



# INITIAL STUDY FOR THE BRANNAN-ANDRUS LEVEE MAINTENANCE DISTRICT SACRAMENTO RIVER EROSION CONTROL AND HABITAT ENHANCEMENT PROJECT

*Prepared for:*

**Brannan-Andrus Levee Maintenance District**

PO Box 338  
Walnut Grove, CA 95690  
(916) 776-9122

*Prepared by:*



9888 Kent Street  
Elk Grove, CA 95624  
(916) 714-1801

*and:*



October 2020



# INITIAL STUDY TABLE OF CONTENTS

SECTION	PAGE
<b>1 INTRODUCTION.....</b>	<b>1</b>
1.1 Project Overview.....	1
1.2 Regulatory Guidance .....	1
1.3 Public Review .....	1
1.4 Summary of Findings.....	2
1.5 Document Organization .....	3
<b>2 PROJECT DESCRIPTION .....</b>	<b>3</b>
2.1 Project Location .....	3
2.2 Project Purpose and Background .....	7
2.3 Proposed Project .....	7
2.3.1 Project Description Overview.....	7
2.3.2 Mobilization.....	8
2.3.3 Site Preparation (Clearing, Grubbing, and Trimming).....	8
2.3.4 Levee Slope and Bench Construction.....	9
2.3.5 Terrabag Placement .....	14
2.3.6 Installation of Plants.....	15
2.3.7 Demobilization .....	16
2.3.8 Construction Schedule.....	16
2.3.9 Post-Construction Habitat Maintenance and Monitoring.....	16
2.3.10 Construction Equipment and Estimated Duration of Use by Project Component .....	17
2.3.11 Avoidance and Minimization Measures .....	18
<b>3 ENVIRONMENTAL CHECKLIST.....</b>	<b>23</b>
3.1 Aesthetics .....	24
3.1.1 Setting.....	24
3.1.2 Discussion .....	24
3.2 Agriculture and Forestry Resources .....	26
3.2.1 Setting.....	26
3.2.2 Discussion .....	27
3.3 Air Quality .....	27
3.3.1 Setting.....	28
3.3.2 Discussion .....	34
3.4 Biological Resources .....	38
3.4.1 Setting.....	39
3.4.2 Discussion .....	53
3.5 Cultural Resources .....	82



# INITIAL STUDY TABLE OF CONTENTS

SECTION	PAGE
3.5.1 Setting.....	82
3.5.2 Discussion .....	83
3.6 Energy .....	85
3.6.1 Setting.....	85
3.6.2 Discussion .....	85
3.7 Geology/Soils.....	86
3.7.1 Setting.....	87
3.7.2 Discussion .....	88
3.8 Greenhouse Gas Emissions .....	90
3.8.1 Setting.....	91
3.8.2 Discussion .....	92
3.9 Hazards & Hazardous Materials .....	93
3.9.1 Setting.....	94
3.9.2 Discussion .....	95
3.10 Hydrology/Water Quality .....	96
3.10.1 Setting.....	97
3.10.2 Discussion .....	98
3.11 Land Use/Planning .....	103
3.11.1 Setting.....	103
3.11.2 Discussion .....	104
3.12 Mineral Resources .....	104
3.12.1 Setting.....	105
3.12.2 Discussion .....	105
3.13 Noise.....	105
3.13.1 Setting.....	105
3.13.2 Discussion .....	108
3.14 Population/Housing.....	111
3.14.1 Setting.....	112
3.15 Public Services .....	112
3.15.1 Setting.....	112
3.15.2 Discussion .....	112
3.16 Recreation .....	113
3.16.1 Setting.....	113
3.16.2 Discussion .....	113
3.17 Transportation.....	114



# INITIAL STUDY TABLE OF CONTENTS

SECTION	PAGE
3.17.1 Setting.....	114
3.17.2 Discussion .....	114
3.18 Tribal Cultural Resources .....	115
3.18.1 Setting.....	116
3.18.2 Discussion .....	116
3.19 Utilities/Service Systems.....	117
3.19.1 Setting.....	117
3.19.2 Discussion .....	117
3.20 Wildfire.....	118
3.20.1 Setting.....	118
3.20.2 Discussion .....	119
3.21 Mandatory Findings of Significance .....	120
3.21.1 Discussion .....	120
<b>4 LIST OF PREPARERS .....</b>	<b>122</b>
<b>5 REFERENCES.....</b>	<b>123</b>



## LIST OF TABLES

Table 1. Typical Equipment that may be Used for Construction of the Project .....	18
Table 2. Summary of avoidance and minimization measures.....	19
Table 3. Health effects associated with criteria pollutants .....	28
Table 4. Summary of annual data on ambient air quality (2016–2018) <sup>1</sup> .....	29
Table 5. Air quality significance thresholds.....	32
Table 6. Project construction criteria pollutant daily maximum emissions .....	34
Table 7. Summary of vegetation communities in the project site .....	40
Table 8. Native fish species potentially occurring in the lower Sacramento River and their status under the federal Endangered Species Act (ESA) and California Endangered Species Act (CESA). .....	41
Table 9. Potential for adult and juvenile special status fish that may occur in the lower Sacramento River in the vicinity of the Proposed Project to occur in the Sacramento River during the period that in-river construction activities may occur (i.e., August 1 to October 31).....	62
Table 10. Fisheries Hydroacoustic Working Group underwater noise criteria for injury to fish from pile driving activities.....	68
Table 11. Estimated construction emissions of greenhouse gases .....	93
Table 12. CalTrans criteria for vibration annoyance .....	107
Table 13. CalTrans criteria for vibration damage .....	108
Table 14. Construction noise levels by phase .....	110

## LIST OF FIGURES

Figure 1. Project location regional map. The yellow star shows the exact location of the Proposed Project. 5	5
Figure 2. Erosion control sites, staging areas, and haul routes .....	6
Figure 3. Typical riparian and wetlands cross section (full bench).....	11
Figure 4. Typical wetland cross section .....	12
Figure 5. Typical riparian cross section with bench detail .....	13
Figure 6. Temporal occurrences of special status fish species in the lower Sacramento River. ....	44

## LIST OF APPENDICES

Appendix A: Proposed Project 75% Engineering Drawings
Appendix B: Air Quality and Greenhouse Gas Emissions Data
Appendix C: Biological Resources Technical Report
Appendix D: Cultural Resources Technical Report



## Appendix E: Construction Noise and Noise Measurements Data



## **ACRONYMS AND ABBREVIATIONS**

AMM	avoidance and minimization measure
BAAQMD	Bay Area Air Quality Management District
BACT	best available control technology
BALMD	Brannan-Andrus Levee Maintenance District
BMPs	best management practices
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
CARB	California Air Resources Board
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
CH <sub>4</sub>	methane
CNDDDB	California Natural Diversity Database
CO	carbon monoxide
CO <sub>2</sub>	carbon dioxide
CO <sub>2</sub> e	carbon dioxide equivalent
Delta	Sacramento-San Joaquin Delta
dB	decibels
dBA	A-weighted decibels
dbh	diameter at breast height
DWSE	Design water surface elevation
ESA	Federal Endangered Species Act
FR	Federal Register
General Permit	General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities
GHG	greenhouse gas
GWP	global warming potential
HFC	hydrofluorocarbons
lbs/day	pounds per day
Leq	equivalent noise level
LF	linear feet
Lmax	maximum noise level
MLLW	mean lower low water



## ACRONYMS AND ABBREVIATIONS

MT	metric tons
NO <sub>2</sub>	nitrogen dioxide
N <sub>2</sub> O	nitrous oxide
NO <sub>x</sub>	nitrous oxides
NPDES	National Pollutant Discharge Elimination System
NTU	nephelometric turbidity units
OHWM	ordinary high water mark
PFC	perfluorocarbons
PM <sub>10</sub>	coarse particulate matter - from 2.5 to 10 microns in diameter
PM <sub>2.5</sub>	Fine particulate matter - less than 2.5 microns in diameter
PPV	peak particle velocity
RCNM	Roadway Construction Noise Model
RM	river mile
ROG	reactive organic gases
RSP	Rock slope protection
SB	Senate Bill
SF <sub>6</sub>	sulfur hexafluoride
SMAQMD	Sacramento Metropolitan Air Quality Management District
SO <sub>2</sub>	sulfur dioxide
SRA	shaded riverine aquatic
SWPPP	storm water pollution prevention plan
TAC	toxic air contaminant
TSS	total suspended solids
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
VMT	vehicle miles traveled
YSAQMD	Yolo-Solano Air Quality Management District



# **1 INTRODUCTION**

## **1.1 Project Overview**

Following the removal of invasive arundo (giant reed; *Arundo donax*) along the left bank of the Sacramento River downstream of the City of Isleton, areas of extensive levee erosion were discovered. To address these deferred maintenance and levee deficiency issues, the Brannan-Andrus Levee Maintenance District (BALMD) is proposing to complete erosion control and habitat enhancement on approximately 1.2 nautical miles (NM) of levee on the left bank of the Sacramento River in three locations between the City of Isleton and the confluence of the Sacramento River and Deep Water Ship Channel (Proposed Project).

The Proposed Project was designed to provide scarce fish-friendly habitat on the Sacramento River channel margin through the construction of riparian benches and freshwater marsh/wetland benches. Past projects in the vicinity of the project location have shown that by providing the proper habitat conditions within the tidal zone for native plant species, there is a higher likelihood of a successful establishment of native vegetation on the berm. Benches would be planted with either riparian or wetland plant species depending on the elevation of the bench at each specific location. These vegetated benches would provide instream cover, create important rearing habitat for fish and reduce water temperatures in the shallow aquatic areas along the bank of the Sacramento River.

The Proposed Project would also minimize long-term maintenance and repair costs by repairing existing areas of erosion using stable and effective erosion control methodologies.

## **1.2 Regulatory Guidance**

This document evaluates the potential environmental impacts of the proposed Sacramento River Erosion Control and Habitat Enhancement Project. This document has been prepared in accordance with the California Environmental Quality Act (CEQA), Public Resources Code §21000 et seq., and the State CEQA Guidelines, Title 14 California Code of Regulations 15000 et seq. This Initial Study was prepared by the BALMD to determine if the Proposed Project could have significant impacts on the environment. In accordance with CEQA Guidelines 15064(a), an Environmental Impact Report must be prepared if there is substantial evidence that a project may have significant impacts on the environment. If the lead agency for the CEQA process determines that there is no substantial evidence for such impacts, or if the potential impacts can be reduced through revisions to the project description or the addition of mitigation measures, a Negative Declaration or Mitigated Negative Declaration can be prepared (CEQA Guidelines 15070). BALMD, as the CEQA lead agency for the Proposed Project, has determined that an Initial Study and Mitigated Negative Declaration is the appropriate document for compliance with CEQA and the CEQA Guidelines.

## **1.3 Public Review**

In accordance with CEQA Guidelines section 15073, this document would be circulated to local, state, and federal agencies and to interested organizations and individuals who may wish to



review and comment on it. In reviewing this Initial Study and proposed Mitigated Negative Declaration, affected public agencies and the interested public should focus on whether the document sufficiently identifies and analyzes the possible impacts on the environment.

Following the close of the public review period, the BALMD would review and evaluate the evidence contained in the Initial Study and public comments received on these documents. At a scheduled and noticed BALMD public meeting, BALMD would review a Statement of Findings prepared for the Proposed Project and would consider adoption of a Mitigated Negative Declaration and Mitigation Monitoring and Reporting Program, and approval of the Proposed Project.

## **1.4 Summary of Findings**

Section 3 of this document contains the analysis and discussion of potential environmental impacts resulting from construction and implementation of the Proposed Project. Based on the resources evaluated, it was determined that the Proposed Project would have no impact on the following resources:

- Agriculture and Forestry Resources
- Land Use/Planning
- Mineral Resources
- Population/Housing

Impacts of the Proposed Project were determined to be less than significant for the following resources:

- Aesthetics
- Energy
- Geology/Soils
- Greenhouse Gas Emissions
- Hazards & Hazardous Materials
- Hydrology/Water Quality
- Public Services
- Recreation
- Transportation
- Utilities/Service Systems
- Wildfire

Impacts of the Proposed Project to the following resources would be less than significant with incorporation of the mitigation measures:

- Air Quality
- Biological Resources
- Cultural Resources
- Noise
- Tribal Cultural Resources



As required by CEQA, a Mitigation Monitoring and Reporting Program would be prepared and adopted at the time of project approval. It would include those mitigation measures that would reduce potentially significant environmental impacts to less than significant levels.

## 1.5 Document Organization

This document is organized in the following manner:

- **Section 1 - Introduction.** This section provides a project overview and regulatory guidance, and describes the public review process and organization of this document.
- **Section 2 - Project Description.** This section describes project location, history and background, purpose, and components.
- **Section 3 - Environmental Checklist.** This section provides an environmental setting for the Proposed Project and analyzes the potential environmental impacts of the Proposed Project. Resource topics appear in the order that they appear in Appendix G (Environmental Checklist) of the CEQA Guidelines. Mitigation measures are incorporated and discussed, where appropriate, to reduce potentially significant impacts to a less than significant level. Mandatory Findings of Significance also are presented in this section.
- **Section 4 - List of Preparers.** This section contains a list of people that assisted in the preparation of this document.
- **Section 5 - References.** This section identifies the references used in the preparation of this document.

## 2 PROJECT DESCRIPTION

This section describes the Proposed Project location, project purpose, and a detailed description of the project components and phases.

### 2.1 Project Location

The Proposed Project is located in Sacramento County, in the primary zone of the Sacramento-San Joaquin Delta (Delta; **Figure 1**). Specifically, the Proposed Project is located on the left bank of the Sacramento River, on Brannan Island. Three sites (i.e., also referred to as the Proposed Project site or Proposed Project area) extend over approximately 1.2 NM of bank, beginning downstream near the confluence of Steamboat Slough, Cache Slough, and the Sacramento River and extending upstream to the City of Isleton (**Figure 2**).

The Proposed Project includes three separate erosion repair sites:

- Site 1 – Station 321+00 to 292+00, river mile (RM) 14.60L to 15.18L, approximately 2,900 linear feet (LF).



- Site 2 – Station 230+00 to 197+30, RM 16.36L to 17.00L, approximately 3,300 LF.
- Site 3 – Station 189+00 to 179+00, RM 17.13L to 17.34L, approximately 1,000 LF.

Proposed construction would occur on approximately 1.2 NM of waterside levee and channel margin. The Proposed Project area includes the Sacramento River channel, including and between the three erosion control sites, and immediately upstream and downstream of the construction boundaries, where water quality could be impacted.

The Proposed Project Area also includes material source, storage, and staging areas (Figure 2). Quarried rock material would be sourced and transported to the project site via rock barge from San Rafael. Clean soil for filling the ‘Terrabags’ would be obtained on Decker Island and transported by barge to a staging area in Rio Vista, which is the closest location to Decker Island that is accessible by road. A small conveyor will be used to load the transported dirt onto a dump truck. Soil would then be transported by dump truck from the Rio Vista staging area to a Terrabag filling staging area.

Mixing of rock and soil, for the 50:50 and 70:30 soil/rock mixes, would also occur on Decker Island, and the mixes would be transported via derrick barge to the project site. Multiple locations may be used for staging construction materials i.e. the Terrabags and container plants, including: an oversized crown area currently under the responsibility of BALMD property near the intersection of River Road (State Route 160) and Highway 12, on the north side of Highway 12; the public parking lot of the Cliff House Fishing Access area near RM 14, a vacant lot on the south side of River Road near RM 14.60, and/or a vacant lot on the south side of River Road near RM 17 (Figure 2). Additionally, a boat launch on the west end of Ida Island would be used for launching the work boat that would be used to transport container plants to the erosion repair sites and for other tasks around the project site, as needed.



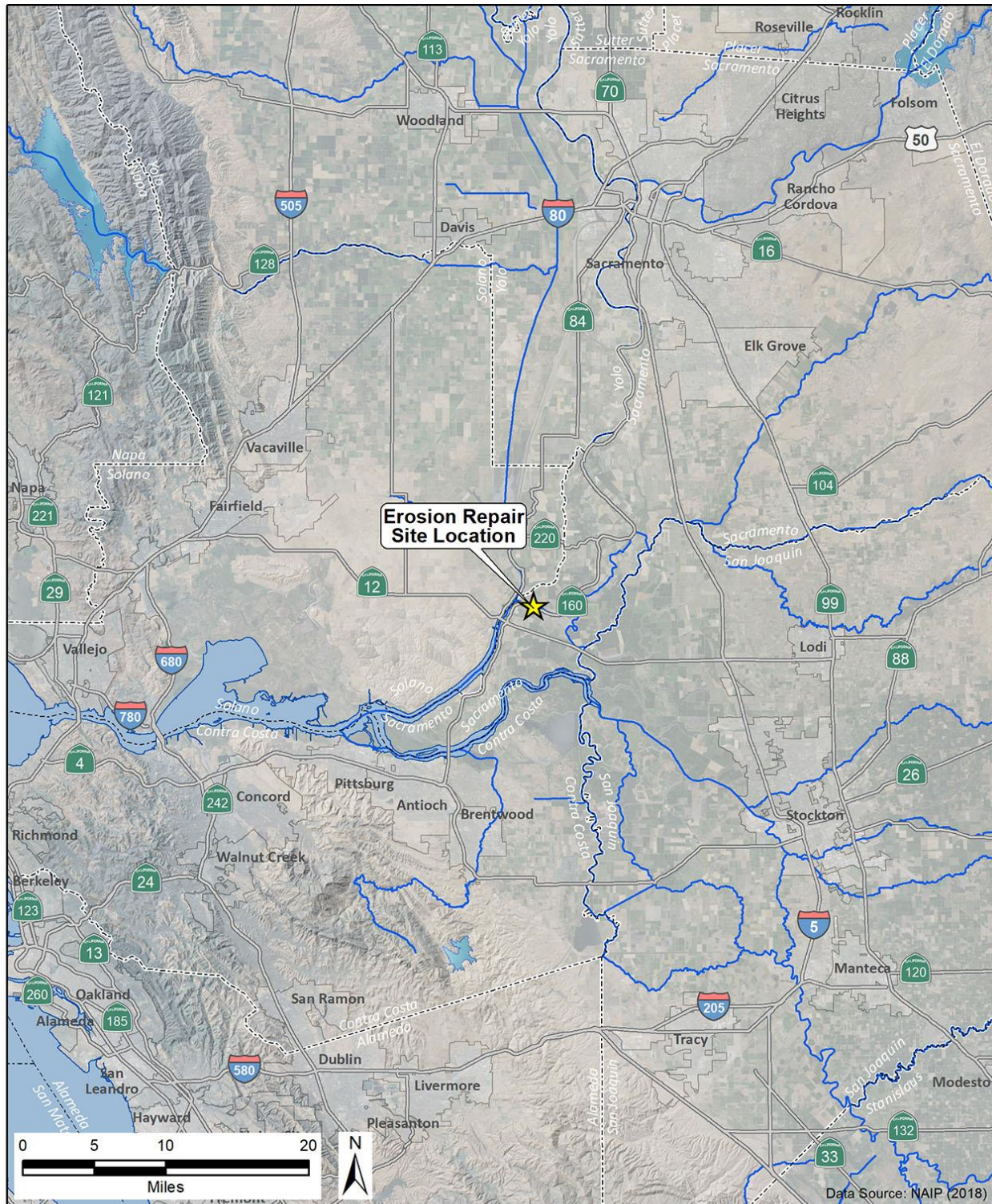


Figure Source: GEI Consultants, Inc.2020.

Z:\Projects\1905687\_BALMD\_ErosionControl\1905687\_G001\_BALMD\_Location.mxd  
29Sep2020 SI

Figure 1. Project location regional map. The yellow star shows the exact location of the Proposed Project.



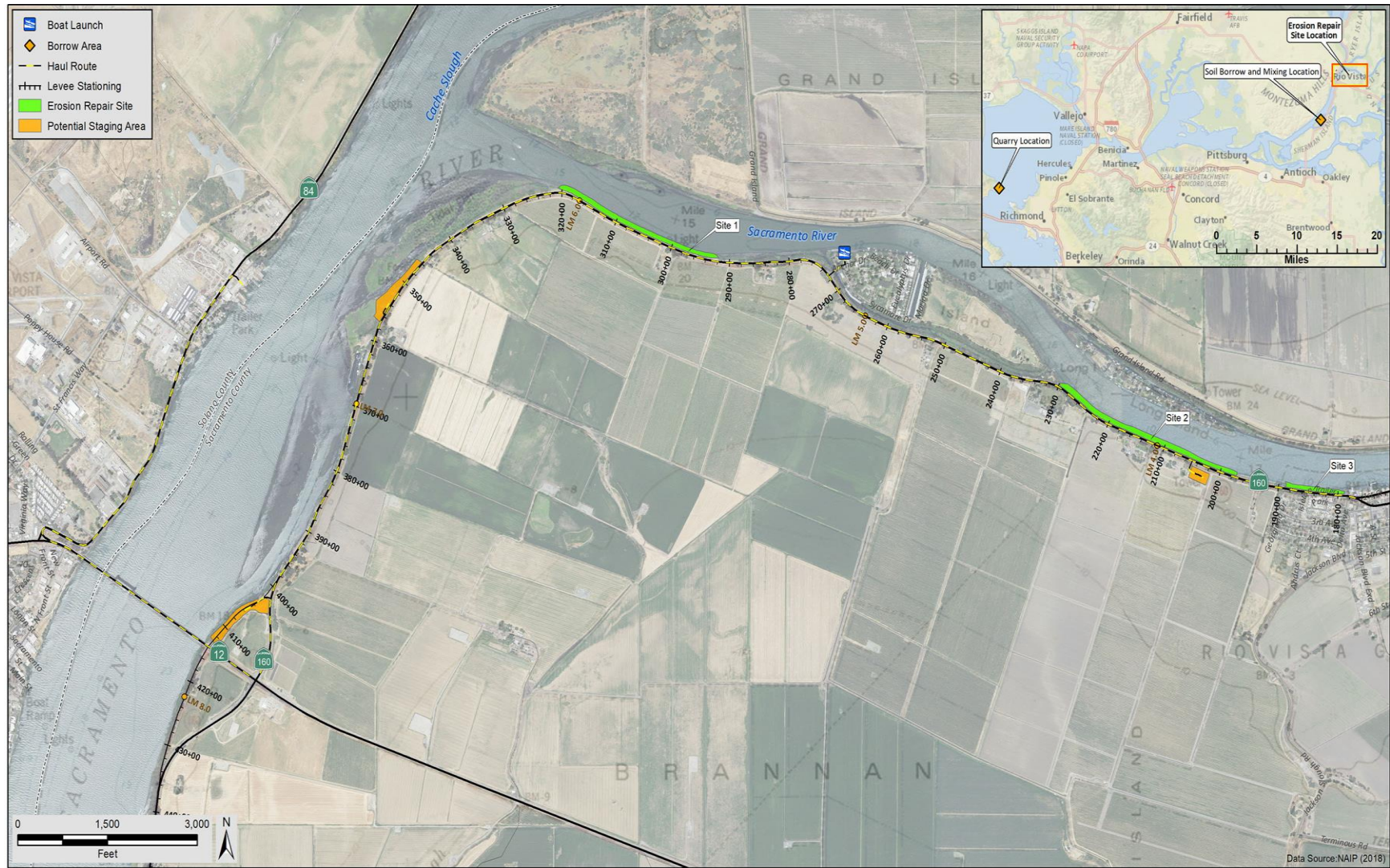


Figure Source: GEI Consultants, Inc. 2020.

29Sep2020 SI Z:\Projects\1905687\_BALMD\_ErosionControl\1905687\_G002\_BALMD\_ProjectArea\_20200508.mxd

**Figure 2. Erosion control sites, staging areas, and haul routes**



## **2.2 Project Purpose and Background**

The purpose of the project is to repair areas of levee erosion located on the left bank of the Sacramento River, between the City of Isleton and the confluence of the Sacramento River and Deep Water Ship Channel. Specifically, the Proposed Project is needed to increase levee stability and improve the level of flood protection for Brannan and Andrus islands by repairing areas of levee erosion. The proposed erosion control project is also required to implement/incorporate methods that provide enhanced riparian and wetland habitat in this reach of the Sacramento River that currently provides limited fish habitat.

The project objectives are to:

- Provide suitable, levee erosion control on approximately 1.2 NM of levee on the left bank of the Sacramento River in three locations between RM 14.60 and 17.34.
- Provide fish-friendly habitat on the Sacramento River channel margin through the creation of wetland and riparian benches.
- Minimize long-term maintenance and repair costs by repairing existing areas of erosion using stable and effective erosion control methodologies.

## **2.3 Proposed Project**

### **2.3.1 Project Description Overview**

The Proposed Project consists of levee repairs for erosion control and habitat enhancement at three locations along the Sacramento River. Proposed construction would occur on approximately 1.2 NM of waterside levee and channel margin located on the left bank of the Sacramento River, adjacent to Brannan Island. After the site was prepared through clearing, grubbing, and trimming new levee slopes would be created at each of the three locations. Along these levee slopes habitat benches would be created to facilitate the growth of wetland or riparian plant species, depending on the bench location (i.e., bench elevation). Riparian benches would be constructed at an elevation to allow for occasional inundation (i.e., during high flow conditions) and freshwater marsh/riparian benches would be constructed at an elevation that would allow for relatively frequent inundation. Above the habitat benches, vegetated slope consisting of waterside scrub-shrub habitat and native grassland would be established. This upland habitat would stabilize the levee and prevent future erosion.

The Proposed Project includes seven major components:

1. mobilization;
2. site preparation (clearing, grubbing, and trimming);
3. levee slope and bench construction;
4. Terrabag placement;
5. Removal/relocation of encroachments and concrete rubble;



6. installation of plants; and
7. demobilization.

Construction at each of the three erosion control sites would occur sequentially, beginning at Site 1 and moving upstream to Sites 2 and 3.

75% construction drawings of the Project are located in **Appendix A**.

### **2.3.2 Mobilization**

Project mobilization would include all preparatory work necessary for the contractor to initiate construction activities. This work would include moving equipment and rock/soil supplies to both the Proposed Project area and a barge landing/staging area in Rio Vista, primarily by barge. A rock barge, accompanied by tug boat, would be used to transport material from the quarry near San Rafael. A small work boat (35–40 feet) would be used to move the derrick barges between the staging and erosion repair sites. Work boats and tugs used to maneuver the barges during site mobilization would be present on site periodically during the duration of construction activity (i.e. tugs may be moored or go to other non-related job sites if there is no need to move a barge for a period of time, and the derrick barges would be traveling back and forth from the quarry and soil borrow sites). Soil for the Terrabags would be transported from the barge staging area in Rio Vista to a bag filling site close to the Project area via highway dump truck. Plants would be transported to the site via flatbed truck.

Mobilization also would include setting up staging and temporary material storage areas (see Figure 2). A construction trailer would be located at one of the identified staging areas and two portable toilets would be placed onsite and accessible to work crews for the duration of construction. Mobilization activities also would include any necessary pre-construction surveys and installation of erosion control and other Best Management Practices (BMP) measures (see Avoidance and Minimization Measures below for details).

### **2.3.3 Site Preparation (Clearing, Grubbing, and Trimming)**

Initial site preparation would include debris removal, mowing, tree trimming, limited grubbing, and clearing on the waterside levee slope. As an initial step to preparing the levee slope for construction activities, any trash would be removed from the waterside levee slope and hauled to an appropriate refuse disposal site (the Keller Canyon Landfill in Pittsburgh, CA is the closest site).

The Proposed Project would not remove any mature trees; however, some mature trees may need to be trimmed to allow for construction activities to occur under the tree canopy (i.e. to ensure worker safety, the crane booms on the derrick barge and boom truck must be able to swing freely, without hitting any trees). Consistent with BALMD's existing routine maintenance agreement with the California Department of Fish and Wildlife (CDFW), trees less than 4 inches in diameter and large shrubs would be cut with a flail mower. Grasses and small shrubs also may be cut with a flail mower and left in place. Small tree trunks (i.e., less than 4 inches in diameter), branches of larger trees, and larger shrubs would be removed with a chainsaw and chipped onsite.



using a trailer-mounted chipper and transported and stockpiled on a BALMD property on southern Brannan Island. Grubbing would occur to remove remnant stands of *Arundo donax* and would be completed using a small excavator (e.g., a Bobcat). Invasive vegetation would be trucked to a landfill or other appropriate disposal site. Clearing and grubbing may necessitate one-way traffic control on State Route 160, during non-commuter hours, for approximately 16 working days at the beginning of project construction.

#### **2.3.4 Levee Slope and Bench Construction**

Construction at each of the three erosion control sites would occur sequentially, beginning at Site 1 and moving upstream to Sites 2 and 3.

Construction of the new levee slope at each of the three sites would occur in three phases: 1) placing rock slope protection (RSP) and 6-inch minus backfill material; 2) placing geogrid material and the Gripper/Terrabag System; and 3) placing planting fill to complete final grade. Work on the levee slopes would occur using barges, work boats, tugs, and excavator, except in sensitive locations (i.e., around mature trees), smaller, single-operator equipment would be used (i.e. Bobcat).

##### **Rock Slope Protection and 6-inch Minus Backfill Placement**

Rock barges would transport material to the site directly from the quarry, and material would be placed using a derrick barge with a specialized attachment (rock bucket). The RSP would be used to create a base for the new levee slope and initial foundation for the riparian and wetland habitat benches. RSP would be placed at a 1.5:1 or 2:1 slope, depending on the existing topography. RSP would extend down to -15.0 feet NAVD 88 and cover the slope of the levee up to approximately +17.5 feet NAVD 88.

Six-inch minus material may be placed via derrick barge on top of the RSP material (i.e., backfilled) to finish the foundation of the riparian habitat bench. Construction of wetland and riparian benches were determined by site-specific bathymetric conditions alternating between stretches of wetland bench and riparian bench. Due to existing erosion and the varying width of the existing levee toe and waterside bench areas along the project sites, the width of riparian habitat benches that provide shaded riverine aquatic (SRA) habitat and wetland benches would vary somewhat along the project site. **Figure 3** shows a typical riparian cross section and detail of the levee design, and **Figure 4** shows a typical wetland cross section and detail of the levee design. **Figure 5** shows a typical riparian cross section and detail of the bench design.

Habitat benches would facilitate growth of wetland or riparian plant species, depending on the bench location, as determined by the characteristics and elevations at each erosion repair site. After construction is complete, the levee slope at each erosion repair site would include a riprap base that extends below the ordinary high water mark (OHWM); the riprap base would be covered with a bench, Gripper/Terrabag System, and riparian or wetland plants would be installed into the soil/rock filled bench and along its face.



### **Riparian Bench – Riparian Forest/Shaded Riverine Aquatic**

Riparian benches (Figure 3 and Figure 5) would be constructed at an elevation that allows for occasional inundation (e.g., during high flow conditions). Riparian benches would provide riparian habitat for terrestrial species and food sources and SRA habitat for aquatic species. For benches intended to provide riparian habitat, the 70:30 soil/6-inch minus mix material would be placed on top of the RSP, from the Mean Lower Low Water (MLLW) elevation (+4.0 NAVD 88) upslope to approximately +8.0 feet NAVD 88. The final waterside slope face of the riparian benches would be approximately 1:1.5. Riparian bench width would vary from a minimum of 6 feet to approximately 14 feet wide. The Proposed Project is anticipated to construct approximately 2.72 acres of riparian forest and 4,430 LF of SRA habitat by site as follows: 1,952 LF (1.08 acres) of riparian bench/forest at Site 1; 2,128 LF (1.25 acres) at Site 2; and 350 LF (0.39 acres) at Site 3.

### **Wetland Bench – Freshwater Marsh**

Freshwater marsh/wetland benches (Figure 3–Figure 5) would be constructed at a relatively low elevation to allow relatively frequent inundation and development of aquatic and semi-aquatic habitat. For wetland benches, materials would include a 70:30 soil/6-inch minus rock mix in a 2-foot deep trench below the MLLW elevation (+4.0 NAVD88). Wetland bench width would also vary slightly, from approximately 6 feet to 15 feet wide, depending on the location along the levee. Transitions from riparian benches to wetland benches would occur at a 1.5:1 slope, with RSP on the upstream transition and a planted slope on the downstream transition. The Proposed Project is anticipated to construct approximately 0.90 acres and 3,528 LF of freshwater marsh habitat by site as follows: 848 LF (0.19 acres) of freshwater marsh at Site 1; 2,180 LF (0.63 acres) of freshwater marsh at Site 2; and 500 LF (0.08 acres) of freshwater marsh at Site 3.

### **Vegetated Slope**

Vegetated slope as denoted on the drawings comprises both waterside scrub-shrub habitat and native grassland.

#### Waterside Scrub-Shrub

Waterside scrub-shrub habitat would be established above both the riparian and freshwater marsh/wetland benches up to elevation 15 feet on the slope. This habitat type would begin at elevation 4 feet for the freshwater marsh/wetland benches, and at elevation 8 feet for the riparian benches. In addition, waterside shrub scrub habitat would be established on the riparian bench face. Prior to planting with scrub-shrub species the slope areas above the benches would be hydroseeded with native grasses. The project is anticipated to create approximately 2.59 acres of scrub-shrub habitat by site as follows: 1.09 acres at Site 1; 1.21 acres at Site 2; and 0.29 acres at Site 3.

#### Native Grassland

Native grassland habitat (also denoted as ‘vegetated slope’ on the drawings) would be established above (15 feet elevation) the waterside scrub shrub habitat zone to the very top of the project limits. A total of 1.61 acres of grasslands will be enhanced at the project site as follows: 0.62 acres at Site 1; 0.85 acres at Site 2; and 0.14 acres at Site 3.



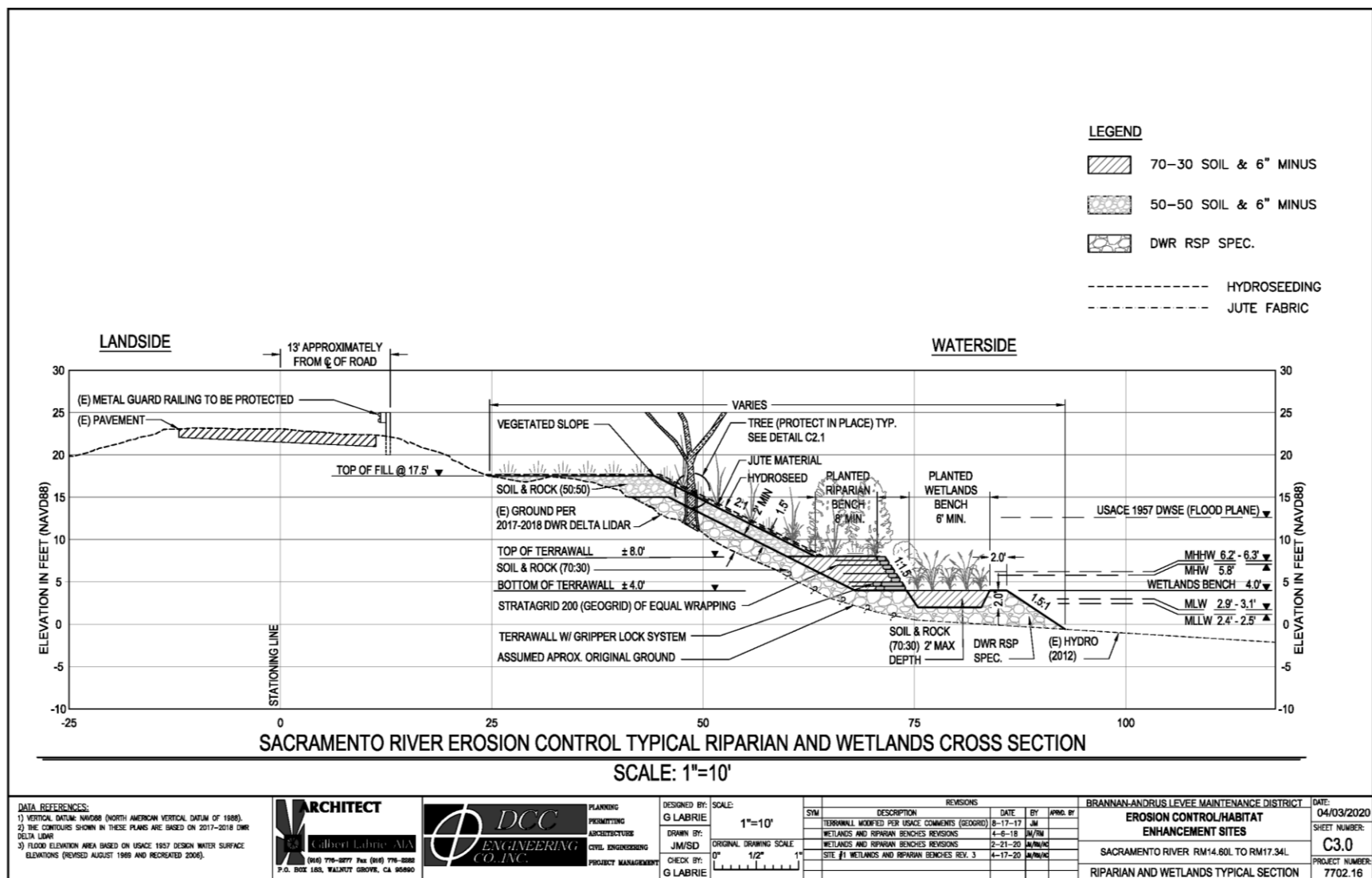


Figure 3. Typical riparian and wetlands cross section (full bench)



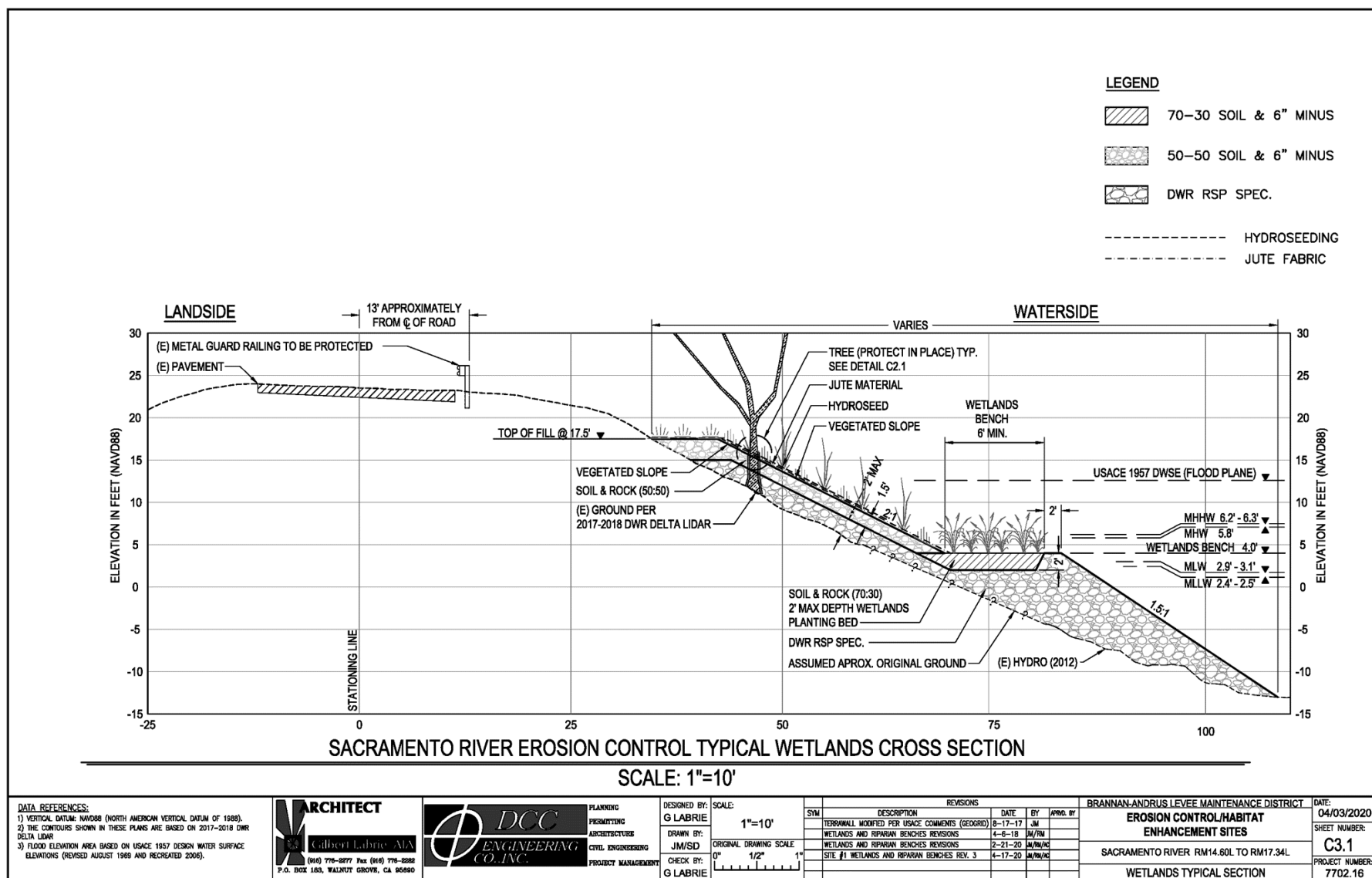


Figure 4. Typical wetland cross section







### **2.3.5 Terrabag Placement**

After the RSP material and 6-inch minus backfill have been placed, geogrid and the Gripper/Terrabag System materials would be transported to the site via truck and placed. Geogrid is the generic term for all soil reinforcing products, such as StrataGrid®. StrataGrid® is a high-performance soil reinforcement product of polyester yarns with a high molecular weight and high tensile strength. These yarns are knitted into a dimensionally stable network to form a geometric grid shape that provides tensile soil reinforcement in vertical and horizontal directions.

Gripper System Terrabags dimensions are approximately 6 inches (tall) x 24 inches (long) x 12 inches (wide). The bags are filled with a mixture of 75 percent sand and 25 percent topsoil. Each segment of geogrid would secure approximately two layers of Terrabags to the slope. Geogrid would extend between layers of Terrabags, through the face of the slope, wrap back over two layers of Terrabags, and be embedded/secured in the compacted backfill (see Figures 3 and Figure 5). The combination of geogrid and Terrabags with the Gripper lock system is used to minimize the potential for slumping and Terrabag failure.

An excavator would place rolls of geogrid that would be rolled out by hand, perpendicular to the slope. A thin layer of fill material would then be placed to hold the geogrid in place while the Gripper System is installed in 12-inch lifts (two layers of Gripper System Terrabags per lift).

The Gripper System Terrabags would be filled at one of the staging areas and brought to the site (in mass) on pallets, by flatbed truck and placed using a boom truck parked along the levee crown to move the bags. Once on the levee, the Terrabags would be installed by hand and locked in place using a patented interlocking gripper lock system produced and installed by Maverick Solutions LLC. The installation sequence would include preparing the slope, placing the geogrid, placing Gripper locks (in contiguous manner end-to-end connection), and placing Terrabags until the first row is completed. For the second row, Grippers locks would be placed on the first row, Terrabags would be placed on the Gripper locks, and 12 inches of backfill would be placed and compacted on and behind the two rows of Terrabags. This sequence would be repeated for additional layers to fully build out the Gripper/Terrabag System wall. One crew would be filling bags at the staging area while another crew is placing bags at one of the erosion repair sites. One crew member would be responsible for sowing both native grass seed and installing container plants between the Terrabags as the wall is being constructed. One-way traffic control would be needed along State Route 160 during Terrabag placement activities.

#### **Placement of Planting Medium**

A 70:30 soil/6-inch minus rock mix would be used to fill the habitat benches and placed on the new levee slope above the benches from approximately +8.0 feet NAVD 88 to +18 feet NAVD, near the crown of the levee. This fill material would be used as the planting medium. It would be transported via barge from the borrow source on Decker Island to the erosion repair sites and placed and contoured to the final grade using a derrick barge and excavator. Borrowed soil must be clean of biological material such as weed seeds. To ensure a clean source of soil, the first six inches of soil material that contains unwanted seed material would be stripped and stockpiled for disposal on Decker Island, as needed



## Removal/Replacement of Encroachments and Removal of Concrete Rubble

Known and unknown encroachments that are in the Proposed Project footprint will be removed or replaced. Two permitted encroachments have been identified. The first encroachment is a former permitted water diversion facility, consisting of an agricultural pump and platform, on pilings and a connecting pipe that extends over to the levee and up the slope to near the top of the levee crown, in the vicinity of Station 217+16 within Site 2. This agricultural diversion facility, with existing in-channel pilings and platform, will be removed by crane and disposed of offsite.

The diversion intake would be relocated and replaced downstream. The vertical pump would be replaced with a new slant in-line pump which would be installed above the 1957 design water surface elevation (DWSE) flood elevation and thereby eliminate the existing pump station obstruction in the wetted channel. The new intake line would be placed along and slightly above the new levee slope and bench location. Once the new pump is permitted and installed the landowner will be responsible for screening the diversion. At this same location, concrete rubble associated with a former barge landing will also be removed and disposed offsite.

The second identified encroachment is an existing private dock located within Site 3 at Station 186+25. Both the dock and the old wood piling supporting the dock installation will be removed. This will necessitate the installation of a new pedestrian bridge and gangway, connected to a new concrete landing installed near the levee crown and above the DWSE. Three new steel pilings (i.e., 12-inches in diameter) would be placed in the new rip-rap toe location to relocate the dock slightly waterward into the channel. This would be done to gain boat clearance from the added habitat bench and revetment.

Two smaller steel pilings (i.e., 8-inches in diameter) would be installed into the water but closer to the levee and also in an area to be filled with rip-rap to support the new connecting bridge and to serve as the hinge point for the new gangway. All new piling will be installed from the water with a crane equipped with a vibratory driver over the course of one day. Importantly, the new dock, pedestrian bridge, and gangway configuration would be the same or less square footage than the existing configuration. As such, there would be no additional shading impacts to the Sacramento River.

### 2.3.6 Installation of Plants

Following construction of the new levee slope and habitat benches, an ecologically suitable mix of plants would be delivered to each erosion repair site via flatbed truck. The benches would be planted using hand tools with either wetland associated plants (e.g., American bulrush, California tule, common rush, Baltic rush, common buttonbush, *baccharis* spp., sandbar willow, common tule, and goodding's willow) or riparian associated plants (e.g., creeping wildrye, Santa Barbara sedge, bulrush, California boxelder, Oregon ash, Goodding's black willow, arroyo willow, sandbar willow, pacific willow, and Freemont cottonwood).

The levee slope above the benches would be hydroseeded with native grasses and planted with scrub-shrub (e.g., California fescue, small barley, creeping wildrye, saltgrass, one sided blue grass, mulefat sandbar willow and coyote brush) for successful habitat vegetation establishment prior to the rainy season. A temporary irrigation system will be installed to water plants during a



3-year establishment period. A screened volume pump drawing water from the Sacramento River will be operated temporarily.

#### **2.3.7 Demobilization**

Site demobilization would include removal of the construction trailer. The staging areas would require minimal demobilization activities since most materials would be removed from the staging areas as they are used up during project implementation. Palettes and Terrabag materials would be cleaned and removed from each site as the work progresses, leaving nothing onsite at the conclusion of construction. Plant delivery palettes would be returned via truck to the source nursery at the conclusion of construction. Minor trash/debris would be removed from each site and disposed of at an approved facility. Barges, tugs and work boats would move on to the next unassociated job site or storage dock at the conclusion of construction.

#### **2.3.8 Construction Schedule**

With favorable weather and tidal conditions, project construction is expected to be completed over approximately 120 days, anytime between June 15, 2021 and December 30, 2021. Note: In-water work would be conducted between August 1 and October 31 to avoid impacts to fish species. However, rock placement above the OHWM may take place at any time over the duration of project construction.

#### **2.3.9 Post-Construction Habitat Maintenance and Monitoring**

Following completion of the Proposed Project, BALMD would conduct a minimum of three years of maintenance and monitoring of the new habitat features to ensure the vegetation is establishing properly. Site maintenance would occur on an as needed basis and focus on managing noxious weeds and ensuring plants on the riparian bench receive adequate irrigation in order to become established. Plant maintenance would include periodic watering of planted vegetation on the riparian bench until plants are established. The tide would inundate portions of the levee slope twice per day, all the way to the top of the slope and thus provide necessary moisture to riparian and wetland bench plants. It is anticipated that maintenance during the first two years would require bi-weekly to monthly site visits during the hot, active growing season (April through September) to ensure proper weed management and irrigation. Subsequent activities during the remaining years of the maintenance period would occur on a monthly basis.

Biological monitoring of the habitat features would occur on an annual basis and begin during the first year following construction. Initial monitoring during the first year would occur in both spring and fall to assess the preliminary condition of the plants relative to meeting overall habitat establishment and survival goals. Subsequent monitoring for the remaining two years would occur in late summer/early fall. Plants would be recorded as dead if no viable above ground growth is visible. Dead plants and trees would be replaced as necessary during the first year and annually in subsequent years. Any re-planting would occur in spring or late fall. Cumulative survival of all plants and trees at the conclusion of the three-year monitoring period would be at least 80 percent.

Invasive weed cover would be estimated visually during annual monitoring. Vegetative cover by invasive species would be less than ten (10) percent of all cover throughout the three-year



monitoring period. In the event invasive species cover exceeds the cover criteria during any of the annual monitoring events, maintenance actions would be taken to reduce this cover to less than 10%.

#### **2.3.10 Construction Equipment and Estimated Duration of Use by Project Component**

**Table 1** shows the equipment type, number of units, estimated duration of use, and estimated truck or barge trips for each phase of the Project. Equipment type and use for the Removal/Replacement of Encroachments and Removal of Concrete Rubble phase are incorporated into the other phases.



**Table 1. Typical Equipment that may be Used for Construction of the Project**

Phase	Equipment Type	Number of Units	Estimated Duration of Use (number of work days)	Estimated Truck or Barge Trips (one-way)
Mobilization	Flatbed Truck (plant transport)	1	3	3
	Pickup Truck (trailer transport)	1	Duration of project	1
	Construction Trailer	1	Duration of project	n/a
	Portable Toilets	2	Duration of project	n/a
Site Preparation	Flail Mower	1	15	n/a
	Trailer-mounted Wood Chipper with Haul Truck	1	15	13
	Chainsaws	2	15	n/a
Levee Slope and Bench Construction	1,000-2,000 ton Rock Barge (non-motorized)	2	66	n/a
	Derrick Barge (non-motorized)	2	66	n/a
	Small Work Boat (40-ft max)	2	66	n/a
	Row Boat/12-ft Skiff (non- motorized crew transport)	1	66	n/a
	Small Excavator (bobcat)	1	44	n/a
	Small Conveyor w/Generator (soil loading)	1	5	n/a
	Small Front-End Loader (conveyor loading)	1	5	n/a
	Tug Boat	2	22	22
	Vibratory Pile Driver	1	1	2
	Forklift	2	66	n/a
Terrabag Filling and Placement	10-cy Dump Truck	1	12	130
	Boom Truck w/Flatbed Trailer (stinger truck)	1	33	33
	Plate Compactor	1	66	n/a
	Small Work Boat (40-ft max)	1	5	n/a
Installation of Plants	Hydroseeding Truck	1	2	3
	1,000-gallon Water Truck	1	10	3
	Pick-up Truck (trailer transport)	1	5	1

### 2.3.11 Avoidance and Minimization Measures

The following avoidance and minimization measures (AMM) would be incorporated into the Proposed Project to assist in mitigating the potential environmental effects during construction. **Table 2** summarizes the general AMMs.



**Table 2. Summary of avoidance and minimization measures.**

<b>Number</b>	<b>Title</b>	<b>Summary</b>
AMM 1	Timing of In-Water Work	Timing of construction would occur between August 1 and October 31, which is the work window for ESA listed fishes. In addition, all in-water will occur during daylight hours and during low tides.
AMM 2	Worker Training	Construction personnel would undergo training and education on applicable environmental rules and regulations, and measures necessary to avoid or minimize effects to sensitive resources.
AMM 3	Construction Best Management Practices (BMPs) and Monitoring	Standard practices and measures that would be implemented prior to, during, and after construction to avoid or minimize impacts to water quality, aquatic habitat, and listed species.
AMM 4	Implementation of General Permit (General Permit) for Storm Water Discharges Associated with Construction Activities	To comply with the general permit a Storm Water Pollution Prevention Plan (SWPPP) would be prepared and implemented for the Proposed Project. All BMPs listed in the general permit would also be implemented.
AMM 5	Vegetation Removal and Tree Protection	Vegetation clearing would only occur within the project footprint. Mature trees would not be removed.
AMM 6	Terrabags and rock placement	Terrabag material would provide 80 percent UV protection at 500 hours. Soil mixes will be able to accommodate rooting volume and successful establishment of riparian vegetation.
AMM 7	Construction site clean-up	Includes revegetation plan and removal of all construction equipment.

### **AMM 1: Timing of Work**

AMM 1 consists of the following measures related to the timing of work.

- All in-water construction activity would be conducted between August 1 and October 31 to ensure protection of anadromous salmonids. This time period is the suggested work window for waterways located within the Delta.
- As much work below OHWM work as possible would be performed during low tide to reduce potential impacts to water quality.
- Work, including equipment operation, would generally occur Monday through Saturday during normal working hours (7 a.m. to 7 p.m.).
- Equipment maintenance could occur before and after working hours and on Sunday.
- Work requiring one-way traffic control on State Route 160 would be limited to non-commuting hours, where feasible.
- In-water construction activities would be limited to daylight hours, leaving a nighttime period for anadromous salmonids and Green Sturgeon to migrate past the Project area.

### **AMM 2: Worker Training**

AMM 2 consists of the following worker training measure.



- All contractors and equipment operators would participate in a Worker Environmental Awareness Program (WEAP) training regarding potential environmental impacts to make them aware of the ecological value of the area, including the potential for special status species and their habitat to be present near the Proposed Project area.
- The WEAP training would cover, at a minimum, the special status species listed that have the potential to occur in the Proposed Project area during construction, including but not limited to anadromous fishes, a description of the regulatory status and general ecological characteristics of sensitive resources, and review of the limits of construction and avoidance measures required to reduce impacts to biological resources within the work area. A fact sheet conveying this information shall also be prepared for distribution to all contractors, their employers, and other personnel involved with construction of the project. All employees shall sign a form provided by the trainer documenting they have attended the WEAP and understand the information presented to them.
- The WEAP training shall be conducted by a qualified biologist, to aid workers in recognizing special status resources that may occur in the project area.
- Personnel involved in the Proposed Project would be trained in emergency response and spill containment techniques.

### **AMM 3: Construction Best Management Practices (BMPs) and Monitoring**

AMM 3 consists of the following construction BMPs.

- Staging, and both temporary and long-term material disposal areas would be located away from Waters of the United States.
- Equipment would be refueled, maintained, and serviced at designated staging areas away from the erosion repair sites. All refueling, maintenance, and staging of equipment and vehicles shall occur at least 60 feet from bodies of water and in a location where a potential spill would not drain directly toward aquatic habitat (e.g., on a slope that drains away from the water source). Fuel transfer vehicles would have absorbent pads, pillows, socks, booms or other spill containment materials placed under the fueling operation.
- Petroleum products would be stored in non-leaking containers at impervious storage sites from which runoff is not permitted to escape.
- Movement of heavy equipment to and from the Proposed Project area shall be restricted to established roadways and equipment shall be stored in established staging areas away from the Sacramento River.
- All feasible avoidance and minimization measures would be implemented to control erosion and runoff from areas associated with construction activities. Specifically, use of straw waddles, silt fences, or other erosion control measures would be used to ensure that constructed-related materials do not reach the Sacramento River. All areas of temporary impacts and all other areas of temporary disturbance which could result in a discharge to the Sacramento River would be restored.



- Soil disturbance activities would cease if adverse weather conditions substantially increase the likelihood of transporting soil off site.
- A planting and monitoring plan would be submitted to Resource Agencies.
- Active water quality monitoring would occur during the construction portion of the project. Should construction create conditions that exceed standard water quality thresholds, remedial actions will be employed to reduce them back to threshold limits.
- Fugitive dust would be minimized by watering or implementing other dust control measures. Fugitive dust would also be minimized by limiting construction vehicle speeds to 15 miles per hour or less, covering haul vehicles, installing wheel washers or other similar methods where vehicles exit the construction sites onto paved roads.
- Construction activities would be limited to the designated work area, which would be clearly identified on the construction drawings and marked with fencing, stakes, and/or flags before ground-disturbing activities begin.
- All construction equipment would have sound-control devices no less effective than those provided on the original equipment; no equipment shall have an unmuffled exhaust system.
- No pets shall be allowed at the project site.
- All trash that may attract predators shall be properly contained in covered containers and removed from the work site on a regular basis.
- During construction, no litter or construction debris shall be placed within jurisdictional areas. All such debris and waste shall be picked up daily and properly disposed of at an appropriate site. In addition, all project-generated debris, building materials, and rubbish shall be removed from jurisdictional areas and from areas where such materials could be washed into them.

#### **AMM 4: Implementation of General Permit (General Permit) for Storm water Discharges Associated with Construction Activities**

AMM 4 consists implementing all measures described in the State Water Resources Control Board National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (General Permit; Order No. 2009-0009-DWQ/NPDES Permit No. CAS000002). This would include preparation of a SWPPP that shall include specific BMPs to avoid and minimize impacts on water quality during construction activities. The goals of the SWPPP would generally be to protect water quality; establish procedures to minimize accelerated soil erosion; and minimize non-storm water runoff. The SWPPP would define measures to prevent, control, and minimize impacts from a spill of hazardous, toxic, or petroleum substances during construction of the Proposed Project, as well as a description of potentially hazardous and non-hazardous materials that could be accidentally spilled, potential spill sources, potential spill causes, proper storage



and transport methods, spill containment and recovery measures, agency notification, and responsible parties. Components of the SWPPP would generally include measures that limit risk of release of contaminants to waterways. The SWPPP would have the following primary objectives.

- Stabilization of the site as soon as possible.
- Controlling the perimeter of the Proposed Project sites.
- Protection of nearby receiving waters.
- Following all necessary pollution prevention measures.
- Minimization of the area and duration of exposed soils.

#### **AMM 5: Vegetation Removal and Tree Protection**

AMM 5 consists of the following erosion and sediment control measures.

- Vegetation clearing including undesirable species such as *Arundo* would be confined to areas within the project footprint.
- Mature trees are not anticipated to be removed. In the unforeseen circumstance that one or more trees greater than 4 inches in diameter are removed, three trees would be planted for each one removed (i.e., 3:1 replacement).
- To the extent it is necessary, any tree replacement that cannot be accommodated on the Proposed Project sites would be conducted at the BALMD's off-site mitigation area.
- The bark of trees larger than four inches in diameter to be retained onsite would be wrapped before the riprap is placed on the levee slope to protect them from damage.

#### **AMM 6: Terrabags and Rock Placement**

- Terrabag material would provide 80 percent UV protection at 500 hours, with verifiable data sheets stating UV standards.
- Soil mixes will be both a 70:30 and 50:50 soil-rock substrate to accommodate rooting volume and successful establishment of riparian vegetation.

#### **AMM 7: Construction Site Clean-up**

AMM 7 consists of the following construction site clean-up measures.

- All construction supplies, materials, and debris from the Proposed Project would be removed following completion of the Proposed Project.
- All creosote coated or chemically treated timbers or timber piles removed from the project area shall be promptly disposed of at a licensed facility.



- Plant delivery palettes would be returned via truck to the source nursery at the conclusion of construction.
- Minor trash/debris would be removed from the site and disposed of at an approved facility.

### 3 ENVIRONMENTAL CHECKLIST

#### Environmental Factors Potentially Affected

The environmental factors, if checked below, would be potentially affected by the Proposed Project and would involve at least one impact that is a “potentially significant impact” that cannot be reduced to a less than significant level as indicated by the checklist on the following pages.

- |  |  |   |
|--|--|---|
| <input type="checkbox"/> Aesthetics                          | <input type="checkbox"/> Greenhouse Gas Emissions      | <input type="checkbox"/> Public Services                    |
| <input type="checkbox"/> Air Quality                         | <input type="checkbox"/> Hazards & Hazardous Materials | <input type="checkbox"/> Recreation                         |
| <input type="checkbox"/> Agricultural and Forestry Resources | <input type="checkbox"/> Hydrology/Water Quality       | <input type="checkbox"/> Transportation                     |
| <input type="checkbox"/> Biological Resources                | <input type="checkbox"/> Land Use/Planning             | <input type="checkbox"/> Tribal Cultural Resources          |
| <input type="checkbox"/> Cultural Resources                  | <input type="checkbox"/> Mineral Resources             | <input type="checkbox"/> Utilities/Service Systems          |
| <input type="checkbox"/> Energy                              | <input type="checkbox"/> Noise                         | <input type="checkbox"/> Wildfire                           |
| <input type="checkbox"/> Geology/Soils                       | <input type="checkbox"/> Population/Housing            | <input type="checkbox"/> Mandatory Findings of Significance |

#### Evaluation of Environmental Impacts

The following Environmental Checklist form is based on the checklist suggested in Appendix G of the State CEQA Guidelines. The Environmental Checklist identifies potential project effects as corresponding to the following categories of impacts:

- **Potentially Significant Impact:** An effect that may be significant based on substantial evidence and the significance criteria. If the Proposed Project may result in one or more Potentially Significant Impacts, an Environmental Impact Report is required.
- **Less than Significant with Mitigation Incorporated:** An effect that, with the implementation of project-specific mitigation measures, is reduced from potentially significant to less than significant.
- **Less than Significant Impact:** An effect for which no significant impacts, only less than significant impacts, result.
- **No Impact:** An effect for which the Proposed Project does not create an impact.



### 3.1 Aesthetics

Except as provided in Public Resource Code Section 21099, would the project...	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
a) Have a substantial adverse effect on a scenic vista?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
c) In non-urbanized areas substantially degrade the existing visual character or quality of public views of the site and its surroundings? (Public views are those that are experienced from publically accessible vantage point). If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

#### 3.1.1 Setting

The Proposed Project area is located on the left bank of the Sacramento River between the City of Isleton and the confluence of the Sacramento River and Deep Water Ship Channel. All three erosion repair sites within the Project area are located adjacent to State Route 160 (River Road), a two-lane levee road, and the Sacramento River. The *City of Isleton General Plan* (City of Isleton 2000) identified State Route 160 and Jackson Blvd. as the two notable visual resources within the city's planning area. Jackson Blvd. is located to the southwest of the city and is not visually associated (directly visible) with any of the erosion repair sites. State Route 160 is officially designated by the California Department of Transportation as a scenic highway from the Contra Costa County border to the City of Sacramento, which includes the Project area. Views from State Route 160 include the Sacramento River and adjacent agricultural lands. Within the Project area the Sacramento River is channelized and bounded by levees containing a mix of native and non-native riparian grasses, shrubs, and trees.

#### 3.1.2 Discussion

- a) A scenic vista is generally considered a view of an area that has remarkable scenery or a natural resource from which the public can experience unique and exemplary high-quality views. Although the Project area is publicly accessible from parts of the City of Isleton and visible from scenic highway State Route 160, the visual character would not be considered as an expansive view of a highly valued landscape because the Sacramento River is channelized (i.e., disturbed), bounded by anthropogenic levees containing a mix of native and non-native vegetation, and is highly utilized by recreational and commercial watercraft. Further, the Project area does not include any scenic vistas that have been



officially designated by the *City of Isleton General Plan* (2000) or the *Sacramento County General Plan* (2011). As such, there would be **no impact** on a scenic vista.

- b) As described above, the Project area is publicly accessible from parts of the City of Isleton and visible from scenic highway State Route 160. The Proposed Project does not anticipate removing mature trees, rock outcroppings, historic building or other scenic resources. However, as described in AMM 5, in the unforeseen circumstances that one or more trees greater than four inches in diameter are removed, three trees would be planted for each one removed (i.e., 3:1 replacement). To the extent it is necessary, any tree replacement that cannot be accommodated on the erosion repair sites would be conducted at the BALMD's off-site mitigation area. The bark of trees larger than four inches in diameter to be retained onsite would be wrapped before the riprap is placed on the levee slope to protect them from damage.

Some mature trees may need to be trimmed to allow for construction activities to occur under the tree canopy (i.e. to ensure worker safety, the crane booms on the derrick barge and boom truck must be able to swing freely, without hitting any trees). Consistent with BALMD's existing routine maintenance agreement with CDFW, trees less than 4 inches in diameter, large shrubs, small shrubs, and grasses would also be removed. Grubbing would also occur to remove remnant stands of *Arundo donax*. However, implementation of habitat enhancement features (riparian and wetland benches) would include planting a variety of native tree, shrub, and grass species that, when mature, would provide similar scenic resources to those which currently exist in the Project area. Further, although State Route 160 is designated as a state scenic highway, construction activities would not permanently alter the use of the highway or the views from the highway. Nonetheless, the views from State Route 160 would be altered during construction and in the short term after construction is completed (i.e., until vegetation grows similarly to the pre-construction condition). Therefore, the impact is **less than significant**.

- c) Both natural and artificial landscape features contribute to perceived visual images and the scenic attractiveness of a landscape. Scenic attractiveness is influenced by vegetation pattern, water characteristics, landforms, recreational features, and rural and urban features. Individuals respond differently to changes in the physical environment based on their experiences of the environment prior to changes, the extent and nature of those changes, and the proximity and duration of their views. The aesthetic value of an area is therefore a subjective measure of the visual character and scenic quality.

The Proposed Project would require removal of immature riparian trees, shrubs, and grasses. However, implementation of habitat enhancement features (riparian and wetland benches) would include planting a variety of native tree, shrub, and grass species that, when mature, would result in a visual character of the erosion repair sites similar to that which currently exists. Nonetheless, the visual character of the Project area would be altered during construction and in the short term after construction is completed (i.e., until vegetation grows similarly to the pre-construction condition). In the long-term, the visual character of the Project area would not be appreciably different from the visual character that currently exists. Therefore, the Proposed Project would not substantially degrade the existing visual character or quality of the erosion repair sites and



surroundings, and would be consistent with City of Isleton and Sacramento County General Plan policies. Therefore, the impact is **less than significant**.

- d) The temporary construction activities over the course of approximately 120 days between June 15, 2021 and December 30, 2021 would be limited to daylight hours; thus, there would be no nighttime lighted activities. The Proposed Project does not involve installation of any new sources of light or glare. Therefore, the Proposed Project would have **no impact** on day or nighttime views in the area.

### 3.2 Agriculture and Forestry Resources

Would the project...	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined in Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 511049g)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d) Result in the loss of forest land or conversion of forest land to non-forest use?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland to non-agricultural use or conversion of forest land to non-forest use?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

#### 3.2.1 Setting

The Project area includes three erosion repair sites on levees abutting the Sacramento River where construction activities would occur. All of the erosion repair sites occur on parcels currently zoned for agricultural use. However, no agricultural production occurs on the erosion repair sites where construction activities would occur. Specifically, the three erosion repair sites currently consist of anthropogenic levee materials (i.e., rock slope protection) and fill material that is vegetated by native and non-native riparian trees and shrubs, and non-native grasses. Agricultural production occurs across State Route 160 from erosion repair sites 1 and 2. Most of the agricultural areas across State Route 160 south of the erosion repair sites and across the Sacramento River north of the erosion repair sites within the vicinity of the Project area are designated as Prime Farmland and much of the agricultural land is under Williamson Act



contract (Sacramento County 2011; City of Isleton 2000). No forest land exists within or near the Project area.

### 3.2.2 Discussion

- a) The Proposed Project would involve temporary construction activities to implement erosion control and habitat enhancement at the three erosion repair sites on existing levees adjacent to the Sacramento River. Additionally, access to the erosion repair sites would occur from State Route 160 and would not require construction of additional access roads. Temporary construction activity would occur within 100 feet of existing agricultural land activities. However, no aspect of construction of the Proposed Project would adversely affect, or directly or indirectly cause or contribute to the conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance to other land uses. Therefore, there would be **no impact**.
- b) As identified in response “a” above, no construction activities would occur on agricultural lands, and would not cause agricultural lands to be converted to other land uses. Therefore, construction activities would not affect lands under Williamson Act contract, or lands that could enter into future Williamson Act contracts. Therefore, there would be **no impact**.
- c) No forest land or timber land exists within or adjacent to the Project area. Therefore, there would be potential for any conflicts with existing zoning, or cause rezoning of forest land. As such, there would be **no impact**.
- d) As identified in response “c” above, none of the Project area is located on any forest land. As such there would be no potential for loss of forest land or conversion of forest land to non-forest use. Thus, there would be **no impact** on forest land.
- e) As identified in responses “c” and “d” above, the Project area is not located on any forest land. As described in “a” and “b” above, construction activities would occur on agricultural lands. As such, the Proposed Project would have **no impact** on the conversion farmland to non-agricultural use or of forest land to a non-forest use.

### 3.3 Air Quality

Would the project...	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
a) Conflict with or obstruct implementation of the applicable air quality plan?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
b) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) Expose sensitive receptors to substantial pollutant concentrations?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>



Would the project...	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
d) Result in other emissions (such as those leading to odors adversely affecting a substantial number of people)?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

### 3.3.1 Setting

The project site is located in Sacramento County, California, and lies within the Sacramento Valley Basin, which is under the jurisdiction of the Sacramento Metropolitan Air Quality Management District (SMAQMD). The Sacramento Valley Basin includes all of Butte, Colusa, Yolo, Sutter, Yuba, Sacramento, and Shasta Counties; and the northeast portion of Solano County. As the local air quality management agency, SMAQMD is required to monitor air pollutant levels to ensure that state and federal air quality standards are met and, if they are not met, to develop strategies to meet the standards. Depending on whether or not the standards are met or exceeded, the Sacramento Valley Basin is classified as being in “attainment” or “nonattainment.” The health effects associated with criteria pollutants upon which attainment of state and federal air quality standards is measured are described in **Table 3** (SMAQMD 2017).

**Table 3. Health effects associated with criteria pollutants**

Pollutant	Adverse Effects
Ozone	(1) Short-term exposures: pulmonary function decrements and localized lung edema in humans and animals, risk to public health implied by alterations in pulmonary morphology and host defense in animals; (2) long-term exposures: risk to public health implied by altered connective tissue metabolism and altered pulmonary morphology in animals after long-term exposures and pulmonary function decrements in chronically exposed humans; (3) vegetation damage; and (4) property damage.
Carbon monoxide (CO)	Reduces oxygen delivery leading to: (1) Aggravation of chest pain (angina pectoris) and other aspects of coronary heart disease; (2) decreased exercise tolerance in persons with peripheral vascular disease and lung disease; (3) impairment of central nervous system functions; and (4) possible increased risk to fetuses.
Nitrogen dioxide (NO <sub>2</sub> )	(1) Potential to aggravate chronic respiratory disease and respiratory symptoms in sensitive groups; (2) risk to public health implied by pulmonary and extra-pulmonary biochemical and cellular changes and pulmonary structural changes; and (3) contribution to atmospheric discoloration.
Sulfur dioxide (SO <sub>2</sub> )	(1) Bronchoconstriction accompanied by symptoms that may include wheezing, shortness of breath, and chest tightness during exercise or physical activity in persons with asthma.
Suspended particulate matter (PM <sub>10</sub> )	(1) Excess deaths from short-term and long-term exposures; (2) excess seasonal declines in pulmonary function, especially in children; (3) asthma exacerbation and possibly induction; (4) adverse birth outcomes including low birth weight; (5) increased infant mortality; (6) increased respiratory



	symptoms in children such as cough and bronchitis; and (7) increased hospitalization for both cardiovascular and respiratory disease (including asthma). <sup>1</sup>
Suspended particulate matter (PM <sub>2.5</sub> )	(1) Excess deaths from short- and long-term exposures; (2) excess seasonal declines in pulmonary function, especially in children; (3) asthma exacerbation and possibly induction; (4) adverse birth outcomes, including low birth weight; (5) increased infant mortality; (6) increased respiratory symptoms in children, such as cough and bronchitis; and (7) increased hospitalization for both cardiovascular and respiratory disease, including asthma. <sup>1</sup>
<sup>1</sup> More detailed discussions on the health effects associated with exposure to suspended particulate matter can be found in the following documents: Office of Environmental Health Hazard Assessment, Particulate Matter Health Effects and Standard Recommendations, <a href="http://www.oehha.ca.gov/air/toxic_contaminants/PM10notice.html#may">www.oehha.ca.gov/air/toxic_contaminants/PM10notice.html#may</a> , May 9, 2002; and EPA, Air Quality Criteria for Particulate Matter, October 2004.	
Source: US EPA 2018	

The Sacramento Valley Basin is in a non-attainment area for federal standards for ozone and fine particulate matter (PM<sub>2.5</sub>), as well as the state standards for ozone and respirable particulate matter (PM<sub>10</sub>). Because the Sacramento Valley Basin currently exceeds several state and federal ambient air quality standards, the SMAQMD is required to implement strategies to reduce pollutant levels to recognized acceptable standards.

The tugboats that would deliver supplies to the project site would travel from San Rafael to the project site via the San Francisco Bay and Sacramento River, which would lead the tugboats through the Bay Area Air Quality Management District (BAAQMD), the Yolo-Solano Air Quality Management District (YSAQMD), and finally through the SMAQMD to where project construction would occur. Both the BAAQMD and the YSAQMD are located in the San Francisco Bay Area Air Basin. The San Francisco Bay Area Air Basin is in a non-attainment area for state and national ozone standards and national particulate matter ambient air quality standards.

Criteria air pollutant concentrations are measured at monitoring stations in the air districts. The Elk Grove-Bruceville Road monitoring station, located within the SMAQMD, is the closest station to the project site located approximately 30 miles northeast, and reports air quality data for ozone. The next nearest station that reports PM<sub>2.5</sub> and PM<sub>10</sub> is the Sacramento T Street Station, located approximately 33 miles north of the project site. There are no monitoring stations in Sacramento County that record CO emissions. The ambient air quality measurements from these stations are representative of the air quality near the project site. **Table 4** summarizes the air quality data for the three most recent calendar years for which data is available.

**Table 4. Summary of annual data on ambient air quality (2016–2018) <sup>1</sup>**

Air Contaminant	2016	2017	2018
<b>Ozone</b>			
Maximum concentration (1-hr/8-hr avg, ppm)	0.089/ 0.072	0.104/ 0.085	0.096/ 0.082



Number of days state standard exceeded (1-hr/8-hr)	0/1	1/3	1/2
Number of days national standard exceeded (8-hr)	0/1	0/3	0/2
<b>Fine Particulate Matter (PM<sub>2.5</sub>)</b>			
Maximum concentration (24-hour µg/m <sup>3</sup> )	24.4	44.5	149.9
Number of days national standard exceeded (24-hour measured <sup>2</sup> )	0	2	3
<b>Respirable Particulate Matter (PM<sub>10</sub>)</b>			
Maximum concentration (24-hour µg/m <sup>3</sup> )	50.3	149.9	292.6
Number of days state standard exceeded (measured/calculated <sup>2</sup> )	1/1	*/21	22/22
Number of days national standard exceeded (measured/calculated <sup>2</sup> )	0/0.0	0/0.0	6/6
Notes: 1 Measurements from the Elk Grove-Bruceville Road Monitoring Station for ozone. Measurements of fine particulate matter (PM <sub>2.5</sub> ) and respirable particulate matter (PM <sub>10</sub> ) obtained from the Sacramento T Street air monitoring station. 2 Measured days are those days that an actual measurement was greater than the level of the state daily standard or the national daily standard. Measurements are typically collected every six days. Calculated days are the estimated number of days that a measurement would have been greater than the level of the standard had measurements been collected every day. The number of days above the standard is not necessarily the number of violations of the standard for the year.  µg/m <sup>3</sup> =micrograms per cubic meter ppm=parts per million *= There was insufficient data to determine the value.  Source: CARB 2020			

## Regulatory Framework

Air quality within the project site is regulated by agencies such as the U.S. Environmental Protection Agency (EPA) and the California Air Resources Board (CARB) at the federal and state levels, respectively, and locally by the SMAQMD, BAAQMD, and YSAQMD. The air districts attain and maintain air quality conditions in their respective basins through a comprehensive program of planning, regulation, enforcement, technical innovation, and promotion of the understanding of air quality issues. The air districts' clean air strategy includes the preparation of plans for the attainment of ambient air quality standards, adoption and enforcement of rules and regulations concerning sources of air pollution, and issuance of permits for stationary sources of air pollution.

### Federal

The U.S. EPA is responsible for enforcing the federal Clean Air Act (CAA). The U.S. EPA is also responsible for establishing the National Ambient Air Quality Standards. The National Ambient Air Quality Standards are required under the 1977 CAA and subsequent amendments. The EPA regulates emission sources that are under the exclusive authority of the federal government, such as aircraft, ships, and certain types of locomotives. The agency has jurisdiction over emission sources outside state waters (e.g. beyond the outer continental shelf) and establishes various emission standards, including those for vehicles sold in states other than



California. Automobiles sold in California must meet the stricter emission standards established by CARB.

