672,930.97	39°08'19.484"N	121°36'27.747"W	Install Guy within in landside slope of levee, 12 kV overhead electric	Flatten Waterside Slope		EL				85.00					2640	yes, cond 4	1957	Pacific Gas & Electric	One Tower, Spear Tower, San Francisco, CA 94105	yes	yes
43	14.30	C	16	1008+38	2,176,779.63	6,672,929.15			12 kv power line across levee	Flatten Waterside Slope		EL	OH			84.62								Pacific Gas & Electric	One Tower, Spear Tower, San Francisco, CA 94105	yes	yes
44	14.60-14.79	C	16	1007+50			Not Verified		To construct approximately 1,300 feet of 12 foot wide bicycle trail on the crown of the right bank levee of the Feather River. The Project is located in Yuba City between the 5th Street Bridge and the easterly extension of Teagarden Avenue	Flatten Waterside Slope		Struc									16344	no	1995	County of Yuba	915 8th Street, Suite 125, Marysville, CA 95901	no	no
45	14.30	C	16						Bike Path below Twin Cities Memorial Bridge	Flatten Waterside Slope		Road									16235		1992	City of Yuba City and City of Marysville	1201 Civic Center Blvd., Yuba City, CA 95991	yes	yes
46	14.30	C	16	1007+51	2,176,709.34	6,672,981.09	39°08'18.844"N	121°36'27.115"W	Twin Cities Memorial Bridge upstream side	Flatten Waterside Slope		Bridge				87.92					2481	yes, cond 4	1957	County of Sutter and Yuba	1120 Civic Center Blvd., Yuba City, CA 95991	yes	yes
47	14.30	C	16	1007+46	2,176,706.50	6,672,984.37	39°08'18.816"N	121°36'27.073"W	Light pole in water side levee slope	Flatten Waterside Slope		EL	OH											City of Yuba City	1201 Civic Center Blvd., Yuba City, CA 95991	yes	yes
48	14.30	C	16	1007+06	2,176,671.72	6,673,005.93	39°08'18.471"N	121°36'26.801"W	Twin Cities Memorial Bridge downstream side	Flatten Waterside Slope		Bridge				87.99					2481	yes, cond 4	1957	County of Sutter and Yuba	1120 Civic Center Blvd., Yuba City, CA 95991	yes	yes
49	14.30	C	16	1006+93	2,176,642.84	6,672,995.25	39°08'18.186"N	121°36'26.939"W	Power line and Anchor in Levee (actual location)	Flatten Waterside Slope		EL				87.92					2367		1957	Pacific Gas & Electric	One Tower, Spear Tower, San Francisco, CA 94105	yes	yes
50	14.28	C	16	1006+60	2,176,647.27	6,673,046.63	39°08'18.228"N	121°36'26.286"W	Sacramento Northern Railroad	Flatten Waterside Slope		RR				86.76					pre-1955		part of orig O&M 1955	Union Pacific Railroad	1400 Douglas Stop #1640, Omaha, NE 68179	yes	yes
51	14.28	C	16	1006+07	2,176,610.55	6,673,084.90	39°08'17.863"N	121°36'25.803"W	Power Pole and anchor in slope of levee. 100 feet south of the SNRR bridge w/ service power overhead	Flatten Waterside Slope		EL	OH			84.44					2475		1957	Pacific Gas & Electric	One Tower, Spear Tower, San Francisco, CA 94105	yes	yes
52	14.25	C	16	1005+80			Not Verified		Authorize concrete steps ad 4 inch diameter PVC pipe on the landward slope and a pump house within 10 feet of the landward toe.	Flatten Waterside Slope											16450	yes. Cond 15	1996	City of Yuba c/o Parks and Recreation	1201 Civic Center Blvd., Yuba City, CA 95991	no	no
53	14.28	C	16	1003+72	2,176,461.52	6,673,266.98	39°08'16.382"N	121°36'23.500"W	Power Pole and anchor in slope of levee. 300 feet south of the SNRR bridge	Flatten Waterside Slope		EL	OH			83.28								Pacific Gas & Electric	One Tower, Spear Tower, San Francisco, CA 94105	yes	yes

LEVEE ENCROACHMENT LIST

APPENDIX A

					Location (NAD 83)		Location (WGS 84)						Elevations (NGVD 1988)			Water Surface Elevation (NGVD 1988)				CVFPB Permit Information			Owner Information				
	Levee Mile	SBFCA Phase	SBFCA Reach	SBFCA STA	Northing	Easting	Latitude	Longitude	Encroachment	Proposed Levee Improvement	Required Improvement Work	Type	cover	Invert of Pipe	Top of Pipe	Top of Levee	100 Yr	200 Yr	500 Yr	DWR 1957	Permit No.	Require Permittee to Relocate	Year	Name	Address	verified	Picture Taken
54	14.22	C	16	1000+55			Not Verified		City of Yuba City. To replace the existing retaining wall with an 8 foot high, 76 foot long concrete retaining wall on the landside of the right (east) bank levee of Feather River.	Flatten Waterside Slope											16844	yes. Cond 27	1998	City of Yuba c/o Parks and Recreation	1201 Civic Center Blvd., Yuba City, CA 95993	no	no
55	14.23	C	16				Not Verified		Authorize a 3-wire barded wire fence and two mature trees at the landward toe. The project is located at 563 Second Street	Flatten Waterside Slope											16449	yes. Cond 18	1996	Levee District No. 1	430 Second Street, Yuba City, CA 95991	no	no
56	14.17	C	16				Not Verified		Authorize a 3-wire barded wire fence with a gate within 5 feet of the levee toe and two mature trees at the landward toe. The project is located on Keyser Street	Flatten Waterside Slope											16448	yes. Cond 17	1996	Levee District No. 1	430 Second Street, Yuba City, CA 95991	no	no
57	14.13	C	16				Not Verified		Authorize a 120 foot long building at the landward toe	Flatten Waterside Slope											16447	no	1996	Rodney and Eleanor Fletcher	511 Second Street, Yuba City, CA 95991	no	no
58	14.04	C	16				Not Verified		To excavate 25 feet into landward side of the right bank of the Feather River and construct a concrete retaining wall to provide parking lot space. The project is located at 463 2nd Street behind the Sutter County Administration Building/	Flatten Waterside Slope		Struc									13951 and 13951 (revised)	yes. Cond 13 (original) and no (revised)	1984 & 1996 (revised)	County of Sutter	1160 Civic Center Boulevard, Yuba City, CA 95993	no	no
59	14.01	C	16	993+50			Not Verified		Authorize a building near the landward toe of the levee.	Flatten Waterside Slope											16446	yes. Cond 16	1996	Dolores Scott	160 C Street, Yuba City, CA 95991	no	no
60	13.84-14.01	C	16	993+56			Not Verified		To install approximately 1,010 feet of 8 foot high chain link fence on the waterside side of the right bank levee of the Feather River.	Flatten Waterside Slope											16499	no	1997	Levee District No. 1	430 Second Street, Yuba City, CA 95991	no	no
61	13.98	C	16				Not Verified		Authorize a shed, concrete wall, and chain-link fence with gate at landward toe. The permit also covers two steel posts on the shoulder and seventeen mature trees on the landward slope	Flatten Waterside Slope											16445	yes. Cond 18	1996	Joe and Patricia Benatar	423 Second Street, Yuba City, CA 95991	no	no
62	13.96	C	16				Not Verified		Authorize a shed at the landward toe	Flatten Waterside Slope											16444	yes. Cond 16	1996	Lois Murphy Brown	413 Second Street, Yuba City, CA 95991	no	no
63	13.95	C	16				Not Verified		Authorize a two-story garage and shop building at the landward toe and six mature trees on the landward slope	Flatten Waterside Slope											16443	no	1996	Marjorie Von Geldern	407 Second Street, Yuba City, CA 95991	no	no
64	13.94	C	16				Not Verified		Authorize a building at the landward toe and 21 mature trees and sprinkler system on the landward slope.	Flatten Waterside Slope											16442	no	1996	Max and Sandra McClendon	379 Second Street, Yuba City, CA 95991	no	no
65	13.93	C	17	988+05	2,175,065.02	6,673,942.87			3 inch steel pipe, does not appear to cross levee anymore	Cutoff Wall	Not sure if the abandonment meets title 23 requirements. Pipe may need to be properly abandoned or completely removed.						74.40	77.54	82.89	78.21				unknown		no	no
66	13.93	C	16				Not Verified		Authorize a garage and a shed at the landward toe	Flatten Waterside Slope											16441	yes. Cond 16	1996	Howard and Raona Hall	373 Second Street, Yuba City, CA 95991	no	no
67	13.91	C	16				Not Verified		Authorize a small building, a chain-link fence, four mature trees at the landward toe, and five clumps of oleanders on the landward slope.	Flatten Waterside Slope											16440	yes. Cond 20	1996	Est. James Barr	365 Second Street, Yuba City, CA 95991	no	no
68	13.90	C	16				Not Verified		Authorize a small building and a chain link fence on an existing retaining wall at the landward toe, concrete stairs, a steel pipe frame, and two large mature trees on the landward slope. A hose bib on the landward shoulder of the right bank of levee.	Flatten Waterside Slope											16439	no	1996	Mark Poole	355 Second Street, Yuba City, CA 95991	no	no
69	13.88	C	16				Not Verified		Authorize a see-through fence on a 5 foot retaining wall, steps, and nine mature trees on the landward slope.	Flatten Waterside Slope											16438	yes. Cond 20	1996	Charles and Jean Sanders	349 Second Street, Yuba City, CA 95991	no	no
70	13.87	C	16				Not Verified		Authorize concrete steps with railing and pomegranate bush on landward slope. The permit also covers a concrete retaining wall at the landward toe.	Flatten Waterside Slope											16437	yes. Cond 16	1996	Theodore and Mary Wilkins	341 Second Street, Yuba City, CA 95991	no	no
71	13.86	C	16				Not Verified		Authorize Chain Link fence with gate, three oleander trees, and steps within the landward slope.	Flatten Waterside Slope											16436	yes. Cond 18	1996	Glenn and Jean Koball	335 Second Street, Yuba City, CA 95991	no	no
72	13.84	C	16				Not Verified		Authorize Chain Link fence with gate, three oleander trees, and steps within the landward slope.	Flatten Waterside Slope											16435	yes. Cond 21	1996	Steve and Nancy Albrecht	329 Second Street, Yuba City, CA 95991	no	no
73	13.81	C	16				Not Verified		Authorize building, barbed wire fence, and ten trees at landward toe	Flatten Waterside Slope											16434	yes. Cond 21	1996	Dennis Coakley	306 West 24th Avenue, San Mateo, CA 94403	no	no
74	13.77	C	16				Not Verified		Authorize a 60 foot long see-through board fence and 75 foot long clothesline and landward toe. A shed 5 feet from landward toe and a mature oak tree on the landward slope	Flatten Waterside Slope											16433	yes. Cond 17	1996	Ronald Souza	1550 Elizabeth Lane, Yuba City, CA 95993	no	no
75	13.76	C	16				Not Verified		Authorize a chain-link fence with gate within 10 feet of landward toe	Flatten Waterside Slope											16432	yes. Cond 19	1996	Stevenson Family Trust	459-1/2 Palora Avenue, Yuba City, CA 95991	no	no
76	13.75	C	16				Not Verified		Authorize a see-through fence and storage shed within 10 feet of the landward toe. The project is located at 265 Second Street, Yuba City, CA	Flatten Waterside Slope											16431	yes. Cond 17	1996	Margaret Kellett	265 Second Street, Yuba City, CA 95991	no	no
77	13.74	C	16				Not Verified		Authorize a see-through fence and storage shed within 5 feet of the landward toe. The project is located at 261 Second Street, Yuba City, CA	Flatten Waterside Slope											16430	yes. Cond 19	1996	Ernest Sandoval	22301 Dersch Road, Anderson, CA 96007	no	no
78	13.73	C	16				Not Verified		Authorize a Chain Link fence with gate within 5 feet of landward toe, a cedar tree at the landward toe, and stone steps on the landward slope. This project is located at 255 Second Street.	Flatten Waterside Slope											16429	yes. Cond 17	1996	Teresa Filby	2072 Sanborn, Yuba City, CA 95993	no	no
79	13.68	C	16				Not Verified		Authorize a shed and three trees at the landward toe of the right bank levee of the Feather River. The project is located at 225 Second Street, Yuba City, CA 95591	Flatten Waterside Slope											16428	no	1996	Minnie and Marvin Cole	2061 Royo Rancho Road, Yuba City, CA 95993	no	no
80	13.67	C	16				Not Verified		Authorize a 6 foot high chain link fence and gate at the right bank levee of the Feather River	Flatten Waterside Slope											16427	yes. Cond 17	1996	Dossie and Wanda Smith	219 Second Street, Yuba City, CA 95991	no	no
81	13.65	C	16				Not Verified		Authorize a residence within 5 feet of the landward toe	Flatten Waterside Slope											16426	yes. Cond 16	1996	Ronald Brockman	209 Second Street, Yuba City, CA 95991	no	no
82	13.64	C	16				Not Verified		Authorize a residence at landward toe and oak on the landward slope	Flatten Waterside Slope											16425	no	1996	Carl and Sandra Stout	201 Second Street, Yuba City, CA 95991	no	no
83	13.55	C	16	975+00			Not Verified		To construct a restroom facility with septic tank and leach lines at the Yuba City Boat Ramp on the right bank of the Feather River.	Flatten Waterside Slope											10967	yes, cond 13	1976	County of Sutter	1160 Civic Center Blvd., Suite D, Yuba City, CA 95993		
84	13.53	C	16	972+00			Not Verified		To construct improvement for the boat launching ramp and related facilities on the right bank of the Feather River.	Flatten Waterside Slope											2623	yes, cond 4	1957	Department of Fish and Game		no	no
85	13.53	C	16	972+00			Not Verified		To construct improvement for the Yuba City Boat Ramp consisting of a paved parking area, restroom facilities, floating boat dock and extension of concrete boat ramp on the right bank of the Feather River	Flatten Waterside Slope											5741, 11989	no	1991	County of Sutter	1160 Civic Center Blvd., Suite D, Yuba City, CA 95993		
86	13.53	C	16	972+00			Not Verified		To reconstruct an existing access road to the Yuba-Sutter Boat Ramp on the right bank of the Feather River	Flatten Waterside Slope											9294	yes, cond 13	1974	County of Sutter	1160 Civic Center Blvd., Suite D, Yuba City, CA 95993		
87	13.53	C	16	972+00			Not Verified		To maintain and operate existing boat dock for public use for boating, fishing, and a campground with related facilities including a mobile home on the right bank of the Feather River.	Flatten Waterside Slope											10830, 15741	yes, cond 13	1978	William Baldner	80 2nd Street, Yuba City, CA 95991		
		C	15/16	968+50					Reach 15/16 Transition																		
88		C	15	968+00			Not Verified		To construct 120 lineal feet of sheet piles retaining wall, and nine 10 x 10 foot boat docks supported by seven 12 inc diameter steel piles to an existing 30 foot wide ramp (Yuba City Boat Ramp)	Cutoff Wall	Located within floodway. Does not affect levee project.										17230	yes. Cond 26	2000	County of Sutter	1160 Civic Center Boulevard, Yuba City, CA 95993		
		C	14/15	954+40					Reach 14/15 Transition																		
89		C	14				Not Verified		12 kv cable	No Rehabilitation Required																	