#### State

CARB is responsible for meeting the State requirements of the federal CAA, administering the California CAA, and establishing the California Ambient Air Quality Standards (CAAQS). The California CAA, as amended in 1992, requires all air districts in the State to endeavor to achieve and maintain the CAAQS. The CAAQS are generally more stringent than the corresponding federal standards and incorporate additional standards for sulfates, hydrogen sulfide, vinyl chloride and visibility reducing particles. CARB regulates mobile air pollution sources, such as motor vehicles. The agency is responsible for setting emission standards for vehicles sold in California and for other emission sources, such as consumer products and certain off-road equipment. CARB established passenger vehicle fuel specifications, which became effective on March 1996. CARB oversees the functions of local air pollution control districts and air quality management districts, which in turn administer air quality activities at the regional and county level.

As described above, the Sacramento Valley Basin is classified as a non-attainment area for federal standards for ozone and PM<sub>2.5</sub>, as well as the state standards for ozone and PM<sub>10</sub>. Under the California CAA, areas not in compliance with the state standards must submit plans to reduce emissions and achieve attainment. SMAQMD developed a 2008 Ozone Standard Attainment Plan to reduce ozone in the region and has not yet developed an attainment plan for particulate matter. As described above, the San Francisco Bay Area Air Basin is in a nonattainment area for state and national ozone standards and national particulate matter ambient air quality standards. The BAAQMD has developed the 2017 Clean Air Plan to reduce ozone and particulate matter in the region. In addition, the YSAQMD has prepared the 2015 Triennial Assessment and Plan Update to reduce ozone in the region.

#### Local

All projects are subject to SMAQMD's rules and regulations in effect at the time of construction. Specific rules applicable to the construction activities under the Proposed Project include, but are not limited to:

- Regulation 2, Rule 20, General Permit Requirements. Includes criteria for issuance or denial of permits, exemptions, appeals.
- Regulation 4, Rule 403, Fugitive dust. Limits fugitive dust by requiring watering during construction and demolition, or other means approved by the Air Pollution Control Officer.
- Regulation 4, Rule 404, Particulate matter. Limits particulate matter in excess of 0.23 grams per dry standard cubic meter.

The only project emissions that would occur within the YSAQMD or BAAQMD would be from the tugboat transporting materials through the districts. Therefore, regulations in those districts



regarding fugitive dust or other typical ground-disturbing or truck hauling construction activities would not apply to the Proposed Project.

#### CEQA Thresholds of Significance

SMAQMD adopted thresholds of significance for the purposes of CEQA assessments in the December 2009 Guide to Air Quality Assessment in Sacramento County, with the Thresholds of Significance Table most recently updated in May 2015 (SMAQMD 2009). The SMAQMD recommends the use of quantitative thresholds to determine the significance of temporary construction-related pollutant emissions and project operations. The YSAQMD has adopted guidelines for quantifying and determining the significance of air quality emissions in their Handbook for Assessing and Mitigating Air Quality Impacts (YSAQMD 2007) and the BAAQMD has adopted guidelines for quantifying and determining the significance of air quality emissions in their CEQA Air Quality Guidelines (BAAQMD 2017). These thresholds are shown in **Table 5**.

**Table 5. Air quality significance thresholds**

Pollutant	Mass Daily Thresholds for Construction (lbs/day)		
	SMAQMD	YSAQMD <sup>1</sup>	BAAQMD
Nitrogen Oxide (NO <sub>x</sub> )	85	167	54
Reactive Organic Gasses (ROG)	--	167	54
PM <sub>10</sub>	0 <sup>2</sup>	80	82 (exhaust only)
PM <sub>2.5</sub>	0 <sup>3</sup>	N/A	54 (exhaust only)
<sup>1</sup> The YSAQMD provides their ROG and NO <sub>x</sub> thresholds in tons per year. This was converted to pounds per day of construction by converting tons to pounds and dividing by 120 days, the length of the construction period. If tugboat emissions were to exceed the pounds per day threshold for all 120 construction days, the tons per year threshold would also be exceeded. <sup>2</sup> If all feasible BACT (best available control technology)/BMPs are applied, then 80 pounds per day and 14.6 tons/year <sup>3</sup> If all feasible BACT/BMPs are applied, then 82 pounds per day and 15 tons/year Source: SMAQMD 2009; YSAQMD 2007; BAAQMD 2017			

#### **Methods**

Construction emissions associated with development of the Proposed Project were calculated using the Road Construction Emissions Model (RCEM), Version 9.0.0 and the SMAQMD Harborcraft, Dredge and Barge Emission Factor Calculator, Version 1.0, as recommended by SMAQMD for levee projects. The Harborcraft, Dredge and Barge Emission Factor Calculator creates emission factors for boats that are then entered into RCEM. Temporary emissions would result from three primary sources: operation of construction vehicles, ground disturbance during clearing and grubbing that create fugitive dust, and operation of boats. The extent of daily emissions, particularly reactive organic gases (ROGs) and nitrogen oxide (NO<sub>x</sub>) emissions, generated by construction equipment would depend on the quantity of equipment used and the hours of operation for each project. The extent of fugitive dust (PM<sub>2.5</sub> and PM<sub>10</sub>) emissions would depend upon the following factors: 1) the amount of disturbed soils; 2) the length of disturbance time; 4) whether excavation is involved; and 5) whether transporting excavated



materials offsite is necessary. The amount of ROG emissions depends upon the type and amount of material utilized. Boat emissions would depend on the type of vessel, the number of engines, the engine model year, the engine horsepower, the engine load factor, and the duration that the vessel would be used.

Construction would include mobilization, site preparation, levee slope and bench construction, Terrabag filling and placement, removal/replacement of encroachment and removal of concrete rubble, installation of plants, and site demobilization. Construction equipment, phases, and schedule were provided by the project applicant. For boat inputs into the SMAQMD Harborcraft, Dredge and Barge Emission Factor Calculator, the following assumptions were used per information provided by the project applicant:

- Levee slope and bench construction
  - Two small work boats
    - 66 days of use
    - Engine runs one hour per day
    - One engine per boat
    - Engine model year: 2012 Tier 3
    - Engine-rated horsepower: 265
    - Engine load factor: 0.45
  - Two tug boats
    - 22 days of use
    - Engine runs 12 hours per day
    - Two engines per boat
    - Engine model year: 2008
    - Engine-rated horsepower: 850
    - Engine load factor: 0.50
- Installation of plants
  - Two small work boats
    - 66 days of use
    - Engine runs one hour per day
    - One engine per boat
    - Engine model year: 2012 Tier 3
    - Engine-rated horsepower: 265
    - Engine load factor: 0.45

The tugboats would be in operation for 12 hours a day during levee slope and bench construction in three different air districts: the BAAQMD, the YSAQMD, and the SMAQMD. The boat would travel through the BAAQMD, YSAQMD, and SMAQMD while in transport, and would conduct unloading operations within the SMAQMD. As the tugboat would unload in the SMAQMD, it would be expected to spend the majority time within the SMAQMD. For purposes of this analysis, it was assumed that the tugboat would spend three hours in the BAAQMD, four hours in the YSAQMD, and five hours in the SMAQMD during each day of operation.

Motorized boats would not be used in phases other than levee slope and bench construction and installation of plants. The emissions factors from the SMAQMD Harborcraft, Dredge and Barge



Emission Factor Calculator were added into RCEM as non-default off-road construction equipment. Assumptions were also made regarding average worker commute trips and default values were used for haul trip capacity. RCEM and SMAQMD Harborcraft, Dredge and Barge Emission Factor Calculator results are shown in **Appendix B**. The emissions between the two models were summed to obtain the project total emissions.

### 3.3.2 Discussion

- a) The emission inventories used to develop a region's air quality attainment plans are based primarily on projected population growth and vehicle miles traveled (VMT) for the region, which are based, in part, on the planned growth identified in regional and community plans. Therefore, projects that would result in increases in population or employment growth beyond that projected in regional or community plans could result in increases in VMT above that planned in the attainment plan, further resulting in mobile source emissions that could conflict with a region's air quality planning efforts. The Proposed Project would involve erosion control and habitat modifications within the Delta. The Proposed Project would not result in an increase in population, changes to land use, or an increase in VMT during project operation. In addition, the Proposed Project would not result in operational emissions. Therefore, implementation of the Proposed Project would not conflict with or obstruct implementation of any air quality planning efforts. Impacts would be **less than significant**.
- b) Construction-related emissions are temporary in duration but have the potential to represent a significant impact with respect to air quality. Project-related construction activities would generate temporary air pollutant emissions and fugitive dust emissions from construction equipment. Construction emissions would also occur from motor vehicles and boats transporting construction workers, equipment, materials, and construction debris to and from the project site.

**Table 6** summarizes the estimated maximum daily construction emissions from the Proposed Project. The significance of construction-related air quality impacts was determined by comparing these modeling results with SMAQMD, YSAQMD, and BAAQMD significance thresholds.

**Table 6. Project construction criteria pollutant daily maximum emissions**

Emissions <sup>1</sup>	ROG	NO <sub>x</sub>	PM <sub>2.5</sub>	PM <sub>10</sub>
SMAQMD Maximum (lbs/day)	9	82	4	3
SMAQMD Threshold (lbs/day)	--	85	82 <sup>2</sup>	80 <sup>3</sup>
<b>Threshold Exceeded?</b>	<b>No</b>	<b>No</b>	<b>No</b>	<b>No</b>
YSAQMD Maximum (lbs/day)	7	66	3	2
YSAQMD Threshold (lbs/day)	167	167	--	80
<b>Threshold Exceeded?</b>	<b>No</b>	<b>No</b>	<b>No</b>	<b>No</b>
BAAQMD Maximum (lbs/day)	5	49	2	2
BAAQMD Threshold (lbs/day)	54	54	54 (exhaust only)	82 (exhaust only)



Threshold Exceeded?	No	No	No	No
<p>Notes:</p> <p><sup>1</sup> Emissions in the YSAQMD and BAAQMD assume four hours and three hours of tugboat hauling operations per day during levee slope and bench construction, respectively. Emissions in the SCAQMD assume five hours of tugboat hauling operations per day during levee slope and bench construction in addition to the other project construction activities.</p> <p><sup>2</sup> Per Mitigation Measure AQ-1 all feasible BACT/BMPs would be applied to the Proposed Project and the 82 lbs/day threshold was applied.</p> <p><sup>3</sup> Per Mitigation Measure AQ-1 all feasible BACT/BMPs would be applied to the Proposed Project and the 80 lbs/day threshold was applied.</p> <p>BACT = Best Available Control Technology  BMPs = Best Management Practices  lbs/day = pounds per day  -- = not applicable</p> <p>Modeled values represent average daily emissions that would occur over the duration of the construction period. See Appendix B for detail on model inputs, assumptions, and project specific modeling parameters.</p>				

As shown in **Table 6**, the maximum daily emissions would not exceed the SMAQMD, YSAQMD, or BAAQMD thresholds of significance for construction emissions. However, as discussed above, to apply the SMAQMD's PM<sub>10</sub> and PM<sub>2.5</sub> construction emissions thresholds, the Proposed Project must implement all feasible BACT/BMPs or have zero particulate matter emissions. Therefore, criteria pollutant emission impacts in the SMAQMD would be potentially significant. Implementation of Mitigation Measure AQ-1 would require relevant SMAQMD BMPs and BACT during construction activities. With implementation of Mitigation Measure AQ-1, impacts would be reduced to a **less than significant** level.

#### **MITIGATION MEASURE AQ-1. BEST AVAILABLE CONSTRUCTION MEASURES**

Project contractors shall ensure that the relevant Sacramento Metropolitan Air Quality Management District Basic Control Emission Control Practices (also known as BMPs) shall be implemented during project construction. BMPs include:

- Control of fugitive dust is required by District Rule 403 and enforced by District staff.
- Water all exposed surfaces two times daily. Exposed surfaces include, but are not limited to soil piles, graded areas, unpaved parking areas, staging areas, and access roads.
- Cover or maintain at least two feet of free board space on haul trucks transporting soil, sand, or other loose material on the site. Any haul trucks that would be traveling along freeways or major roadways should be covered.
- Use wet power vacuum street sweepers to remove any visible trackout mud or dirt onto adjacent public roads at least once a day. Use of dry power sweeping is prohibited.



- Limit vehicle speeds on unpaved roads to 15 miles per hour (mph).
  - All roadways, driveways, sidewalks, parking lots to be paved should be completed as soon as possible. In addition, building pads should be laid as soon as possible after grading unless seeding or soil binders are used.
  - The following practices describe exhaust emission control from diesel powered fleets working at a construction site. California regulations limit idling from both on-road and offroad diesel-powered equipment. The California Air Resources Board (CARB) enforces idling limitations and compliance with diesel fleet regulations.
    - Minimize idling time either by shutting equipment off when not in use or reducing the time of idling to 5 minutes [California Code of Regulations, Title 13, sections 2449(d)(3) and 2485]. Provide clear signage that posts this requirement for workers at the entrances to the site.
    - Provide current certificate(s) of compliance for CARB's In-Use Off-Road Diesel-Fueled Fleets Regulation [California Code of Regulations, Title 13, sections 2449 and 2449.1].
  - Maintain all construction equipment in proper working condition according to manufacturer's specifications. The equipment must be checked by a certified mechanic and determined to be running in proper condition before it is operated.
- 

#### **Long-Term Operational-Related Regional Criteria Air Pollutant and Precursor Emissions**

As previously mentioned, no new local criteria pollutant emissions sources are anticipated under long-term project operation and the Proposed Project would have no operational air quality impacts since the Proposed Project would not change the existing use of the site. The Proposed Project would involve erosion control and habitat enhancement and would therefore not result in long-term emissions. There would be **no impact**.

- c) The potential for the Proposed Project to result in the exposure of sensitive receptors to substantial pollutant concentrations was evaluated for construction-related activities. Project operation would not produce emissions.

#### **Temporary Construction**

CARB's Air Quality and Land Use Handbook: A Community Health Perspective (April 2005) provides recommendations for siting projects near sensitive land uses. These recommendations are intended to reduce the risk of potential health effects associated with diesel exhaust emitted from trucks. Diesel exhaust contain diesel particulate matter (DPM), a toxic air contaminant (TAC) associated with temporary health effects, including eye-watering, exacerbation of asthma, respiratory irritation, and more serious long-term effects, such as cancer and lung disease (CARB 2005).



During construction, residences and other sensitive receptors may be affected by the temporary construction emissions from diesel-generated particulate matter exhaust. Nearby sensitive receptors include a mobile home park 85 feet south of the project site, single family residences approximately 125 feet south of the project site, residences across the river approximately 600 feet north of the project site, and residences in Vieira's Resort approximately 1,000 feet east of the project site. Additional sensitive receptors in the project vicinity include single family residences in Isleton and Isleton Elementary School located approximately 1,000 feet southeast of the project site. Construction of the Proposed Project would occur for approximately 120 working days over at least five months.

The dose to which receptors are exposed is the primary factor used to determine health risk (i.e., potential exposure to TAC emission levels that exceed applicable standards). Dose is a function of the concentration of a substance or substances in the environment and the duration of exposure to the substance. Dose is positively correlated with time, meaning that a longer exposure period would result in a higher exposure level for any exposed receptor. Thus, the risks estimated for an exposed individual are higher if a fixed exposure occurs over a longer period of time.

According to Office of Environmental Health Hazard Assessment, Health Risk Assessments, which determine the exposure of sensitive receptors to TAC emissions, should be based on a 30-year exposure period; however, such assessments should be limited to the period/duration of activities associated with the Proposed Project (Office of Environmental Health Hazard Assessment 2012:11-3). Consequently, it is important to consider that the use of off-road heavy-duty diesel equipment would be limited to the construction period, which would be approximately 120 days for the Proposed Project. Additionally, studies show that diesel PM is highly dispersive (e.g., decrease of 70 percent at 500 feet from the source) (Zhu et al. 2002).

The Proposed Project would result in maximum emissions of three pounds per day of PM<sub>10</sub> exhaust and four pounds per day of PM<sub>2.5</sub> exhaust in the SMAQMD. SMAQMD has not established a quantitative threshold of significance for construction-related TAC emissions but recommends taking into consideration specific construction-related characteristics of the project, which are described above. Therefore, considering the highly dispersive properties of diesel PM, the relatively low mass of diesel PM emissions that would be generated during Project construction, the distance of sensitive receptors, and the relatively short duration of construction activities (120 days) when compared to a 30-year exposure period, construction-related TAC emissions would not expose sensitive receptors to a substantial incremental increase in cancer risk. As a result, the Proposed Project would not conflict with SMAQMD guidance for risks and hazards to receptors associated with new emissions sources. Thus, the Proposed Project would not expose sensitive receptors to substantial pollutant concentrations during construction. Impacts would be **less than significant**.

- d) The occurrence and severity of odor impacts depend on numerous factors, including the nature, frequency, and intensity of the source; wind speed and direction; and the presence of sensitive receptors. Although offensive odors rarely cause physical harm, they may still be



very unpleasant, leading to considerable distress and often generating citizen complaints to local governments and regulatory agencies.

Construction associated with the Proposed Project would result in odors from exhaust emissions from onsite diesel equipment. Such emissions would be intermittent in nature and would dissipate rapidly with increasing distance from the source. In addition, SMAQMD Rule 402 prohibits any person or source from emitting air contaminants that cause detriment, nuisance, or annoyance to a considerable number of persons or the public.

Operation of the Proposed Project would involve new erosion control and habitat enhancements. Thus, operation of the Proposed Project would not expose the nearby existing receptors to objectionable odors or other emissions.

Implementation of the Proposed Project would not involve the construction or operation of major odor sources or other emissions. Thus, the Proposed Project would not result in the exposure of sensitive receptors to objectionable odors. Impacts would be **less than significant**.

### 3.4 Biological Resources

Would the Proposed Project...	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
c) Have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
d) 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?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Would the Proposed Project...	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

### 3.4.1 Setting

The Proposed Project includes construction work on the levee adjacent to and within the Sacramento River channel. The Sacramento River in the vicinity of the Proposed Project is fully leveed and has a channel width of 500 to 700 feet. River flow in the area is strong and shallow-water fish friendly habitats are limited. The terrestrial area includes diverse land uses including the urbanized areas along the river and agricultural land area of the Delta.

Information related to terrestrial vegetation and wildlife discussed below is based on the Biological Resources Assessment (BRA) for the Proposed Project completed by Rincon Consultants, Inc. (Rincon), in January 2018 and updated in April 2020, included as **Appendix C**.

Impacts to biological resources could occur from either construction activities or the permanent modification of the levee.

#### Terrestrial Vegetation and Wildlife

##### Methods

A literature review and reconnaissance-level field surveys of the terrestrial project environment was completed to identify and map natural habitat and to determine the potential for presence of special status plant and wildlife species to occur in the project area. Queries of the U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation system (IPaC) (USFWS 2017a, 2020), CDFW California Natural Diversity Database (CNDDDB) (CDFW 2017a, 2020), and the California Native Plant Society (CNPS) Online Inventory of Rare and Endangered Plants of California (CNPS 2017, 2020) were conducted to obtain comprehensive information regarding state and federally listed species as well as other special status species considered to have potential to occur in the project vicinity. The results of these scientific database queries are included in Appendix B of the BRA (Appendix C).

In addition, the following resources were reviewed for information about the Proposed Project area:

- Aerial photographs of the project area and vicinity;
- Rio Vista, California and Isleton, California USGS 7.5-minute topographic quadrangles;
- U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) Web Soil Survey (2017, 2020);
- USFWS Critical Habitat Portal (2017b, 2020); and
- USFWS National Wetlands Inventory (2017c, 2020).



Reconnaissance surveys were conducted on December 1, 2017 and April 1, 2020 to document the existing site conditions and to evaluate the potential for presence of sensitive terrestrial biological resources including sensitive plant and animal species, and to map sensitive plant communities, potentially jurisdictional waters of the U.S. and wetlands, and habitat for federally and state protected nesting birds.

Assessments for the potential occurrence of special status species are based upon known ranges, habitat preferences for the species, species occurrence records from the CNDDB, species occurrence records from other sites in the vicinity of the survey area, and previous reports for the project site. See Appendix C for a discussion of how special status species are defined for this analysis.

#### Existing Conditions for Terrestrial Vegetation and Wildlife

##### *Vegetation*

Four terrestrial vegetation communities or land cover types occur within the project site: Oak Woodland, Black Willow Thicket, Ruderal and Developed as shown in Table 7 and described below.

**Table 7. Summary of vegetation communities in the project site**

<b>Vegetation Community</b>	<b>Approximate Acreage within Project Site</b>	<b>Approximate Percentage of Project Site</b>
Oak Woodland	5.58	28
Black Willow Thicket	0.32	1
Ruderal	7.00	34
Developed	7.13	36

Oak Woodland occurs within the majority of the project site. Tree species identified on site included: box elder (*Acer negundo*), valley oak (*Quercus lobata*), edible fig (*Ficus carica*), interior live oak (*Quercus wislizeni*), Northern California black walnut (*Juglans hindsii*), Oregon ash (*Fraxinus latifolia*), western sycamore (*Platanus racemosa*), white alder (*Alnus rhombifolia*), black locust (*Robinia pseudoacacia*), Coast live oak (*Quercus agrifolia*), and a variety of willow species (*Salix* spp.). The understory is dominated by California rose (*Rosa californica*), blackberry (*Rubus* sp.), scouringrush horsetail (*Equisetum hyemale*), and California wild grape (*Vitis californica*).

Black Willow Thicket occurs within the western portion of the project site. Black willow is the dominant tree species. Other tree species identified on site included: coast live oak, valley oak, and a variety of willow species (*Salix* spp.). The understory is dominated by blackberry and California wild grape.

Ruderal vegetation occurs within the most of the proposed optional staging areas and consists predominantly of non-native annual grasses (recently mowed) and weedy species, such as black



mustard (*Brassica nigra*), cheeseweed (*Malva parviflora*), fennel (*Foeniculum vulgare*), and prickly lettuce (*Lactuca serriola*).

Areas that were considered developed within the project site consisted of areas where rip rap, concrete-lined riverbank, and utility development existed. These areas contain little vegetation and represent engineered areas with man-made structures present. Additionally, much of the optional staging areas were developed with paved, graveled or landscaped areas.

#### General Wildlife

Terrestrial wildlife activity was observed during the reconnaissance survey of the project site. See Appendix C of the BRA (Appendix C) for a full list of species observed in the vicinity of the project site. Avian species observed included common species such as red tailed hawk (*Buteo jamaicensis*), Canada goose (*Branta canadensis*), mourning dove (*Zenaida macroura*), turkey vulture (*Cathartes aura*), raven (*Corvus corax*), California scrub jay (*Aphelocoma californica*), and California gull (*Larus californicus*). Small mammal signs consisting of pocket gopher (*Thomomys sp.*) and California ground squirrel (*Otospermophilus beecheyi*) burrows were uncommon and were found intermittently throughout the project site.

## Fisheries

### Methods

A literature review of the Sacramento River in the vicinity of the Proposed Project was completed to identify the potential for presence of native fish species to occur in the project area. The list of special status fish species considered during impact analysis was compiled using the review of literature, a CNDDDB (CDFW 2017a, 2020) search within a five-mile radius of the Proposed Project site, and a query of the USFWS IPaC (USFWS 2017a, 2020).

### Existing Conditions for Fisheries Resources

The reach of the Sacramento River in the vicinity of the Proposed Project supports 22 fish species/races (**Table 8**). These include a number of federally and state designated special status species that are described in further detail below.

**Table 8. Native fish species potentially occurring in the lower Sacramento River and their status under the federal Endangered Species Act (ESA) and California Endangered Species Act (CESA).**

Family	Common Name	Scientific Name	Special status Designation <sup>1</sup>	
			ESA	CESA
<i>Acipenseridae</i> (Sturgeon)	Green Sturgeon	<i>Acipenser medirostris</i>	FT	SSC
	White Sturgeon	<i>A. transmontanus</i>	--	SSC
<i>Catostomidae</i> (Suckers)	Sacramento Sucker	<i>Catostomus occidentalis</i>	--	--
<i>Cottidae</i> (Sculpins)	Prickly Sculpin	<i>C. asper</i>	--	--
<i>Cyprinidae</i>	Hardhead	<i>Mylopharodon conocephalus</i>		SSC



(Minnows)	Hitch	<i>Lavinia exilicauda</i>	--	--
	California Roach	<i>Hesperoleucus symmetricus</i>	--	--
	Sacramento Blackfish	<i>Orthodon microlepidotus</i>	--	--
	Sacramento Pikeminnow	<i>Pytchocheilus grandis</i>	--	--
	Sacramento Speckled Dace	<i>Rhinichthys osculus</i>	--	--
	Sacramento Splittail	<i>Pogonichthys macrolepidotus</i>	--	SSC
<i>Embiotocidae</i> (Surfperches)	Tule Perch	<i>Hysterocephalus traskii</i>	--	--
<i>Gasterosteidae</i> (Sticklebacks)	Threespine Stickleback	<i>Gasterosteus aculeatus</i>	--	--
<i>Osmeridae</i> (Smelts)	Delta Smelt	<i>Hypomesus transpacificus</i>	FT	SE
	Longfin Smelt	<i>Spirinchus thaleichthys</i>	--	ST
<i>Petromyzontidae</i> (Lampreys)	Pacific Lamprey	<i>Lampetra tridentata</i>	FSC	SSC
	River Lamprey	<i>L. ayresi</i>	--	SSC
<i>Salmonidae</i> (Salmon and Trout)	Chinook Salmon	<i>Onchorhynchus tshawytscha</i>		
	Winter-run		FE	SE
	Spring-run		FT	ST
	Fall-run		SC	SSC
	Late-fall run		SC	SSC
	Steelhead	<i>O. mykiss</i>	FT	--
	Rainbow Trout		--	--

<sup>1</sup> Special status designation abbreviations

FE = Federally listed as endangered

FSC = Federal Species of Concern

FT = Federally listed as threatened

SE = Listed as endangered by the State of California

ST = Listed as threatened by the State of California

SSC = California Species of Special Concern

Sources: Moyle 2002, Moyle et al. 2015

### Special status Fish Species

This section provides an overview of the life history and distribution of fish species occurring in the Sacramento River that are endemic to California waters and are identified as endangered, threatened, or candidate species under the ESA or CESA, or identified as federal Species of Concern or California Species of Special Concern.

Special status fish occurring in the Sacramento River in the Proposed Project vicinity include Chinook Salmon, steelhead, Green Sturgeon, White Sturgeon, Delta Smelt, Longfin Smelt, Pacific Lamprey, River Lamprey, Hardhead, and Sacramento Splittail. The temporal occurrence of adult and juvenile special status fish species that occur in the lower Sacramento River are shown in **Figure 6**.



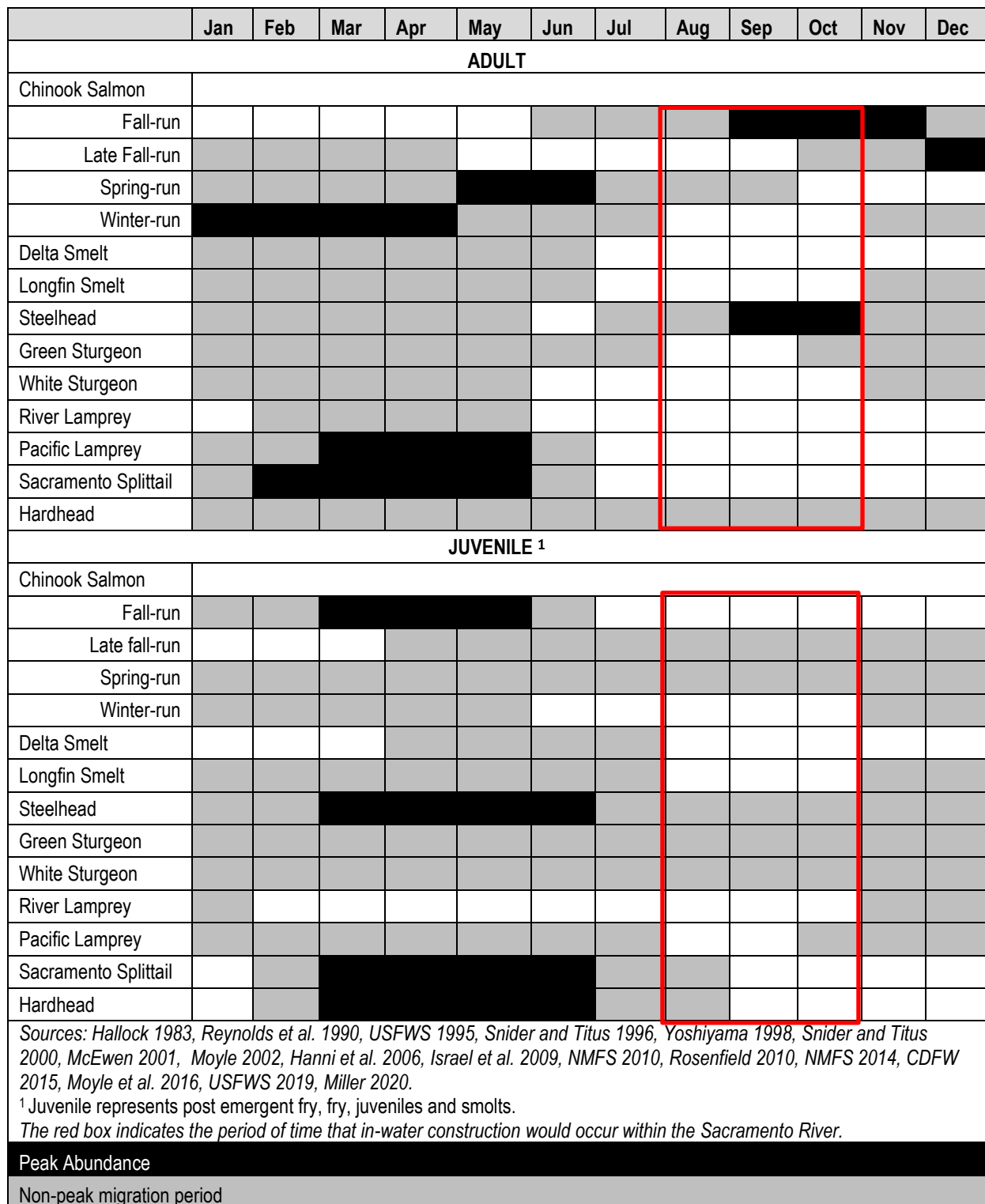
### *Central Valley Spring-run ESU Chinook Salmon*

Central Valley ESU spring-run Chinook Salmon were listed as threatened under the ESA on September 16, 1999 (50 CFR 50394). 5-year status reviews in 2005 and 2011 reaffirmed their threatened status. A 5-year status review completed in 2016 also recommended that Central Valley Spring-run Chinook Salmon remain classified as threatened, even though the recent drought raised concerns that these populations could deteriorate into high extinction risk in the coming years (NMFS 2016b).

Historically, spring-run Chinook Salmon were abundant throughout the Sacramento and San Joaquin river systems, but were extirpated from the entire San Joaquin Basin by 1951 (Lufkin 1991). The Central Valley ESU includes all spawning populations in the Sacramento River and its tributaries, including the Feather River, and one artificial propagation program, the Feather River Hatchery spring-run Chinook Salmon program.

Adult Central Valley spring-run Chinook Salmon begin upstream migration from the ocean in late January and early February (CDFW 1998) and continue through September (NMFS 2014). The fish enter rivers sexually immature and hold in deep, cold freshwater pools to mature for several months prior to spawning (Moyle 2002) and generally enter their natal streams from mid-February through July (CDFW 1998). A majority of Central Valley spring-run Chinook Salmon enter the Sacramento River basin to spawn as three year olds (Fisher 1994). Spawning typically occurs from mid-August to early October, peaking in September (Moyle 2002). Juveniles generally reside in freshwater for 12–16 months and emigrate as yearlings from October through March with peak movement during November and December (NMFS 2014). Length of residency within the Delta is unknown, but the fish are less likely to remain in the late spring months. Nevertheless, it is possible for juvenile spring-run Chinook Salmon to be present in the lower Sacramento River in all months of the year and adult spring-run Chinook Salmon to be present from January through September (NMFS 2014; Figure 6).





**Figure 6. Temporal occurrences of special status fish species in the lower Sacramento River.**



### *Sacramento River Winter-run ESU Chinook Salmon*

The Sacramento River winter-run ESU Chinook Salmon was listed as a threatened species under emergency provisions of the federal Endangered Species Act (ESA) in August 1989 (54 Federal Register [FR] 32085; August 4, 1989) and formally listed as threatened in November 1990 (55 FR 46515; November 5, 1990). In June 1992, NMFS proposed reclassifying the species as endangered (57 FR 27416; June 19, 1992) and winter-run ESU Chinook were formally listed as endangered January 4, 1994 (59 FR 440). NMFS developed a draft recovery plan in 1997 that was never finalized. However, the endangered designation status was reaffirmed on June 28, 2005 (70 FR 37160). NMFS completed another 5-Year Review of Sacramento winter-run ESU Chinook Salmon in August 2011, and again recommended maintaining the endangered classification (NMFS 2011). In July 2014, NMFS released a Recovery Plan for Sacramento River winter-run ESU Chinook Salmon (NMFS 2014). The ESU includes all naturally spawned populations of winter-run ESU Chinook Salmon in the Sacramento River and its tributaries, as well as Chinook Salmon that are part of the conservation hatchery at the Livingston Stone National Fish Hatchery located at the foot of the Shasta Dam.

Escapement (the amount of fish that escape harvest and return to spawn) of Sacramento River winter-run ESU Chinook in the late 1960s was nearly 100,000 fish but declined to under 200 fish in the 1990s (Good et al. 2005). Since 1998 the Livingston Stone National Fish Hatchery salmon conservation program has produced and released winter-run ESU Chinook Salmon. This program has been a major factor in preventing species extinction through increasing population size from critical lows in the 1990s (NMFS 2014). Although the ESU was saved from extinction much of the current population is made up of hatchery fish (NMFS 2014).

Upstream spawning migrations through the Delta and into the lower Sacramento River occur from November through July, with peak immigration from January through April (USFWS 1995, NMFS 2014). Spawning occurs from May to August, peaking from May to July (NMFS 2014). After rearing in streamside habitats for almost one year, juvenile salmon migrate downstream. Although juveniles spend a substantial amount of time rearing in the Delta, the importance of the Delta to winter-run ESU Chinook's life history is not fully understood (NMFS 2014). Juvenile winter-run Chinook Salmon may occur in the lower Sacramento River from November through early May (NMFS 2014). Because all in-water work would be conducted between August 1 and October 31 winter-run Chinook Salmon would not be present in the lower Sacramento River during any in-water work.

### *Central Valley Fall/Late-Fall Run Chinook Salmon*

The Central Valley fall-run and late fall-run Chinook salmon ESU were transferred from the federal candidate species list to the federal species of concern list in 2004 (64 FR 19975; April 15, 2004). Although Central Valley fall and late-fall runs are different life history forms, they are part of the same ESU. The Central Valley fall-run and late fall-run Chinook ESU includes all naturally spawned fall-run Chinook Salmon in the San Joaquin and Sacramento Basins, east of the Carquinez Strait. The fall-run of Chinook Salmon is currently the largest run of Chinook Salmon in the San Joaquin and Sacramento River watersheds. Fall-run Chinook Salmon continue to support commercial and recreational fisheries of significant economic importance.



In general, adult fall-run Chinook Salmon migrate into the Delta, and Sacramento River and upstream tributaries from June through December, with immigration peaking from September through November. Spawning generally occurs from October through December, with fry emergence typically beginning in late December and January.

Fall-run Chinook Salmon emigrate as post-emergent fry, juveniles, and as smolts after rearing in their natal streams for up to six months. Consequently, fall-run emigrants may be present in the lower Sacramento River from January through June, with peak emigration occurring between March and May. Emigrating juveniles remain in the Delta for variable lengths of time prior to entering the ocean.

#### *Delta Smelt*

USFWS listed Delta Smelt (*Hypomesus transpacificus*) as a threatened species under the federal ESA in March 1993 (58 FR 12854). In early 2005, the USFWS reviewed the population status of this species and, based on 37 years of data, recommended that no change in its threatened status was warranted. The Delta Smelt also was listed as threatened under the CESA in 1993, and re-designated by the state as endangered in 2008. On November 13, 2009, the Center for Biological Diversity filed separate lawsuits challenging the USFWS' failure to respond to a petition to change the Delta Smelt's federal status from threatened to endangered, and the USFWS' denial of federal listing for the Longfin Smelt. On April 2, 2010, the USFWS issued a finding that re-listing Delta Smelt as endangered was warranted, but precluded by the need to devote resources to higher-priority matters.

Delta Smelt are endemic to the Delta and were historically one of the most common fish found in the Delta with a range extending from Suisun Bay upstream to the City of Sacramento and below Mossdale on the San Joaquin River (USFWS 1995). However, because of the recent declines in population, there have been substantial changes to the distribution and abundance of the species in its native geographic range (IEPMAS 2015). The majority of the population is usually observed in the northern Delta and near to and west of the Sacramento-San Joaquin River confluence.

Delta Smelt are generally considered a diadromous (i.e., move between fresh and salt water) seasonal reproductive migrant (IEPMAS 2015). The species reside in areas with low salinity most of the year. The 2019 state of scientific understanding indicates that most adult fish aggregate around Grizzly Island, Sherman Island, and in the Cache Slough Complex (USFWS 2019). Although some smelt remain year round in fresh water (Sommer et al. 2011, Merz et al. 2011), typically Delta Smelt begin their freshwater migration to spawn in early winter. In the lower Sacramento River Delta Smelt spawning is known to occur in Cache Slough and Lindsey Slough (in the vicinity of Isleton) (Wang 2007).

The spawning period is highly variable from year to year, and may occur from late January through June (Moyle et al. 2016), with peak spawning activity typically occurring in April and May (USFWS 2008, Moyle 2002). The majority of Delta Smelt complete their entire life cycle in one year and the adults die after spawning. However, observations from laboratory studies indicate that, in aquaculture settings, a small proportion (<10 percent) of adults do not spawn until age-two and another small portion of adults survive spawning after age-one and live to



spawn as age-two adults (Moyle 2002). Delta Smelt larvae are transported downstream by river currents to zones of freshwater/saltwater mixing from late March through July (Wang 1986).

Upstream spawning migrations through the Delta and into the lower Sacramento River by Delta Smelt occur from January through June. Juvenile Delta Smelt migrate/drift downstream into the upper Delta from April through July. Because all in-water construction work would be conducted between August 1 and October 31 Delta Smelt would not be present in the lower Sacramento River during any in-water work.

#### *Longfin Smelt*

The Delta supports the largest population of Longfin Smelt in California, but their range also extends into San Pablo Bay, San Francisco Bay, South San Francisco Bay, and the Gulf of the Farallones. Longfin Smelt was first petitioned for listing under CESA in August 2007 and was listed as threatened under CESA on March 5, 2009 because of apparent long-term declines in abundance. On April 2, 2012, the USFWS released their 12 month *Findings on a Petition to List the San Francisco Bay-Delta Population of the Longfin Smelt as Endangered or Threatened*. The USFWS determined the listing of Bay-Delta DPS of Longfin Smelt is warranted, however, the listing is precluded by higher priority actions to amend the Lists of Endangered and Threatened Wildlife and Plants. This finding means that the Longfin Smelt DPS was added to the list of candidates for ESA listing, where its status will be reviewed annually. Only the Bay-Delta population was advanced to candidate status.

The primary cause of decline of Longfin Smelt is reduction in outflows associated with water exports from state and federal pumping operations, especially during periods of drought (Moyle 2002). Other factors cited as contributing to decline of Longfin Smelt include entrainment losses to diversions, extreme climatic variation, toxic substances (especially pesticides), predation, and competition from introduced species (Moyle 2002).

Longfin Smelt are found in areas ranging in salinity from almost pure seawater (35 parts per thousand) upstream to areas of pure fresh water. Distribution of Longfin Smelt is centered in the west Delta, Suisun Bay, and San Pablo Bay. In wet years they may be distributed more toward San Pablo Bay, and in dry years more toward the west Delta.

Longfin Smelt are relatively short-lived, reaching maturity at age two. Most individuals live only two years, but some may live as long as three years. Adult Longfin Smelt move from estuarine areas into rivers to spawn. Spawning occurs in fresh water, over substrates composed of sand and/or gravel, rocks, and aquatic plants, and may occur from November into June, with peak spawning activity occurring from February through April (Emmett et al. 1991, Wang 1986). Spawning occurs mainly downstream of about Rio Vista in the Sacramento River, and below Medford Island in the San Joaquin River, with a downstream boundary near Pittsburg and Montezuma Slough (Merz et al. 2013). Longfin Smelt have also been observed in their winter and spring spawning as far upstream as Isleton (USFWS 2012). Once adult Longfin Smelt spawn they die. Due to the timing of the Proposed Project there would be no overlap of with Proposed Project construction activities and Longfin Smelt spawning.



Longfin Smelt larvae are most common in winter and early spring, but are not found from August through October (Rosenfield 2010). Within three months larvae develop into juveniles. Juveniles and sub-adults are distributed throughout the year in brackish and marine environments. Thus, these life stages would not be present in the vicinity of the Proposed Project.

#### *Central Valley DPS Steelhead*

The Central Valley DPS steelhead (*Oncorhynchus mykiss*) was listed as threatened under the ESA on March 19, 1998 (63 FR 13347). Following 5-year status reviews in 2006 and 2011, the species was reaffirmed as threatened. On May 26, 2016 NMFS completed another 5-year status review and recommended the species remain classified as threatened (NMFS 2016a).

The Central Valley DPS includes a mixture of hatchery and wild fish, and resident and anadromous steelhead from the Sacramento and San Joaquin Rivers and their tributaries, excluding steelhead from San Francisco and San Pablo bays and their tributaries (NMFS 2014, 63 FR 13347). Four artificial steelhead propagation programs are used to mitigate for loss of steelhead habitat: (1) Coleman National Fish Hatchery, (2) Feather River Hatchery, (3) Nimbus Hatchery and (4) Mokelumne Hatchery. The Coleman National, Feather River, and Mokelumne River hatcheries are considered to be part of the DPS (NMFS 2016a). The four hatcheries release approximately 600,000 yearling smolts annually and these fish now appear to constitute a major proportion of the total Central Valley steelhead population (NMFS 2014).

Currently, Central Valley steelhead are considered “ocean maturing” or “winter” steelhead (McEwan and Jackson 1996), although “stream maturing” or “summer” steelhead may have been present historically (Moyle 2002). Adult steelhead, typically averaging 600 to 800 mm in length (Moyle 2002), generally leave the ocean and begin upstream migration through the Delta to spawning reaches when river flows increase. Entry into the river system occurs to some degree every month except June (McEwan and Jackson 1996) although generally migration occurs from July through March, and peaks in September and October (NMFS 2014).

Unlike salmon, steelhead are iteroparous (i.e., able to spawn repeatedly) and may spawn and return to the ocean for up to four consecutive years before dying; however, it is rare for steelhead to spawn more than twice and the majority of repeat spawners are females (Busby et al. 1996). Spawning generally occurs from January through April (McEwan and Jackson 1996). Steelhead spawn in the upper Sacramento River and tributaries, but in the vicinity of the Proposed Project (McEwan and Jackson 1996).

Juvenile steelhead rear in their natal streams for 1 to 3 years prior to smoltification. Emigration of 1- to 3-year old sub-adults primarily occurs from January through June (Snider and Titus 1996). However, juvenile steelhead can be found in the lower Sacramento River during all months of the year (NMFS 2014; Figure 6).

#### *Southern DPS Green Sturgeon*

Green Sturgeon are found in the lower reaches of large rivers from British Columbia south to the Delta. On April 7, 2006, NMFS proposed the Southern DPS of Green Sturgeon, which includes all fish populations south of the Eel River, California, as threatened under the federal



Endangered Species Act (ESA) (71 FR 17757). The Final Rule establishing take prohibitions for the Southern DPS was promulgated on June 2, 2010 (75 FR 30714).

Green Sturgeon are anadromous and have diverse habitat needs that include freshwater streams, rivers, estuarine, and marine waters (NMFS 2018). There are three general phases in Green Sturgeon life history: (1) freshwater stage (<3 years old), (2) coastal migrants (3–13 years old for females; 3–9 years old for males); and (3) adults (>13 years old for females, >9 years old for males) (EPIC et al. 2001). Although time spent in freshwater is thought to be minimal, freshwater access is an important component of the sturgeon's life history since it uses freshwater environments for spawning (Erickson et al. 2002, Emmett et al. 1991). It is thought that most adult fish, in preparation for spawning, follow a direct path to the Sacramento River when leaving the San Francisco Bay.

Adult Green Sturgeon move into the upper reaches of rivers in spring and early summer to feed and spawn. Based on angler and incidental catches of Green Sturgeon in the Sacramento River, spawning times are believed to be from April through July, peaking from mid-April to mid-June (USFWS 1995, NMFS 2018). Adult Green Sturgeon may be present in the lower Sacramento River, as they migrate upstream to spawning grounds, from February to July (Heublein et al. 2009, NMFS 2018). Adult emigration typically occurs from November through January and coincides with increased seasonal river flows (CFTS 2015). As such, adult Green Sturgeon may occur in the lower Sacramento River while moving to or from upstream spawning habitats during all months of the year (Figure 1).

Juvenile Green Sturgeon are believed to reside in freshwater habitats from one to four years, before emigrating to the Delta under winter high-flow events; however, the exact timing of emigration is unknown (EPIC et al. 2001). Juvenile Green Sturgeon may rear in the Delta throughout the year, thus it is possible for juvenile Green Sturgeon to be present in the lower Sacramento River during all months of the year.

#### *White Sturgeon*

White Sturgeon (*A. transmontanus*), a California Species of Special Concern, is the largest freshwater fish in North America (Israel et al. 2009). The fish are sometimes found in marine waters, but more typically they reside in large rivers and their associated estuaries such as the Delta. White Sturgeon in the Sacramento-San Joaquin River system are the southernmost spawning population of the species.

White Sturgeon spawn primarily in the mainstem of the Sacramento River upstream of Knights Landing (i.e., upstream of the Proposed Project area). Adults migrate from the estuary to spawning areas in the Sacramento River from February through June and then return to the Delta. Spawning, postspawning, and mature adult White Sturgeon can occur in the lower Sacramento River from November through May (Israel et al. 2009). Juvenile White Sturgeon may be present in the lower Sacramento River in all months of the year (Israel et al. 2009).

#### *Hardhead*

Hardhead (*M. conocephalus*), a California Species of Special Concern, is a large warm water cyprinid (i.e., minnow) that occurs primarily in large, undisturbed low to mid-elevation rivers



and streams (Moyle 2002). Hardhead in large rivers, such as the Sacramento River, typically migrate into smaller tributary streams to spawn, where habitat conditions are more suitable for spawning (Moyle 2002). Hardhead mature in their third year and spawn primarily in April and May, although some data suggests that spawning may extend into August (Moyle 2002). Although the early life history of juvenile Hardhead is poorly understood, juvenile Hardhead move into deeper habitats, such as the Sacramento River, as they grow (Moyle 2002). No Hardhead spawning would occur in the vicinity of the Proposed Project site, but juveniles and adults could be present in the lower Sacramento River during all months of the year.

#### *Pacific Lamprey*

The Pacific lamprey is a federal species of concern; however, no state designation has been made. Pacific Lamprey are still present throughout much of their historical range. However, some populations have been reduced or extirpated from streams that have been highly degraded or modified by humans. The Pacific Lamprey range includes Pacific coast drainages extending from Hokkaido Island, Japan to Alaska and south to Rio Santo Domingo, California (Moyle 2002) and includes rivers and creeks of the Central Valley, California. Pacific Lamprey are anadromous and highly predaceous (Moyle 2002). The predatory adult stage is spent in the ocean, although some scattered landlocked populations occur in some freshwater reservoirs.

The adults begin their upstream spawning migrations to freshwater rivers as early as January, with peak immigration occurring from early March through late June (Moyle 2002). Spawning occurs shortly after the adult lamprey reach suitable spawning areas, primarily during the spring and summer months. Following hatching, the ammocoetes reside in upstream waters for a period of five to seven years, where they burrow into the sediments and filter organic matter, before undergoing metamorphosis to the predatory and saltwater-tolerant adult phase and subsequent emigration from freshwater to the ocean. Emigration occurs under high flows during the winter and spring, possibly coincident with the upstream migration of the adults (Moyle 2002). Based on the available information, adult Pacific Lamprey may be present in the lower Sacramento River during their spawning migrations as early as January, but primarily between March and June, and juvenile Pacific Lamprey may occur in the vicinity of the Proposed Project between October and July (Hanni et al. 2006).

#### *River Lamprey*

The River Lamprey is a California Species of Special Concern. The River Lamprey is relatively small (averaging 17 centimeters) and highly predaceous (Moyle 2002). The River Lamprey is distributed in streams and rivers along the eastern Pacific Ocean from Juneau, Alaska, to San Francisco Bay. Primary abundance in California is in the lower Sacramento River and San Joaquin River watersheds, especially the Stanislaus and Tuolumne Rivers.

A great deal of what is known about the River Lamprey is from information on populations in British Columbia. There, adults migrate from the Pacific Ocean into rivers and streams in the fall and spawn from February through May. Adults will excavate a saucer-shaped depression in sand or gravel riffles where the eggs are deposited. After spawning, the adults perish. Ammocoetes remain in backwaters for several years, where they feed on algae and microorganisms (Moyle et al. 1995). The metamorphosis from juvenile to adulthood begins in July and is complete by the



following April. Following completion of metamorphosis, River Lamprey congregate immediately upriver from salt water and emigrate into the ocean in late spring (Moyle 2002).

Based on this life history, adult River Lamprey may occur in the lower Sacramento River from February through May, and juvenile River Lamprey may occur between late November and January (Hanni et al. 2006). Because all in-water work would be conducted between August 1 and October 31 no River Lamprey would be present in the lower Sacramento River during the in-water work phase of the Proposed Project.

#### *Sacramento Splittail*

The Sacramento Splittail, a California Species of Special Concern, is an endemic cyprinid (i.e., minnow) that was once widely distributed in lakes and rivers throughout the Central Valley, including the Sacramento River upstream to Redding and in the American River as far east as Folsom (Moyle 2002). Its present range 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 to the Tuolumne River near Modesto (Moyle 2002).

Adult splittail generally migrate upstream from the San Francisco Estuary to spawn from November through February (CDFG 2010). Spawning most frequently occurs on floodplains or edge habitats in March and April (Moyle 2002, CDFG 2010). Juvenile splittail inhabit shallow areas with abundant vegetation that are devoid of strong currents (Wang 1986) as they travel downstream into the San Francisco Estuary from spawning grounds from April through August. Because all in-water work would be conducted between August 1 and October 31 it is possible that some juvenile splittail could be present in the lower Sacramento River during in-water work.

#### Other Fish Species

The remaining non-special status species comprising the lower Sacramento River's fish community include a diverse array of resident native and introduced fishes occupying multiple trophic levels and habitat types, and other recreationally important anadromous fishes (i.e., Striped Bass).

Native non-special status fish species include the resident form of Rainbow Trout, Sacramento Blackfish, and Threespine Stickleback. Introduced fish species within the lower Sacramento River occupy multiple trophic levels and habitat types. Many centrarchids (e.g. black basses and sunfish) and ictalurids (i.e., catfish and bullheads) may prey on eggs, juveniles, and small-bodied adult native and non-native fish. American Shad and Striped Bass, both introduced intentionally to provide a sport fishery, may also feed on juvenile fish, including natives. Western Mosquitofish, introduced as a mosquito-control agent, provide a forage base for native and non-native piscivores.

#### Critical Habitat

Critical habitat is the specific areas within a specific geographic area that contain the physical or biological features (PBFs) that are essential to the conservation of an endangered or threatened species.



### *Green Sturgeon*

Critical habitat for Green Sturgeon occurs in the Proposed Project area. The PBFs for critical habitat in the vicinity of the Proposed Project for the sDPS Green Sturgeon consist of:

- Food resources. Abundant prey items for larval, juvenile, subadult, and adult life stages. Benthic invertebrates and fish are critical for rearing, foraging, growth and development;
- Water flow. A flow regime (i.e., the magnitude, frequency, duration, seasonality, and rate-of change of fresh water discharge over time) necessary for normal behavior, growth, and survival of all life stages;
- Water quality. Water quality, including temperature, salinity, oxygen content, and other chemical characteristics, necessary for normal behavior, growth, and viability of all life stages;
- Migratory corridor. A migratory pathway necessary for the safe and timely passage of sDPS fish within riverine habitats and between riverine and estuarine habitats (e.g., an unobstructed river or dammed river that still allows for safe and timely passage).
- Depth. Deep (i.e.,  $\geq 5$  m) holding pools for both upstream and downstream holding of adult or subadult fish, with adequate water quality and flow to maintain the physiological needs of the holding adult or subadult fish; and
- Sediment quality. Sediment quality (i.e., chemical characteristics) necessary for normal behavior, growth, and viability of all life stages. This includes sediments free of contaminants that can negatively affect all life stages.

### *Steelhead*

Critical habitat for steelhead occurs in the Proposed Project area. The PBFs for critical habitat in the vicinity of the Proposed Project for Central Valley steelhead consist of:

- Freshwater migration corridors free of obstruction and excessive predation with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival; and
- Freshwater rearing sites with sufficient water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; water quality and forage supporting juvenile development; and natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks. These features are essential to conservation because, without them, juveniles cannot access and use the areas needed to forage, grow, and develop behaviors (e.g., predator avoidance, competition) that help ensure their survival.

### *Spring-run Chinook Salmon*

Critical habitat for spring-run Chinook Salmon occurs in the Proposed Project area. The PBFs for critical habitat in the vicinity of the Proposed Project for spring-run Chinook Salmon consist of:



- Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development; and
- Freshwater rearing habitat with water quantity and quality, floodplain connectivity, forage, and natural cover supporting juvenile development, growth, mobility, and survival.

#### *Winter-run Chinook Salmon*

Critical habitat for winter-run Chinook Salmon occurs in the Proposed Project area. The PBFs for critical habitat in the vicinity of the Proposed Project for winter-run Chinook Salmon consist of:

- Access to spawning areas in the upper Sacramento River;
- Habitat areas and adequate prey that are not contaminated;
- Riparian habitat that provides for successful juvenile development and survival; and
- Access downstream so that juveniles can migrate from spawning grounds to San Francisco Bay and the Pacific Ocean.

#### *Delta Smelt*

Critical habitat for Delta Smelt occurs in the Proposed Project area. The PBFs for critical habitat for Delta Smelt consist of:

- Physical habitat – structural components of habitat, including spawning substrate and, possibly, water depth;
- Water – suitable water quality conditions (e.g., temperature, turbidity, food availability, entrainment risk, contaminants) to support the various Delta Smelt life stages;
- River flow – transport flows to facilitate migrations to and from spawning habitats; and,
- Salinity – low-salinity zone (freshwater-brackish interface) used as nursery habitat.

### **3.4.2 Discussion**

The potential for project-related effects to biological resources is assessed below in responses to the Initial Study checklist questions. The assessment of effects primarily considers the likely presence of biological resources and their habitats in the project area, the magnitude and duration of direct and indirect effects to the species and their habitats, and the availability of feasible mitigation measures to avoid or minimize the effects.

- a) The following discussion assesses potential impacts of the Proposed Project, both directly and through habitat modifications, on species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the CDFW (formerly California Department of Fish and Game), USFWS, and/or NMFS occurring within the affected environment.

#### **Terrestrial Vegetation and Wildlife**

Construction activities and ground disturbance associated with the Proposed Project could potentially result in adverse effects to special status plants and wildlife. There



would be no operational impacts to special status plants and wildlife because there are no operational activities associated with the project.

#### Project-Related Effects to Special status Plants

The Proposed Project may result in direct impacts to special status plant species from construction-related activities. Based on the presence of suitable habitat in the Proposed Project area, seven special status plant species have a low potential to occur within the project site, and three special status species have a moderate potential to occur within the project site (Appendix C). Two special status plant species are known to occur on the project site, Suisun Marsh aster (*Symphyotrichum lentum*) and Northern California black walnut (*J. hindsii*).

Northern California black walnut is present within the eastern portion of the project site and Suisun Marsh aster is present within two of the three erosion repair sites. These species are not federally or State listed, but are identified by CNPS as rare or endangered. Significant impacts to these species would occur if the loss of individuals on the project site would represent a population-level impact that may result in a loss of, or risk to the entire regional population.

Mason's lilaeopsis (*Lilaeopsis masonii*), designated as a State Rare Plant under the CESA, has low potential to occur on the project site. This species can occur on mud banks and flats and in marsh and riparian vegetation along erosional zones of creek-banks, sloughs, and rivers, and it is known to occur along the Sacramento River approximately 200 feet west of the project site. Habitat quality in the location mapped as supporting this species is superior to the conditions within the project site, but some potentially suitable habitat is present within the project site. Given the proximity of the project site to an existing occurrence of Mason's lilaeopsis, individuals may be present in the project site and could be impacted during project construction. Due to the rarity of this species, impacts to individuals during project construction would be potentially significant. The Proposed Project would not result in permanent loss of habitat for this species following Project restoration of riparian and wetland habitat.

AMMs incorporated into the project include a WEAP training to educate workers about the potential impacts to special status plants, and limit the removal of vegetation to the project footprint. Additionally, implementation of Mitigation Measure BIO-1 would reduce impacts to special status plants to a **less than significant** level by requiring avoidance and minimization of impacts if special status plant species cannot be avoided.

#### **MITIGATION MEASURE BIO-1. SPECIAL STATUS PLANT AVOIDANCE, MINIMIZATION, AND MITIGATION MEASURES.**

Prior to construction, a qualified biologist shall survey all areas of suitable habitat for special status plant species with potential to occur on the project site. If detected, the location of all individual special status plant species shall be mapped. Where feasible, individuals shall be fenced for avoidance during construction. Where avoidance is not possible, losses shall be offset through inclusion of these



species into the restoration planting palette. To the extent feasible, rhizomes of the Suisun Marsh aster and Mason's lilaeopsis shall be salvaged and stored in damp soil and cared for by a qualified biologist or nursery professional until restoration plantings are implemented. Salvage of Mason's lilaeopsis may require additional authorizations from CDFW due to its status as State rare species. Any consultation with CDFW, if this species is found, shall be completed prior to the start of construction in occupied areas, and the applicant shall submit written documentation of the results of such consultations. Black walnut, Mason's lilaeopsis, and Suisun Marsh aster shall be included in the plant palette at a minimum 1 to 1 ratio of individuals planted to individuals removed.

All efforts shall be made to avoid the spread or introduction of invasive weeds during implementation of the Proposed Project. Appropriate BMPs (AMM 3) that are intended and designed to curtail the spread of invasive plant species shall be implemented during construction. These include, but are not limited to, the following:

- During construction, the project will make all reasonable efforts to ensure imported material is free of invasive plant species.
  - Equipment and vehicles must be free of caked on mud and weed seeds/propagules before accessing and leaving the project site
  - Landscaping materials shall not include invasive, non-native ornamentals as identified by the California Invasive Plant Council (Cal-IPC) Inventory
- 

Significant impacts to the remaining special status plant species on the project site would occur if the loss of individuals on the project site would represent a population-level impact that would result in a loss of, or risk the entire regional population. Given the small size of the project site, and the presence of extensive areas of similar habitat (i.e., riparian oak woodland and willow thicket) along the banks of the Sacramento River both upstream and downstream from the project site, it is unlikely that special status plants would be impacted on the population level. The Proposed Project would not result in permanent impacts to riparian habitats, and all riparian areas would be restored and enhanced following project restoration activity. Implementation of the Proposed Project would ultimately be beneficial for special status plant populations through enhancement of riparian habitat and creation of marsh habitat. As a result, any temporary loss of special status plants would be offset by restoration activity that is incorporated into the project design and impacts to other special status plant species would be **less than significant**.

#### Project-Related Effects to Special status Amphibians or Reptiles

##### *Giant Garter Snake*

Giant Garter Snake (GGS) typically inhabits marshes, sloughs, irrigation canals, rice paddies, ponds, and low-gradient streams. Specifically, GGS prefers stagnant or slow-moving waterbodies with abundant emergent vegetation; consequentially, suitable habitats in the Sacramento Valley are primarily within the rice-growing regions on the



valley floor (Halstead et al. 2010). The current of the Sacramento River is too fast to provide suitable habitat for the GGS and preferred habitats are not present in the project site. Suitable terrestrial habitat consists of grassy banks and openings near waterside vegetation for basking, and higher elevation upland habitats for cover and refuge from flood waters during the inactive winter season (USFWS 1999). These habitat elements are not present in the project site and the terrestrial portions of the project site do not provide any suitable habitat for this species. Implementation of the Proposed Project would be beneficial for GGS through enhancement of riparian habitat and creation of marsh habitat. Environmental commitments incorporated into the project include a WEAP training to educate workers about GGS. Therefore, the GGS would not occur within the project site and there would be **no impact**.

#### *Western Pond Turtle*

The western pond turtle is known to occur in a wide variety of wetland habitats including rivers and streams, lakes, ponds, reservoirs, permanent and ephemeral shallow wetlands, stock ponds, and sewage treatment lagoons (Holland 1994). Optimal habitat is characterized by the presence of adequate emergent basking sites, emergent vegetation, and the presence of suitable refugia in the form of undercut banks, submerged vegetation, mud, rocks and logs. Therefore, there is potential for the Sacramento River to provide suitable habitat for the western pond turtle. Although the species may occur in the Sacramento River, the project site lacks the typical habitat structure and basking options for this species, and as such, the project site would not support western pond turtle. Implementation of the Proposed Project would be beneficial for western pond turtle through enhancement of riparian habitat and creation of marsh habitat. Environmental commitments incorporated into the project include a WEAP training to educate workers about western pond turtle. There would be **no impact** to western pond turtle.

#### Construction-Related Effects to Special status Mammals

##### *Western Red Bat*

The western red bat, listed as a CDFW Species of Special Concern, roosts solitarily most often in the foliage of trees or shrubs (Bolster 2005) and prefers habitat edges and mosaics for foraging. Some evidence suggests the migration distances in California are fairly short, and red bats have been documented to breed in the Delta along the Sacramento River (Pierson et al 2006). Arousal from hibernation on warm days to feed has been reported, as has periodic foraging during the winter in the San Francisco Bay area (Bolster 2005). The oak trees and willow riparian areas found throughout the project site provide suitable roosting sites for western red bat.

Based on the habitat requirements, western red bat has the potential to forage and roost throughout the project site. Potential impacts to this species would include injury or mortality from direct destruction of roosts, or abandonment from construction activity or noise. Therefore, the Proposed Project could result in temporary loss of roosting and foraging habitat. The small size of the project site in comparison to the available habitat in the surrounding region indicates that the loss of individuals at the project site is unlikely to result in a population-level effect. Additionally, because the project site would



be restored and enhanced, permanent impacts from temporary loss of suitable habitat would not occur. Implementation of the Proposed Project would be beneficial for western red bat through enhancement of riparian habitat and creation of marsh habitat. Environmental commitments incorporated into the project include a WEAP training to educate workers about western red bat, and includes some BMPs to reduce impacts to the surrounding habitat through spill, dust, and sediment control. However, impact to the western red bat could still occur during project construction if pets or predatory wildlife were onsite. Implementation of **Mitigation Measures BIO-2** through **BIO-3** would reduce impacts to **less than significant**.

---

#### **MITIGATION MEASURE BIO-2. ROOSTING BATS IMPACT AVOIDANCE AND MINIMIZATION.**

Prior to construction activities that require removal of trees or large shrubs, a qualified biologist shall conduct a survey of potential bat roosts to determine if roosting bats are present.

- If a bat roost is found, further analysis shall be conducted sufficient to determine the species present and the type of roost (day, night, maternity, etc.).
- If the bats are not part of an active maternity colony, passive exclusion measures may be implemented prior to removal of the affected vegetation. These exclusion measures may include one-way valves that allow bats to exit the structure but are designed so that the bats may not re-enter if the roost is a cavity roost.
- For non-maternity tree roosts, the roost shall be checked daily until the bats have moved and then vegetation removal can proceed with a monitor present.
- Maternal bat colonies shall not be disturbed while young are present and dependent on the roost.

---

#### **MITIGATION MEASURE BIO-3. GENERAL WILDLIFE BEST MANAGEMENT PRACTICES.**

The following general wildlife Best Management Practices shall be implemented during project construction:

- No pets shall be allowed at the project site.
- All trash that may attract predators shall be properly contained in covered containers and removed from the work site on a regular basis.
- No plastic monofilament netting shall be utilized on-site.

---

Four terrestrial sensitive plant communities have been documented surrounding the project site: Great Valley Mixed Riparian Forest, Stabilized Interior Dunes, Coastal and



Valley Freshwater Marsh, and Coastal Brackish Marsh. These sensitive plant communities are not present on the project site and would not be impacted during project construction. Implementation of the Proposed Project would be beneficial for sensitive natural communities through enhancement of riparian habitat and creation of marsh habitat.

The Proposed Project would result in impacts to the Sacramento River and adjacent riparian habitats which are under CDFW jurisdiction pursuant to Section 1600 et seq. of the CFGC. Direct impacts are expected to consist of clearing, pruning, and rock installation during project construction. However, these impacts are considered temporary and would be offset through implementation of the restoration components of the Proposed Project. Therefore, impacts would be **less than significant**.

#### Project-Related Effects to Nesting or Foraging Birds

##### *Swainson's Hawk*

Larger trees within the project site and in the vicinity of the project site provide suitable nesting habitat for the Swainson's hawk. The CNDDDB contains 11 records of Swainson's hawk occurrences within five miles of the Proposed Project area, including three nesting records within one mile of the project area. Swainson's hawk is listed as State Threatened and has the potential to occur (nesting) within the Proposed Project area and the immediate vicinity. The Proposed Project area does not provide suitable foraging habitat for Swainson's hawk. Therefore, project activity would not result in a loss of foraging habitat for Swainson's hawk.

Direct impacts to Swainson's hawk could occur during project construction if the species is nesting within the Proposed Project area or within 0.5 mile of the Proposed Project area. Direct impacts could include injury to or mortality of individuals through destruction of active nests during tree removal or vegetation trimming or through nest failure from noise and other disturbance in the vicinity of a nest during project construction. Therefore, impacts to Swainson's hawk would be potentially significant. Implementation of the Proposed Project would be beneficial for Swainson's hawk through enhancement of riparian habitat and creation of marsh habitat. Implementation of Mitigation Measures BIO-3, listed above, and Mitigation Measure BIO-4, listed below, would reduce impacts to Swainson's hawk to a **less than significant** level.

#### **MITIGATION MEASURE BIO-4. RAPTOR AVOIDANCE AND MINIMIZATION EFFORTS.**

The following avoidance and minimization efforts shall be implemented for the Proposed Project:

- If feasible, all vegetation clearing, tree removal and tree trimming shall occur outside of the nesting season (February 15 through August 31).
- If construction activity is scheduled during the nesting season, a qualified biologist shall conduct a pre-construction survey for active Swainson's hawk and white-tailed kite nests. Surveys shall be conducted within two



weeks of the start of construction activities that are scheduled to occur during the nesting/breeding season. The survey shall include the project site plus a 0.5 mile buffer. The pre-construction survey shall be conducted during the time of day when the birds are active and shall be of sufficient duration to reliably conclude presence/absence of Swainson's hawk and white-tailed kite nests. A report of the survey results shall be submitted to the BALMD prior to issuance of any grading or building permits. As a fully protected species, there is no allowable "take" for white-tailed kite under any circumstances. As a State endangered species, there is no "take" of Swainson's hawk without "take" authorization from CDFW.

- If no active Swainson's hawk or white-tailed kite nests are detected, no additional action is required.
  - If active Swainson's hawk nests are observed within 0.5 mile of the project site, a minimum 0.25 mile avoidance buffer shall be established around each nest. If active white-tailed kite nests are identified within 0.5 mile of the project, a minimum avoidance buffer of 500 feet shall be established. Any variance for smaller avoidance buffers shall only be allowed through approval by the CDFW and the BALMD. Active nests shall be monitored by a qualified biologist during project-related activities. The avoidance buffer shall be maintained for the duration of the project, unless the biologist has determined that the young have fledged or are no longer dependent upon the nest and parental care.
  - If a Swainson's hawk or white-tailed kite is observed perched or foraging in the project area, all project-related work shall cease and the individual shall be allowed to leave the project site unimpeded and of its own accord before work may resume.
  - Work activities shall be prohibited within active raptor nest buffers until the qualified biologists has determined that young birds have fledged and left the nest(s). Readily visible exclusion zones shall be established in areas where nests must be avoided.
- 

#### *White-tailed Kite*

Suitable habitat for white-tailed kite, a State Fully Protected Species, occurs within the Proposed Project area. The species forages in undisturbed, open grasslands, meadows, farmlands and emergent wetland. The Proposed Project area does not provide suitable foraging habitat for this species, and indirect impacts through loss of foraging habitat would not occur. However, there is potential nesting habitat for white-tailed kite within the riparian habitat present on the project site. Potential impacts to this species, if nesting during project activity, include injury or mortality from nest destruction or nest abandonment. Implementation of the Proposed Project would be beneficial for white-tailed kite through enhancement of riparian habitat and creation of marsh habitat.



Implementation of the Mitigation Measure Bio-4, listed above, would reduce impacts to **less than significant** level.

*Song Sparrow ("Modesto" population)*

Suitable habitat occurs within the Proposed Project area for the song sparrow ("Modesto" population), which is listed by CDFW as a Species of Special Concern. There is potential for this species to nest within the riparian shrubs and trees found within the Proposed Project area. Potential impacts to this species, if nesting on site during project activity, include injury or mortality from direct destruction of nests, or nest abandonment from construction activity or noise. Impacts to the song sparrow would be considered significant if the regional population were to be adversely affected by the loss of individuals at the project site.

The small size of the Proposed Project area in comparison to the available nesting habitat in the surrounding region indicates that the loss of individuals at the project site is unlikely to result in a population-level effect. Additionally, because the project site would be restored and enhanced as part of the Proposed Project, there would be no expected impacts from loss of suitable breeding habitat. Implementation of the Proposed Project would be beneficial for song sparrow through enhancement of riparian habitat and creation of marsh habitat. Furthermore, implementation of Mitigation Measures BIO-4 would avoid impacts to individuals from project activity and would reduce impacts to a **less than significant** level.

*Western Yellow-billed Cuckoo*

Western yellow-billed cuckoo, listed as Federally Endangered, prefers a minimum breeding plot size of 15 to 20 hectares (approximately 37 to 49 acres), and riparian woodland composition is a critical factor for breeding site selection by this species. The willow thickets and riparian oak woodland within the project site and vicinity are comprised of habitat features that have generally been associated with suitable nesting and foraging habitat for the western yellow-billed cuckoo. However, a woodland dominated by willow, cottonwood, and other broad leaved riparian species (some sycamores, walnuts, elderberries, and alders) are essential for cuckoo nesting and foraging.

The woodlands in the Proposed Project area are dominated by oak, but woodland patches are too small a size to function effectively as cuckoo breeding habitat, and are in too close proximity to roads and, agricultural fields. The overall lack of habitat complexity (complex multi-tiered canopies, small open patches in between links to larger forested areas, etc.) in the Proposed Project area presents poor quality breeding and foraging habitat for cuckoos. Implementation of the Proposed Project would be beneficial to yellow billed cuckoo through enhancement of riparian habitat and creation of marsh habitat. Therefore, impacts to western yellow-billed cuckoo would be **less than significant**.



### *Nesting Birds*

Suitable nesting habitat for a wide variety of birds protected under the Migratory Bird Treaty Act (MBTA) and/or the CFGC is present on the project site and vicinity. For impacts to nesting birds not listed under CESA or ESA to be considered significant, the impact would have to jeopardize a local or regional population. Given the small size of the Proposed Project area and the abundance of similar nesting habitat (i.e., riparian woodland along the Sacramento River) in the area, it is unlikely that impacts to other protected bird species would be considered significant.

Impacts to individual protected nesting birds may include injury or mortality as a result of nest destruction during vegetation clearing, tree removal or trimming, or nest abandonment from construction activity and noise. Therefore, there is the potential for direct impacts to bird species. Implementation of the Proposed Project would be beneficial for nesting birds through enhancement of riparian habitat and creation of marsh habitat. Implementation of Mitigation Measure BIO-5 would avoid impacts to nesting birds and as such would reduce potential impacts to a **less than significant** level.

#### **MITIGATION MEASURE BIO-5. NON-RAPTOR AVOIDANCE AND MINIMIZATION EFFORTS.**

The following avoidance and minimization efforts shall be implemented:

- If feasible, removal and/or trimming of trees shall be scheduled to occur in the outside of the nesting season during non-breeding fall/winter months (September 1 through February 14), after fledging and before the initiation of the nesting season.
- If project activities will occur between February 15 and August 31, a qualified biologist shall conduct pre-construction surveys for nesting birds no more than 14 days prior to construction. The survey shall include the entire project site and a 250-foot buffer. If active nests are found, the qualified biologist shall establish an appropriate species-specific avoidance buffer of sufficient size to prevent disturbance of the nest by project activity (typically a minimum of 50 feet).
- If no active nests are detected, no additional action is required.
- If applicable (i.e., nests are detected as a result of the pre-construction surveys), the qualified biologist shall perform at least two hours of pre-construction monitoring of the nest to characterize “typical” bird behavior. The qualified biologist shall monitor the nesting birds and shall increase the buffer if the qualified biologist determines the birds are showing signs of unusual or distressed behavior by project activities. Atypical nesting behaviors which may cause reproductive harm include, but are not limited to, defensive flights/vocalizations directed toward project personnel, standing up from a brooding position, and flying away from the nest.
- If applicable, the qualified biologist shall have authority to order the cessation of all project activities if the nesting birds exhibit atypical



behavior which may cause reproductive failure (nest abandonment and loss of eggs and/or young) until an appropriate buffer is established. To prevent encroachment, the established buffer(s) shall be clearly marked by high visibility material. The established buffer(s) shall remain in effect until the young have fledged or the nest has been abandoned as confirmed by the qualified biologist. Any sign of nest abandonment shall be reported to CDFW within 48 hours.

---

## Fisheries

The following section assesses the Proposed Project's potential to affect special status fish species in the vicinity of the Proposed Project area. An important factor in determining if any specific Proposed Project component would affect these species is the timing of occurrence of their life stages in the Sacramento River near the Proposed Project area, relative to the timing, magnitude, and duration of various Proposed Project components. In-river construction activities would be conducted between August 1 and October 31 to avoid impacts to fish species. Based on the timing of each species' life stage and habitat present in the Proposed Project area, **Table 9** shows the special status species and life stages that have the potential to be present while in-water construction is occurring.

**Table 9. Potential for adult and juvenile special status fish that may occur in the lower Sacramento River in the vicinity of the Proposed Project to occur in the Sacramento River during the period that in-river construction activities may occur (i.e., August 1 to October 31).**

Fish Species/Race	Juvenile	Adult
Fall-run Chinook Salmon	X	--
Late Fall-run Chinook Salmon	X	X
Spring-run Chinook Salmon	X	X
Winter-run Chinook Salmon	--	--
Delta Smelt	--	--
Longfin Smelt	--	--
Steelhead	X	X
Green Sturgeon	X	X
White Sturgeon	X	X
Hardhead	X	X
Pacific Lamprey	--	X
River Lamprey	--	--
Sacramento Splittail	--	X
X = Lifestage could be present during in-river construction work -- = Lifestage would not be present during in-river construction work		



The Proposed Project's potential to have a substantial effect on special status species and their habitats can be classified into two general categories: 1) temporary construction-related effects, which would occur only during active construction; and 2) permanent effects, which would result from creation of riparian and wetland benches.

Based on their life history, and the period of time that in-river construction work would occur winter-run Chinook Salmon, Delta Smelt, Longfin Smelt, and River Lamprey would not occur in the vicinity of the Proposed Project during any of the in-river construction areas. As such, these species are not discussed further in relation to temporary construction-related effects. However, these species are considered when assessing the permanent effects from creation of riparian and wetland benches.

Specific temporary construction-related impact mechanisms that potentially could affect special status species include:

- temporary effects to water quality, including increased turbidity and suspended solids as a result of construction activities that include; site preparation, levee slope and bench construction, Terrabag placement, removal/replacement of encroachments, removal of concrete rubble, and plant installation.
- temporary effects to water quality from contaminants that may wash off construction equipment working in or near the river;
- temporary effects from underwater noise as a result of operating tugboats and barges in the Sacramento River, and from operating construction equipment adjacent to and in the river channel;
- direct effects, including disturbance, injury or mortality, as a result of in-river work activities listed above;
- direct effects from tugboat propeller strikes or entrainment of special status fishes and their food resources (i.e., invertebrates, phytoplankton, and zooplankton) from barge trips; and
- temporary effects to predator prey dynamics and increased predation of special status fish due to shading caused by temporary docking of one rock barge and one derrick barge.

Specific permanent impacts that could potentially affect special status fish species include:

- effects to habitat from creation of riparian and wetland benches in the lower Sacramento River



## Temporary Effects

### *Effects to Water Quality: Increased Suspended Sediment and Turbidity*

Site-preparation, levee slope and bench construction, Terrabag placement, removal/replacement of encroachments, removal of concrete rubble, and plant installation would have the potential to introduce suspended sediment into the Sacramento River.

Site-preparation and construction mobilization, would include moving equipment and rock/soil supplies to both the Proposed Project area and a barge landing/staging area in Rio Vista, primarily by barge. Mobilization would include setting up staging and temporary material storage areas, pre-construction surveys, and installation of erosion control and other construction BMPS (see AMM 3). All of this work would be done above the OHWM. Erosion control measures (AMM 3) and timing this work to occur during the dry season (AMM 2) would eliminate the potential for runoff, soil, and other construction debris to enter the Sacramento River during this phase of the project.

Construction of the levee slopes at each of the three erosion repair sites would require placement of backfill, geogrid material and Terrabags, and planting fill to complete final grade. Some of the levee slope work would occur below the OHWM. Encroachments at Site 2 and Site 3 (i.e., a water diversion facility and private dock, respectively) in the Proposed Project footprint will be removed and/or replaced. The water diversion facility will primarily be removed by crane from the water and disposed of off-site. Existing in-channel pilings at the agricultural diversion facility at Site 2 and the dock at Site 3 would be removed by an on-site crane barge which would pull piles out of the mud. These piles would then be placed on an empty barge and brought to an offloading area for transport to an acceptable dump location.

Direct discharges of soil and suspended sediment to the Sacramento River resulting in increases in total suspended sediments (TSS) and turbidity levels would be the main concern during the construction period, as much of project construction involves working on a levee slope on soils that are highly susceptible to erosion. The activities with the greatest potential to generate elevated TSS and turbidity are the underwater levee slope work and pile removal.

At least a small portion of the levee slope construction work would occur under water (Figure 3–Figure 5). This would also disturb soils and cause localized turbidity plumes at each of the three erosion control sites. Active water quality monitoring and implementation of remedial actions (AMM 3) will ensure turbidity remains below threshold limits.

As described above, work is planned to occur in a single construction period during the seasonally dry period of the year when risk of rainfall and related storm water runoff at the site would be minimal (i.e., between June and October). In-water work would be limited to August 1 to October 31 and most work would occur during low tide (AMM 1). Elevated suspended sediment and turbidity levels would occur only during construction activity, and would decrease back to existing conditions levels daily during the nighttime non-construction period. The implementation of appropriate erosion control and pollution



prevention BMPs (AMM 3), including active water quality monitoring and use of remedial actions if necessary, would ensure construction-related erosion and TSS and turbidity generated from the construction activities does not affect water quality outside of the immediate vicinity of the work area.

Chronic increased concentrations of suspended solids and resulting increased turbidity are of concern to fish because they can cause species to avoid turbid waters during homing, reduce feeding and growth, displace juveniles, cause physiological stress and respiratory impairment, cause gill damage, reduce tolerance to disease and toxicants, reduce survival, and cause direct mortality (Sigler et al. 1983, Stern 1988, Newcombe and Jensen 1996, Bash et al. 2001, Madej 2004). However, Bash et al. (2001) reported that the primary effect of increased turbidity on juvenile salmonids was irritation of the gills and that direct lethality was unlikely.

Salmonids may alter their migratory behavior by moving laterally or downstream to avoid turbid areas (Sigler et al. 1984). Larger fish tend to be more tolerant of high concentrations of suspended sediment than smaller fish although migrating adult salmonids may cease migration or avoid areas with high silt loads (Bjorn and Resier 1991). Any juvenile salmonids occurring in the area would be expected to swim to an unaffected portion of the river in response to elevated suspended sediment and turbidity and thus would not be expected to be affected by temporary daytime increases in suspended sediment and turbidity. If fish did remain in the construction zone, a sufficient portion of the channel (e.g., along the opposite bank and just upstream) would remain unaffected and provide suitable migration and rearing habitat.

There is little direct information available to assess turbidity effects on juvenile or adult sturgeon. However, elevated turbidity may alter the behavior of adult, subadult and juvenile sturgeon. In a dredging field study, juvenile and adult Atlantic Sturgeon avoided water in the vicinity of a dredged material disposal site (Hatin et al. 2007). Therefore, increases in suspended sediment and turbidity related to construction activities could result in avoidance behavior by sturgeon present in the vicinity of the in-water construction work. Like salmonids, sturgeon would be expected to swim to an unaffected portion of the river in response to elevated suspended sediment and turbidity and thus would not be expected to be affected by temporary daytime increases in suspended sediment and turbidity.

Like salmonids and sturgeon the other special status fish (i.e., juvenile and adult Hardhead, adult Pacific Lamprey, and adult Sacramento Splittail) that could be residing in or moving through the construction area would seek to move away from working construction equipment because of underwater noise and elevated turbidity levels.

Additional potential indirect effects in-river construction activities on special status fish species include localized losses of benthic macroinvertebrates and potential displacement of benthic macroinvertebrates resulting from sediment deposition. These effects would be expected to be short-lived due to the rapid re-colonization rates typically observed for benthic macroinvertebrates communities following temporary disturbances (Barbour et



al. 1999). Moreover, the relative proportion of the benthic macroinvertebrates community affected within the project site would be negligible.

Incorporation of AMM 1 (Timing of In-water Work), AMM 3 (Construction BMPs that include turbidity monitoring), and AMM 4 (Implementation of the General Permit) would minimize suspended sediment levels and turbidity in the lower Sacramento River during the construction period. Further, sediment and turbidity levels would be localized, and only elevated for a temporary period of time. Overall, any potential increases in turbidity and suspended sediment levels would be of sufficiently low magnitude and duration to not cause adverse effects to special status species within the Proposed Project area. Based on the levels of suspended sediment and turbidity anticipated to occur, the daily reduction in levels each night, and the overall short duration of exposure, the Proposed Project's potential to generate suspended sediment and turbidity would have a **less than significant impact** to special status fish species in the lower Sacramento River.

*Effects to Water Quality: Contaminants Entering the Sacramento River from Construction Equipment*

Because all construction activities associated with the Proposed Project involve the use of heavy equipment, accidental chemical spills could occur. Since these construction activities would require heavy equipment to operate near the edge of and in the river channel, spills of fuels and other construction-related materials may enter the lower Sacramento River. Accidental spills and leakage from construction equipment may include fuel, lubricants, hydraulic fluids and coolants. An accidental spill or inadvertent discharge of contaminants into the lower Sacramento River associated with project activities could cause direct effects to special status fish.

The potential magnitude of impacts to special status fish resulting from accidental or unintentional contaminant spills would depend on several factors, including the proximity to the water body, the type, amount, concentration, and solubility of the contaminant, and the timing and duration of the discharge. Contaminants entering the lower Sacramento River in sufficient amounts could affect survival and growth rates of special status fish using the area, as well as other aquatic organisms including prey sources.

Petroleum products can cause oily films to form on the water surface that can reduce dissolved oxygen levels available to aquatic organisms. The severity of the effect depends on the concentration(s) of contaminant entering the river, species and life stage sensitivity, duration of exposure, condition or health of individuals (e.g., nutritional status), and physical or chemical properties of the water (e.g., temperature, dissolved oxygen). Potential effects can range from no effect to mortality. Thus, risks of such water quality-related effects to special status fish, and their prey organisms are directly proportional to the likelihood that petroleum contaminants would enter the river from the construction equipment, and the quantities expected to enter the river.

Construction activities would not occur at night or on weekends (AMM 1: Timing of In-water Work), leaving a daily period of approximately 14 hours or more with no construction activity and no potential for inadvertent spills to occur. Additionally, the



project description includes implementation of construction BMPs (AMM 3), adherence to the Construction General Permit (AMM 4), and worker training (AMM 2) would avoid and minimize the potential for any discharge of contaminants into the lower Sacramento River. These AMMs contain measures that are intended to reduce the probability for the release of toxic materials to the lower Sacramento River, and establish measures to contain any accidental spills quickly.

As such, the potential for contaminants to enter the lower Sacramento River are considered to be a discountable effect (i.e., one that is not expected to occur) and thus would not adversely affect special status fish species. Based on the assessment provided above, the Proposed Project would have a **less than significant** impact to special status fish in regard to construction equipment-related contaminants entering the lower Sacramento River at levels that would cause substantial adverse effects to their prey organisms and other aquatic life.

#### *Effects from Underwater Noise*

Pile driving five steel piles with a vibratory driver in the Sacramento River and construction equipment operating adjacent to and in the Sacramento River during construction of the Proposed Project would result in temporary periods of elevated noise levels. Anthropogenic noise can induce startle and alarm responses in fish. (Scholik and Yan 2002) causing fish to flee an area (Boussard 1981). Thus, increased noise can temporarily disrupt essential behavior patterns such as feeding and predator escapement. However, such transient startle responses are unlikely to result in adverse impacts as fish are likely to quickly respond to normal behaviors (Popper et al. 2019). Abiotic and biotic sounds are important to fish and many use acoustic signals to communicate. Noise emanating from construction activities can temporarily reduce auditory sensitivity of some fish species (Scholik and Yan 2002) and interfere with signals that affect communication, behavior and fitness (Popper and Hastings 2009, Purser and Radford 2011).

The type and severity of noise impacts would depend on several factors, including the intensity and characteristic of the sound, the distance of the fish from the source, and the frequency and duration of the noise-generating activities. The Fisheries Hydroacoustic Working Group (FHWG), which included representatives from CalTrans, the Federal Highways Administration, Washington State Department of Transportation, Oregon Department of Transportation, Regions 1 and 8 of the USFWS, and NMFS, developed an Agreement in Principal for Interim Criteria for Injury to Fish from Impact Pile Driving Activities. Although these interim criteria were designed to address sound exposure thresholds associated with pile driving activities the criteria can also be applied to any anthropogenic, intense, and relatively long-duration sound such as that generated from heavy construction equipment (U.S. Department of the Interior and Bureau of Ocean Energy Management 2012). The interim criteria used to determine the onset of physiological effects on fishes are presented in **Table 10**.



**Table 10. Fisheries Hydroacoustic Working Group underwater noise criteria for injury to fish from pile driving activities.**

Effect	Metric	Fish Mass	Threshold
Onset of physical injury	Peak pressure	N/A	206 dB (re: 1 $\mu$ Pa)
	Accumulated Sound Exposure Level	$\geq 2$ grams	187 dB (re: 1 $\mu$ Pa)
		$< 2$ grams	183 dB (re: 1 $\mu$ Pa)
Adverse behavioral effects	Root Mean Square Pressure	N/A	150 dB (re: 1 $\mu$ Pa)
<b>Notes:</b> dB = decibels $\mu$ Pa = micropascal N/A = not applicable Source: Fisheries Hydroacoustic Working Group 2008			

While the criteria in Table 10 are the accepted noise criteria for assessing noise impacts to fish, the information used to determine the criteria was based on very limited experimental data and incomplete studies of the effects of pile driving (U.S. Department of the Interior and Bureau of Ocean Energy Management 2012). More recent research shows that onset of physiological response to noise by salmonids does not occur until noise levels are substantially higher than the criteria in Table 10 (U.S. Department of the Interior and Bureau of Ocean Energy Management 2012).

Popper et al. (2019) suggest there are major issues with the threshold used for adverse behavioral effects described in Table 10 since the origin for this threshold is unknown and no scientific basis for it has been documented. The authors suggest the sound pressures to which fish schools actually respond are closer 163dB (re: 1  $\mu$ Pa). However, further studies on wild fishes in their natural environment are necessary before a behavioral threshold can be developed (Popper et al. 2019).

Another issue with the thresholds described in Table 10 is that most species of interest, including salmonids and sturgeon, are primarily detectors of particle motion, not sound pressure (Lovell et al. 2005, Meyer et al. 2012, Popper et al. 2019). Sturgeon, like other fish with swim bladders far removed from the ear, are unlikely to hear anthropogenic sounds unless they are very close to the sound source. It is unknown what level of particle motion would lead to behavioral effects of these species, but it is assumed that it would take a very high level of signal to prompt behavioral changes (Popper et al. 2019). It is likely that noise affects lamprey and Sacramento Splittail similarly to salmonids as both have nothing within the structure of the ear or associated structures to suggest any specializations that make them more than a hearing generalist (Popper 2005, CalTrans 2015). It is unknown how Hardhead perceive sound (CalTrans 2015).

Most of the temporary increase in noise associated with the Proposed Project would occur on land away from the Sacramento River. AMM 3 requires all combustion engine equipment be equipped with exhaust mufflers that are in good condition and appropriate



for the machines. Based on inclusion of AMM 3, noise levels would be expected to be similar to traffic noise currently generated from the road and bridge located adjacent to Proposed Project area. Therefore, noise generated from the terrestrial portion of the Proposed Action would not be expected to be of a magnitude that would cause any behavioral or direct effects to special status fishes.

Vibratory pile driving is the Proposed Project component that would generate the most underwater noise. Vibratory hammers are used to vibrate a pile into sediment by use of an oscillating hammer placed on top of the pile. The vibratory action causes the sediment immediately surrounding the pile to liquefy. This allows the pile to be driven through the sediment. Sound pressure levels generated by pile driving are variable depending on the substrate being penetrated, distance from the source, and depth of the water (Popper et al. 2019). Pile driving can trigger a reflexive startle response (Popper et al. 2019).

Only five, small posts, three that are 12-inches in diameter and two that are 8-inches in diameter, would be driven into sediment within the Sacramento River. Thus, the total time (i.e., one day to drive all piles) that vibratory pile driving would occur within the river would be minimal. Further, there would be a period of time in between installation of each of the five piles when no noise was being generated. Vibratory installation of 13-inch diameter steel piles in the Mad River Slough near Arcata, CA produced average peak sub pressures of 171 dB with peak pressure approach 180 dB at 10 meters distance and 3 meters depth (CalTrans 2015). As described above levels attenuate in underwater environments as distance from the pile driving increases. Based on the peak sound pressure associated with driving 13-inch diameter steel piles into the Mad River Slough, using a vibratory pile driver for the five steel piles is expected to be below the onset of physical injury threshold identified in Table 10.

Although the peak pressure of for 13-inch diameter pipes exceeds the threshold for potential behavioral effects in Table 10, as described above there is uncertainty about this criterion and it is likely that sound pressure would need to be higher before causing behavioral effects to fish (Popper et al. 2019). Further, the special status fish that would potentially be present in the Proposed Project area detect particle motion rather than sound pressure (Popper et al. 2019). At this time it is unknown what particle motion threshold would lead to behavioral changes in special status fishes.

Regardless of how noise is measured, studies have shown that fishes exposed to pile driving sounds may show startle and alarm responses. Due to the low number (i.e., five) of relatively small piles (<13-inch diameter) if a fish did come close enough to the sound the startle response from pile driving five piles with a vibratory hammer would be expected to be brief and unlikely to result in adverse effects to fish (Popper et al. 2019). Fish would be more likely to move away from the sound and utilize areas of the river that are not impacted by the temporary noise generated by pile driving.

Use of construction equipment adjacent to and in the river channel and pile driving may result in temporary periods of elevated noise levels in the Sacramento River. However, any increase in noise associated with these activities would be temporary and localized



and would not reach levels that would cause substantial impacts. Any behavioral startle or avoidance responses that might occur would be brief and would not have biologically significant consequences; rather, it would aid fish in avoiding direct contact with the equipment. The Sacramento River in the vicinity of the Proposed Project is wide (i.e., channel width of 500 to 700 feet) and there is ample room for fish to swim around and avoid the area in the river where the loudest noises would be generated. Consequently, the underwater noise associated with the proposed project would result in a **less than significant** impact to special status fish species.

#### *Effects from Direct Contact with Construction Equipment*

Construction activities that could result in direct effects include any activities using heavy equipment (i.e., small excavator, small conveyor with generator, small front-end loader, and vibratory pile driver) in the water. In-water construction activities include construction of the levee slope, encroachment removal, and pile driving to replace the existing dock and pedestrian bridge. Direct effects to special status fish from construction equipment operating in the river channel could be in the form of harassment, harm, wounding, killing, trapping, capturing, or collecting the fish.

Underwater noise, turbidity, and flow pattern disruption (i.e., disruption of laminar flow vectors immediately adjacent to the equipment itself), would cause special status fish that could be present in the work area to likely avoid the equipment, thereby causing most fish to avoid direct effects. As discussed above, when salmonids and other special status fish detect sounds they respond with startle and avoidance responses, which would be brief and biologically insignificant (Knudson et al. 1994, NMFS 2013), but sufficient to avoid the equipment. Additionally, construction activities would not occur at night or on weekends (AMM 1: Timing of In-water Work), leaving a daily period of approximately 14 hours or more with no construction activity and thus no potential for direct effects from operation of construction equipment in the river channel to occur. Further, AMM 3 (Construction BMPs) would be implemented to reduce potential direct injuries to special status fish.

Based on these considerations, the timing of construction equipment working in the main channel, implementation of AMM 1 and 3, the Proposed Project would have a **less than significant** impact to special status fish species.

#### *Effects from Propeller Strikes and Entrainment*

A rock barge, accompanied by tug boat, would be used to transport material from the quarry near San Rafael to the Proposed Project area. A small work boat would be used to move the derrick barges between the staging and erosion repair sites. Work boats and tugs used to maneuver the barges during site mobilization would be present on site periodically during the duration of construction activity (i.e. tugs may be moored or go to other non-related job sites if there is no need to move a barge for a period of time, and the derrick barges would be traveling back and forth from the quarry and soil borrow sites). Work on the levee slopes would occur using barges, work boats, and tugs.



Changes in pressure, shear forces, acceleration or deceleration and direct impacts have potential to cause injury to special status fishes if they come in contact with boat propellers. Barges have potential to entrain larvae, invertebrates, phytoplankton and zooplankton, and as a result have more potential to affect fishes via impacts to food resources than direct propeller strikes (Miranda and Killgore 2013). However, entrainment from boat propellers is difficult to measure since organisms killed or injured in this manner show no visible scars.

Fish, such as salmonids that utilize surface waters may be at higher risk of collision with a propeller than benthic dwelling fish such as sturgeon. Due to their small size, direct hits to juvenile salmonids are not expected. Adult salmonids and other special status fishes would have the ability to move out of the way of a boat or barge. Noise generated from the watercraft would cause adult fishes to move away from the boat or barge. Further, boats would be moving slowly when utilizing waters in the immediate vicinity of the Proposed Project area, therefore, direct hits or entrainment of salmonids and other special status fishes are not expected to occur.

Sturgeon are benthic dwellers that prefer deep areas of the river so are not expected to be close enough to the surface to be directly affected by propellers or entrainment. Balazik et al. (2012) found direct strikes to Atlantic Sturgeon by small recreational powerboats in the Saint James River, Virginia were rare since fish spent a majority of time near the river bottom.

The Proposed Project would only result in minor increases in the number and frequency of barges and small boats operating in the Delta relative to existing conditions. Further, restriction of barge and tugboat operations from August 1 to October 31 will avoid the primary migration and rearing periods of juvenile anadromous salmonids. Adult special status species have the ability to move out of the way of barges and boats because of their greater swimming ability (Wolter and Arlinghaus 2003).

Although there is potential for entrainment of phytoplankton and zooplankton (i.e., food supply to special status fishes) while barges and boats are operating in the river, the watercraft operational period will be outside of the main period when juvenile salmonids are present and feeding in the river. In general most plankton species have a fast regeneration period. For example, phytoplankton species typically have a regeneration period of two to four days (Rojo et al. 1994 as cited in Sarkar et al. 2019). As such, plankton populations would return to the same composition and population size as existing conditions within a few days of project-related barges and boats completing work. Finally, temporary losses of plankton from entrainment would be negligible relative to the total plankton production that occurs in the Sacramento River.

For the reasons discussed above, temporary effects to special status fishes and their prey resources from propeller strikes and entrainment due to barges and boats operating in the vicinity of the Proposed Project would be **less than significant**.



*Temporary effects to special status fish due to shading caused by temporary presence of barges*

Barges would be present in the Sacramento River, near the Proposed Project area, intermittently during the 66 day in-water construction period. Based on the size of the derrick barge and rock barge, approximately 0.296 acres of the river will be shaded while the barges are present. Anthropogenic structures that cause shading in aquatic environments are of concern because they can decrease light levels that reduce primary production, promote predation by creating favorable conditions for ambush predators, and contribute to increased avoidance behavior during downstream juvenile salmonid migrations (Lange 1999, Kemp 2005).

Delta Smelt, Longfin Smelt, juvenile fall-run Chinook Salmon, and juvenile winter run Chinook Salmon would not be present during the in-water work window (i.e., July 1 to October 31). Thus, the shade created by barges during the in-water work window would not affect these species.

Information on the effects of shading from barges is limited. However, shade cast from over-water structures such as bridges can limit light available for photosynthesis affecting primary productivity that supports the food-web of special status fish species. Artificial shade can also alter the composition of invertebrate species by reducing abundance of larger species that salmonids and Green sturgeon prefer (Duffy-Anderson and Able 2001). Reduced light can affect the ability of fish to detect and consume prey (Munsch et al. 2015). Since juvenile salmonids are visual predators poor quality habitats under manmade structures can inhibit feeding and may suppress growth of salmonids and demersal fish such as Green Sturgeon (Duffy-Anderson and Able 1999, 2001, Abel et al. 2005).

Information in the literature is conflicting on how artificial structures influence predator and prey aggregations (Lehman et al. 2019). It is thought that shaded areas can increase a predator's capture efficiency by creating a light/dark interface that allows ambush predators to remain in a darkened area and watch for prey to swim against a bright, highly visible background. Predators can see sunlit prey more than 2.5 times as far as a sunlit fish can see into a shaded area (Helfman 1981). However, the potential for artificial structures to create predatory hotspots is dependent on the predator community composition and habitat type (i.e., slope, aquatic vegetation present, etc.) (Lehman et al. 2019, Zeug et al. 2020).

The area of shade created by the barges will be temporary, and intermittent since barges will continue to operate between the staging sites and Proposed Project area during the 66 day period of in-water construction work. By nature of the construction process, barges will not be anchored in a stationary position. Construction of bank protection features will result in barges being constantly repositioned, therefore shading impacts during construction sequence in any given day will change.

Due to the small area of shade created by the barges, the relatively large area of river that will not be shaded, and the temporary nature of the construction work, it is unlikely that shading will have any effect on primary productivity. As such, it is not expected that the



temporary stationing of barges in the vicinity of the Proposed Project area will affect prey production, or the ability of special status fish species to have access to food resources.

Although areas of artificial shade can create favorable conditions for ambush predators, there is no evidence in the Delta that these artificially shaded environments increase the predation rates of special status fishes (Lehman et al. 2019, Zeug et al. 2020). Although there is potential for barges to increase predatory fish habitat, the barge operational period will be outside of the main period when juvenile salmonids are present and feeding in the river. Juvenile Green Sturgeon within the Delta are typically large and not subject to significant piscivorous predation. Thus, temporary shading from barges is expected to have no impact on juvenile Green Sturgeon.

In conclusion, artificial shade created by construction barges would move throughout the course of each day that the barges are present so that no one area of the river is shaded for any substantial period of time. For the reasons described above, it is unlikely that the presence of construction barges would reduce primary productivity or create predatory hotspots. As such, the impacts to special status fish species due to the temporary and intermittent stationing of barges in the Proposed Project area will be **less than significant**.

#### Permanent Effects

##### *Creation of Riparian and Wetland Benches in the Sacramento River*

Prior to anthropogenic alterations much of the Delta shorelines were comprised of shallow-water habitat that provided a diverse array of habitat for juvenile salmonids. Today, these shorelines, are characterized primarily by steep-sloped levee embankments reinforced with riprap (Hellmair et al. 2018). The lower Sacramento River within the Proposed Project area is essentially an armored trapezoidal channel designed to convey water and protect adjacent lands from flooding which provides little suitable rearing and refugia habit for salmonid migrants, and instead, promotes habitat preferred by black basses (*Micropterus* spp.) and other predatory fish species.

Riparian vegetation losses have also occurred in the Proposed Project area and there are large open areas along banks of the Sacramento River that lack complex habitat in part due to the large amounts of riprap (Hellmair et al. 2018). In spite of the degraded condition of this habitat, the conservation value of the Proposed Project area is high because it is used by anadromous fish species for rearing and as a migration pathway.

The Proposed Project is located along a reach of the Sacramento River that is fully leveed and has a channel width of 500 to 700 feet. River flow in the area is strong and shallow-water fish friendly habitats are limited. An objective of the Proposed Project is to create vegetated habitat benches to enhance shaded riverine habitat and riparian and wetland benches to provide shallow-water high value seasonal rearing habitat for special status fish species (e.g. juvenile steelhead and Chinook Salmon).

The creation of the vegetated benches along the newly stabilized levee would restore loss of ecosystem functions due to modifications of the river bank by providing refugia from



predators, increasing foraging opportunities, and creating velocity refugia (McLain and Castillo 2009, McNair 2015, Hellmair et al. 2018, Dahm et al. 2019). This increased habitat availability, continuity and complexity would mimic characteristics of natural shorelines and floodplains used by native fish species including listed salmonids. Restoring habitat diversity and hydraulic complexity would support other ecological functions (e.g., vegetative success and invertebrate production) that are characteristic of natural shorelines and floodplains. Survival and emigration success is expected to increase from increased access to these complex habitats.

Wetland benches would be constructed at a relatively low elevation to allow frequent inundation and development of aquatic and semi-aquatic habitat. Wetland benches will be constructed approximately 1.5 feet above the MLLW (i.e., the average of the lower low water height of each tidal day). The depth would provide optimum short-term rearing and refugia habitat for juvenile salmonids during their winter-spring seaward emigration period, while minimizing the frequency of creating optimum spawning habitats for invasive fishes such as black basses, during their spring-summer spawning period.

Largemouth Bass (*M. salmoides*), Smallmouth Bass (*M. dolomieu*), and Spotted Bass (*M. punctulatus*) dominate Delta waters and pose a predatory threat to emigrating juvenile salmonids (Moyle 2002). Largemouth Bass are one of the most common invasive fish species in the Delta (Nobriga and Feyrer 2007, Young et al. 2018) and are thus used as a surrogate for all black basses in the following discussion. Largemouth Bass typically spawn on nests created near aquatic vegetation and spawning may occur at depths ranging from 0.5–27 feet (Stuber et al. 1982), but most frequently spawn at depths of 3–4 feet (Johnke 1995). Spawning is usually initiated in April, when water temperatures reach 59–61°F (which exceeds the optimal temperatures for juvenile salmonids reducing habitat overlap potential), and continues through June (Moyle 2002). In rivers, spawning by black basses may extend into July (Moyle 2002).

Survival and development of black bass embryos are dependent on relatively stable water levels, low velocities, and constant inundation (Stuber et al. 1982). Von Geldern and Mitchell (1975) reported that Largemouth Bass spawning was unsuccessful when Millerton Lake, CA, water levels fluctuated during the spawning season. Therefore, survival of embryos to the larval stage may be decreased or precluded by water level fluctuations, particularly if the water level fluctuations results in dewatering of the nests. Based on this information, optimal spawning habitats for Largemouth Bass are defined as stable water depths of 3–4 feet during the period April–July.

The wetland habitat benches would be at an elevation that would have frequent inundation, but there would be periods of time during most days when tides would cause the water to drop and dewater the benches. This dewatering would prevent successful nesting of Largemouth Bass. Outside of the spawning period, bass are typically associated with steeper bank slopes and greater water depths than that provided by the wetland benches (Zanjac et al. 2012). In contrast, migrating juvenile salmonids rely on nearshore riverine habitat that provides shallower depths and slower velocity than the mainstem of the Sacramento River during their outmigrations (Hellmair et al. 2018).



Creation of seasonal, shallow water habitat areas could lead to stranding of special status fishes due to fluctuating water levels on these newly created habitats. However, native fishes are adapted to the natural hydrologic regimes of floodplains and rivers and, as such, shallow water habitat emigration is likely to be triggered by environmental cues (e.g., increases in floodplain water temperatures as the water recedes, decreases in water surface elevations) (Moyle et al. 2007). Moyle et al. 2007 found native fish generally occur in floodplain habitats earlier (e.g., February through April) than nonnative fish and native fish emigrated from floodplain habitats rapidly (e.g., approximately one week or less) when daily maximum air temperatures rose from 68°F to 77°F. Further, no juvenile salmonids were found to be permanently stranded (i.e., isolated on the floodplain following the final disconnection of the year) during the four-year study (Moyle et al. 2007).

Wetland bench width would vary slightly, from approximately 6 feet to 15 feet wide, depending on the location along the levee. Due to the narrow width (6–15 feet wide) of the benches and response to environmental cues, juvenile salmonids are not expected to get stranded. Instead juvenile salmonids are expected to utilize these nearshore habitat benches for a short period of time during their downstream migration (Hellmair et al. 2018). Delta Smelt, Longfin Smelt, and sturgeon are also not expected to be stranded on the newly constructed wetland benches because these species are not expected to spend any significant amount of time utilizing the benches. If these fish did utilize the habitat benches, they would be expected to cue into environmental changes (e.g., increasing temperatures, lowering water surface elevations) and exit the area prior to incurring adverse effects.

Although the new benches would cause the Proposed Project area to become more complex and dynamic relative to existing conditions it would also partially change the composition of the benthic environment from one dominated by soft soils to a mixture of soil types and rock slope protection. This rock slope protection could reduce the amount of benthic foraging opportunities for Green Sturgeon.

Overall, the creation of wetland and riparian benches are expected to benefit special status fish species. Newly planted trees will grow over time and add to the overhanging shade as planted trees mature (i.e., >15 years). Increased shade and creation of low velocity habitat would lead to increase foraging opportunities for migrating salmonids and other native fish species through increased macroinvertebrate production. However, loss of soft bank/bottom habitats (i.e., impacts to benthic environments) resulting from place of rock slope protection in the water column could cause impacts that are potentially significant to Green Sturgeon. Implementation of Mitigation Measures BIO-6, listed below, would reduce impacts to Green Sturgeon to a **less than significant** level.

#### **MITIGATION MEASURE BIO-6. GREEN STURGEON MITIGATION ACREAGE AND MITIGATION CREDITS**

The following avoidance and minimization efforts shall be implemented for the Proposed Project:



- Mitigation acreage created by habitat benches:
    - 0.96 acres of riparian forest
    - 0.90 acres of freshwater marsh/tule habitat
    - 0.73 acres of scrub shrub
    - Total acreage created = 2.59 acres
  - Impacts (5.63) less created bench habitat (2.59) will require purchase of 3.04 acres of Green Sturgeon mitigation credit.
  - Mitigation bank credits will be purchased from Fremont Landing Conservation Bank (operated by Wildlands) prior to project impacts.
- 

### *Summary*

Project construction would cause temporary effects to Sacramento River water quality, create underwater noise, cause construction equipment to operate for a temporary period of time in the river channel creating the potential for fish to come into direct contact with the equipment, and cause barges to operate for a temporary period of time in the river channel creating areas of shade within the river and the potential for direct impacts with the barges. All of these temporary construction-related activities would have minimal effects to special status species and their habitats. In the long term, the creation of riparian and wetland benches will improved the complexity within the river channel which will benefit special status species. Although the placement of rock slop protection could affect Green Sturgeon, the implementation of BIO-6 will ensure that impacts are less than significant. In conclusion this impact would be **less than significant**.

- b) Riparian vegetation losses have occurred in the Proposed Project area and there are large open areas along banks of the Sacramento River that lack complex habitat in part due to the large amounts of riprap (Hellmair et al. 2018). Nevertheless, natural riparian vegetation communities occur in the vicinity of the Proposed Project area (i.e. riparian oak woodland and willow thicket). Natural communities and “vegetation types” are now used interchangeably by CDFW (CDFW 2020). Thus, sensitive natural communities are vegetation types that are considered rare or are threatened. Vegetation that has been assigned the state rank (S-rank) of S1 (critically impaired), S2 (imperiled), or S3 (vulnerable) is considered sensitive for the purposes of CEQA. As described above in “a” several special status plant species occur in the Proposed Project area. These include species identified by CNPS as rare or endangered one species (Mason’s lilaeopsis) assigned S2.

A main objective of the Proposed Project is to enhance riparian habitats in the Proposed Project vicinity. Nevertheless, some temporary changes to riparian habitats and vegetation removal would occur during the construction phase of the Proposed Project. Initial site preparation would include limited grubbing, small tree removal, tree trimming and vegetation clearing on the waterside levee slope. Much of the vegetation removal and grubbing would occur to remove remnant stands of *Arundo donax*.



To avoid impacts to special status plants, sensitive natural communities, and riparian vegetation AMM 2 includes a WEAP training to educate workers about the potential impacts to special status plants. Additionally, implementation of Mitigation Measure BIO-1 would reduce impacts to special status plants during the construction phase of the project by requiring avoidance and minimization of impacts if special status plant species cannot be avoided. This AMM and Mitigation Measure combined with limiting the removal of vegetation within the project footprint when possible would reduce any potential impacts to sensitive natural communities.

Riparian vegetation is important because it can provide shaded riverine habitat features including the ability to promote localized water cooling and increased BMI production. Concerns related to removal of riparian vegetation include potential for warmer localized stream temperatures (Werner et al. 2005), decreased food (i.e., BMI) production (Baxter et al. 2005), reduced habitat complexity, and increased sedimentation (Klapproth and Johnson 2009). The Proposed Project would not remove any mature trees; however, some mature trees may need to be trimmed to allow for construction activities to occur under the tree canopy (i.e. to ensure worker safety, the crane booms on the derrick barge and boom truck must be able to swing freely, without hitting any trees).

Consistent with BALMD's existing routine maintenance agreement with the California Department of Fish and Wildlife (CDFW), trees less than 4 inches in diameter and large shrubs would be cut with a flail mower. Thus, removal of some riparian vegetation would have minimal if any affect shaded riverine habitat. Changes in nearshore habitat would be temporary in nature, limited to areas where construction occurs and not permanently affect riparian or migration habitat.

The Proposed Project is designed to be a restoration project and planting trees and other riparian vegetation are part of the project description. Thus, after project completion there would be more riparian vegetation than what occurs at the Proposed Project area under existing conditions. Although there would be some temporary effects to riparian habitats during the construction phase of the Proposed Project, ultimately implementation of the Proposed Project would enhance riparian habitat relative to existing conditions. This would improve shaded riverine habitat in the Proposed Project Area.

Based on the above considerations, construction-related activities would cause short-term and localized alterations of riparian habitats during construction. However, the temporary nature of the riparian removal would not have a substantial adverse effect on any riparian habitat that would result in adverse effects to special status fish or their prey resources (i.e., prey resources including BMI or plankton communities). As such, impacts to riparian habitat and sensitive natural communities would be **less than significant**.

- c) The Proposed Project area is located on the left bank of the Sacramento River. No other natural wetlands or waterways occur in the Proposed Project area. However, the entirety of the project site consists of vegetation communities (i.e. riparian oak woodland and willow thicket) and the constructed levee is considered part of the jurisdictional limits of the waters of the state under the CDFW and/or the Regional Water Quality Control Board (RWQCB). Portions of the Proposed Project area within the river up to the top of the



levee may also be considered part of the jurisdictional limits of the U.S Army Corps of Engineers (USACE). Therefore, any portions of the project site that include the river, the developed levee, and the riparian oak woodland and willow thicket (out to the drip-line) would likely fall within the jurisdiction(s) of the USACE, CDFW, and/or RWQCB. Additionally, multiple jurisdictional wetlands occur adjacent to the project site: freshwater emergent wetlands and freshwater forested/shrub wetlands; a freshwater forested/shrub wetland; and palustrine-farmed wetlands. Therefore, the Proposed Project would result in impacts to features under USACE and RWQCB jurisdictions.

Impacts to USACE and RWQCB jurisdictions are expected to consist of vegetation clearing, pruning, and rock installation during project construction and impacts would be potentially significant. However, because the project is designed as a restoration and enhancement project, the Proposed Project is anticipated to require a Clean Water Act Section 404 Nationwide Permit from the USACE and a Section 401 Water Quality Certification from the RWQCB, which would include restoration of all temporary impacts to riparian habitat. In addition the Proposed Project incorporates best management practices (BMP) to avoid impacts to jurisdictional areas as part of the project description (AMM 3). These BMPs include, but are not limited to: spill prevention; dust and erosion control; and timing of work below the OHWM during low tide to reduce potential impacts to water quality. With implementation of these measures, impacts would be **less than significant**.

d) The following discussion assesses potential impacts of the Proposed Project on native and/or migratory terrestrial and aquatic wildlife species and their established wildlife corridors and nursery sites.

### **Terrestrial Wildlife**

Wildlife movement corridors, or habitat linkages, are generally defined as connections between habitat patches that allow for physical and genetic exchange between otherwise isolated animal populations. Typically, habitat linkages are contiguous strips of natural areas, though dense plantings of landscape vegetation can be used by certain disturbance-tolerant species. For highly mobile or aerial species, habitat linkages may be discontinuous patches of suitable resources spaced sufficiently close together to permit travel along a route in a short period of time.

Regionally, the project site is not located within an Essential Connectivity Area (ECA) as mapped in the report California Essential Habitat Connectivity Project: A Strategy for Conserving a Connected California (2010). ECAs represent principle connections between Natural Landscape Blocks and are regions in which land conservation and management actions should be prioritized to maintain and enhance ecological connectivity.

The project site is located along the bank of the Sacramento River, and the majority of the project site consists of natural riparian vegetation communities associated with the Sacramento River. The Sacramento River links ocean and freshwater habitats, and



riparian habitats along the banks of the Sacramento River likely function as important wildlife movement corridors between downstream and upstream natural areas.

The project site likely serves as an important wildlife corridor for terrestrial wildlife moving along the Sacramento River. Particularly, the project site serves as a movement corridor for great blue herons, great egrets, and hoary bats as discussed below. The Proposed Project is designed to restore and enhance the levee and associated habitat. As such there would be no long-term impacts related to project site functions for wildlife movement.

#### Great Blue Heron and Great Egret

Great blue herons and great egrets are common year-round residents in California that feed along the margins of estuaries, lakes, and rivers as well as on mudflats, in fields and pastures. Rookeries may be occupied for many years, and increase in size as more birds build nests and occupy the site (Vermont Fish and Wildlife Department 2002). Rookeries are generally located near suitable feeding and foraging habitat for the birds that occupy and nest within the rookery. The nearest rookery reported in the CNDDDB is approximately 5.74 miles southwest of the project site on Decker Island. No rookeries were present during the December or April site visits. The Proposed Project may result in temporary loss of potential roosting and nesting habitat during project construction and impacts would be potentially significant. However, because the project site would be restored and enhanced, there would be no expected impacts from temporary loss of potentially suitable habitat. Furthermore, implementation of the proposed avoidance and minimization measures, Mitigation Measures BIO-6, described above would reduce impacts to individuals to a **less than significant** level.

#### Hoary Bat

Hoary bats have widespread distribution and can occur throughout California. Hoary bats roost in dense foliage of medium to large trees with good cover above the roost. Tree roosts are also used for breeding and rearing young. Potential impacts to this species, if roosting on site during project construction, include injury or mortality from direct destruction of roosts, or abandonment from construction activity or noise. Therefore, the Proposed Project could result in temporary loss of roosting and foraging habitat and impacts would be potentially significant. The small size of the project site in comparison to the available habitat in the surrounding region indicates that the loss of individuals at the project site is unlikely to result in a population-level effect. The project site would be restored and enhanced; there would be no expected permanent impacts from temporary loss of suitable habitat. Furthermore, implementation of the proposed avoidance and minimization measures, Mitigation Measure BIO-2, described above would reduce impacts to a **less than significant** level.



## Fisheries

### Temporary Effects

#### *Construction-Related Effects to Movement or Established Migratory Corridors of Special Status and Native Fish Species*

Temporary effects from construction-related noise and disturbance associated with the Proposed Project have the potential to affect migrations and movements of special-status anadromous and resident fish near the active construction site. Presence of construction equipment could cause underwater noise, turbidity, and flow pattern disruption channel (i.e., disruption of laminar flow vectors immediately adjacent to the equipment itself) to occur during the short period of time the construction equipment may be present in the river. This would likely cause any native species or special status fish that could be present in the work area to make slight changes to their movements to avoid the construction activities. However, most fish would move past the construction area unimpeded in a portion of the main river channel that is a sufficient distance from the area of disturbance.

The temporary areas of shade created by the barges is also not expected to delay migration of salmonids. In a study that assessed the impacts of shading from a large bridge in Washington State, only some migrating juvenile salmonids were delayed by the shade (Bloch et al. 2009). These fish were only delayed by an average of 10 minutes (Bloch et al. 2009). The areas of shade from the construction barges would be much smaller than that cast by large bridges and thus the artificial shade is expected to create minimal, if any delay in the downstream migration of juvenile salmonids.

Restriction of in-water works from August 1 to October 31 will avoid the primary migration periods of juvenile anadromous salmonids and all work would be limited to daylight hours during the week, leaving extensive periods of undisrupted passage for migrating fishes in the evenings, daily, and on weekends, when little to no construction would occur.

In summary, disturbance and noise associated with construction-related activities and creation of artificial shade due to presence of barges is not expected to adversely affect the migrations or movements of anadromous special status fishes. This is because most fish would move past the construction area unimpeded in a portion of the channel that is a sufficient distance from the active construction area. Because construction would be limited to daylight hours during the week, any delays in movement past or in the vicinity of the construction area would be short-term (i.e., several hours). Further, construction-related activities would not interfere substantially with the movement of any native or resident special status fish species. Consequently, this impact would be **less than significant**.



### Permanent Effects

#### *Permanent Effects to Movement or Established Migratory Corridors of Special status and Native Fish Species*

As described above in “a” creation of the vegetated benches along the newly stabilized levee would restore loss of ecosystem functions due to modifications of the river bank by providing refugia from predators and creating velocity refugia (McLain and Castillo 2009, McNair 2015, Hellmair et al. 2018, Dahm et al. 2019). This increased habitat availability, continuity and complexity would mimic characteristics of natural shorelines and floodplains used by native fish species including listed salmonids, smelt and other native species. Ultimately, habitat enhancement and levee stabilization would provide a better migratory corridor than what is present under existing conditions.

Restoring habitat diversity and hydraulic complexity would support other ecological functions (e.g., vegetative success and invertebrate production) that are characteristic of natural shorelines and floodplains. Survival and emigration success is expected to increase from increased access to these complex habitats.

Although the seasonal, shallow water habitat areas could lead to stranding of special status fishes due to fluctuating water levels on these newly created habitats native fishes are adapted to the natural hydrologic regimes of floodplains and rivers. As such, shallow water habitat emigration is likely to be triggered by environmental cues (e.g., increases in floodplain water temperatures as the water recedes, decreases in water surface elevations) (Moyle et al. 2007).

Based on the assessment provided above, the Proposed Project would have a **less than significant** impact, on the movement of any native or migratory fish species or established native resident or migratory corridor, or on native fish nursery sites.

- e) The project site includes riparian oak woodland and willow thicket habitats with big leaf maple, boxelder, white alder, Oregon ash, black walnut, western sycamore, coast live oak, valley oak, interior live oak, black locust, and black willow. Therefore, the project site includes protected trees covered under the Sacramento County Tree Ordinance, which regulates tree removal and pruning within its jurisdiction.

A Sacramento County tree permit may be required to remove or prune any public and certain private trees. As specified in the County ordinance, a “tree” shall mean any living native oak tree having at least one trunk of six inches or more in diameter measured four and one-half feet above the ground (dbh), or a multi-trunked native oak tree having an aggregate diameter of ten inches or more, measured at dbh. The Proposed Project is a restoration project and planting of trees is included as part of the project description. However, removal of specific trees (e.g., black walnut) may require specific replacement mitigation or plantings in accordance with the Sacramento County Tree Ordinance. The Proposed Project would not conflict with any local policies or ordinances protecting biological resources and impacts would be **less than significant**.



- f) The Proposed Project is not located within the plan areas for any adopted Habitat Conservation Plan, Natural Conservation Community Plan, or other approved local, regional, or state habitat conservation plan. As such, the project would not conflict with the provisions of any such plans and there would be **no impact**.

### 3.5 Cultural Resources

Would the project...	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
a) Cause a substantial adverse change in the significance of a historical resource pursuant to Section 15064.5?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) Disturb any human remains, including those interred outside of dedicated cemeteries?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

#### 3.5.1 Setting

The following section summarizes information presented in **Appendix D**, which contains a comprehensive discussion of the cultural resources setting of the region and City areas, and information regarding known and potential historical and archaeological resources in the project site, and regulatory framework. The cultural resources and paleontological resources reports were prepared by Rincon in December 2017 and updated in April 2020.

Efforts to identify cultural resources in the project site consisted of records searches, literature review, and an archaeological field inspection. Three records searches have been conducted of the area of potential affect (APE) plus a half-mile radius. The North Central Information Center completed a cultural resources records searches on November 28, 2017 and April 21, 2020. The Northwest Information Center completed a cultural resources records search on April 20, 2020. The Native American Heritage Commission Sacred Lands File search was conducted on November 29, 2017 and March 24, 2020, both of which were negative. Letters were sent to recommended Native American contacts for both searches. The inquiry did not identify Native American cultural resources in the project vicinity.

A pedestrian survey was conducted by Rincon archaeologist Hannah Haas of the project construction footprint on December 5, 2017. Ms. Haas surveyed the Proposed Project area by driving the length of the proposed levee repairs and walking a single transect parallel to the levee where vegetation and access permitted. The top of the levee is occupied almost entirely by State Route 160 with no shoulder and steeply sloping banks, making pedestrian survey of much of the project alignment difficult to impossible due to safety concerns. Rincon archaeologist Elaine Foster conducted the pedestrian survey of the staging areas on March 27, 2020. Where accessible, Ms. Foster surveyed the staging areas using transects spaced 10 to 15 meters apart. Where inaccessible and/or paved, Ms. Foster observed each



staging area from fence lines and examined any unpaved areas. No newly recorded cultural resources were identified during the pedestrian surveys.

No archaeological resources have been identified within or near the project site or staging areas as a result of the field survey or records search, and as a historically-constructed levee that's been continuously modified and repaired since 1870, none are likely to exist. The soils within the Proposed Project area are disturbed soils that were transported to this location to construct the levee in the historical period and are thus not expected to contain intact prehistoric resources.

Three previously recorded cultural resources have been identified within the project site: P-34-002109 (a historic irrigation feature), P-34-002143 (the levee itself), and P-34-005225 (Sacramento River Tribal Cultural Landscape).

Five historically significant shipwrecks have been identified to have sunk within or nearby Cache Slough, the waterbody adjacent to the project site. No wrecks are known to exist directly within the project site.

### 3.5.2 Discussion

- a) The records search identified that the project is encompassed by the Sacramento River Tribal Cultural Landscape, which has been previously recommended eligible for the NRHP and CRHR. The current proposed project intends to repair sections of an existing levee on the Sacramento River and therefore would not introduce any new impacts to the Sacramento River Tribal Cultural Landscape (P-34-005225). Thus, the current project would not impact the significance of the resource. The records search also identified a historic-era water pump (P-34-002109) and the Isleton Levee (P-34-002143) within the project site. The historic-era water pump was located during the pedestrian survey and appears in the same condition as its original recording. The pump was previously evaluated for listing in the CRHR and recommended as ineligible, thus the Proposed Project would not have a significant impact on resource P-34-002109. The Isleton Levee has been previously determined eligible for listing in the NRHP and is eligible for listing in the CRHR and is thus considered a significant historical resource under CEQA. However, because the Proposed Project would only replace eroded soils from the levee and add planting benches by placing Terrabags and riprap on the surface of the levee, the alignment, location, and purpose of the levee would not be altered by the Proposed Project. The levee has been continuously maintained and repaired since its original construction. Thus, the Proposed Project would not impact the significance of the resource. Therefore, there would be **no impact** to historical resources.
- b) Temporary construction activities for the Proposed Project would involve ground disturbing activities including excavation of the key trench at the toe of the levee to prevent water seepage below the new fill material. No prehistoric or historic archaeological resources or recorded shipwrecks were identified during the records search and field survey of the Proposed Project area and the majority of soils in the project site are non-native and were placed to construct the levee. However, construction activities have the potential to encounter buried archaeological resources if key trench excavation extends into native soils. Buried archaeological resources may include but are



not limited to deposits of stone, bone and shell artifacts, dark gray “midden” sediments, historic trash deposits, stone or adobe foundations, ship remains, and/or shipwreck artifacts. Therefore, the impact would be potentially significant. Implementation of Mitigation Measure CULT-1 would reduce impacts to archaeological resources to a **less than significant** level.

**MITIGATION MEASURE CULT-1. UNANTICIPATED DISCOVERY OF ARCHAEOLOGICAL RESOURCES.**

If prehistoric or historic artifacts, or other indications of archaeological resources such as unusual deposits of stone, bone or shell, stone artifacts, or historic trash deposits or foundations are discovered once ground-disturbing activities are underway, the find(s) shall be immediately evaluated by a qualified archaeologist. If the find is determined to be a historical or unique archaeological resource, contingency funding and a time allotment to allow for implementation of avoidance measures or appropriate mitigation shall be made available, as provided in §15064.5 of the CEQA Guidelines. Such measures may include, but not be limited to, Phase II archaeological evaluation and Phase III data recovery excavation. Work may continue on other parts of the Proposed Project Area while historical or unique archaeological resource mitigation takes place on-site.

- c) No human remains were identified during either pedestrian field survey, nor were any previously recorded burials included in the record search results. Encountering human remains is unlikely; however, it is always possible during ground disturbing activities such as the excavation of the key trench at the toe of the levee. Thus, this project would have a potentially significant impact on human remains. Implementation of Mitigation Measure CULT-2 would reduce impacts to human remains to a **less than significant** level.

**MITIGATION MEASURE CULT-2. DISCOVERY OF HUMAN REMAINS.**

If human remains are found, the State of California Health and Safety Code Section 7050.5 states that no further disturbance shall occur until the county coroner has made a determination of origin and disposition pursuant to Public Resources Code Section 5097.98. In the event of an unanticipated discovery of human remains, the county coroner must be notified immediately. If the human remains are determined to be prehistoric, the coroner shall notify the Native American Heritage Commission (NAHC), which will determine and notify a most likely descendant (MLD). The MLD shall complete the inspection of the site within 48 hours of being granted access and may recommend scientific removal and nondestructive analysis of human remains and items associated with Native American burials. If the landowner or authorized representative rejects the recommendation of the MLD, either the landowner or the MLD may request mediation by the NAHC, which would include the meaningful and timely discussion and



careful consideration of the views of each party to come to an agreement. If the NAHC is unable to identify a MLD or the MLD fails to make a recommendation within 24 hours after notification by the NAHC, or the landowner or his authorized agent rejects the recommendation by MLD and mediation by the NAHC fails to provide a measure acceptable to the landowner, then the landowner or his authorized representative shall rebury the human remains and grave goods with appropriate dignity at a location on the property not subject to further disturbances.

### 3.6 Energy

Would the project...	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
a) Result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
b) Conflict with or obstruct a state or local plan for renewable energy or energy efficiency?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

#### 3.6.1 Setting

As described above in Section 3.3, Air Quality, CARB regulates mobile air pollution sources such as those from motor vehicles. These regulations also ensure that wasteful, inefficient, or unnecessary consumption of energy resources does not occur by off-road diesel vehicles, such as construction equipment.

#### 3.6.2 Discussion

- a, b) Proposed Project construction would involve consumption of energy resources related to use of oil, gasoline, and diesel fuel for construction work vehicle trips, hauling truck trips, materials delivery truck trips, and operation of off-road construction equipment. Construction would not require the use of natural gas appliances or equipment. Diesel-powered construction equipment includes a small excavator, small conveyor with generator, small front-end loader, forklift, dump truck, boats, and pickup trucks. The use of off-road heavy-duty diesel equipment would be limited to the construction period, which would be over a course of approximately 120 days for the Proposed Project. Diesel equipment would not be operated on each day of construction, so there would be a number of days during construction where no use of diesel. The operation of all construction equipment would be regulated by the CARB In-Use-Off-Road Diesel Vehicle Regulation (see Mitigation Measure AQ-1). This regulation is intended to reduce emissions from in-use off-road, heavy-duty diesel vehicles by limiting idling, requiring all vehicles to be reported to CARB, restricting the addition of



older vehicles into construction fleets, requiring emissions by retiring, replacing, or repowering older engines. These regulations would result in the use of fuel efficient construction vehicles.

Based on FRAQMD's Indirect Source Review Guidelines, the Proposed Project is a "Type 2" project, which is a non-land use project that has no operational phase. In other words, once the project is complete, it would not utilize energy resources.

Based on the above, the Proposed Project would not result in wasteful, inefficient, or unnecessary consumption of energy resources during project construction or operation. Further, the Proposed Project would not conflict with or obstruct a State or local plan for renewable energy and energy efficiency. As such, the Proposed Project would have a **less than significant** impact on energy.

### 3.7 Geology/Soils

Would the project...	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
a) Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:				
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
ii) Strong seismic ground shaking?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
iii) Seismic-related ground failure, including liquefaction?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
iv) Landslides?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Result in substantial soil erosion or the loss of topsoil?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
c) 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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
e) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>



Would the project...	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
f) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

### 3.7.1 Setting

#### Geological and Soil Characteristics

There are 11 geomorphic provinces in California. These provinces are naturally defined geologic regions that have distinct landscapes and features based on geology, faults, topographic relief, and climate (California Geological Survey 2002). The Proposed Project occurs within the Great Valley geomorphic province. The Great Valley is an alluvial plain approximately 50 miles wide and 400 miles long (California Geological Survey 2002). The Great Valley is a trough in which sediments have been deposited continuously since the Jurassic period (i.e., approximately 160 million years ago).

Soils in the Project area, are comprised of Delta peat and range from 10 feet to as much as 40 feet in depth (City of Isleton 2000). The soils in the region have undergone, and continue to undergo, varying degrees of subsidence (i.e., sinking or gradual downward settling) as a result of exposure (oxidation). As subsidence progresses in the soils behind the levee, where land has been drained, it causes stresses on the levee making it less stable. Levee foundations in the Delta are composed of the same peat soil formed by the marsh's original vegetation (Water Education Foundation 2020). The levee structure is comprised of sandy and silty material that was dredged from the river over the years (Galloway 1999).

#### Seismicity

The seismicity of the Project area is primarily related to the San Andreas Fault system (City of Isleton 2000). The Loma Prieta earthquake on the San Andreas Fault in the Santa Cruz mountains in 1989 seriously damaged structures in the City of Isleton. However, even with major strike-slip faults on the San Andreas systems producing larger and more frequent earthquakes than faults within the Delta, earthquakes from the San Andreas Fault system contribute to lower hazards than faults in the Delta due to their greater distance from the Delta levee system (Unruh and Hitchcock 2009).

The Midland Fault, a subsurface fault, is the closest Delta fault to the Project area (approximately three miles east of erosion repair 1) (City of Isleton 2000, California Geological Survey 2010a). Although the California Geologic Survey (2010b) identified the Midland Fault as last rupturing during the Quaternary Period (between 11,000 and 1.6 million years ago) and classifies it as "potentially active", Wong et al. (2010) suggested that the Midland Fault was potentially seismogenic and had a high probability of activity. Wong et al. (2010) further identified a roughly east-west-trending buried structure referred to as the Thornton Arch Source Zone in the vicinity of the Thornton and West-Thornton-Walnut Grove gas fields may be an active fault with a low probability of activity. Seismic hazards are those associated with faulting, ground shaking, liquefaction (i.e., loss of soil strength due to seismic forces), and seiches



whereas geologic hazards are those associated with subsidence, expansive soils, landslides, and erosion. Levees can be unstable under seismic loading and liquefaction can occur in levees due to the presence of sand and silt in levees (Galloway 1999). Potential seismic hazards in the Project area include ground shaking or lurching resulting from seismic activity in faults within the region (City of Isleton 2000, Wong et al. 2010).

Even with the potential for the Midland Fault to be potentially active, geologic hazards are more prevalent than seismic hazards in Sacramento County. According to Sacramento County (2016) and City of Isleton (2000) geologic hazards in the Project area include subsidence and levee erosion. However, the land forms within the Project area where construction activities would occur are generally level and therefore not prone to landslides. Soils in the vicinity of the proposed project are also not classified as expansive (i.e., soils that shrink or swell depending on the level of moisture they adsorb).

### **Paleontological Resources**

On November 24, 2017, the Los Angeles County Museum conducted a paleontological locality search of the Proposed Project area. No recorded fossil localities have been identified within the Proposed Project area, though at least one vertebrate locality has been recorded nearby and paleontological literature illustrates an abundant fossil record for Quaternary alluvial deposits in California's Central Valley. However, the Holocene levee deposits mapped at the ground surface have been determined to have a low paleontological sensitivity and are likely too young to contain fossilized material. Project excavation is not anticipated to extend below the surficial sediments into the older Quaternary alluvium that likely underlies the project site.

### **3.7.2 Discussion**

- a) The following discussion is based off of the known geology and seismicity of the project site.
- a-i) Fault ground ruptures would not occur in the Project area because there are no active faults mapped in the Project area by the California Geological Survey. Further, the erosion repair sites are not located in any Alquist-Priolo Earthquake Fault Zone. Surface ruptures almost always follow pre-existing faults. Further, earthquake fault zones average about one-quarter mile wide and ruptures are directly associated with fault zones (California Department of Conservation 2020). The nearest fault (i.e., the Midland Fault) is three miles from the project site. The fault is not exposed to the ground surface, the likelihood of ground rupture is low. Although the likelihood of the Midland Fault rupturing is unknown, it is not close enough to the project site to cause a rupture in the vicinity of the Proposed Project. Therefore there would be **no impact** related to rupture of a known earthquake fault.
- a-ii) The potential for an earthquake to occur at the Midland Fault exists and strong seismic ground shaking could occur. Strong shaking could also occur from earthquakes that occur along the San Andreas fault. Therefore, the potential exposure of the reconstructed levee to be exposed to strong seismic shaking also exists. However, the Proposed Project would not result in an operational land change that would alter the people or structures exposed to strong seismic ground shaking. Instead it would provide more stabilization of the levee



relative to existing conditions. As such, there would be a **less than significant impact** related to strong seismic ground shaking.

- a-iii) The potential for seismic-related ground failure of the levee, including liquefaction is unknown. However, like much of the Delta the area is likely susceptible to seismically induced liquefaction that could cause the earthen-levee integrity to fail. The Proposed Project is specifically being done to further stabilize the levee. This would be done in part by adding denser materials to the existing levee slope. The Proposed Project would not result in operational or land use change that would alter the levee in such a way that would make it more susceptible to seismic-related ground failure, including liquefaction. As such, the Proposed Project would have **no impact** on ground failure or liquefaction.
- a-iv) The Proposed Project area is on a levee which was designed with slopes that are not conducive to sliding. The remaining area surrounding the levee has flat topography and is not susceptible to landslides. The Proposed Project would further reinforce the slopes on the levee. As such, the Proposed Project would have **no impact** on landslides.
- b) The temporary construction-related activities require some soil to be removed from the levee face to allow placement of rock slope protection. Additionally, initial site preparation, including mowing, tree trimming, and limited grubbing on the waterside levee slope at each of the three locations has the potential to result in localized and temporary soil erosion, in particular when exposed to rainfall and storm water runoff events during or immediately following construction.

One of the main objectives of the Proposed Project is to stabilize the levee and prevent further erosion. The Proposed Project would revegetate the three erosion repair sites and create vegetated habitat, which would enhance long-term soil retention. AMM 3 includes BMPs to reduce erosion, dust, and other soil disturbance activities. As part of AMM 3, soil disturbance activities would cease if adverse weather conditions increase the likelihood of transporting soil off site.

As a result of construction occurring over one season, and immediate revegetation of the disturbed soils the area would be substantially stabilized and resistant to mobilization and transport within the first year after construction is finished. Therefore, the Proposed Project would have a **less than significant** impact on soil erosion and loss of topsoil.

- c) The erosion repair sites do overlie potentially unstable geologic units. However, the project would not cause the area to become unstable. In contrast, the levee itself is considered stable, and the Proposed Project would substantially improve the stability of the existing levee structure. The project design, which involves adding denser material to the existing levee slope, starting at the toe of the slope and building a sloping, rock buttress upward. As such, the Proposed Project would have a beneficial effect regarding unstable soils. Thus, there would be **no impact**.
- d) Expansive soils are typically fine-grained, clay soils that swell when they absorb water and shrink as they dry. Because the existing levee was constructed on soils deposited over time by the Sacramento River, the potential exists for expansive soils to occur in the Project area



(e.g., beneath the existing levee). The proposed project has been designed to address the potential for expansive soil. Further, by improving the stability of the levee the proposed project would reduce risks to life and property from expansive soil. As such, the proposed project being located on expansive soils would be **less than significant**.

- e) The Proposed Project would not involve the construction of septic tanks or alternative wastewater disposal systems. Therefore, the Proposed Project would have **no impact** on soils utilized for septic tanks or alternative wastewater disposal systems.
- f) No paleontological resources have been identified within the project site. Surficial sediments within the project site have been identified to have a low paleontological sensitivity and project excavation is not likely to extend below these sediments. However, there remains a small possibility of encountering paleontological resources during Project ground disturbance. The impact is potentially significant. Implementation of Mitigation Measure GEO-1 would reduce this impact to a **less than significant** level.

**MITIGATION MEASURE GEO-1. ACCIDENTAL DISCOVERY OF PALEONTOLOGICAL RESOURCES.**

If vertebrate fossils (e.g., teeth, bones) are unearthed by the construction crew anywhere on the project, the finds should be set aside and all excavation activity cease at the specific place of discovery until a paleontologist has assessed the find and, if deemed significant, salvaged the find in a timely manner. The decision to conduct paleontological salvage operations will be determined by the paleontologist in consultation with District staff. Work may proceed on other parts of the project while assessment and/or salvage by the paleontologist is underway. Finds determined significant by the paleontologist shall be conserved and deposited with a recognized repository such as the University of California Museum of Paleontology.

### 3.8 Greenhouse Gas Emissions

Would the project...	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
b) Conflict with any applicable plan, policy, or regulation of an agency adopted for the purpose of reducing the emissions of greenhouse gases?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>



### 3.8.1 Setting

Gases that absorb and re-emit infrared radiation in the atmosphere are called greenhouse gases (GHGs). The GHGs that are widely seen as the principal contributors to human-induced climate change include carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxides (N<sub>2</sub>O), fluorinated gases such as hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs), and sulfur hexafluoride (SF<sub>6</sub>). Water vapor is excluded from the list of GHGs because it is short-lived in the atmosphere and its atmospheric concentrations are primarily determined by natural processes, such as oceanic evaporation.

GHGs are emitted by both natural processes and human activities. Of these gases, CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O are emitted in the greatest quantities from human activities. Emissions of CO<sub>2</sub> are largely by-products of fossil fuel combustion, whereas CH<sub>4</sub> results from off-gassing are associated with agricultural practices and landfills. N<sub>2</sub>O is produced by microbial processes in soil and water, including those reactions that occur in fertilizers that contain nitrogen, fossil fuel combustion, and other chemical processes.

Man-made GHGs, many of which have greater heat-absorption potential than CO<sub>2</sub>, include fluorinated gases and SF<sub>6</sub> (California Environmental Protection Agency 2006). Different types of GHGs have varying global warming potentials. The global warming potential of a GHG is the potential of a gas or aerosol to trap heat in the atmosphere over a specified timescale (generally, 100 years). Because GHGs absorb different amounts of heat, a common reference gas (CO<sub>2</sub>) is used to relate the amount of heat absorbed to the amount of the gas emissions, referred to as “carbon dioxide equivalent” (CO<sub>2</sub>e), and is the amount of a GHG emitted multiplied by its global warming potential (GWP). Carbon dioxide has a 100-year GWP of one. By contrast, methane has a GWP of 25, meaning its global warming effect is 25 times greater than CO<sub>2</sub> on a molecule-per-molecule basis (Intergovernmental Panel on Climate Change 2007).

#### Regulatory Framework

California’s major initiative for reducing GHG emissions is outlined in Assembly Bill 32 (AB 32), the “California Global Warming Solutions Act of 2006,” signed into law in 2006. AB 32 codifies the statewide goal of reducing GHG emissions to 1990 levels by 2020, and requires CARB to prepare a Scoping Plan that outlines the main State strategies for reducing GHGs to meet the 2020 deadline. In addition, AB 32 requires CARB to adopt regulations to require reporting and verification of statewide GHG emissions. Based on this guidance, CARB approved a 1990 statewide GHG level and 2020 limit of 427 MMT CO<sub>2</sub>e. The Scoping Plan was approved by CARB on December 11, 2008, and included measures to address GHG emission reduction strategies related to energy efficiency, water use, and recycling and solid waste, among other measures. Many of the GHG reduction measures included in the Scoping Plan (e.g., Low Carbon Fuel Standard, Advanced Clean Car standards, and Cap-and-Trade) have been adopted since approval of the Scoping Plan.

In May 2014, CARB approved the first update to the AB 32 Scoping Plan. The 2013 Scoping Plan update defined CARB’s climate change priorities for the next five years and set the groundwork to reach post-2020 statewide goals. Senate Bill 32 (SB 32) was signed by the governor on September 8, 2016 to extend AB 32 by requiring the State to further reduce GHGs to 40 percent below 1990 levels by 2030 (the other provisions of AB 32 remain unchanged). To ensure consistency with SB 32 CARB adopted another update the Scoping Plan in December



2017. The 2017 Scoping Plan update highlights California’s progress toward meeting the “near-term” 2030 GHG emission reduction goals defined in the original Scoping Plan. The strategy includes extending the Cap-and-Trade program post-2020, implementation of the Short-Lived Climate Pollutant Plan and Mobile Source Strategy and increasing renewable energy generation and improving energy efficiency.

#### SMAQMD Thresholds

The majority of individual projects do not generate sufficient GHG emissions to directly influence climate change. However, physical changes caused by a project can contribute incrementally to cumulative effects that are significant, even if individual changes resulting from a project are limited. The issue of climate change typically involves an analysis of whether a project’s contribution towards an impact would be cumulatively considerable. “Cumulatively considerable” means that the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, other current projects, and probable future projects (CEQA Guidelines, Section 15064[h][1]).

According to the SMAQMD CEQA Guide (SMAQMD 2009; last revised in 2019), the SMAQMD “recognizes that although there is no known level of emissions that determines if a single project will substantially impact overall GHG emission levels in the atmosphere, a threshold must be set to trigger a review and assessment of the need to mitigate project GHG emissions. Recommended thresholds were developed to ensure at least 90 percent of new GHG emissions would be reviewed and assessed for mitigation, thereby contributing to GHG emissions reduction goals of AB 32, SB 32, the Scoping Plan, and Executive Orders. Lead agencies shall compare the project’s estimated GHG emissions to SMAQMD’s recommended thresholds of significance for construction of 1,100 metric tons of CO<sub>2</sub>e per year.” Therefore, if construction of the project exceeds the 1,100 metric tons of CO<sub>2</sub>e per year threshold of significance, the projects emissions may have a cumulatively considerable contribution to a significant cumulative environmental impact.

#### **Methods**

Construction emissions associated with development of the Proposed Project were calculated using the Road Construction Emissions Model (RCEM), Version 9.0.0 and the SMAQMD Harborcraft, Dredge and Barge Emission Factor Calculator, Version 1.0 as recommended by SMAQMD for levee projects; model inputs and outputs are shown in Appendix B. Please refer to the discussion under Section 3.3 (“Air Quality”) above for a full explanation of the emissions calculations methods and assumptions.

#### **3.8.2 Discussion**

- a) Construction of the Proposed Project would generate GHG emissions from construction equipment, truck hauling, construction worker trips, and operation of the tugboats and work boats. Construction activity is estimated to occur over a period of approximately 120 days. As shown in **Table 11**, construction activity for the Proposed Project would generate an estimated 636 metric ton (MT) of CO<sub>2</sub>. The Proposed Project would involve erosion control and habitat enhancement and thus would not include operational emissions. Project-



generated annual GHG emissions would not exceed the 1,100 MT CO<sub>2</sub>e threshold and impacts would be **less than significant**.

**Table 11. Estimated construction emissions of greenhouse gases**

Construction Year	Annual Emissions (CO <sub>2</sub> MT/year)
2021	636 <sup>1</sup>
CO <sub>2</sub> = carbon dioxide MT = Metric Tons  Modeled values represent total emissions that would occur over the duration of the construction period. See Appendix B for detail on model inputs, assumptions, and project specific modeling parameters.  <sup>1</sup> Emissions were conservatively based on a 5 month construction schedule.	

- b) The Proposed Project would be consistent with applicable regulations or plans addressing GHG reductions. As discussed in (a) above, the Proposed Project would demonstrate compliance with SMAQMD thresholds for GHG emissions. SMAQMD's recommended thresholds and mitigation measures were developed to show consistency with AB 32, SB 32, and the Scoping Plan. Therefore, the Proposed Project would not conflict with or obstruct implementation of CARB's Scoping Plan for achieving GHG reductions consistent with AB 32 and SB 32 and would achieve reductions consistent with SMAQMD's guidance. This impact would be **less than significant**.

### 3.9 Hazards & Hazardous Materials

Would the project...	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>



Would the project...	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard or excessive noise for people residing or working in the Project area?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
f) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
g) Expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildland fires?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

### 3.9.1 Setting

Hazardous materials and wastes are regulated by federal and state laws and are required to be recycled or properly disposed. Hazardous wastes include waste listed on one of the four Resource Conservation and Recovery Act hazardous wastes lists—the F-list (non-specific source wastes), K-list (source-specific wastes), P-list and U-list (both lists consist of discarded commercial waste products), or that exhibits one of the four characteristics of a hazardous waste—ignitability, corrosivity, reactivity, or toxicity. No hazardous waste sites are listed on the California Department of Toxic Substances Control EnviroStor database (i.e., identifies sites with known contamination or suspected of contamination) as occurring near the Project area (DTSC 2020).

In 2016, Sacramento County partnered with cities within the County to develop a multijurisdictional Local Hazard Mitigation Plan. The Plan assesses natural hazards of concern, evaluates risk life safety, public health and property, and the environment. It also evaluates mitigation measures to reduce these risk and vulnerabilities (Sacramento County 2016). Hazards identified in the Local Hazard Mitigation Plan were related to severe weather, floods, climate change, and subsidence. No contamination sites or other areas with hazardous materials were identified as an issue.

The Proposed Project requires the use of small quantities of hazardous materials, typically in the form of oil, fuel, and lubricants for construction equipment; however, these materials are not acutely hazardous. The potential severity of a hazardous material incident related to these materials depends on the type, location, and quantity of the material released. The greatest potential for risk of public exposure to fuel, oil, lubricant, or waste spills from the Proposed Project would occur during transport given some residences are close to transportation corridors that would be used to deliver materials to the project site.

The Proposed Project is located approximately two miles from Rio Vista Municipal Airport. The airport is located on 273 acres of land and has a 4,200 foot long, 75 foot wide primary runway. There is also a 2,200 foot long, 60 foot wide general aviation runway and helipad. The nearest



school, Isleton Elementary School, is located approximately 0.3 miles from the most upstream portion of Site 3.

The project site is not located in a wildland fire hazard area or a designated California Department of Forestry and Fire Protection area. Further, the multijurisdictional Local Hazard Mitigation Plan (Sacramento County 2016) identified wildfires (including burn area and smoke) in the Project area as unlikely.

### 3.9.2 Discussion

- a, b) Construction activities would involve the use heavy equipment, which would contain fuels, oils, lubricant, solvents and various other products. These materials are not acutely toxic and are commonly used during construction activities. All materials would be used in accordance with applicable federal, state, and local laws, including Cal-OSHA requirements and manufacturer's instructions. Cal-OSHA has adopted regulations for safe workplaces and practices, including the handling and transporting of hazardous materials required for construction activities. Further, much of the access to the project sites would occur from boats and barges on the Sacramento River. Therefore, the Proposed Project would have a **less than significant** impact on the creation of a significant hazard to the public or the environment through the routine transport of disposal materials.
- c) The nearest school, Isleton Elementary School, is located approximately 0.3 miles from the most upstream portion of Site 3. No schools are within one-quarter mile of Sites 1 or 2. Therefore, no hazardous emissions would occur, or hazardous materials, substances, or waste would be handled within one-quarter mile of an existing or proposed school. Therefore, there would be **no impact**.
- d) Based on a search of the State of California EnviroStor database, the Project area is not located on, or near, any federal-, state-, or local-designated hazardous wastes site (DTSC 2020). Therefore, the Proposed Project would have **no impact** on the related safety of people residing or working in the Project area.
- e) The Project area is not located within the vicinity of a private airstrip or an airport land use plan. The nearest airport, Rio Vista Municipal Airport, is located approximately two miles northwest of the project site across the Sacramento River. The project would be located far enough from the airport that it would not create a safety hazard or excessive noise for people residing or working within the Project area. As such, the impacts would be **no impact**.
- f) Access to the project sites would predominantly occur from the Sacramento River. During planting activities, after completion of the rock slope protection and habitat benches, access to the Proposed Project could occur from turnouts on State Route 160. Additionally, some staging activities would occur and a construction trailer would be parked in the public parking lot of the Cliff House Fishing Access Area during some portion of the construction activities. However, staging activities and the construction trailer would not impede access to or from the parking area and State Route 160. These



project-related trips would be temporary, and not substantially hinder the passage of emergency vehicles. Further, the Proposed Project does not include any actions that would impair or physically interfere with the Sacramento County Emergency Operations Plan (Sacramento County 2017) or the implementation of any evacuation plan along State Route 160. Therefore, there would be **no impact**.

- g) The Project area is not located in a wildland fire hazard area or a designated California Department of Forestry and Fire Protection area. Therefore, there would be **no impact**.

### 3.10 Hydrology/Water Quality

Would the project...	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
a) Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or groundwater quality?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
b) Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) Substantially alter the existing drainage pattern of the site or area including through the alteration of the course of a stream or river or through the addition of impervious surfaces in a manner which would:				
i. result in substantial erosion or siltation on- or off site;	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
ii. substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or offsite;	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
iii. create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff; or	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
iv. impede or redirect flood flows?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
d) In flood hazard, tsunami, or seiche zones, risk release of pollutants to project inundation?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
e) Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>



### **3.10.1 Setting**

#### **Surface Water/Storm water**

The project site is located in the lower Sacramento River watershed. The Sacramento River Basin covers 27,210 square miles. The Sacramento River flows along the northern side of the levee where the Proposed Project would be constructed. The Sacramento River's flow is controlled by several reservoirs including Lake Shasta on the Sacramento River, Lake Oroville along the Feather River, and Folsom Lake along the American River. The lower Sacramento River, and the entire Delta, are under the influence of tides which affects water movement in the Project area.

The Sacramento River is generally characterized by good water quality. This is largely due to the overall size of the main channel and snowmelt that serves as a water source to the river. However, as the Sacramento River flows through the Central Valley its water quality degrades due to agricultural return flows and entrainment of fine particulate matter.

The Sacramento River in the Delta provides water for several beneficial uses including: municipal and domestic supply, irrigation, stock watering, process, service supply, contact recreation, other non-contact recreation, warm and cold freshwater habitat, warm and cold migration habitat, warm spawning habitat, wildlife habitat, and navigation (Central Valley Regional Water Quality Control Board 2018).

Despite the Sacramento River providing a number of beneficial uses in the Proposed Project vicinity it has also been classified as impaired by the State Water Resources Control Board (State Water Resources Control Board 2018). The Sacramento River adjacent to the Proposed Project (Delta Waterways: northern portion) is Clean Water Act Section 303(d)-listed for metals (mercury), pesticides (chlordane, chlorpyrifos, DDT, diazinon, dieldrin, group A pesticides, PCBs), miscellaneous (invasive species), and toxicity (unknown toxicity) (State Water Resources Control Board 2018)

Turbidity is also of concern in the project area due to its potential effects on aquatic life. The closest continuous turbidity measurements to the Proposed Project come from the USGS river gauge near Rio Vista which is located approximately four miles southwest of the Proposed Project on the Sacramento River. Continuous turbidity measurements made since 2010 recorded values ranging up to approximately 50 nephelometric turbidity units (NTU) between June and October (i.e., during the period that the Proposed Project may occur; USGS 2020). In the June to October time period between 2010 and 2020 there was one date in late August 2010 when turbidity values measured close to 100 NTU.

The project site is located on the slope of a levee. Storm water in the Project area infiltrates the open fields adjacent to the Proposed Project.