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	Levee Mile	SBFCA Phase	SBFCA Reach	SBFCA STA	Northing	Easting	Latitude	Longitude	Encroachment	Proposed Levee Improvement	Required Improvement Work	Type	cover	Invert of Pipe	Top of Pipe	Top of Levee	100 Yr	200 Yr	500 Yr	DWR 1957	Permit No.	Require Permittee to Relocate	Year	Name	Address	verified	Picture Taken
		C	13/14	927+00					Reach 13/14 Transition																		
90	12.50-13.07	C	15	925+00			Not Verified		To construct access ramps	Cutoff Wall	Located within floodway. Does not affect levee project.										7460A		1974	County of Sutter	1160 Civic Center Boulevard, Yuba City, CA 95993		
90	12.51	C	13	913+19	2,168,046.21	6,673,496.81	39°06'53.190"N	121°36'21.046"W	Two 16 inch gas lines. (PG&E map shows the gas lines as 12 inch)	Cutoff Wall and relief wells at 200 foot and 65 feet deep	The pipeline is appears to meet the elevation requirement over 200 year WSEL based on the record information and type of pipe might appears to meet Title 23. Appears no work required.	GL	3.0			82.00	72.16	75.17	80.17	77.14				Pacific Gas & Electric	One Tower, Spear Tower, San Francisco, CA 94105	yes	yes
91	12.15	C	13	894+23	2,166,221.70	6,673,147.49	39°06'35.171"N	121°36'25.578"W	To install a 12kv buried power cable through the right bank levee and across the right bank overflow of the Feather River, a total distance of 896 feet. Poles will be installed near the top of the banks of the low water channel and aerial cable will be placed between the two poles which will be connected to the underground cable	Cutoff Wall and relief wells at 200 foot and 65 feet deep		EL	UG								12407	yes, cond. 13	1978	Pacific Gas and Electric Company	One Tower, Spear Tower, San Francisco, CA 94105	no	no
92	12.14	C	13	893+84	2,166,181.41	6,673,142.43	39°06'34.772"N	121°36'25.614"W	Garden Highway Industrial Park. To install a 12 inch steel storm drain pipeline through the right bank levee of the Feather River	Cutoff Wall and relief wells at 200 foot and 65 feet deep	The pipeline is appears to meet the elevation requirement over 200 year WSEL based on the record information and type of pipe might appears to meet Title 23. Appears no work required. We have as-built drawings	SD(P)	3.3	77.70	78.70	82.00	71.72	74.77	79.80	76.93	12827	yes, cond. 13	1979	City of Yuba City	1201 Civic Center Blvd., Yuba City, CA 95991	yes	yes
93	12.12	C	13	893+78	2,166,175.45	6,673,142.43	39°06'34.772"N	121°36'25.614"W	Burns Drive Storm Water Pump Station. 16 inch steel storm drain discharge pipe through levee.	Cutoff Wall and relief wells at 200 foot and 65 feet deep	The pipeline is appears to meet the elevation requirement over 200 year WSEL based on the record information and type of pipe might appears to meet Title 23. Appears no work required. We have as-built drawings	SD(P)	2.7	77.97	79.30	82.00	71.72	74.77	79.80	76.93	15863	?	1992	City of Yuba City	1201 Civic Center Blvd., Yuba City, CA 95991	yes	yes
94	11.90	C	13	881+41	2,164,942.19	6,673,036.13	39°06'22.535"N	121°36'27.067"W	Levee District No. 1 Relief Well Pump Station 6" and 14" pipes located just southeast of the Waste Water Treatment Plant	Cutoff Wall and relief wells at 200 foot and 65 feet deep	The pipeline is appears to meet the elevation requirement over 200 year WSEL based on the record information and type of pipe appears to meet Title 23. The cover over pipe is questionable. Appears no work required but need to pothole to verify.	RW(P)	5.1	75.23	76.40	81.50	71.49	74.54	79.57	76.79				Levee District No. 1	243 Second Street, Yuba City, CA 95991	yes	yes
95	11.43	C	13	856+23	2,162,702.52	6,674,085.34	39°06'05.587"N	121°36'18.675"W	South Yuba City Storm Drainage Pump Station 24 inch 7 GA Steel Pipe asphalt coated and wrapped with asphalt saturated felt discharge pipe	Cutoff Wall and relief wells at 200 foot and 65 feet deep	The pipeline is appears to meet the elevation requirement over 200 year WSEL based on the record information and type of pipe might appears to meet Title 23. Appears no work required. We have as-built drawings	SD(P)	5.2	76.80	78.80	82.00	70.94	74.02	79.04	76.38	15565	no	1992	City of Yuba City	1201 Civic Center Blvd., Yuba City, CA 95991	yes	yes
96	11.43	C	13	856+08	2,162,689.81	6,674,093.30	39°06'05.587"N	121°36'18.675"W	South Yuba City Seepage Interceptor Pump Station 24 inch 7 GA Steel Pipe asphalt coated and wrapped with asphalt saturated felt discharge pipe	Cutoff Wall and relief wells at 200 foot and 65 feet deep	The pipeline is appears to meet the elevation requirement over 200 year WSEL based on the record information and type of pipe might appears to meet Title 23. Appears no work required. We have as-built drawings	SD(P)	5.2	76.80	78.80	82.00	70.94	74.01	79.03	76.37	15565	no	1992	City of Yuba City	1201 Civic Center Blvd., Yuba City, CA 95991	yes	yes
97	11.24 - 11.95	C	13						Seepage Interceptor Trench and additional relief wells. The improvements were adjacent to the River Oaks subdivision between the wastewater treatment plant and Shanghai Road. All work on landside of levee	Cutoff Wall and relief wells at 200 foot and 65 feet deep											15850		1991	City of Yuba City	1201 Civic Center Blvd., Yuba City, CA 95991	no	no
98	10.80 - 16.00	C	16				Not Verified		Bike Path below Twin Cities Memorial Bridge	Flatten Waterside Slope		Road									16820	yes. Cond 28	1998	City of Yuba City	1201 Civic Center Blvd., Yuba City, CA 95991		
		C	12/13	845+00					Reach 12/13 Transition																		
99	10.60 - 11.15		12						Shanghai Bend Road Setback levee project	No Rehabilitation Required														USACE	1325 J Street, Sacramento, CA	no	no
		B	11/12	830+00					Reach 11/12 Transition																		
100	10.57	B	11	828+55	2,160,267.77	6,675,134.01	39°05'36.240"N	121°36'00.697"W	City of Yuba City Sewer 24 inch welded steel pipe mortar lined and coated pipe (wall thickness 0.188" min) Discharge Pipe to river diffuser	Cutoff Wall	The pipeline is appears to meet the elevation requirement over 200 year WSEL based on the record information and type of pipe might appears to meet Title 23. Appears no work required. We have as-built drawings	WW(P)	2.3	75.70 rd	77.8 est	79.80	69.02	72.20	77.24	75.15	7151D	yes, cond 13?	1974	City of Yuba City	1201 Civic Center Blvd., Yuba City, CA 95991	yes	yes
101	10.47	B	11				Not Verified		To place an 18 inch storm drain pipeline through the levee on the right bank of the Feather River **(project was not completed - no pipeline installed)**	Cutoff Wall		SD(P)									13219	yes, cond 13	1981	Hauss and Steel Inc.	3909 Garden Highway, Yuba City, CA 95991	n/a	n/a
	9.55	B	10/11	774+00					Reach 10/11 Transition																		
102	9.50	B	10				Not Verified		Construct gauging station 150 feet downstream of Shanghai Bend	Cutoff Wall											4033	yes, cond 5	1962	Department of Water Resources	1120 N Street, Sacramento, CA	no	no
103	9.11	B	10	750+40	2,152,869.21	6,673,338.66	39°04'23.178"N	121°36'23.886"W	115 kv steel tower transmission line crossing of levee	Cutoff Wall		EL	OH								7647		1971	Pacific Gas and Electric Company	One Tower, Spear Tower, San Francisco, CA 94105	yes	yes
104	9.10	B	10	750+10	2,152,823.05	6,673,332.24	39°04'22.722"N	121°36'23.970"W	12 kv power line crossing of levee	Cutoff Wall		EL									3665	yes, cond 5	1961	Pacific Gas and Electric Company	One Tower, Spear Tower, San Francisco, CA 94105	yes	yes
	8.27	B	9/10	706+50					Reach 9/10 Transition																		
105	8.00	B	9	692+00			Not Verified		To construct 140 lineal feet of sheet piles retaining wall, and nine 10 x 20 foot boat docks supported by seven 12 inch diameter steel piles to an existing 30 foot wide ramp (Boyd Pump Boat Ramp)	Cutoff Wall	Located within floodway. Does not affect levee project.										1723, 11586, 11587	yes. Cond 26	2000	County of Sutter	1160 Civic Center Boulevard, Yuba City, CA 95993		
106	7.94	B	9	692+00			Not Verified		To improve the existing Boyd Pump Boat Launching Facility by widening the existing ramp to 30 feet with 4 foot walkways on each side, paving existing access road, and expanding parking area by 25 spaces, and placing riprap on the right bank of the Feather River.	Cutoff Wall		Struc									14380	yes, cond 13	1985	County of Sutter	1160 Civic Center Boulevard, Yuba City, CA 95993	yes	yes
107	7.94	B	9	692+00			Not Verified		To construct boat launching ramp, well, pump, pressure system, and sanitary facilities on the right bank overflow of the Feather River	Cutoff Wall		Struc									2675	yes, cond 5	1958	Department of Fish and Game		no	no
108	7.94	B	9	689+09	2,146,949.33	6,672,031.04	39°03'24.759"N	121°36'40.813"W	Oswald Mutual Water Company (Boyds Pump) 18 inch epoxy coated mortar lined steel pipe through existing 24 inch concrete pipe crossing of levee	Cutoff Wall	The pipeline does not meet title 23 requirements and will need a positive shut-off structure installed and gate valve at pump. Pumping up and over levee does not appear to be feasible.	IR(P)	27.6	46.00	48.20	75.80	65.22	68.52	73.36	70.91	pre-1955 & 18181	yes, cond 29	part of orig O&M 1955 & 2007	Oswald Mutual Water Company	Yuba City, CA 95991	yes	yes
109	7.94	B	9	689+00	2,146,953.52	6,672,029.11	39°03'24.759"N	121°36'40.813"W	To replace an existing pole line with a new pole line across the right bank levee of the Feather River. A new pole will be placed 10 feet landward of the landward toe of the levee and another pole will be placed 24 feet water ward of the water ward toe of the levee.	Cutoff Wall		EL	OH			75.94					11663	yes, cond 13	1976	Pacific Gas and Electric Company	5555 Florin Perkins Road, Sacramento, CA 95826	yes	yes
110	7.94	B	9	689+00	2,146,953.52	6,672,029.11	39°03'24.759"N	121°36'40.813"W	To place a service line on a PG&E pole crossing the right bank levee of the Feather River	Cutoff Wall		TL	OH			75.94					11610	yes, cond 13	1976	Pacific Gas and Electric Company	1426 Howe Avenue, Suite 50, Sacramento, CA 95826	yes	yes
111	7.47	B	9	664+07	2,144,450.88	6,672,127.42	39°03'00.186"N	121°36'39.792"W	Sierra Gold Nursery. An 8 inch steel pipe through levee. This pipe was pressure checked and in 1984 as part of permit 13980 to connect to existing pipe.	Cutoff Wall	Not sure if the pipeline meets the elevation requirement over 200 year WSEL. The type of pipe may or may not meet Title 23. Need to pothole to verify.	SD(P)	3.6	70.23	70.90	74.50	64.57	67.89	72.68	69.90	pre-1955 & 13980	yes, cond 13	part of orig O&M 1955 & 1984	Sierra Gold Nursery	5320 Garden Highway, Yuba City, CA 95991	yes	yes
112	7.40 - 7.64	B	9	664+20			Not Verified		To reconstruct and pave a 12 foot wide, approximately 1370 feet long road on the landside toe of the right bank levee of the Feather River	Cutoff Wall			4.0								17128	yes. Cond 23	1999	Sierra Gold Nursery	5320 Garden Highway, Yuba City, CA 95991		
	7.29	B	8/9	654+75					Reach 8/9 Transition																		
113	7.18	B	8	649+11	2,142,954.74	6,672,128.18	39°02'45.228"N	121°36'39.774"W	12 kv power line across levee 1900 feet downstream of Mesick Road	Cutoff Wall		EL	OH								4017 & 4378		1962 & 1963	Pacific Gas & Electric	One Tower, Spear Tower, San Francisco, CA 94105	yes	yes

LEVEE ENCROACHMENT LIST

APPENDIX A

					Location (NAD 83)		Location (WGS 84)						Elevations (NGVD 1988)			Water Surface Elevation (NGVD 1988)				CVFPB Permit Information			Owner Information			
	Levee Mile	SBFCA Phase	SBFCA Reach	SBFCA STA	Northing	Easting	Latitude	Longitude	Encroachment	Proposed Levee Improvement	Required Improvement Work	Type	cover	Invert of Pipe	Top of Pipe	Top of Levee	100 Yr	200 Yr	500 Yr	DWR 1957	Permit No.	Require Permittee to Relocate	Year	Name	Address	verified	Picture Taken
114	7.16	B	8	647+74	2,142,830.08	6,672,119.48	39°02'43.998"N	121°36'39.919"W	Feather Water District North Pump Station 1-26" irrigation discharge pipes	Cutoff Wall	The pipeline appears to meet the elevation requirement over 200 year WSEL. May not meet 1957 profile requirement. The type of pipe may or may not meet Title 23. Appears no work required.	IR(P)	1.6	69.90	71.90	73.50	64.28	67.60	72.36	69.33	4127	yes, cond 5	1962	Feather Water District	280 Willkie Avenue, Yuba City, CA 95991	yes	yes
115	7.16	B	8	647+70	2,142,826.16	6,672,118.89	39°02'43.961"N	121°36'39.926"W	Feather Water District North Pump Station 1-26" irrigation discharge pipes	Cutoff Wall	The pipeline appears to meet the elevation requirement over 200 year WSEL. The type of pipe may or may not meet Title 23. Appears no work required.	IR(P)	1.3	70.15	72.15	73.50	64.28	67.60	72.36	69.33	4127	yes, cond 5	1962	Feather Water District	280 Wilkie Avenue, Yuba City, CA 95991	yes	yes
116	7.16	B	8	647+66	2,142,822.01	6,672,118.27	39°02'43.917"N	121°36'39.942"W	Feather Water District North Pump Station 1-26" irrigation discharge pipes	Cutoff Wall	The pipeline appears to meet the elevation requirement over 200 year WSEL. May not meet 1957 profile requirement. The type of pipe may or may not meet Title 23. Appears no work required.	IR(P)	1.4	70.10	72.10	73.50	64.28	67.60	72.36	69.33	4127	yes, cond 5	1962	Feather Water District	280 Wilkie Avenue, Yuba City, CA 95991	yes	yes
117	7.16	B	8	647+61	2,142,817.52	6,672,117.60	39°02'43.870"N	121°36'39.951"W	Feather Water District North Pump Station 1-26" irrigation discharge pipes	Cutoff Wall	The pipeline appears to meet the elevation requirement over 200 year WSEL. The type of pipe may or may not meet Title 23. Appears no work required.	IR(P)	1.3	70.15	72.15	73.50	64.28	67.60	72.36	69.33	4127	yes, cond 5	1962	Feather Water District	280 Wilkie Avenue, Yuba City, CA 95991	yes	yes
118	6.69	B	8	622+79	2,140,350.59	6,671,955.66	39°02'19.494"N	121°36'42.102"W	12 kv power line across levee	Cutoff Wall		EL	OH								4003		1962	Pacific Gas & Electric	One Tower, Spear Tower, San Francisco, CA 94105	yes	yes
	6.41	B	7/8	596+00					Reach 7/8 Transition																		
119	6.35	B	7	592+67	2,137,447.24	6,671,791.94	39°01'50.802"N	121°36'44.334"W	12 kv power line across levee	565+00 to 596+00 Cutoff Wall		EL	OH								4530	yes, cond 5	1963	Pacific Gas & Electric	One Tower, Spear Tower, San Francisco, CA 94105	yes	yes
120	6.00	B	7	587+00	2,136,925.70	6,671,619.94	39°01'45.654"N	121°36'46.542"W	Spur Levee upstream of Abbott Lake	565+00 to 598+87 Cutoff Wall											3787 and 4254	yes, cond 5	1961 and 1963	C.E. Sullivan	5320 Garden Highway, Yuba City, CA 95991	yes	yes
121	5.5 - 6.2	B	7	560+00			Not Verified		To fill in approximately one mile of an existing irrigation ditch at the waterside toe of the right bank of the Feather River.	510+37 to 546+00 Cutoff Wall		Struc									14717	no	1987	Department of Fish and Game	1701 Nimbus Road, Ranch Cordova, CA 95670		
122	5.50	B	7	560+00			Not Verified		To construct a water well with a 14 inch casing in the right bank overflow of the Feather River at Abbott Lake	510+37 to 546+00 Cutoff Wall		Struc									12837	yes, cond. 13	1980	A.S. Cozzolino	9 Cozzolino Drive, Millbrae, CA 94030	no	no
123	5.50	B	7	560+00			Not Verified		To extend approximately 2,500 of 12kv electric service line in the right bank overflow area of the Feather River near Abbott Lake to serve 25 HP Ag Pump for A.S. Cozzolino.	510+37 to 546+00 Cutoff Wall		EL	OH								12832	yes, cond. 13	1980	Pacific Gas & Electric Company	5555 Florin-Perkins Road, Sacramento, CA 95826	no	no
124	5.22	B	7	545+41	2,132,940.57	6,672,317.26	39°01'06.071"N	121°36'37.818"W	Crushed CMP Riser in Land Side Slope. Possible location of 8 inch steel pipe.	510+37 to 546+00 Cutoff Wall	Not sure if the abandonment meets title 23 requirements. Pipe may need to be properly abandoned or completely removed.	IR(A)	3.1	67.33	68.00	71.10	63.16	66.46	71.05	67.11	pre-1955		part of orig O&M 1955			yes	yes
125	5.05	~~B~~	~~7~~	~~536+73~~	~~2,132,153.19~~	~~6,672,681.57~~	~~39°00'58.434"N~~	~~121°36'33.348"W~~	~~Existing 10 inch steel pipe. Removed in 1964 by Levee District No. 1 as part of permit 4775~~	~~510+37 to 546+00 Cutoff Wall~~	~~Not sure if the abandonment meets title 23 requirements. Pipe may need to be properly abandoned or completely removed.~~	~~IR(?)~~									pre-1955 and 4775	yes, cond 5	part of orig O&M 1955	Levee District No. 1	243 Second Street, Yuba City, CA 95991	yes	yes
126	5.05	B	7	536+64	2,132,149.73	6,672,692.81			5 inch steel drainage pipe	510+37 to 546+00 Cutoff Wall	Not sure if the pipeline meets the elevation requirement over 200 year WSEL. The type of pipe may or may not meet Title 23. Need to pothole to verify.	SD(P)	2.0			70.50	63.04	66.34	70.91	66.94	2161	yes, cond 5	1955	C.E. Sullivan	5320 Garden Highway, Yuba City, CA 95991	no	no
127	4.91	B	7	529+47	2,131,549.40	6,673,081.12			Abandon 6 inch pipe	510+37 to 546+00 Cutoff Wall	Not sure if the abandonment meets title 23 requirements. Pipe may need to be properly abandoned or completely removed.	IR(A)	4.0			70.60	62.95	66.25	70.81	66.72	pre-1955		part of orig O&M 1955			no	no
128	4.50-5.25	B	7						Seepage Interceptor Trench for Star Bend Relief Well Pumps	510+37 to 546+00 Cutoff Wall														USACE	1325 J Street, Sacramento, CA	yes	yes
129	4.50	B	7	512+08	2,130,379.55	6,674,329.99	39°00'40.852"N	121°36'12.526"W	Corp of Engineers Star Bend Road Relief Well Pump Station north 15" Steel Discharge Pipe Crossings	510+37 to 546+00 Cutoff Wall	The pipeline meets the elevation requirement over 200 year WSEL based on the as-built information and type of pipe meets Title 23 requirements. Does not require any work. It does not meet 1957 criteria	SD(P)	3.8	66.15	67.40	71.20	62.77	66.06	70.59	66.37	no permit issued	no		USACE	1325 J Street, Sacramento, CA	yes	yes
130	4.50	B	7	512+04	2,130,375.66	6,674,332.71	39°00'40.814"N	121°36'12.492"W	Corp of Engineers Star Bend Road Relief Well Pump Station south 15" Steel Discharge Pipe Crossings	510+37 to 546+00 Cutoff Wall	The pipeline meets the elevation requirement over 200 year WSEL based on the as-built information and type of pipe meets Title 23 requirements. Does not require any work. It does not meet 1957 criteria	SD(P)	3.7	66.25	67.50	71.20	62.77	66.06	70.59	66.37	no permit issued	no		USACE	1325 J Street, Sacramento, CA	yes	yes
131	4.50	B	7	510+97	2,130,288.81	6,674,393.77	39°00'39.904"N	121°36'11.680"W	12 kv power line crossing of levee	510+37 to 546+00 Cutoff Wall		EL	OH			72.22					5072	yes, cond 5	1965	Pacific Gas & Electric	One Tower, Spear Tower, San Francisco, CA 94105	yes	yes
	4.49	B	6/7	510+37					Reach 6/7 Transition																		
132	4.0-4.19		6	510+50			Not Verified		To retain a 12 kv overhead service line and four power poles in the right bank overflow area of the Feather River.	No Rehabilitation Required		EL	OH								15786	no	1992	Pacific Gas & Electric	One Tower, Spear Tower, San Francisco, CA 94105	yes	yes
133	4.48		6	510+36	2,130,239.19	6,674,428.41	39°00'39.435"N	121°36'11.304"W	Volcano Vista Farms 18 inch steel irrigation discharge pipe crossing of levee	No Rehabilitation Required	The pipeline meets the elevation requirement over 200 year WSEL based on the as-built information and type of pipe meets Title 23 requirements. Does not require any work.	IR(P)	4.0	68.08 rd	69.6 est	73.64	62.75	66.05	70.57	66.35	18438	yes. Cond 19	2009	Volcano Vista Farms	P.O. Box 9, Meridian, CA 95957	yes	yes
134	4.08		6	510+30					To install 20 hp irrigation pump and to retain an existing walnut orchard (35 acres) all on the right bank of the Feather. Now owned by Volcano Vista Farms and located on Tudor Mutual Pump Station (relocated pipeline part of permit 18438)	No Rehabilitation Required		IR(P)									10551	yes, cond 13	1975	John R. Johnson/M.L. Gilbertson	8104 Garden Highway, Yuba City, CA 95991	no	no
135	4.48		6	510+25	2,130,230.41	6,674,434.54	39°00'39.345"N	121°36'11.232"W	Tudor Mutual Water Company North 30 inch steel irrigation discharge pipes crossing of levee	No Rehabilitation Required	The pipeline meets the elevation requirement over 200 year WSEL based on the as-built information and type of pipe meets Title 23 requirements. Does not require any work.	IR(P)	4.2	66.92 rd	69.5 est	73.68	62.75	66.05	70.57	66.35	18437	yes. Cond 19	2009	Tudor Mutual Water Company	280 Wilkie Avenue, Yuba City, CA 95991	yes	yes
136	4.48		6	510+20	2,130,222.24	6,674,437.45	39°00'39.306"N	121°36'11.196"W	Tudor Mutual Water Company South 30 inch steel irrigation discharge pipes crossing of levee	No Rehabilitation Required	The pipeline meets the elevation requirement over 200 year WSEL based on the as-built information and type of pipe meets Title 23 requirements. Does not require any work.	IR(P)	4.1	66.92 rd	69.5 est	73.57	62.75	66.05	70.57	66.35	18437	yes. Cond 19	2009	Tudor Mutual Water Company	280 Wilkie Avenue, Yuba City, CA 95991	yes	yes
	~~4.22~~		~~6~~				levee removed		~~12 inch steel pipe through levee (this pipeline removed as part of 2009 setback levee)~~	~~No Rehabilitation Required~~											~~pre-1955~~		~~part of orig O&M 1955~~			~~no~~	~~no~~
	~~4.25~~		~~6~~				levee removed		~~12 kv power line crossing of levee (this portion of levee removed in 2009 as part of Setback Levee)~~	~~No Rehabilitation Required~~											2502	yes, cond 4	1957	Pacific Gas & Electric	One Tower, Spear Tower, San Francisco, CA 94105	no	no
	~~4.18~~		~~6~~				levee removed		~~12 kv power line crossing including 9 power poles and 3 anchors (appears to cover permit 2502 and 5072)~~	~~No Rehabilitation Required~~											10552	yes, cond 13	1975	Pacific Gas & Electric	One Tower, Spear Tower, San Francisco, CA 94105	no	no
	~~4.15~~		~~6~~				levee removed		~~Abandon 14 inch pipe (this pipeline removed as part of 2009 setback levee project). Listed as 10" Steel in original 1955 O&M manual.~~	~~No Rehabilitation Required~~		~~IR(P)~~	~~4.1~~								~~pre-1955~~		~~part of orig O&M 1955~~			~~no~~	~~no~~
137	3.8-4.0		6	508+00					To clear, level, and plant a peach orchard on approximately 170 acres on the right bank of the Feather River.	No Rehabilitation Required		Trees									13033	yes. Cond 31	1980	Mark Teesdale	Route 2, Box 2518, Oroville, CA 95965	no	no
138	3.75 - 4.50		6						3,400 lineal feet of setback levee and removal of 4,500 lineal feet of existing levee	No Rehabilitation Required											18191	yes. Cond 31	2009	Levee District No. 1	243 Second Street, Yuba City, CA 95991	no	no
	3.76	A	5/6	478+68					Reach 5/6 Transition																		
139	3.70		5	475+00			Not Verified		To plant walnut orchard in the right overflow area of the Feather River downstream from Star Bend	456+00 to 478+68 Cutoff Wall and 200 foot Seepage Berm		Trees									6641	yes, cond 5	1969	Leo Gildersleeve	8104 Garden Highway, Yuba City, CA 95991	no	no
	3.44	A	5	461+00					Urban (200 year) North - Nonurban (100 year) South Transition																		
140	3.42	A	5	460+11	2,125,845.57	6,676,268.36	38°59'55.716"N	121°35'48.216"W	Abandon 8" steel drainpipe	456+00 to 478+68 Cutoff Wall and 200 foot Seepage Berm	Not sure if the abandonment meets title 23 requirements. Pipe may need to be properly abandoned or completely removed.	IR(A)	4.1			68.10	60.79	64.06	68.37	63.77	pre-1955		part of orig O&M 1955			yes	yes