#### **Flooding**

The areas where the Proposed Project would occur are designated "AE" by the Federal Emergency Management Agency (Sacramento County 2016). The designation AE indicates areas at high risk for flooding with an approximately 1 percent chance for annual flooding.



The most severe flood conditions in the Proposed Project area would result when high tide and a large volume of stream outflow occurred simultaneously, and strong winds generate wave action (Sacramento County 2016). Indeed, past flooding in the Proposed Project area has occurred from levee failures caused by the separate or coincidental occurrences of very high tides and high stream flow, as well as unexplained levee failures not related to this phenomenon (Sacramento County 2016). Usually there are approximately eight to twenty hours of notice before levee failure occurs. However, it is possible for a catastrophic levee collapse to occur quickly with little or no warning. This would likely occur when the levee is saturated and the high hydrostatic water pressure on the river side combined with levee erosion from high water flows or some type of levee defect cause an almost instant collapse of the levee (Sacramento County 2016). Areas located near the break would suffer immediate and extensive damage.

### **Groundwater**

The Proposed Project is located within the Solano Subbasin, which lies within the Sacramento Valley Basin. The Solano Subbasin boundaries are defined by Putah Creek on the north, the Sacramento River on the east (from Sacramento to Walnut Grove), the North Mokelumne River on the southeast (from Walnut Grove to the San Joaquin River), the San Joaquin River on the south (from the North Mokelumne River to the Sacramento River). The western subbasin border is defined by the hydrologic divide that separates lands draining to the San Francisco Bay from those draining to the Sacramento-San Joaquin River Delta. That divide is roughly delineated by the English Hills and the Montezuma Hills.

The Solano Subbasin has tectonically subsiding sedimentary deposits and within these deposits fresh groundwater extends to an elevation of -3,000 feet mean sea level. In the area of the Proposed Project there are high water tables, which results in groundwater near the surface. Because of these high water tables, restrictive land use laws, and no future development pressures, the groundwater in the region is not facing the same groundwater declines that other areas in the Solano Subbasin are experiencing (NDGSA 2020).

The California Department of Water Resources has designated the Solano Subbasin as medium priority in accordance with the Sustainable Groundwater Management Act. Because of its medium priority designation, the Solano Subbasin must be managed by a locally-developed groundwater sustainability plan developed by a local groundwater sustainability agency. The Solano Subbasin is managed by the Solano Collaborative Groundwater Sustainability Agency, which is working on developing a groundwater sustainability plan by January 31, 2022.

#### **3.10.2 Discussion**

- a) Construction activities, including site preparation, levee slope and bench construction, Terrabag placement, and plant installation, would have the potential to affect Sacramento River water quality. Site preparation would include vegetation removal and setting up staging areas. Construction of the levee slopes at each of the three locations would require placement of backfill, geogrid material and Terrabags, and planting fill to complete final grade. Work is planned to occur in a single construction period during the seasonally dry period of the year when risk of rainfall and related storm water runoff at the site would be minimal (i.e., between June and October). Most work would also occur



during low tide (AMM 1). Nevertheless, at least a small portion of the levee slope construction work would occur under water (Figure 3–Figure 5).

The above-described construction activities have the potential to result in temporary water quality effects to the following physical or chemical constituents within the Sacramento River: total suspended solids (TSS), turbidity, oil and grease, petroleum hydrocarbons, and trash. Construction-related eroded soil and runoff also may contain organic matter, plant nutrients (nitrogen and phosphorus), and other contaminants such as trace metals and pesticides.

### **Total Suspended Solids and Turbidity**

Direct discharges of soil and suspended sediment to the Sacramento River resulting in increases in TSS and turbidity levels would be the main concern during the construction period, as much of project construction involves working on a levee slope on soils that are highly susceptible to erosion. Vegetation removal, backfill placement, planting fill, Terrabag placement, and installation of plants may all cause temporary increases in TSS and turbidity levels in the Sacramento River as a result in the temporary disturbance of soils. Construction activities would occur over a period of 120 working days (i.e., 8 hours a day for six days a week). The activity with the greatest potential to generate elevated TSS and turbidity is the levee slope work, because some of the work would occur under water. This in-river construction work would occur over a 90 day period (i.e. August 1 to October 31) during the dry season.

As stated above, construction activities would be conducted during the seasonally dry months when storm water runoff would be low or nonexistent. Elevated suspended sediment and turbidity levels would occur only during construction activity, and would decrease back to existing condition levels daily during the nighttime non-construction period. The implementation of appropriate erosion control and pollution prevention BMPs (AMM 3) would avoid and minimize construction-related erosion and potential for TSS and turbidity from the construction work to enter into the Sacramento River. AMM 3 includes active water quality monitoring and implementation of remedial actions if TSS and turbidity reach levels that would exceed established thresholds.

Construction activities would also be conducted in conformance with applicable federal and state regulations pertaining to erosion control, and contaminant spill control and response measures. In particular, the construction work would be subject to authorization under the State Water Resources Control Board NPDES General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (general permit; Order No. 2009-0009-DWQ/NPDES Permit No. CAS000002) (AMM 4). Therefore, BALMD and/or its construction contractor would be required to develop a SWPPP and implement appropriate construction BMPs for all activities that may result in the discharge of construction-related contaminants from disturbed construction areas. Implementation of appropriate erosion control and pollution prevention BMPs would avoid and minimize construction-related erosion and contaminant discharges. In addition to the BMPs, the SWPPP would include BMP inspection and monitoring activities, and identify responsibilities of all parties, contingency measures, agency contacts, and



training requirements and documentation for those personnel responsible for installation, inspection, maintenance, and repair of BMPs.

The initial runoff following construction, or return of seasonal rains to previously disturbed sites, can result in “first flush” runoff events with elevated levels of TSS and turbidity. However, the levee slope would be hydroseeded with native grasses and planted with scrub-shrub (e.g., California fescue, small barley, creeping wildrye, saltgrass, one sided blue grass, Rose, mulefat sandbar willow and coyote brush) for successful habitat vegetation establishment prior to the rainy season. Thus, the levee slope would be substantially stabilized and resistant to mobilization and transport prior to onset of the rainy season.

The purpose of the Proposed Project is to repair areas of levee erosion. By installing stable and effective erosion control methodologies there would be lower potential for TSS and turbidity to enter the Sacramento River relative to existing conditions. Thus, the Proposed Project would not contribute to long-term elevated TSS and turbidity levels in the Sacramento River. Instead, the Proposed Project would lead to long-term improvements (i.e., decreases) in TSS and turbidity due to decreasing erosion on the levee slope in the vicinity of the Proposed Project.

#### **Petroleum Hydrocarbons and Other Construction-Related Contaminants**

The use of motorized equipment on shore and in the river, and storage and handling of fuels and equipment lubricants and fluids may result in petroleum product discharges that could be harmful to water quality if they directly enter the Sacramento River or are spilled on the ground where they may enter the groundwater, or be mobilized and transported in storm water runoff following construction. Other potential construction-related contaminants associated with the equipment used or inadvertently discharged by construction workers may include trash, cleaners, solvents, and human sanitary wastes.

Some construction related-contaminants, such as PAHs that are found in some fuel and oil petroleum byproducts, can bioaccumulate in aquatic and terrestrial organisms. Construction activities may also disturb areas where bioaccumulative constituents included on the state’s Clean Water Act Section 303(d) list are present in the soil (e.g., mercury and pesticides). Bioaccumulation of constituents in the aquatic food chain arises as a result of long-term loading of a constituent or a pervasive and widespread source of constituent discharge. However, as a result of the generally localized disturbances, and intermittent and temporary nature of construction-related activities, construction would not result in contaminant discharges of a substantial magnitude or duration to contribute to long-term bioaccumulation processes, or cause measureable long-term degradation such that existing Section 303(d) impairments would be made discernibly worse.

The potential for direct discharge of equipment- or worker-related contaminants to the Sacramento River from vegetation removal, backfill placement, planting fill, Terrabag placement, and installation of plants is anticipated to be minimal because of implementation of construction BMPs (AMM 3), adherence to the Construction General Permit (AMM 4), and worker training (AMM 2).



Finally, as stated above, construction activities would be conducted during the seasonally dry months when storm water runoff would be low or nonexistent. As such, the potential for indirect discharges of contaminants during the construction period, or via storm water runoff following construction, is considered low.

### Summary

In summary, the risk of direct discharges of construction-related contaminants to water would be very low, site disturbances would be of short duration during a single dry-weather construction season with limited exposure to rainfall and storm water runoff, and implementation of construction BMPs (AMM 3 and AMM 4) and worker training (AMM 2) would further avoid and minimize potential adverse construction-related effects. Additionally, because construction-related disturbances and potential constituent discharges would be temporary, construction activities would not be expected to cause any substantial increase in levels of any bioaccumulative pollutants that would result in measurably higher body burdens of a pollutant in aquatic organisms or wildlife, nor contribute to long-term water quality degradation by measurable levels such that the Clean Water Act Section 303(d)-designated beneficial use impairment for the Sacramento River would be made discernibly worse. Furthermore, the Proposed Project would not be expected to cause constituent discharges of sufficient frequency and magnitude to result in a substantial increase of exceedances of water quality objectives/criteria, nor substantially degrade water quality with respect to constituents of concern, and thus would not adversely affect any beneficial uses in the Sacramento River. In summary, the Proposed Project would not violate water quality standards or waste discharge requirements or otherwise substantially degrade water quality; potential construction-related water quality impacts would be **less than significant**.

- b) The Proposed Project would not involve extraction of groundwater or a change in impervious surface area that would impede groundwater recharge. Therefore, the Proposed Project would have **no impact** on groundwater supplies or recharge, or the sustainable groundwater management of the underlying basin.
- c) The Proposed Project involves rehabilitation of the existing levee and thus could slightly improve the drainage of the site by preventing further erosion of the levee. The Proposed Project would not add any impervious surfaces to the area.
- c-i) As described in detail above in “a” the purpose of the Proposed Project is to repair areas of levee erosion located on the left bank of the Sacramento River. Construction would occur during the dry season so soil erosion would be unlikely to occur from rainfall or storm water runoff events during construction. As described above in “a” AMM 3 and AMM 4 would be in place to prevent construction-generated loose soils from entering the Sacramento River. Thus, substantial erosion or siltation of the area would not occur.

Following completion of construction, the levee would be more stable and the potential for the levee to erode would be much lower than existing conditions. Thus, in the long-term the potential for substantial erosion or siltation to occur would be lower than existing conditions.



As such, the Proposed Project would have a **less than significant** impact on erosion or siltation on or off-site.

- c-ii) As described above in “a,” the Proposed Project would not result in substantial surface runoff. Thus, the project would not result in on- or offsite flooding. Instead, the project would enhance stability of the existing levee structure relative to existing conditions and decrease or prevent potential for erosion and subsequent levee failure. As such, the potential for runoff would be less with the Proposed Project than under existing conditions. Therefore, the Proposed Project would have a **less than significant impact** on the amount of surface runoff from the site which would result in flooding on- or off-site.
- c-iii) As described above in “a,” the Proposed Project would not result in substantial contributions of pollutants to adjacent waters. Also, as described above the project would enhance stability of the existing levee structure relative to existing conditions. As such, the potential for polluted runoff would be less with the Proposed Project than under existing conditions. Therefore, the Proposed Project would have a **less than significant impact** on the capacity of existing or planned storm water drainage systems or additional sources of polluted runoff.
- c-iv) The Proposed Project consists of site preparation, levee slope and bench construction, Terrabag placement, and plant installation. These project components would neither impede nor redirect flood flows. Instead, the Proposed Project would stabilize the levee and reduce the potential for levee failure to occur. This would reduce potential flood risks. Therefore, the Proposed Project would have a **less than significant** impact on flood flows.
- d) The Proposed Project is not located in a region subject to a seiche or tsunami. Therefore, the Proposed Project would have **no impact** on pollutant release due to inundation by seiche or tsunami.

The construction period would fall during the dry season. As described above in the setting, the greatest potential for flooding to occur in the areas is during periods of high river flow. As such, there would be no risk of flooding during the construction period.

In the long-term the rehabilitation of the existing levee would increase flood protections by minimizing the risk of levee failure through prevention of future levee erosion. This would lessen potential hazards associated with a flood. Compared to existing conditions the Proposed Project would result in a lower risk of inundation.

As such, the Proposed Project would have **no impact** on pollutant release due to a flood hazard.

- e) As component of the Proposed Project would be obtaining coverage under the NPDES General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (Order No. 2009-0009-DWQ/NPDES Permit No. CAS000002). The NPDES permit implements federal and state water quality standards, including



provisions of state water quality control plans. Further, to obtain a Section 404 permit from the USACE, the state regional water quality control board would have to issue a Section 401 Water Quality Certification that the project would comply with water quality standards. Thus, the Proposed Project would not conflict with a water quality control plan.

As described above in “b” the Proposed Project would not result in depletion of groundwater or impeded groundwater recharge in the Project area. Thus, the Proposed Project would not conflict with the groundwater management plan currently under development by the Solano Collaborative Groundwater Sustainability Agency.

Therefore, the Proposed Project would have **no impact** with regard to conflicting with or obstructing the implementation of a water quality control plan or sustainable groundwater management plan.

### 3.11 Land Use/Planning

Would the project...	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
a) Physically divide an established community?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

#### 3.11.1 Setting

The zone designation sites 1 and 2 for the Proposed Project under the Sacramento County General Plan are for “Agricultural Cropland.” The zone designation for site 3 is “Urban.” No agricultural production occurs on Sites 1 or 2 where construction activities would occur.

The Proposed Project is located within an area covered by the Delta Plan, a comprehensive, long-term management plan for the Delta required by the 2009 Delta Reform Act. The Delta Reform Act also included the creation of The Delta Stewardship Council, the State agency responsible for developing and implementing the Delta Plan. The Delta Plan was unanimously adopted by the Delta Stewardship Council on May 16, 2013. It was amended in 2016 then again in 2018. The Delta Plan includes a comprehensive, and legally enforceable, sustainable management plan to achieve the coequal goals of providing a more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem. To achieve these coequal goals the Delta Plan states that it is necessary to protect and enhance the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place.

The Delta Plan contains a set of regulatory policies pursuant to California Water Code section 85057.5(b)(5). Actions subject to these policies are called “covered actions.” The Proposed



Project is classified as a “covered action” and was developed to be consistent with the Delta Plan.

The Proposed Project is located in the Primary Zone of the Delta. Thus, it is within the planning area of the Delta Protection Commission. The Delta Protection Act required the Delta Protection Commission to prepare, adopt, and, thereafter review and maintain a comprehensive long-term Resource Management Plan for land uses within the Primary Delta. The goals of the Resource Management Plan are to “protect, maintain, and where possible enhance and restore the overall quality of the Delta environment, including but not limited to agriculture, wildlife habitat, and recreational activities; assure orderly, balanced conservation and development of Delta land resources and improve flood protection by structural and nonstructural means to ensure an increased level of public health and safety.” The Proposed Project was also developed to be consistent with the Delta Protection Commission’s Resource Management Plan.

### 3.11.2 Discussion

- a) The Proposed Project consists of temporary construction activities over the course of approximately four and a half months. Two of the three sites are located in areas used for agricultural cropland. The other erosion repair site is located on land that is designated as urban. The Proposed Project would not change the land use, it would only improve the current levee that is currently in place at all sites. As such, no local communities would be divided as a result of the Proposed Project. Therefore, the Proposed Project would have **no impact** on an established community.
- b) The Proposed Project would not conflict with any goals or policies in the *Sacramento County General Plan* (Sacramento County 2011) or *Isleton General Plan* (City of Isleton 2000). The Proposed Project would not conflict with the Delta Plan or the Delta Protection Commission’s Resource Management Plan. The Proposed Project is located within lands zones for agricultural cropland and urban areas. No land use designation changes are proposed. Therefore, the Proposed Project would have **no impact** due to a conflict with any applicable land use plans, policies, or regulations adopted for the purpose of avoiding or mitigation environmental effects.

### 3.12 Mineral Resources

Would the project...	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
a) 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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>



### 3.12.1 Setting

No significant mineral resources are found in much of the Delta. The City of Isleton and Sacramento County General Plans indicate no known mineral resources within the Proposed Project area (City of Isleton 2000, Sacramento County 2011).

### 3.12.2 Discussion

- a,b) There are no known mineral resources in the Proposed Project area. Thus, the construction activity would not result in the removal of any mineral resources. Therefore, the Proposed Project would have **no impact** on the availability of mineral resources.

### 3.13 Noise

Would the project result in:	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
a) Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Generation of excessive groundborne vibration or groundborne noise levels?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
c) For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the Project area to excessive noise levels?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

### 3.13.1 Setting

#### Overview of Sound Measurement

Sound is a vibratory disturbance created by a moving or vibrating source, which is capable of being detected by the hearing organs (e.g., the human ear). Noise is defined as sound that is loud, unpleasant, unexpected, or undesired and may therefore be classified as a more specific group of sounds. The effects of noise on people can include general annoyance, interference with speech communication, sleep disturbance, and, in the extreme, hearing impairment (CalTrans 2013a).

Noise levels are commonly measured in decibels (dB) using the A-weighted sound pressure level (dBA). The A-weighting scale is an adjustment to the actual sound pressure levels so that they are consistent with the human hearing response, which is most sensitive to frequencies around 4,000 Hertz (Hz) and less sensitive to frequencies around and below 100 Hz (Kinsler, et al. 1999). Decibels are measured on a logarithmic scale that quantifies sound intensity in a manner similar to the Richter scale used to measure earthquake magnitudes. A doubling of the energy of



a noise source, such as a doubling of traffic volume, would increase the noise level by 3 dB; similarly, dividing the energy in half would result in a decrease of 3 dB (Crocker 2007).

Human perception of noise has no simple correlation with sound energy: the perception of sound is not linear in terms of dBA or in terms of sound energy. Two sources do not “sound twice as loud” as one source. It is widely accepted that the average healthy ear can barely perceive an increase (or decrease) of up to 3 dBA in noise levels (i.e., twice [or half] the sound energy); that a change of 5 dBA is readily perceptible (8 times the sound energy); and that an increase (or decrease) of 10 dBA sounds twice (or half) as loud (10.5 times the sound energy) (Crocker 2007).

Sound changes in both level and frequency spectrum as it travels from the source to the receiver. The most obvious change is the decrease in sound level as the distance from the source increases. The manner by which noise reduces with distance depends on factors such as the type of sources (e.g., point or line), the path the sound will travel, site conditions, and obstructions. Noise levels from a point source (e.g., construction, industrial machinery, ventilation units) typically attenuate, or drop off, at a rate of 6 dBA per doubling of distance. Noise from a line source (e.g., roadway, pipeline, railroad) typically attenuates at about 3 dBA per doubling of distance (CalTrans 2013a).

Noise levels may also be reduced by intervening structures; the amount of attenuation provided by this “shielding” depends on the size of the object and the frequencies of the noise levels. Natural terrain features, such as hills and dense woods, and man-made features, such as buildings and walls, can significantly alter noise levels. Generally, any large structure blocking the line of sight will provide at least a 5-dBA reduction in source noise levels at the receiver (Federal Highway Administration 2011). Structures can substantially reduce occupants’ exposure to noise as well. The Federal Highway Administration’s guidelines indicate that modern building construction generally provides an exterior-to-interior noise level reduction of 20 to 35 dBA with closed windows.

The impact of noise is not a function of sound level alone. The time of day when noise occurs and the duration of the noise are also important. Most noise that lasts for more than a few seconds is variable in its intensity. Consequently, a variety of noise descriptors have been developed. One of the most frequently used noise metrics is the equivalent noise level (Leq); it considers both duration and sound power level. Leq is defined as the single steady A-weighted level equivalent to the same amount of energy as that contained in the actual fluctuating levels over a period of time. Typically, Leq is summed over a one-hour period. Lmax is the highest root mean squared (RMS) sound pressure level within the sampling period.

Noise that occurs at night tends to be more disturbing than that occurring during the day. Community noise is usually measured using Day-Night Average Level (Ldn or DNL), which is the 24-hour average noise level with a +10 dBA penalty for noise occurring during nighttime hours (10:00 p.m. to 7:00 a.m.). Community noise can also be measured using Community Noise Equivalent Level (CNEL), which is the 24-hour average noise level with a +5 dBA penalty for noise occurring from 7:00 p.m. to 10:00 p.m. and a +10 dBA penalty for noise occurring from 10:00 p.m. to 7:00 a.m. (CalTrans 2013a). Noise levels described by Ldn and CNEL usually



differ by about 1 dBA. Quiet suburban areas typically have CNEL noise levels in the range of 40 to 50 dBA, while areas near arterial streets are in the 50 to 60+ dBA CNEL range.

## Vibration

Groundborne vibration of concern in environmental analysis consists of the oscillatory waves that move from a source through the ground to adjacent structures. The number of cycles per second of oscillation makes up the vibration frequency, described in terms of hertz (Hz). The frequency of a vibrating object describes how rapidly it oscillates. The normal frequency range of most groundborne vibration that can be felt by the human body is from a low of less than 1 Hz up to a high of about 200 Hz (Crocker 2007).

While people have varying sensitivities to vibrations at different frequencies, in general they are most sensitive to low-frequency vibration. Vibration in buildings, such as from nearby construction activities, may cause windows, items on shelves, and pictures on walls to rattle. Vibration of building components can also take the form of an audible low-frequency rumbling noise, referred to as groundborne noise. Groundborne noise may result in adverse effects, such as building damage, when the originating vibration spectrum is dominated by frequencies in the upper end of the range (60 to 200 Hz). The primary concern from vibration is that it can be intrusive and annoying to building occupants and vibration-sensitive land uses.

Vibration amplitudes are usually expressed in peak particle velocity (PPV) or root mean square vibration velocity. Particle velocity is the velocity at which the ground moves. The PPV and root mean square velocity are normally described in inches per second (in/sec). PPV is defined as the greatest magnitude of particle velocity associated with a vibration event.

## Regulatory Setting

Chapter 6.68 of the Sacramento County Code exempts construction noise associated with the repair, remodeling, demolition, paving or grading of any property between the hours of 6:00 AM and 8:00 PM on weekdays and between 7:00 AM and 8:00 PM on Saturday and Sunday. Construction noise would be a significant impact if it occurred outside of these hours.

The County does not have standards for vibration. CalTrans has published applicable guidelines for vibration annoyance caused by transient and intermittent sources, as shown in **Table 12**.

**Table 12. CalTrans criteria for vibration annoyance**

Human Response	Maximum PPV (in/sec)	
	Transient Sources <sup>1</sup>	Continuous/Frequent Intermittent Sources <sup>1</sup>
Barely perceptible	0.04	0.01
Distinctly perceptible	0.25	0.04
Strongly perceptible	0.9	0.10
Severe	2.0	0.4
<sup>1</sup> CalTrans defines transient sources as those that create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent intermittent sources can include impact pile drivers, pogo-stick compactors, crack-and-seat equipment,		



Human Response	Maximum PPV (in/sec)	
	Transient Sources <sup>1</sup>	Continuous/Frequent Intermittent Sources <sup>1</sup>
vibratory pile drivers, and vibratory compaction equipment. Source: CalTrans 2013b		

In addition, CalTrans has published its own guidelines for structural damage from vibration, as shown in **Table 13**.

**Table 13. CalTrans criteria for vibration damage**

Structure and Condition	Maximum PPV (in/sec)	
	Transient Sources	Continuous/Frequent Intermittent Sources
Extremely fragile historic buildings, ruins, ancient monuments	0.12	0.08
Fragile buildings	0.2	0.1
Historic and some old buildings	0.5	0.25
Older residential structures	0.5	0.3
New residential structures	1.0	0.5
Modern industrial/commercial buildings	2.0	0.5
Source: CalTrans 2013b		

### Sensitive Receptors

Noise exposure goals for various types of land uses reflect the varying noise sensitivities associated with each of these uses. Typically, noise sensitive land uses include single family residential, multiple family residential, churches, hospitals and similar health care institutions, convalescent homes, libraries, and school classroom areas. Noise sensitive receptors closest to the project site include a mobile home park approximately 85 feet south of the project site, single family residences approximately 125 feet south of the project site, residences across the river approximately 600 feet north of the project site, and residences in the Vieira's Resort area approximately 1,000 feet east of the project site. Additional sensitive receptors in the project vicinity include single family residences in Isleton and Isleton Elementary School located approximately 1,000 feet southeast of the project site.

#### 3.13.2 Discussion

- a) The Proposed Project would generate temporary construction noise that would exceed existing ambient noise levels in the project vicinity. In order to determine existing noise levels, one 15-minute noise measurement was recorded approximately 50 feet from the project site using an ANSI Type II integrating sound level meter on December 5, 2017. The noise measurement was taken on State Route 160 near single family residences from 12:16 to 12:31 p.m. approximately 20 feet from the centerline of State Route 160. The noise level along the roadway was measured at approximately 68 dBA  $L_{eq}$ .



Noise impacts associated with construction activity are a function of the noise generated by construction equipment, the location and sensitivity of nearby land uses, and the timing and duration of the noise-generating activities. Project construction is anticipated to be completed over 120 days anytime between June 15, 2021 and December 30, 2021. Work would generally occur Monday through Saturday from 7:00 a.m. to 7:00 p.m. and limited to daylight hours. In addition, all construction equipment would have sound-control devices and no equipment would be unmuffled. The nearest noise sensitive receptors, mobile homes, are located approximately 85 feet south of the project site. All staging areas would be located over 500 feet from nearby receptors.

Construction noise was estimated using the Federal Highway Administration Roadway Construction Noise Model (RCNM). RCNM predicts construction noise levels for a variety of construction operations based on empirical data and the application of acoustical propagation formulas. RCNM provides reference noise levels for standard construction equipment, with an attenuation of 6 dBA per doubling of distance for stationary equipment and 3 dBA per doubling of distance for mobile equipment. The model does not take into consideration topographic variation of the area; as such, it provides more conservative results. Noise was modeled based on the type of equipment to be used in each phase of construction, as included in Table 13, and the distance to nearby receptors. Using RCNM, construction noise levels were estimated for the nearest noise sensitive receptor approximately 85 feet from construction activity.

**Table 14** shows the maximum expected noise levels at the nearest sensitive receptor based on the combined construction equipment anticipated to be used concurrently during each phase of construction as modeled in RCNM.

As shown in Table 14, construction noise could reach as high as 109 dBA Leq at the nearest sensitive receptor. This exceeds the County of Sacramento daytime and nighttime exterior noise standards in residential areas of 55 dBA Leq and 50 dBA Leq respectively. However, construction would occur from 7:00 a.m. to 7:00 p.m. Monday through Saturday and would be compliant with Chapter 6.68 of the Sacramento County Code which exempts construction noise between the hours of 6:00 AM and 8:00 PM on weekdays and between 7:00 AM and 8:00 PM on Saturday and Sunday. In addition, all construction equipment would be equipped with sound control devices and no equipment would have unmuffled exhaust systems. However, construction noise during site preparation, specifically from the wood chipper, could disturb nearby residents and impacts would be considered potentially significant. With implementation of Mitigation Measure NZ-1, this impact would be less than significant.



**Table 14. Construction noise levels by phase**

Construction Phase	Equipment <sup>1</sup>	Construction Noise Level (dBA L <sub>eq</sub> ) at 85 feet
Mobilization	Pickup Truck, Flatbed Truck	69
Site Preparation	Flail Mower, Wood Chipper, Haul Truck, Chainsaw (2)	109
Levee Slope and Bench Construction and Encroachment	2,000 ton barge (non-motorized) (2), Derrick Barge (non-motorized) (2), work boat (2), excavator, conveyor with generator, front-end loader, tug boat (2), Vibratory Pile Driver	90
"Terra" Bag Placement	Forklift (2), dump truck, boom truck, plate compactor	82
Installation of Plants	Work boat, hydroseeding truck, water truck	73
Site Demobilization	Pickup Truck	66
<sup>1</sup> Only equipment that would result in temporary construction noise is shown See Appendix E for RCNM modeling results		

#### **MITIGATION MEASURE NZ-1. MINIMIZE WOOD CHIPPER-RELATED NOISE.**

To reduce wood chipper noise-related impacts to occupants of nearby noise sensitive land uses, the wood chipper used during the site preparation phase shall include one or more of the following noise reduction measures by design:

- Selection of low noise components, e.g. engine;
- Optimization of the knife mounting configuration to reduce noise;
- Selection of a low noise exhaust system; and/or
- Use of low-noise operating mode.

- b) The use of heavy construction equipment can generate substantial vibration near the source. Construction activity associated with the Proposed Project would be a temporary source of groundborne vibration in the project vicinity. Similar to construction noise, vibration levels would be variable depending on the type of construction project and related equipment use. Typical project construction activities may also generate substantial vibration in the immediate vicinity, typically within 25 feet of the equipment.

Vibratory construction equipment used during project construction would include loaded trucks, plate compactor, vibratory pile driver, and wood chipper. Loaded trucks have a vibration level of 0.076 PPV at 25 feet (FTA 2018). A plate compactor and wood chipper are anticipated to have vibration levels similar to a small bulldozer and would have a



vibration level of 0.003 PPV at 25 feet. A vibratory pile driver would be the largest source of vibration at the site with a vibration level of 0.644 PPV at 25 feet. At 85 feet, the distance to the nearest noise sensitive receptors, vibration levels from the vibratory roller on the project site would be 0.168 PPV and vibration from the loaded truck would be 0.012 PPV. The project vibration level of 0.168 PPV from the vibratory pile drive would exceed the distinctly perceptible threshold for humans of 0.04 PPV, but remain below the threshold for building damage of 0.25 PPV, because there are no fragile buildings within 85 feet of the project site (CalTrans 2013b). Project construction would occur during daytime hours of 7:00 a.m. to 7:00 p.m., in accordance with the Sacramento Municipal Code and would not occur when people are sleeping. Further, there would be a period of time in between installation of each of the five piles when no noise was being generated and pile driving would not occur. Pile driver vibration would be temporary occurring for only one day to install five piles.

The project vibration level of 0.012 PPV from loaded trucks would not exceed the distinctly perceptible threshold for humans or the threshold for damage to extremely fragile buildings (CalTrans 2013b). Vibration from other construction equipment, including the plate compactor and wood chipper, would not be perceptible because of the distance to the nearest receivers. The Proposed Project would not involve long-term use of any equipment or processes that would result in potentially substantial levels of ground vibration.

Based on the above discussion, building damage and human disturbance from use of the pile driver during construction and impacts from other construction equipment would be **less than significant**.

- c) The nearest airport to the project site, Rio Vista Airport, is located approximately two miles northwest. The construction areas for the Proposed Project are not located in the airport's noise contours and the Proposed Project would not subject people to excessive noise levels (Environmental Science Associates 2018). Therefore, there would be **no impact**.

### 3.14 Population/Housing

Would the project...	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
a) Induce substantial unplanned population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>



### 3.14.1 Setting

Sites 1 and 2 are zoned for agricultural cropland. Site 3 is in an area that is zoned urban. Discussion

- a, b) The Proposed Project would not include construction of new housing or commercial businesses. Construction would be short-term and would not result in construction employees relocating to the project vicinity. No additional permanent staff would be needed for project operation. The Proposed Project would not remove any homes or result in displacement of people. Therefore, the Proposed Project would have **no impact** on population growth, displacement of existing housing, or displacement of people.

### 3.15 Public Services

Would the project...	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
a) Result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:				
i) Fire protection?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
ii) Police protection?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
iii) Schools?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
iv) Parks?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
v) Other public facilities?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

### 3.15.1 Setting

The project site is located in the jurisdiction of the River Delta Fire District. The Isleton Fire Department also serves the area and has mutual aid agreements with the River Delta Fire District. Law enforcement services for the Project area are provided by the Isleton Police Department and Sacramento County Sheriff's Department. The nearest school is the Isleton Elementary School located approximately 0.3 miles from the most upstream portion of Site 3.

### 3.15.2 Discussion

- a) The Proposed Project involves temporary construction activity on a relatively small area of public lands, which would not directly or indirectly affect existing public services, nor



require alteration or provision of additional public services. Clearing and grubbing may necessitate one-way traffic control (i.e., reduction to one lane) on State Route 160, during non-commuter hours, for approximately 16 working days at the beginning of project construction. Emergency vehicles would still be able to travel on State Route 160 and their response times would not be affected.

Therefore, the Proposed Project would have **a less than significant** impact on fire and police protection services, schools, parks, or other public facilities.

### 3.16 Recreation

Would the project...	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
a) Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
b) Include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

#### 3.16.1 Setting

The Proposed Project area is located on levees that do not typically receive much, if any public access. One of the proposed staging areas is located at the Cliffhouse Fishing Access Parking lot. There are no boat launches at the Cliffhouse Fish Access area, but people do utilize the area for parking to access fishing spots along the Sacramento River. Fishing, pleasure boating, and watersports are known to occur in the Sacramento River adjacent to the proposed levee work.

#### 3.16.2 Discussion

- a,b) The Proposed Project involves temporary construction activity on a relatively small area of levees. Although a small area of the Cliffhouse Fishing Access Parking lot may be used as part of the construction equipment staging area this would not impact recreational activities. There is no boat launch area at the Cliffhouse Fish Access Parking area and the staging area would only use a small area of the parking lot. Because a majority of the parking in the parking lot would continue to be available, people would be able to continue to utilize the Cliffhouse Fish Access area throughout the duration of the construction period.

During construction, recreational activities may be temporarily affected near the construction sites due to the presence of barges on the Sacramento River. Construction machinery may interfere with fishing opportunities by generating noise and their general presence in the river. The construction area is relatively small, and there would be sufficient fishing areas nearby that could continue to be utilized for fishing during the temporary construction period. This potential temporary impact on recreational activities



from construction would not necessitate the construction or expansion of recreational facilities.

The Proposed Project would have a **less than significant impact** on the physical deterioration of existing neighborhood or regional parks or other recreational facilities, or the need for the construction or expansion of recreational facilities.

### 3.17 Transportation

Would the project...	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
a) Conflict with a program plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle, and pedestrian facilities?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Would the project conflict or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b)?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
c) Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
d) Result in inadequate emergency access?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

#### 3.17.1 Setting

The Sacramento County General Plan Circulation Element provides the framework for Sacramento County decisions relating the transportation system and the transportation vision for the County. The Circulation Element includes goals, policies, and implementation programs to guide transportation in the County.

State Route 160 runs parallel to the project site along the levee and is the main access to the project site. State Route 160 is a two-lane road that connects Sacramento and Antioch.

#### 3.17.2 Discussion

- a) The Proposed Project would not result in changes to the transportation system infrastructure within the project site or result in additional traffic from long-term operation. The Proposed Project would not cause measurable changes in long-term traffic volumes or circulation patterns in the project vicinity. Therefore, the Proposed Project would not conflict with a transportation plan or policy or effect transit, bicycle, or pedestrian facilities. There would be **no impact**.
- b) The Proposed Project would not result in an increase in operational vehicle trips; therefore, there would be no increase in vehicle miles traveled from project operation. The Proposed Project would result in temporary increases in construction-related traffic on State Route 160 and State Route 84 for construction of the erosion control measures and hauling material to the project site. Construction staging and stockpiling of all



materials for the Proposed Project would occur at the four staging areas near the project site to reduce construction VMT. Project construction vehicle trips were provided by the project applicant and would result in at most 32 daily round trips during the grading/excavation phase. Construction VMT is temporary and occur over approximately 120 days. Therefore, construction would not constitute significant VMT. The Proposed Project would be consistent with CEQA Guidelines Section 15064.3 and impacts would be **less than significant**.

- c,d) The Proposed Project would not result in changes to the transportation system infrastructure within the Proposed Project area. The Proposed Project would not result in additional traffic from long-term operation or physical changes to area roadways. Therefore, the Proposed Project would not cause hazards due to a design feature or measurable changes to circulation patterns.

Worker parking during project construction would occur off State Route 160 or Highway 84, west of the project site, at one of the four construction staging areas as shown in Figure 2. Work requiring one-way traffic control on State Route 160 would be limited to non-commuting hours to reduce congestion on the roadway. One-way traffic control would reduce the potential for roadway hazards. Therefore, project parking during construction would not result in safety, emergency access, or other traffic issues. The Proposed Project would not result in inadequate emergency access or increase hazards due to a design feature. Impacts would be **less than significant**.

### 3.18 Tribal Cultural Resources

Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
a) Listed or eligible for listing on the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code Section 5020.1(k), or	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resources Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



### 3.18.1 Setting

As of July 1, 2015, California Assembly Bill 52 of 2014 (AB 52) was enacted and expands CEQA by defining a new resource category, “tribal cultural resources.” Assembly Bill 52 establishes that “A project with an effect that may cause a substantial adverse change in the significance of a tribal cultural resource is a project that may have a significant effect on the environment” (PRC Section 21084.2). It further states that the lead agency shall establish measures to avoid impacts that would alter the significant characteristics of a tribal cultural resource, when feasible (PRC Section 21084.3).

To initiate the AB 52 consultation process, tribes must submit a written request to a lead agency to be informed through formal notification of proposed projects in the geographic area that is traditionally and culturally affiliated with the tribe (PRC Section 21080.3.1[b]).

No tribes have submitted AB 52 notices to BALMD requesting consultation on new projects, therefore no AB 52 consultation was completed. Nevertheless, informal outreach letters were sent on December 8, 2017 to 10 Native American contacts to inquire about cultural resources in the area.

### 3.18.2 Discussion

a,b) The Proposed Project is not known to contain any Native American resources eligible for listing in the CRHR or local register nor does it contain any resources determined by the lead agency to be significant tribal cultural resources. However, construction activities have the potential to encounter buried archaeological resources that could be considered tribal cultural resources if they are of Native American origin. Buried tribal cultural resources may include but are not limited to deposits of stone, bone and shell artifacts, dark gray “midden” sediments, or cemeteries. Therefore, the impact is considered potentially significant. Implementation of Mitigation Measure CULT-1 would reduce impacts to tribal cultural resources to a **less than significant** level.

#### **MITIGATION MEASURE TCR-1. ACCIDENTAL DISCOVERY OF TRIBAL CULTURAL RESOURCES.**

If any resources of Native American origin are discovered once ground-disturbing activities are underway, the BALMD shall contact local Native Americans to consult on the find. If the find is determined to be a tribal cultural resource, contingency funding and a time allotment to allow for implementation of avoidance measures or appropriate mitigation determined in consultation with local Native Americans shall be made available. Work may continue on other parts of the project site while tribal cultural resource mitigation takes place on-site.



### 3.19 Utilities/Service Systems

Would the project...	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
a) Require or result in the relocation or construction of new or expanded water, wastewater treatment, or storm water drainage, electric power, natural gas, or telecommunication facilities, the construction or relocation of which could cause significant environmental effects?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry, and multiple dry years?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the providers existing commitments?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d) Generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
e) Comply with federal, state, and local management and reduction statutes and regulations related to solid waste?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

#### 3.19.1 Setting

The Proposed Project would not generate wastewater or require the use of any wastewater treatment facility or storm water drainage facility. The nearest solid waste disposal transfer station is the Keller Canyon Landfill in Pittsburgh, CA approximately 26 miles southwest of the project site. Dutra Decker Island where planting medium would come from and where unwanted soils would be disposed of is approximately nine NM from the Proposed Project area.

#### 3.19.2 Discussion

- a) The Proposed Project does not involve any changes to wastewater, storm water drainage, electrical power, natural gas, or telecommunication services in the Proposed Project area, or involve any changes in wastewater disposal activities. Further, the Proposed Project would not generate wastewater that would require a wastewater treatment facility or involve any changes in wastewater disposal activities. Therefore, the Proposed Project would have **no impact** on the need for new or expanded water or wastewater treatment plant, storm water drainage, electrical power, natural gas, or telecommunication facilities.
- b) The Proposed Project would not create the need for an increased water supply. Therefore, the Proposed Project would have **no impact** on the need for new or expanded water supplies to serve the project.



- c) As described above in “b,” the Proposed Project does require water service, thus the project would not involve any changes to wastewater services in the Proposed Project area. Therefore, there would be **no impact** on wastewater treatment plant capacity.
- d,e) As an initial step to preparing the levee slope for construction activities, any trash would be removed from the waterside levee slope and hauled to an appropriate refuse disposal site (the Keller Canyon Landfill in Pittsburgh, CA is the closet site). Invasive vegetation that is removed for site preparation would also be trucked to the Keller Canyon Landfill or other appropriate disposal site. Some waste would also be generated during the placement of planting medium. To ensure a clean source of soil, the first six inches of soil material that contains unwanted seed material would be stripped and stockpiled for disposal on Decker Island, as needed. In addition to any trash or refuse produced by construction personnel, the disposal of any solid wastes would comply with applicable federal, state, or local regulations for solid waste disposal. The Proposed Project would not impair the attainment of solid waste reduction goals. Therefore, this impact would be **less than significant** on compliance with statutes and regulations related to solid waste.

### 3.20 Wildfire

If located in or near state responsibility areas or lands classified as very high fire hazard severity zones, would the project ...	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
a) Substantially impair an adopted emergency response plan or emergency evacuation plan?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
b) Due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
c) Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d) Expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

#### 3.20.1 Setting

In California wildfire protection jurisdictions are separated and overseen by local, state, or federal governments. The majority of Sacramento County is considered to be Local Responsibility Areas. CalFire is the state agency responsible for providing fire protection on all State Responsibility Area lands. The State Responsibility Area closest to the Proposed Project area is in the eastern part of the county in the Sierra Nevada foothills and is categorized as moderate for fire hazard severity (CalFire 2007). This area is more than 30 miles from the



Proposed Project site. In 2008 CalFire also provided hazard severity zones for Local Responsibility Areas. There are no “Very High Fire Hazard Severity Zones” in or near the Proposed Project site (CalFire 2008).

As described above in Section 3.9, Hazards and Hazardous Materials, the project site is not located in a wildland fire hazard area or a designated California Department of Forestry and Fire Protection area. Further, the multijurisdictional Local Hazard Mitigation Plan (Sacramento County 2016) identified wildfires (including burn area and smoke) in the Proposed Project area as unlikely.

Sacramento County has developed a Community Wildfire Protection Plan (Sacramento County 2014). This plan includes measures to reduce wildfire risks and addresses emergency response and emergency operations.

### 3.20.2 Discussion

- a) As described above in Section 3.17, Transportation, the temporary construction-related trips for the Proposed Project would not substantially affect the capacity or congestion patterns on affected roads. Emergency access would continue to be provided via State Route 160 throughout the entire duration of the construction period. Although construction work would limit Highway to one lane for 16 days, emergency access would not be affected. As such the Proposed Project would not interfere with *The Sacramento County Community Wildfire Protection Plan* (2014) emergency response plan, or any other emergency response or emergency evacuation plan. Therefore, there would be a **less than significant** impact on an adopted emergency response plan or emergency evacuation plan.
- b) There are some tall grasses and shrubs on some of the areas of the Proposed Project and machinery and vehicles working in these areas have potential to generate sparks that temporarily increase fire risk. Construction vehicles would be equipped with fire extinguishers to address any possibility of a small fire that could be ignited by construction activities. The Proposed Project will stabilize the existing slope of the levee in the long-term. Having a more stable slope than existing conditions would not pose any increased wildfire risk. Thus, there would be a **less than significant** impact on exacerbating wildfire risks and thereby, would not expose project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire.
- c) The purpose of the Proposed Project is to stabilize the existing levee to prevent future erosions. This would reduce the potential for future maintenance activities. The Proposed Project does not require installation or maintenance of associated infrastructure such as roads, fuel breaks, emergency water sources, etc. As such, there would be **no impact** on exacerbating wildfire risk or resulting in temporary or ongoing impacts to the environment.
- d) The Proposed Project would improve the existing drainage pattern of the site by stabilizing the levee and reducing erosion of the levee slope. The Proposed Project would not impact people or structures. Thus, the Proposed Project would have a **less than**



**significant** impact on risks to people or structures as a result of runoff, post-fire slope instability, or drainage changes.

### 3.21 Mandatory Findings of Significance

Does the project...	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
a) Does the project have 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 a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
b) Does the project have impacts that are individually limited, but cumulatively considerable? (“Cumulatively considerable” means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
c) Does the project have environmental effects that would cause substantial adverse effects on human beings, either directly or indirectly?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

#### 3.21.1 Discussion

- a) With respect to terrestrial wildlife and aquatic life resources in the Proposed Project area, as discussed in Section 3.4, Biological Resources, implementation of the Proposed Project has the potential to result in temporary construction-related disturbance to potential habitats in the Proposed Project area, and wildlife and aquatic life species, if present during the time of construction. However, feasible project-specific mitigation measures are identified to minimize and avoid the potential adverse effects.

Permanent effects of the Proposed Project include levee stabilization to prevent future erosion and aquatic and riparian habitat creation. This would benefit terrestrial and aquatic biological resources relative to Existing Conditions. Consequently, with the implementation of the mitigation measures identified herein, the Proposed Project would not 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, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory. Therefore, this impact is considered **less than significant**.



- b) Cumulative environmental effects are multiple individual effects that, when considered together, would be considerable or compound or increase other environmental impacts. Individual effects may result from a single project or a number of separate projects and may occur at the same place and point in time or at different locations and over extended periods of time. The Proposed Project would result in stabilization of the levee bank along the Sacramento River and enhance fisheries habitat in the highly channelized river.

Potential impacts associated with construction of the Proposed Project would be less than significant, short-term, and localized, and would not combine in such a way that a significant cumulative effect could occur. In addition, as described in Section 2, Project Description, the project includes avoidance and minimization measures that would avoid or minimize potential contribution to cumulative environmental impacts. Further, levee stabilization and habitat enhancement would cause the Proposed Project area to mimic a more natural habitat relative to existing conditions. This permanent effect would improve natural ecological functions in the Proposed Project area. As such, the Proposed Project does not have impacts that are individually limited, but cumulatively considerable and this impact would be **less than significant**.

- c) Based on the nature and scope of the project and the analysis herein, the Proposed Project would not result in any direct or indirect substantial adverse effects on human beings. The Proposed Project would result in temporary impacts to human health during project implementation, including changes to air quality as a result of ozone precursors and PM10 emissions (discussed in Section 3.3, Air Quality) and exposure of persons to noise impacts from construction equipment (discussed in Section 3.12, Noise). All the identified potential impacts to human beings would be temporary and have a low potential for occurring. Each of the impacts that may cause adverse effects on human beings have been evaluated and found to be less than significant. No substantial adverse effects on human beings would occur; the impact would be **less than significant**.



## 4 LIST OF PREPARERS

### **Robertson-Bryan, Inc.**

Keith Whitener.....Senior Scientist  
Michelle Brown ..... Associate Engineer  
Ellen Preece .....Project Scientist III

### **Rincon Consultants, Inc.**

Matt Maddox, MESM, AICP.....Principal  
Kari Zajac, MESM..... Project Manager  
Bill Vosti, MESM.....Senior Environmental Planner  
Hannah Hass .....Archaeologist  
Craig Lawrence..... Senior Biologist/Regulatory Specialist  
Elizabeth Wilson.....Associate Biologist  
Allysen Valencia..... GIS Analyst



## 5 REFERENCES

- Abel, K.W., and J.T. Duffy-Anderson. 2005. *A synthesis of impacts of piers on juvenile fishes and selected invertebrates in the lower Hudson River*. Institute of Marine and Coastal Sciences. Contribution #2005-13. August 2005.
- Association of Environmental Professions (AEP). 2016. *Beyond Newhall and 2020: A Field Guide to New CEQA Greenhouse Gas Thresholds and Climate Action Plan Targets in California*. Accessed November 2017. Available: <https://www.califaep.org/climate-change>.
- Balazik, M.T., K.J. Reine, A.J. Spells, C.A. Fredrickson, M.L. Fine, G.C. Garman and S.P. McIninch. 2012. *The Potential for Vessel Interactions with Adult Atlantic Sturgeon in the James River, Virginia*. North American Journal of Fisheries Management 32: 1062–1069.
- Barbour, M. T., J. Gerritsen, B. D. Snyder, and J. B. Stribling. 1999. *Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates and Fish*. Second edition. EPA 841-B099-002. U.S. Environmental Protection Agency, Office of Water. Washington, DC
- Baxter, C. V., K. D. Fausch, and C. Saunders. 2005. *Tangled Webs: Reciprocal Flows of Invertebrate Prey Link Streams and Riparian Zones*. Freshwater Biology 50:201–220.
- Bay Area Air Quality Management District (BAAQMD). 2017. *CEQA Air Quality Guidelines*. May. [https://www.baaqmd.gov/~media/files/planning-and-research/ceqa/ceqa\\_guidelines\\_may2017-pdf?la=en](https://www.baaqmd.gov/~media/files/planning-and-research/ceqa/ceqa_guidelines_may2017-pdf?la=en) (accessed April 2020).
- Bloch, P., M. Celedonia, R. Tabor. 2009. *Do Bridges Affect Migrating Juvenile Salmon: Tracking Juvenile Salmon and Predator Fish Movements and Habitat Use Near the SR 520 Bridge in Lake Washington*. Ecological Considerations for Bridges. Session 212: ICOET 2009 Proceedings. 299–316.
- Bolster, Betsy C. 2005. *Lasiurus blossevillei - Western Red Bat: Species Account*. Western Bat Working Group Species Accounts Updated at the 2005 Portland Meeting. <http://relicensing.pcwa.net/documents/Library/PCWA-L%20545.pdf>
- Boussard, A. 1981. *The Reactions of Roach (Rutilus rutilus) and Rudd (Scardinius erythrophthalmus) to Noises Produced by High Speed Boating*. Pages 188–200 in Proceedings of 2nd British Freshwater Fisheries Conference, Southampton.
- Busby, P.J., T.C. Wainwright, G.J. Bryant, L.J. Lierheimer, R.S. Waples, F.W. Waknitz and I.V. Lagomarsino. 1996. *Status Review of West Coast Steelhead from Washington, Idaho, Oregon and California*. U.S. Department of Commerce, NOAA. NMFS\_NWFSC-27. 261 pp.
- Calflora. 2009. *Information on wild California plants for conservation, education, and appreciation*. Berkeley, CA. Updated online and accessed via: <http://www.calflora.org/>.



- CARB (California Air Resources Board). 2005. *Air Quality and Land Use Handbook: A Community Health Perspective*. <https://www.arb.ca.gov/ch/handbook.pdf>
- . 2020. *Top 4 Measurements and Days Above the Standard*. Accessed: March 2020. Available: <https://www.arb.ca.gov/adam/topfour/topfour1.php>
- California Department of Conservation. 2020. *Alquist-Priolo earthquake fault zones*. Accessed March 31, 2020 from <https://www.conservation.ca.gov/cgs/alquist-priolo>.
- California Department of Fish and Game. 2010. *Western River Lamprey (Lampetra ayresi)*. Available: <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=104364>.
- California Department of Fish and Wildlife (CDFW). 1998. *Report to the Fish and Game Commission: Report to the Fish and Game Commission: A Status Review of the Spring-Run Chinook Salmon (Oncorhynchus tshawytscha) in the Sacramento River Drainage*. Candidate Species Status Report 98-01. Sacramento, CA: Department of Fish and Game.
- . 2015. 2014 Sturgeon Fishing Report Card: Preliminary Data Report. February 10, 2015. Available From: <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=93524>
- . 2017a. *California Natural Diversity Database, Rareind V*. Accessed September, 2017.
- . 2017b. *Special Animals List. Biogeographic Data Branch, California Natural Diversity Database*. December 2017.
- . 2017c. *Biogeographic Information and Observation System (BIOS)*. Retrieved December, 2017 from <http://bios.dfg.ca.gov>
- . 2017d. *Special Vascular Plants, Bryophytes, and Lichens List. Biogeographic Data Branch, California Natural Diversity Database*. December 2017.
- California Department of Toxic Substances Control (DTSC). 2020. *Hazardous Waste and Substances Sites List*. Accessed December 2020. Available from: <https://www.envirostor.dtsc.ca.gov/public/map/?myaddress=isleton>
- California Department of Transportation (Caltrans). 2013a. *Technical Noise Supplement to the Traffic Noise Analysis Protocol. (CT-HWANP-RT-13-069.25.2)*. September. Available at: [http://www.dot.ca.gov/hq/env/noise/pub/TeNS\\_Sept\\_2013B.pdf](http://www.dot.ca.gov/hq/env/noise/pub/TeNS_Sept_2013B.pdf)
- . 2013b. *Transportation and Construction Vibration Guidance Manual (CT-HWANP-RT-13-069.25.3)*. September. Available at: [http://www.dot.ca.gov/hq/env/noise/pub/TCVGM\\_Sep13\\_FINAL.pdf](http://www.dot.ca.gov/hq/env/noise/pub/TCVGM_Sep13_FINAL.pdf)
- . 2015. *Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish*. November.
- California Environmental Protection Agency. 2006 (March). *Climate Action Team Report to Governor Schwarzenegger and the Legislature*. Available: [https://www.climatechange.ca.gov/climate\\_action\\_team/reports/#2006](https://www.climatechange.ca.gov/climate_action_team/reports/#2006).



CFTS California Fish Tracking Database. 2015. Available from:  
<http://californiafishtracking.ucdavis.edu/default.shtml>

California Geological Survey. 2002. *California's Geomorphic Provinces*. Note 36.

———. 2010a. *Fault Activity Map of California*. Accessed April 3, 2020. Available from:  
<https://maps.conservation.ca.gov/cgs/fam/>

———. 2010b. *Fault Activity Map Information Pamphlet*. Accessed April 3, 2020. Available from: [http://www.conservation.ca.gov/cgs/cgs\\_history/Documents/FAM\\_phamplet.pdf](http://www.conservation.ca.gov/cgs/cgs_history/Documents/FAM_phamplet.pdf)

California Native Plant Society, Rare Plant Program. 2017. *Inventory of Rare and Endangered Plants of California (online edition, v8-03 0.39)*. Website <http://www.rareplants.cnps.org> [accessed 27 December 2017].

———. 2020. *Inventory of Rare and Endangered Plants of California (online edition, v8-03 0.39)*. Website <http://www.rareplants.cnps.org> [accessed April 2020].

CalTrans. 2015. *Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish*. November.

Central Valley Regional Water Quality Control Board. 2018. *Water Quality Control Plan (Basin Plan) for Sacramento River Basin and San Joaquin River Basin*. Revised May 2018 (with Approved Amendments). Rancho Cordova, CA. Available:  
<[https://www.waterboards.ca.gov/centralvalley/water\\_issues/basin\\_plans/#basinplans](https://www.waterboards.ca.gov/centralvalley/water_issues/basin_plans/#basinplans)>.

City of Isleton. 2000. *General Plan: Part III the Environmental Setting*.

Crocker, Malcolm J. Crocker (Editor). 2007. *Handbook of Noise and Vibration Control Book*, ISBN: 978-0-471-39599-7, Wiley-VCH, October.

Dahm, C., W. Kimmerer, J. Korman, P. B. Moyle, G. T. Ruggerone, C.A. Simenstad. 2019. *Developing Biological Goals for the Bay-Delta Plan: Concepts and Ideas from an Independent Scientific Advisory Panel*. A Final Report to the Delta Science Program. April.

Dauble, D.D., T.L. Page, R. W. Hanf. 1989. *Spatial distribution of juvenile salmonids in the hanford reach, Columbia River*. Fishery Bulletin, U.S. 87: 775-790.

Duffy-Anderson, J.T., and K.W. Able. 1999. *Effects of municipal piers on the growth of juvenile fishes in the Hudson River estuary: a study across a pier edge*. Marine Biology. 133: 409-418.

Duffy-Anderson, J.T., and K.W. Able. 2001. *An assessment of the feeding success of young-of-the-year winter flounder (*Pseudopleuronectes americanus*) near a municipal pier in the Hudson River estuary*. U.S.A. Estuaries. 24(3): 430-440.

Emmett, R.L., S.L. Stone, S.A. Hinton, and M.E. Monaco. 1991. *Distribution and Abundance of Fishes and Invertebrates in West Coast Estuaries, Volume II: Species Life Histories*



*Summaries*. ELMR Report No. 8. NOAA/NOS Strategic Environmental Assessments Division. Rockville, MD.

- Environmental Science Associates. 2018. *Rio Vista Airport Land Use Compatibility Plan*. Adopted May 10, 2018. Prepared for Solano County Airport Land Use Commission. <http://www.solanocounty.com/civicax/filebank/blobdload.aspx?blobid=29620>
- EPIC (Environmental Protection Information Center), Center for Biological Diversity, Waterkeepers Northern California, Petitioners. 2001. *Petition to List the North American Green Sturgeon (Acipenser Medirostris) as an Endangered or Threatened Species Under the Endangered Species Act*.
- Erickson, D.L. and J.E. Hightower. 2002. *Movement and Habitat Use of Green Sturgeon Acipenser medirostris in the Rogue River, Oregon, USA*. Journal of Applied Ichthyology 18:565-569.
- Federal Transit Administration. 2018. *Transit Noise and Vibration Impact Assessment Manual*. September 2018. FTA Report No. 0123.
- Fisher, F.W. 1994. *Past and present status of Central Valley Chinook salmon*. Conservation Biology. 8(3):870-873.
- Good, T. P., R. S. Waples, and P. Adams. 2005. *Updated Status of Federally Listed ESUs of West Coast Salmon and Steelhead*. U.S. Dept. of Commerce, NOAA Technical Memorandum NMFS-NWFSC-66, 598 p.
- Hallock, R. J. 1983. *Effects of Red Bluff Diversion Dam on Chinook Salmon Fingerlings*. California Department of Fish and Game. Anadromous Fish Branch Office Report. 8 p.
- Halstead, B.J., Wylie, G.D., Casazza, M.L. 2010. *Habitat suitability and conservation of the giant garter snake (Thamnophis gigas) in the Sacramento Valley of California*. Copeia 4: 591–599.
- Hanni, J., B. Poytress, and H. Blaylock-Herod. 2006. *Spatial and Temporal Distribution Patterns of Pacific and River Lamprey in the Sacramento and San Joaquin Rivers and Delta*. American Fisheries Society, 40th annual meeting of the American Fisheries Society California-Nevada Chapter. 3/30-4/1/2006. San Luis Obispo, CA.
- Hatin, D., S. Lachance, and D. Fournier. 2007. *Effect of dredged sediment deposition on use by Atlantic sturgeon and lake sturgeon at an open-water disposal site in the St. Lawrence Estuarine Transition Zone*. American Fisheries Society Symposium. 56: 235-255.
- Health and Safety Executive. 2008. *Noise emissions and exposure from mobile woodchippers*. Health and Safety Laboratory. Accessed November 2017. Available: <http://www.hse.gov.uk/research/rrpdf/rr618.pdf>
- Helfman, G. S. 1981. *The advantage to fishes of hovering in shade*. Copeia (2): 392–400.



- Hellmair, M., Peterson, M., Mulvey, B., Young, K., Montgomery, J., Fuller, A., 2018. *Physical Characteristics Influencing Nearshore Habitat Use by Juvenile Chinook Salmon in the Sacramento River, California*. North American Journal of Fisheries Management. Available: <https://doi.org/10.1002/nafm.10201>
- Holland, D.C. 1994. *The western pond turtle: habitat and history*. U.S. Department of Energy, Bonneville Power Administration, Portland, Oregon. 11 chapters + appendices.
- Intergovernmental Panel on Climate Change (IPCC). 2007. *Summary for Policymakers*. In: *Climate Change 2007: The Physical Science Basis*. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY
- IEPMAS [Interagency Ecological Program, Management, Analysis, and Synthesis Team. 2015. *An updated conceptual model of Delta Smelt biology: our evolving understanding of an estuarine fish*. Technical Report 90, January 2015. Available from: [http://www.fws.gov/sfbaydelta/documents/Delta\\_Smelt\\_MAST\\_Synthesis\\_Report\\_January\\_2015.pdf](http://www.fws.gov/sfbaydelta/documents/Delta_Smelt_MAST_Synthesis_Report_January_2015.pdf) 2015
- Israel, J., A. Drauch, and M. Gingras. 2009. *Life History Conceptual Model for White Sturgeon (Acipenser transmontanus)*.
- Kemp, P.S., Gessel, M.H., and Williams, J.G. 2005. *Seaward migrating subyearling chinook salmon avoid overhead cover*. Journal of Fish Biology 67(5), 1381–1391.
- Kinsler, Lawrence E. and R. Frey, Austin and B. Coppers, Alan and V. Sanders, James. 1999. *Fundamentals of Acoustics, 4th Edition*. ISBN 0-471-84789-5. Wiley-VCH, December 1999.
- Klapproth, J.C., Johnson, J.E. 2009. *Understanding the science behind riparian forest buffers: Effects on water quality*. Produced by Communications and Marketing, College of Agriculture and Life Sciences, Virginia Polytechnic Institute and State University. Publication 420-151.
- Knudson, F.R., P.S. Enger, and O. Sand. 1994. *Avoidance responses to low frequency sound in downstream migrating Atlantic salmon smolt, Salmo salar*. Journal of Fish Biology. 45: 227–233.
- Lange, M. 1999. *Abundance and Diversity of Fish in Relation to Littoral and Shoreline Features*. Thesis. The University of Guelph.
- Lehman, B.M., M.P. Gary, N.J. Demetras, and C.J. Michel. 2019. *Where predators and prey meet: Anthropogenic contact points between fishes in a freshwater estuary*. San Francisco Estuary and Watershed Science. <https://doi.org/10.15447/sfews>. 2019v17iss4art3.



- Lovell, J.M., M.M. Findlay, R.M. Moate, J.R. Nedwell, and M.A. Pegg. 2005. *The Inner Ear Morphology and Hearing Abilities of the Paddlefish (Polyodon spathula) and the Lake Sturgeon (Acipenser fulvescens)*. Comparative Biochemistry and Physiology Part A: Molecular Integrative Physiology. 142: 286-289.
- Lufkin, A. 1991. *California's Salmon and Steelhead: the Struggle to Restore an Imperiled Resource*. University of California Press, Berkeley.
- McEwan, D., and T. Jackson. 1996. *Steelhead Restoration and Management Plan for California*. Sacramento, CA: California Department of Fish and Game.
- McLain, J.S., G.C. Castillo. 2009. *Nearshore Areas Used by Chinook Salmon Fry, Oncorhynchus tshawytscha, in the Northwestern Sacramento-San Joaquin Delta, California*. San Francisco Estuary & Watershed Science. December:1–12.
- McNair, N.N. 2015. *An Analysis of Juvenile Chinook Salmon (Oncorhynchus tshawytscha) Outmigration Speed and Survival in Response to Habitat Features: Sacramento River from Knights Landing to Sacramento, California*. Master's Thesis, University of San Francisco.
- Merz JE, Hamilton S, Bergman PS, Cavallo B. 2011. *Spatial perspective for Delta Smelt; a summary of contemporary survey data*. Cal Fish Game 97(4): 164-189.
- Meyer, M., A.N. Popper, R.R. Fay. 2012. *Coding of Sound Direction in the Auditory Periphery of the Lake Sturgeon, Acipenser fulvescens*. Journal of Neurophysiology 107: 658-665.
- Miller, E.A., G.P. Singer, M.L. Peterson, E.D. Chapman, M. E. Johnston, M.J. Thomas, R.D. Batteson, M. Gingras, A. P. Klimley. 2020. *Spatio-Temporal Distribution of Green Sturgeon (Acipenser medirostris) and White Sturgeon (A. transmontanus) in the San Francisco Estuary and Sacramento River California*. Environ. Biol. Fish. <https://doi.org/10.1007/s10641-020-00972-x>.
- Miranda, L.E., and K.J. Killgore. 2013. *Entrainment of shovelnose sturgeon by towboat navigation in the upper Mississippi River*. USGS Staff -- Published Research. Paper 737. Available from: <http://digitalcommons.unl.edu/usgsstaffpub/737>.
- Moyle P.B., R.M. Yoshiyama, J.E. Williams, and E.D. Wikramanayake. 1995 (June). *Fish Species of Special Concern in California, Second Edition*. California Department of Fish and Game, Inland Fisheries Division, Rancho Cordova. Final Report for Contract No. 2128F.
- Moyle, P.B. 2002. *Inland Fishes of California*. Berkeley, CA: University of California Press.
- Moyle, P.B., P.K. Crain, and K. Whitener. 2007. *Patterns in the use of a restored California floodplain by native and alien fishes*. San Francisco Estuary and Watershed Science. 5(3).
- Moyle, P.B., R. M. Quiñones, J. V. Katz and J. Weaver. 2015. *Fish Species of Special Concern in California. Sacramento: California Department of Fish and Wildlife*. [www.wildlife.ca.gov](http://www.wildlife.ca.gov)



- Moyle, P.B., Brown, L.R., Durand, J.R., Hobbs, J.A. 2016. Delta Smelt: Life History and Decline of a Once-Abundance Species in the San Francisco Estuary. San Francisco Estuary & Watershed Science. 14(2)6: doi: <http://dx.doi.org/10.15447/sfew.2016v14iss2art6>.
- Munsch, S.H., J.R. Cordell, J.D. Toft and E.E. Morgan. 2014. *Effects of Seawalls and Piers on Fish Assemblages and Juvenile Salmon Feeding Behavior*. North American Journal of Fisheries Management. 34: 814–827.
- NMFS (National Marine Fisheries Service). 2011. *5-Year Review: Summary and Evaluation of Sacramento River Winter-run Chinook Salmon ESU*. August 2011. Southwest Region. Long Beach, CA. 38pp.
- \_\_\_\_\_. 2013. *Final biological opinion on issuance of LOA and U.S. Navy activities in the Gulf of Alaska temporary maritime training area 2013-2016*. Endangered Species Act Section 7 (a)(2) Biological Opinion.
- \_\_\_\_\_. 2014. *Recovery Plan for the Evolutionary Significant Units of Sacramento River Winter-Run Chinook Salmon and Central Valley Spring-Run Chinook Salmon and the Distinct Population Segment of California Central Valley Steelhead*. California Central Valley Area Office. July 2014.
- \_\_\_\_\_. 2016a. California Central Valley Recovery Domain. *5-Year Review: Summary and Evaluation. California Central Valley Steelhead Distinct Population Segment*. West Coast Region.
- \_\_\_\_\_. 2016b. California Central Valley Recovery Domain. *5-Year Review: Summary and Evaluation of Central Valley Spring-run Chinook Salmon Evolutionary Significant Unit*. West Coast Region. April.
- \_\_\_\_\_. 2018. *Recovery Plan for the Southern Distinct Population Segment of North American Green Sturgeon (Acipenser medirostris)*. West Coast Region. August.
- Nobriga, M. L., Feyrer, F. 2007. *Shallow-water piscivore-prey dynamics in the Sacramento-San Joaquin Delta*. San Francisco Estuary and Watershed Science 5: <http://repositories.cdlib.org/jmie/sfew/vol5/iss2/art4>.
- Northern Delta GSA. 2020. *Northern Delta GSA*. Accessed April 3, 2020 from <https://www.ndgsa.org/basin-boundary-modification>.
- Office of Environmental Health Hazard Assessment. 2012 (August). *Air Toxics Hot Spots Program Risk Assessment Guidelines: Technical Support Document for Exposure Assessment and Stochastic Analysis*. Accessed November 2017. Available: [http://oehha.ca.gov/air/hot\\_spots/SRP/index.html](http://oehha.ca.gov/air/hot_spots/SRP/index.html)
- Pierson, E.O., W.E. Rainey, and C. Corben. 2006. *Distribution and Status of Western Red Bats (Lasiurus blossevillii) in California*. Calif. Dept. Fish and Game, Habitat Conservation



- Planning Branch, Species Conservation and Recovery Program Report 2006-04.*  
Sacramento, CA 45 pp.
- Popper, A.N. 2005. August. *A Review of Hearing by Sturgeon and Lamprey*. Submitted to the U.S. Army Corps of Engineers, Portland District.
- Popper, A. N. and M.C. Hastings. 2009. *Effects of Anthropogenic Sources of Sound on Fishes*. J. Fish Biol. 75:455-498.
- Popper, A.N., Hawkins, A.D., Halvorsen, M.B. 2019. *Anthropogenic sound and fishes*. Washington State Department of Transportation. Research Report Agreement Y-11761, Task AD WA-RD 891.1. February.
- Purser J., and A.N. Radford. 2011. *Acoustic Noise Induces Attention Shifts and Reduces Foraging Performance in Three-Spined Sticklebacks (Gasterosteus aculeatus)*. PLoS ONE 6(2): e17478. doi: 10.1371/journal.pone.0017478
- Reynolds, F. L., R. L. Reavis, and J. Schuler. 1990. *Central Valley Salmon and Steelhead Restoration and Enhancement*. Sacramento, CA: California Department of Fish and Game.
- Rosenfield, J.A. 2010. *Life History Conceptual Model and Sub-Models for Longfin Smelt, San Francisco Estuary Population*. Delta Regional Ecosystem Restoration Implementation Plan. May.
- Sacramento County. 2011. *Sacramento County General Plan of 2005–2030*. Community Planning & Development Department.
- . 2014. *Sacramento Metropolitan Fire District Community Wildfire Protection Plan*. June.
- . 2016. *Local Hazard Mitigation Plan Update. Delta Annex — City of Isleton*. December.
- . 2017. *Emergency Operations Plan*. Version 1.0. April
- . 2017 Sacramento County Code. Accessed March 2020. Available: <http://qcode.us/codes/sacramentocounty/>
- Sacramento Metropolitan Air Quality Management District (SMAQMD). 2009. *Guide to Air Quality Assessment in Sacramento County. Thresholds of Significance Table Last updated: May 2015*. Accessed March 2020. Available: <http://www.airquality.org/businesses/ceqa-land-use-planning/ceqa-guidance-tools>
- . 2017. *Air Quality and Health*. Accessed March 2020. Available: <http://www.airquality.org/air-quality-health>.
- Sarkar, S.D., Naskar, M, Gogoi, P, Raman, R.K., Manna, R.K., Samanta, S., Mohanty, B.P., Das, B.K. 2019. *Impact Assessment of Barge Trafficking on Phytoplankton Abundance and*



- Chl a* concentration, in River Ganga, India. PlosOne.  
<https://doi.org/10.1371/journal.pone.0221451>
- Scholik, A. R. and H. Y. Yan. 2002. *Effect of boat engine noise on the auditory sensitivity of the fathead minnow, Pimephales promelas*. Env. Biol. Fish. 63: 203-209.
- Sigler, J.W., T.C. Bjornn, and F.H. Everest. 1984. *Effects of Chronic Turbidity On Density and Growth of Steelhead and Coho Salmon*. Transactions of the American Fisheries Society 113: 142-150.
- Sommer, T., Mejia, F.H., Nobriga, M.L., Feyer, F., and Grimaldo, L. 2011. *The spawning migration of delta smelt in the upper San Francisco Estuary*. San Francisco Estuary and Watershed Science, John Muir Institute of the Environment, UC Davis. June. 2011.
- Snider, B. and R. Titus. 1996. *Fish Community Survey, Lower American River, January through June 1995*. California Department of Fish and Game, Environmental Services Division, Stream Flow Habitat Evaluation Program Report.
- State Water Resources Control Board. 2018 (December). *Water Quality Control Plan for the San Francisco Bay/Sacramento San Joaquin Delta Estuary*. Sacramento, CA.
- Stuber, R.J., G. Gebhart, and O.E. Maughan. 1982. *Habitat suitability index models: largemouth bass*. U.S. Fish and Wildlife Service, Western Energy and Land Use Team, Office of Biological Services, Washington, D.C.
- United States Department of Agricultural, Natural Resources Conservation Service. 2017a. *Web Soil Survey*. Accessed December 21, 2017. Soil Survey Area: Sacramento County, California. Soil Survey Data: Version 16, Sep 26, 2017.  
<http://websoilsurvey.nrcs.usda.gov/>.
- \_\_\_\_\_. 2017b. State Soil Data Access (SDA) Hydric Soils List: California. *National Cooperative Soil Survey, U.S. Department of Agriculture*.  
[https://www.nrcs.usda.gov/Internet/FSE\\_DOCUMENTS/nrcseprd1316619.html](https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcseprd1316619.html).
- U.S. Department of the Interior and Bureau of Ocean Energy Management. 2012. December. *Effects of noise on fish, fisheries, and invertebrates in the U.S. Atlantic and Arctic from energy industry sound-generating activities*.
- USEPA (United States Environmental Protection Agency). 2018. *Criteria Air Pollutants*. Available: <<https://www.epa.gov/criteria-air-pollutants>>. Accessed September 2018.
- United States Fish and Wildlife Service. 1973. *The Endangered Species Act of 1973, as amended (16 U.S.C 1531 et seq.)*.
- \_\_\_\_\_. 1995. *Working paper on restoration needs: habitat restoration actions to double natural production of anadromous fish in the Central Valley of California*. Volume 2. May 9, 1995. Prepared for the U.S. Fish and Wildlife Service under the direction of the Anadromous Fish Restoration Program Core Group. Stockton, California. 293 p.
- \_\_\_\_\_. 1999. *Draft Recovery Plan for the Giant Garter Snake*. Available online at:  
[http://ecos.fws.gov/docs/recovery\\_plan/990702b.pdf](http://ecos.fws.gov/docs/recovery_plan/990702b.pdf).



- \_\_\_\_\_. 2000b. *Guidelines for Conducting and Reporting Botanical Inventories for Federally Listed, Proposed, and Candidate Plants*. January 2000.
- \_\_\_\_\_. 2008. *Biological Opinion on the Coordinated Operations of the Central Valley Project and State Water Project in California*. December 15, 2008. Sacramento, CA.
- \_\_\_\_\_. 2012. *Species Account, Longfin Smelt *Spirinchus thaleichthys**.
- \_\_\_\_\_. 2017a. *Federal Endangered and Threatened Species that Occur in or may be Affected by Projects in the Counties and/or USGS 7 1/2 Minute Quads you requested*. Available at: [http://www.fws.gov/sacramento/es/spp\\_lists/auto\\_list.cfm](http://www.fws.gov/sacramento/es/spp_lists/auto_list.cfm)
- \_\_\_\_\_. 2017b. *Critical Habitat Portal*. Available at: <http://criticalhabitat.fws.gov>
- \_\_\_\_\_. 2017c. *National Wetlands Inventory*. Available at: <https://www.fws.gov/wetlands/>
- \_\_\_\_\_. 2019. *Biological Opinion for the Reinitiaion of Consultation on the Coordinated Operations of the Central Valley Project and State Water Project*. October.
- \_\_\_\_\_. 2020. *Information for Planning and Consultation Online Project Planning Tool*. Available at: <https://ecos.fws.gov/ipac/>.
- Unruh, J.R., Hitchcok, C.S. 2009. *Characterization of Potential Seismic Sources in the Sacramento-San Joaquin Delta, California*. Final Technical Report for the U.S. Geological Survey National Earthquake Hazards Reduction Program.
- Vermont Fish and Wildlife Department. 2002. *Guidelines for Protection and Management of Impacts to Great Blue Heron Rookeries in Vermont*.
- Von Geldern, C.E., Jr. and Mitchell, D. 1975. *Largemouth bass and threadfin shad in California*. Pages 426-449. In R.H. Stroud and H. Clepper, ed. *Black bass biology and management*. Sport Fishing Institute, Washington D.C.
- Water Education Foundation. 2020. *Sacramento-San Joaquin Delta Levees*. Accessed April 2, 2020 from <https://www.watereducation.org/aquapedia/sacramento-san-joaquin-delta-levees>.
- Wang, J.C.S. 2007. *Spawning, Early Life Stages, and Early Life Histories of the Osmerids Found in the Sacramento-San Joaquin Delta of California*. Tracy Fish Facility Studies Volume 38.
- Werner, I., T. B. Smith, J. Feliciano, and M. L. Johnson. 2005. *Heat Shock Proteins in Juvenile Steelhead Reflect Thermal Conditions in the Navarro River Watershed, California*. Transactions of the American Fisheries Society 134:399–410.
- Wolter, C. and R. Arlinghaus. 2003. *Navigational impacts on freshwater fish assemblages: the ecological relevance of swimming performance*. Res. Fish. Biol. and Fisheries 13: 63-89.
- Wong, I.G., P. Thomas, J.R. Unruh, K.L. Hanson, and R.R. Youngs. 2010. *Quantifying the Earthquake Threat in the Sacramento-San Joaquin Delta, California: How Bad Can it*



*Get? Conference Paper. Third Conference on Earthquake Hazards in the Eastern San Francisco Bay Area.* California Geological Survey Publication 219.

Yolo-Solano Air Quality Management District (YSAQMD). 2007. *Handbook for Assessing and Mitigating Air Quality Impacts*. July 11, 2007. <http://www.ysaqmd.org/wp-content/uploads/Planning/CEQAHandbook2007.pdf> (accessed April 2020).

Yoshiyama, R. M., E. R. Gerstung, F. W. Fisher, and P. B. Moyle. 1996. *Historical and Present Distribution of Chinook Salmon in the Central Valley Drainage of California*. In: Sierra Nevada Ecosystem Project: Final Report to Congress, Volume III, Assessments, Commissioned Reports, and Background Information. University of California, Davis, Centers for Water and Wildland Resources.