LEVEE ENCROACHMENT LIST

APPENDIX A

	Levee Mile	SBFCA Phase	SBFCA Reach	SBFCA STA	Location (NAD 83) Northing	Location (NAD 83) Easting	Location (WGS 84) Latitude	Location (WGS 84) Longitude	Encroachment	Proposed Levee Improvement	Required Improvement Work	Type	cover	Elevations (NGVD 1988) Invert of Pipe	Elevations (NGVD 1988) Top of Pipe	Elevations (NGVD 1988) Top of Levee	Water Surface Elevation (NGVD 1988) 100 Yr	200 Yr	500 Yr	DWR 1957	CVFPB Permit Information Permit No.	Require Permittee to Relocate	Year	Owner Information Name	Address	verified	Picture Taken
141	3.09	A	5	442+80	2,124,212.69	6676803.8			Abandon 8" steel drainpipe	456+00 to 478+68 Cutoff Wall and 200 foot Seepage Berm	Not sure if the abandonment meets title 23 requirements. Pipe may need to be properly abandoned or completely removed.	IR(A)	4.1				60.24	63.47	67.69	63.12	pre-1955		part of orig O&M 1955			yes	yes
142	2.95	A	5	433+50	2,123,304.56	6,677,004.67	38°59'30.780"N	121°35'39.072"W	Power line across levee to service pole with meter on waterside slope of levee	410+67 to 478+68 Cutoff Wall		EL														yes	yes
143	~~2.69~~	~~A~~	~~5~~	~~417+66~~ Not Verified			~~pipe removed~~		~~Abandon Existing 24 inch pipe through levee. The permit was revised to removal of 24 inch via 4666A so there should not be any pipe.~~	~~410+67 to 478+68 Cutoff Wall~~		~~SD(C)~~									pre-1955 (install) and 4666 (remove)	yes, cond 5	part of orig O&M 1955 and 1964	Levee District No. 1	243 Second Street, Yuba City, CA 95991	no	no
	2.49	A	4/5	410+67					Reach 4/5 Transition																		
144	2.47	A	4	410+53	2,121,173.09	66,776,661.21	38°59'09.036"N	121°35'31.038"W	Power line crossing to Feather Water District Pumps	Cutoff Wall		EL	OH								4464	yes, cond 5	1963	Pacific Gas & Electric	One Tower, Spear Tower, San Francisco, CA 94105	yes	yes
145	2.47	A	4	409+84	2,121,105.29	6,677,660.77	38°59'09.036"N	121°35'31.038"W	To install a 2 inch electrical conduit through the levee. The conduit will be buried in the levee slopes and through the crown with one foot of cover. The conduit will provide electrical service to an existing pumping plant in the floodway of the Feather River.	Cutoff Wall	Not sure if the conduit meets the elevation requirement over 200 year WSEL. The type of conduit may or may not meet Title 23. Need to pothole to verify.	EL	2.0			66.20	59.08	62.19	66.19	62.09	7322	yes, cond 5	1971	Feather Water District	280 Wilkie Avenue, Yuba City, CA 95991	yes	yes
146	2.47	A	4	409+66	2,121,086.77	6,677,660.88	38°59'08.25"N	121°35'30.876"W	Feather Water District South Pump Station 1-18" irrigation discharge pipes. The improvements include a reservoir at the landside toe of levee and a inlet channel from river to waterside toe.	Cutoff Wall	Pipeline meets the elevation requirement over 200 year WSEL. The type of pipe may or may not meet Title 23. Need to pothole to verify.	IR(P)	0.8	64.10	65.60	66.40	59.08	62.18	66.18	62.08	5313	yes, cond 5	1966	Feather Water District	280 Wilkie Avenue, Yuba City, CA 95991	yes	yes
147	2.47	A	4	409+62	2,121,082.47	6,677,660.77	38°59'08.789"N	121°35'30.876"W	Feather Water District South Pump Station 1-18" irrigation discharge pipes. The improvements include a reservoir at the landside toe of levee and a inlet channel from river to waterside toe.	Cutoff Wall	Pipeline meets the elevation requirement over 200 year WSEL. The type of pipe may or may not meet Title 23. Need to pothole to verify.	IR(P)	0.9	64.05	65.55	66.40	59.08	62.18	66.18	62.08	4228	yes, cond 5	1963	Feather Water District	280 Wilkie Avenue, Yuba City, CA 95991	yes	yes
148	2.47	A	4	409+58	2,121,078.48	6,677,660.82	38°59'08.748"N	121°35'30.872"W	Feather Water District South Pump Station 1-18" irrigation discharge pipes. The improvements include a reservoir at the landside toe of levee and a inlet channel from river to waterside toe.	Cutoff Wall	Pipeline meets the elevation requirement over 200 year WSEL. The type of pipe may or may not meet Title 23. Need to pothole to verify.	IR(P)	0.8	64.10	65.60	66.40	59.08	62.18	66.18	62.08	4228	yes, cond 5	1963	Feather Water District	280 Wilkie Avenue, Yuba City, CA 95991	yes	yes
149	2.41	A	4	409+55	2,121,075.08	6,677,660.80	38°59'08.668"N	121°35'30.885"W	Taylor Brothers Farm Irrigation Pump Station. A inclined pump located on the waterside slope of levee with 14 Inch Pipeline through levee	Cutoff Wall	Pipeline meets the elevation requirement over 200 year WSEL. The type of pipe may or may not meet Title 23. Need to pothole to verify.	IR(P)	1.4	63.83	65.00	66.40	59.07	62.17	66.17	62.08	4568A	yes, cond 5	1965	George E. Taylor	182 Wilkie Avenue, Yuba City, CA 95991	yes	yes
150	2.47	A	4	409+50	2,121,069.88	6,677,660.77	38°59'08.721"N	121°35'30.870"W	Feather Water District South Pump Station 1-18" irrigation discharge pipes. The improvements include a reservoir at the landside toe of levee and a inlet channel from river to waterside toe.	Cutoff Wall	Pipeline meets the elevation requirement over 200 year WSEL. The type of pipe may or may not meet Title 23. Need to pothole to verify.	IR(P)	1.7	63.25	64.75	66.40	59.08	62.18	66.18	62.08	4228	yes, cond 5	1963	Feather Water District	182 Wilkie Avenue, Yuba City, CA 95991	yes	yes
151	2.40	A	4	407+72	2,120,892.86	6,677,656.42	38°59'08.668"N	121°35'30.885"W	Abandoned pipe and structure at landside toe, pipe is 8 inch, but the headwall appears that it is ran through a larger older pipe possibly and old drainage pip	Cutoff Wall	Not sure if the abandonment meets title 23 requirements. Pipe may need to be properly abandoned or completely removed.	IR(A)	21.8	43.87	44.70	66.50	59.00	62.09	66.08	62.01						yes	yes
152	2.21	A	4	396+32	2,119,752.28	6,677,651.86	38°58'55.692"N	121°35'31.050"W	8 inch pipe crossing. Headwall at land toe, art on land side of crown, and cut pipe near water side toe	Cutoff Wall	Not sure if the pipeline meets the elevation requirement over 200 year WSEL. The type of pipe may or may not meet Title 23. Need to pothole to verify.	IR(A)	4.1	61.74	62.40	66.50	58.59	61.63	65.52	61.54	pre-1955		part of orig O&M 1955			yes	yes
153	1.84	A	4	386+63	2,118,786.69	6,677,704.40	38°58'46.170"N	121°35'30.504"W	Abandon 8 inch pipe crossing, stand pipe on land toe has been destroyed.	Cutoff Wall	Not sure if the abandonment meets title 23 requirements. Pipe may need to be properly abandoned or completely removed. Could not find pipe	IR(A)	4.6			66.10	58.29	61.29	65.12	61.07	pre-1955		part of orig O&M 1955			no	no
154	1.51	A	4	365+00	2,116,703.78	6,678,265.36	38°58'25.482"N	121°35'23.46"W	Abandon 8 inch pipe crossing, stand pipe on land toe has been removed.	Cutoff Wall	Not sure if the abandonment meets title 23 requirements. Pipe may need to be properly abandoned or completely removed. Could not find pipe	IR(A)	4.8			65.10	57.71	60.66	64.40	59.97	pre-1955		part of orig O&M 1955			yes	yes
155	1.00	A	4	342+27	2,114,521.83	6,678,856.40	38°57'22.128"N	121°35'08.814"W	Irrigation Production Well (located xx foot west of levee toe)	Cutoff Wall		IR(W)														no	yes
	0.39	A	3/4	300+66					Reach 3/4 Transition																		
156	0.34	A	3	298+89	2,110,314.83	6,679,535.86	38°57'22.204"N	121°35'07.763"W	Removal of a portion and filling with concrete a portion of an abandoned 36 inch steel pipe through the right bank levee of the Feather River	Cutoff Wall		IR(G)									pre-1955 (install) and 4667	yes, cond 5	part of orig O&M 1955 and 1964	Levee District No. 1	243 Second Street, Yuba City, CA 95991	yes	yes
157	0.36	A	3	298+67	2,110,292.12	6,679,458.78	38°57'22.218"N	121°35'08.814"W	Garden Highway Mutual Water - Irrigation Production Well (located 30 foot west of levee toe)	Cutoff Wall		IR(W)											2009	Garden Highway Mutual Water Company	12755 Garden Highway, Yuba City, CA 95991	yes	yes
158	0.35	A	3	298+38	2,110,262.81	6,679,553.51	38°57'21.757"N	121°35'07.763"W	Garden Highway Mutual Water 54 inch Irrigation Pump Station Discharge Pipeline through Levee. The improvements include a inlet channel from the river to the 200 feet from waterside toe of levee and irrigation canal at the toe of the landside of levee.	Cutoff Wall	The pipeline does not meet title 23 requirements and will need a positive shut-off structure installed and gate valve at pump. Pumping up and over levee does not appear to be feasible.	IR(G)	25.1	38.00		63.90	55.88	58.57	61.86	57.78	pre-1955		part of orig O&M 1955	Garden Highway Mutual Water Company	12755 Garden Highway, Yuba City, CA 95991	yes	yes
	0.00	A	3	280+90					State Maintenance Area 3 / Levee District No. 1 Levees Transition																		
1	4.05	A	3	219+00	Not Verified		Not Verified		12 inch pipe. Appears to be removed by pipe laying on ground adjacent to location	Cutoff Wall	Not sure if the abandonment meets title 23 requirements or elevation requirements. Could not find pipe.	IR(A)		59.2 (USED)			55.23	57.92	61.19	56.15	pre-1955		part of orig O&M 1955			no	no
	4.01	A	2/3	218+66					Reach 2/3 Transition																		
2	3.84	A	2	209+89	2,101,737.07	6,678,031.40	38°55'57.543"N	121°35'27.300"W	Electrical service crossing for pump	181+00 to 218+66 Cutoff Wall and 100 foot Seepage Berm		EL	OH			62.29										yes	yes
3	3.83	A	2	209+23	2,101,673.35	6,678,014.21	38°55'56.918"N	121°35'27.543"W	Private Irrigation Pump Station. 14 inch welded steel pipe crossing	181+00 to 218+66 Cutoff Wall and 100 foot Seepage Berm	Pipeline meets the elevation requirement over 200 year WSEL. The type of pipe may or may not meet Title 23. Need to pothole to verify.	IR(P)	3.0	59.37 est	60.20	62.90	55.17	57.86	61.13	56.00	1730	yes, cond 3	1952	Robert Crandall	Bogue Road, Route 1, Yuba City, CA 95991	yes	yes
4	3.70 - 4.25	A	2	217+00					National Audubon Society. To plant approximately 4,000 native trees on 40 acres within the right bank overflow area of the Feather River	181+00 to 218+66 Cutoff Wall and 100 foot Seepage Berm		Trees									17012	yes, cond 17	2000	National Audubon Society	555 Audubon Place, Sacramento, CA 95825		
5	2.9-5.19	A	2	217+00					National Audubon Society. To plant approximately 300 to 500 native trees (primarily cottonwoods) on the right bank overflow area of the Feather River.	181+00 to 218+66 Cutoff Wall and 100 foot Seepage Berm		Trees									16817	yes, cond 21	1998	National Audubon Society	555 Audubon Place, Sacramento, CA 95825		
6	3.18	A	2	174+91	Not Verified		Not Verified		12 inch pipe	129+66 to 181+00 Stability Berm and 100 foot Seepage Berm	Not sure if the abandonment meets title 23 requirements or elevation requirements. Could not find pipe.		4.5				54.73	57.40	60.61	55.57						no	no
	0.00	A	1/2	129+66					Reach 1/2 Transition																		
7	2.19-3.00	A	1	125+00					To level 60 hectares of leered land westward of the right bank of the Feather River upstream of the SR 99 Bridge	Cutoff Wall		Struc									8638, 13343, 12590	yes, cond. 13	1982	Nevis Land Co. now owned by DFG	1416 9th Street, Sacramento, CA 95814	yes	yes
8	2.19	A	1	124+32	2,094,124.90	6,679,433.55	38°54'42.235"N	121°35'09.990"W	Hamatani Ranch - Sacramento Avenue Irrigation Pump Station and pipeline crossing	Cutoff Wall	The pipeline does not meet title 23 requirements and will need a positive shut-off structure installed and gate valve at pump. Pumping up and over levee does not appear to be feasible. Should be part of 30 percent design.	IR(P)		32.01		60.39	53.53	56.08	59.07	53.55	3284	yes, cond 4	1960	T.H. Richards now owned by Odysseus Farms PTN	P.O. Box H, Yuba City, CA 95992	yes	yes
9	2.19	A	1	124+32	2,094,124.90	6,679,433.55	38°54'42.235"N	121°35'09.990"W	24 inch culvert pipe. Part of Sacramento Avenue Irrigation Pump Station	Cutoff Wall	The pipeline does not meet title 23 requirements and will need a positive shut-off structure installed and gate valve at pump. Pumping up and over levee does not appear to be feasible. Should be part of 30 percent design.	IR(P)	26.0	32.01		60.39	53.53	56.08	59.07	53.55	pre-1955		part of orig O&M 1955	T.H. Richards now owned by Odysseus Farms PTN	P.O. Box H, Yuba City, CA 95992	yes	yes
10	2.10	A	1	124+21	2,094,115.32	6,679,426.80	38°54'42.141"N	121°35'10.076"W	12 kv overhead electrical crossing	Cutoff Wall		EL	OH			60.31								Pacific Gas & Electric	One Tower, Spear Tower, San Francisco, CA 94105	yes	yes
11	1.85	A	1	107+21	2,092,674.99	6,678,527.08	38°54'27.944"N	121°35'21.542"W	Remaining abutment for old Nicolaus Bridge	Cutoff Wall		Bridge				60.80								County of Sutter	1160 Civic Center Blvd, Yuba City, CA	yes	yes

LEVEE ENCROACHMENT LIST

APPENDIX A

	Levee Mile	SBFCA Phase	SBFCA Reach	SBFCA STA	Location (NAD 83) Northing	Location (NAD 83) Easting	Location (WGS 84) Latitude	Location (WGS 84) Longitude	Encroachment	Proposed Levee Improvement	Required Improvement Work	Type	cover	Elevations (NGVD 1988) Invert of Pipe	Top of Pipe	Top of Levee	Water Surface Elevation (NGVD 1988) 100 Yr	200 Yr	500 Yr	DWR 1957	CVFPB Permit Information Permit No.	Require Permittee to Relocate	Year	Owner Information Name	Address	verified	Picture Taken
12		A	1	105+00			Not Verified		To construct three 1 acre ponds on the right bank overflow area of the feather River	Cutoff Wall		Struc									16738	no	1997	Department of Fish and Game	1701 Nimbus Road, Suite A, Rancho Cordova, CA 95670		
13		A	1	99+00					Hamatani Ranch Irrigation Canal - Station 99+00 to 107+00	Cutoff Wall		IR(G)												T.H. Richards now owned by Odysseus Farms PTN	P.O. Box H, Yuba City, CA 95992	no	no
14	1.60	A	1	98+00	2,092,080.61	6,677,794.38	38°54'22.101"N	121°35'30.845"W	State Route 99 Crossing of Levee -To install two removable barriers on the roadway shoulders at the SR 99 crossing of the right bank of levee crown of the Feather River.	Cutoff Wall		Bridge				62.03					14286	no	1986	Caltrans	703 B Street, Marysville, CA 95901	yes	yes
15	1.60	A	1	97+61	2,092,071.07	6,677,788.96	38°54'22.007"N	121°35'30.914"W	U.S. Communication cable	Cutoff Wall	Not sure if the conduit meets the elevation requirement over 200 year WSEL. The type of conduit may or may not meet Title 23. Need to pothole to verify.	TL	3.0			61.04					3511					yes	yes
16	1.2-2.7	A	1	74+00			Not Verified		To install two sections of 12KV three phase power lines, approximately 2.3 kilometers in combined length, to provide service for irrigation pumps. The project is located in the overflow area at the right bank levee of the Feather River running north and south of the Garden Highway crossing and over the Nelson Slough levee.	Cutoff Wall		EL	OH							13409	yes, cond 13	1982	Pacific Gas & Electric	5555 Florin-Perkins Road, Sacramento, CA 95826	no	no
17	1.20	A	1	73+39	2,090,564.35	6,675,895.46	38°54'07.197"N	121°35'54.953"W	12 kv overhead electrical crossing	Cutoff Wall		EL	OH			56.04					2483	yes, cond 4	1957	Pacific Gas & Electric	One Tower, Spear Tower, San Francisco, CA 94105	yes	yes
18	1.20	A	1	72+27	2,090,511.86	6,675,799.08	38°54'06.682"N	121°35'56.176"W	Transmission Line Crossing - East Line	Cutoff Wall		EL	OH			55.83							2008	WPA	114 Parkshore Drive, Folsom, CA 95630-4710	yes	yes
19	1.20	A	1	71+89	2,090,504.83	6,675,762.31	38°54'06.614"N	121°35'56.641"W	Transmission Line Crossing - West Line	Cutoff Wall		EL	OH			55.64							2009	WPA	114 Parkshore Drive, Folsom, CA 95630-4710	yes	yes
20	0.80	A	1	52+25	2,091,015.74	6,673,876.41	38°54'11.746"N	121°36'20.470"W	Hamatani Ranch Storm Drainage Pump Station. The pump discharge is a 20 inch pipe and pump is Bryon Jackson 17H0H with 50 HP electrical motor.	Cutoff Wall	The pipeline is appears to meet the elevation requirement over 200 year WSEL based on the record information and type of pipe may or may not meet Title 23. Should be part of 30 percent design.	SD(P)	3.0	49.35 rd	51.02 rd	56.34	50.43	52.76	55.28	48.84	13624	yes, cond. 13	1983	Danna & Danna Inc. now owned by Odysseus Farms PTN	P.O. Box H, Yuba City, CA 95992	yes	yes
21	0.80	A	1	52+25	2,091,015.74	6,673,876.41	38°54'11.746"N	121°36'20.470"W	2-18 inch steel pipes with concrete "U" headwall at waterside toe.	Cutoff Wall	Not sure if the abandonment meets title 23 requirements. Pipe may need to be properly abandoned or completely removed. Could not find pipe.	SD(G)	32.0	24.0 (USED)							pre-1955		part of orig O&M 1955	Danna & Danna Inc. now owned by Odysseus Farms PTN	P.O. Box H, Yuba City, CA 95992	yes	yes
22	0.00	A	1	10+82	2,088,598.75	6,670,597.31	38°53'47.993"N	121°37'02.081"W	To install canal gates on two existing 48 inch CMP culverts under a spur levee on the right bank overflow area of the Feather River	Cutoff Wall		IR(G)	32.0			54.48					13506	yes, cond. 13	1982	Nevis Land Co. now owned by DFG	1416 9th Street, Sacramento, CA 95814	yes	yes
23	0.00	A	1	10+60					Hamatani Ranch Storm Drainage Ditch - Station 10+60 to 68+25	Cutoff Wall		IR(G)	32.0			54.48					13506		1982	Nevis Land Co. now owned by DFG	1416 9th Street, Sacramento, CA 95814	yes	yes
	0.00	A	1	10+00					Begin Reach 1																		

Part of TO 6 Contract

Part of TO 5 Contract

Part of TO 4 Contract

Encroachment but not part of MHM work - Redline HDR or WR Plans

SD(G)	Storm Water - Gravity
SD(P)	Storm Water - Pressure
WW(G)	Waste Water - Gravity
WW(P)	Waste Water - Pressure
IR(G)	Irrigation Line - Gravity
IR(P)	Irrigation Line - Pressure
RW (P)	Raw Water - Pressure
W(P)	Water Line - Pressure
RD	Roadway Crossing
GL	Gas Line
TL	Telephone
EL	Electric Line
SEEP	Seepage

Appendix H

Public Health and Hazards: EDR Data Map Environmental Atlas

ENVIRONMENTAL SITE ASSESSMENT
SUTTER BASIN FEASABILITY STUDY
SUTTER AND BUTTE COUNTIES, CALIFORNIA

1.0 SUMMARY

This report presents the results of an Environmental Site Assessment (ESA) performed during June/July of 2009 by the Environmental Design Section (EDS) of the U. S. Army Corps of Engineers (USACE), Sacramento District. This ESA identified numerous sources of possible contamination due to Hazardous, Toxic, or Radioactive Waste (HTRW) during records research and site investigation.

Data research showed 85 sources of potential contamination within 1/4 mile of the project boundaries. The breakdown of these sources is as follows:

- 51 registered underground storage tanks (UST's) and 3 aboveground storage tanks (AST's).
- 5 sources are listed as small and large generators of EPA regulated hazardous waste.
- 5 sites that had leaking UST's, 2 which have/had affected public drinking water
- 6 known or potential hazardous substance sites under investigation or cleanup
- 2 Waste discharge systems
- 2 Landfills
- 12 suspected drug labs
- 1 pesticide-producing facility

For the majority of the sources, no records were found to indicate that these potential sources have actually caused major contamination, although there are still on-going investigations. For the purpose of this investigation, there are several areas of concern in the event of flooding. Most involve registered UST's, hazardous waste generators, minor tank leaks, UST removal and remediation, and accidental releases.

This Environmental Site Assessment (ESA) did not confirm any known contamination due to Hazardous, Toxic, or Radioactive Waste (HTRW) within the construction zone during records research and field survey.

No field investigation or records review found any evidence to indicate that any other potential sources of contamination would interfere with any planned construction of the levees.

2.0 INTRODUCTION

2.1 Scope of Report

The purpose of this ESA is to identify recognized environmental conditions, including the presence or likely presence of any hazardous substances 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. This report addresses HTRW within the study area which may affect construction for levee repairs on the Sutter Bypass within the Sutter Basin project. This report was prepared in accordance with ASTM E-1527-94, ER 1165-2-132; Hazardous, Toxic, and Radioactive Waste (HTRW) Guidance for Civil Works Projects; and EC 1105-2-206, Project Modifications for Improvement of the Environment. A data search and an on-site investigation were conducted in order to compile information for this ESA. This assessment did not include sampling or analysis of soil or groundwater.

3.0 PROJECT DESCRIPTION

The focus of this feasibility study is to recommend a plan for flood damage reduction, ecosystem restoration, and recreation in accordance with the Water Resource Council's Principles and Guidelines, and Corps civil works planning policies. The purposes of this PMP revision are to redirect the study to focus on the Sutter Bypass - Feather River sub-basin, to apply the Corps' current levee standards, and to incorporate ecosystem restoration and recreation into the study. Results of the State's geotechnical analysis will be used to define without-project conditions,

including levees that might be at risk of failure.

The study scope will refocus on providing flood damage reduction to the urban areas of Yuba City, Live Oak, Gridley and Biggs in the Sutter Bypass - Feather River sub-basin and developing a flood warning system for the outlying areas of the sub-basin. Other study objectives will include ecosystem restoration and recreation.

Several miles of levees along the Feather River upstream of Yuba City protect close to 30,000 residential homes, 1500 commercial structures, 620 farm houses and buildings, and 120 semipublic structures from devastating floods. Much of these levees are inadequate for the desired protection of the cities at risk. A flood damage reduction project will enhance the public health, safety and welfare by eliminating damages to single family residences, interruptions to interstate commerce and reducing the impacts to agriculture thereby promoting a safe environment for the residents of Sutter County and the economy throughout California and the surrounding areas.

For this report the project has been divided into seven (7) separate sites for ease of investigating and reporting. For the purpose of this ESA a corridor data search and site investigations were conducted. The corridor will consist of the site description plus 1/4 mile on each side of the site, in accordance to ASTM-E 1527-94. Each Site project description is as follows:

Cherokee Canal - This site starts at the inter section of the Cherokee canal and the Clousa highway. The canal runs northeast to the Richvale Highway, where it turns east until it reaches State Highway 99. The levee runs parallel to the Thermalito Afterbay approximately 3 miles south on Highway 99 until it turns east on Hamilton Road. Approximately 1.7 miles east Hamilton Road dead ends into Larkin Road, where the levee turns northeast and follows Thermalito Afterbay to where it intersecs the feather River. This section is approximately 19.7 miles long.

Feather River North (Yuba) - This site roughly follows the Feather River from the Thermolita Afterbay to approximately Metteer road or the Butte/Sutter County line. This section of the project covers about 13.5 miles of the levee.

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.

Yuba City Levee – This section of the levee project 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. From there it continues south, mostly following the Garden highway to Star Bend Road. This section is approximately 12.5 miles long.

Feather River South – Starting at Star Bend Road this levee section goes south on the Levee Road, which parallels Highway 99. The Levee Road will cross Highway 99 and continue to the Sutter Bypass, where this section ends. This section is approximately 9.3 miles long.

Sutter Bypass – This section of the project starts at the intersection of the Feather River Levee road and the Sutter Bypass Levee Road and goes north along the Sutter bypass for approximately 17.5 miles. This section ends at the intersection of the Sutter Bypass Levee Road and the Wadsworth Canal Levee Road.

Wadsworth Canal – This 4.5 mile section of the project starts at the intersection of the Sutter Bypass and Wadsworth Canal and goes northeast to end at Butte House road.

4.0 SITE DESCRIPTION

4.1 Location

Sutter Basin is located in the north-central part of California. Sutter County's 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. The Sutter Bypass passes through Sutter County from the northwest and acts as flood relief for the Sacramento River. The Sutter Bypass conveys flood waters from Butte Basin and additional flood waters from the Sacramento River through the Tisdale Bypass, which connects to the Sacramento River downstream from the town of Grimes. The study area will include the Sutter Bypass – Feather River sub-basin of the Sutter Basin, which extends into the south-central

portion of Butte County along the west side of the Feather River. See Appendix A for site map and legend.

4.2 Site and Vicinity Characteristics

The top of the levees are accessible by vehicle but are limited to public access by locked gates. The predominant use adjacent to the land side of levee is agricultural, while the river side is predominately recreational. Within the study area are several dwellings with their out structures. Most of these dwellings are associated with farming operations. The study area also includes several businesses and show up on several data bases, but appear to have no or little impact on the construction site.

4.3 Descriptions of Improvements on the Site

No improvements have been made to the actual levee in recent years, other than general maintenance and flood damage.

5.0 RECORDS REVIEW

The following sources were used in researching the occurrence of HTRW within the study area. The following information was acquired during a records search and phone interviews.

California Environmental Protection Agency

California EPA has set up a web site, www.swrch.ca.gov/~cw/phome/lusts, for the most updated information. This same list was also duplicated in the data base search.

State Water Resources Control Board

The Division of Clean Water Programs, Tanks Unit, sent a list of leaking underground storage tanks (LUSTs) in the study area. This list was duplicated in the database search.

California Department of Toxic Substances Control

A copy of the CalSites database for the study area was faxed, locating areas where hazardous substances have been released or where the potential for release exists. The database mainly covers spills. This same list was duplicated in the data base search. There was no evidence of any spills that would affect this project.

Data Base Review

Environmental Data Resources (EDR) conducted a records research of the study area consisting of 69 federal, state and publicly available data bases. (See Attachment A for a list of the sources plus a definition and a summary of the information stored in each database).

6.0 SITE RECONNAISSANCE AND OBSERVATIONS

In June and July of 2009, Bruce Van Etten from the Environmental Design Section (EDS) of the United States Army Corps of Engineers-Sacramento District (USACE) visited the study area several times. The objective of the site visit is to identify recognizable environmental concerns in connection with the property. Common environmental concerns that were looked for include the following: asbestos; construction and demolition debris; drums; landfill or solid waste disposal sites; pits, ponds or lagoons; wastewater; fill dirt, depressions, mounds, or any artificial structures; PCB containing transformers; and the presence or likely presence of any hazardous substance or petroleum products on the property under conditions that indicate an existing release, a past release, or a material threat of a release on the property or into the ground, groundwater, or surface water of the property.

6.1 Cherokee Canal

Four (4) Underground Storage tanks (UST's) were mentioned in the data search and located during the site visit. All four of the UST's are outside of the construction zone for this project.

6.2 Feather River North (Yuba)

This section of the levee project contained:

Four (4) UST's

One (1) landfill

Two reports on the HAZNET database.

- Four (4) Underground Storage tanks (UST's) were mentioned in the data search and located during the site visit. All four of the UST's are outside of the construction zone for this project.

- The landfill that is noted in the data base search is actually a burn dump and is located at the end of Walnut Ave., Biggs, California. The burn dump is owned by the California Department of Fish and Game and has been closed for several years. The burn dump presents no obstacle to this project.

- The HAZNET data base extracts copies of hazardous waste manifest received each year by the DTSC. The two sites that showed up on this data base show that hazardous waste was deposed of properly.

6.3 Feather River North (Sutter)

This section of the levee project contained:

Seven (7) UST's

One (1) waste discharge system

Three reports on the HAZNET database

One RCRA-SQG or small quantity generator.

- Seven (7) Underground Storage tanks (UST's) were mentioned in the data search and located during the site visit. All seven of the UST's are outside of the construction zone and present no threat to this project.

- The HAZNET data base extracts copies of hazardous waste manifest received each year by the DTSC. The two sites that showed up on this data base show that hazardous waste was deposed of properly.

-Yuba City Prune Dehydrator showed up on the data base search a facility that treats and/or disposes of liquid or semisolid waste. This is an active facility that is considered a minor threat to water quality and has no reclamation requirements associated with it at this time.

- Andermac, Inc. showed up on the data search as a small quantity generator of hazardous waste. A small quantity generator is a facility that generates more than 100 and less than 1,000 kg of hazardous waste during any calendar month and accumulates less than 6,000 kg of hazardous waste at any time. There are no violations against this facility for generation or disposal of their waste.

6.4 Yuba City Levee

This section of the levee project is the most populated and contained:

Thirty three (33) UST's

Five (5) UST's on the Leaking Underground Storage Tank (LUST) list

One (1) landfill

Three (3) Aboveground Storage Tanks (AST's),

Four (4) RCRA-SQG or small quantity generators

One (1) pesticide producer

Three (3) sites on the Spills, Leaks, Investigation, and Cleanup (SLIC) database

Fifty eight (58) reports on the HAZNET database

Eleven (11) sites on the Clandestine Drug Labs (CDL) database

- Thirty three (33) Underground Storage Tanks (UST's) were mentioned in the data search and located during the site visit. All 33 of the UST's are outside of the construction zone and present no threat to this project.

- There are five UST's on the LUST list that are still open and undergoing cleanup. Two of the sites are in remediation and the other three are undergoing site assessments.

- There is one solid waste facility landfill within the project site but is closed and presents no problems to this project.

- Three (3) Aboveground Storage Tanks (AST's) were mentioned in the data search and located during the site visit. All 3 of the AST's are outside of the construction zone and present no threat to this project.

- There are four facilities that showed up on the data search as a small quantity generator of hazardous waste. A small quantity generator is a facility that generates more than 100 and less than 1,000 kg of hazardous waste during any calendar month and accumulates less than 6,000 kg of hazardous waste at any time. There are no violations against these facilities for generation or disposal of their waste.

- The data search shows the Sutter County Department of Agriculture as a registered pesticide producing establishment of insecticide, fungicide, and Rodenticide. There are no violations against this facility for generation or disposal of their waste and product

- The SLIC (Spills, Leaks, Investigation and Cleanup) program is designed to protect and restore water quality from spills, leaks and similar discharges. All three of the sites on this list are considered an open site undergoing site assessments, but are considered low priority. The sites are outside of the construction zone and presents no threat to this project.

- The HAZNET data base extracts copies of hazardous waste manifest received each year by the DTSC. The 58 sites that showed up on this data base show that hazardous waste was deposed of properly.

- Eleven (11) sites showed up on the Clandestine Drug Labs (CDL) database during a records search. Listing of a location in this database does not indicate that any illegal drug lab materials were or were not present there, and does not constitute a determination that the location either requires or does not require additional cleanup work.

6.5 Feather River South

This section of the levee project contained:

One (1) site on the Clandestine Drug Labs (CDL) database

- One (1) site showed up on the Clandestine Drug Labs (CDL) database during a records search. Listing of a location in this database does not indicate that any illegal drug lab materials were or were not present there, and does not constitute a determination that the location either requires or

does not require additional cleanup work.

6.6 Sutter Bypass

This section of the levee project contained:

One (1) site that showed up on the ENVIROSTOR database.

- The ENVIROSTOR database comes from DTSC and identifies sites that have know contamination or sites for which there may be reason to investigate further. Growers Ag Services, Inc. is considered an open case by the California Regional Water Quality Control Board. A preliminary assessment has been done and no further action is recommended by the EPA. The Central Valley RWQCB (Region 5S) has it listed as a cleanup program site due to presence of discolored soil and pesticide odor noted on site.

6.7 Wadsworth Canal

This section of the levee project contained:

Three (3) UST's

One (1) site on the Spills, Leaks, Investigation, and Cleanup (SLIC) database

- Three (3) Underground Storage Tanks (UST's) were mentioned in the data search and located during the site visit. All 3 of the UST's are outside of the construction zone and present no threat to this project.

- The SLIC (Spills, Leaks, Investigation and Cleanup) program is designed to protect and restore water quality from spills, leaks and similar discharges. The Helena Chemical Company showed up on this list as an open site undergoing a site assessment for potential contamination of fertilizers. The site is outside of the construction zone and presents no threat to this project.

7.0 FINDINGS AND CONCLUSIONS

Based on information gathered during the site visit, data base search, and interviews conducted, there is no apparent HTRW contamination within the study limits.

The results of the interviews and research of available records of known or suspected contaminated sites indicate the potential for HTRW impact from inundation may be significant. The following additional factors should also be considered.

Possible pesticide residuals in the soil due to normal pesticide application.

Possible soil contamination associated with unknown or unregistered UST's and AST's within the study areas.