Zanjac, D., S.H. Kramer, N. Nur, and P.A. Nelson. 2012. *Holding behavior of Chinook salmon (*Oncorhynchus tshawytscha*) and steelhead (*O. mykiss*) smolts, as influenced by habitat features of levee banks, in the highly modified lower Sacramento River, California*. *Environmental Biology and Fisheries*. 96: 245-256.

Zeug, S.C., Beakes, M., Wiesenfeld, J., Greenwood, M., Grimaldo, L., Hassrick, J., Collins, A., Acuna, S., Johnston, M. 2020. *Experimental Quantification of Piscivore Density and Habitat Effects on Survival of Juvenile Chinook Salmon in a Tidal Freshwater Estuary*. *Estuaries and Coasts*. <https://doi.org/10.1007/s12237-020-00836-8>.

Zhu, Y., W. C. Hinds, S. Kim, S. Shen, and Sioutas, C. 2002. *Study of Ultrafine Particles Near a Major Highway with Heavy-duty Diesel Traffic*. 36:4323–4335.



**Appendix A**

**Proposed Project Engineering Drawings**



# BRANNAN-ANDRUS LEVEE MAINTENANCE DISTRICT

SACRAMENTO COUNTY, CALIFORNIA

## SACRAMENTO RIVER EROSION CONTROL/HABITAT ENHANCEMENT PROJECT

SITE 1: RM 14.60L [STA 321+00] TO RM RM15.18L[STA 292+00]

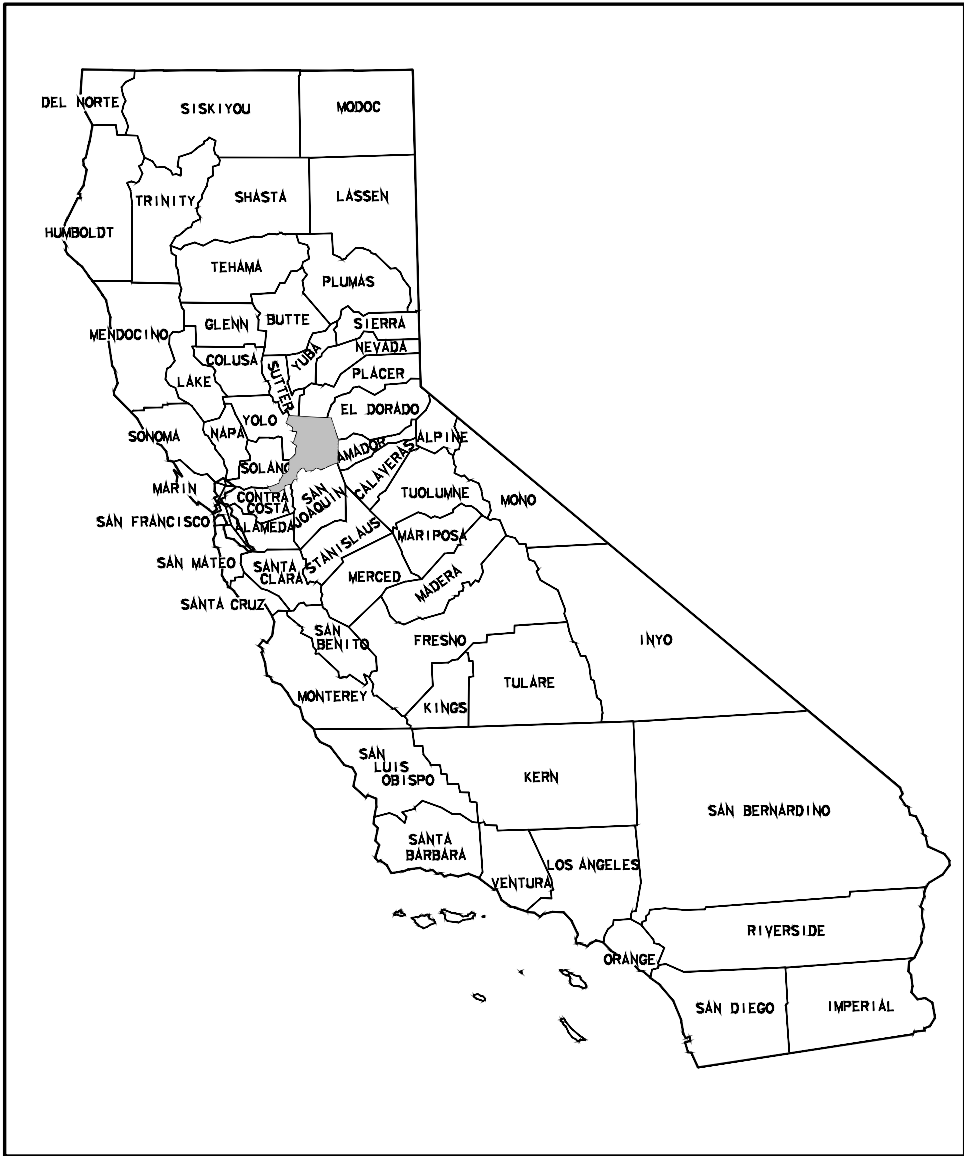
SITE 2: RM 16.36L [STA 230+00] TO RM 17.00L[STA 197+30]

SITE 3: RM 17.13L [STA 189+00] TO RM 17.34L [STA 179+00]

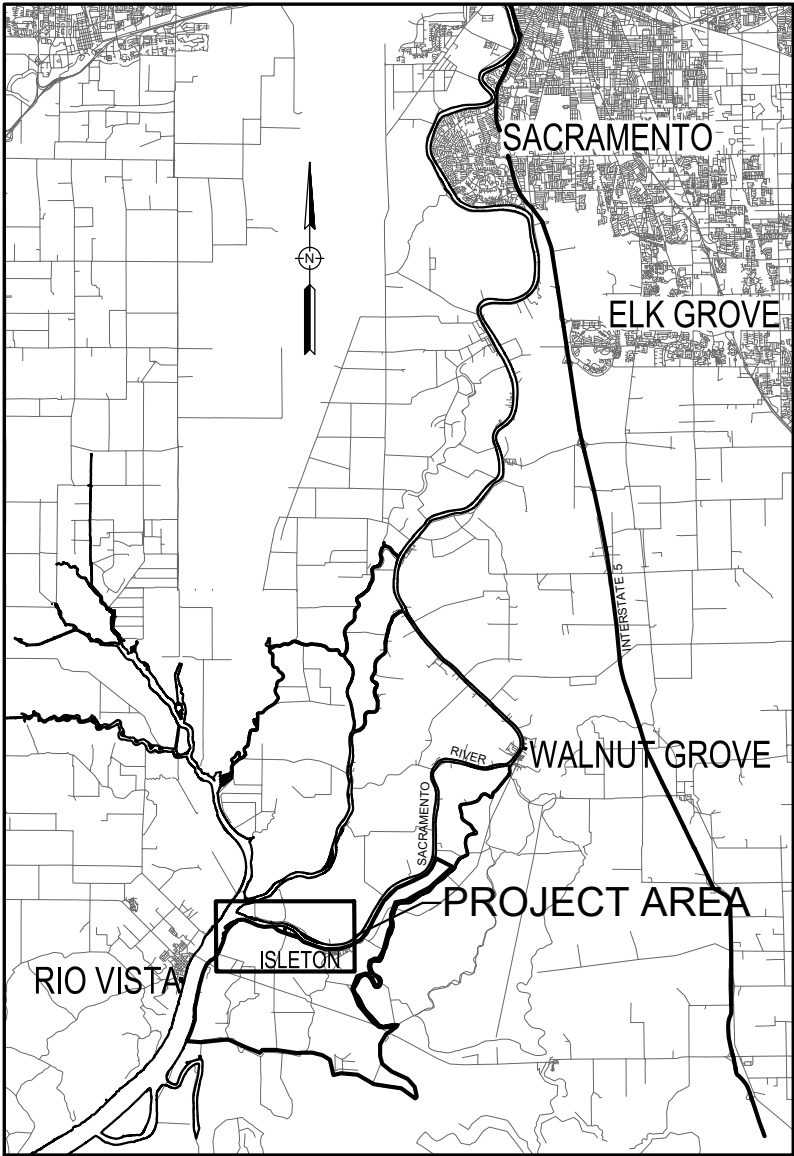
### DRAWING INDEX

C1.0	COVER SHEET
C1.1	SITE LOCATIONS
C1.2	STAGING AREAS
C2.0	GENERAL NOTES AND SPECS
C2.1	TREE PROTECTION DETAIL
C3.0	RIPARIAN AND WETLANDS TYPICAL SECTION
C3.1	WETLANDS TYPICAL SECTION
C3.2	RIPARIAN TYPICAL SECTION
C3.3	RIPARIAN AND WETLANDS TYPICAL PROFILE ELEVATION
C4.0	SITE 1 STA 312+00 TO STA 321+00 PLAN & PROFILE
C4.1	SITE 1 STA 303+00 TO STA 312+00 PLAN & PROFILE
C4.2	SITE 1 STA 294+00 TO STA 303+00 PLAN & PROFILE
C4.3	SITE 1 STA 292+00 TO STA 294+00 PLAN & PROFILE
C4.4	SITE 1 CROSS SECTIONS STA 315+00 AND STA 320+00
C4.5	SITE 1 CROSS SECTIONS STA 309+00 AND STA 312+00
C4.6	SITE 1 CROSS SECTIONS STA 303+00 AND STA 306+00
C4.7	SITE 1 CROSS SECTIONS STA 296+00 AND STA 299+00
C4.8	SITE 1 CROSS SECTION STA 293+00
C5.0	SITE 2 STA 222+00 TO STA 230+00 PLAN & PROFILE
C5.1	SITE 2 STA 214+00 TO STA 222+00 PLAN & PROFILE
C5.2	SITE 2 STA 206+00 TO STA 214+00 PLAN & PROFILE
C5.3	SITE 2 STA 197+00+00 TO STA 206+00 PLAN & PROFILE
C5.4	SITE 2 CROSS SECTIONS STA 224+00 AND STA 229+00
C5.5	SITE 2 CROSS SECTIONS STA 216+00 AND STA 220+00
C5.6	SITE 2 CROSS SECTIONS STA 209+00 AND STA 213+00
C5.7	SITE 2 CROSS SECTIONS STA 203+00 AND STA 205+00
C5.8	SITE 2 CROSS SECTION STA 199+00
C5.9	SITE 2 SITE PLAN STA 217+16 IRRIG. PIPE REPLACEMENT
C5.10	SITE 2 CROSS SECTION STA 217+16 IRRIG. PIPE REPLACEMENT
C6.0	SITE 3 STA 184+00 TO STA 189+00 PLAN & PROFILE
C6.1	SITE 3 STA 179+00 TO STA 184+00 PLAN & PROFILE
C6.2	SITE 3 CROSS SECTIONS STA 186+25 AND STA 188+00
C6.3	SITE 3 CROSS SECTIONS STA 183+00 AND STA 185+00
C6.4	SITE 3 CROSS SECTION STA 180+00
C6.5	DOCK SITE PLAN PERMIT # 12583




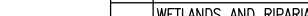
LANDSCAPING SHEETS TDB



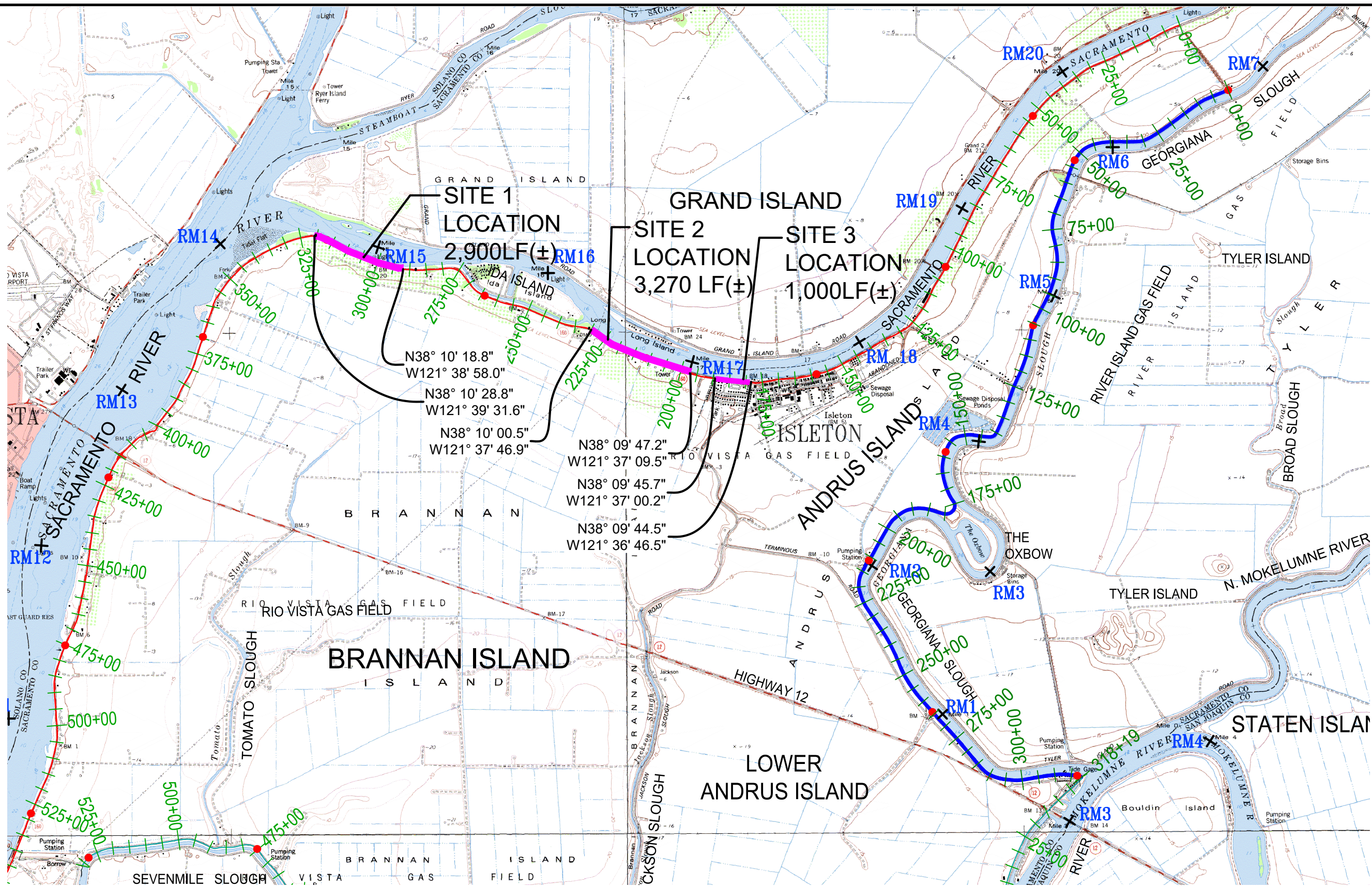
STATE OF CALIFORNIA



VICINITY MAP

<b>DATA REFERENCES:</b> 1) VERTICAL DATUM: NAVD88 (NORTH AMERICAN VERTICAL DATUM OF 1988). 2) THE CONTOURS SHOWN IN THESE PLANS ARE BASED ON 2017-2018 DWR DELTA LIDAR 3) FLOOD ELEVATION AREA BASED ON USACE 1957 DESIGN WATER SURFACE ELEVATIONS (REVISED AUGUST 1969 AND RECREATED 2006).	 <b>ARCHITECT</b>   <b>Calbert Labrie AIA</b>  (916) 776-2277 Fax (916) 776-2282 P.O. BOX 183, WALNUT GROVE, CA 95690	 <b>DCC ENGINEERING CO., INC.</b>  PLANNING PERMITTING ARCHITECTURE CIVIL ENGINEERING PROJECT MANAGEMENT	DESIGNED BY: <b>G LABRIE</b>	SCALE:  <b>AS SHOWN</b>  ORIGINAL DRAWING SCALE 0" 1/2" 1" 	REVISIONS					BRANNAN-ANDRUS LEVEE MAINTENANCE DISTRICT	
			DRAWN BY: <b>JM/SD</b>		SYM	DESCRIPTION	DATE	BY	APRVD. BY	<b>EROSION CONTROL/HABITAT ENHANCEMENT SITES</b>	
			CHECK BY: <b>G LABRIE</b>			TERRAWALL MODIFIED PER USACE COMMENTS (GEOGRID)	8-17-17	JM		SACRAMENTO RIVER RM14.60L TO RM17.34L	
						WETLANDS AND RIPARIAN BENCHES REVISIONS	4-6-18	JM/RM		<b>COVER SHEET</b>	
						WETLANDS AND RIPARIAN BENCHES REVISIONS	2-21-20	JM/RM/AC			
						SITE #1 WETLANDS AND RIPARIAN BENCHES REV. 3	4-17-20	JM/RM/AC			
DATE: 04/03/2020											
SHEET NUMBER: <b>C1.0</b>											
PROJECT NUMBER: 7702.16											





SITE LOCATIONS-VICINITY MAP  
1"=3000'

DATA REFERENCES:  
1) VERTICAL DATUM: NAVD88 (NORTH AMERICAN VERTICAL DATUM OF 1988).  
2) THE CONTOURS SHOWN IN THESE PLANS ARE BASED ON 2017-2018 DWR DELTA LIDAR  
3) FLOOD ELEVATION AREA BASED ON USACE 1957 DESIGN WATER SURFACE ELEVATIONS (REVISED AUGUST 1969 AND RECREATED 2006).

**ARCHITECT**  
Gilbert Labrie AIA  
(916) 776-2277 Fax (916) 776-2282  
P.O. BOX 183, WALNUT GROVE, CA 95690

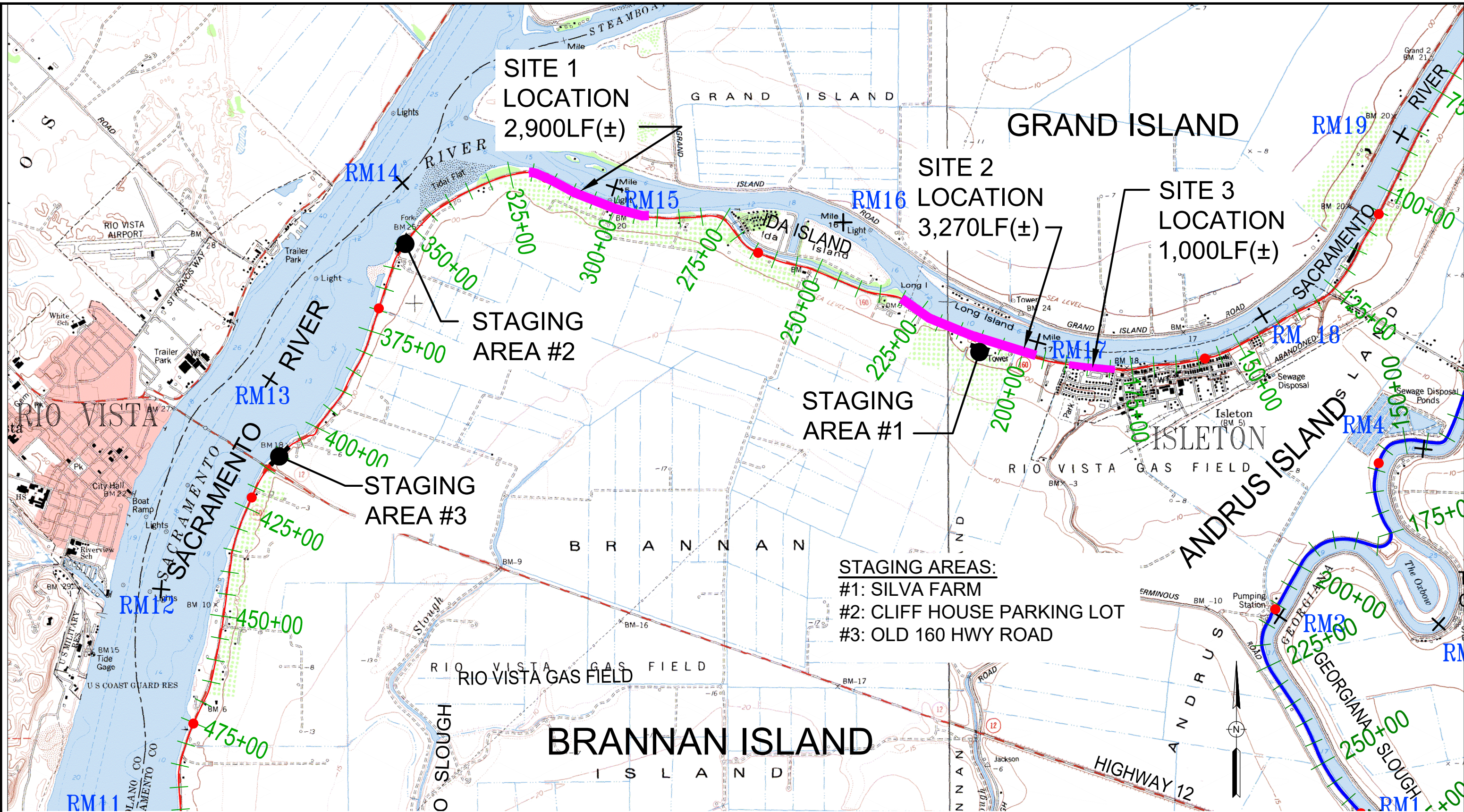
**DCC**  
ENGINEERING  
CO., INC.  
PLANNING  
PERMITTING  
ARCHITECTURE  
CIVIL ENGINEERING  
PROJECT MANAGEMENT

DESIGNED BY:  
G LABRIE  
DRAWN BY:  
JM/SD  
CHECK BY:  
G LABRIE  
SCALE:  
AS SHOWN  
ORIGINAL DRAWING SCALE  
0" 1/2" 1"

REVISIONS				
SYM	DESCRIPTION	DATE	BY	APRVD. BY
	TERRAWALL MODIFIED PER USACE COMMENTS (GEOGRID)	8-17-17	JM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	4-6-18	JM/RM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	2-21-20	JM/RM/AC	
	SITE #1 WETLANDS AND RIPARIAN BENCHES REV. 3	4-17-20	JM/RM/AC	

BRANNAN-ANDRUS LEVEE MAINTENANCE DISTRICT  
**EROSION CONTROL/HABITAT ENHANCEMENT SITES**  
SACRAMENTO RIVER RM14.60L TO RM17.34L  
**SITE LOCATIONS**  
DATE:  
04/03/2020  
SHEET NUMBER:  
**C1.1**  
PROJECT NUMBER:  
7702.16





STAGING AREA MAP  
1"=2000'

DATA REFERENCES:

- 1) VERTICAL DATUM: NAVD88 (NORTH AMERICAN VERTICAL DATUM OF 1988).
- 2) THE CONTOURS SHOWN IN THESE PLANS ARE BASED ON 2017-2018 DWR DELTA LIDAR
- 3) FLOOD ELEVATION AREA BASED ON USACE 1957 DESIGN WATER SURFACE ELEVATIONS (REVISED AUGUST 1969 AND RECREATED 2006).

**ARCHITECT**  
**Gilbert Labrie AIA**  
(916) 776-2277 Fax (916) 776-2282  
P.O. BOX 183, WALNUT GROVE, CA 95690

**DCC**  
**ENGINEERING**  
**CO., INC.**  
PLANNING  
PERMITTING  
ARCHITECTURE  
CIVIL ENGINEERING  
PROJECT MANAGEMENT

DESIGNED BY:  
G LABRIE  
DRAWN BY:  
JM/SD  
CHECK BY:  
G LABRIE

SCALE:  
AS SHOWN  
ORIGINAL DRAWING SCALE  
0" 1/2" 1"

REVISIONS				
SYM	DESCRIPTION	DATE	BY	APRVD. BY
	TERRAWALL MODIFIED PER USACE COMMENTS (GEOGRID)	8-17-17	JM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	4-6-18	JM/RM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	2-21-20	JM/RM/AC	
	SITE #1 WETLANDS AND RIPARIAN BENCHES REV. 3	4-17-20	JM/RM/AC	

BRANNAN-ANDRUS LEVEE MAINTENANCE DISTRICT		DATE:
<b>EROSION CONTROL/HABITAT ENHANCEMENT SITES</b>		04/03/2020
SACRAMENTO RIVER RM14.60L TO RM17.34L		SHEET NUMBER:
<b>STAGING AREA</b>		<b>C1.2</b>
		PROJECT NUMBER:
		7702.16



GENERAL NOTES

1. GENERAL NOTES AREA APPLICABLE TO ALL WORK, UNLESS OTHERWISE ON OTHER SHEETS.
2. REFERENCE LINE IS INTENDED TO FACILITATE SITE RELATED COMMUNICATION BETWEEN THE CONTRACTOR AND THE ENGINEER.

SURVEY NOTES

1. COORDINATES REFER TO THE CALIFORNIA STATE PLANE COORDINATE SYSTEM ZONE 2, NAD 83, FEET.
2. ELEVATIONS ARE REFERENCE TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) IN FEET.
3. BATHYMETRY DATA WAS OBTAINED FROM A HYDRO BY DUTRA DONE IN MARCH OF 2012.
4. LANDSIDE CONTOURS SHOWN ON THESE PLANS ARE PER 2017–2018 DWR DELTA LIDAR.
6. THE CONTRACTOR SHALL BE RESPONSIBLE TO CONFIRM FIELD CONDITIONS PRIOR TO COMMENCEMENT OF CONSTRUCTION AND SHALL NOTIFY THE ENGINEER IF A DISCREPANCY IS FOUND THAT WILL AFFECT CONSTRUCTION.

CONSTRUCTION NOTES

1. THE LIMITS OF CONSTRUCTION WORK SHALL BE STAKED BY DCC ENGINEERING.
2. THE DIMENSIONS AND QUANTITIES SHOWN ON THESE PLANS ARE APPROXIMATE AND ONLY INDICATE THE SCOPE OF EACH REPAIR.
3. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL UTILITIES WITHIN THE CONSTRUCTION ZONE, ALONG THE CONSTRUCTION ACCESS ROUTE AND IN STAGING AREAS BEFORE COMMENCING WORK. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE CAUSED BY THE CONTRACTOR’S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UTILITIES.
4. LEVEE SLOPES SHALL NOT BE CUT IN ORDER TO PROVIDE CONSTRUCTION RAMPS, IF REQUIRED. TEMPORARY CONSTRUCTION ACCESS RAMPS MAY BE CONSTRUCTED DOWN THE WATERSIDE FACE OF THE LEVEE BY PLACING EARTH MATERIALS. UPON COMPLETION OF THE JOB ALL TEMPORARY RAMPS SHALL BE REMOVED AND THE MATERIALS DISPOSED OF BY THE CONTRACTOR. ANY TEMPORARY EARTHWORK ASSOCIATED WITH CONSTRUCTION MUST BE APPROVED BY THE CONTRACTING OFFICER.
5. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIRING ANY DAMAGE CAUSED BY THE CONTRACTOR TO THE STAGING AREAS, PAVEMENT, ROADS, FENCES, FLOOD CONTROL STRUCTURES, INCLUDING LEVEES, LEVEE RAMPS, AND EXISTING BANK PROTECTION IMPROVEMENTS, VEGETATION, AND ALL OTHER UTILITIES AND IMPROVEMENTS NOT DESIGNATED FOR REMOVAL.
6. EXISTING ROADWAYS SHALL BE KEPT CLEAR OF MUD AND DEBRIS AT ALL TIMES. AT THE STAGING SITE.
7. CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES TO REMAIN WITHIN PROJECT LIMITS, AND WILL BE RESPONSIBLE FOR ANY DAMAGE TO THESE UTILITIES BY CONTRACTOR WORK.
8. ALL CONSTRUCTION SHALL TAKE PLACE FROM THE WATER SIDE USING RIVER BARGE(S) ONLY UNLESS OTHERWISE SPECIFIED.
9. BARGE ACCESS TO THE SITE AND COORDINATION WITH DRAW BRIDGE AUTHORITY IS THE RESPONSIBILITY OF THE CONTRACTOR.
10. CONTRACTOR SHALL BE RESPONSIBLE FOR EVALUATING THE CAPACITY OF ALL BRIDGES, CULVERTS AND BURIED PIPELINES TO BE CROSSED BY HAUL VEHICLES.
11. SEEDING SHALL BE APPLIED ON ALL EXPOSED SOIL–FILLED ROCKFILL.
12. SEED REPAIR SITE AND ANY DISTURBED AREAS OUTSIDE OF THE REPAIR SITES WITH A NATIVE EROSION CONTROL SEEDMIX AS PER PLANTING SPECIFICATION


ABBREVIATION

@  
AB  
AC  
APPROX.  
CL  
CNC  
CMP  
COE  
CW  
DET  
DWG  
DWSE  
E  
EX. (E), OR EXIST.  
EP  
ELEV., EL.  
ESMT  
FIN  
FT  
GB  
HORIZ.  
INV  
LF  
MAX  
MIN  
MHW  
MHHW  
MLW  
MLLW  
NTS  
OFF  
OG  
P OR (P)  
RD  
RSP  
STA  
SHT  
SPECS  
STA  
STD  
TBD  
TBR  
THRU  
TYP  
USACE  
VERT  
+  
–


DESCRIPTION

AT  
AGGREGATE BASE  
ASPHALT CONCRETE  
APPROXIMATE  
CENTERLINE  
CONCRETE  
CORRUGATED METAL PIPE  
CORPS OF ENGINEERING  
COORDINATE WITH  
DETAIL  
DRAWING  
DESIGN WATER SURFACE ELEVATION  
EAST  
EXISTING  
EDGE OF PAVEMENT  
ELEVATION  
EASEMENT  
FINISH  
FEET  
GRADE BREAK  
HORIZONTAL  
INVERT  
LINEAR FEET  
MAXIMUM  
MINIMUM  
MEAN HIGH WATER  
MEAN HIGHER HIGH WATER  
MEAN LOW WATER  
MEAN LOWER LOW WATER  
NOT TO SCALE  
OFFSET  
ORIGINAL GRADE  
PROPOSED  
RECLAMATION DISTRICT  
ROCK SLOPE PROTECTION  
STATION  
SHEET  
SPECIFICATIONS  
STATION  
STANDARD  
TO BE DETERMINED  
TO BE RELOCATED  
THROUGH  
TYPICAL  
US ARMY CORPS OF ENGINEERS  
VERTICAL  
PLUS OR MINUS


LEGEND:




JUTE FABRIC




HYDRSEEDING



EXIST SLOPE

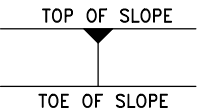


EXISTING GUARD RAIL



FLOW


DIRECTION OF WATER FLOW



TOP OF SLOPE


TOE OF SLOPE

SLOPE

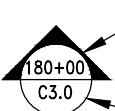


+10.0

SPOT ELEVATION




SURVEY CONTROL POINT



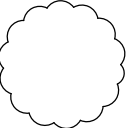
INDICATES SECTION NUMBER OR STATION



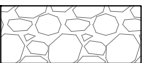
INDICATES DRAWING SHEET ON WHICH SECTION IS SHOWN




6" AGGREGATE BASE



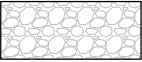
PROTECT IN PLACE TREE




DWR RSP SPEC.




70-30 SOIL & ROCK 6" MINUS




50-50 SOIL & ROCK 6" MINUS



RIPARIAN BENCH @ +8.0' ELEV. NAVD88



WETLANDS BENCH @ +4.0' ELEV. NAVD88




VEGETATED SLOPE

#	UCIP DS ID	LM	FIELD STRUCTURE DESCRIPTION
①	21896	3.903	2–INCH PIPE THROUGH LEVEE 3.0 FEET BELOW CROWN. BOTH ENDS CAPPED (ABO NO. 11284, 1975)
②	21900	4.023	4–INCH PIPE THROUGH LEVEE 10.3 FEET BELOW CROWN. ORIGINALLY INCLUDED IN THE 1959 O&M MANUAL
③	21901	4.033	*ABANDONED* 4–INCH PIPE THROUGH LEVEE 3.3 FEET BELOW CROWN. OPEN ON BOTH ENDS. ORIGINALLY INCLUDED IN THE 1959 O&M MANUAL.
④	21902	4.052	4X4–FOOT CONCRETE TUNNEL THROUGH LEVEE 5.0 FEET BELOW CROWN. ORIGINALLY INCLUDED IN THE 1959 O&M MANUAL.
⑤	21903	4.062	6–INCH PIPE THROUGH LEVEE 4.2 FEET BELOW THE CROWN. PIPE BADLY RUSTED. ORIGINALLY INCLUDED IN THE 1959 O&M MANUAL. UNABLE TO LOCATE 4/24/13.
⑥	21905	4.182	8–INCH PIPE THROUGH LEVEE 5.0 FEET BELOW CROWN. PLUGGED WITH CONCRETE BY USACE, 1966.
⑦	21912	5.771	*ABANDONED* 12–INCH PIPE THROUGH LEVEE 13.0 FEET BELOW CROWN. PUMP AND GATE VALVE IN PUMPHOUSE AT LANDSIDE TOE. 1.5–INCH ELECTRICAL CONDUIT ALONG PIPE AT SAME LOCATION. 42–INCH CONCRETE STAND PIPE AT LANDSIDE TOE.
ALL ABOVE LEVEE PENETRATIONS ARE PER DWR DEFERRED MAINTENANCE MITIGATION PROGRAM. IF SAID PENETRATIONS ARE FOUND DURING CONSTRUCTION THE PROJECT ENGINEER SHALL ADVISE THE CONTRACTOR ACCORDINGLY ON HOW TO ADDRESS THEM.			

DWR RSP SPEC				
WEIGHT (LB.)	% SMALLER BY WEIGHT			
	MIN	–	MAX	
400			100	
300	85		100	
70	15		50	
15	0		5	
6” MINUS				
ROCK WEIGHT	% LARGER THAN			

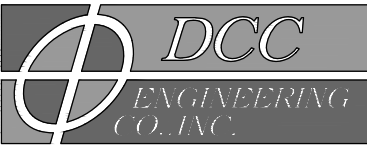
DATA REFERENCES:  
1) VERTICAL DATUM: NAVD88 (NORTH AMERICAN VERTICAL DATUM OF 1988).  
2) THE CONTOURS SHOWN IN THESE PLANS ARE BASED ON 2017–2018 DWR DELTA LIDAR  
3) FLOOD ELEVATION AREA BASED ON USACE 1957 DESIGN WATER SURFACE ELEVATIONS (REVISED AUGUST 1969 AND RECREATED 2006).



ARCHITECT

Gilbert Labrie AIA

(916) 776–2277 Fax (916) 776–2282  
P.O. BOX 183, WALNUT GROVE, CA 95690



DCC  
ENGINEERING  
CO. INC.

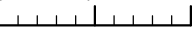
PLANNING  
PERMITTING  
ARCHITECTURE  
CIVIL ENGINEERING  
PROJECT MANAGEMENT

DESIGNED BY:  
G LABRIE

DRAWN BY:  
JM/SD

CHECK BY:  
G LABRIE

SCALE:

ORIGINAL DRAWING SCALE  
0" 1/2" 1"  


SYMBOL

DESCRIPTION

DATE

BY

APRVD. BY

TERRAWALL MODIFIED PER USACE COMMENTS (GEOGRID) 8–17–17 JM

WETLANDS AND RIPARIAN BENCHES REVISIONS 4–6–18 JM/RM

WETLANDS AND RIPARIAN BENCHES REVISIONS 2–21–20 JM/RM/AC

SITE #1 WETLANDS AND RIPARIAN BENCHES REV. 3 4–17–20 JM/RM/AC

BRANNAN-ANDRUS LEVEE MAINTENANCE DISTRICT

EROSION CONTROL/HABITAT  
ENHANCEMENT SITES

SACRAMENTO RIVER RM14.60L TO RM17.34L

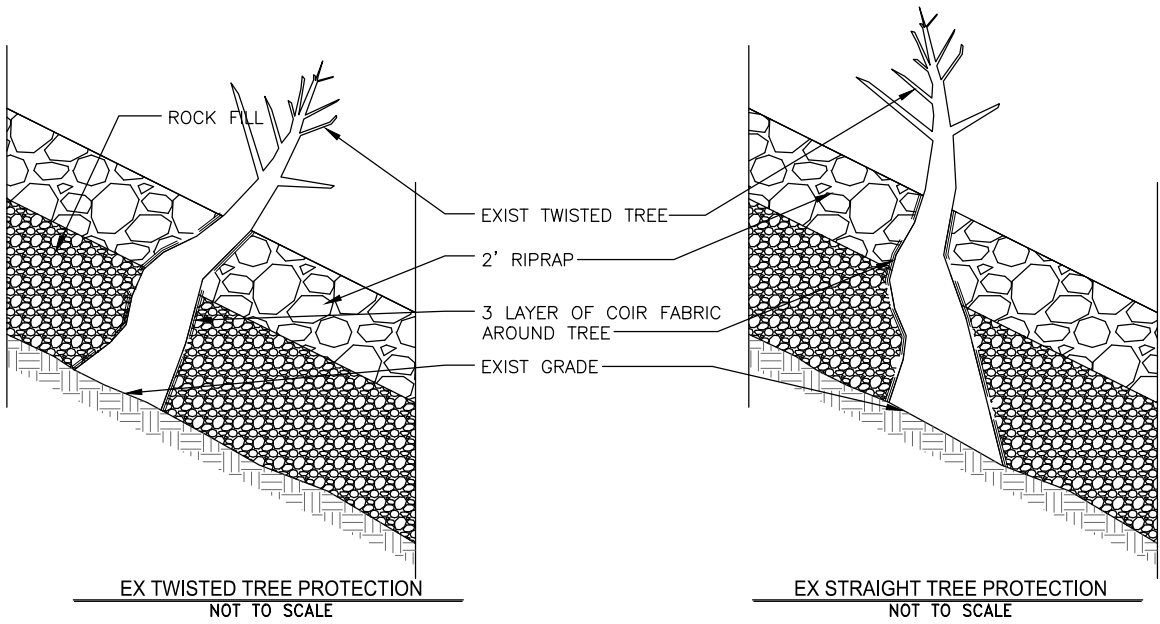
GENERAL NOTES AND SPECS

DATE:  
04/03/2020

SHEET NUMBER:  
C2.0

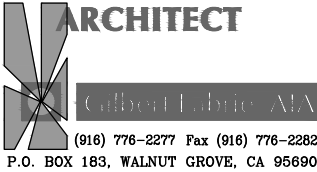
PROJECT NUMBER:  
7702.16



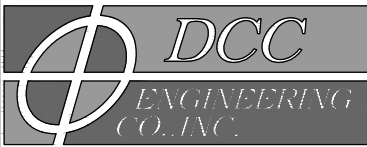


**DATA REFERENCES:**

- 1) VERTICAL DATUM: NAVD88 (NORTH AMERICAN VERTICAL DATUM OF 1988).
- 2) THE CONTOURS SHOWN IN THESE PLANS ARE BASED ON 2017-2018 DWR DELTA LIDAR
- 3) FLOOD ELEVATION AREA BASED ON USACE 1957 DESIGN WATER SURFACE ELEVATIONS (REVISED AUGUST 1969 AND RECREATED 2006).



(916) 776-2277 Fax (916) 776-2282  
P.O. BOX 183, WALNUT GROVE, CA 95690



PLANNING  
PERMITTING  
ARCHITECTURE  
CIVIL ENGINEERING  
PROJECT MANAGEMENT

DESIGNED BY:  
**G LABRIE**

DRAWN BY:  
**JM/SD**

CHECK BY:  
**G LABRIE**

SCALE:

ORIGINAL DRAWING SCALE

0" 1/2" 1"

SYM	REVISIONS			
	DESCRIPTION	DATE	BY	APRVD. BY
	TERRAWALL MODIFIED PER USACE COMMENTS (GEOGRID)	8-17-17	JM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	4-6-18	JM/RM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	2-21-20	JM/RM/AC	
	SITE #1 WETLANDS AND RIPARIAN BENCHES REV. 3	4-17-20	JM/RM/AC	

BRANNAN-ANDRUS LEVEE MAINTENANCE DISTRICT

**EROSION CONTROL/HABITAT  
ENHANCEMENT SITES**

SACRAMENTO RIVER RM14.60L TO RM17.34L

**TREE PROTECTION DETAIL**

DATE:

04/03/2020

SHEET NUMBER:

**C2.1**

PROJECT NUMBER:

7702.16



LEGEND

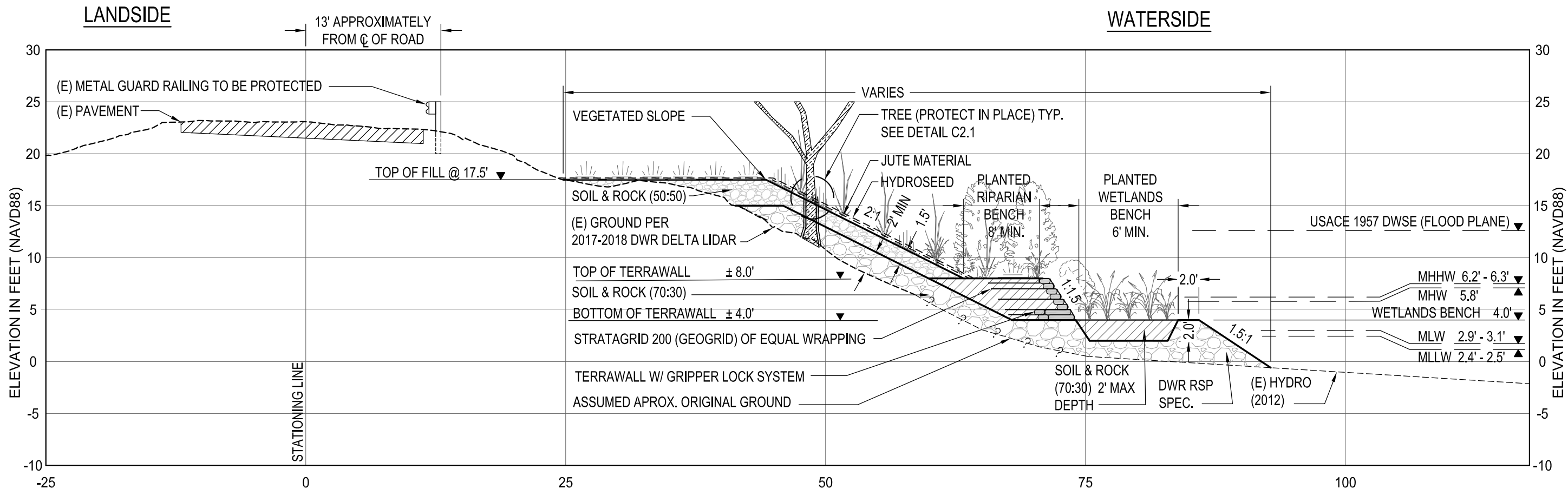
70-30 SOIL & 6" MINUS

50-50 SOIL & 6" MINUS

DWR RSP SPEC.

HYDROSEEDING

JUTE FABRIC

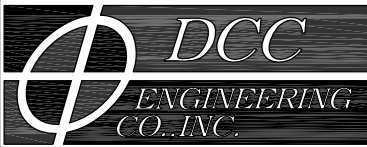
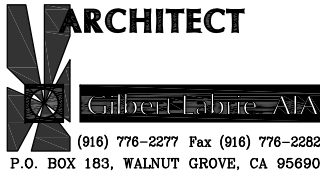


SACRAMENTO RIVER EROSION CONTROL TYPICAL RIPARIAN AND WETLANDS CROSS SECTION

SCALE: 1"=10'

DATA REFERENCES:

- 1) VERTICAL DATUM: NAVD88 (NORTH AMERICAN VERTICAL DATUM OF 1988).
- 2) THE CONTOURS SHOWN IN THESE PLANS ARE BASED ON 2017-2018 DWR DELTA LIDAR
- 3) FLOOD ELEVATION AREA BASED ON USACE 1957 DESIGN WATER SURFACE ELEVATIONS (REVISED AUGUST 1969 AND RECREATED 2006).



PLANNING  
PERMITTING  
ARCHITECTURE  
CIVIL ENGINEERING  
PROJECT MANAGEMENT

DESIGNED BY:  
G LABRIE  
DRAWN BY:  
JM/SD  
CHECK BY:  
G LABRIE

SCALE:

1"=10'

ORIGINAL DRAWING SCALE

0" 1/2" 1"

REVISIONS				
SYM	DESCRIPTION	DATE	BY	APRVD. BY
	TERRAWALL MODIFIED PER USACE COMMENTS (GEOGRID)	8-17-17	JM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	4-6-18	JM/RM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	2-21-20	JM/RM/AC	
	SITE #1 WETLANDS AND RIPARIAN BENCHES REV. 3	4-17-20	JM/RM/AC	

BRANNAN-ANDRUS LEVEE MAINTENANCE DISTRICT

EROSION CONTROL/HABITAT  
ENHANCEMENT SITES





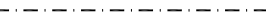
SACRAMENTO RIVER RM14.60L TO RM17.34L

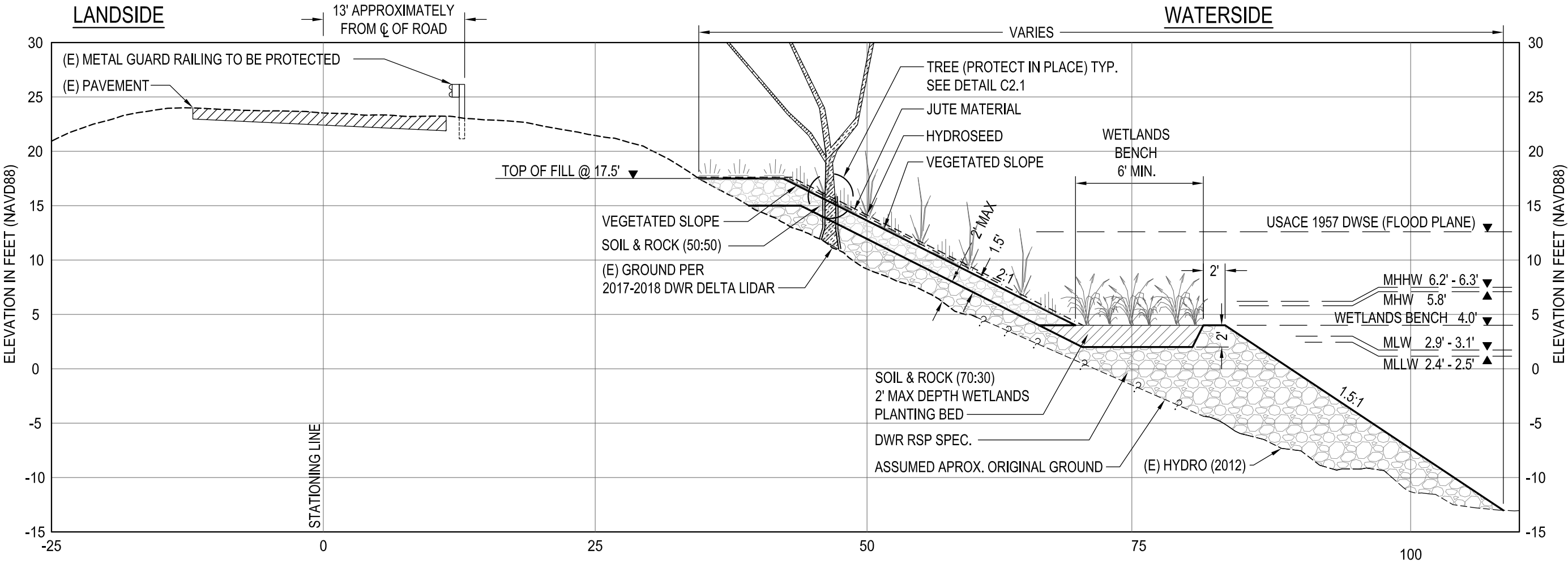
RIPARIAN AND WETLANDS TYPICAL SECTION

DATE:  
04/03/2020  
SHEET NUMBER:  
C3.0  
PROJECT NUMBER:  
7702.16



LEGEND

-  70-30 SOIL & 6" MINUS
-  50-50 SOIL & 6" MINUS
-  DWR RSP SPEC.
-  HYDROSEEDING
-  JUTE FABRIC



SACRAMENTO RIVER EROSION CONTROL TYPICAL WETLANDS CROSS SECTION

SCALE: 1"=10'

DATA REFERENCES:

- 1) VERTICAL DATUM: NAVD88 (NORTH AMERICAN VERTICAL DATUM OF 1988).
- 2) THE CONTOURS SHOWN IN THESE PLANS ARE BASED ON 2017-2018 DWR DELTA LIDAR
- 3) FLOOD ELEVATION AREA BASED ON USACE 1957 DESIGN WATER SURFACE ELEVATIONS (REVISED AUGUST 1969 AND RECREATED 2006).

**ARCHITECT**

**Gilbert Labrie AIA**  
(916) 776-2277 Fax (916) 776-2282  
P.O. BOX 183, WALNUT GROVE, CA 95690

**DCC**  
**ENGINEERING**  
**CO., INC.**

PLANNING  
PERMITTING  
ARCHITECTURE  
CIVIL ENGINEERING  
PROJECT MANAGEMENT

DESIGNED BY:  
G LABRIE

DRAWN BY:  
JM/SD

CHECK BY:  
G LABRIE

SCALE:

1"=10'

ORIGINAL DRAWING SCALE

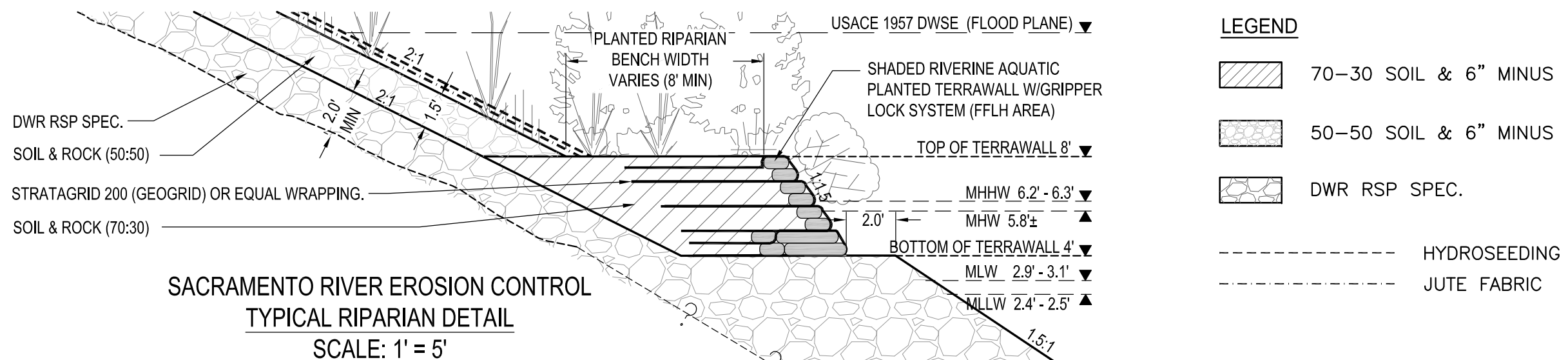
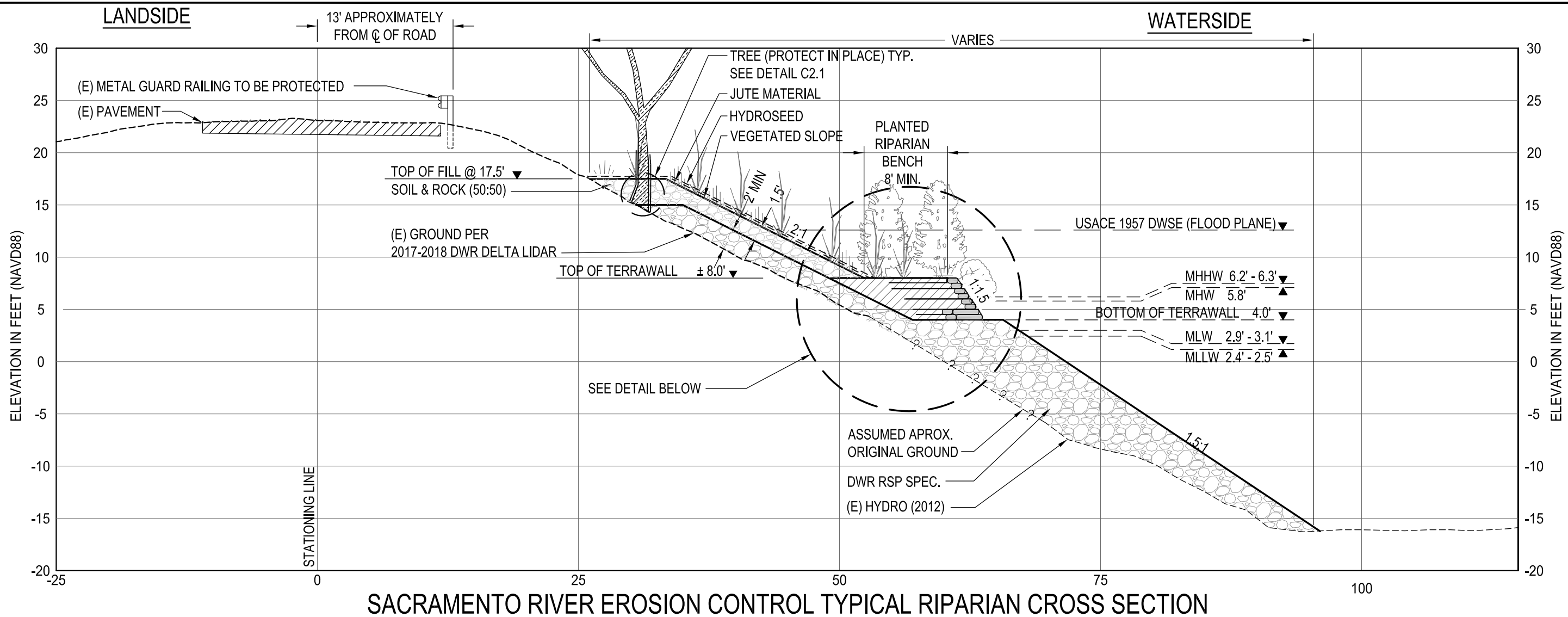
0" 1/2" 1"

SYM	DESCRIPTION	REVISIONS			
		DATE	BY	APPRD. BY	
	TERRAWALL MODIFIED PER USACE COMMENTS (GEOGRID)	8-17-17	JM		
	WETLANDS AND RIPARIAN BENCHES REVISIONS	4-6-18	JM/RM		
	WETLANDS AND RIPARIAN BENCHES REVISIONS	2-21-20	JM/RM/AC		
	SITE #1 WETLANDS AND RIPARIAN BENCHES REV. 3	4-17-20	JM/RM/AC		

BRANNAN-ANDRUS LEVEE MAINTENANCE DISTRICT
<b>EROSION CONTROL/HABITAT ENHANCEMENT SITES</b>
SACRAMENTO RIVER RM14.60L TO RM17.34L
<b>WETLANDS TYPICAL SECTION</b>

DATE:	04/03/2020
SHEET NUMBER:	C3.1
PROJECT NUMBER:	7702.16





**LEGEND**

	70-30 SOIL & 6" MINUS
	50-50 SOIL & 6" MINUS
	DWR RSP SPEC.
	HYDROSEEDING
	JUTE FABRIC

**DATA REFERENCES:**  
 1) VERTICAL DATUM: NAVD88 (NORTH AMERICAN VERTICAL DATUM OF 1988).  
 2) THE CONTOURS SHOWN IN THESE PLANS ARE BASED ON 2017-2018 DWR DELTA LIDAR  
 3) FLOOD ELEVATION AREA BASED ON USACE 1957 DESIGN WATER SURFACE ELEVATIONS (REVISED AUGUST 1969 AND RECREATED 2006).

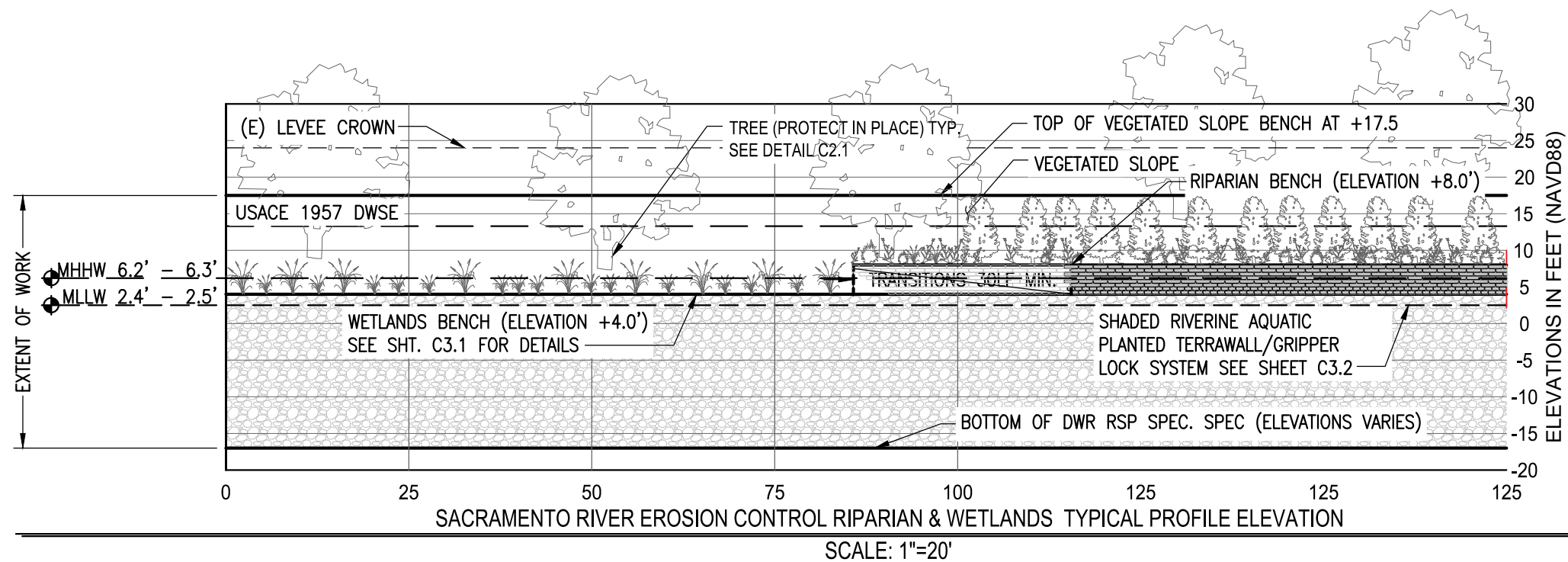


DESIGNED BY:  
G LABRIE  
 DRAWN BY:  
JM/SD  
 CHECK BY:  
G LABRIE  
 SCALE:  
AS SHOWN  
 ORIGINAL DRAWING SCALE  
0" 1/2" 1"

REVISIONS				
SYM	DESCRIPTION	DATE	BY	APPROV. BY
	TERRAWALL MODIFIED PER USACE COMMENTS (GEOGRID)	8-17-17	JM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	4-6-18	JM/RM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	2-21-20	JM/RM/AC	
	SITE #1 WETLANDS AND RIPARIAN BENCHES REV. 3	4-17-20	JM/RM/AC	

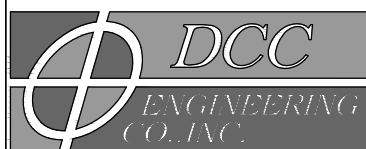
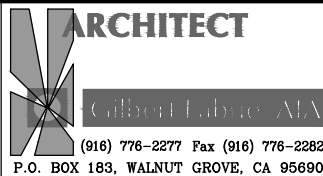
BRANNAN-ANDRUS LEVEE MAINTENANCE DISTRICT		DATE:
<b>EROSION CONTROL/HABITAT ENHANCEMENT SITES</b>		04/03/2020
SACRAMENTO RIVER RM14.60L TO RM17.34L		SHEET NUMBER:
RIPARIAN TYPICAL SECTION		C3.2
		PROJECT NUMBER:
		7702.16





DATA REFERENCES:

- 1) VERTICAL DATUM: NAVD88 (NORTH AMERICAN VERTICAL DATUM OF 1988).
- 2) THE CONTOURS SHOWN IN THESE PLANS ARE BASED ON 2017-2018 DWR DELTA LIDAR
- 3) FLOOD ELEVATION AREA BASED ON USACE 1957 DESIGN WATER SURFACE ELEVATIONS (REVISED AUGUST 1969 AND RECREATED 2006).



PLANNING  
PERMITTING  
ARCHITECTURE  
CIVIL ENGINEERING  
PROJECT MANAGEMENT

DESIGNED BY:  
**G LABRIE**  
DRAWN BY:  
**JM/SD**  
CHECK BY:  
**G LABRIE**

SCALE:

**AS SHOWN**

ORIGINAL DRAWING SCALE

0" 1/2" 1"

SYM	REVISIONS			
	DESCRIPTION	DATE	BY	APRVD. BY
	TERRAWALL MODIFIED PER USACE COMMENTS (GEOGRID)	8-17-17	JM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	4-6-18	JM/RM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	2-21-20	JM/RM/AC	
	SITE #1 WETLANDS AND RIPARIAN BENCHES REV. 3	4-17-20	JM/RM/AC	

BRANNAN-ANDRUS LEVEE MAINTENANCE DISTRICT

**EROSION CONTROL/HABITAT  
ENHANCEMENT SITES**

SACRAMENTO RIVER RM14.60L TO RM17.34L

RIPARIAN & WETLANDS TYPICAL PROFILE ELEVATION

DATE:

**04/03/2020**

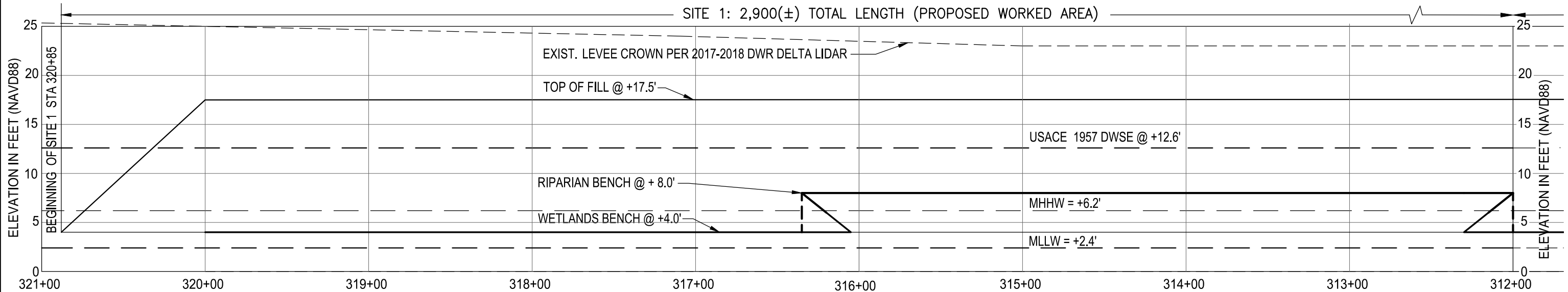
SHEET NUMBER:

**C3.3**

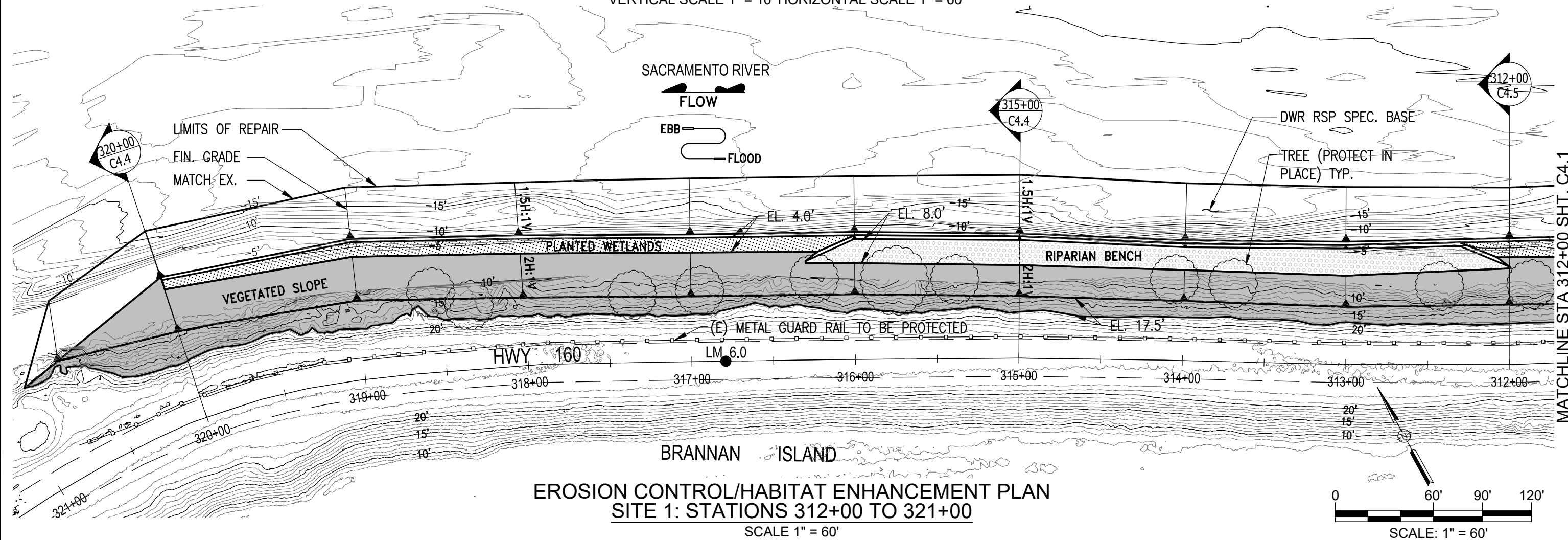
PROJECT NUMBER:

**7702.16**





EROSION CONTROL/HABITAT ENHANCEMENT PROFILE  
VERTICAL SCALE 1" = 10' HORIZONTAL SCALE 1" = 60'



EROSION CONTROL/HABITAT ENHANCEMENT PLAN  
SITE 1: STATIONS 312+00 TO 321+00  
SCALE 1" = 60'

DATA REFERENCES:

- 1) VERTICAL DATUM: NAVD88 (NORTH AMERICAN VERTICAL DATUM OF 1988).
- 2) THE CONTOURS SHOWN IN THESE PLANS ARE BASED ON 2017-2018 DWR DELTA LIDAR
- 3) FLOOD ELEVATION AREA BASED ON USACE 1957 DESIGN WATER SURFACE ELEVATIONS (REVISED AUGUST 1969 AND RECREATED 2006).

**ARCHITECT**

**Gilbert Labrie AIA**

(916) 776-2277 Fax (916) 776-2282  
P.O. BOX 183, WALNUT GROVE, CA 95690

**DCC**

**ENGINEERING**

**CO., INC.**

PLANNING  
PERMITTING  
ARCHITECTURE  
CIVIL ENGINEERING  
PROJECT MANAGEMENT

DESIGNED BY:  
**G LABRIE**

DRAWN BY:  
**JM/SD**

CHECK BY:  
**G LABRIE**

SCALE:  
**AS SHOWN**

ORIGINAL DRAWING SCALE  
0" 1/2" 1"

REVISIONS				
SYM	DESCRIPTION	DATE	BY	APRVD. BY
	TERRAWALL MODIFIED PER USACE COMMENTS (GEOGRID)	8-17-17	JM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	4-6-18	JM/RM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	2-21-20	JM/RM/AC	
	SITE #1 WETLANDS AND RIPARIAN BENCHES REV. 3	4-17-20	JM/RM/AC	

BRANNAN-ANDRUS LEVEE MAINTENANCE DISTRICT

**EROSION CONTROL/HABITAT  
ENHANCEMENT SITES**

SACRAMENTO RIVER RM14.60L TO RM17.34L

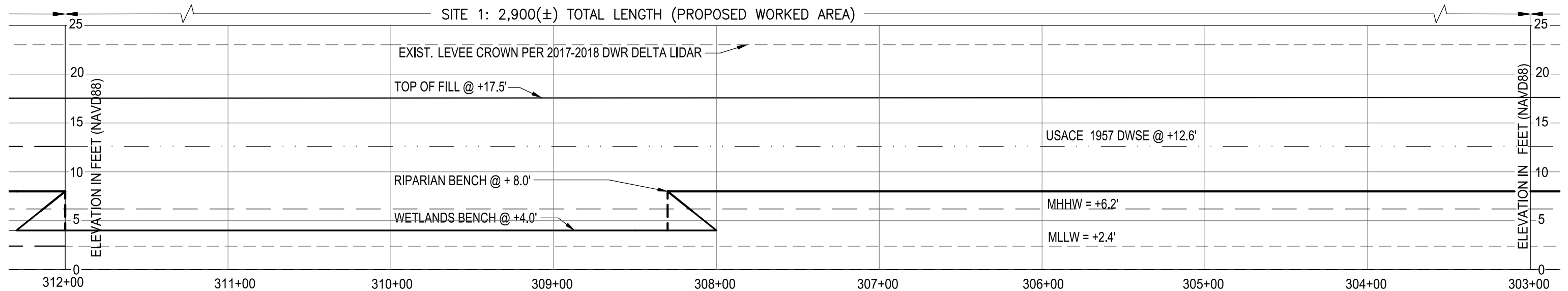
SITE 1 STA 312+00 TO STA 321+00 - PLAN & PROFILE

DATE:  
**04/03/2020**

SHEET NUMBER:  
**C4.0**

PROJECT NUMBER:  
**7702.16**

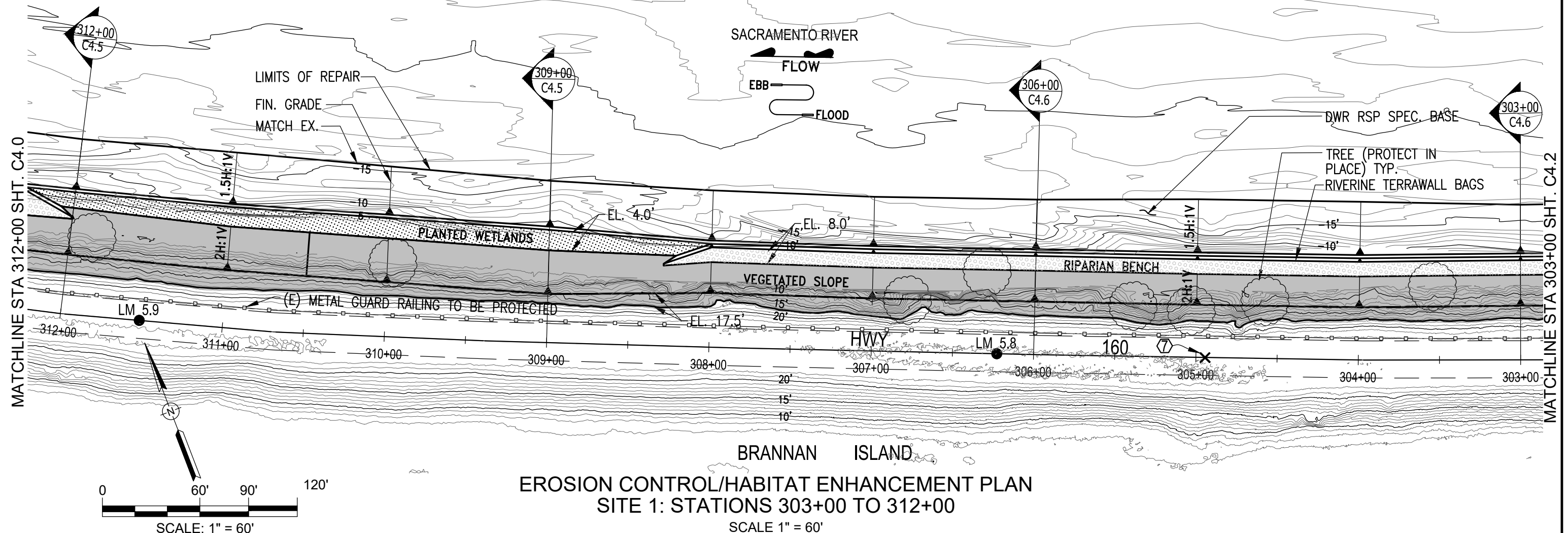




# EROSION CONTROL/HABITAT ENHANCEMENT PROFILE

VERTICAL SCALE 1" = 10' HORIZONTAL SCALE 1" = 60'

SEE SHEET C2.0 FOR DESCRIPTION



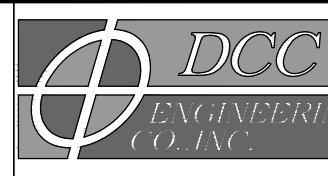
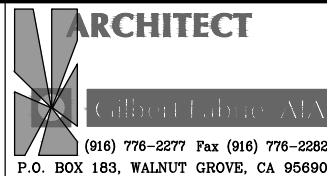
# EROSION CONTROL/HABITAT ENHANCEMENT PLAN

SITE 1: STATIONS 303+00 TO 312+00

SCALE 1" = 60'

## DATA REFERENCES:

- 1) VERTICAL DATUM: NAVD88 (NORTH AMERICAN VERTICAL DATUM OF 1988).
- 2) THE CONTOURS SHOWN IN THESE PLANS ARE BASED ON 2017-2018 DWR DELTA LIDAR
- 3) FLOOD ELEVATION AREA BASED ON USACE 1957 DESIGN WATER SURFACE ELEVATIONS (REVISED AUGUST 1969 AND RECREATED 2006).



PLANNING  
PERMITTING  
ARCHITECTURE  
CIVIL ENGINEERING  
PROJECT MANAGEMENT

DESIGNED BY:  
G LABRIE  
DRAWN BY:  
JM/SD  
CHECK BY:  
G LABRIE

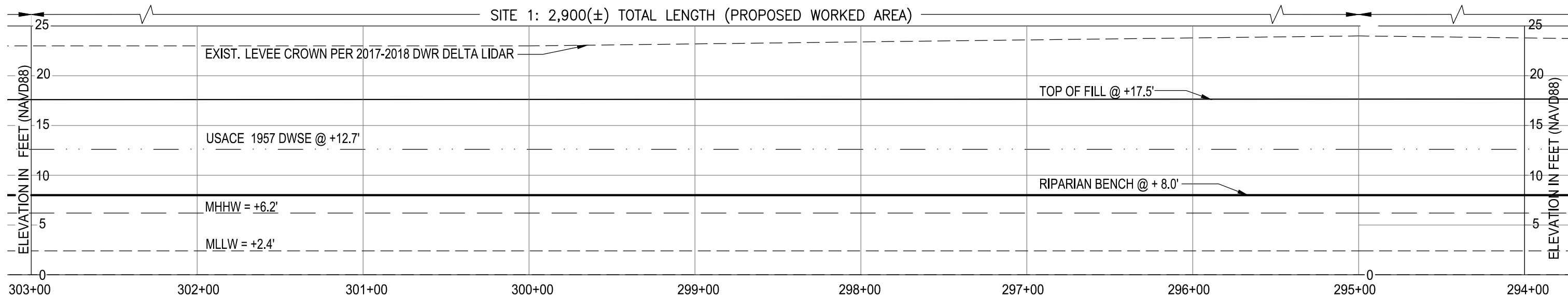
SCALE:  
AS SHOWN  
ORIGINAL DRAWING SCALE  
0" 1/2" 1"

REVISIONS				
SYM	DESCRIPTION	DATE	BY	APRVD. BY
	TERRAWALL MODIFIED PER USACE COMMENTS (GEOGRID)	8-17-17	JM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	4-6-18	JM/RM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	2-21-20	JM/RM/AC	
	SITE #1 WETLANDS AND RIPARIAN BENCHES REV. 3	4-17-20	JM/RM/AC	

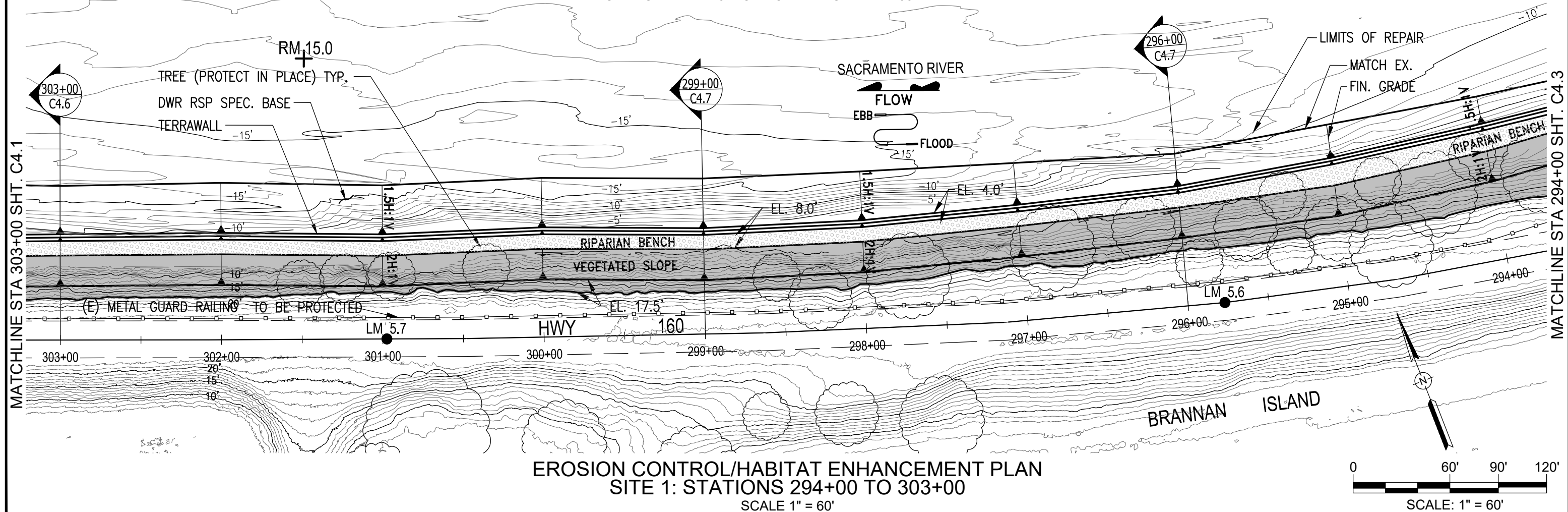
BRANNAN-ANDRUS LEVEE MAINTENANCE DISTRICT	
<b>EROSION CONTROL/HABITAT ENHANCEMENT SITES</b>	
SACRAMENTO RIVER RM14.60L TO RM17.34L	
SITE 1 STA 303+00 TO STA 312+00 - PLAN & PROFILE	

DATE:  
04/03/2020  
SHEET NUMBER:  
C4.1  
PROJECT NUMBER:  
7702.16



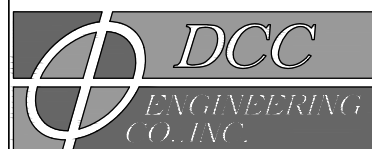
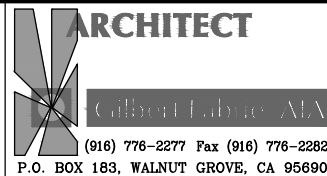


**EROSION CONTROL/HABITAT ENHANCEMENT PROFILE**  
VERTICAL SCALE 1" = 10' HORIZONTAL SCALE 1" = 60'



**DATA REFERENCES:**

- 1) VERTICAL DATUM: NAVD88 (NORTH AMERICAN VERTICAL DATUM OF 1988).
- 2) THE CONTOURS SHOWN IN THESE PLANS ARE BASED ON 2017-2018 DWR DELTA LIDAR
- 3) FLOOD ELEVATION AREA BASED ON USACE 1957 DESIGN WATER SURFACE ELEVATIONS (REVISED AUGUST 1969 AND RECREATED 2006).



DESIGNED BY:  
G LABRIE  
DRAWN BY:  
JM/SD  
CHECK BY:  
G LABRIE

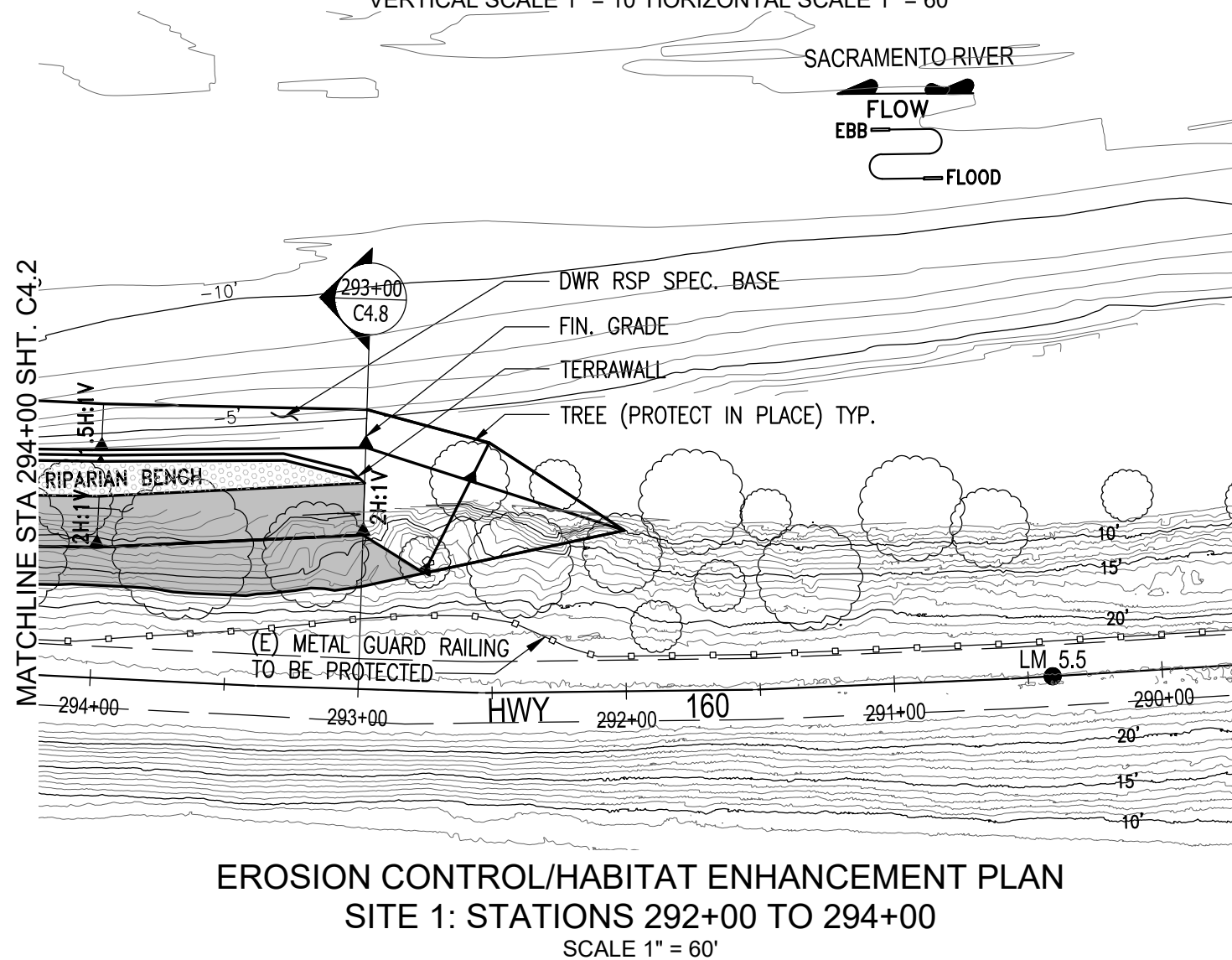
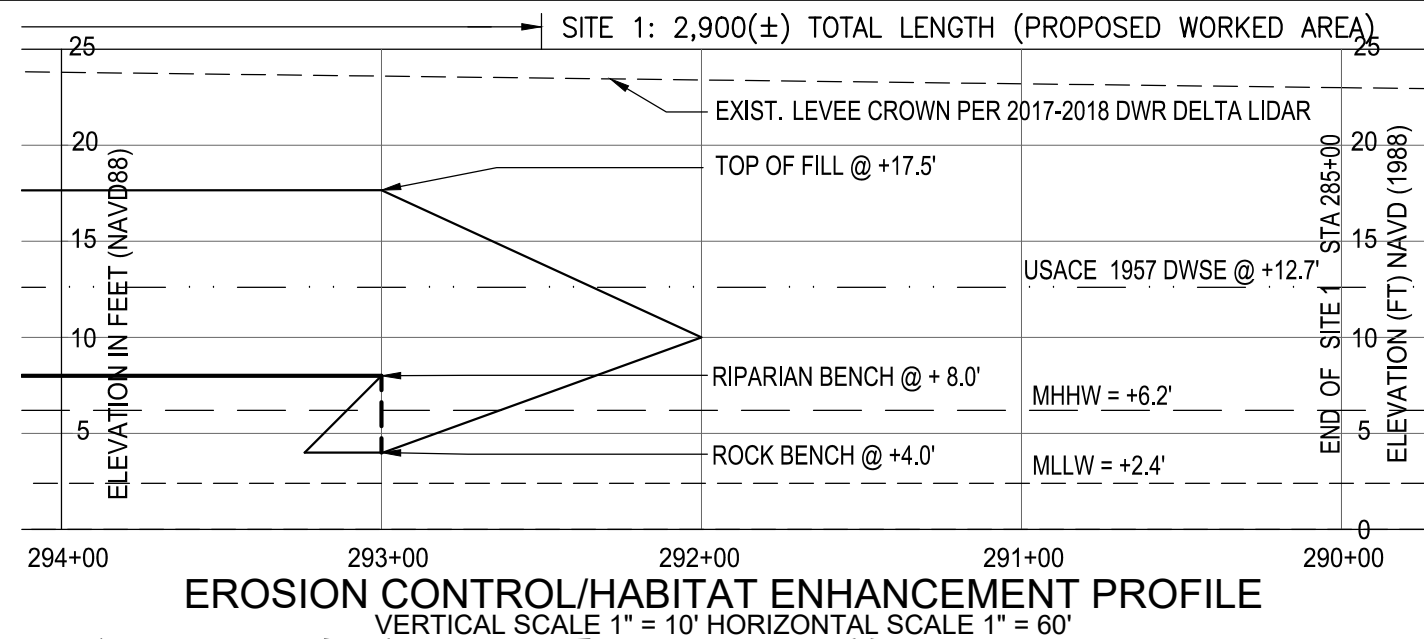
SCALE:  
AS SHOWN  
ORIGINAL DRAWING SCALE  
0" 1/2" 1"

REVISIONS				
SYM	DESCRIPTION	DATE	BY	APRVD. BY
	TERRAWALL MODIFIED PER USACE COMMENTS (GEOGRID)	8-17-17	JM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	4-6-18	JM/RM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	2-21-20	JM/RM/AC	
	SITE #1 WETLANDS AND RIPARIAN BENCHES REV. 3	4-17-20	JM/RM/AC	

BRANNAN-ANDRUS LEVEE MAINTENANCE DISTRICT	
<b>EROSION CONTROL/HABITAT ENHANCEMENT SITES</b>	
SACRAMENTO RIVER RM14.60L TO RM17.34L	
SITE 1 STA 294+00 TO STA 303+00 - PLAN & PROFILE	

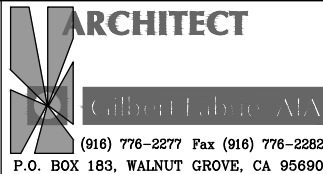
DATE:  
04/03/2020  
SHEET NUMBER:  
C4.2  
PROJECT NUMBER:  
7702.16





DATA REFERENCES:

- 1) VERTICAL DATUM: NAVD88 (NORTH AMERICAN VERTICAL DATUM OF 1988).
- 2) THE CONTOURS SHOWN IN THESE PLANS ARE BASED ON 2017-2018 DWR DELTA LIDAR
- 3) FLOOD ELEVATION AREA BASED ON USACE 1957 DESIGN WATER SURFACE ELEVATIONS (REVISED AUGUST 1969 AND RECREATED 2006).



DESIGNED BY:  
G LABRIE  
DRAWN BY:  
JM/SD  
CHECK BY:  
G LABRIE

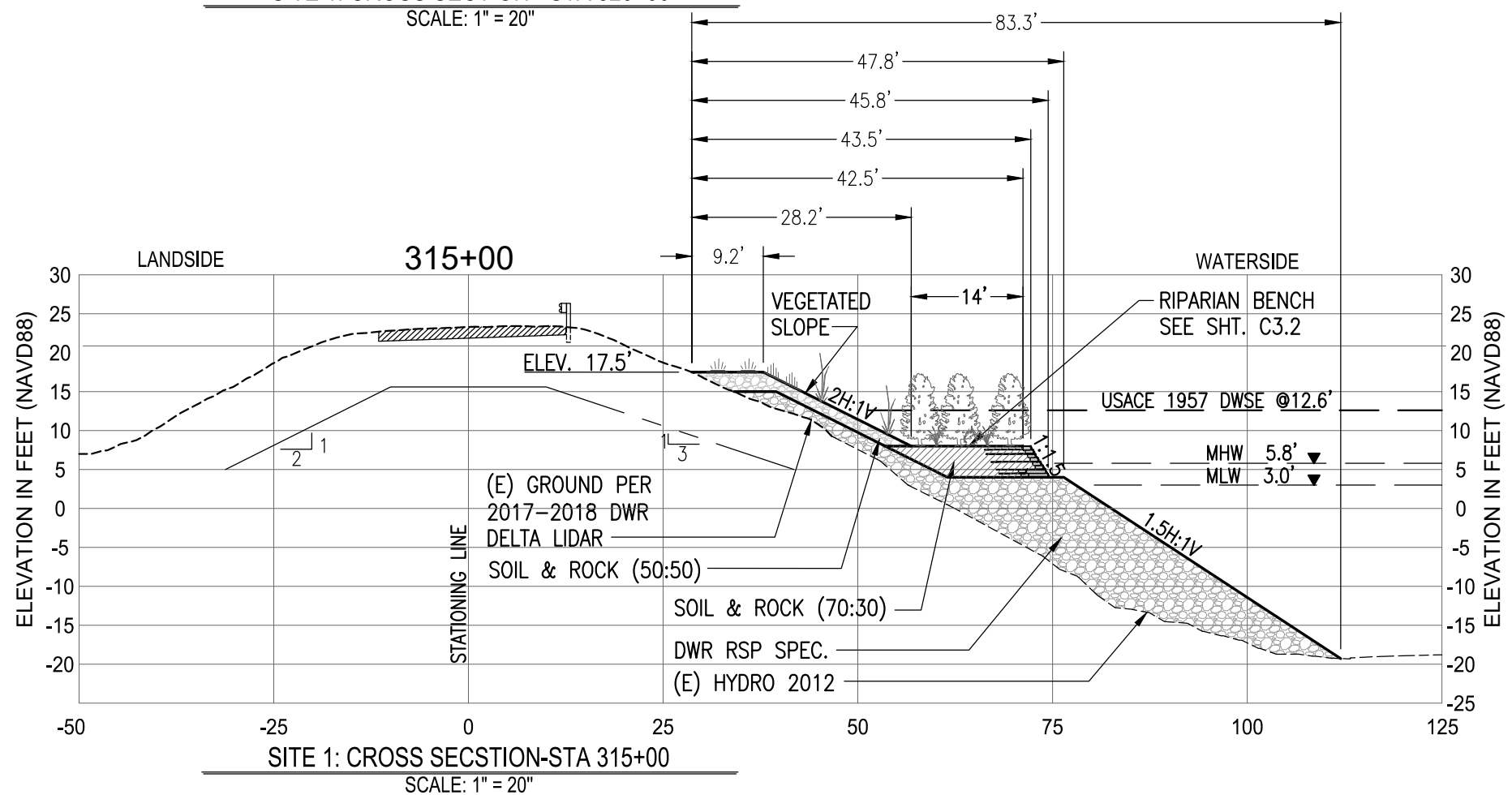
SCALE:  
AS SHOWN  
ORIGINAL DRAWING SCALE  
0" 1/2" 1"

SYM	REVISIONS			
	DESCRIPTION	DATE	BY	APRVD. BY
	TERRAWALL MODIFIED PER USACE COMMENTS (GEOGRID)	8-17-17	JM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	4-6-18	JM/RM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	2-21-20	JM/RM/AC	
	SITE #1 WETLANDS AND RIPARIAN BENCHES REV. 3	4-17-20	JM/RM/AC	

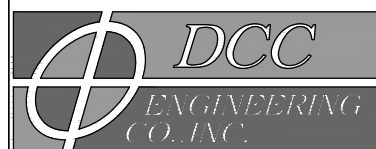
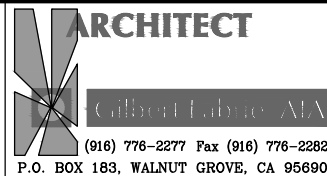
BRANNAN-ANDRUS LEVEE MAINTENANCE DISTRICT	
EROSION CONTROL/HABITAT ENHANCEMENT SITES	
SACRAMENTO RIVER RM14.60L TO RM17.34L	
SITE 1 STA 292+00 TO STA 294+00 - PLAN & PROFILE	

DATE:  
04/03/2020  
SHEET NUMBER:  
C4.3  
PROJECT NUMBER:  
7702.16





- 1) VERTICAL DATUM: NAVD88 (NORTH AMERICAN VERTICAL DATUM OF 1988).
- 2) THE CONTOURS SHOWN IN THESE PLANS ARE BASED ON 2017-2018 DWR DELTA LIDAR
- 3) FLOOD ELEVATION AREA BASED ON USACE 1957 DESIGN WATER SURFACE ELEVATIONS (REVISED AUGUST 1969 AND RECREATED 2006).



- PLANNING
- PERMITTING
- ARCHITECTURE
- CIVIL ENGINEERING
- PROJECT MANAGEMENT

TT	DESIGNED BY: <b>G LABRIE</b>
	DRAWN BY: <b>JM/SD</b>
	CHECK BY: <b>G LABRIE</b>

SCALE:

AS SHOWN

ORIGINAL DRAWING SCALE

0"	1/2"	1
----	------	---

A horizontal number line with 11 equally spaced tick marks. The first tick mark on the left is labeled '0', and the last tick mark on the right is labeled '10'. There are no numbers in between.

	REVISIONS			
SYM	DESCRIPTION	DATE	BY	APPRD. BY
	TERRAWALL MODIFIED PER USAGE COMMENTS (GEOGRID)	8-17-17	JM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	4-6-18	JM/RM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	2-21-20	JM/RM/AC	
"	SITE #1 WETLANDS AND RIPARIAN BENCHES REV. 3	4-17-20	JM/RM/AC	

BRANNAN-ANDRUS LEVEE MAINTENANCE DISTRICT
---

### EROSION CONTROL/HABITAT ENHANCEMENT SITES

SACRAMENTO RIVER	RM14.60L TO RM17.34L
------------------	----------------------

SITE 1 CROSS SECTIONS STA 315+00 AND STA 320+00

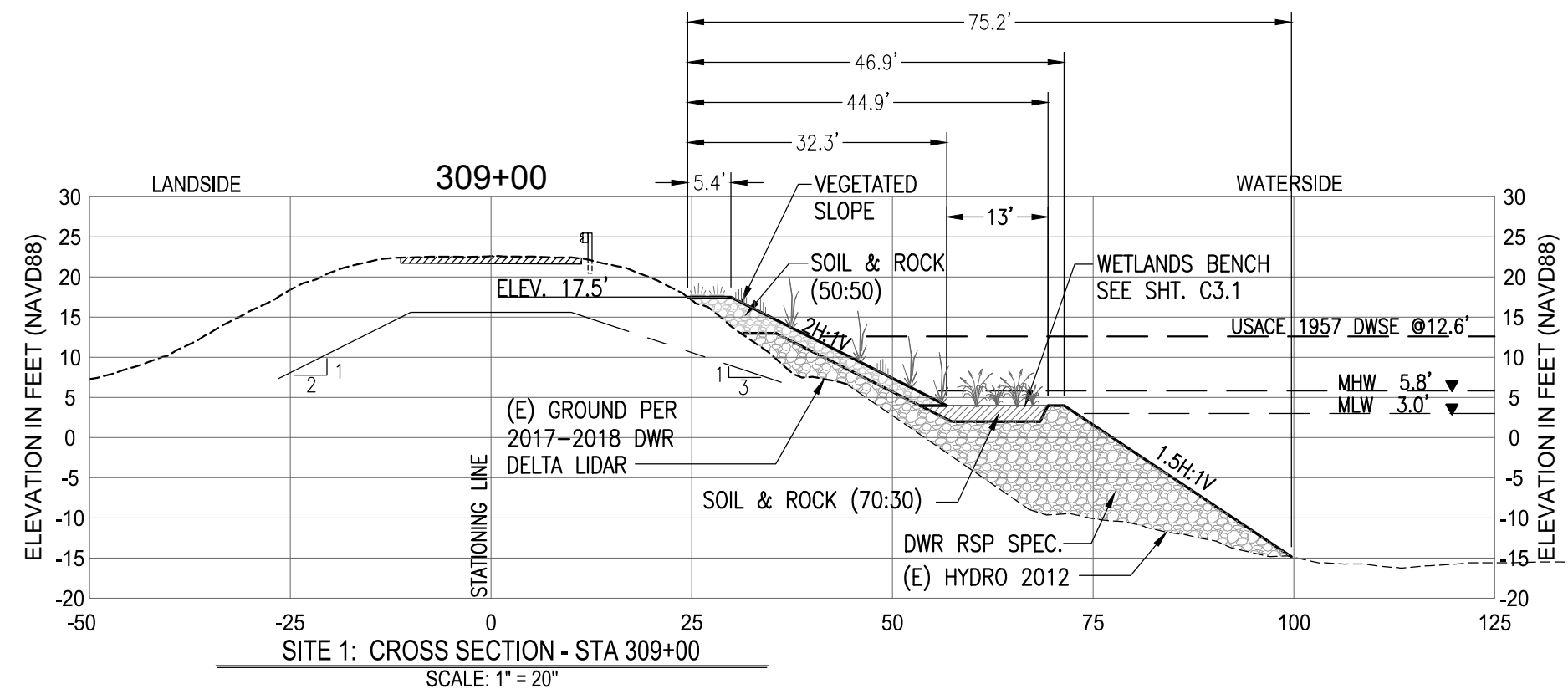
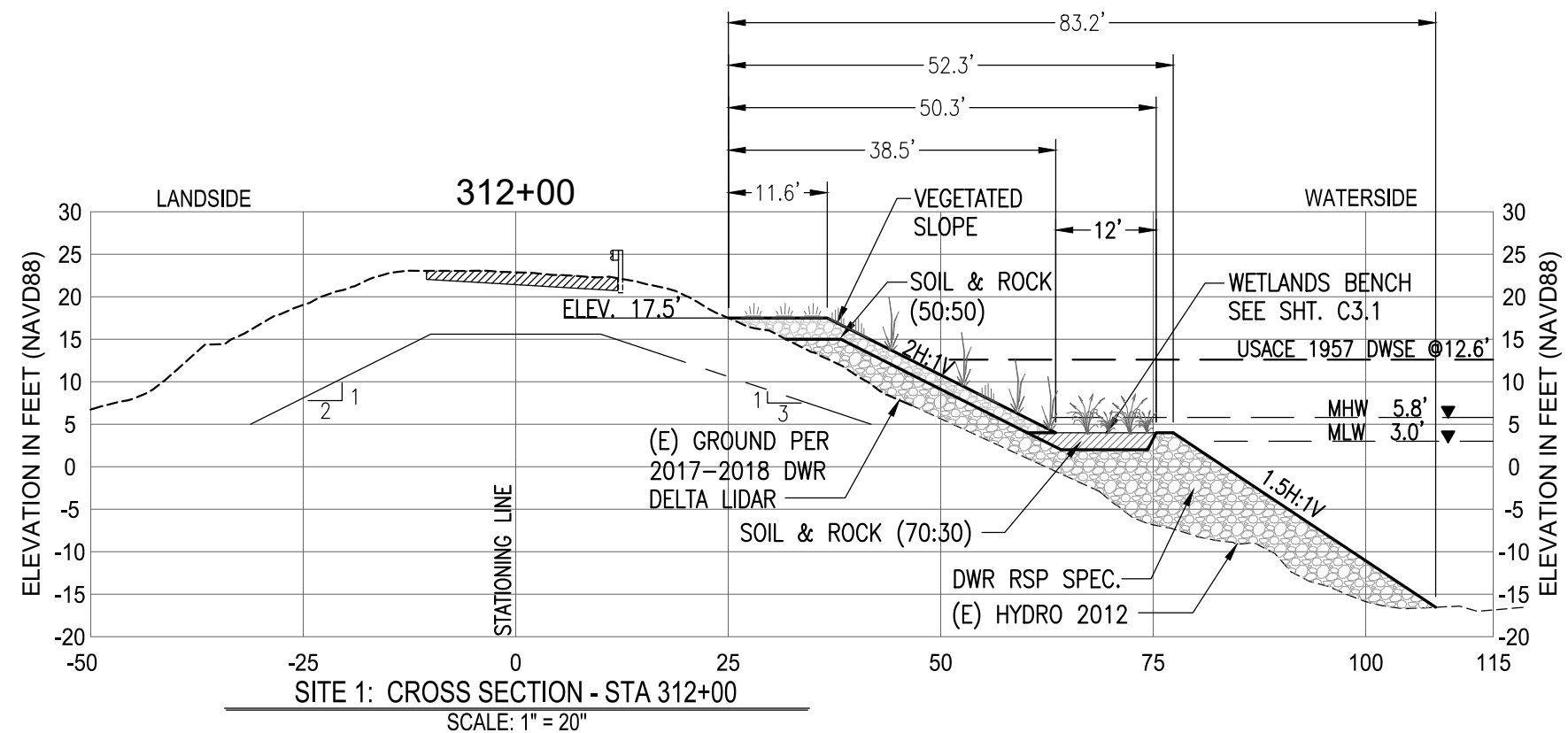
DATE: 01/02/2000

SHEET NUMBER:

C4.4

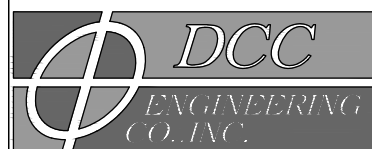
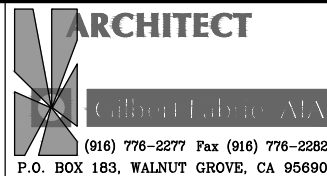
PROJECT NUMBER:  
7702.16





# DATA REFERENCES:

- 1) VERTICAL DATUM: NAVD88 (NORTH AMERICAN VERTICAL DATUM OF 1988).
- 2) THE CONTOURS SHOWN IN THESE PLANS ARE BASED ON 2017-2018 DWR DELTA LIDAR
- 3) FLOOD ELEVATION AREA BASED ON USACE 1957 DESIGN WATER SURFACE ELEVATIONS (REVISED AUGUST 1969 AND RECREATED 2006).



PLANNING  
PERMITTING  
ARCHITECTURE  
CIVIL ENGINEERING  
PROJECT MANAGEMENT

DESIGNED BY:  
**G LABRIE**

DRAWN BY:  
**JM/SD**

CHECK BY:  
**G LABRIE**

SCALE:

**AS SHOWN**

ORIGINAL DRAWING SCALE

0" 1/2" 1"

REVISIONS				
SYM	DESCRIPTION	DATE	BY	APRVD. BY
	TERRAWALL MODIFIED PER USACE COMMENTS (GEOGRID)	8-17-17	JM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	4-6-18	JM/RM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	2-21-20	JM/RM/AC	
	SITE #1 WETLANDS AND RIPARIAN BENCHES REV. 3	4-17-20	JM/RM/AC	

BRANNAN-ANDRUS LEVEE MAINTENANCE DISTRICT

## **EROSION CONTROL/HABITAT ENHANCEMENT SITES**

SACRAMENTO RIVER RM14.60L TO RM17.34L

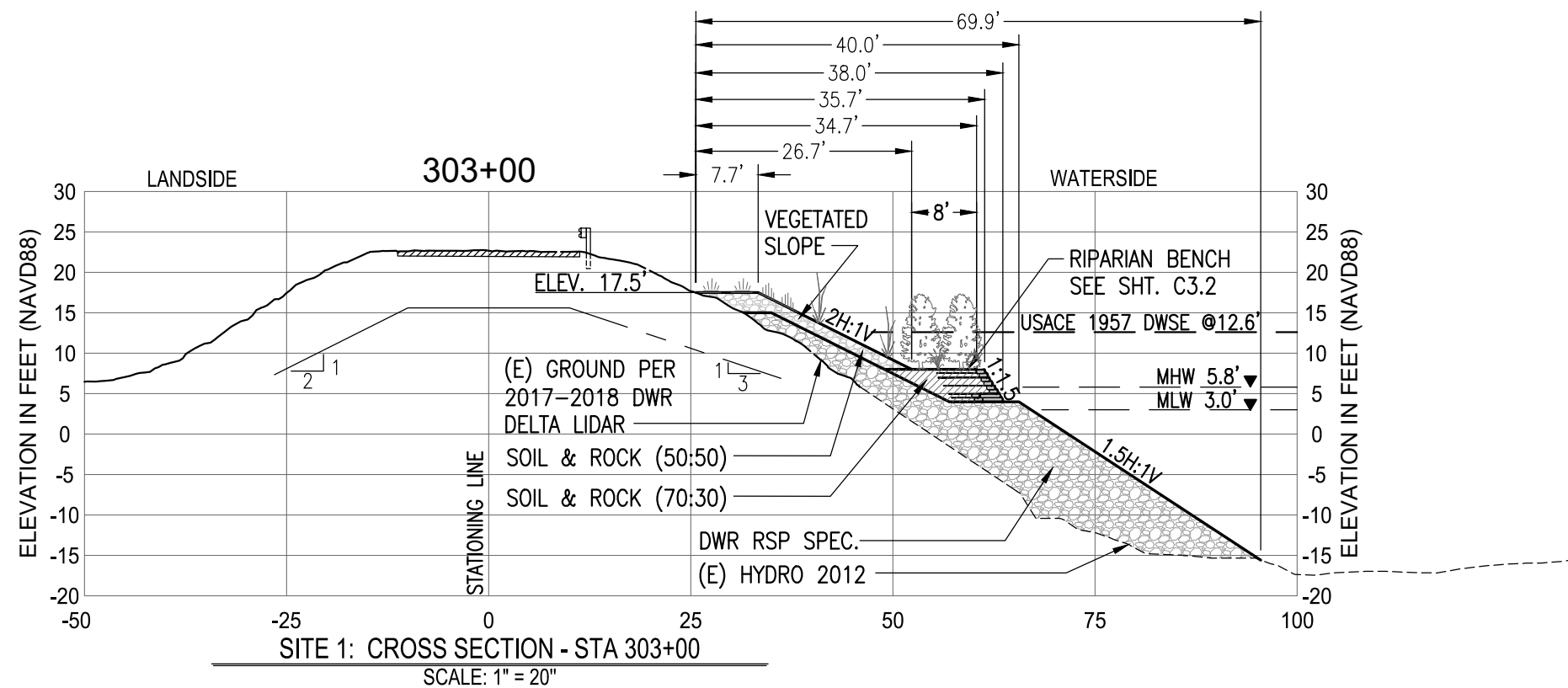
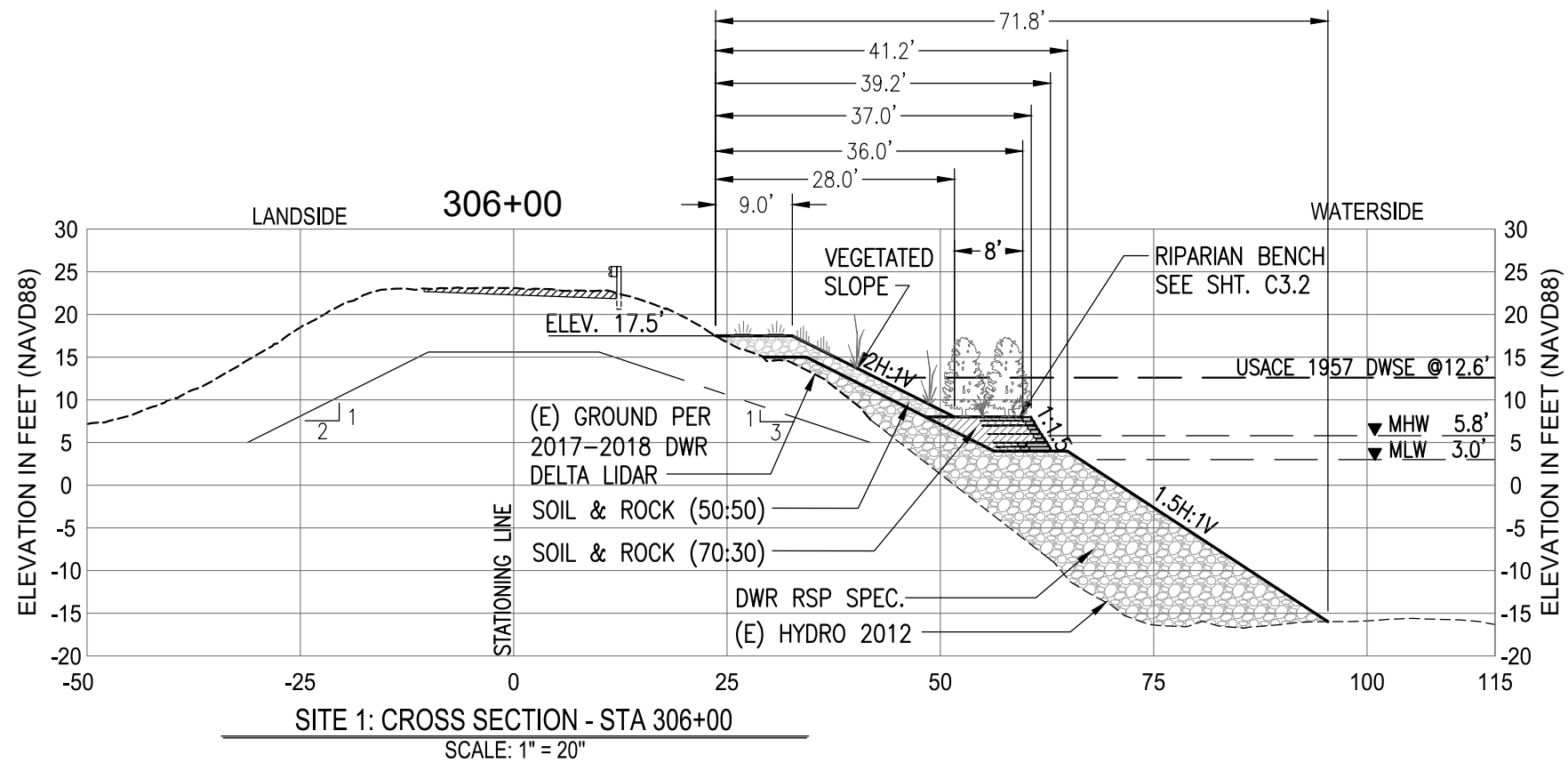
SITE 1 CROSS SECTIONS STA 309+00 AND STA 312+00

DATE:  
**04/03/2020**

SHEET NUMBER:  
**C4.5**

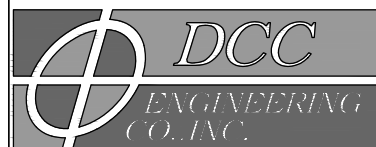
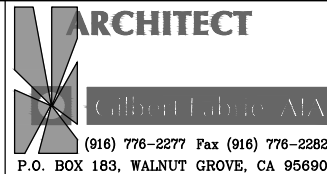
PROJECT NUMBER:  
**7702.16**





# DATA REFERENCES:

- 1) VERTICAL DATUM: NAVD88 (NORTH AMERICAN VERTICAL DATUM OF 1988).
- 2) THE CONTOURS SHOWN IN THESE PLANS ARE BASED ON 2017-2018 DWR DELTA LIDAR
- 3) FLOOD ELEVATION AREA BASED ON USACE 1957 DESIGN WATER SURFACE ELEVATIONS (REVISED AUGUST 1969 AND RECREATED 2006).



PLANNING  
PERMITTING  
ARCHITECTURE  
CIVIL ENGINEERING  
PROJECT MANAGEMENT

DESIGNED BY:  
G LABRIE  
DRAWN BY:  
JM/SD  
CHECK BY:  
G LABRIE

SCALE:  
AS SHOWN  
ORIGINAL DRAWING SCALE  
0" 1/2" 1"

REVISIONS				
SYM	DESCRIPTION	DATE	BY	APRVD. BY
	TERRAWALL MODIFIED PER USACE COMMENTS (GEOGRID)	8-17-17	JM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	4-6-18	JM/RM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	2-21-20	JM/RM/AC	
	SITE #1 WETLANDS AND RIPARIAN BENCHES REV. 3	4-17-20	JM/RM/AC	

BRANNAN-ANDRUS LEVEE MAINTENANCE DISTRICT

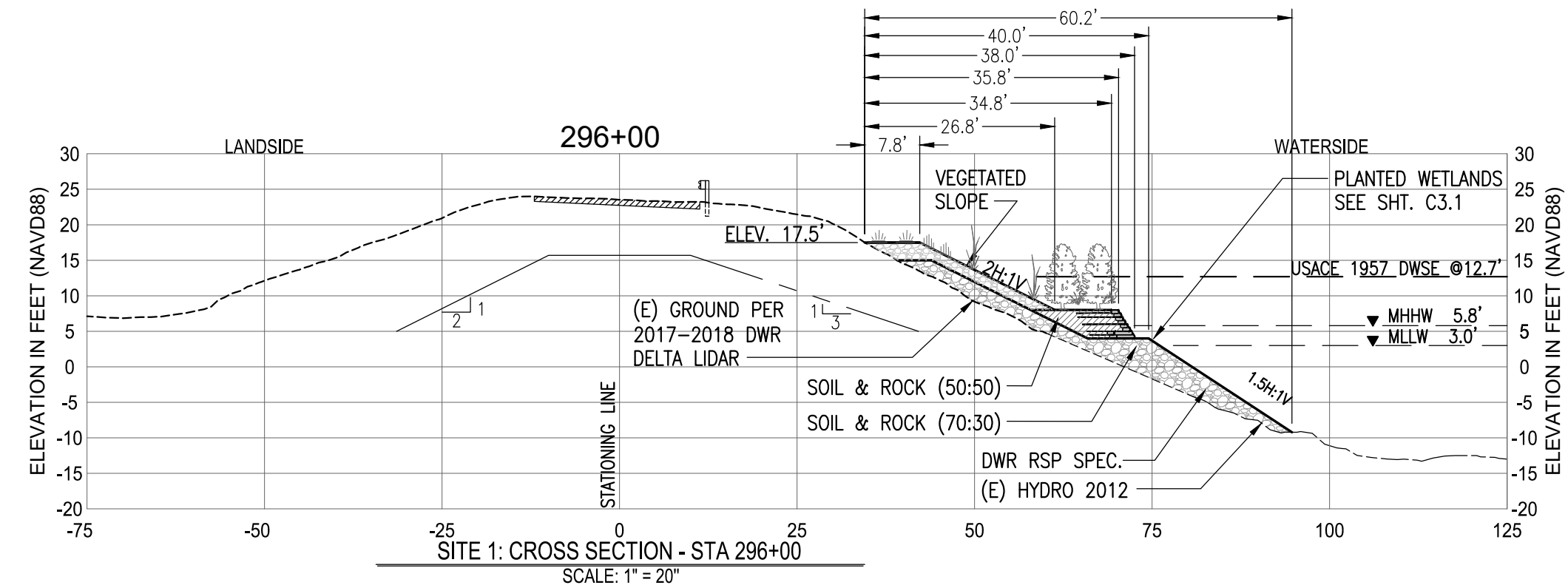
**EROSION CONTROL/HABITAT  
ENHANCEMENT SITES**

SACRAMENTO RIVER RM14.60L TO RM17.34L

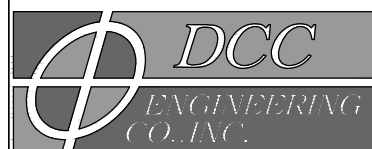
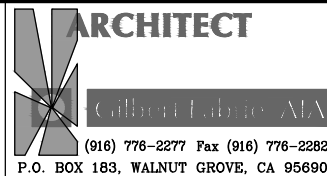
**SITE 1 CROSS SECTIONS STA 303+00 AND STA 306+00**

DATE:  
04/03/2020  
SHEET NUMBER:  
**C4.6**  
PROJECT NUMBER:  
7702.16





- 1) VERTICAL DATUM: NAVD88 (NORTH AMERICAN VERTICAL DATUM OF 1988).
- 2) THE CONTOURS SHOWN IN THESE PLANS ARE BASED ON 2017-2018 DWR DELTA LIDAR
- 3) FLOOD ELEVATION AREA BASED ON USACE 1957 DESIGN WATER SURFACE ELEVATIONS (REVISED AUGUST 1969 AND RECREATED 2006).




- PLANNING
- PERMITTING
- ARCHITECTURE
- CIVIL ENGINEERING
- PROJECT MANAGEMENT

TT	DESIGNED BY: <b>G LABRIE</b>
	DRAWN BY: <b>JM/SD</b>
	CHECK BY: <b>G LABRIE</b>

SCALE:  
AS SHOWN

ORIGINAL DRAWING SCALE

0" 1/2" 1"

A horizontal scale bar with vertical tick marks. The first major tick is labeled "0". The fifth major tick is labeled "1/2". The tenth major tick is labeled "1". There are four minor ticks between each major tick, representing 1/8 inch increments.

		REVISIONS			
SYM	DESCRIPTION	DATE	BY	APPRD. BY	
	TERRAWALL MODIFIED PER USAGE COMMENTS (GEOGRID)	8-17-17	JM		
	WETLANDS AND RIPARIAN BENCHES REVISIONS	4-6-18	JM/RM		
	WETLANDS AND RIPARIAN BENCHES REVISIONS	2-21-20	JM/RM/AC		
"	SITE #1 WETLANDS AND RIPARIAN BENCHES REV. 3	4-17-20	JM/RM/AC		

BRANNAN-ANDRUS LEVEE MAINTENANCE DISTRICT
---

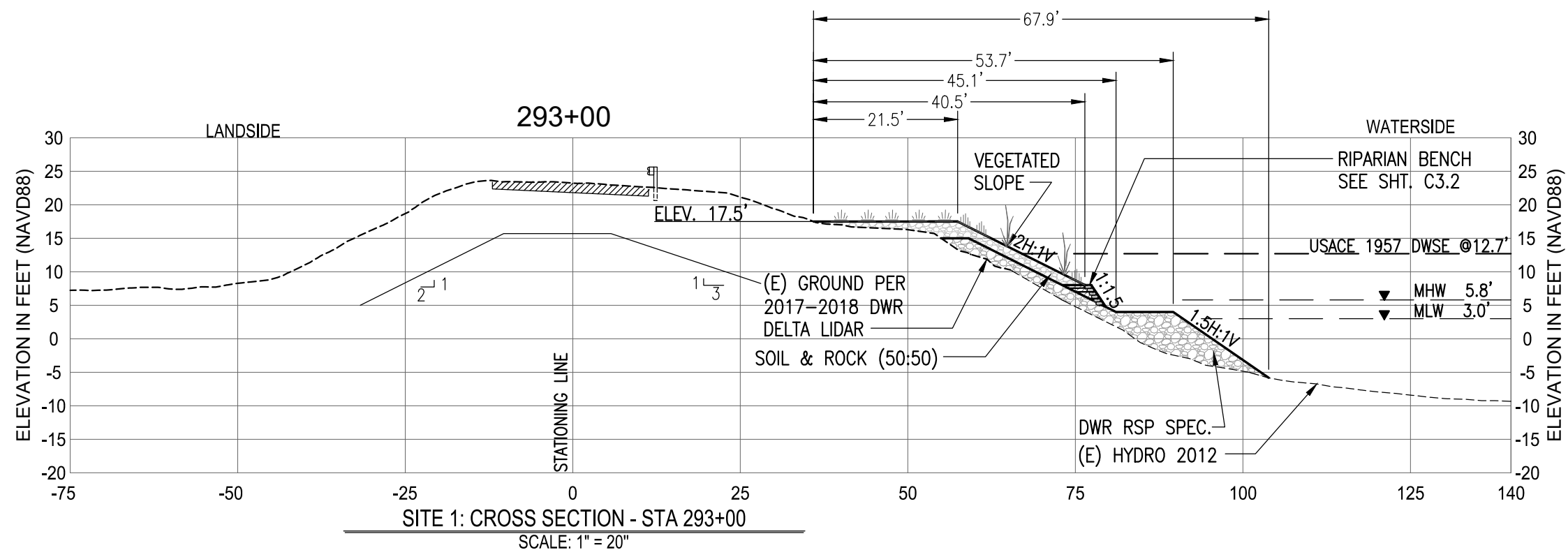
## EROSION CONTROL/HABITAT ENHANCEMENT SITES



SACRAMENTO RIVER RM14.60L TO RM17.34L

# SITE 1 CROSS SECTIONS STA 296+00 AND STA 299+00

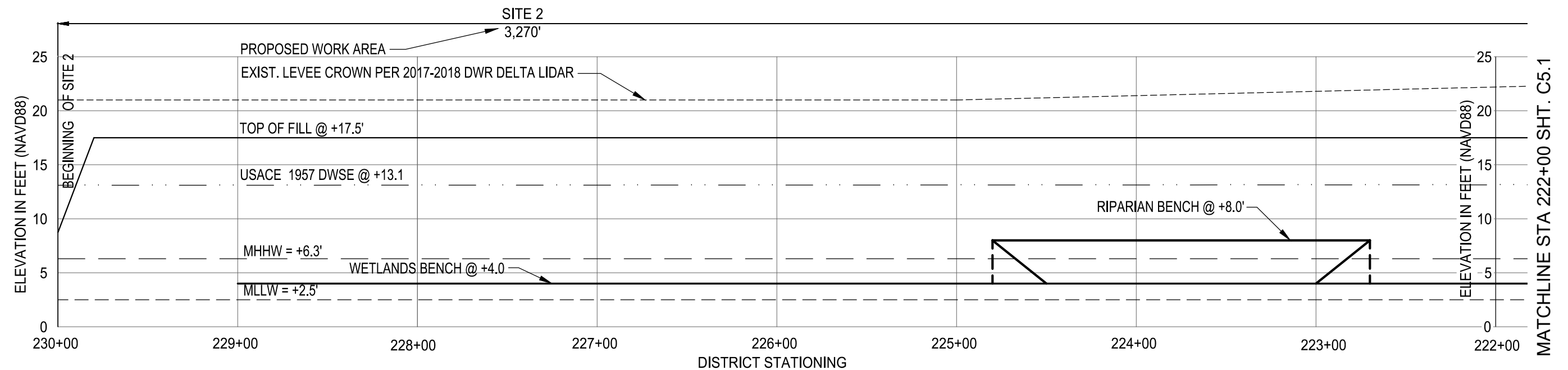
DATE: 04/03/2020
SHEET NUMBER: C4.7
PROJECT NUMBER: 7702.16



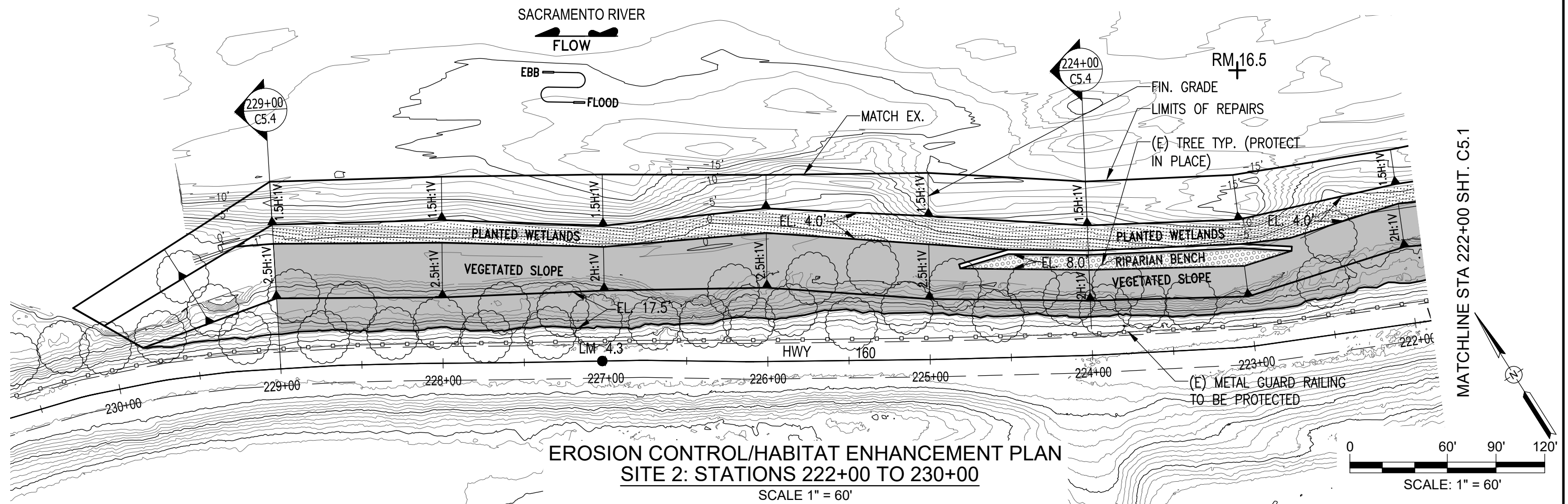


<div>DATA REFERENCES:</div> <div>1) VERTICAL DATUM: NAVD88 (NORTH AMERICAN VERTICAL DATUM OF 1988).</div> <div>2) THE CONTOURS SHOWN IN THESE PLANS ARE BASED ON 2017-2018 DWR DELTA LIDAR</div> <div>3) FLOOD ELEVATION AREA BASED ON USACE 1957 DESIGN WATER SURFACE ELEVATIONS (REVISED AUGUST 1969 AND RECREATED 2006).</div>	<div><div>ARCHITECT</div><div></div><div>(916) 776-2277 Fax (916) 776-2282</div><div>P.O. BOX 183, WALNUT GROVE, CA 95690</div></div>	<div><div></div><div>PLANNING</div><div>PERMITTING</div><div>ARCHITECTURE</div><div>CIVIL ENGINEERING</div><div>PROJECT MANAGEMENT</div></div>	DESIGNED BY:	SCALE:	REVISIONS					BRANNAN-ANDRUS LEVEE MAINTENANCE DISTRICT		DATE:	
			G LABRIE	AS SHOWN	SYM	DESCRIPTION	DATE	BY	APRVD. BY	EROSION CONTROL/HABITAT ENHANCEMENT SITES		04/03/2020	
			DRAWN BY:	JM/SD	ORIGINAL DRAWING SCALE		TERRAWALL MODIFIED PER USACE COMMENTS (GEOGRID)	8-17-17	JM		SACRAMENTO RIVER RM14.60L TO RM17.34L		SHEET NUMBER:
							WETLANDS AND RIPARIAN BENCHES REVISIONS	4-6-18	JM/RM		C4.8		
							WETLANDS AND RIPARIAN BENCHES REVISIONS	2-21-20	JM/RM/AC				
			CHECK BY:	G LABRIE	0" 1/2" 1"		SITE #1 WETLANDS AND RIPARIAN BENCHES REV. 3	4-17-20	JM/RM/AC		SITE 1 CROSS SECTIONS STA 293+00		PROJECT NUMBER:
										7702.16			





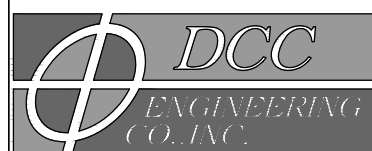
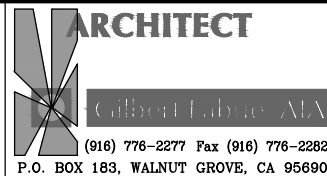
EROSION CONTROL/HABITAT ENHANCEMENT PROFILE  
VERTICAL SCALE 1" = 10' HORIZONTAL SCALE 1" = 60'



EROSION CONTROL/HABITAT ENHANCEMENT PLAN  
SITE 2: STATIONS 222+00 TO 230+00  
SCALE 1" = 60'

DATA REFERENCES:

- 1) VERTICAL DATUM: NAVD88 (NORTH AMERICAN VERTICAL DATUM OF 1988).
- 2) THE CONTOURS SHOWN IN THESE PLANS ARE BASED ON 2017-2018 DWR DELTA LIDAR
- 3) FLOOD ELEVATION AREA BASED ON USACE 1957 DESIGN WATER SURFACE ELEVATIONS (REVISED AUGUST 1969 AND RECREATED 2006).



PLANNING  
PERMITTING  
ARCHITECTURE  
CIVIL ENGINEERING  
PROJECT MANAGEMENT

DESIGNED BY:  
G LABRIE  
DRAWN BY:  
JM/SD  
CHECK BY:  
G LABRIE

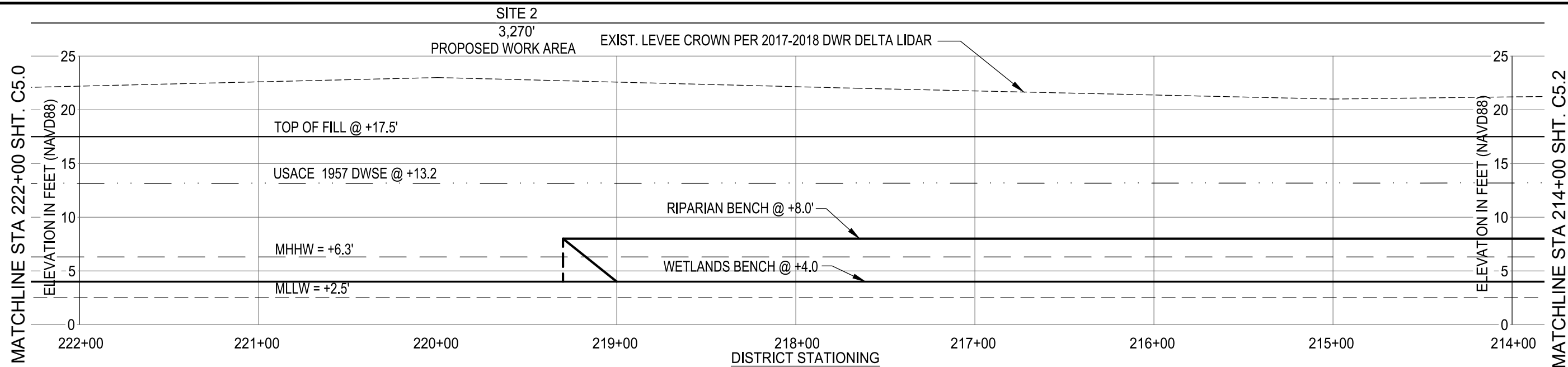
SCALE:  
AS SHOWN  
ORIGINAL DRAWING SCALE  
0" 1/2" 1"

REVISIONS				
SYM	DESCRIPTION	DATE	BY	APRVD. BY
	TERRAWALL MODIFIED PER USACE COMMENTS (GEOGRID)	8-17-17	JM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	4-6-18	JM/RM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	2-21-20	JM/RM/AC	
	SITE #1 WETLANDS AND RIPARIAN BENCHES REV. 3	4-17-20	JM/RM/AC	

BRANNAN-ANDRUS LEVEE MAINTENANCE DISTRICT	
EROSION CONTROL/HABITAT ENHANCEMENT SITES	
SACRAMENTO RIVER RM14.60L TO RM17.34L	
SITE 2 STA 222+00 TO STA 230+00 PLAN & PROFILE	

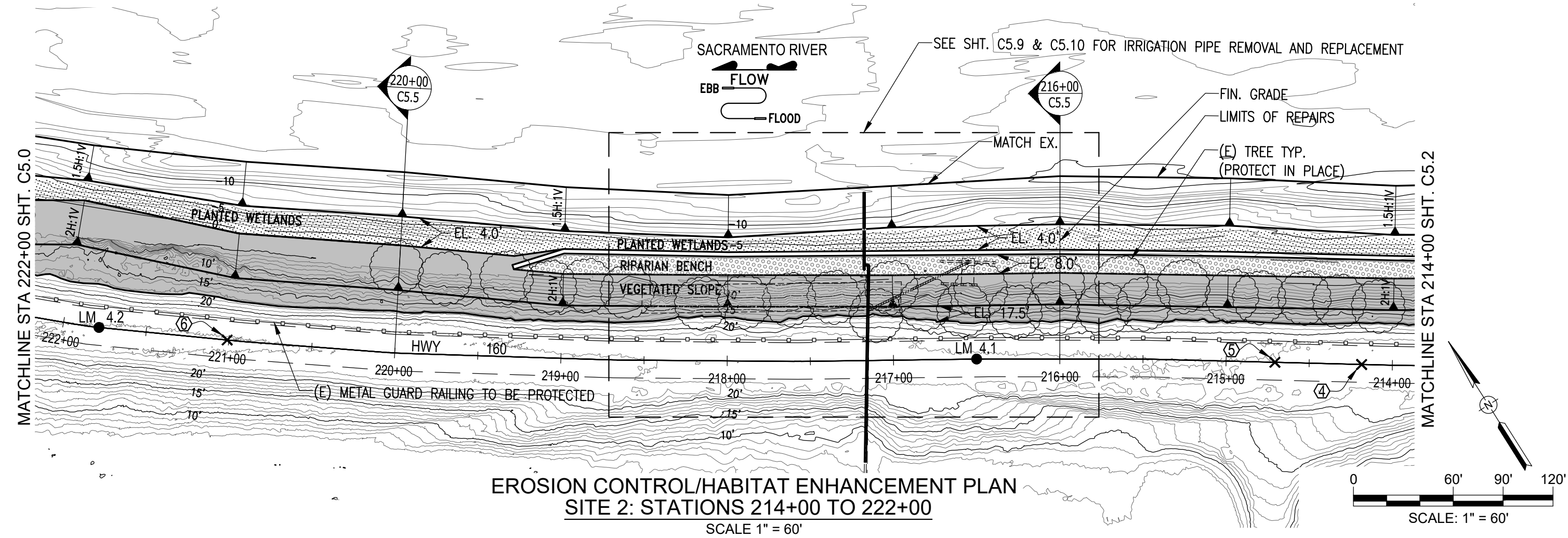
DATE:  
04/03/2020  
SHEET NUMBER:  
C5.0  
PROJECT NUMBER:  
7702.16





EROSION CONTROL/HABITAT ENHANCEMENT PROFILE  
VERTICAL SCALE 1" = 10' HORIZONTAL SCALE 1" = 60'

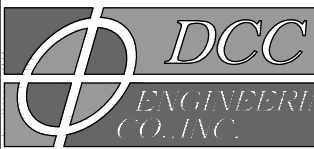
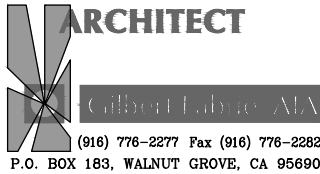
SEE SHEET C2.0 FOR DESCRIPTION



EROSION CONTROL/HABITAT ENHANCEMENT PLAN  
SITE 2: STATIONS 214+00 TO 222+00  
SCALE 1" = 60'

DATA REFERENCES:

- 1) VERTICAL DATUM: NAVD88 (NORTH AMERICAN VERTICAL DATUM OF 1988).
- 2) THE CONTOURS SHOWN IN THESE PLANS ARE BASED ON 2017-2018 DWR DELTA LIDAR
- 3) FLOOD ELEVATION AREA BASED ON USACE 1957 DESIGN WATER SURFACE ELEVATIONS (REVISED AUGUST 1969 AND RECREATED 2006).



PLANNING  
PERMITTING  
ARCHITECTURE  
CIVIL ENGINEERING  
PROJECT MANAGEMENT

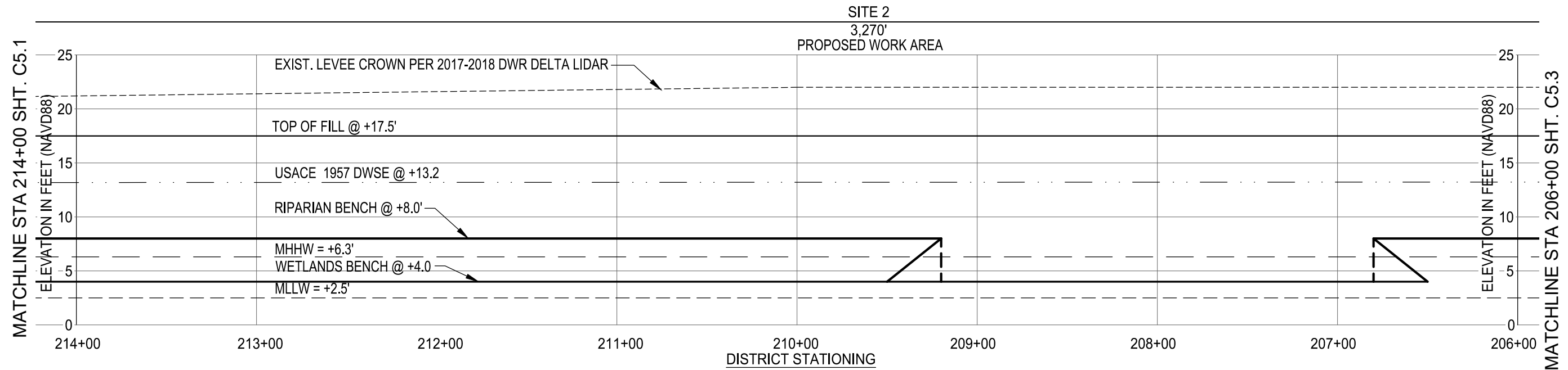
DESIGNED BY:  
G LABRIE  
DRAWN BY:  
JM/SD  
CHECK BY:  
G LABRIE

SCALE:  
AS SHOWN  
ORIGINAL DRAWING SCALE  
0" 1/2" 1"

SYM	DESCRIPTION	REVISIONS			
		DATE	BY	APRVD. BY	
	TERRAWALL MODIFIED PER USACE COMMENTS (GEOGRID)	8-17-17	JM		
	WETLANDS AND RIPARIAN BENCHES REVISIONS	4-6-18	JM/RM		
	WETLANDS AND RIPARIAN BENCHES REVISIONS	2-21-20	JM/RM/AC		
	SITE #1 WETLANDS AND RIPARIAN BENCHES REV. 3	4-17-20	JM/RM/AC		

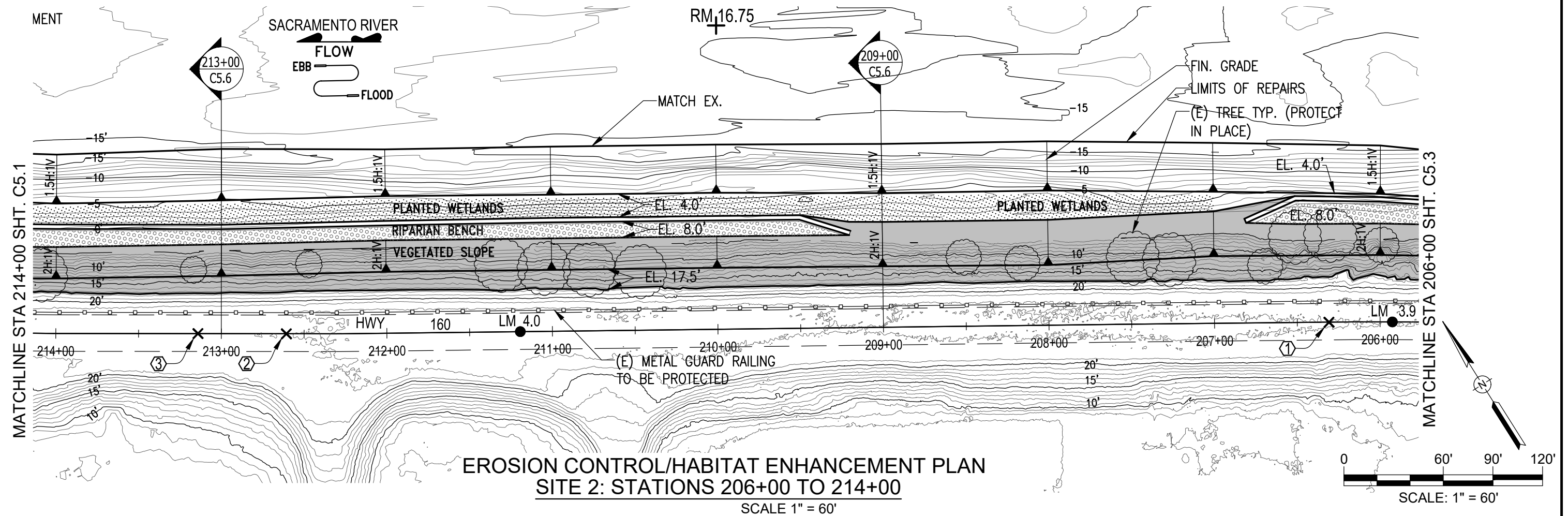
BRANNAN-ANDRUS LEVEE MAINTENANCE DISTRICT				DATE:	04/03/2020
EROSION CONTROL/HABITAT ENHANCEMENT SITES				SHEET NUMBER:	C5.1
SACRAMENTO RIVER RM14.60L TO RM17.34L				PROJECT NUMBER:	7702.16
SITE 2 STA 214+00 TO STA 222+00 PLAN & PROFILE					





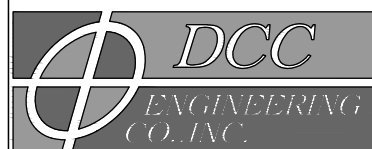
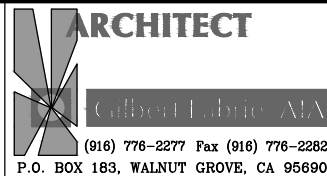
**EROSION CONTROL/HABITAT ENHANCEMENT PROFILE**  
VERTICAL SCALE 1" = 10' HORIZONTAL SCALE 1" = 60'

⊞ SEE SHEET C2.0 FOR DESCRIPTION



**DATA REFERENCES:**

- 1) VERTICAL DATUM: NAVD88 (NORTH AMERICAN VERTICAL DATUM OF 1988).
- 2) THE CONTOURS SHOWN IN THESE PLANS ARE BASED ON 2017-2018 DWR DELTA LIDAR.
- 3) FLOOD ELEVATION AREA BASED ON USACE 1957 DESIGN WATER SURFACE ELEVATIONS (REVISED AUGUST 1969 AND RECREATED 2006).



PLANNING  
PERMITTING  
ARCHITECTURE  
CIVIL ENGINEERING  
PROJECT MANAGEMENT

DESIGNED BY:  
G LABRIE  
DRAWN BY:  
JM/SD  
CHECK BY:  
G LABRIE

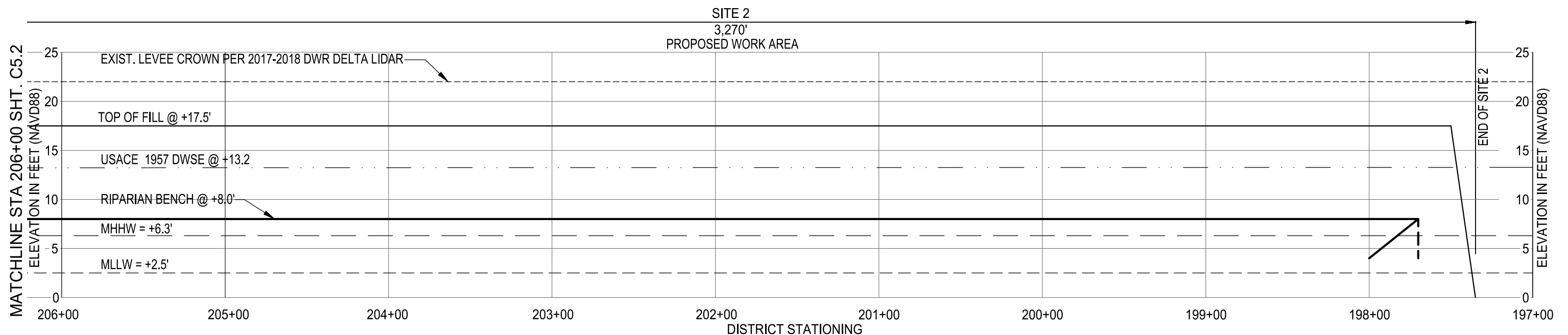
SCALE:  
AS SHOWN  
ORIGINAL DRAWING SCALE  
0" 1/2" 1"

REVISIONS				
SYM	DESCRIPTION	DATE	BY	APRVD. BY
	TERRAWALL MODIFIED PER USACE COMMENTS (GEOGRID)	8-17-17	JM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	4-6-18	JM/RM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	2-21-20	JM/RM/AC	
	SITE #1 WETLANDS AND RIPARIAN BENCHES REV. 3	4-17-20	JM/RM/AC	

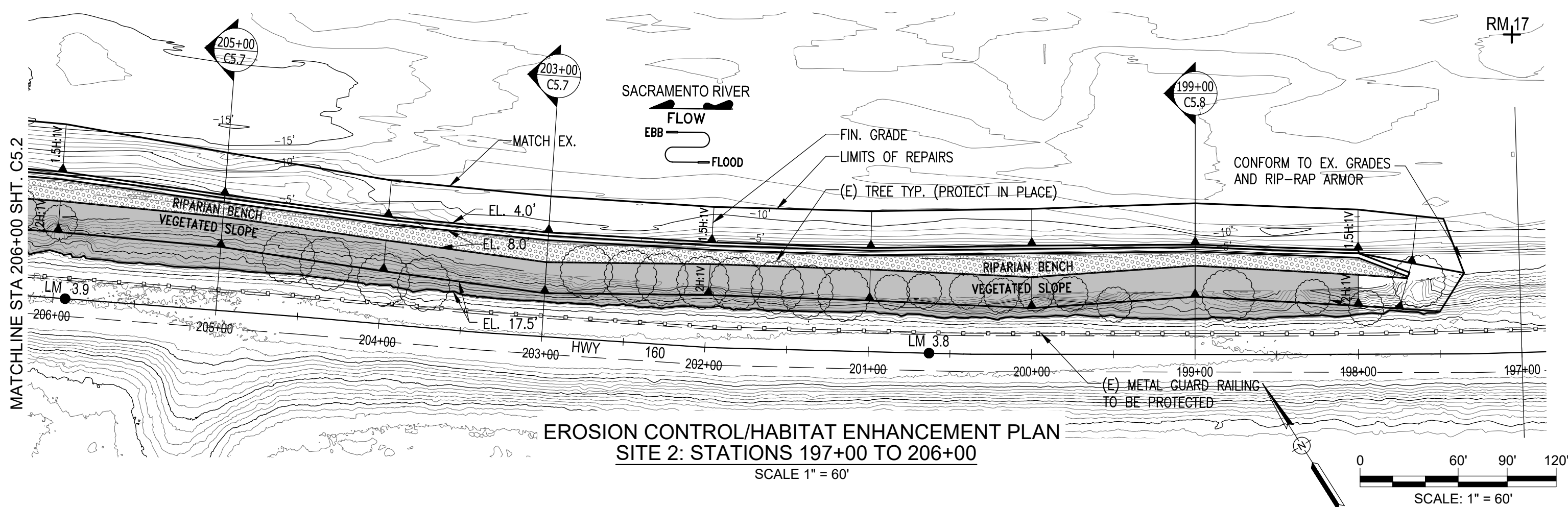
BRANNAN-ANDRUS LEVEE MAINTENANCE DISTRICT	
<b>EROSION CONTROL/HABITAT ENHANCEMENT SITES</b>	
SACRAMENTO RIVER RM14.60L TO RM17.34L	
SITE 2 STA 206+00 TO STA 214+00 PLAN & PROFILE	

DATE:  
04/03/2020  
SHEET NUMBER:  
C5.2  
PROJECT NUMBER:  
7702.16





EROSION CONTROL/HABITAT ENHANCEMENT PROFILE  
VERTICAL SCALE 1" = 10' HORIZONTAL SCALE 1" = 60'



EROSION CONTROL/HABITAT ENHANCEMENT PLAN  
SITE 2: STATIONS 197+00 TO 206+00  
SCALE 1" = 60'

DATA REFERENCES:  
1) VERTICAL DATUM: NAVD88 (NORTH AMERICAN VERTICAL DATUM OF 1988).  
2) THE CONTOURS SHOWN IN THESE PLANS ARE BASED ON 2017-2018 DWR DELTA LIDAR.  
3) FLOOD ELEVATION AREA BASED ON USACE 1957 DESIGN WATER SURFACE ELEVATIONS (REVISED AUGUST 1969 AND RECREATED 2006).

**ARCHITECT**  
**Calbert Labrie AIA**  
(916) 776-2277 Fax (916) 776-2282  
P.O. BOX 183, WALNUT GROVE, CA 95690

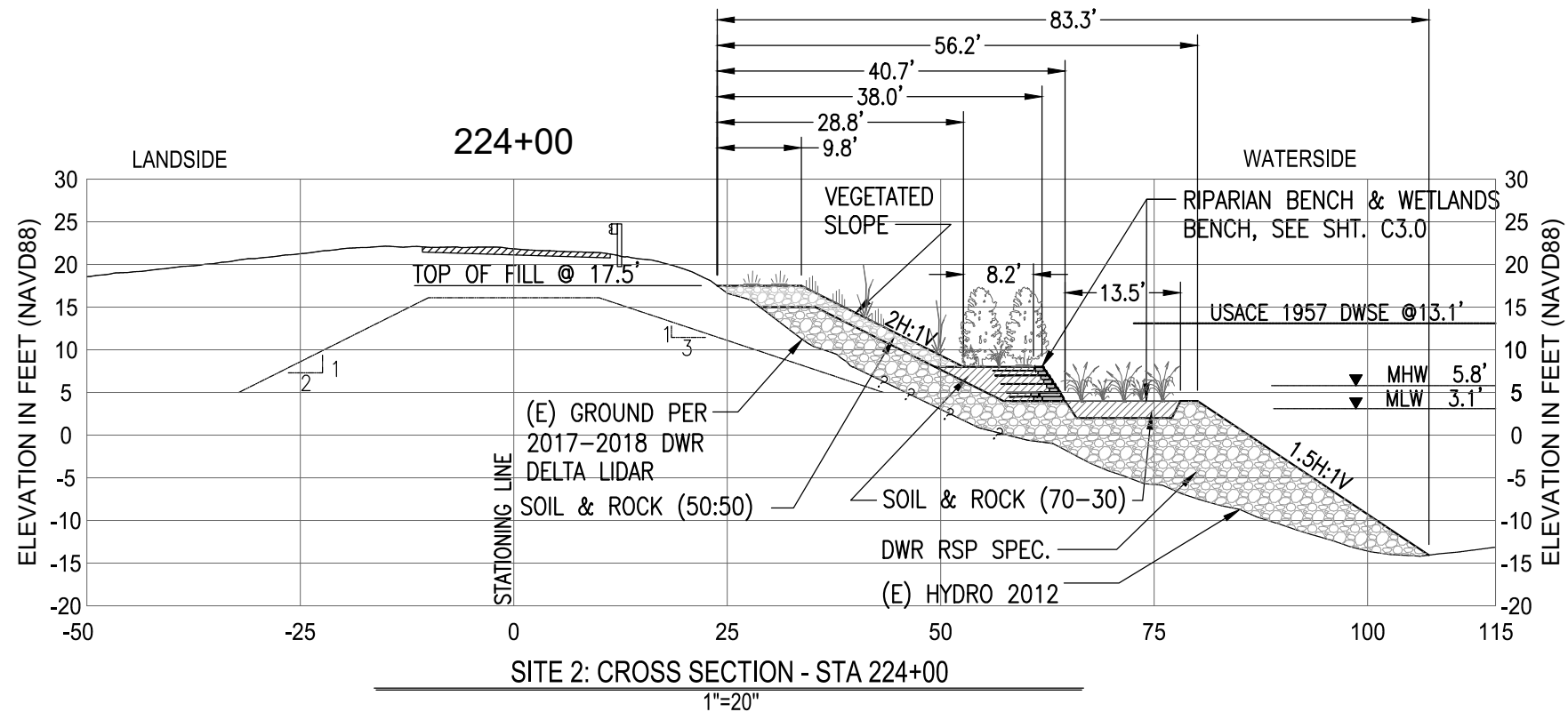
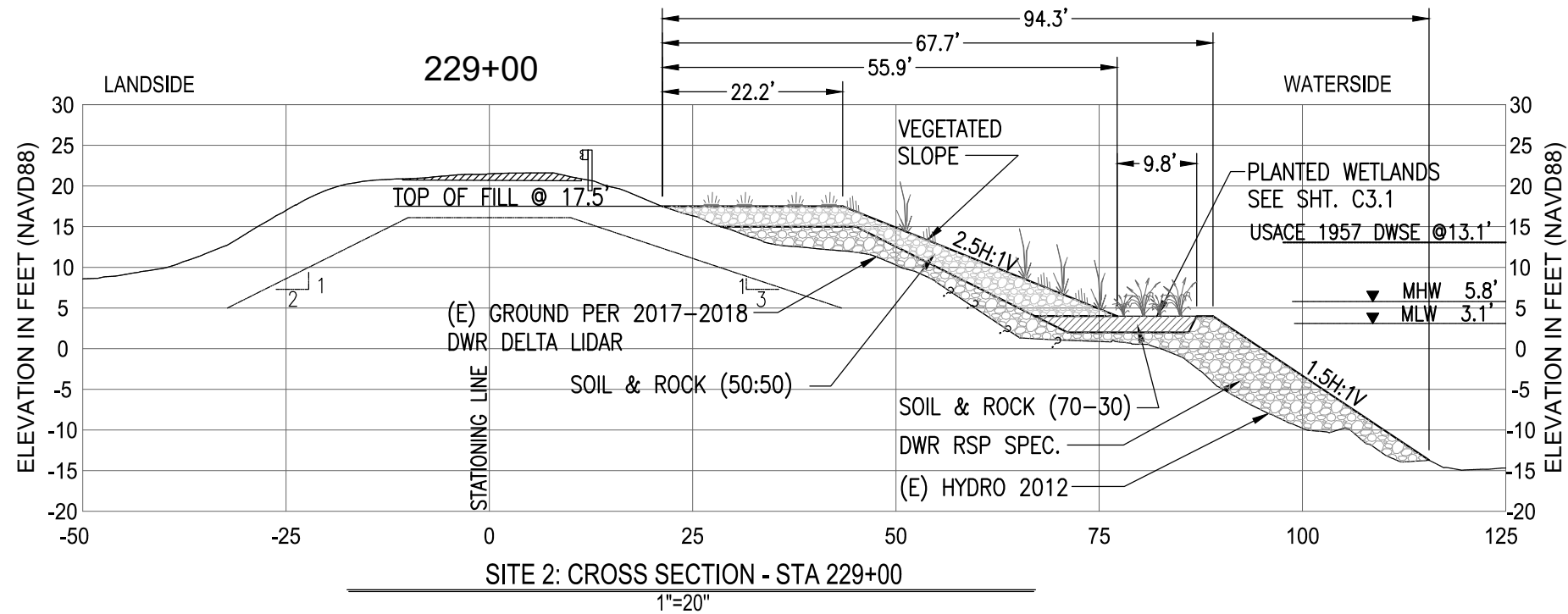
**DCC**  
**ENGINEERING**  
**CO., INC.**  
PLANNING  
PERMITTING  
ARCHITECTURE  
CIVIL ENGINEERING  
PROJECT MANAGEMENT

DESIGNED BY:  
**G LABRIE**  
DRAWN BY:  
**JM/SD**  
CHECK BY:  
**G LABRIE**  
SCALE:  
**AS SHOWN**  
ORIGINAL DRAWING SCALE  
0" 1/2" 1"

REVISIONS				
SYM	DESCRIPTION	DATE	BY	APRVD. BY
	TERRAWALL MODIFIED PER USACE COMMENTS (GEOGRID)	8-17-17	JM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	4-6-18	JM/RM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	2-21-20	JM/RM/AC	
	SITE #1 WETLANDS AND RIPARIAN BENCHES REV. 3	4-17-20	JM/RM/AC	

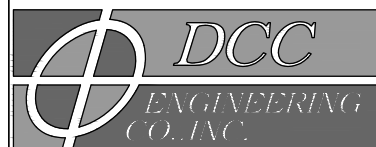
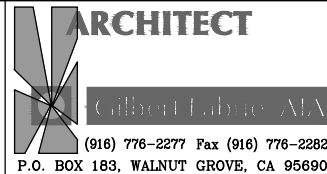
BRANNAN-ANDRUS LEVEE MAINTENANCE DISTRICT  
**EROSION CONTROL/HABITAT  
ENHANCEMENT SITES**  
SACRAMENTO RIVER RM14.60L TO RM17.34L  
SITE 2 STA 197+00 TO STA 206+00 PLAN & PROFILE  
DATE:  
**04/03/2020**  
SHEET NUMBER:  
**C5.3**  
PROJECT NUMBER:  
**7702.16**





**DATA REFERENCES:**

- 1) VERTICAL DATUM: NAVD88 (NORTH AMERICAN VERTICAL DATUM OF 1988).
- 2) THE CONTOURS SHOWN IN THESE PLANS ARE BASED ON 2017-2018 DWR DELTA LIDAR
- 3) FLOOD ELEVATION AREA BASED ON USACE 1957 DESIGN WATER SURFACE ELEVATIONS (REVISED AUGUST 1969 AND RECREATED 2006).