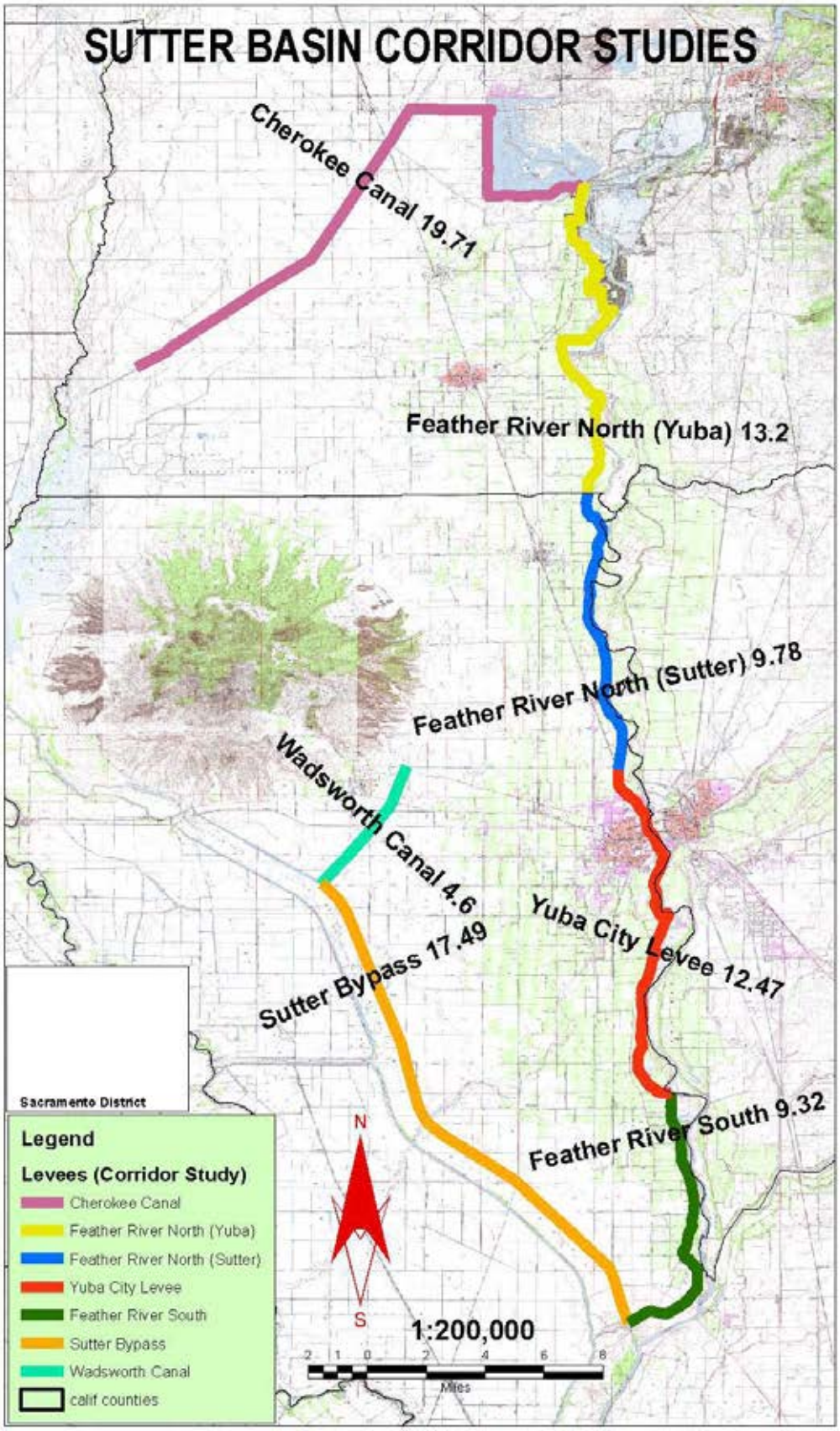
Based on information gathered during the site visit and data base search there is no apparent HTRW contamination, that is not already documented within the study area, that may affect the proposed project.

APPENDICES

Appendix 1 Site Map
Appendix 2 Photos
Appendix 3 Regulatory Research Documentation
EDR

Appendix 1

SITE MAPS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Cherokee Canal 19.71
Feather River North (Yuba) 13.2
Feather River North (Sutter) 9.78
Wadsworth Canal 4.6
Sutter Bypass 17.49
Yuba City Levee 12.47
Feather River South 9.32
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Levees (Corridor Study)
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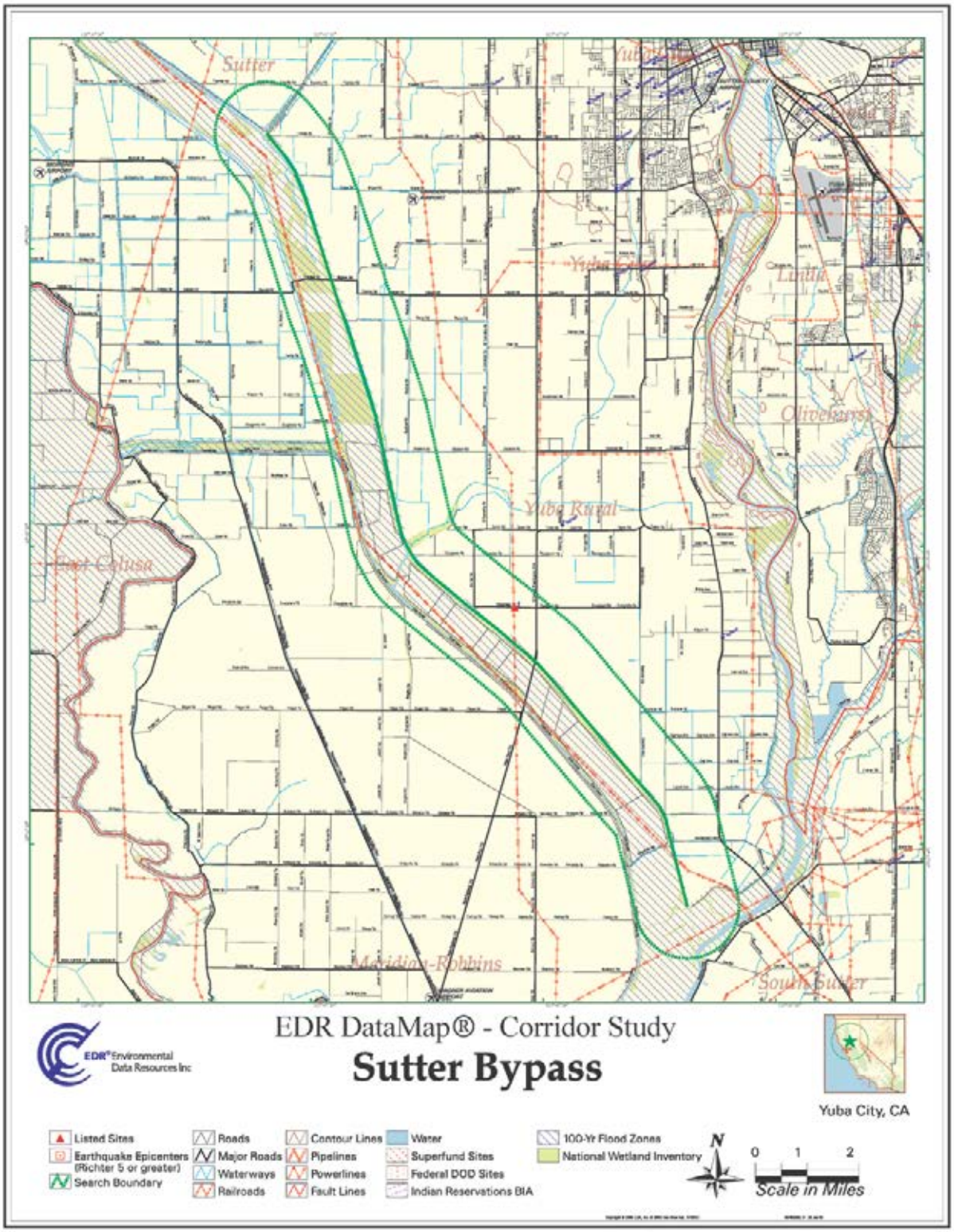
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South Sutter
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Sutter Bypass
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Yuba City, CA
Listed Sites
Earthquake Epicenters (Richter 5 or greater)
Search Boundary
Roads
Major Roads
Waterways
Railroads
Contour Lines
Pipelines
Powerlines
Fault Lines
Water
Superfund Sites
Federal DOD Sites
Indian Reservations BIA
100-Yr Flood Zones
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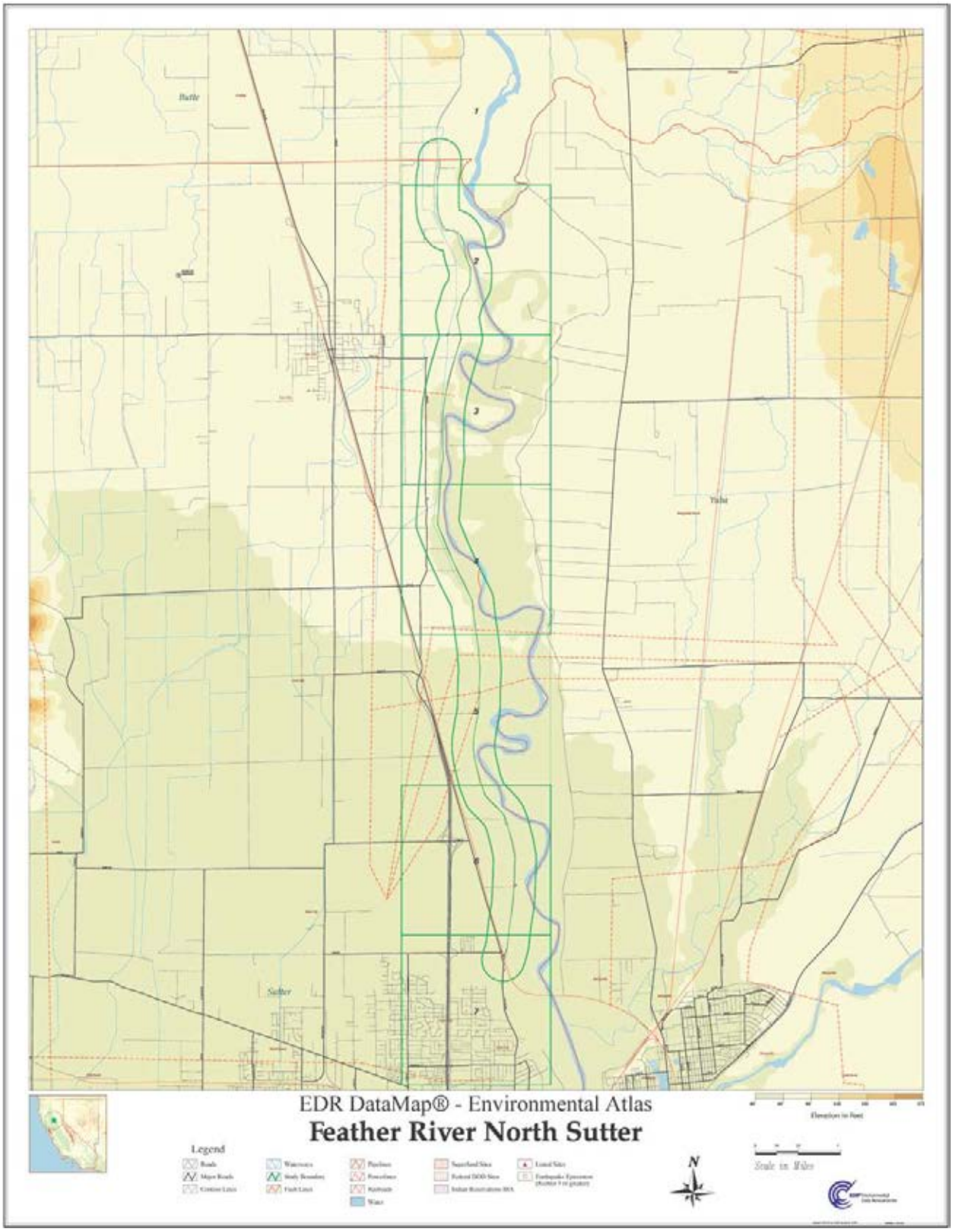
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Feather River North Sutter
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Scale in Miles
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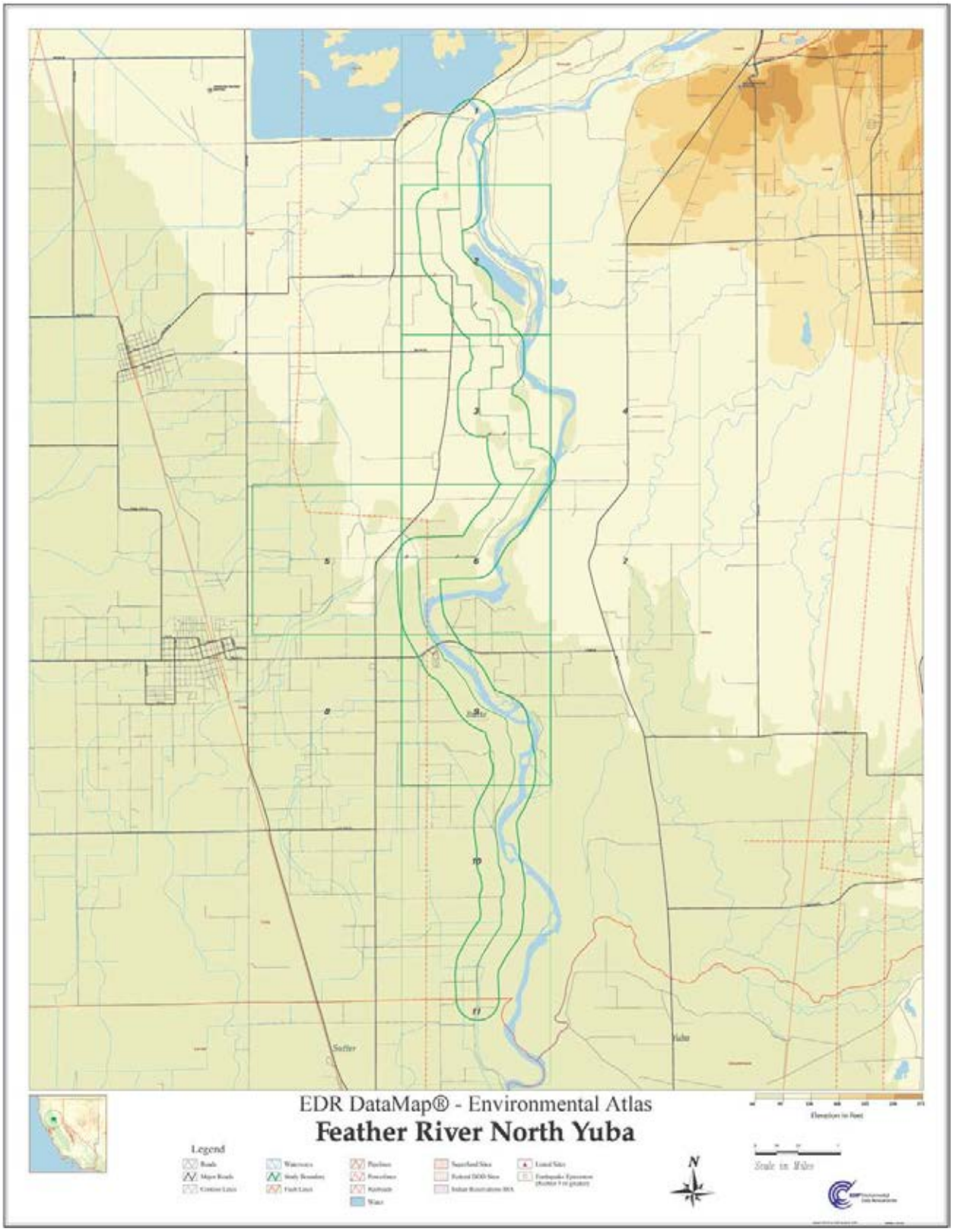
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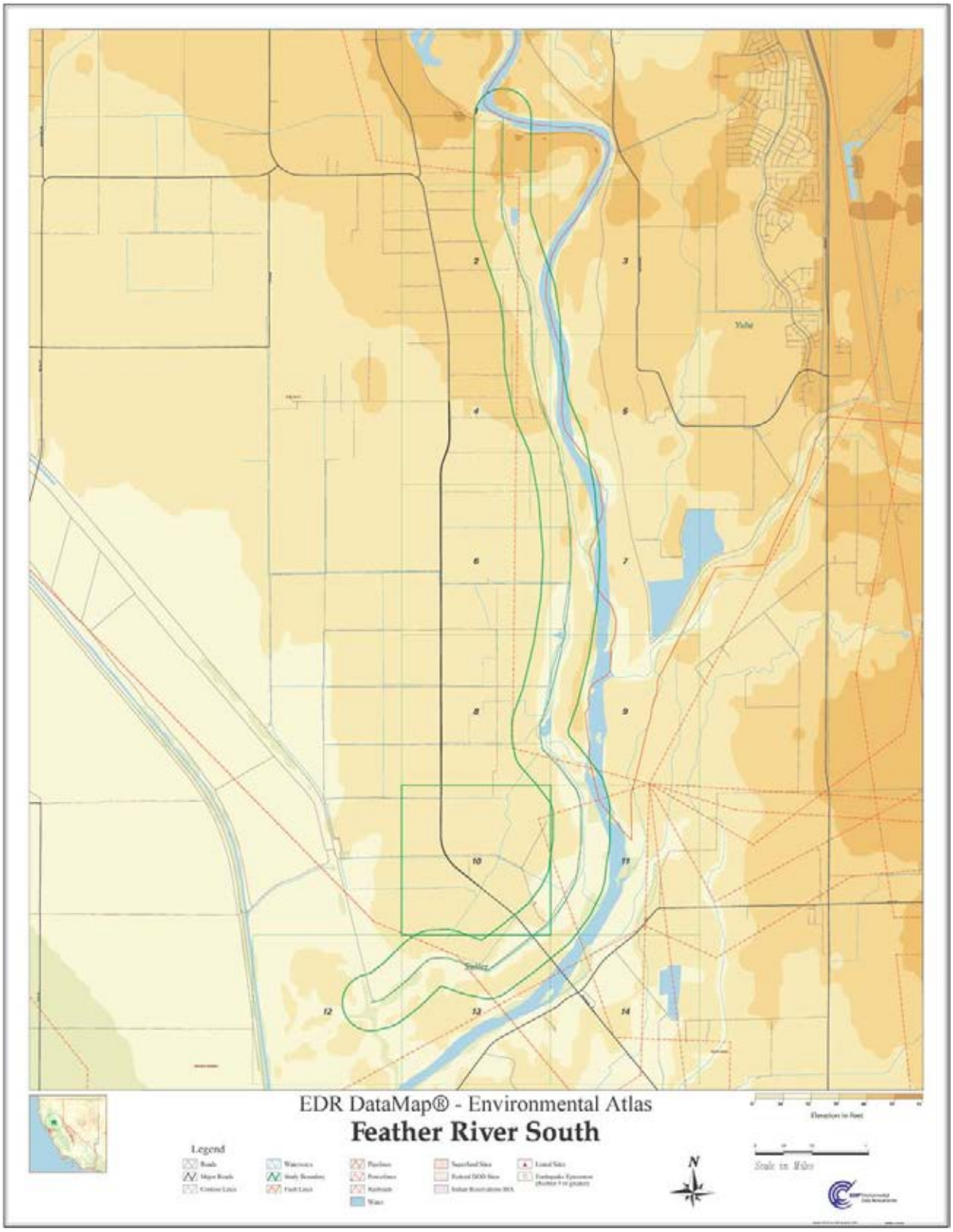
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Legend
Scale in Miles
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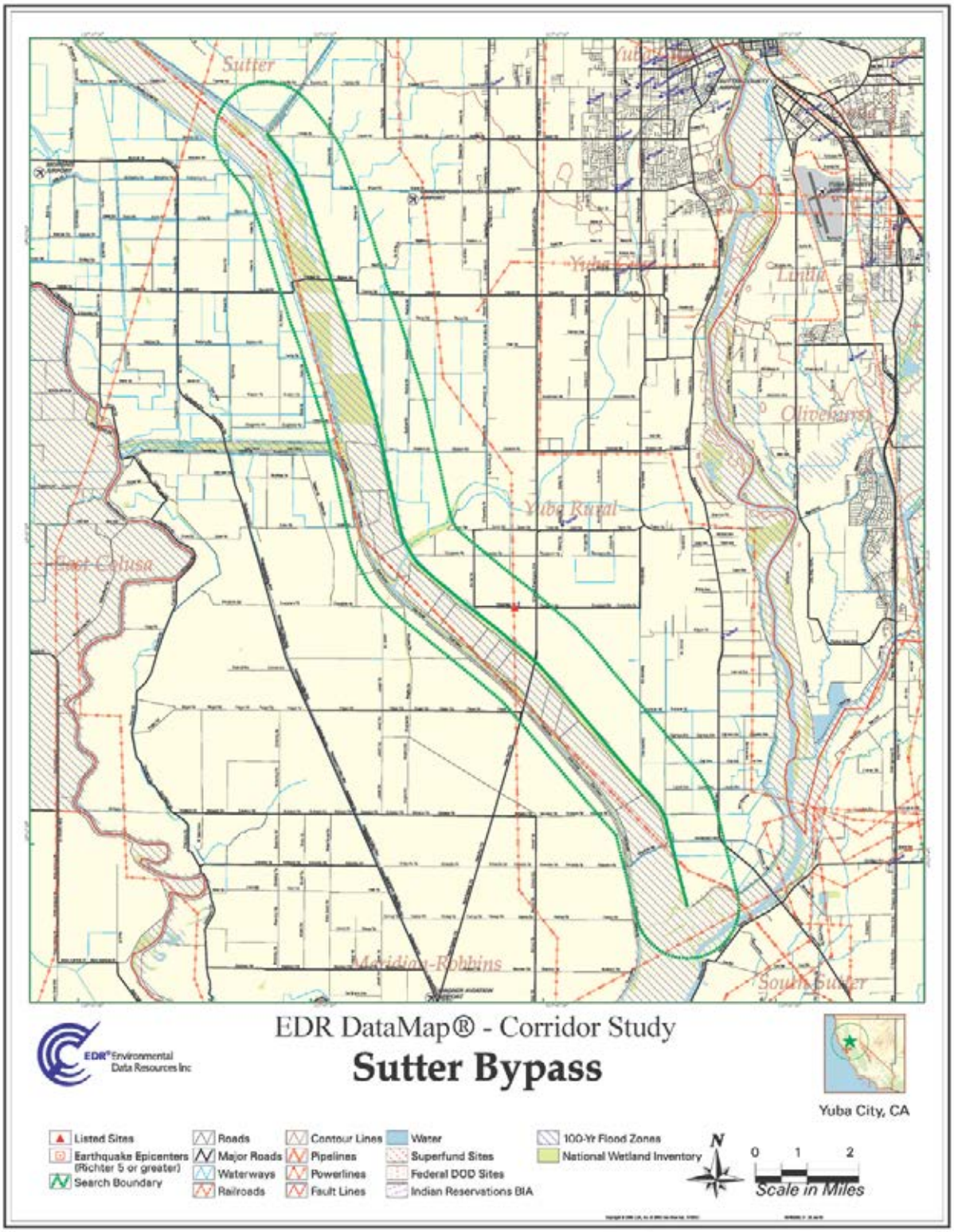
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Earthquake Epicenters (Richter 5 or greater)
Search Boundary
Roads
Major Roads
Waterways
Railroads
Contour Lines
Pipelines
Powerlines
Fault Lines
Water
Superfund Sites
Federal DOD Sites
Indian Reservations BIA
100-Yr Flood Zones
National Wetland Inventory
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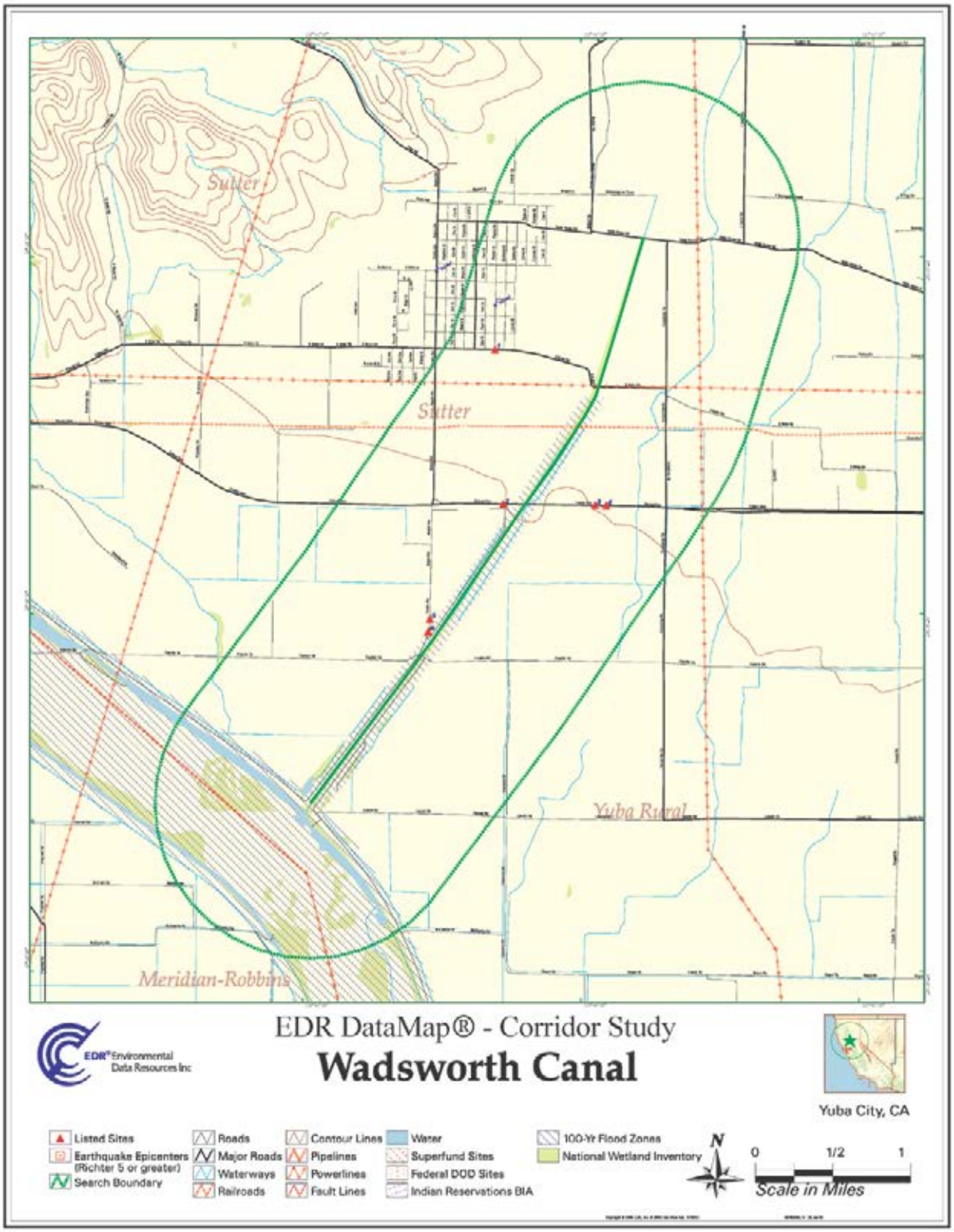
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100-Yr Flood Zones
National Wetland Inventory
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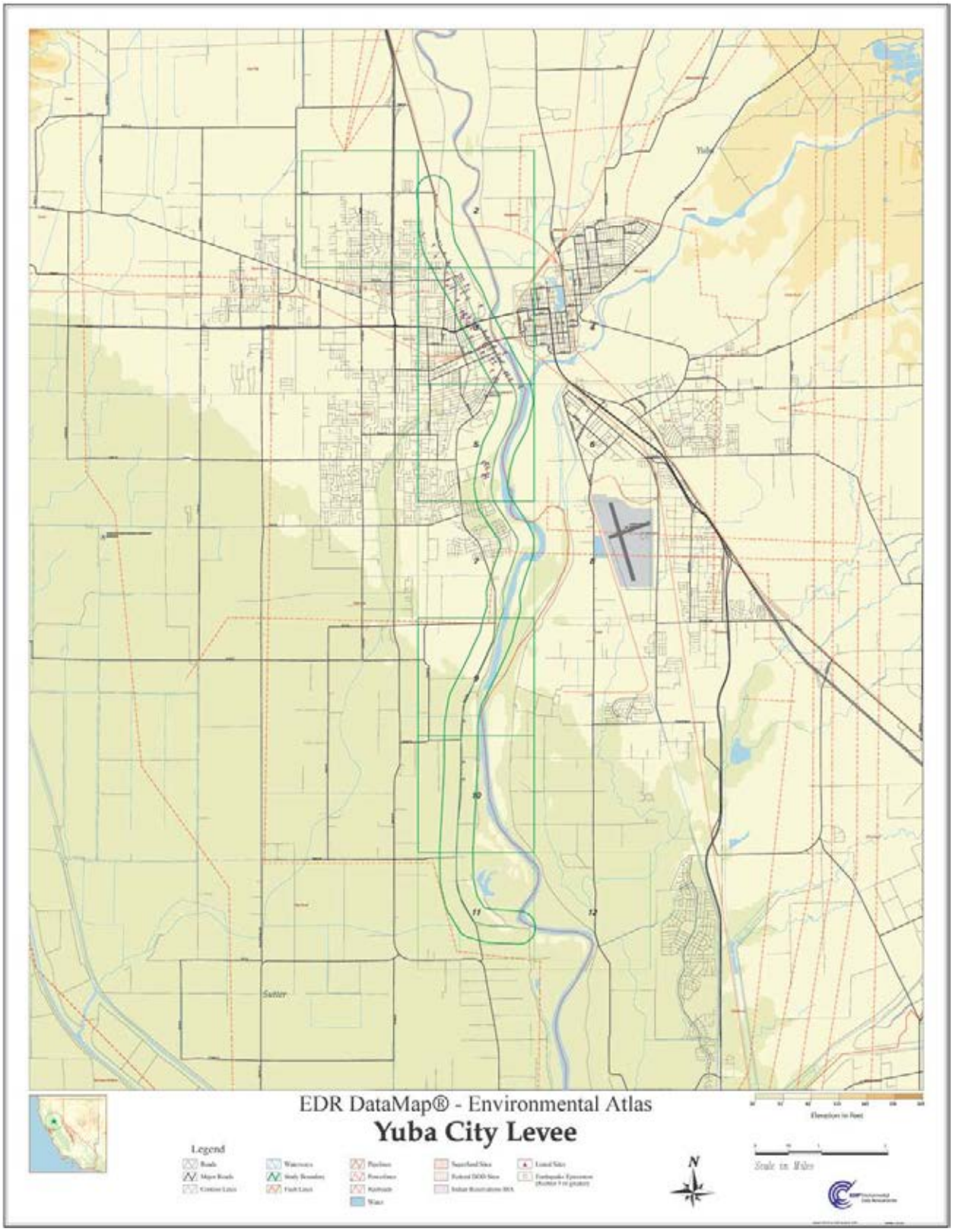
EDR DataMap® - Environmental Atlas
Yuba City Levee
Legend
Scale in Miles
N
Sutter