PLANNING  
PERMITTING  
ARCHITECTURE  
CIVIL ENGINEERING  
PROJECT MANAGEMENT

DESIGNED BY:  
**G LABRIE**  
DRAWN BY:  
**JM/SD**  
CHECK BY:  
**G LABRIE**

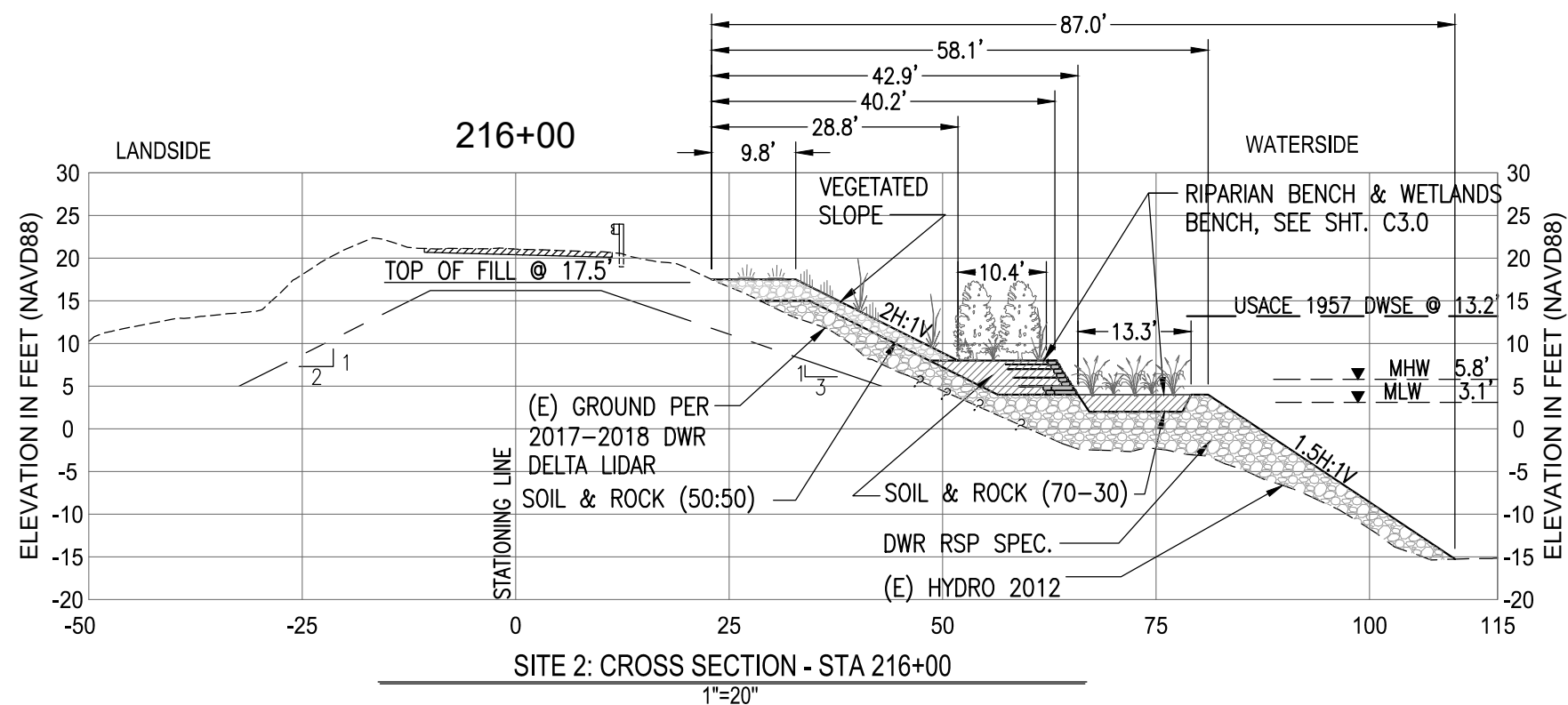
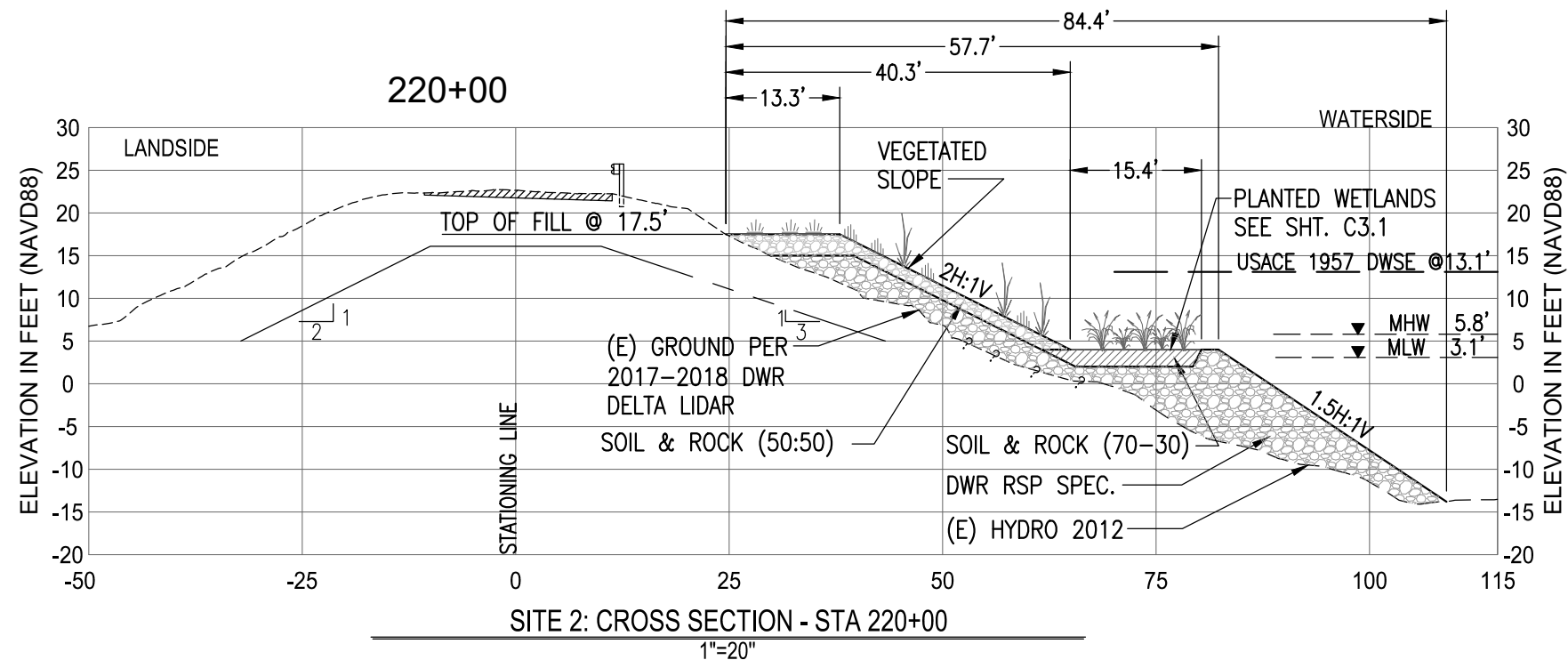
SCALE:  
**AS SHOWN**  
ORIGINAL DRAWING SCALE  
0" 1/2" 1"

REVISIONS				
SYM	DESCRIPTION	DATE	BY	APRVD. BY
	TERRAWALL MODIFIED PER USACE COMMENTS (GEOGRID)	8-17-17	JM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	4-6-18	JM/RM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	2-21-20	JM/RM/AC	
	SITE #1 WETLANDS AND RIPARIAN BENCHES REV. 3	4-17-20	JM/RM/AC	

BRANNAN-ANDRUS LEVEE MAINTENANCE DISTRICT	
<b>EROSION CONTROL/HABITAT ENHANCEMENT SITES</b>	
SACRAMENTO RIVER RM14.60L TO RM17.34L	
SITE 2 CROSS SECTIONS STA 224+00 AND STA 229+00	

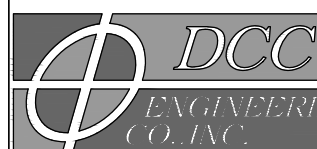
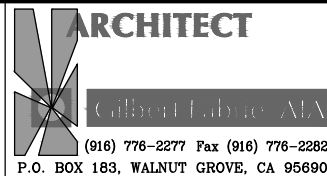
DATE:  
**04/03/2020**  
SHEET NUMBER:  
**C5.4**  
PROJECT NUMBER:  
**7702.16**





# DATA REFERENCES:

- 1) VERTICAL DATUM: NAVD88 (NORTH AMERICAN VERTICAL DATUM OF 1988).
- 2) THE CONTOURS SHOWN IN THESE PLANS ARE BASED ON 2017-2018 DWR DELTA LIDAR
- 3) FLOOD ELEVATION AREA BASED ON USACE 1957 DESIGN WATER SURFACE ELEVATIONS (REVISED AUGUST 1969 AND RECREATED 2006).



PLANNING  
PERMITTING  
ARCHITECTURE  
CIVIL ENGINEERING  
PROJECT MANAGEMENT

DESIGNED BY:  
G LABRIE  
DRAWN BY:  
JM/SD  
CHECK BY:  
G LABRIE

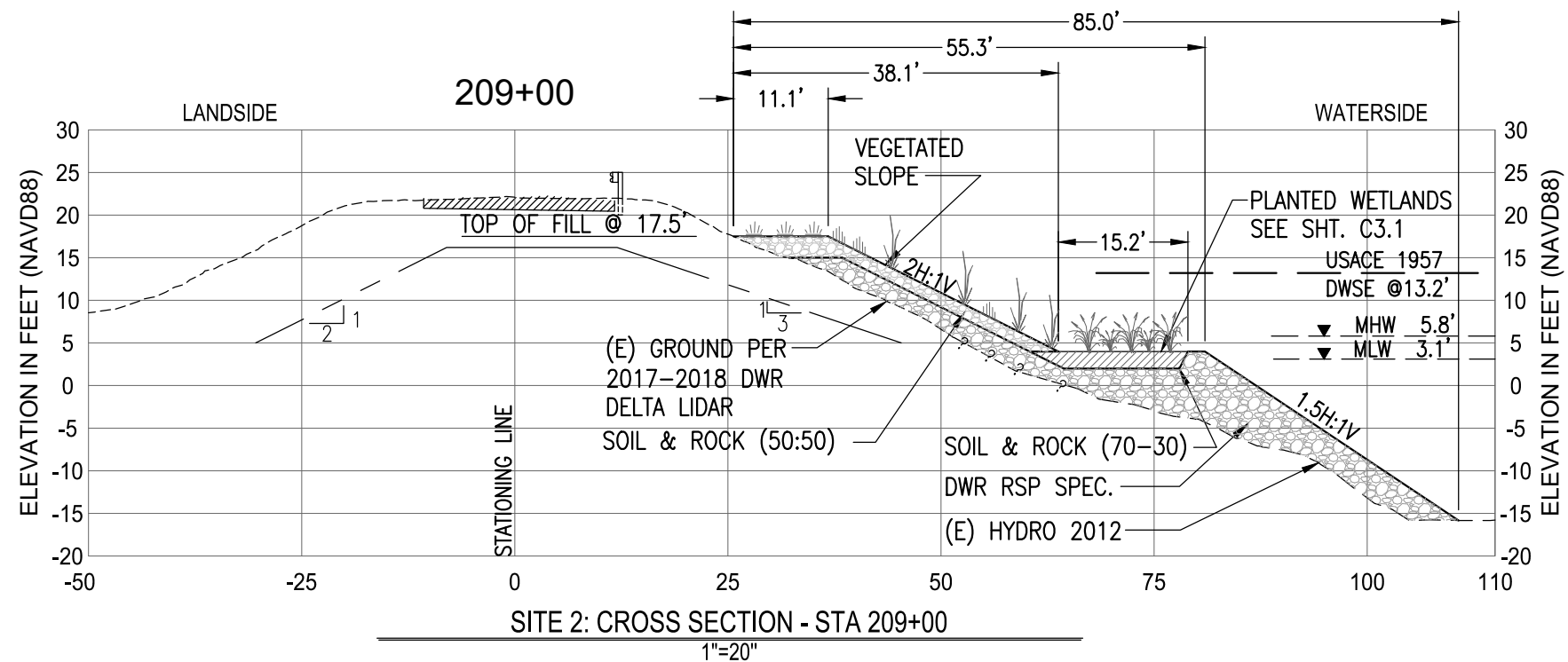
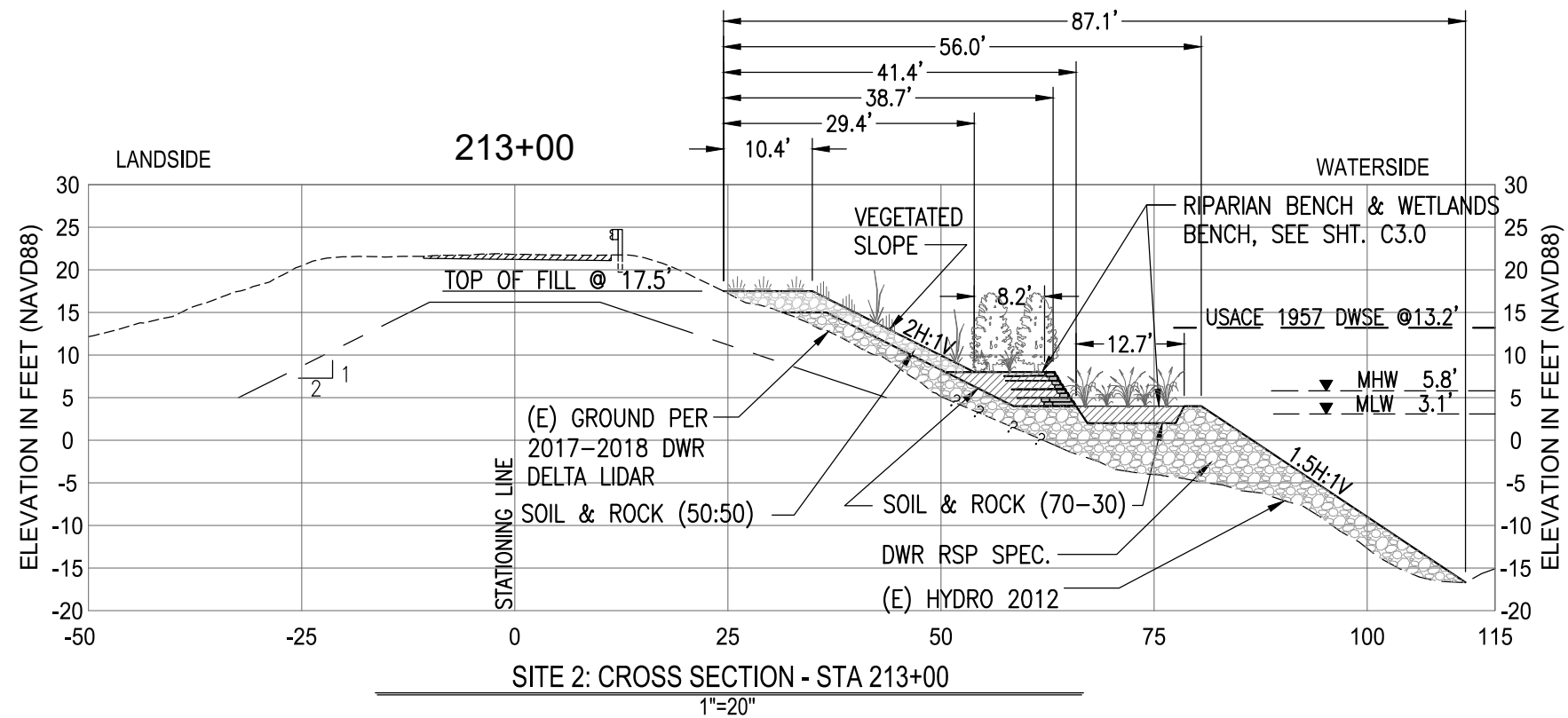
SCALE:  
**AS SHOWN**  
ORIGINAL DRAWING SCALE  
0" 1/2" 1"

REVISIONS				
SYM	DESCRIPTION	DATE	BY	APRVD. BY
	TERRAWALL MODIFIED PER USACE COMMENTS (GEOGRID)	8-17-17	JM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	4-6-18	JM/RM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	2-21-20	JM/RM/AC	
	SITE #1 WETLANDS AND RIPARIAN BENCHES REV. 3	4-17-20	JM/RM/AC	

BRANNAN-ANDRUS LEVEE MAINTENANCE DISTRICT	
<b>EROSION CONTROL/HABITAT ENHANCEMENT SITES</b>	
SACRAMENTO RIVER RM14.60L TO RM17.34L	
SITE 3 CROSS SECTIONS STA 216+00 AND STA 220+00	

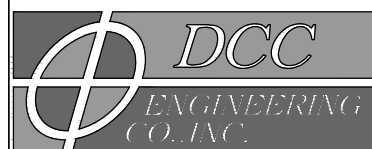
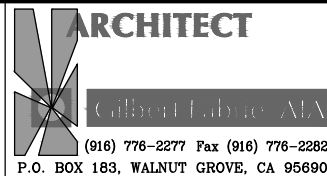
DATE:  
**04/03/2020**  
SHEET NUMBER:  
**C5.5**  
PROJECT NUMBER:  
**7702.16**





#### DATA REFERENCES:

- 1) VERTICAL DATUM: NAVD88 (NORTH AMERICAN VERTICAL DATUM OF 1988).
- 2) THE CONTOURS SHOWN IN THESE PLANS ARE BASED ON 2017-2018 DWR DELTA LIDAR
- 3) FLOOD ELEVATION AREA BASED ON USACE 1957 DESIGN WATER SURFACE ELEVATIONS (REVISED AUGUST 1969 AND RECREATED 2006).



PLANNING  
PERMITTING  
ARCHITECTURE  
CIVIL ENGINEERING  
PROJECT MANAGEMENT

DESIGNED BY:  
**G LABRIE**  
DRAWN BY:  
**JM/SD**  
CHECK BY:  
**G LABRIE**

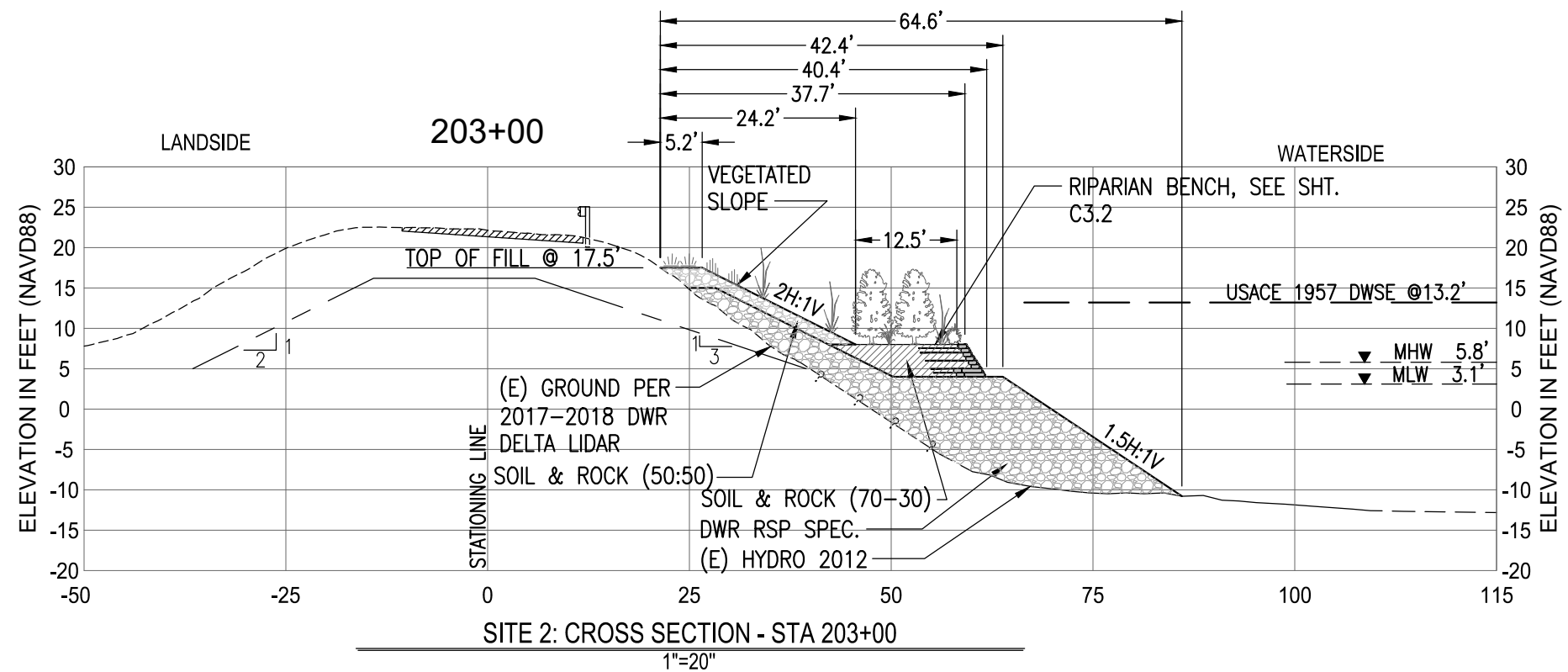
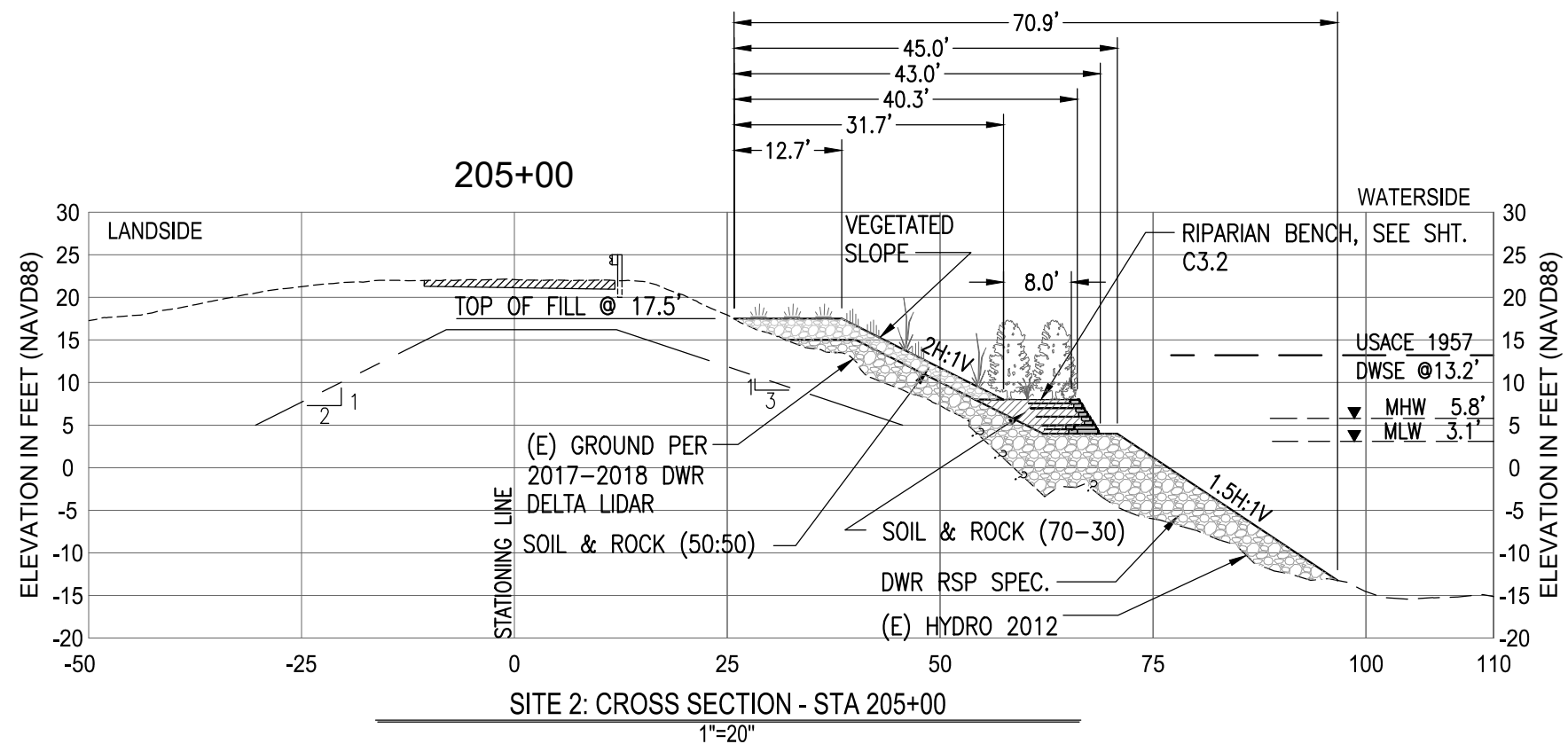
SCALE:  
**AS SHOWN**  
ORIGINAL DRAWING SCALE  
0" 1/2" 1"

REVISIONS				
SYM	DESCRIPTION	DATE	BY	APRVD. BY
	TERRAWALL MODIFIED PER USACE COMMENTS (GEOGRID)	8-17-17	JM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	4-6-18	JM/RM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	2-21-20	JM/RM/AC	
	SITE #1 WETLANDS AND RIPARIAN BENCHES REV. 3	4-17-20	JM/RM/AC	

BRANNAN-ANDRUS LEVEE MAINTENANCE DISTRICT	
<b>EROSION CONTROL/HABITAT ENHANCEMENT SITES</b>	
SACRAMENTO RIVER RM14.60L TO RM17.34L	
SITE 3 CROSS SECTIONS STA 209+00 AND STA 213+00	

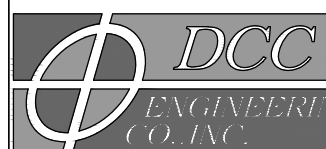
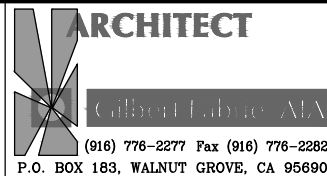
DATE:  
**04/03/2020**  
SHEET NUMBER:  
**C5.6**  
PROJECT NUMBER:  
**7702.16**





# DATA REFERENCES:

- 1) VERTICAL DATUM: NAVD88 (NORTH AMERICAN VERTICAL DATUM OF 1988).
- 2) THE CONTOURS SHOWN IN THESE PLANS ARE BASED ON 2017-2018 DWR DELTA LIDAR
- 3) FLOOD ELEVATION AREA BASED ON USACE 1957 DESIGN WATER SURFACE ELEVATIONS (REVISED AUGUST 1969 AND RECREATED 2006).



PLANNING  
PERMITTING  
ARCHITECTURE  
CIVIL ENGINEERING  
PROJECT MANAGEMENT

DESIGNED BY:  
G LABRIE  
DRAWN BY:  
JM/SD  
CHECK BY:  
G LABRIE

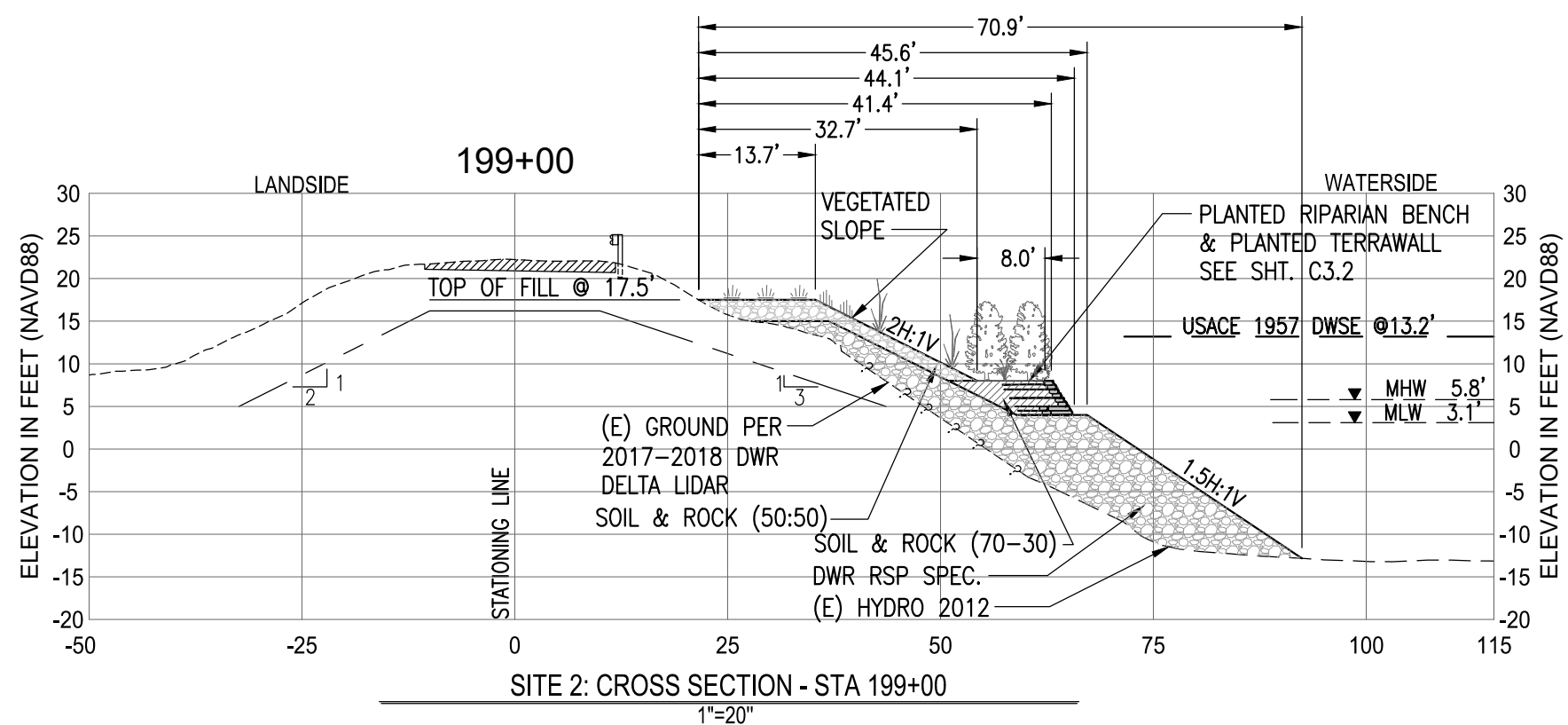
SCALE:  
AS SHOWN  
ORIGINAL DRAWING SCALE  
0" 1/2" 1"

REVISIONS				
SYM	DESCRIPTION	DATE	BY	APRVD. BY
	TERRAWALL MODIFIED PER USACE COMMENTS (GEOGRID)	8-17-17	JM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	4-6-18	JM/RM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	2-21-20	JM/RM/AC	
	SITE #1 WETLANDS AND RIPARIAN BENCHES REV. 3	4-17-20	JM/RM/AC	

BRANNAN-ANDRUS LEVEE MAINTENANCE DISTRICT  
**EROSION CONTROL/HABITAT  
ENHANCEMENT SITES**  
SACRAMENTO RIVER RM14.60L TO RM17.34L  
SITE 3 CROSS SECTIONS STA 203+00 AND STA 205+00

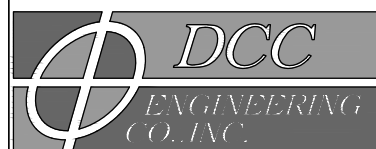
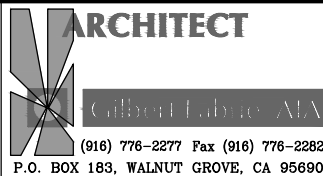
DATE:  
04/03/2020  
SHEET NUMBER:  
**C5.7**  
PROJECT NUMBER:  
7702.16





DATA REFERENCES:

- 1) VERTICAL DATUM: NAVD88 (NORTH AMERICAN VERTICAL DATUM OF 1988).
- 2) THE CONTOURS SHOWN IN THESE PLANS ARE BASED ON 2017-2018 DWR DELTA LIDAR
- 3) FLOOD ELEVATION AREA BASED ON USACE 1957 DESIGN WATER SURFACE ELEVATIONS (REVISED AUGUST 1969 AND RECREATED 2006).



PLANNING  
PERMITTING  
ARCHITECTURE  
CIVIL ENGINEERING  
PROJECT MANAGEMENT

DESIGNED BY:  
G LABRIE  
DRAWN BY:  
JM/SD  
CHECK BY:  
G LABRIE

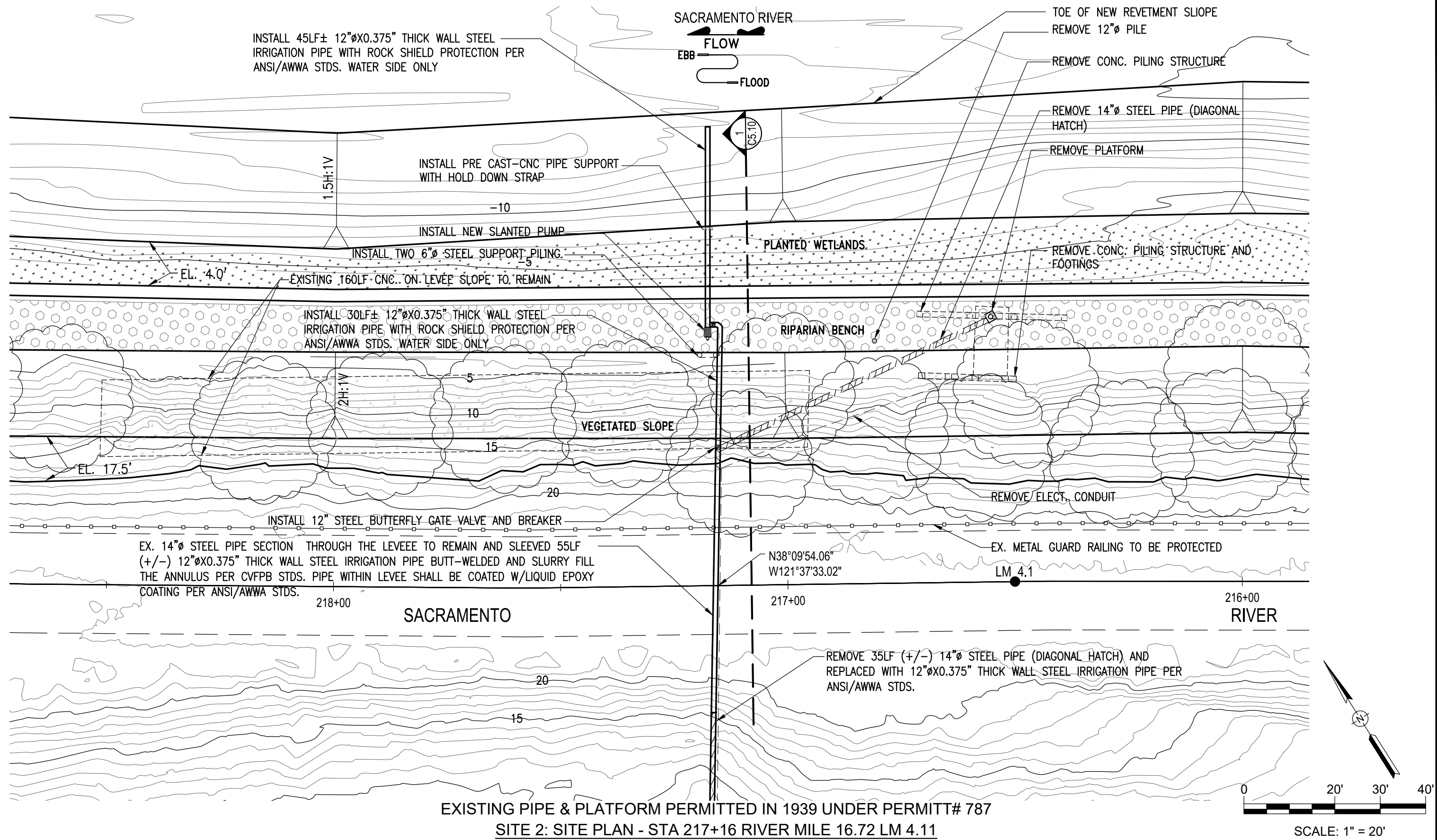
SCALE:  
AS SHOWN  
ORIGINAL DRAWING SCALE  
0" 1/2" 1"

REVISIONS				
SYM	DESCRIPTION	DATE	BY	APRVD. BY
	TERRAWALL MODIFIED PER USACE COMMENTS (GEOGRID)	8-17-17	JM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	4-6-18	JM/RM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	2-21-20	JM/RM/AC	
	SITE #1 WETLANDS AND RIPARIAN BENCHES REV. 3	4-17-20	JM/RM/AC	

BRANNAN-ANDRUS LEVEE MAINTENANCE DISTRICT
<b>EROSION CONTROL/HABITAT ENHANCEMENT SITES</b>
SACRAMENTO RIVER RM14.60L TO RM17.34L
SITE 3 CROSS SECTION STA 199+00

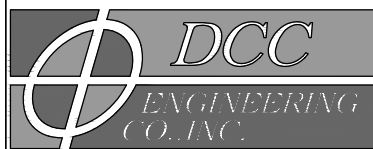
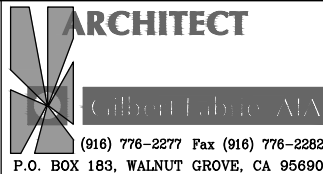
DATE:  
04/03/2020  
SHEET NUMBER:  
C5.8  
PROJECT NUMBER:  
7702.16





DATA REFERENCES:

- 1) VERTICAL DATUM: NAVD88 (NORTH AMERICAN VERTICAL DATUM OF 1988).
- 2) THE CONTOURS SHOWN IN THESE PLANS ARE BASED ON 2017-2018 DWR DELTA LIDAR
- 3) FLOOD ELEVATION AREA BASED ON USACE 1957 DESIGN WATER SURFACE ELEVATIONS (REVISED AUGUST 1969 AND RECREATED 2006).



PLANNING  
PERMITTING  
ARCHITECTURE  
CIVIL ENGINEERING  
PROJECT MANAGEMENT

DESIGNED BY:  
G LABRIE  
DRAWN BY:  
JM/SD  
CHECK BY:  
G LABRIE

SCALE:  
AS SHOWN  
ORIGINAL DRAWING SCALE  
0" 1/2" 1"

REVISIONS				
SYM	DESCRIPTION	DATE	BY	APRVD. BY
	TERRAWALL MODIFIED PER USACE COMMENTS (GEOGRID)	8-17-17	JM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	4-6-18	JM/RM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	2-21-20	JM/RM/AC	
	SITE #1 WETLANDS AND RIPARIAN BENCHES REV. 3	4-17-20	JM/RM/AC	

BRANNAN-ANDRUS LEVEE MAINTENANCE DISTRICT
<b>EROSION CONTROL/HABITAT ENHANCEMENT SITES</b>
SACRAMENTO RIVER RM14.60L TO RM17.34L
SITE 2 SITE PLAN STA 217+16 IRRIG PIPE REPLACEMENT

DATE:  
04/03/2020  
SHEET NUMBER:  
C5.9  
PROJECT NUMBER:  
7702.16

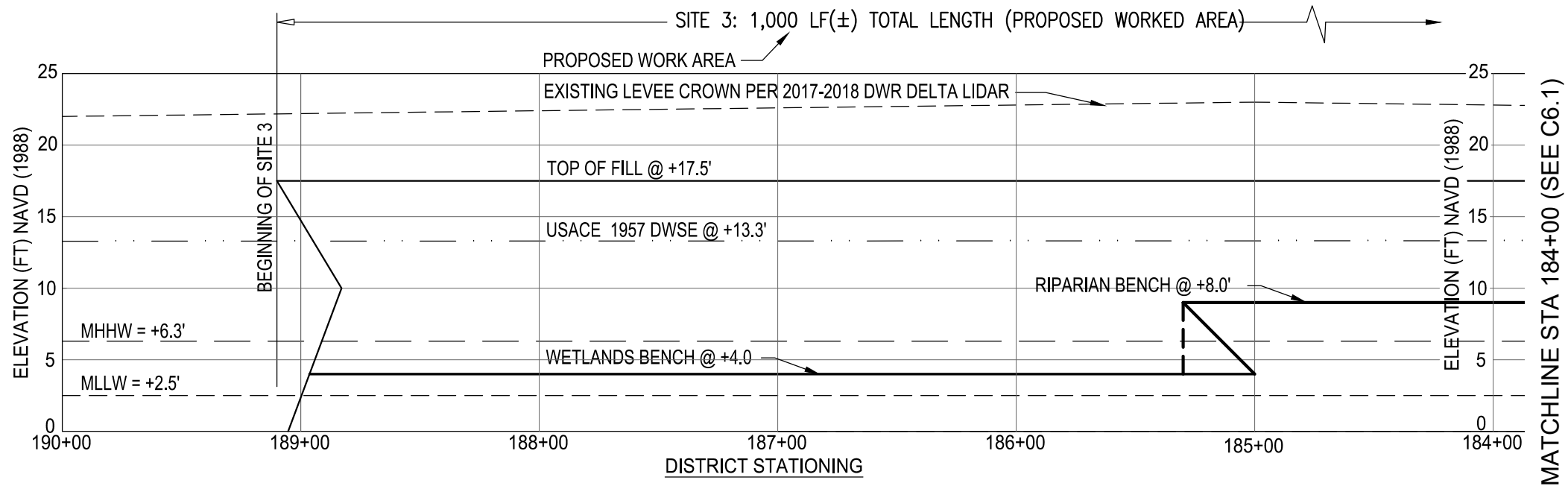


- 

**1 SITE 2: CROSS SECTION - STA 217+16 RIVER MILE 16.72 LM 4.11**

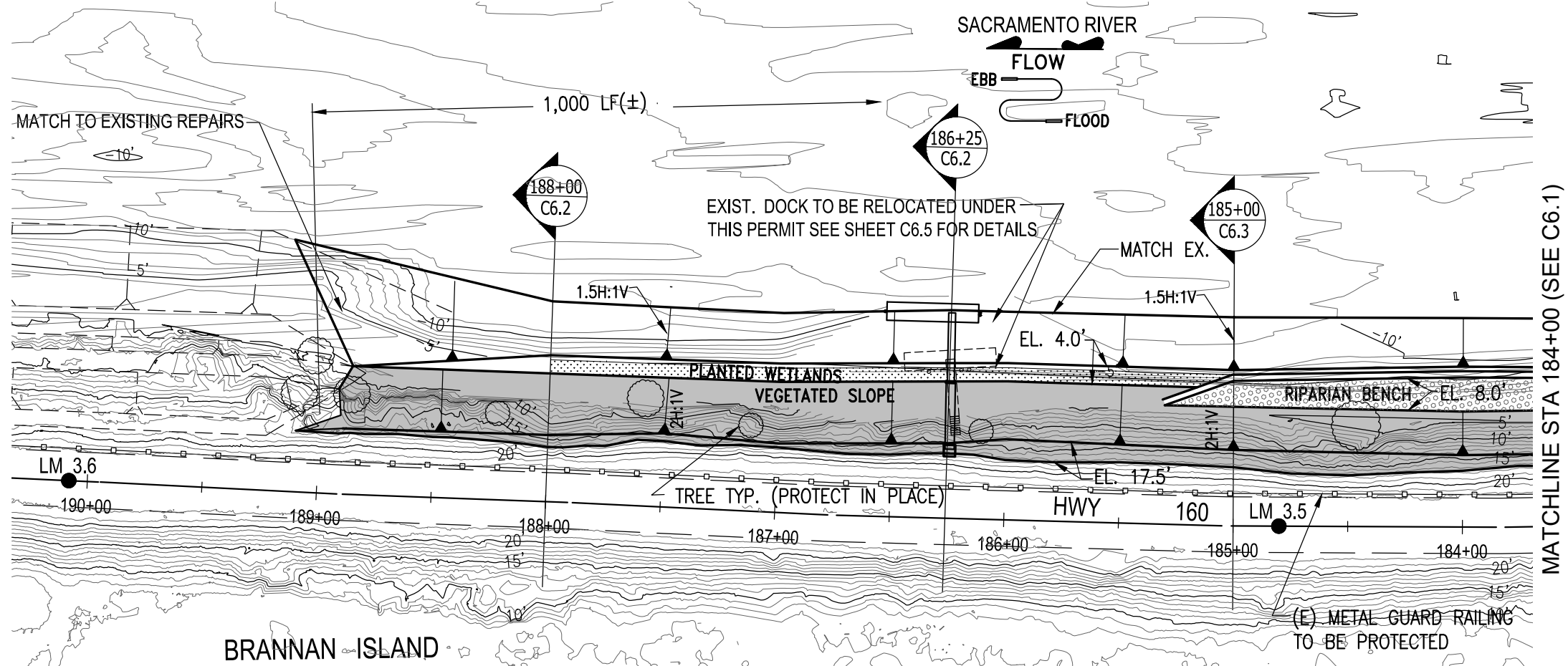
DATE:	04/03/2020
SHEET NUMBER:	C5.10
PROJECT NUMBER:	7702.16





### EROSION CONTROL/HABITAT ENHANCEMENT PROFILE

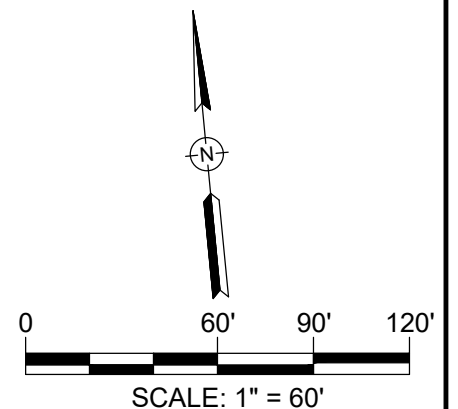
VERTICAL SCALE 1" = 10' HORIZONTAL SCALE 1" = 60'



### EROSION CONTROL/HABITAT ENHANCEMENT PLAN

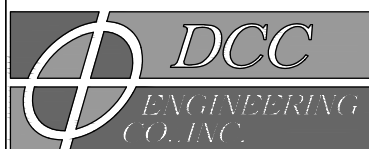
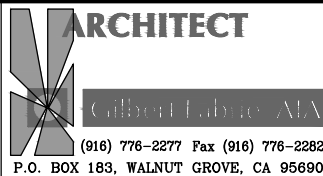
SITE 3: STATIONS 184+00 TO 189+00

SCALE 1" = 60'



#### DATA REFERENCES:

- 1) VERTICAL DATUM: NAVD88 (NORTH AMERICAN VERTICAL DATUM OF 1988).
- 2) THE CONTOURS SHOWN IN THESE PLANS ARE BASED ON 2017-2018 DWR DELTA LIDAR
- 3) FLOOD ELEVATION AREA BASED ON USACE 1957 DESIGN WATER SURFACE ELEVATIONS (REVISED AUGUST 1969 AND RECREATED 2006).



PLANNING  
PERMITTING  
ARCHITECTURE  
CIVIL ENGINEERING  
PROJECT MANAGEMENT

DESIGNED BY:  
G LABRIE  
DRAWN BY:  
JM/SD  
CHECK BY:  
G LABRIE

SCALE:  
AS SHOWN  
ORIGINAL DRAWING SCALE  
0" 1/2" 1"

REVISIONS				
SYM	DESCRIPTION	DATE	BY	APRVD. BY
	TERRAWALL MODIFIED PER USACE COMMENTS (GEOGRID)	8-17-17	JM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	4-6-18	JM/RM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	2-21-20	JM/RM/AC	
	SITE #1 WETLANDS AND RIPARIAN BENCHES REV. 3	4-17-20	JM/RM/AC	

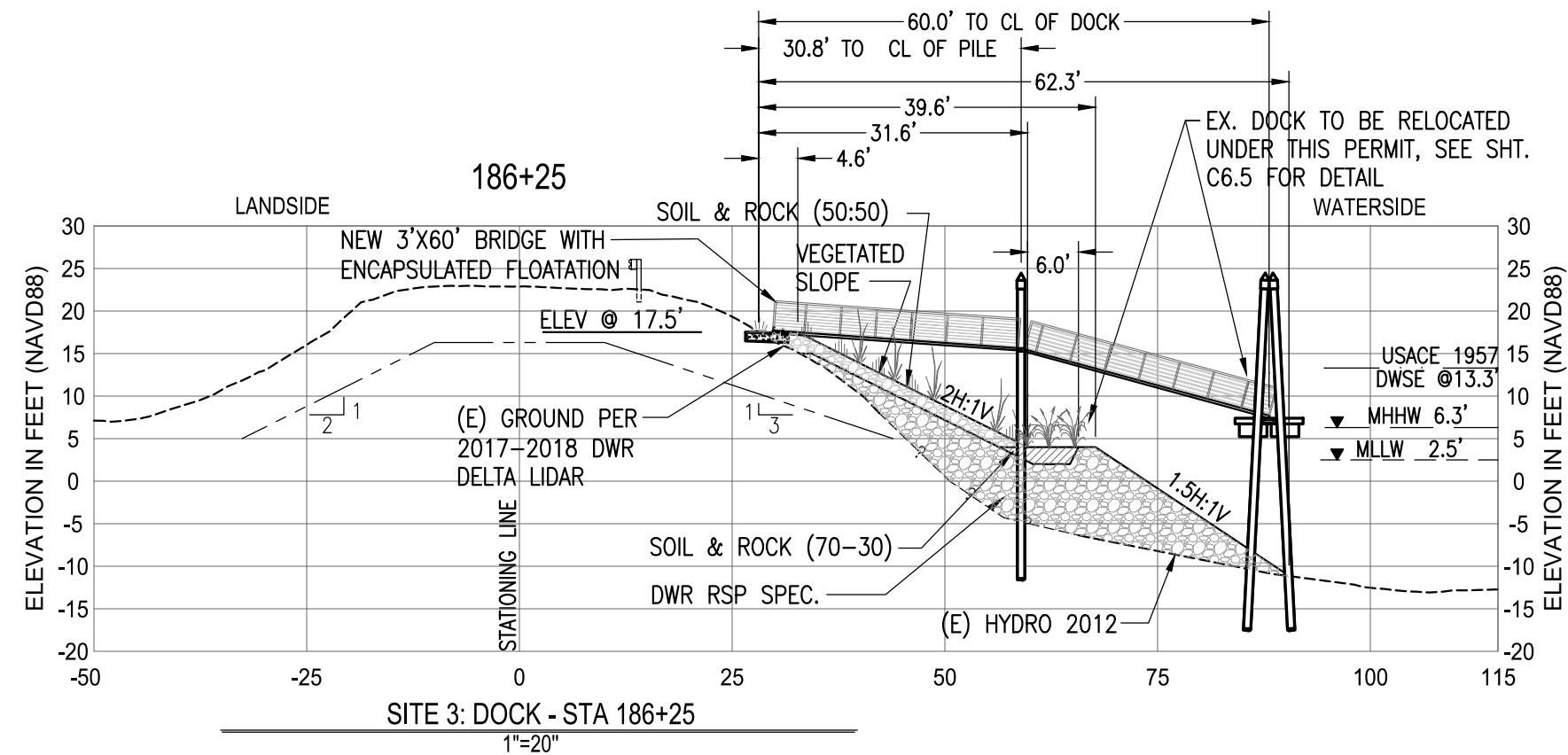
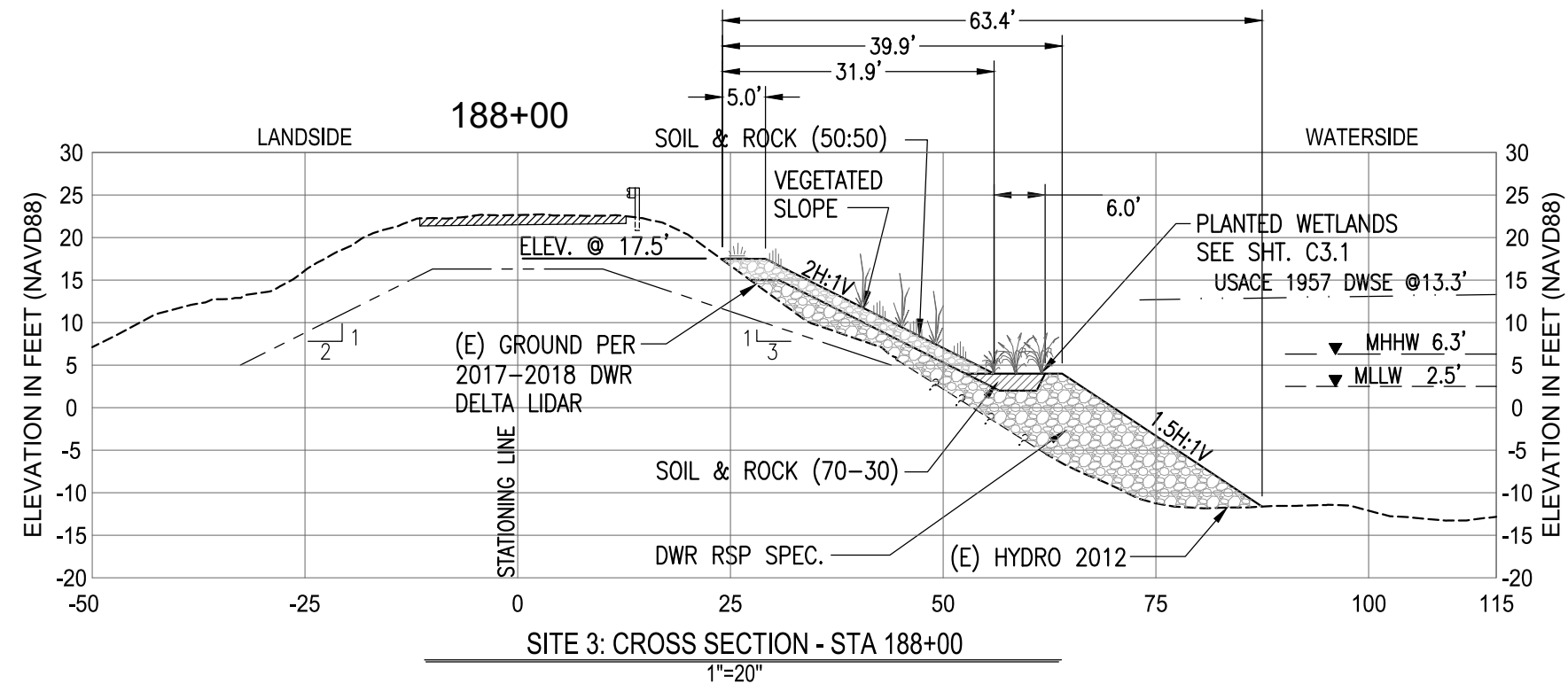
BRANNAN-ANDRUS LEVEE MAINTENANCE DISTRICT	
EROSION CONTROL/HABITAT ENHANCEMENT SITES	
SACRAMENTO RIVER RM14.60L TO RM17.34L	
SITE 3 STA 184+00 TO STA 189+00 PLAN & PROFILE	

DATE:  
04/03/2020  
SHEET NUMBER:  
C6.0  
PROJECT NUMBER:  
7702.16



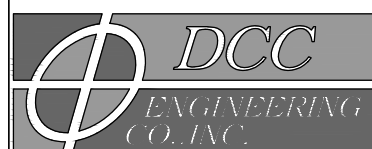
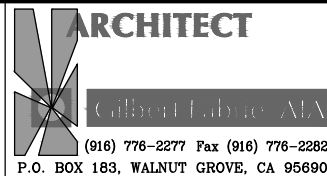






#### DATA REFERENCES:

- 1) VERTICAL DATUM: NAVD88 (NORTH AMERICAN VERTICAL DATUM OF 1988).
- 2) THE CONTOURS SHOWN IN THESE PLANS ARE BASED ON 2017-2018 DWR DELTA LIDAR
- 3) FLOOD ELEVATION AREA BASED ON USACE 1957 DESIGN WATER SURFACE ELEVATIONS (REVISED AUGUST 1969 AND RECREATED 2006).



PLANNING  
PERMITTING  
ARCHITECTURE  
CIVIL ENGINEERING  
PROJECT MANAGEMENT

DESIGNED BY:  
G LABRIE  
DRAWN BY:  
JM/SD  
CHECK BY:  
G LABRIE

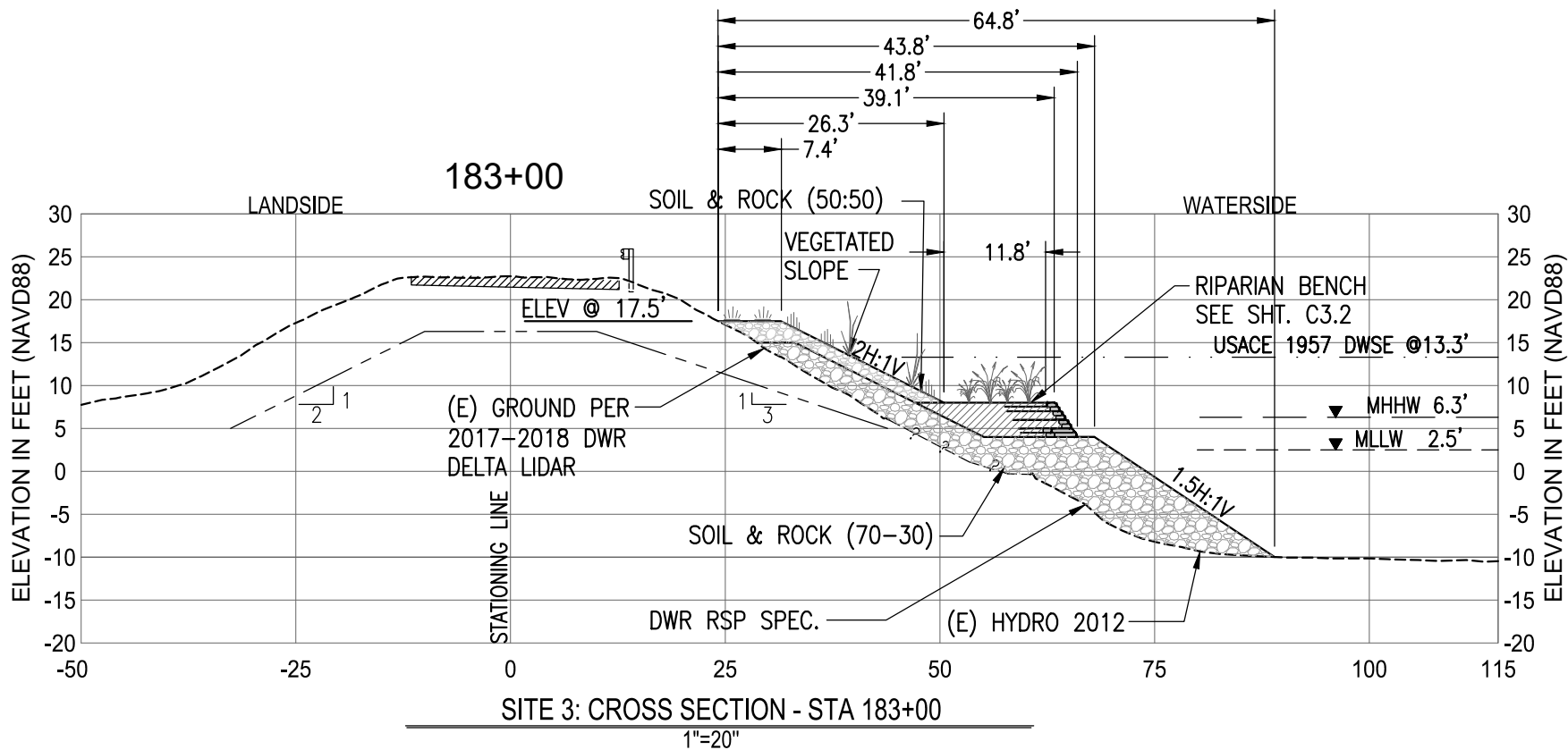
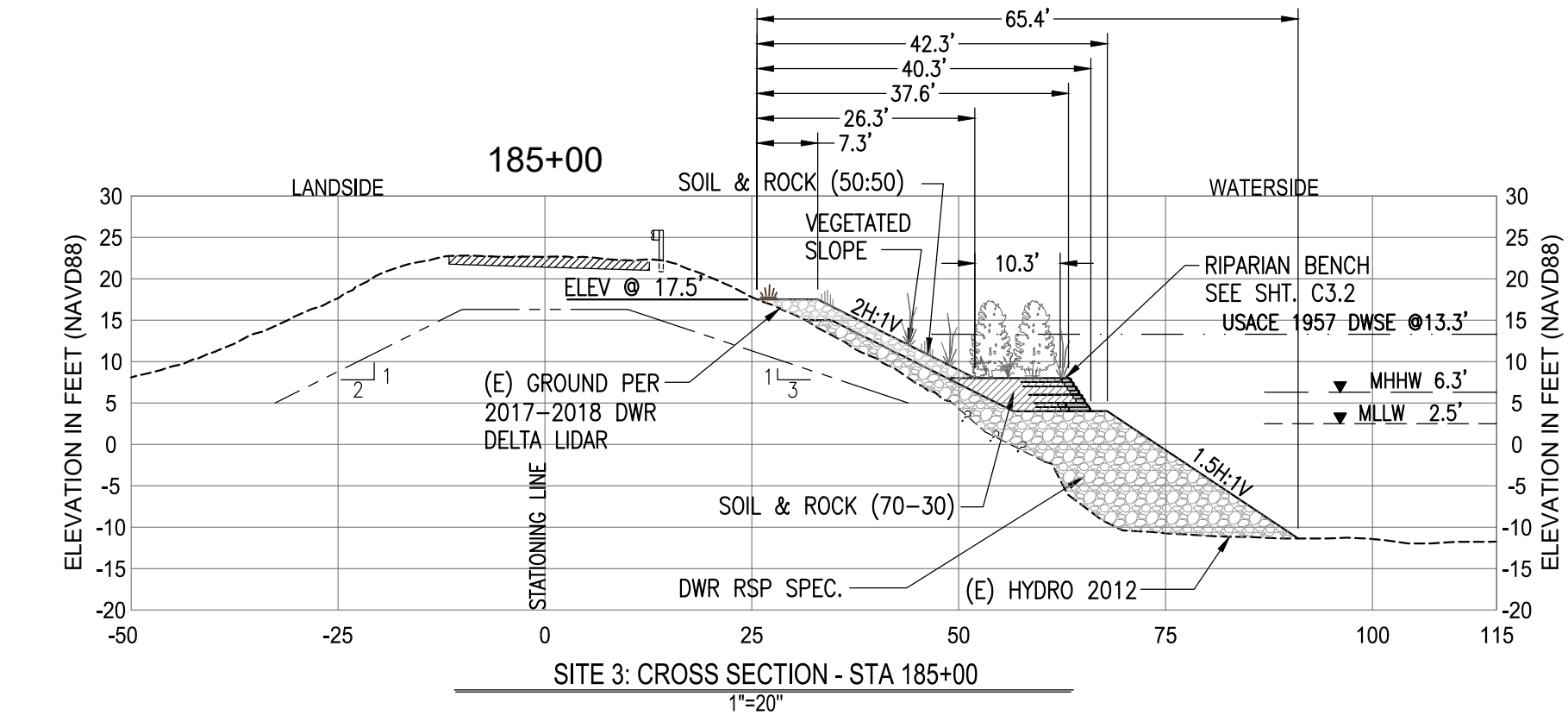
SCALE:  
AS SHOWN  
ORIGINAL DRAWING SCALE  
0" 1/2" 1"

REVISIONS				
SYM	DESCRIPTION	DATE	BY	APRVD. BY
	TERRAWALL MODIFIED PER USACE COMMENTS (GEOGRID)	8-17-17	JM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	4-6-18	JM/RM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	2-21-20	JM/RM/AC	
	SITE #1 WETLANDS AND RIPARIAN BENCHES REV. 3	4-17-20	JM/RM/AC	

BRANNAN-ANDRUS LEVEE MAINTENANCE DISTRICT	
<b>EROSION CONTROL/HABITAT ENHANCEMENT SITES</b>	
SACRAMENTO RIVER RM14.60L TO RM17.34L	
<b>SITE 3 CROSS SECTIONS STA 186+26 AND STA 188+00</b>	

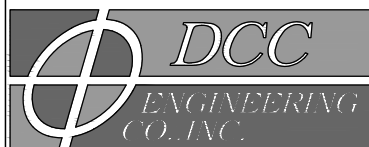
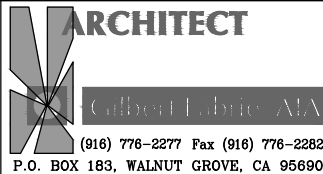
DATE:  
04/03/2020  
SHEET NUMBER:  
**C6.2**  
PROJECT NUMBER:  
7702.16





#### DATA REFERENCES:

- 1) VERTICAL DATUM: NAVD88 (NORTH AMERICAN VERTICAL DATUM OF 1988).
- 2) THE CONTOURS SHOWN IN THESE PLANS ARE BASED ON 2017-2018 DWR DELTA LIDAR.
- 3) FLOOD ELEVATION AREA BASED ON USACE 1957 DESIGN WATER SURFACE ELEVATIONS (REVISED AUGUST 1969 AND RECREATED 2006).



PLANNING  
PERMITTING  
ARCHITECTURE  
CIVIL ENGINEERING  
PROJECT MANAGEMENT

DESIGNED BY:  
G LABRIE  
DRAWN BY:  
JM/SD  
CHECK BY:  
G LABRIE

SCALE:  
AS SHOWN  
ORIGINAL DRAWING SCALE  
0" 1/2" 1"

REVISIONS				
SYM	DESCRIPTION	DATE	BY	APRVD. BY
	TERRAWALL MODIFIED PER USACE COMMENTS (GEOGRID)	8-17-17	JM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	4-6-18	JM/RM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	2-21-20	JM/RM/AC	
	SITE #1 WETLANDS AND RIPARIAN BENCHES REV. 3	4-17-20	JM/RM/AC	

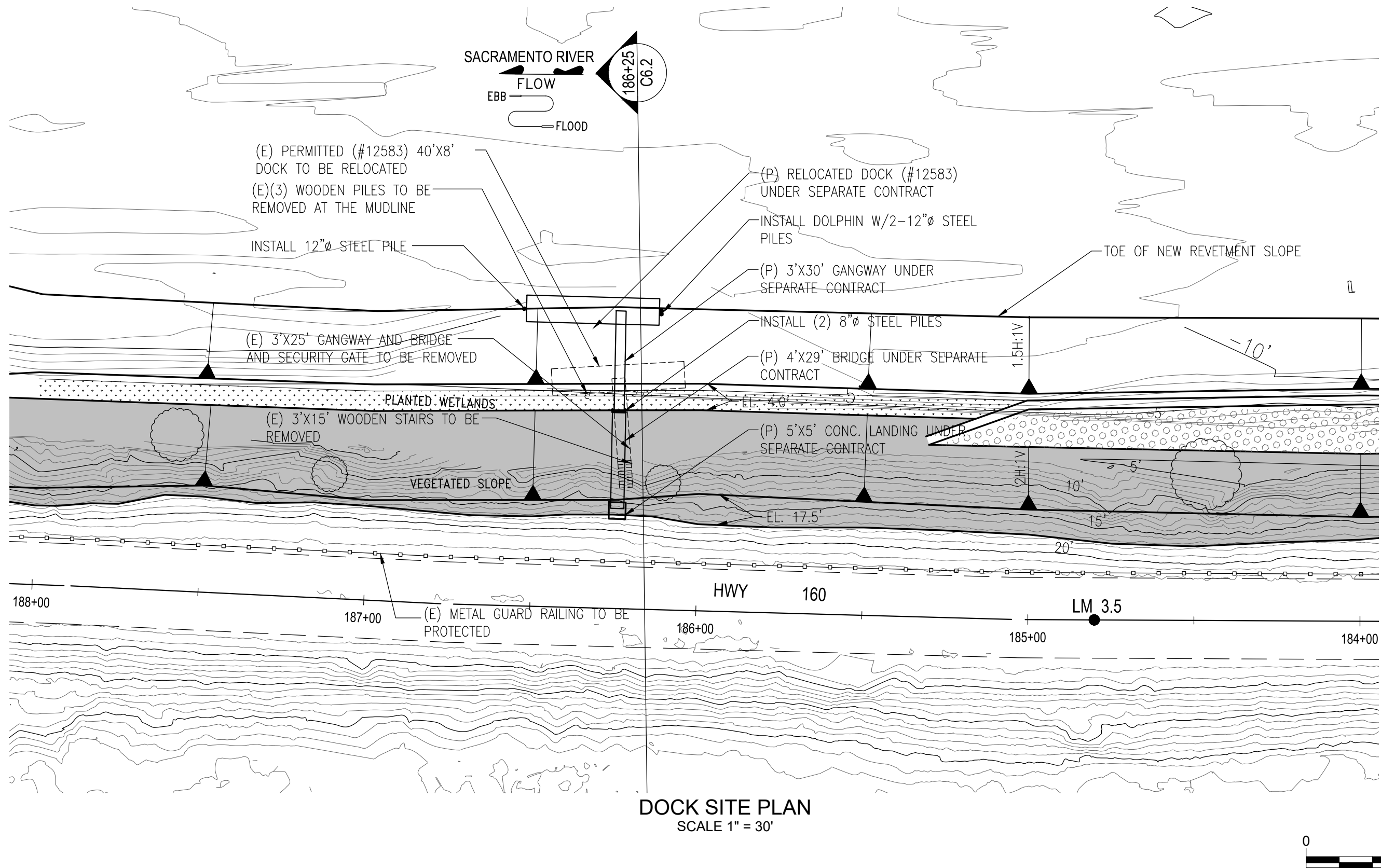
BRANNAN-ANDRUS LEVEE MAINTENANCE DISTRICT  
**EROSION CONTROL/HABITAT  
ENHANCEMENT SITES**  
SACRAMENTO RIVER RM14.60L TO RM17.34L  
SITE 3 CROSS SECTIONS STA 183+00 AND STA 185+00

DATE:  
04/03/2020  
SHEET NUMBER:  
**C6.3**  
PROJECT NUMBER:  
7702.16



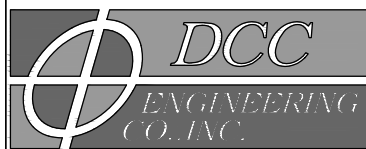
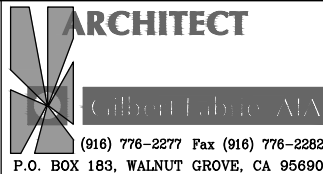






#### DATA REFERENCES:

- 1) VERTICAL DATUM: NAVD88 (NORTH AMERICAN VERTICAL DATUM OF 1988).
- 2) THE CONTOURS SHOWN IN THESE PLANS ARE BASED ON 2017-2018 DWR DELTA LIDAR
- 3) FLOOD ELEVATION AREA BASED ON USACE 1957 DESIGN WATER SURFACE ELEVATIONS (REVISED AUGUST 1969 AND RECREATED 2006).