Appendix 2

PHOTOS



Start of the Cherokee Canal, looking NE from the Colusa Highway



Cherokee Canal overcrossing on the Richvale Hwy looking north



Sutter Bypass at Sacramento Ave. on the west side of the canal. Tanks are presumed to hold pesticides but no staining or leaks were visible.





Feather River North (Yuba) at East Gridley Road



Yuba City Levee, 2nd Street Boat Ramp



Yuba City Levee, 2nd Street



Yuba City Levee, 5th Street



Yuba City Levee, B Street



Yuba City Levee Highway 20



Yuba City Levee, Keyser Street



Yuba City Levee, Sutter Street



Yuba City Levee, Teega Ave.



Feather River South, Laura Ave.



Sutter Bypass



Sutter Bypass



Sutter Bypass



Sutter Bypass



Wadsworth Canal, Butte Road



Wadsworth Canal, Highway 20

Appendix 3

REGULATORY RESEARCH DOCUMENTATION

Appendix I

Cultural Context, Native American Correspondence, and Identified Resource Descriptions

Appendix I
Cultural Context, Native American Correspondence, and Identified Resource Descriptions

This appendix provides information in support of Section 3.17, *Cultural Resources.* This appendix contains a description of the prehistoric, ethnographic, and historic contexts for the FRLWP, a list of previous cultural resource studies performed in and near the footprint of the action alternatives, a list of properties on the National Register of Historic Places (NRHP) that occur near the action alternatives, as well as records of correspondence with the Native American community. Table I-1 presents a list of acronyms and abbreviations found in this appendix.

Table I-1. List of Acronyms and Abbreviations

APE	area of potential effects
APN	assessor's parcel number
B.P.	before present
CEQA	California Environmental Quality Act
CRHR	California Register of Historic Resources
LD 1	Levee District 1
FERC	Federal Energy Regulatory Commission
kV	kilovolt
MGD	million gallons per day
NAHC	Native American Heritage Commission
NRHP	National Register of Historic Places
SRFCP	Sacramento River Flood Control Project
USACE	U.S. Army Corps of Engineers

I.1 Cultural Context

I.1.1 Prehistoric Context

I.1.1.1 Feather River Vicinity, Foothills

The foothill region in the project vicinity corresponds roughly to the ethnographically known Maidu territory, and includes four recognized prehistoric archeological phases: the Mesilla, Bidwell, Sweetwater, and Oroville (Moratto 1984; Selverston et al. 2005).

Dating to approximately 3000–2000 before present (B.P.), the Mesilla Complex is characterized by atlatl projectile points (spear tips), bowl mortars, various shell beads, charm stones, and bone implements. Sites defining this phase apparently reflect seasonal forays into the foothills for hunting and gathering and appear to indicate a Martis influence (Moratto 1984). The Martis culture consists of large atlatl projectile points found at higher altitudes in the Sierra Nevada mountain range.

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The Bidwell Complex dates to approximately 2000–1200 B.P., and is defined by milling stones, wooden mortars (inferred from ethnographic sources; none have been found), large slate and basalt points, steatite vessels, and flexed burials. The settlement/subsistence pattern appears to have included permanent villages with surrounding task-specific locations (e.g., hunting, fishing, food processing).

The Sweetwater Complex dates to 1200–500 B.P. Relevant material culture includes shell, bead, and ornament forms; steatite cups; small projectile points (Eastgate, Rose Spring, and Gunther Barbed types); and extended or semi-extended burials.

The Oroville Complex dates to approximately 500–150 B.P. Typical manifestations include bedrock mortars, incised bird bone tubes, gorge hooks, gaming bones, clamshell disk beads, circular dance houses, and tightly flexed burials. This phase ended with the malaria epidemic of 1833, which greatly reduced the Maidu population (Riddell 1978).

I.1.1.2 Valley Prehistory

The prehistoric sequence of the Central Valley has been revised several times, and therefore a variety of terms are used across the relevant literature. Early literature described the prehistoric cultures in terms of different, regional manifestations with unique material culture, called patterns. Frequently used regional divisions refer to Windmiller, Berkeley, and Augustine patterns. The current explanatory framework focuses less on regionally specific aspects and integrates the overall prehistory into a sequence (Bennyhoff and Fredrickson 1994). Bennyhoff and Fredrickson describe the Central Valley prehistory in terms of Early, Middle, and Late Horizons. This revision considers Central Valley prehistory in terms of culture change as a process rather than the more descriptive methods of early literature.

Early Horizon, Pleistocene/Holocene Transition: 12,000–8000 B.P.

Archaeological evidence for human use of the Central Valley during the late Pleistocene and early Holocene is scarce. At the end of the Pleistocene, circa 12,000–8000 B.P., parts of the Sierra Nevada adjacent to the Central Valley were covered with large glaciers, and the valley provided a major transportation route for animals and people. This transportation corridor, perhaps rivaled only by maritime coastal travel, undoubtedly was used heavily by early Californians.

Although rare, the archaeological remains of these activities have been identified in the Central Valley (Ann S. Peak & Associates 1981; Johnson 1967; Treganza and Heizer 1953). Johnson (1967) presents evidence for some use of the Mokelumne River area, under what is now Camanche Reservoir, during the late Pleistocene. A number of lithic cores and a flake were found at three different locations. All lithic specimens were associated with Pleistocene-age gravels. Early research describes this material as part of the Farmington Complex, characterized by core tools and large, reworked percussion flakes (Treganza and Heizer 1953:28). Farther north, at Rancho Murieta, lithic artifacts spanning the reduction sequence, as well as unworked raw material, were recovered from gravel deposits attributed to the late Pleistocene (Ann S. Peak & Associates 1981). However, recent geoarchaeological investigations at CA-STA-69 (in the vicinity of Farmington Complex–type site CA-STA-44) identified Farmington artifacts at the site within Holocene-age alluvial terrace deposits, not Pleistocene-age deposits. These indicate reinvestigation of the age of the Farmington Complex may associate this archaeological culture with the Holocene (Rosenthal et al. 2007).

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Most researchers conclude the Pleistocene and early Holocene human economy focused on large game. Although no direct evidence of this exists in the Central Valley, the similarity of the artifact assemblages to those of other locations in western North America, where the association can be demonstrated, supports this argument. Many large Pleistocene mammals suffered extinction during the Pleistocene/Holocene transition. These extinctions were caused by warming temperatures, rising sea levels, and changing precipitation patterns (Meyer and Rosenthal 2008). The Central Valley gradually became both warmer and dryer. Pine forests were replaced with vegetation similar to that found today. The rising sea level filled what is now the San Francisco Bay and created the Sacramento–San Joaquin River Delta marshes. To survive without large game, people had to change their food procurement strategies to make use of a more diverse range of smaller plants and animals (Moratto 1984).

Early Horizon: 8000–4000 B.P.

As humans altered their subsistence strategy to increase the range of pursued food items, their mobility also increased. Small groups of people probably moved through the valley, foothills, and Sierra Nevada to take advantage of seasonally available resources and resources limited to particular unique environments. The ability to move from resource to resource was a critical element of this subsistence strategy (Rosenthal et al. 2007).

Reliance on a number of diverse smaller plants and animals had several consequences. First, people had to move from one area to another to take advantage of the seasonal availability of particular resources. Second, large areas of land were needed to ensure that enough resources were available during all times of the year. Third, more specialized tools were necessary to procure and process the wider range of plants and animals that were being used. This broad-based strategy continued relatively unchanged until approximately 6000 B.P.

As the population slowly increased, it became increasingly difficult for people to obtain seasonally available resources across large areas of land (Meyer and Rosenthal 2008). Dental pathologies in the burial record reveal dietary stress (Moratto 1978). Growing populations decreased the land available to given cultural units, and thus the suite of resources available to those populations. This pressure resulted in a further expansion of the suite of resources pursued, relative to previous conditions.

Fredrickson (1973) identified archaeological indicators of this expansion in the Windmiller site (CA-SAC-107). Artifacts and faunal remains at Windmiller sites indicate that a diverse range of resources were exploited, including seeds, a variety of small game, and fish. The material culture includes trident fish spears; at least two types of fishhooks; quartz crystals and numerous charm stone styles; and a baked clay assemblage that included net sinkers, pecan-shaped fish line sinkers, and cooking balls. Ground-stone items included mortars and pestles. The bone tool industry appears minimal but includes awls, needles, and flakers. People with a Windmiller adaptation buried their dead in formal cemeteries, both within and separate from their villages, in a ritual context that included the use of red ochre, often rich grave offerings, and ventral extension with a predominantly western orientation (although other burial positions, such as dorsal extension and flexed, and cremations are also known) (Moratto 1984). While the Windmiller pattern is identified with the Sacramento–San Joaquin River Delta, work at Camanche Reservoir has identified sites with Windmiller assemblages (Johnson 1967), indicating that other valley settings also were used by people exhibiting these adaptations.

Middle Horizon: 4000–1500 B.P.

In the Middle Horizon, resource specialization resulting from the expanded subsistence strategy is readily visible in the archaeological record. Dietary expansion was associated with new exploitation of niche environments such as marshlands in the Delta. Acorn procurement from oak trees (*Quercus,* sp.) also increased. The acorn had been used before this time, but it became a much more significant portion of the overall diet breadth, with specialized procurement and processing technologies (Rosenthal et al. 2007). People in this period were more sedentary than they had been in the past, and village sites are found throughout the valley along rivers and near other areas with permanent sources of water (Moratto 1984).

Previous research described the Berkeley Pattern identified at CA-Ala-307 as a typical Middle Horizon site (Fredrickson 1973). Sites displaying Windmiller Pattern assemblages, however, also are found in the Middle Horizon. The Windmiller Pattern sites in this period seem to occur with more frequency in or near the Delta, while Berkeley Pattern sites tend to be more prevalent farther north. The Berkeley Pattern differs primarily in its greater emphasis on the exploitation of the acorn as a staple. This distinction is reflected in the more numerous and varied mortars and pestles. This complex is also noted for its especially well-developed bone tool industry and such technological innovations as ribbon flaking of chipped stone artifacts. During this era, flexed burials replaced extended burials, and the use of grave goods generally declined (Moratto 1984).

A restricted land base, coupled with a more specialized resource base, meant that people had to develop economic relationships with groups of people living in other areas who had different specialized resources. Although resources and commodities were being exchanged throughout the region prior to this period, it is during this period that more extensive and more frequently used economic networks developed. Transported resources likely included foods (trans-Sierra acorn movement is known from later periods) and commodities more visible in the archaeological record such as shell and lithic materials (Moratto 1984).

Late Horizon: 1500–150 B.P.

The Late Horizon archaeological record documents further increases in specialization, sedentary settlement, and exchange networks relative to the Middle Horizon. Population continued to increase, and group territories continued to become smaller and more defined. The Delta region of the Central Valley reached population density figures higher than almost any other area of North America (Chartkoff and Chartkoff 1984). Patterns in the activities, social relationships, belief systems, and material culture continued to develop during this period and took forms similar to those described by the first Europeans that entered the area.

The predominant generalized subsistence pattern during this period is called the Augustine Pattern (Fredrickson 1973). Archaeological sites representing the Augustine Pattern show a high degree of technological specialization. Artifacts in this period include artifacts of composite materials, developed reductive technologies such as stone and shell work, and highly specialized adaptive technologies, including basketwork and ceramic production. Other notable elements of the material culture assemblage include flanged tubular smoking pipes; harpoons; ceramic figurines and vessels (Cosumnes Brownware); clamshell disk beads; and small projectile point types such as the Gunther Barbed series. These small projectile points may indicate the use of the bow and arrow. Complex social and economic institutions also are represented by different access to wealth, the

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implementation of a shell money system, and the maintenance of extensive exchange networks (Meyer and Rosenthal 2008).

I.1.2 Ethnographic Context

I.1.2.1 Konkow Maidu

The Konkow Maidu occupied foothills east of Chico and Oroville, as well as a portion of the Sacramento Valley (Riddell 1978). Konkow is one of three languages composing the Maiduan language family of the Penutian linguistic stock. Several dialects of Konkow were spoken from the lower extent of the Feather River Canyon to the surrounding hills and in the adjacent parts of the Sacramento Valley (Shipley 1978).

The Konkow lived in village communities of three to five villages, in round semi-subterranean houses covered with earth. It is estimated that a typical village consisted of about 35 people during ethnographic times. Villages were made up of smaller groups. Family units usually were made up of two to five people. A major village with a large assembly and subterranean ceremonial lodge served as the central ceremonial and political focus for affiliated villages in the vicinity. This central village was not necessarily the most populous village but likely served as the residence of the chief, who lived in the ceremonial lodge. The chief's primary roles were advisor and spokesman. The individual villages were self-sufficient, not under the control of a headman (California Department of Water Resources 2004; Riddell 1978).

In winter, the Konkow settled in widely dispersed patterns along river canyons, usually on ridges high above rivers and generally on small flats on the crest of the ridge, or half way down the canyon side. A village-community owned and defended a known territory, which served as a communal hunting and fishing ground. Some villages were located strategically atop isolated knolls in consideration of attack and defense. The Konkow followed an annual gathering cycle that made it necessary for them to leave their winter settlements on the river ridges. In the summer, they traveled into the mountains to hunt. In the spring, they ventured into the valley areas to collect grass seeds (Riddell 1978).

The Konkow harvested greens, tubers, roots, seeds, nuts, and berries. Although wild rye was common in their diet and pine nuts were highly valued, the most important of the harvested foods were acorns, from black oak (*Quercus kelloggi)* in particular. Konkow burned grass and brush cover to optimize the mix of plants eaten by deer. Fisherman pursued salmon on the Feather River. The Konkow also pursued lamprey eels. Terrestrial game eaten by the Konkow included deer, elk, rabbits, squirrels, and birds such as quail, pigeons, and ducks (California Department of Water Resources 2004; Riddell 1978).

Because the Konkow had no complex political organization, the shaman was an important figure in their society. The shaman occupied a role that combined political, spiritual, and medical functions. The shaman role was passed down as a hereditary office from father to son (Riddell 1978).

The Konkow held an annual mourning ceremony, the Keruk, for the recently deceased, which reenacted the death of the creator, Kukumat. For this ceremony a male and female effigy were created, clothed, and burned. The Konkow also offered money, food, and blankets to the god, through incineration. The Maidu participated in the Kuksu cult, also practiced by the Patwin, Pomo, northern Costanoans, and the Coast and Sierra Miwok. Kuksu, "the south god," renewed the world

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each year. The ritual was celebrated in round dance houses by dancers with elaborate costumes, including large feather headdresses (Riddell 1978).

Konkow life was little affected by European contact until the gold rush in 1849. At this time miners descended upon the Feather River and surrounding foothills to remove abundant gold. The miners brought diseases that were deadly to the native peoples, decimating the population. These miners also destroyed the landscape with their mining techniques and violently drove the surviving Konkow from their lands. When the mining craze was over, the miners settled in the area and turned large tracts of land into agricultural fields. Because the miners wanted their land, the Konkow were twice driven off their traditional lands. In 1853, the Konkow, along with other Native American groups, were gathered by force and sent to the Nome Lackee reservation in Tehama County. This was not a successful reservation, and most of the families returned to their original lands. In 1863, the Konkow again were rounded up by militias and driven to the Round Valley Reservation in northern Mendocino County. Many of these families remain in Round Valley today. Around the turn of the twentieth century, the Federal government created rancherias for the Konkow, establishing a limited land base for the tribe and formalizing their tribal status with the Federal government. Today the Konkow are very active in cultural preservation in and around the Palermo/Feather River area. (California Department of Water Resources 2004.)

I.1.2.2 Valley Nisenan

The Feather River West Levee Project encompasses lands associated with the Southern Maidu, or Nisenan. The language of the Nisenan, which includes several dialects, is classified in the Maiduan family of the Penutian linguistic stock (Kroeber 1976; Shipley 1978). The western boundary of Nisenan territory was the western bank of the Sacramento River. The eastern boundary was "the line in the Sierra Nevada mountains where the snow lay on the ground all winter" (Littlejohn 1928).

Nisenan permanent villages usually were located on low rises along major watercourses. Village size ranged from 3 houses to 50. Houses were domed structures covered with earth and tule or grass and measured 3.0–4.6 meters in diameter. Brush shelters were used in the summer and at temporary camps during food-gathering rounds. Larger villages often had semi-subterranean dance houses that were covered in earth and tule or brush, with a central smoke hole at the top and an east-facing entrance. Another common village structure was a granary used for storing acorns (Wilson and Towne 1978). A Nisenan village, Holloh, was located just outside of the eastern boundary of the project area along the Bear River.

The Nisenan occupied permanent settlements from which specific task groups set out to harvest the seasonal bounty of flora and fauna provided by the rich valley environment. The Valley Nisenan economy involved riparian resources, in contrast to the Hill Nisenan, whose resource base consisted primarily of acorn and game procurement. The Nisenan cultivated native tobacco (*Nicotiana* sp.), and also managed wild species through burning. The Nisenan harvested blue oak (*Quercus douglasii*) and black oak (*Q. kelloggii*). Acorns could be stored in anticipation of winter shortfalls in resource abundance. Deer, rabbit, and salmon were the chief sources of animal protein in the aboriginal diet, but many other insect and animal species were taken when available.

Religion played an important role in Nisenan life. The Nisenan believe that all natural objects were endowed with supernatural powers. Two kinds of shamans existed: curing shamans and religious shamans. Curing shamans had limited contact with the spirit world and diagnosed and healed

illnesses. Religious shamans gained control over the spirits through dreams and esoteric experiences (Wilson and Towne 1978). The usual mode of burial was cremation (Faye 1923).

The gold rush of 1849 had a devastating effect on the Valley Nisenan. The flood of miners that came to the area in search of gold brought diseases with them that decimated the Nisenan population. Those who survived were subjected to violence and prejudice at the hands of the miners, and the Nisenan eventually were pushed out of their ancestral territory. Although this contact with settlers had a profound negative effect on the Nisenan population, the Nisenan people survive and maintain strong communities.

I.1.3 Historical Context

I.1.3.1 Early Exploration

Spanish exploration of the region began with Gabriel Moraga's forays into the region in 1808. Moraga named one of the area rivers *Rio de las Uvas*, which came to be known as the Yuba River. Hudson's Bay Company trappers later traveled through the region in the 1830s, followed by the expedition led by John C. Fremont in 1846. Sutter County received its name from John A. Sutter, who established Sutter's Fort in Sacramento during the early 1840s and whose Hock Farm and New Helvetia lands included areas of Sutter County (Hoover et al. 1990; Rawls and Bean 2003; Williams et al. 2002).

I.1.3.2 Gold Rush

This region exploded with mining activity during the gold rush, which attracted both American and international settlers. Euro Americans settled the present-day Yuba City/Marysville area intensively during the California gold rush. Beginning in 1849, prospectors and entrepreneurs overran the streams of the Sierra Nevada, including the Feather and Yuba Rivers, in search of riches. Placer miners initially established claims and settlements on watercourses, and then gradually worked back from the flats adjacent to streams to ridges and hillsides.

The flood of 1850 encouraged miners to work areas located above the high-water mark of the Feather and Yuba Rivers. By 1857, hydraulic mining began to replace the placer methods. Hydraulic mining occurred primarily in uplands, while small-scale placer mining operations continued along rivers and streams. Hydraulic mining removed large upland deposits, which were washed into waterways, contributing to disastrous flooding and making waterways un-navigable. The industry went into decline after 1884, when a Federal court outlawed mining debris in rivers in the decision *Woodruff v. North Bloomfield Gravel Mining Company*. Gold excavation in the region was revived with dredge mining operations around Oroville and Honcut after 1900 (Rawls and Bean 2003; Williams et al. 2002).

I.1.3.3 Agriculture and Irrigation

Settlers raised wheat and vegetables in the Yuba City /Marysville area as early as the 1840s. Small-scale hop farming was introduced to the area in 1859. Domesticated cattle and sheep arrived from the Midwest in the early 1850s and multiplied substantially. Agriculture made gains in the region during the 1860s, but in Butte County mining activity increased at the expense of agriculture during the next decade (Rawls and Bean 2003; Williams et al. 2002).

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During the 1880s the agricultural economy increased markedly, as a result of two factors. First, the conversion of hydraulic-mining water conduits to irrigation systems, a process dominated by private companies in this region of California, introduced the possibility of transforming otherwise poor land into highly productive agricultural land. Second, the railroad and, by the late 1880s, the refrigerated rail car, encouraged local farmers' participation in a wider range of markets (Rawls and Bean 2003; Williams et al. 2002).

Fruit production became a major element of the regional economy during the last two decades of the nineteenth century. Citrus colonies were organized in Butte County between 1886 and 1895, the most prominent of which were Thermalito, Palermo, and Rio Bonito (Frederich 1974).

I.1.3.4 Settlement of Local Towns

A large portion of the project area was originally included in John A. Sutter's New Helvetia land grant established in 1841. In order to support his settlement in Sacramento, Sutter started a livestock ranch called the Hock Farm near the site of what would become Yuba City. Yuba City was founded in 1849 on land purchased from John Sutter by Samuel Brannan, Pierson Reading, and Henry Cheever. They established a distribution center for supplying the gold rush 49ers. Sam Brannan, as senior partner, had the town site laid out and hired agents to sell lots. During the gold rush, Marysville, on the east bank of the Feather River, overshadowed Yuba City because it was easier for miners arriving by riverboat from San Francisco and Sacramento to reach the gold fields to the east. It was not until after the gold rush was over, and people turned to the fertile land west of the river, that Yuba City began to prosper. Yuba City was established as the county seat by a vote in 1856 and incorporated January 23, 1908 (Rawls and Bean 2003; Williams et al. 2002).

The California and Oregon Railroad established Biggs in 1870, naming the town after the first rancher to ship grain from the region, Major Marion Biggs. By the early twentieth century, the town of Biggs had an established agricultural industry, predominantly producing hemp, alfalfa, berries, vegetables, and grapes. The town incorporated in 1903. From its beginning, Biggs has been associated with municipally owned public utilities—water works and an electricity distribution system purchased to provide Biggs residents with low cost utilities (Sacramento Bee 1953a; Sacramento Bee Annual Edition for 1902; Gudde and Bright 1998).

The Southern Pacific Railroad Company established the town of Gridley in 1870, naming the town after George W. Gridley, the owner of approximately 8,000 acres, 320 of which encompassed the new town. Gridley was a native of Cazenovia, New York, who migrated to California in 1850 in search of gold. In 1853, Gridley settled in Butte County, where he raised sheep and worked as an auctioneer. The city of Gridley grew steadily during the late nineteenth century, and by 1887 the town had a population of roughly 1,500 residents. From its origins, Gridley had a developed agricultural industry, including an established dairy production and a variety of crop output such as grain and fruit (Gudde and Bright 1998:153; Robb 1915; Sacramento Union 1887).

The town of Live Oak was established in 1874. Named by H. L. Gregory, the town grew steadily but slowly, and by 1881 it included a population of 180 residents. Live Oak historically has been an agricultural community, producing crops such as walnuts, peaches, prunes, and grain. Ranching and canning also have been an important part of the agricultural industry in Live Oak. In 1947, the town featured the last of 65 canneries opened by the United States Department of Agriculture during World War II in high schools throughout California. The town incorporated in 1947 with a

population of approximately 1,500 (Gudde and Bright 1998; Sacramento Bee 1947, 1953b, 1966; Sacramento Union 1881).

I.1.3.5 Flood Control and Reclamation

Impacts from hydraulic mining were felt by most communities and farmers in the Sacramento Valley. In the early years of statehood, the Sacramento Valley experienced extensive flooding. In response, private landowners constructed small levees—between 3 and 4 feet high—near their farms. This was a pattern repeated by most landowners along rivers in the Sacramento area. These levees, however, proved ineffective and failed during the catastrophic floods from this early period (Crawford and Herrick 2006:138; McGowan 1961:287; O'Neill 2006:74). As the floods worsened, landowners attempted to build higher levees, but these too proved ineffective (McGowan 1961:288).

California was included in the Federal Swamp Land Act of 1850, which allowed the state to reclaim its wetlands through the construction of levees. The program, however, was riddled with corruption and problems that compounded levee construction (O'Neill 2006:48–50, 52, 73; U.S. Geological Survey 2006). In the early 1860s, as hydraulic mining increased and flooding continued to be a significant problem for farmers in the Sacramento Valley, a concentrated effort at levee construction began. The state legislature tried to coordinate a levee system and control levee construction by creating the Swamp Land Commission. Modeled after districts in Mississippi, the legislation gave California drainage districts, which were permitted to grant the power to construct levees. It would become the responsibility of state engineers to design the levees for each district. By the end of the first year, there were 28 districts. For a multitude of reasons, including more flooding, landowners who refused to pay levee fees, and others who were unable to pay, the system produced only minor tangible results. The legislature enhanced levee district powers in 1864, which spurred more levee construction (O'Neill 2006:81). However, by 1866, after complaints for local control over the districts, the state was no longer planning a centralized levee system. The following year, the region suffered another catastrophic flood when the American River rose so high that it flowed across the Sacramento River and breached the levees on the west side of the river, north of present-day West Sacramento in Yolo County (McGowan 1961:289).

The Green Act boosted levee construction in 1868. The act eliminated the limit on the number of swampland acres allowed under the Federal swampland program and transferred to landowners the task of creating levee districts. Between 1868 and 1871, almost all remaining swampland passed into the hands of private owners (O'Neill 2006:82). During this period, private owners constructed extensive levee systems that were much larger and, combined with the reclamation of swamplands, made flooding more serious (O'Neill 2006:82; McGowan 1961:287).

Levee construction and flood control were compounded in the 1880s and 1890s as the fight between miners and farmers continued. There was also disagreement between the U.S. Army Corps of Engineers (USACE) and the state about USACE's role and authority in the matter. This hindered Federal involvement. Local reclamation districts continued to build levees in a piecemeal fashion, including levees on the west bank of the Sacramento River. These raised the floodplain, protected the local lands, and blocked natural outlets. This created flood problems for residents farther down the river during the first part of the twentieth century.

In 1903 and 1904, the Sacramento River once again flooded. In 1904, a statewide lobbying organization was created for the purpose of generating more work from the state government for river improvement in cooperation with landowners and other government agencies. The governor

created a Board of River Engineers composed of engineers with extensive experience with river management on the Mississippi River. The board recommendation was to relieve stress on the levees by constructing weirs that would temporarily allow excess water to bypass the river channel until a proper channel depth could be achieved. The proposal was rejected by the California Board of Trade, which was pushing for the construction of more levees. This was ultimately the approach adopted by the legislature (O'Neill 2006:94, 104, 106–107).

California continued to lobby the Federal government for help. Another devastating flood in 1907 increased pressure for more Federal funding, but plans for a comprehensive flood control plan stalled after it was learned that the driving force behind the plan was private landowners. It would take until 1911 for California Debris Commission member Thomas H. Jackson to design a comprehensive flood control plan that was more than just constructing levees. This approach was acceptable to the Federal government, and a special session of the state legislature approved California's support and participation in the new flood plan (O'Neill 2006:111, 114–115). Lobbying efforts continued to press the Federal government and finally were successful when the 1917 Flood Control Act was passed. Among other things, the act required USACE to work with state governments and local levee districts and gave $5.6 million to construct flood control facilities in the Sacramento Valley (O'Neill 2006:125). The act authorized the Sacramento River Flood Control Project (SRFCP), which provided for the construction of more levees and the Yolo and Sutter Bypasses. The SRFCP was the first complete Federal flood control project (Bailey 2007:24; California Central Valleys Flood Control Association 1960; O'Neill 2006:125).

Changes to the act were made in 1928, 1937, and 1941. The projects in the Sacramento Valley were further affected by the Flood Control Acts of 1944, 1950, 1958, and 1960. The SRFCP resulted in 980 miles of levee construction (California Central Valleys Flood Control Association 1960). In 1955, another devastating flood occurred in the Sacramento region. A subsequent investigation exposed structural and functional deficiencies in the levees that could not have been foreseen or tested until a flood occurred. The levees in the Sacramento Valley needed maintenance, which continued to be costly. One reason for the deterioration was thought to be erosion caused by increased pleasure boating on the rivers, which caused waves to erode adjacent levees (California Central Valleys Flood Control Association 1960).

Feather River Levees and Local Reclamation

Levee District 1 (LD 1) was formed in April 1868, following a flood in 1867, to construct a portion of the present levees along the Feather River. The Green Act of 1868 fixed the present district boundaries. The flood of 1867 took out the existing levee across Gilsizer Slough. The levee broke again at Gilsizer Slough in 1871. From 1871 on, as hydraulic mining debris raised the bed of the Feather River channel, it was necessary to raise the existing levees and construct and maintain a back levee to protect the district from the waters in Sutter Basin between the Sacramento and Feather Rivers, which overflowed during high-water stages.

Realizing that the levee crown of the Feather River was too close to a possible flood stage, based on past floods and the possibility of the levee being overtopped, LD 1 decided to slab the sides and raise the crowns of all the levees 5 feet above the estimated flood plain. This project consisted of raising the Feather River levee from the south boundary of LD 1 to the wagon bridge between Yuba City and Marysville. Work started in 1905 and was carried on in different locations along the Feather River until the flood of March 1907. Two breaks occurred on the levee, one on the Starr Bend north of Yuba City and one on the Holmes tract, about 5 miles south of Yuba City (Levee District 1 2009).

Nearly all of LD 1, including Yuba City, was flooded and much of the uncompleted dredger levee was washed away. The dredge work continued on the levee between Star Bend and Yuba City, and work was completed on a sand levee between Shanghai Bend and Yuba City when a flood occurred in 1909. The flood reached an elevation about 1 foot higher than the top of the levee in the pocket where the old bow levee joined the sand levee at Shanghai Bend. A break occurred in the sand levee at its junction with the old bow levee, which eroded to an 800-foot gap, and another break occurred in the sand levee halfway between Shanghai Bend and Yuba City, which eroded to a 2,600-foot gap. These breaks allowed water to overflow the lands between the sand levee and the old original levee along the Garden Highway. The sand levee constructed by the dredger on an alignment slightly east of the original earth levee was washed out, the water overflowed the old levee, and another break occurred just south of Shanghai Bend. During the year following the 1909 flood, the dredger filled the breaks in the sand levee. The moving of sand deposited by the dredger away from the river created a slope of 6–7 feet (Levee District 1 2009).

In 1938, USACE rebuilt the sand levee from Shanghai Bend to Yuba City. The levee was maintained by LD 1 from that time until 1955. In December 1955, California experienced heavy rains. As a result, a large boil exploded between Shanghai Bend and Yuba City. Nearly all of Yuba City was inundated, and 37 people were killed. The levee was rebuilt by USACE, affirming the critical role flood control plays in the regional economy.

I.2 Previous Studies

Table I-2 lists studies that have been completed within the vicinity of the action alternatives.

Table I-2. Previous Studies

Study #	Year	Author(s)	Title
01047	1990	Bouey, P.	Sacramento River Flood Control System Evaluation, Marysville-Yuba City Area
01133	1980	Holman, M., and M. Clark	Archaeological Reconnaissance of the Feather River Project Area: Proposed Feather River Sand and Gravel Quarry
01405	1995	McGowan, D.	Cultural Resources Inventory Report of the Therm II Power Project
01485	1996	Storm, D.	Archaeological Investigations along the Feather River near Nicolaus, Audubon Sanctuary
02666	1998	Dietz, F.	Cultural Resources Assessment within Levee Districts 1 and 9, Maintenance Area 3
03134	1997	Shapiro, W. et al.	Archaeological Assessment within Levee District 1 and 9, Maintenance Area 3
06868	2005	Selverston, M. et al.	Archaeological and Historical Resources Inventory Report, Oroville Facilities Relicensing FERC Project No. 2100
07154	1992	Offerman, J.	Negative ASR: Extension of State Route 65 as a Connection between Routes 70 and 99 in Yuba and Sutter Counties
07165	2005	Quidachay, K., and S. Baxter	Cultural Resources Inventory Report for the Yuba Water Treatment Plant 24 to 30 MGD Water Supply Replacement Project
08002	2006	Sikes, N.	Cultural Resources Inventory for the City of Live Oak General Plan Update, Sutter County

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Study #	Year	Author(s)	Title
08783	2006	Neuenschwander, N.	Determination of Eligibility and Effect for the Proposed Feather River Setback Levee at Star Bend Project, Sutter County
08954	2007	Grant, J.	Cultural Resources Report for Geotechnical Borings along the Feather River, Sutter Bypass, and Wadsworth Canal
09539	2008	Leach-Palm, L. et al.	Cultural Resources Inventory of Caltrans District 3 Rural Conventional Highways
09954	2008	Berg, J.	Cultural Resources Inventory for the Pease-Marysville 60kV Transmission Line Project
10202	2008	Jensen, S.	Archaeological Inventory for the Proposed Live Oak Riverfront Boat Park Boat Ramp Project
10203	2008	Jensen, S.	Archaeological Inventory for the Proposed Gridley Boat Ramp Project

FERC = Federal Energy Regulatory Commission
MGD = million gallons per day
kV = kilovolt

I.3 Native American Correspondence

As part of the identification efforts for cultural resources, ICF staff requested a list of Native American contacts from the Native American Heritage Commission (NAHC) and a search of the Sacred Lands File maintained by the NAHC. The NAHC responded by letter on March 22, 2012, by providing a list of contacts and indicating that there are no resources identified for the project area in the Sacred Lands File. ICF contacted all parties identified in the NAHC list by letter on September 28, 2012.

I.4 Identified Resources Affected by the Action Alternatives

This section of this appendix provides an overview of the identified resources that may be affected by the action alternatives. This section has been prepared to provide factual basis describing why these resources are likely to be historical resources under the California Environmental Quality Act (CEQA) and historic properties under the NRHP. This section also provides description of the probable effects of the project and the reasons why preservation in place of all potentially eligible resources may not be feasible.

I.4.1 Archaeological Resources

I.4.1.1 CA-BUT-52

This resource consists of a prehistoric "mound" site approximately 91 meters in diameter with midden. Midden consists of organic material deposit during human habitation that is frequently useful in archaeological research for analysis of subsistence and settlement patterns. Mound sites consist of sites that were originally elevated above grade and formed low mounds relative to the surrounding landscape. Burials are also typically found in mound sites. Because any remaining

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portions of the site may be useful in providing data for archaeological research and because burials frequently contain grave goods that may be used to identify specific time periods of habitation, this site may have both integrity and data potential (NRHP Criterion D/California Register of Historical Resources (CRHR) Criterion 4). For these reasons it may qualify as an historical resource and historical property.

I.4.1.2 CA-BUT-53

This resource consists of a prehistoric midden and mound site approximately 61 meters in diameter. The site contains human burials, projectile points (*arrowheads*), ground stone artifacts, and shell ornaments. Because any remaining portions of the site may be useful in providing data for archaeological research (NRHP Criterion D/CRHR Criterion 4) and because burials frequently contain grave goods that may be used to identify specific time periods of habitation, this site may have both integrity and data potential. For these reasons it may qualify as an historical resource and historical property.

I.4.1.3 CA-BUT-465

The resource consists of a feature of axe-cut trees, tailings, a road, and other features within an expansive landscape composed of intact and historic-era mined tailings, levees, ponds, original landscape remnants, and other features made between 1898 and 1952 (the larger resource is recorded as CA-BUT-1345). This resource is associated with the significant historical theme of gold mining. This resource is also potentially useful in studying historic-era activity associated with this theme (NRHP Criterion D/CRHR Criterion 4). Because the resource is expansive it likely has at least some portions with the ability to convey this significance. For these reasons it may qualify as an historical resource and historical property.

I.4.1.4 CA-BUT-1123

This resource consists of a prehistoric deposit spanning 90 meters with human remains and "invertebrate fragments." Flaked stone tools and ground stone artifacts were noted. If the site retains portions with integrity and useful information it may be valuable for research domains (NRHP Criterion D/CRHR Criterion 4). For these reasons it may qualify as an historical resource and historical property.

I.4.1.5 CA-BUT-1345

The resource consists of an expansive landscape composed of intact and historic-era mined tailings, similar to CA-BUT-465. This resource is associated with the significant historical theme of gold mining. This resource is also potentially useful in studying historic-era activity associated with this theme (NRHP Criterion D/CRHR Criterion 4). Because the resource is expansive it likely has at least some portions with the ability to convey this significance. For these reasons it may qualify as an historical resource and historical property.

I.4.1.6 CA-SUT-5

This resource consists of a midden and mound site measuring approximately 30 meters in diameter. The deposit contains midden, glass and clamshell beads, a bone awl, and a pestle (a ground stone implement). Because any remaining portions of the site may be useful in providing data for

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archaeological research and because burials frequently contain grave goods that may be used to identify specific time periods of habitation, this site may have both integrity and data potential (NRHP Criterion D/CRHR Criterion 4). For these reasons it may qualify as an historical resource and historical property.

I.4.1.7 CA-SUT-10

This resource consists of a midden and mound site measuring approximately 60 meters in diameter. The deposit contains midden, burials, shell beads, and shell pendants. Because any remaining portions of the site may be useful in providing data for archaeological research and because burials frequently contain grave goods that may be used to identify specific time periods of habitation, this site may have both integrity and data potential (NRHP Criterion D/CRHR Criterion 4). For these reasons it may qualify as an historical resource and historical property.

I.4.1.8 CA-SUT-20

This prehistoric resource consists of a midden deposit of uncertain dimensions, with shell beads and ornaments and burials. Because these materials are useful in prehistoric research (NRHP Criterion D/CRHR Criterion 4) and because the portions of the site may remain with integrity to provide this utility, this site may qualify as an historical resource and historical property.

I.4.1.9 CA-SUT-77

This resource contains midden soil, with shell, bone, flaked stone debris, in a deposit spanning 10 meters in diameter. Other noted artifacts include shell beads, a projectile point, and a bone ornament. The identified deposit is consistent with expectations for a habitation site with a burial component such remains and documented cultural constituents may be useful in prehistoric research (NRHP Criterion D/CRHR Criterion 4). Because portions of the site may remain with integrity to provide this utility, this site may qualify as an historical resource and historical property.

I.4.2 Built Environment Resources

I.4.2.1 Residential Historic District in Yuba City (Potentially NRHP- and CRHR-eligible)

There are 11 residential buildings located in the project area along 2nd Street in Yuba City that are associated with a potential NRHP- and CRHR-eligible historic district. The boundary for the potential residential historic district would include the east and west sides of 2nd Street between Garden Highway and C Street, and possibly extend a few blocks west of this area. The area appears eligible for listing in the NRHP under Criteria A and C (CRHR Criteria 1 and 3), at the local level of significance in the areas of residential community development and architecture. The period of significance is approximately circa 1870 to approximately 1940 for the district and its contributing resources. The district comprises Yuba City's earliest collection of residential buildings and highlights architectural styles such as Italianate, Craftsman, and Queen Anne Victorian. Table I-3 below describes 11 residential buildings located in the area of potential effects (APE) that are individually eligible and those that would be contributing resources to the potential historic district.

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Table I-3. Contributing Elements of the Yuba City Residential Historic District

APN	Address	Resource Name if Applicable	Architectural Style	Eligibility Criteria*
52-552-007	329 2nd Street	William O'Banion House	Italianate	Eligible under NRHP Criteria A and C individually and as a potential historic district contributor
52-552-006	335 2nd Street	NA	Craftsman	Eligible under NRHP Criteria A and C as a potential historic district contributor
52-552-005	341 2nd Street	NA	Craftsman	Eligible under NRHP Criteria A and C as a potential historic district contributor
52-552-004	349 2nd Street	NA	Craftsman	Eligible under NRHP Criteria A and C as a potential historic district contributor
52-552-003	355 2nd Street	NA	Prairie	Eligible under NRHP Criteria A and C as a potential historic district contributor
52-552-002	365 2nd Street	NA	Prairie	Eligible under NRHP Criteria A and C individually and as a potential historic district contributor
52-552-001	373 2nd Street	NA	Craftsman	Eligible under NRHP Criteria A and C as a potential historic district contributor
52-535-007	379 2nd Street	McGruder House	Queen Anne Victorian	Eligible under NRHP Criteria A and C individually and as a potential historic district contributor
52-535-006	407 2nd Street	NA	Queen Anne Victorian	Eligible under NRHP Criteria A and C as a potential historic district contributor
52-535-005	413 2nd Street	G.W. Carpenter House	Queen Anne Victorian	Eligible under NRHP Criteria A and C individually and as a potential historic district contributor
52-535-004	423 2nd Street	Thomas D. Boyd House	Neoclassical	Eligible under NRHP Criteria A and C individually and as a potential historic district contributor

NA = not applicable.

NRHP = National Register of Historic Places.

*Resources are also CRHR-eligible under parallel CRHR criteria

I.4.2.2 Sutter County Office Building/Courthouse—APN 52-534-001

The Sutter County Office Building located at 463 2nd Street was built in 1953 and designed by master architect Harry J. Devine. The building and associated detached garage appears to meet the eligibility criteria for listing in the NRHP and CRHR under Criterion C and Criterion 3, respectively, as an excellent example of an International-style government building in Sutter County.

I.4.2.3 Masonic Temple—APN 52-516-004

The Masonic Temple located at 501 2nd Street in downtown Yuba City appears eligible for listing in NRHP and CRHR under Criterion C and Criterion 3, respectively, at the local level of significance as an excellent example of an early reinforced concrete building constructed in the Mission Revival style.

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I.4.2.4 Gridley Workers Camp Historic District—APN 024-220-030

The Gridley Workers Camp Historic District is located at 850 East Gridley Road in the city of Gridley. The contributing resources associated with the historic district are 25 wood frame units constructed in 1938 by the Farm Security Administration. The district is eligible for listing in the NRHP and CRHR under Criterion A and Criterion 1, respectively, for its association with the Farm Security Administration's efforts during the Great Depression to address the health and housing crisis. The district is also eligible for the NRHP and CRHR under Criterion C and CRHR Criteria 3, respectively, as an excellent example of Farm Security Administration's vernacular architecture and landscape design.

I.4.2.5 Feather River Levee

The Feather River Levee is eligible for the NRHP and CRHR under Criterion A and Criterion 1, respectively, for its association with advances in flood control in California.

I.4.2.6 P-1340 Sutter Butte Canal

The Sutter Butte Canal (P-1340) appears eligible for listing in the NRHP and CRHR under Criterion A and Criteria 1, respectively, at the local level of significance for its associated with the development of agricultural irrigation in Sutter and Butte Counties.

I.4.2.7 Southern Pacific Shasta Route Historic District (alignment segment and bridge)

Contributing elements of the Southern Pacific Shasta Route Historic District (SPSRHD) are located in the APE. The historic district has been determined eligible for the NRHP under Criteria A, B, and C (CRHR Criteria 1, 2, and 3) with a period of significance of 1863 to 1945. Under Criterion A the district is historically associated with engineering, transportation history, economic history in California and Oregon, as well as the development of the West. The SPSRHD is also NRHP eligible under Criterion B for its association with railroad mogul E.H. Harriman. The bridges located along the route that were built according to the railroad's "Common Standard" design are also NRHP eligible under Criterion C as they represent the particular type, period and methods on construction for railroad bridges built during the period of significance. The rail alignment in the APE is approximately 2,680 feet long and includes a wooden trestle bridge that dates to 1939.

I.4.3 Potential Effects and Treatment

Table I-4 identifies archaeological resources affected by the action alternatives and potential treatment options. Table I-5 lists the built environment resources affected by the action alternatives and potential treatment options.

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Table I-4. Archaeological Resources Affected by the Action Alternatives and Potential Treatment

County	Primary Number	Trinomial	Alt. 1	Alt. 2	Alt. 3	Potential Treatment/Basis for Treatment*
Butte	P-04-52	CA-BUT-52	SE	SE	SE	Data Recovery/Construction Constrained by Existing Footprint
Butte	P-04-53	CA-BUT-53	SE	SE	SE	Data Recovery/Construction Constrained by Existing Footprint
Butte	P-04-465	CA-BUT-465	SE	SE	SE	Data Recovery/Construction Constrained by Existing Footprint
Butte	P-04-1123	CA-BUT-1123	SE	SE	SE	Data Recovery/Construction Constrained by Existing Footprint
Butte	P-04-1345	CA-BUT-1345	SE	SE	SE	Data Recovery/Construction Constrained by Existing Footprint
Sutter	P-51-05	CA-SUT-5	SE	SE	SE	Data Recovery/Construction Constrained by Existing Footprint
Sutter	P-51-10	CA-SUT-10	SE	SE	SE	Data Recovery/Construction Constrained by Existing Footprint
Sutter	P-51-20	CA-SUT-20	SE	SE	SE	Data Recovery/Construction Constrained by Existing Footprint
Sutter	P-51-77	CA-SUT-77	SE	SE	SE	Data Recovery/Construction Constrained by Existing Footprint

Alt = alternative; SE = significant effect.

*Treatment is conservatively estimated to require data recovery rather than preservation in place because construction is constrained to the existing footprint of flood control features. Alternative right-of-way on the landside of the Feather River that would avoid all cultural resources is not a feasible location for levee improvements because substantial construction has been invested in existing features. While the proposed improvements may not directly intrude on the boundaries of identified features some boundaries are being refined through ground-truth excavation. In addition construction activity areas such as staging, access, driving, and ancillary work may result in disturbance of known or previously unidentified boundaries. For these reasons, avoidance of direct effects may be infeasible.

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Table I-5. Built Environment Resources Affected by the Action Alternatives/Potential Treatment

APN	Address	County	Alt. 1 Effect	Alt. 2 Effect	Alt. 3 Effect	Probable Treatment*/ Reason for Not Preserving in Place
52-552-007	329 2nd Street	Sutter	SE	SE	NS	HABS/Relocate
52-552-006	335 2nd Street	Sutter	SE	SE	NS	HABS/Relocate
52-552-005	341 2nd Street	Sutter	SE	SE	NS	HABS/Relocate
52-552-004	349 2nd Street	Sutter	SE	SE	NS	HABS/Relocate
52-552-003	355 2nd Street	Sutter	SE	SE	NS	HABS/Relocate
52-552-002	365 2nd Street	Sutter	SE	SE	NS	HABS/Relocate
52-552-001	373 2nd Street	Sutter	SE	SE	NS	HABS/Relocate
52-535-007	379 2nd Street	Sutter	SE	SE	NS	HABS/Relocate
52-535-006	407 2nd Street	Sutter	SE	SE	NS	HABS/Relocate
52-535-005	413 2nd Street	Sutter	SE	SE	NS	HABS/Relocate
52-535-004	423 2nd Street	Sutter	SE	SE	NS	HABS/Relocate
52-534-001	463 2nd Street	Sutter	SE	SE	SE	HABS/Relocate
52-516-004	501 2nd Street	Sutter	SE	SE	NE	HABS/Relocate
024-220-030	850 East Gridley Road	Butte	NS	SE	SE	HABS/Relocate
Feather River Levee	Entire APE	Sutter and Butte	NS	NS	NS	NA/Treatment not required (HAER if effects identified)
P-1340. Sutter Butte Canal	Ends near the junction of Levee Rd & Clark Road	Sutter	SE	SE	SE	HAER
Southern Pacific Shasta Route Historic District (alignment segment and bridge)	Near Live Oak Blvd and Pease Road (north of Yuba City)	Sutter	SE	SE	SE	HAER

Alt = alternative; SE = significant effect; NS = not significant; NE = no effect; HABS = documentation per Historic American Building Survey; HAER = documentation per Historic American Engineering Record; NA = not applicable.

*Treatment is conservatively estimated to require documentation or relocation rather than preservation in place because construction is constrained to the existing footprint of flood control features. Alternative right-of-way on the landside of the Feather River that would avoid all cultural resources is not a feasible location for levee improvements because substantial construction has been invested in existing features. Proposed improvements may result in direct or indirect effects. Direct effects consist of demolition of the whole or portion of a resource removing its ability to convey its significance. Indirect effects consist of changes to the setting that diminish the necessary surrounding feeling and association required for the resource to convey its significance. Construction of improvements may result in direct or indirect effects because the proposed improvements will introduce a wider levee prism or require removal of encroachment; including structures that are register-eligible resources.

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