PLANNING  
PERMITTING  
ARCHITECTURE  
CIVIL ENGINEERING  
PROJECT MANAGEMENT

DESIGNED BY:  
**G LABRIE**  
DRAWN BY:  
**JM/SD**  
CHECK BY:  
**G LABRIE**

SCALE:  
**AS SHOWN**

ORIGINAL DRAWING SCALE  
0" 1/2" 1"

SYM	REVISIONS			
	DESCRIPTION	DATE	BY	APRVD. BY
	TERRAWALL MODIFIED PER USACE COMMENTS (GEOGRID)	8-17-17	JM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	4-6-18	JM/RM	
	WETLANDS AND RIPARIAN BENCHES REVISIONS	2-21-20	JM/RM/AC	
	SITE #1 WETLANDS AND RIPARIAN BENCHES REV. 3	4-17-20	JM/RM/AC	

BRANNAN-ANDRUS LEVEE MAINTENANCE DISTRICT

#### EROSION CONTROL/HABITAT ENHANCEMENT SITES

SACRAMENTO RIVER RM14.60L TO RM17.34L

DOCK SITE PLAN PERMIT # 12583

DATE:  
**04/03/2020**  
SHEET NUMBER:  
**C6.5**  
PROJECT NUMBER:  
**7702.16**



## Appendix B

### Air Quality and Greenhouse Gas Emissions Data



## Road Construction Emissions Model, Version 9.0.0

Daily Emission Estimates for -> Sac River Erosion Repair														
Project Phases (Pounds)	ROG (lbs/day)	CO (lbs/day)	NOx (lbs/day)	PM10 (lbs/day)	Exhaust (lbs/day)	Fugitive Dust (lbs/day)	PM2.5 (lbs/day)	Exhaust (lbs/day)	Fugitive Dust (lbs/day)	SOx (lbs/day)	CO2 (lbs/day)	CH4 (lbs/day)	N2O (lbs/day)	CO2e (lbs/day)
Grubbing/Land Clearing	0.94	9.78	7.55	1.69	0.49	1.20	0.69	0.44	0.25	0.02	1,664.90	0.25	0.02	1,678.21
Grading/Excavation	20.90	150.94	197.90	8.90	7.70	1.20	7.14	6.89	0.25	0.20	21,540.20	1.10	0.20	21,626.39
Drainage/Utilities/Sub-Grade	2.68	18.27	24.24	2.13	0.93	1.20	1.07	0.82	0.25	0.04	4,264.34	0.93	0.05	4,301.82
Paving	0.78	5.63	6.50	0.29	0.29	0.00	0.24	0.24	0.00	0.02	1,747.75	0.43	0.03	1,766.06
Maximum (pounds/day)	20.90	150.94	197.90	8.90	7.70	1.20	7.14	6.89	0.25	0.20	21,540.20	1.10	0.20	21,626.39
Total (tons/construction project)	0.63	4.55	5.94	0.30	0.23	0.07	0.22	0.21	0.01	0.01	698.15	0.06	0.01	701.57
Notes: Project Start Year -> 2020														
Project Length (months) -> 5														
Total Project Area (acres) -> 8														
Maximum Area Disturbed/Day (acres) -> 0														
Water Truck Used? -> Yes														
Total Material Imported/Exported Volume (yd³/day)														
Daily VMT (miles/day)														
Phase	Soil	Asphalt	Soil Hauling	Asphalt Hauling	Worker Commute	Water Truck								
Grubbing/Land Clearing	0	0	0	0	600	0								
Grading/Excavation	0	0	0	0	1,280	0								
Drainage/Utilities/Sub-Grade	1,033	0	0	0	600	0								
Paving	0	0	0	0	600	0								
PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.														
Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns G and H. Total PM2.5 emissions shown in Column I are the sum of exhaust and fugitive dust emissions shown in columns J and K.														
CO2e emissions are estimated by multiplying mass emissions for each GHG by its global warming potential (GWP), 1, 25 and 298 for CO2, CH4 and N2O, respectively. Total CO2e is then estimated by summing CO2e estimates over all GHGs.														
Total Emission Estimates by Phase for -> Sac River Erosion Repair														
Project Phases (Tons for all except CO2e. Metric tonnes for CO2e)	ROG (tons/phase)	CO (tons/phase)	NOx (tons/phase)	PM10 (tons/phase)	Exhaust (tons/phase)	Fugitive Dust (tons/phase)	PM2.5 (tons/phase)	Exhaust (tons/phase)	Fugitive Dust (tons/phase)	SOx (tons/phase)	CO2 (tons/phase)	CH4 (tons/phase)	N2O (tons/phase)	CO2e (MT/phase)
Grubbing/Land Clearing	0.01	0.06	0.05	0.01	0.00	0.01	0.00	0.00	0.00	0.00	9.99	0.00	0.00	9.13
Grading/Excavation	0.55	3.98	5.22	0.24	0.20	0.03	0.19	0.18	0.01	0.01	568.66	0.03	0.01	517.95
Drainage/Utilities/Sub-Grade	0.07	0.48	0.64	0.06	0.02	0.03	0.03	0.02	0.01	0.00	112.58	0.02	0.00	103.03
Paving	0.00	0.02	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.92	0.00	0.00	6.34
Maximum (tons/phase)	0.55	3.98	5.22	0.24	0.20	0.03	0.19	0.18	0.01	0.01	568.66	0.03	0.01	517.95
Total (tons/construction project)	0.63	4.55	5.94	0.30	0.23	0.07	0.22	0.21	0.01	0.01	698.15	0.06	0.01	636.46
PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.														
Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns G and H. Total PM2.5 emissions shown in Column I are the sum of exhaust and fugitive dust emissions shown in columns J and K.														
CO2e emissions are estimated by multiplying mass emissions for each GHG by its global warming potential (GWP), 1, 25 and 298 for CO2, CH4 and N2O, respectively. Total CO2e is then estimated by summing CO2e estimates over all GHGs.														
The CO2e emissions are reported as metric tons per phase.														



Road Construction Emissions Model		Version 9.0.0																																								
<b>Data Entry Worksheet</b>																																										
<p><small>Note: Required data input sections have a yellow background. Optional data input sections have a blue background. Only areas with a yellow or blue background can be modified. Program defaults have a white background. The user is required to enter information in cells D10 through D24, E28 through G35, and D38 through D41 for all project types. Please use "Clear Data Input &amp; User Overrides" button first before changing the Project Type or begin a new project.</small></p>																																										
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p><b>Input Type</b></p> <p>Project Name: <span style="background-color: yellow;">Sac River Erosion Repair</span></p> <p>Construction Start Year: <span style="background-color: yellow;">2020</span></p> <p>Project Type: <span style="background-color: yellow;">4</span></p> <p>Project Construction Time: <span style="background-color: yellow;">5.00</span> months</p> <p>Working Days per Month: <span style="background-color: yellow;">24.00</span> days (assume 22 if unknown)</p> <p>Predominant Soil/Site Type: Enter 1, 2, or 3 (for project within "Sacramento County", follow soil type selection instructions in cells E18 to E20 otherwise see instructions provided in cells J18 to J22) <span style="background-color: yellow;">2</span></p> <p>Project Length: <span style="background-color: yellow;">1.50</span> miles</p> <p>Total Project Area: <span style="background-color: yellow;">8.35</span> acres</p> <p>Maximum Area Disturbed/Day: <span style="background-color: yellow;">0.12</span> acres</p> <p>Water Trucks Used?: <span style="background-color: yellow;">1</span></p> </div> <div style="width: 50%;"> <p>Enter a Year between 2014 and 2040 (inclusive)</p> <p>1) New Road Construction : Project to build a roadway from bare ground, which generally requires more site preparation than widening an existing roadway</p> <p>2) Road Widening : Project to add a new lane to an existing roadway</p> <p>3) Bridge/Overpass Construction : Project to build an elevated roadway, which generally requires some different equipment than a new roadway, such as a crane</p> <p>4) Other Linear Project Type: Non-roadway project such as a pipeline, transmission line, or levee construction</p> <p>1) Sand Gravel : Use for quaternary deposits (Delta/West County)</p> <p>2) Weathered Rock-Earth : Use for Laguna formation (Jackson Highway area) or the lone formation (Scott Road, Rancho Murieta)</p> <p>3) Blasted Rock : Use for Salt Springs Slate or Copper Hill Volcanics (Folsom South of Highway 50, Rancho Murieta)</p> <p>1. Yes 2. No</p> </div> </div>																																										
<div style="display: flex; justify-content: space-between; align-items: flex-start;"> <div style="width: 45%;"> <p><b>Material Hauling Quantity Input</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Material Type</th> <th>Phase</th> <th>Haul Truck Capacity (yd<sup>3</sup>) (assume 20 if unknown)</th> <th>Import Volume (yd<sup>3</sup>/day)</th> <th>Export Volume (yd<sup>3</sup>/day)</th> </tr> </thead> <tbody> <tr> <td rowspan="4">Soil</td> <td>Grubbing/Land Clearing</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Grading/Excavation</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Drainage/Utilities/Sub-Grade</td> <td>20.00</td> <td>1033.00</td> <td></td> </tr> <tr> <td>Paving</td> <td></td> <td></td> <td></td> </tr> <tr> <td rowspan="4">Asphalt</td> <td>Grubbing/Land Clearing</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Grading/Excavation</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Drainage/Utilities/Sub-Grade</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Paving</td> <td></td> <td></td> <td></td> </tr> </tbody> </table> </div> <div style="width: 50%;"> <p>Please note that the soil type instructions, provided in cells E18 to E20 are specific to Sacramento County. Maps available from the California Geologic Survey (see weblink below) can be used to determine soil type outside Sacramento County.</p> <p><a href="http://www.conservation.ca.gov/cgs/information/geologic_mapping/Pages/googlemaps.aspx#regionalseries">http://www.conservation.ca.gov/cgs/information/geologic_mapping/Pages/googlemaps.aspx#regionalseries</a></p> </div> </div>				Material Type	Phase	Haul Truck Capacity (yd <sup>3</sup> ) (assume 20 if unknown)	Import Volume (yd <sup>3</sup> /day)	Export Volume (yd <sup>3</sup> /day)	Soil	Grubbing/Land Clearing				Grading/Excavation				Drainage/Utilities/Sub-Grade	20.00	1033.00		Paving				Asphalt	Grubbing/Land Clearing				Grading/Excavation				Drainage/Utilities/Sub-Grade				Paving			
Material Type	Phase	Haul Truck Capacity (yd <sup>3</sup> ) (assume 20 if unknown)	Import Volume (yd <sup>3</sup> /day)	Export Volume (yd <sup>3</sup> /day)																																						
Soil	Grubbing/Land Clearing																																									
	Grading/Excavation																																									
	Drainage/Utilities/Sub-Grade	20.00	1033.00																																							
	Paving																																									
Asphalt	Grubbing/Land Clearing																																									
	Grading/Excavation																																									
	Drainage/Utilities/Sub-Grade																																									
	Paving																																									
<p><b>Mitigation Options</b></p> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>On-road Fleet Emissions Mitigation</p> <p>Off-road Equipment Emissions Mitigation</p> </div> <div style="width: 50%;"> <p>Select "2010 and Newer On-road Vehicles Fleet" option when the on-road heavy-duty truck fleet for the project will be limited to vehicles of model year 2010 or newer</p> <p>Select "20% NOx and 45% Exhaust PM reduction" option if the project will be required to use a lower emitting off-road construction fleet. The SMAQMD Construction Mitigation Calculator can be used to confirm compliance with this mitigation measure (<a href="http://www.airquality.org/Businesses/CEQA/Land-Use-Planning/Mitigation">http://www.airquality.org/Businesses/CEQA/Land-Use-Planning/Mitigation</a>).</p> <p>Select "Tier 4 Equipment" option if some or all off-road equipment used for the project meets CARB Tier 4 Standard</p> </div> </div>																																										
<p>The remaining sections of this sheet contain areas that require modification when 'Other Project Type' is selected.</p>																																										



Note: The program's estimates of construction period phase length can be overridden in cells D50 through D53, and F50 through F53.

Construction Periods	User Override of Construction Months	Program Calculated Months	User Override of Phase Starting Date	Program Default Phase Starting Date
Grubbing/Land Clearing	0.50	0.50		1/1/2020
Grading/Excavation	2.20	2.25		1/17/2020
Drainage/Utilities/Sub-Grade	2.20	1.50		3/24/2020
Paving	0.33	0.75		5/30/2020
<b>Totals (Months)</b>		5		

Please note: You have entered a different number of months than the project length shown in cell D16.

Note: Soil Hauling emission default values can be overridden in cells D61 through D64, and F61 through F64.

Soil Hauling Emissions		User Override of	Program Estimate of	User Override of Truck	Default Values	Calculated				
User Input	Miles/Round Trip	Miles/Round Trip	Miles/Round Trip	Round Trips/Day	Round Trips/Day	Daily VMT				
Miles/round trip: Grubbing/Land Clearing					0	0.00				
Miles/round trip: Grading/Excavation					0	0.00				
Miles/round trip: Drainage/Utilities/Sub-Grade					52	0.00				
Miles/round trip: Paving					0	0.00				

Emission Rates	ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	CO2e
Grubbing/Land Clearing (grams/mile)	0.04	0.42	3.03	0.11	0.05	0.02	1,801.75	0.00	0.28	1,886.20
Grading/Excavation (grams/mile)	0.04	0.42	3.03	0.11	0.05	0.02	1,801.75	0.00	0.28	1,886.20
Drainage/Utilities/Sub-Grade (grams/mile)	0.04	0.42	3.03	0.11	0.05	0.02	1,801.75	0.00	0.28	1,886.20
Paving (grams/mile)	0.04	0.42	3.03	0.11	0.05	0.02	1,801.75	0.00	0.28	1,886.20
Grubbing/Land Clearing (grams/trip)	0.00	0.00	3.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grading/Excavation (grams/trip)	0.00	0.00	3.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Drainage/Utilities/Sub-Grade (grams/trip)	0.00	0.00	3.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paving (grams/trip)	0.00	0.00	3.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hauling Emissions	ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	CO2e
Pounds per day - Grubbing/Land Clearing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tons per const. Period - Grubbing/Land Clearing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pounds per day - Grading/Excavation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tons per const. Period - Grading/Excavation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pounds per day - Drainage/Utilities/Sub-Grade	0.00	0.00	0.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tons per const. Period - Drainage/Utilities/Sub-Grade	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pounds per day - Paving	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tons per const. Period - Paving	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total tons per construction project	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Note: Asphalt Hauling emission default values can be overridden in cells D91 through D94, and F91 through F94.

Asphalt Hauling Emissions		User Override of Miles/Round Trip	Program Estimate of Miles/Round Trip	User Override of Truck Round Trips/Day	Default Values Round Trips/Day	Calculated Daily VMT
User Input						
Miles/round trip: Grubbing/Land Clearing				0	0.00	
Miles/round trip: Grading/Excavation				0	0.00	
Miles/round trip: Drainage/Utilities/Sub-Grade				0	0.00	
Miles/round trip: Paving				0	0.00	

Emission Rates	ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	CO2e
Grubbing/Land Clearing (grams/mile)	0.04	0.42	3.03	0.11	0.05	0.02	1,801.75	0.00	0.28	1,886.20
Grading/Excavation (grams/mile)	0.04	0.42	3.03	0.11	0.05	0.02	1,801.75	0.00	0.28	1,886.20
Drainage/Utilities/Sub-Grade (grams/mile)	0.04	0.42	3.03	0.11	0.05	0.02	1,801.75	0.00	0.28	1,886.20
Paving (grams/mile)	0.04	0.42	3.03	0.11	0.05	0.02	1,801.75	0.00	0.28	1,886.20
Grubbing/Land Clearing (grams/trip)	0.00	0.00	3.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grading/Excavation (grams/trip)	0.00	0.00	3.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Drainage/Utilities/Sub-Grade (grams/trip)	0.00	0.00	3.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paving (grams/trip)	0.00	0.00	3.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Emissions	ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	CO2e
Pounds per day - Grubbing/Land Clearing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tons per const. Period - Grubbing/Land Clearing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pounds per day - Grading/Excavation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tons per const. Period - Grading/Excavation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pounds per day - Drainage/Utilities/Sub-Grade	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tons per const. Period - Drainage/Utilities/Sub-Grade	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pounds per day - Paving	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tons per const. Period - Paving	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total tons per construction project	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00



Note: Worker commute default values can be overridden in cells D121 through D126.

Worker Commute Emissions											
User Input	User Override of Worker Commute Default Values			Default Values		Calculated Daily Trips		Calculated Daily VMT			
	20										
Miles/ one-way trip	2										
One-way trip/day	15										
No. of employees: Grubbing/Land Clearing	32										
No. of employees: Grading/Excavation	15										
No. of employees: Drainage/Utilities/Sub-Grade	15										
No. of employees: Paving	15										
Emission Rates	ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	CO2e	
Grubbing/Land Clearing (grams/mile)	0.02	1.22	0.11	0.05	0.02	0.00	350.90	0.01	0.01	353.67	
Grading/Excavation (grams/mile)	0.02	1.22	0.11	0.05	0.02	0.00	350.90	0.01	0.01	353.67	
Drainage/Utilities/Sub-Grade (grams/mile)	0.02	1.22	0.11	0.05	0.02	0.00	350.90	0.01	0.01	353.67	
Paving (grams/mile)	0.02	1.22	0.11	0.05	0.02	0.00	350.90	0.01	0.01	353.67	
Grubbing/Land Clearing (grams/trip)	1.25	3.05	0.37	0.00	0.00	0.00	75.08	0.09	0.04	88.34	
Grading/Excavation (grams/trip)	1.25	3.05	0.37	0.00	0.00	0.00	75.08	0.09	0.04	88.34	
Drainage/Utilities/Sub-Grade (grams/trip)	1.25	3.05	0.37	0.00	0.00	0.00	75.08	0.09	0.04	88.34	
Paving (grams/trip)	1.25	3.05	0.37	0.00	0.00	0.00	75.08	0.09	0.04	88.34	
Emissions	ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	CO2e	
Pounds per day - Grubbing/Land Clearing	0.11	1.82	0.17	0.06	0.03	0.00	469.13	0.01	0.01	473.67	
Tons per const. Period - Grubbing/Land Clearing	0.00	0.01	0.00	0.00	0.00	0.00	2.81	0.00	0.00	2.84	
Pounds per day - Grading/Excavation	0.01	0.10	0.01	0.00	0.00	0.00	1,000.81	0.03	0.03	1,010.49	
Tons per const. Period - Grading/Excavation	0.00	0.00	0.00	0.00	0.00	0.00	26.42	0.00	0.00	26.66	
Pounds per day - Drainage/Utilities/Sub-Grade	0.11	1.82	0.17	0.06	0.03	0.00	469.13	0.01	0.01	473.67	
Tons per const. Period - Drainage/Utilities/Sub-Grade	0.00	0.00	0.00	0.00	0.00	0.00	12.39	0.00	0.00	12.50	
Pounds per day - Paving	0.11	1.82	0.17	0.06	0.03	0.00	469.13	0.01	0.01	473.67	
Tons per const. Period - Paving	0.00	0.01	0.00	0.00	0.00	0.00	1.86	0.00	0.00	1.86	
Total tons per construction project	0.01	0.17	0.02	0.01	0.00	0.00	43.48	0.00	0.00	43.90	

Note: Water Truck default values can be overridden in cells D153 through D156, I153 through I156, and F153 through F156.

Water Truck Emissions											
User Input	User Override of Default # Water Trucks	Program Estimate of Number of Water Trucks	User Override of Truck Round Trips/Vehicle/Day	Default Values Round Trips/Vehicle/Day	Calculated Trips/day	User Override of Miles/Round Trip	Default Values Miles/Round Trip	Calculated Daily VMT			
Grubbing/Land Clearing - Exhaust											0.00
Grading/Excavation - Exhaust											0.00
Drainage/Utilities/Subgrade											0.00
Paving											0.00
Emission Rates	ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	CO2e	
Grubbing/Land Clearing (grams/mile)	0.04	0.42	3.03	0.11	0.05	0.02	1,801.75	0.00	0.28	1,886.20	
Grading/Excavation (grams/mile)	0.04	0.42	3.03	0.11	0.05	0.02	1,801.75	0.00	0.28	1,886.20	
Drainage/Utilities/Sub-Grade (grams/mile)	0.04	0.42	3.03	0.11	0.05	0.02	1,801.75	0.00	0.28	1,886.20	
Paving (grams/mile)	0.04	0.42	3.03	0.11	0.05	0.02	1,801.75	0.00	0.28	1,886.20	
Grubbing/Land Clearing (grams/trip)	0.00	0.00	3.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Grading/Excavation (grams/trip)	0.00	0.00	3.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Drainage/Utilities/Sub-Grade (grams/trip)	0.00	0.00	3.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Paving (grams/trip)	0.00	0.00	3.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Emissions	ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	CO2e	
Pounds per day - Grubbing/Land Clearing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Tons per const. Period - Grubbing/Land Clearing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Pounds per day - Grading/Excavation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Tons per const. Period - Grading/Excavation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Pounds per day - Drainage/Utilities/Sub-Grade	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Tons per const. Period - Drainage/Utilities/Sub-Grade	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Pounds per day - Paving	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Tons per const. Period - Paving	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Total tons per construction project	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

Note: Fugitive dust default values can be overridden in cells D183 through D185.

Fugitive Dust		User Override of Max Acreage Disturbed/Day	Default Maximum Acreage/Day	PM10 pounds/day	PM10 tons/per period	PM2.5 pounds/day	PM2.5 tons/per period
Fugitive Dust - Grubbing/Land Clearing				1.20	0.01	0.25	0.00
Fugitive Dust - Grading/Excavation				1.20	0.03	0.25	0.01
Fugitive Dust - Drainage/Utilities/Subgrade				1.20	0.03	0.25	0.01



Values in cells D195 through D226, D246 through D279, D297 through D330, and D348 through D381 are required when 'Other Project Type' is selected.

Off-Road Equipment Emissions														
Grubbing/Land Clearing	Default	Mitigation Option		Default	ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	CO2e
	Number of Vehicles	Override of Default Equipment Tier (applicable only when "Tier 4 Mitigation" Option Selected)		Equipment Tier	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
	Override of Default Number of Vehicles	Program-estimate												
				Model Default Tier	Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.00				Model Default Tier	Concrete/Industrial Saws	0.42	3.69	3.30	0.20	0.01	592.67	0.04	0.00	594.93
				Model Default Tier	Cranes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Excavators	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.00				Model Default Tier	Forklifts	0.14	1.18	1.30	0.10	0.09	148.03	0.05	0.00	149.63
				Model Default Tier	Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Graders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.00				Model Default Tier	Off-Highway Tractors	0.26	3.09	2.78	0.13	0.12	455.08	0.15	0.00	459.98
				Model Default Tier	Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Other General Industrial Equipm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Other Material Handling Equipm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Pavers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Pumps	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Rollers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Trenchers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Welders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
User-Defined Off-road Equipment					If non-default vehicles are used, please provide information in "Non-default Off-road Equipment" tab									
	Number of Vehicles			Equipment Tier	Type	ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	CO2e
	0.00			N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00			N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00			N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00			N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00			N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00			N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00			N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00			N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Grubbing/Land Clearing			pounds per day	0.82	7.96	7.38	0.43	0.41	0.01	1,196.77	0.23	0.01
		Grubbing/Land Clearing			tons per day	0.00	0.05	0.04	0.00	0.00	0.00	7.17	0.00	0.00
														1,204.54
														7.23



Grading/Excavation		Default Number of Vehicles	Mitigation Option Override of Default Equipment Tier (applicable only when "Tier 4 Mitigation" Option Selected)	Default Equipment Tier	Type	ROG pounds/day	CO pounds/day	NOx pounds/day	PM10 pounds/day	PM2.5 pounds/day	SOx pounds/day	CO2 pounds/day	CH4 pounds/day	N2O pounds/day	CO2e pounds/day
Override of Default Number of Vehicles		Program-estimate													
				Model Default Tier	Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Cranes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.00				Model Default Tier	Excavators	0.25	3.27	2.41	0.12	0.11	0.01	500.12	0.16	0.00	505.51
				Model Default Tier	Forklifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Generator Sets	0.40	3.71	3.48	0.20	0.20	0.01	623.04	0.04	0.00	625.31
				Model Default Tier	Graders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Other General Industrial Equipm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Other Material Handling Equipm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Pavers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Pumps	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Rollers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.00				Model Default Tier	Tractors/Loaders/Backhoes	0.21	2.28	2.11	0.13	0.12	0.00	300.77	0.10	0.00	304.01
				Model Default Tier	Trenchers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Welders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>User-Defined Off-road Equipment</b>						ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	CO2e
If non-default vehicles are used, please provide information in "Non-default Off-road Equipment" tab						pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
Number of Vehicles			Equipment Tier	Type	Tux Boat	19.45	135.33	186.37	7.02	6.32	0.18	18,763.65	0.78	0.15	18,828.04
2.00			N/A	Work Boat	0	0.35	2.48	3.16	0.10	0.09	0.00	351.82	0.01	0.00	353.03
0.00			N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00			N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grading/Excavation						pounds per day	20.66	147.07	197.53	7.57	6.84	0.19	20,539.39	1.07	20,615.89
Grading/Excavation						tons per phase	0.55	3.88	5.21	0.20	0.18	0.01	542.24	0.03	544.26



Drainage/Utilities/Subgrade	Default	Mitigation Option		Default	ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	CO2e
	Number of Vehicles	Override of	Default											
Override of Default Number of Vehicles	Program-estimate	Default Equipment Tier (applicable only when "Tier 4 Mitigation" Option Selected)	Equipment Tier		pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
			Model Default Tier	Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Cranes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Excavators	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.00			Model Default Tier	Forklifts	0.14	1.18	1.30	0.10	0.09	0.00	148.03	0.05	0.00	149.63
			Model Default Tier	Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Graders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.00			Model Default Tier	Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Off-Highway Trucks	1.33	7.62	12.65	0.46	0.42	0.03	2,557.25	0.83	0.02	2,584.79
			Model Default Tier	Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Other General Industrial Equipm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Other Material Handling Equipm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Pavers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.00			Model Default Tier	Plate Compactors	0.04	0.21	0.25	0.01	0.01	0.00	34.48	0.00	0.00	34.65
			Model Default Tier	Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Pumps	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Rollers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Trenchers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Welders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>User-Defined Off-road Equipment</b>														
If non-default vehicles are used, please provide information in "Non-default Off-road Equipment" tab														
Number of Vehicles		Equipment Tier	Type		ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	CO2e
2.00		N/A	Work Boat		1.06	7.44	9.49	0.30	0.27	0.01	1,955.46	0.04	0.01	1,959.06
0.00		N/A	0		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00		N/A	0		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00		N/A	0		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00		N/A	0		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00		N/A	0		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00		N/A	0		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00		N/A	0		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Drainage/Utilities/Sub-Grade					pounds per day	2.57	16.46	23.68	0.87	0.79	3,795.21	0.92	0.03	3,828.15
Drainage/Utilities/Sub-Grade					tons per phase	0.07	0.43	0.63	0.02	0.02	100.19	0.02	0.00	101.06



Paving	Default		Mitigation Option		ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	CO2e
	Number of Vehicles	Override of Default Equipment Tier (applicable only when "Tier 4 Mitigation" Option Selected)	Default	Type										
	Override of Default Number of Vehicles	Program-estimate	Equipment Tier	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
			Model Default Tier	Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Cranes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Excavators	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Forklifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Graders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1.00		Model Default Tier	Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Off-Highway Trucks	0.66	3.81	6.32	0.23	0.21	0.01	1,278.62	0.41	0.01	1,292.39
			Model Default Tier	Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Other General Industrial Equipm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Other Material Handling Equipm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Pavers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Pumps	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Rollers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Signal Boards	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Trenchers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Welders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>User-Defined Off-road Equipment</b>														
If non-default vehicles are used, please provide information in "Non-default Off-road Equipment" tab														
Number of Vehicles		Equipment Tier	Type		ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	CO2e
0.00		N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00		N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00		N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00		N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00		N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00		N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00		N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
					0.66	3.81	6.32	0.23	0.21	0.01	1,278.62	0.41	0.01	1,292.39
Paving					0.02	0.02	0.03	0.00	0.00	0.00	5.06	0.00	0.00	5.12
Total Emissions all Phases (tons per construction period) =>					0.62	4.38	5.91	0.23	0.20	0.01	654.67	0.06	0.01	657.67



Equipment default values for horsepower and hours/day can be overridden in cells D403 through D436 and F403 through F436.

Equipment	User Override of Horsepower	Default Values Horsepower	User Override of Hours/day	Default Values Hours/day
Aerial Lifts		63		8
Air Compressors		78		8
Bore/Drill Rigs		221		8
Cement and Mortar Mixers		9		8
Concrete/Industrial Saws		81		8
Cranes		231		8
Crawler Tractors		212		8
Crushing/Proc. Equipment		85		8
Excavators		158		8
Forklifts		89		8
Generator Sets		84		8
Graders		187		8
Off-Highway Tractors		124		8
Off-Highway Trucks		402		8
Other Construction Equipment		172		8
Other General Industrial Equipment		88		8
Other Material Handling Equipment		168		8
Pavers		130		8
Paving Equipment		132		8
Plate Compactors		8		8
Pressure Washers		13		8
Pumps		84		8
Rollers		80		8
Rough Terrain Forklifts		100		8
Rubber Tired Dozers		247		8
Rubber Tired Loaders		203		8
Scrapers		367		8
Signal Boards		6		8
Skid Steer Loaders		65		8
Surfacing Equipment		263		8
Sweepers/Scrubbers		64		8
Tractors/Loaders/Backhoes		97		8
Trenchers		78		8
Welders		46		8

END OF DATA ENTRY SHEET



[illegible][illegible]

You have Entered a non-default vehicle type, please provide number of vehicles, engine tier, horsepower, load factor, operation hours per day and emission factors of the vehicle type.

[illegible]

You have Entered a non-default vehicle type, please provide number of vehicles, engine tier, horsepower, load factor, operation hours per day and emission factors of the vehicle type.

[illegible]



## SMAQMD Harborcraft, Dredge and Barge Emission Factor Calculator - Input Data Page

**INSTRUCTIONS:**

1. Enter inputs into tables A1, A2, A3, and A4 below. Required inputs must be entered to estimate emission rates, optional inputs should be entered if available.
2. After entering inputs, review status and error messages (cell E14); make changes as necessary until this cell is green indicating that inputs are ready.
3. Results may be reviewed in "MainEngineEmissRates" and "AuxEngineEmissRates" tabs, both colored yellow.

## Inputs and Status

Inputs color legend	Required Input
	Optional Input
Status and error messages	OK

### A1. Inventory Calendar year

Inventory Calendar Year	2020
-------------------------	------

## A2. Main Engine Inputs

[illegible]



#### A4. Project Information

Inputs	
Date (mm/dd/yyyy):	3/23/2020
Project Name:	Sacramento River Erosion Repair and Habitat Enhancement Project
Project Location:	Left bank of the Sacramento River, on Brannan Island
Contact Person:	
Company Name:	
Mailing Address:	
Phone Number:	
Email Address:	

### A3. Auxiliary Engine Inputs

[illegible]



### SMAQMD Harborcraft, Dredge and Barge Emission Factor Calculator - Main Engine Emission Rates

**Calendar Year:** 2020

**Number of Entries:** 2

[illegible]



[illegible]



## Appendix C

### Biological Resources Technical Report





# BALMD Levee Erosion Control and Habitat Enhancement Project

## Biological Resources Assessment

*prepared for*

**Robertson-Bryan, Inc.**

9888 Kent Street

Elk Grove, California 95624

Via email: [adrian@robertson-bryan.com](mailto:adrian@robertson-bryan.com)

*prepared by*

**Rincon Consultants, Inc.**

4825 J Street, Suite 200

Sacramento, California 95819

**June 2020**



**RINCON CONSULTANTS, INC.**

Environmental Scientists | Planners | Engineers

[rinconconsultants.com](http://rinconconsultants.com)



# BALMD Levee Erosion Control and Habitat Enhancement Project

## Biological Resources Assessment

*prepared for*

**Robertson-Bryan, Inc.**

9888 Kent Street

Elk Grove, California 95624

Via email: [adrian@robertson-bryan.com](mailto:adrian@robertson-bryan.com)

*prepared by*

**Rincon Consultants, Inc.**

4825 J Street, Suite 200

Sacramento, California 95819

**June 2020**



**RINCON CONSULTANTS, INC.**

Environmental Scientists | Planners | Engineers

[rinconconsultants.com](http://rinconconsultants.com)



*This report prepared on 50 percent recycled paper with 50 percent post-consumer content.*







# Table of Contents

---

1	Introduction .....	1
1.1	Project Overview .....	1
1.2	Project Location .....	1
1.3	Project Description.....	12
1.3.1	Project Purpose and Objectives .....	12
1.3.2	Project Location .....	12
1.3.3	Project Components and Construction Phasing .....	13
1.3.4	Construction Equipment and Staffing.....	18
1.3.5	Construction Schedule .....	20
1.3.6	Project Environmental Commitments .....	20
1.3.7	Post-Construction Habitat Maintenance and Monitoring .....	21
2	Methodology.....	23
2.1	Regulatory Overview.....	23
2.1.1	Environmental Statutes .....	23
2.1.2	Guidelines for Determining CEQA Significance.....	23
2.2	Literature Review .....	24
2.3	Field Reconnaissance Survey .....	24
3	Existing Conditions.....	26
3.1	Physical Characteristics .....	26
3.1.1	Watershed and Drainages.....	26
3.1.2	Soils .....	26
3.2	Vegetation.....	28
3.3	General Wildlife .....	37
4	Sensitive Biological Resources .....	38
4.1	Special Status Species .....	38
4.1.1	Special Status Plant Species .....	40
4.1.2	Special Status Wildlife Species .....	41
4.2	Sensitive Plant Communities .....	41
4.3	Jurisdictional Waters and Wetlands .....	41
4.4	Wildlife Movement .....	42
4.5	Resources Protected By Local Policies and Ordinances.....	42
5	Impact Analysis and Mitigation Measures.....	43
5.1	Special-Status Species .....	43
5.1.1	Special Status Plants .....	43
5.1.2	Special Status Animals and Nesting Birds .....	44
5.2	Sensitive Plant Communities .....	49
5.3	Jurisdictional Waters and Wetlands .....	50



**BALMD Levee Erosion Control and Habitat Enhancement Project**

5.4	Wildlife Movement .....	50
5.5	Local Policies and Ordinances .....	52
5.6	Adopted or Approved Plans .....	52
6	Limitations, Assumptions, and Use Reliance .....	53
7	References .....	54
8	List of Preparers .....	56

**Tables**

Table 1	Typical Equipment that may be Used for Construction of the Project .....	19
Table 2	Summary of Vegetation Communities within the BSA .....	28

**Figures**

Figure 1	Regional Location .....	3
Figure 2a	Terrestrial Portions of the Project Area .....	4
Figure 2b	Project Location Site 1(a) .....	5
Figure 2b	Project Location Site 1(b) .....	6
Figure 2c	Project Location Site 2(a) .....	7
Figure 2c	Project Location Site 2(b) .....	8
Figure 2d	Project Location Site 3 .....	9
Figure 2e	Staging Area 3 .....	10
Figure 2f	Staging Area 4 .....	11
Figure 3a	Site 1(a) Vegetation Communities .....	29
Figure 3a	Site 1(b) Vegetation Communities .....	30
Figure 3b	Site 2(a) Vegetation Communities .....	31
Figure 3b	Site 2(b) Vegetation Communities .....	32
Figure 3c	Site 3 Vegetation Communities .....	33
Figure 3d	Staging Area 3 Vegetation Communities .....	34
Figure 3e	Staging Area 4 Vegetation Communities .....	35
Figure 4	Sensitive Species, Natural Communities, and Designated Critical Habitats .....	39



## **Appendices**

Appendix A	Regulatory Setting
Appendix B	Special Status Species Evaluation Tables
Appendix C	Floral and Faunal Compendium
Appendix D	Site Photographs
Appendix E	Project Plans



*This page intentionally left blank.*



# 1 Introduction

---

## 1.1 Project Overview

Following the removal of invasive arundo (giant reed; *Arundo donax*) from the levee of the Sacramento River downstream of the City of Isleton, areas of extensive levee erosion were discovered. To address these deferred maintenance issues, the Brannan Andrus Levee Maintenance District (BALMD) is proposing to complete erosion control using methodologies that would result in fish-friendly habitat (Proposed Project). The specific project sites were targeted because of extensive, on-going erosion and their potential for establishing fish-friendly habitat.

The Proposed Project was designed to control erosion using terra bags and benches, which create opportunities for the natural establishment of native riparian and wetland plant species that, when inundated and/or extended over the Sacramento River, would provide instream cover and reduce water temperatures in the shallow aquatic areas along the river margin to create important rearing habitat for fish. Past projects in the vicinity of the project location have shown that by providing growing mediums at the proper elevations there is a higher likelihood of a successful establishment of native vegetation than using traditional erosion control methodologies, such as creating water side levee slopes using traditional riprap or rock slope protection (RSP). Overall, the Proposed Project is designed to offset any short-term construction-related impacts, such as removal of blackberry shrubs, with long-term habitat benefits provided by the vegetated terra bags and habitat benches. Specifically, the Proposed Project is expected to create 0.96 acres of riparian forest and 4,430 linear feet (LF) of shaded riverine aquatic (SRA) habitat, 3,528 linear feet and 0.90 acres of freshwater marsh habitat, and 3,528 LF, 4.35 acres of shrub scrub habitat and 1.61 acres of native grassland habitat.

## 1.2 Project Location

The Proposed Project is located on the left (south) bank of the Sacramento River, on Brannan Island, in Sacramento County (County), California (Figure 1). Brannan Island is approximately 7,400 acres in size, with agriculture being the primary land use. Part of the City of Isleton is also located on Brannan Island. Highway 160, an important north-south corridor that connects the Bay Area with the Delta and Sacramento regions, runs adjacent to the proposed project site. The project consists of three separate sites with a cumulative length of approximately 1.2 miles (Figure 2a), from the confluence of Deep Water Ship Channel (at 38°10'29 N 121°39'31 W ) upstream to the City of Isleton (at 38°09'45 N 121°36'46 W). The individual sites are located at River Mile (RM) 15.18L to RM 14.60L (Site 1), RM 17.00L to RM 16.36L (Site 2), and RM 17.34L to RM 17.13L (Site 3) (Figures 2b, 2c and 2d). Four optional staging areas are also located along the Sacramento River on Brannan Island and in the City of Rio Vista (Figure 2b, 2c, and 2e through 2f).

This report evaluates terrestrial biological resources only focusing on project activities above the ordinary high water mark (OHWM) of the Sacramento River and those biological resources that could be affected by ground disturbance and other construction activity on the terrestrial portions of the project sites. An analysis of aquatic resources and potential impacts to aquatic resources and associated wildlife will be addressed in a separate report. The Biological Study Area (BSA) for this analysis is defined as the three individual sites, from the edge of the water at the toe of the levee to

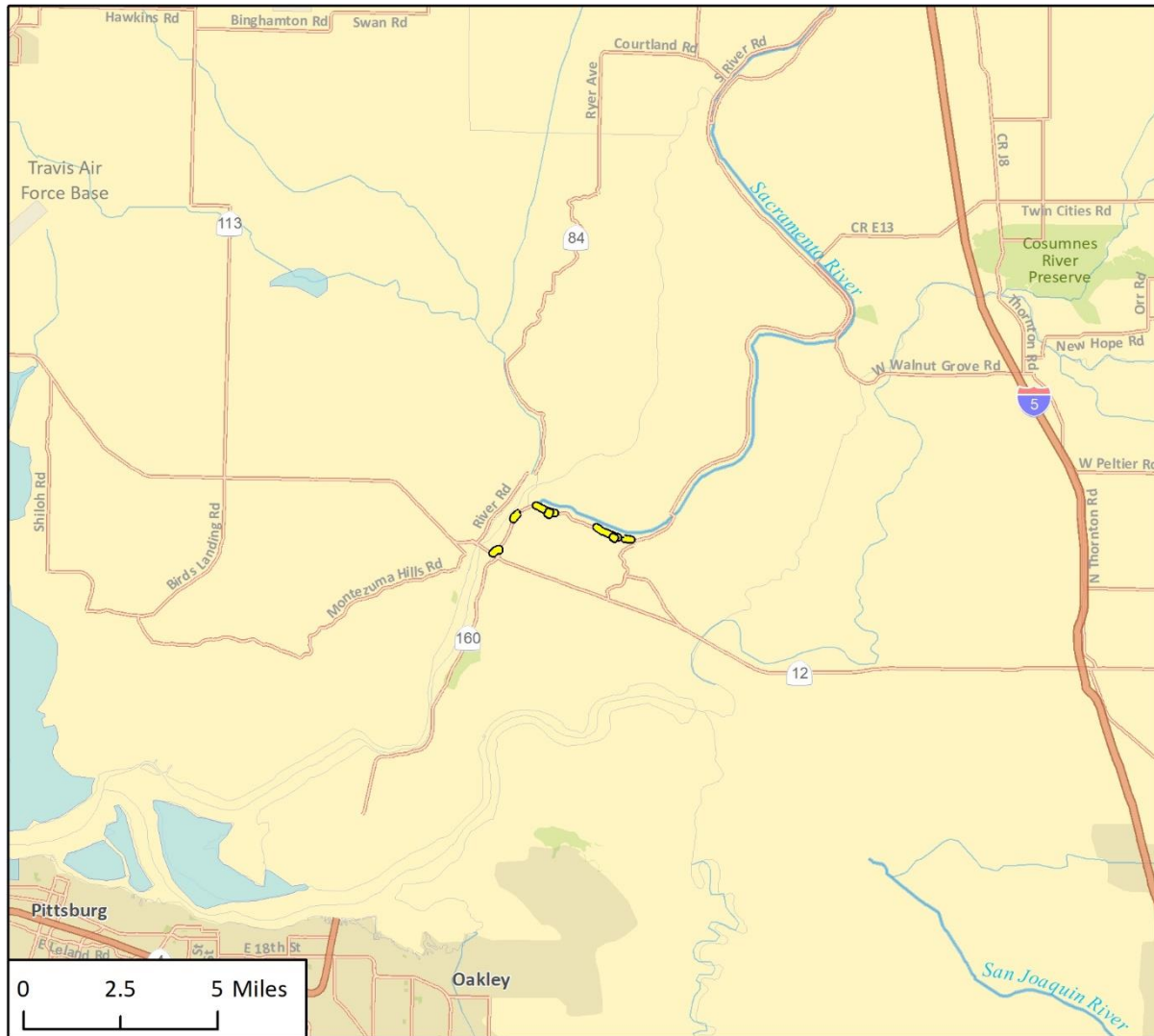


**BALMD Levee Erosion Control and Habitat Enhancement Project**

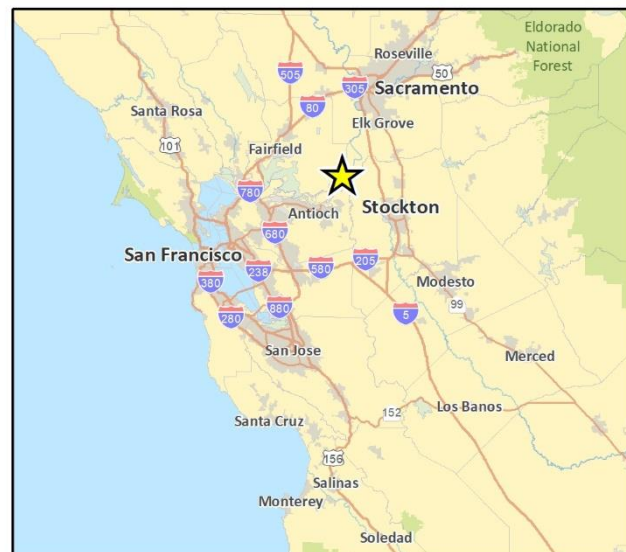
the edge of the road at the top of the levee as shown in Figures 2c, 2d and 2e, and four optional staging areas shown in Figures 2b, 2c, and 2e through 2f.



**Figure 1 Regional Location**



 Project Location 



Bio Fig 1: Regional Location\_vcc 2020-04-15



Figure 2a Terrestrial Portions of the Project Area



BID Fig 2a Terrestrial Project Area 2020.04.17



Figure 2b Project Location Site 1(a)





Figure 2b Project Location Site 1(b)





Figure 2c Project Location Site 2(a)





Figure 2c Project Location Site 2(b)



Imagery provided by Esri and its licensors © 2017.

BIO Fig 2c Study Area - Site 2b 2020-04-17



Figure 2d Project Location Site 3

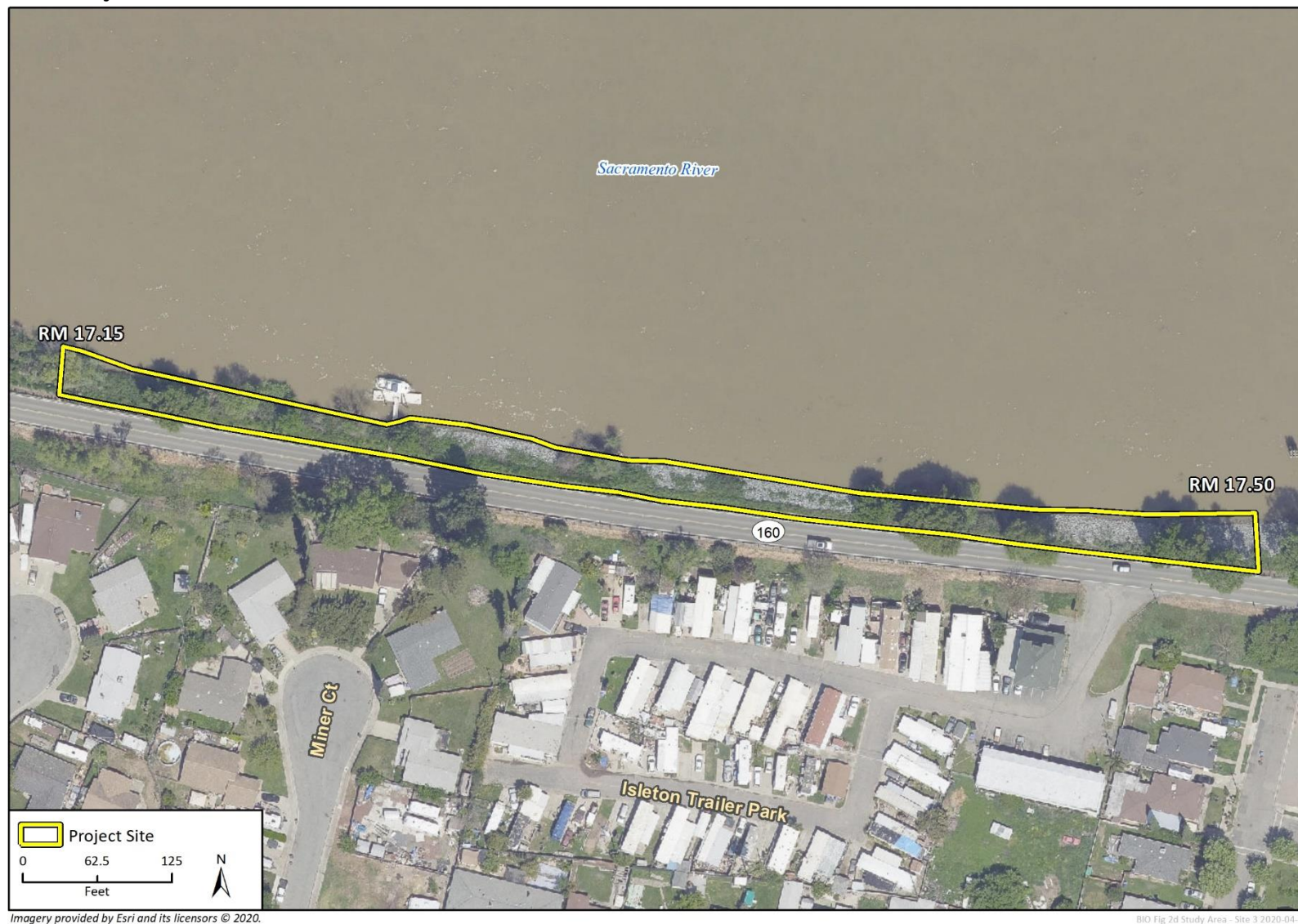
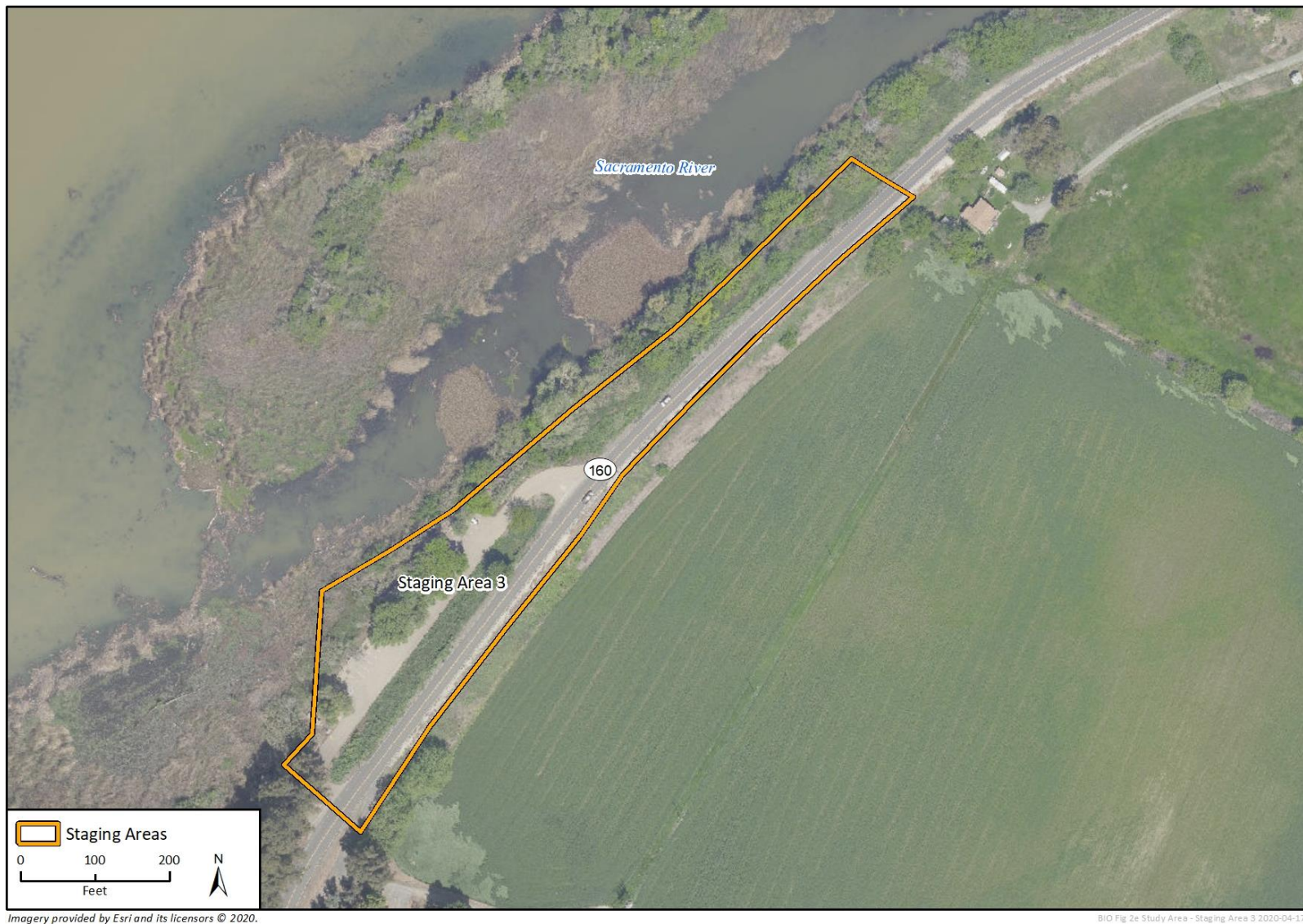
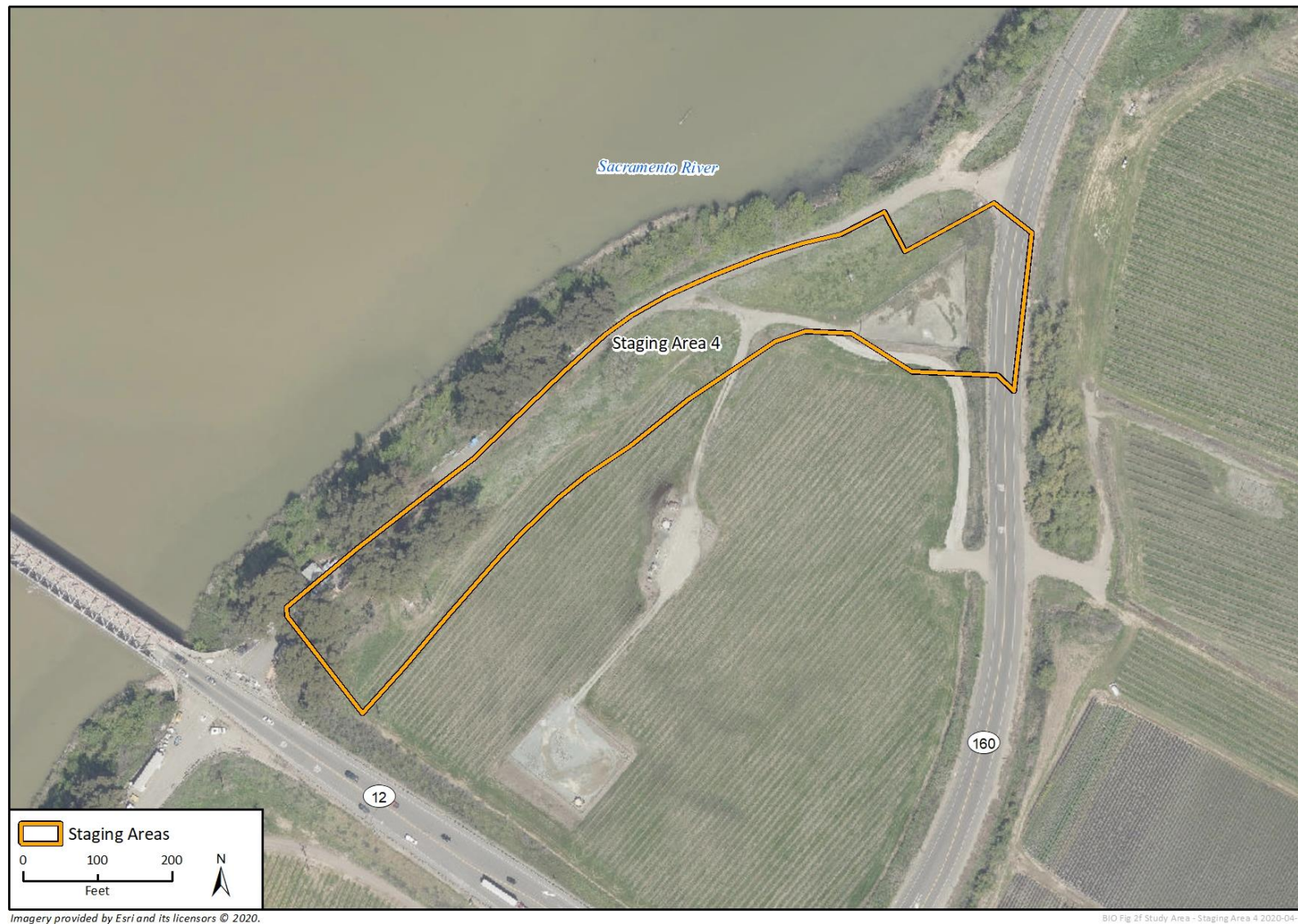




Figure 2e Staging Area 3





**Figure 2f Staging Area 4**



## 1.3 Project Description

### 1.3.1 Project Purpose and Objectives

The purpose of the project is to repair areas of levee erosion located on the left bank of the Sacramento River, between the City of Isleton and the confluence of the Sacramento River and Deep Water Ship Channel. Specifically, the project is needed to increase levee stability and improve the level of flood protection for Brannan and Andrus islands by repairing areas of levee erosion. Erosion control would be implemented using methods that would also provide enhanced habitat in this reach of the Sacramento River that currently provides limited fish habitat.

The project objectives are to:

- Provide suitable, levee erosion control on approximately 1.2 nautical miles (NM) of levee on the left bank of the Sacramento River in three locations between river miles (RM) 14.6 and 17.1.
- Provide fish-friendly habitat on the Sacramento River channel margin.
- Minimize long-term maintenance and repair costs by repairing existing areas of erosion using stable and effective erosion control methodologies.

■

### 1.3.2 Project Location

The project is located in Sacramento County, in the primary zone of the Sacramento-San Joaquin Delta (Figure 1). Specifically, the project is located on the left bank of the Sacramento River, on Brannan Island. The sites extend over approximately 1.2 NM of bank, beginning downstream near the confluence of Steamboat Slough, Cache Slough, and the Sacramento River and extending upstream to the City of Isleton (Figure 2).

The project includes three separate erosion control sites:

- Site 1 – Station 292+00 to 321+00, RM 15.18L to 14.60L, approximately 2,900 linear feet (LF)
- Site 2 – Station 197+00 to 230+00, RM 17.00L to 16.36L, approximately 3,300 LF.
- Site 3 – Station 179+00 to 189+00, RM 17.34L to 17.13L, approximately 1,000 LF.

Proposed construction would occur on approximately 1.2 NM of waterside levee and channel margin located on the left bank of the Sacramento River, adjacent to Brannan Island. The Project Area includes the Sacramento River channel, including and between the three erosion control sites, and immediately upstream and downstream of the construction boundaries, where water quality could be impacted.

The Project Area also includes material source, storage, and staging areas (Figure 2). Quarried rock material would be sourced and transported to the project site via rock barge



from San Rafael. Clean soil for filling the 'Terrabags' would be obtained on Decker Island and transported by barge to a staging area in Rio Vista, which is the closest location to Decker Island that is accessible by road. A small conveyor will be used to load the transported dirt onto a dump truck. Soil would then be transported by dump truck from the Rio Vista staging area to a Terrabag filling staging area. Mixing of rock and soil, for the 50:50 and 70:30 soil/rock mixes, would also occur on Decker Island, and the mixes would be transported via derrick barge to the project site. Multiple locations may be used for staging construction materials i.e. the Terrabags and container plants, including: an oversized crown area currently under the responsibility of BALMD property near the intersection of River Road (Highway 160) and Highway 12, on the north side of Highway 12; the public parking lot of the Cliff House Fishing Access area near RM 14, a vacant lot on the south side of River Road near RM 14.6, and/or a vacant lot on the south side of River Road near RM 17. Additionally, a boat launch on the west end of Ida Island would be used for launching the work boat that would be used to transport container plants to the erosion repair sites and for other tasks around the project site, as needed.

### 1.3.3 Project Components and Construction Phasing

The Proposed Project would be implemented in the following six phases:

1. Mobilization
2. Site Preparation
3. Levee Slope and Bench Construction
4. 'Terra' Bag Placement
5. Removal/Relocation of Encroachments and Concrete Rubble
6. Installation of Plants
7. Site Demobilization Construction at each of the three erosion control sites would occur sequentially, beginning at Site 1 and moving upstream to Sites 2 and 3.

### Construction Materials

Material necessary for project construction would be imported from offsite locations (Figure 2) and transported to the project site by barge and truck, including:

- Riprap rock slope protection (angular rock ranging from 15 to 400 pounds) (RSP) and 6-inch minus rock - obtained from a quarry in San Rafael and transported via rock barge and tug, approximately 46 NM to the project site.
- Geogrid and gripper system material. Geogrid and Terrabags would be sourced from a Sacramento-area supplier. Gripper system materials would be sourced from Tennessee and transported via one 40-foot container truck. A maximum of 30,000 Terrabags would be needed for construction.
- Fill soil for the Gripper/Terrabag System and for the 50:50 and 70:30 soil/rock mixes would be obtained from a borrow site on Decker Island, approximately 9 NM from the project site.
- Container plants would be obtained from a nursery in the Sacramento area.



## **Mobilization**

Project mobilization would include all preparatory work necessary for the contractor to initiate construction activities. This work would include moving equipment and rock/soil supplies to both the Project Area and a barge landing/staging area in Rio Vista, primarily by barge. A rock barge, accompanied by tugboat, would be used to transport material from the quarry near San Rafael. A small work boat (35-40 feet) would be used to move the derrick barges between the staging and erosion repair sites. Work boats and tugs used to maneuver the barges during site mobilization would be present on site periodically during the duration of construction activity (i.e. tugs may be moored or go to other non-related job sites if there is no need to move a barge for a period of time, and the derrick barges would be traveling back and forth from the quarry and soil borrow sites). Soil for the Terrabags would be transported from the barge staging area in Rio Vista to a bag filling site close to the Project Area via highway dump truck. Plants would be transported to the site via flatbed truck.

Mobilization also would include setting up staging and temporary material storage areas (see Figure 2). A construction trailer would be located at one of the identified staging areas and two portable toilets would be placed onsite and accessible to work crews for the duration of construction. Mobilization activities also would include any necessary pre-construction surveys and installation of erosion control and other Best Management Practices (BMP) measures.

## **Site Preparation (Clearing/Grubbing/Trimming)**

Initial site preparation would include debris removal, mowing, tree trimming, limited grubbing, and clearing on the waterside levee slope. As an initial step to preparing the levee slope for construction activities, any trash would be removed from the waterside levee slope and hauled to an appropriate refuse disposal site (the Keller Canyon Landfill in Pittsburgh, CA is the closest site).

The Proposed Project would not remove any mature trees; however, some mature trees may need to be trimmed to allow for construction activities to occur under the tree canopy (i.e. to ensure worker safety, the crane booms on the derrick barge and boom truck must be able to swing freely, without hitting any trees). Consistent with BALMD's existing routine maintenance agreement with the California Department of Fish and Wildlife (CDFW), trees less than 4 inches in diameter and large shrubs would be cut with a flail mower. Grasses and small shrubs also may be cut with a flail mower and left in place. Small tree trunks (i.e., less than 4 inches in diameter), branches of larger trees, and larger shrubs would be removed with a chainsaw and chipped onsite using a trailer-mounted chipper and transported and stockpiled on a BALMD property on southern Brannan Island. Grubbing would occur to remove remnant stands of *Arundo donax* and would be completed using a small excavator (e.g., a Bobcat). Invasive vegetation would be trucked to a landfill or other appropriate disposal site. Clearing and grubbing may necessitate one-way traffic control on Highway 160, during non-commuter hours, for approximately 16 working days at the beginning of project construction.

## **Levee Slope and Bench Construction**

Construction of the new levee slope at each of the three locations would occur in three phases: 1) placing RSP and 6-inch minus backfill material; 2) placing geogrid material and the Gripper/Terrabag System; and 3) placing planting fill to complete final grade. Work on the levee slopes would occur using barges, work boats, tugs, and excavator, except in sensitive locations (i.e., around mature trees), smaller, single-operator equipment would be used (i.e. bobcat) .



### *Rock Slope Protection and 6-inch Minus Backfill Placement*

Rock barges would transport material to the site directly from the quarry, and material would be placed using a derrick barge with a specialized attachment (rock bucket). The RSP would be used to create a base for the new levee slope and initial foundation for the riparian and wetland habitat benches. RSP would be placed at a 1.5:1 or 2:1 slope, depending on the existing topography. RSP would extend down to -15.0 feet NAVD 88 and cover the slope of the levee up to approximately +17.5 feet NAVD 88.

Six-inch minus material may be placed via derrick barge on top of the RSP material (i.e., backfilled) to finish the foundation of the riparian habitat bench. Construction of wetland and riparian benches are determined by site-specific bathymetric conditions, alternating between stretches of wetland bench and riparian bench. Due to existing erosion sites and the varying width of the existing levee toe and waterside bench areas along the project sites, the width of riparian habitat benches that provide riparian forest, shaded riverine aquatic (SRA) habitat and freshwater marsh wetland benches vary somewhat along the project site and were confirmed during final designs. Figure 3 shows a typical riparian cross section and detail of the levee design, and Figure 4 shows a typical wetland cross section and detail of the levee design.

Habitat benches would facilitate growth of wetland or riparian plant species, depending on the bench location, as determined by the characteristics and elevations at each erosion control site. After construction is complete, the levee slope at each erosion control site would include a riprap base that extends below the ordinary high water mark (OHWM); the riprap base would be covered with a bench, Gripper/Terrabag System, and riparian or wetland plants would be installed into the soil/rock filled bench and along its face.

### *Riparian Bench - Riparian Forest/Shaded Riverine Aquatic*

Riparian benches (Figures 3-5) would be constructed at an elevation that allows for occasional inundation (e.g., during high flow conditions) and development of riparian habitat for terrestrial species and provides a source for food inputs to the Sacramento River and SRA habitat for aquatic species. If the bench is intended for riparian habitat, the 70:30 soil/6-inch minus mix material would be placed on top of the RSP, from the Mean Lower Low Water (MLLW) elevation (+4.0 NAVD 88) upslope to approximately +8.0 feet NAVD 88. The final waterside slope face of the riparian benches would be approximately 1:1.5. Riparian bench width would vary from a minimum of 6 feet to approximately 14 feet wide. The project is anticipated to construct approximately 0.96 acre of riparian forest and 4,430 LF of SRA habitat by site as follows: 1,952 LF (0.42 acre) of riparian bench at Site 1; 2,128 LF (0.45 acre) at Site 2; and 350 LF (0.09 acre) at Site 3.

### *Wetland Bench - Freshwater Marsh*

Freshwater marsh/wetland benches (Figures 3-5) would be constructed at a relatively low elevation to allow relatively frequent inundation and development of aquatic and semi-aquatic habitat. For wetland benches, materials would include a 70:30 soil/6-inch minus rock mix in a 2-foot deep trench below the MLLW elevation (+4.0 NAVD88). Wetland bench width would also vary slightly, from approximately 6 feet to 15 feet wide, depending on the location along the levee. Transitions from riparian benches to wetland benches would occur at a 1.5:1 slope, with RSP on the upstream transition and a planted slope on the downstream transition. The project is anticipated to construct approximately 0.90 acre and 3,528 LF of freshwater marsh habitat by site as follows: 848 LF (0.19 acre) of wetland bench at Site 1; 2,180 LF (0.63 acre) at Site 2; and 500 LF (0.08 acre) at Site 3.



### *Vegetated Slope*

Vegetated slope as denoted on the drawings comprises both waterside scrub-shrub habitat and native grassland.

### **WATERSIDE SCRUB-SHRUB**

Waterside scrub-shrub habitat will be established above both the riparian and freshwater marsh/wetland benches up to elevation 15 feet on the slope. This habitat type will begin at elevation 4 ft for the freshwater marsh/wetland benches, and at elevation 8 ft for the riparian benches. In addition, waterside shrub scrub habitat will be established on the riparian bench face. Prior to planting with scrub-shrub species the slope areas above the benches will be hydroseeded with native grasses. The project is anticipated to create approximately 4.35 acres of scrub-shrub habitat by site as follows: 1.75 acres at Site 1; 2.01 acres at Site 2; and 0.59 acre at Site 3.

### **NATIVE GRASSLAND**

Native grassland habitat (also denoted as ‘vegetated slope’ on the drawings) will be established above (15 ft elevation) the waterside scrub shrub habitat zone to the very top of the project limits. A total of 1.61 acres of grasslands will be enhanced at the project site as follows: 0.62 acre at Site 1; 0.85 acre at Site 2; and 0.14 acre at Site 3..

### **Terrabag Placement**

After the RSP material and 6-inch minus backfill have been placed, geogrid and the Gripper/Terrabag System materials would be transported to the site via truck and placed. Geogrid is the generic term for all soil reinforcing products, such as StrataGrid®. StrataGrid® is a high-performance soil reinforcement product of polyester yarns with a high molecular weight and high tensile strength. These yarns are knitted into a dimensionally stable network to form a geometric grid shape that provides tensile soil reinforcement in vertical and horizontal directions.

Gripper System Terrabags dimensions are approximately 6 inches (tall) x 24 inches (long) x 12 inches (wide). The bags are filled with a mixture of 75 percent sand and 25 percent topsoil. Each segment of geogrid would secure approximately two layers of Terrabags to the slope. Geogrid would extend between layers of Terrabags, through the face of the slope, wrap back over two layers of Terrabags, and be embedded/secured in the compacted backfill (Appendix E). The combination of geogrid and Terrabags with the Gripper lock system is used to minimize the potential for slumping and Terrabag failure.

An excavator would place rolls of geogrid that would be rolled out by hand, perpendicular to the slope. A thin layer of fill material would then be placed to hold the geogrid in place while the Gripper System is installed in 12-inch lifts (two layers of Gripper System Terrabags per lift).

The Gripper System Terrabags would be filled at one of the staging areas and brought to the site (in mass) on pallets, by flatbed truck and placed using a boom truck parked along the levee crown to move the bags. Once on the levee, the Terrabags would be installed by hand and locked in place using a patented interlocking gripper lock system produced and installed by Maverick Solutions LLC. The installation sequence would include preparing the slope, placing the geogrid, placing Gripper locks (in contiguous manner end-to-end connection), and placing Terrabags until the first row is completed. For the second row, Grippers locks would be placed on the first row, Terrabags would be placed on the Gripper locks, and 12 inches of backfill would be placed and compacted on and behind the two rows of Terrabags. This sequence would be repeated for additional layers to fully



build out the Gripper/Terrabag System wall. One crew would be filling bags at the staging area while another crew is placing bags at one of the erosion sites. One crew member would be responsible for sowing both native grass seed and installing container plants between the Terrabags as the wall is being constructed. One-way traffic control would be needed along Highway 160 during bag placement activities.

### *Placement of Planting Medium*

A 70:30 soil/6-inch minus rock mix would be used to fill the habitat benches and placed on the new levee slope above the benches from approximately +8.0 feet NAVD 88 to +18 feet NAVD, near the crown of the levee. This fill material would be used as the planting medium. It would be transported via barge from the borrow source on Decker Island to the erosion sites and placed and contoured to the final grade using a derrick barge and excavator. Borrowed soil must be clean of biological material such as weed seeds. To ensure a clean source of soil, the first six inches of soil material that contains unwanted seed material would be stripped and stockpiled for disposal on Decker Island, as needed.

### **Removal/Replacement of Encroachments and Removal of Concrete Rubble**

Both known and unknown encroachments that are in the proposed project footprint will be removed or replaced. Two specific, permitted, encroachments have been identified. These include a former permitted water diversion facility, consisting of an agricultural pump and platform, on pilings and a connecting pipe that extends over to the levee and up the slope to near the top of the levee crown, in the vicinity of Station 217+16 within Site 2. This agricultural diversion facility, with existing in-channel pilings and platform, will be removed and the diversion intake relocated and replaced downstream. A new in-line pump will be installed above the 1957 design water surface elevation (DWSE) flood elevation and thereby eliminate the existing pump station obstruction in the wetted channel. At this same location, concrete rubble associated with a former barge landing will also be removed and disposed off site. The second identified encroachment is an existing private dock located within Site 3 at Station 186+25. Both the dock and the piling supporting the dock installation will be removed new piling will be placed to relocate the dock slightly waterward into the channel to gain boat clearance from the added habitat bench and revetment. This will necessitate the installation of a new pedestrian bridge and gangway, connected to a new concrete landing installed near the levee crown and above the DWSE.

### **Installation of Plants**

Following construction of the new levee slope and habitat benches, an ecologically suitable mix of plants would be delivered to the site via flatbed truck. The benches would be planted using hand tools with either wetland associated plants (e.g., American bulrush, California tule, common rush, Baltic rush, common buttonbush, *baccharis* spp, sandbar willow, common tule, and Goodding's willow) or riparian associated plants (e.g., creeping wildrye, Santa Barbara sedge, bulrush, California boxelder, Oregon ash, Goodding's black willow, arroyo willow, sandbar willow, pacific willow, and Fremont cottonwood). The levee slope above the benches would be hydroseeded with native grasses and planted with scrub-shrub (e.g., California fescue, small barley, creeping wildrye, saltgrass, one sided blue grass, rose, mulefat sandbar willow and coyote brush) for successful habitat vegetation establishment prior to the rainy season.



## **Site Demobilization**

Site demobilization would include removal of the construction trailer and associated site BMPs. The staging areas would require minimal demobilization activities since most materials would be removed from the staging areas as they are used up during project implementation. Palettes and Terrabag materials would be cleaned and removed from the site as the work progresses, leaving nothing onsite at the conclusion of construction. Plant delivery palettes would be returned via truck to the source nursery at the conclusion of construction. Minor trash/debris would be removed from the site and disposed of at an approved facility. Barges, tugs and work boats would move on to the next unassociated job site or storage dock at the conclusion of construction.

### **1.3.4 Construction Equipment and Staffing**

The types and number of pieces of equipment needed for each project phase and their anticipated duration of usage are shown in Table 1. Actual equipment use may vary, depending on contractor capabilities and preferences and equipment availability.



**Table 1 Typical Equipment that may be Used for Construction of the Project**

Phase	Equipment Type	Number of Units	Estimated Duration of Use (number of workdays)	Estimated Truck or Barge Trips (one-way)
Mobilization	Flatbed Truck (plant transport)	1	3	3
	Pickup Truck (trailer transport)	1	Duration of project	1
	Construction Trailer	1	Duration of project	n/a
	Portable Toilets	2	Duration of project	n/a
Site Preparation	Flail Mower	1	15	n/a
	Trailer-mounted Wood Chipper with Haul Truck	1	15	13
	Chainsaws	2	15	n/a
Levee Slope and Bench Construction	1,000-2,000 ton Rock Barge (non-motorized)	2	66	n/a
	Derrick Barge (non-motorized)	2	66	n/a
	Small Work Boat (40-ft max)	2	66	n/a
	Rowboat/12-ft Skiff (non-motorized crew transport)	1	66	n/a
	Small Excavator (bobcat)	1	44	n/a
	Small Conveyor w/Generator (soil loading)	1	5	n/a
	Small Front-End Loader (conveyor loading)	1	5	n/a
	Tugboat	2	22	22
Terrabag Filling and Placement	Forklift	2	66	n/a
	10-cy Dump Truck	1	12	130
	Boom Truck w/Flatbed Trailer (stinger truck)	1	33	33
	Plate Compactor	1	66	n/a
Installation of Plants	Small Work Boat (40-ft max)	1	5	n/a
	Hydroseeding Truck	1	2	3
	1,000-gallon Water Truck	1	10	3
Site Demobilization	Pick-up Truck (trailer transport)	1	5	1

A maximum of up to approximately 40 construction personnel would work on the project, depending on the construction phase. Workers required for specific construction phases are anticipated to include:

- Two crew lead workers would be onsite, 8 hours per day, six days a week, for the duration of the project.



**BALMD Levee Erosion Control and Habitat Enhancement Project**

- Two, six person Terrabag crews working for approximately 120 days.
  - Bag Filling. Each six-person crew can fill 700-800 bags per day – Two crews (12 persons total), would fill between 1,400-1,600 per day.
    - Example: 30,000 Bags should take two crews between 19-22 days.
  - Wall Building. Each six-person crew can place 400-500 bags per day – Two crews (12 persons), would lay between 800-1000 bags per day.
    - Example: 30,000 Bags should take two crews between 30-38 days.
- Two, five-person crews of operator engineers would operate two derrick barges and the small work boats during levee slope and bench construction.
- Two, tugboats would have a crew of 4 persons each and would be onsite periodically, as needed.
- One excavator operator would work 10 hours per day, during levee slope and bench construction.
- One highway truck driver would work 10 hours per day to transport soil from the Rio Vista staging area to the Terrabag filling sites.
- One foreman and one laborer would be present on the project site during all site work.
- One surveyor would be onsite, as needed.
- A planting crew of two to six workers.

### 1.3.5 Construction Schedule

With favorable weather and tidal conditions, project construction is expected to be completed over approximately 120 days, anytime between June 15, 2020 and September 30, 2021. Note: In-water work would be conducted between August 1 and October 31 to avoid impacts to fish species. However, rock placement above the OHWM may take place at any time over the duration of project construction.

Work, including equipment operation, would generally occur Monday through Saturday during normal working hours (7 a.m. to 7 p.m.). Equipment maintenance could occur before and after working hours and on Sunday. Work requiring one-way traffic control on Highway 160 would be limited to non-commuting hours, where feasible.

### 1.3.6 Project Environmental Commitments

The following environmental commitments have been incorporated into the project to avoid or minimize the potential adverse effects fish and wildlife and their habitats and the physical environment.

- All in-water construction activity would be conducted between August 1 and October 31 to ensure protection of anadromous salmonids.
- As much work below OHWM work as possible would be performed during low tide to reduce potential impacts to water quality.
- Construction activities would be limited to the designated work area, which would be clearly identified on the construction drawings and marked with fencing, stakes, and/or flags before ground-disturbing activities begin.



- Construction activities would be limited to daylight hours, leaving a nighttime period for anadromous salmonids and green sturgeon to migrate past the Project Area.
- Equipment would be refueled, maintained, and serviced at designated staging areas away from the erosion control sites. All staging, maintenance, and storage of heavy machinery would be conducted in a location and manner that no fuel, oil, or other petroleum products may run off or be washed by rainfall into water bodies within or adjacent to the Project Area.
- BMPs would be implemented to minimize effects on the river and adjacent vegetation. Specifically, BMPs would be implemented to prevent sedimentation from entering the Sacramento River and to reduce erosion, dust, noise, and other deleterious aspects of construction related activities. Soil disturbance activities would cease if adverse weather conditions substantially increase the likelihood of transporting soil off site.
- Vegetation clearing including undesirable species such as *Arundo* would be confined to areas within the project footprint.
- Mature trees are not anticipated to be removed. In the unforeseen circumstance that one or more trees greater than 4 inches in diameter are removed, three trees would be planted for each one removed (i.e., 3:1 replacement). To the extent it is necessary, any tree replacement that cannot be accommodated on the project site would be conducted at the BALMD's off-site mitigation area. The bark of trees larger than 4 inches in diameter to be retained onsite would be wrapped before the riprap is placed on the levee slope to protect them from damage.
- All construction equipment would have sound-control devices no less effective than those provided on the original equipment; no equipment shall have an unmuffled exhaust system.
- All contractors and equipment operators would participate in a Worker Environmental Awareness Program (WEAP) training regarding potential environmental impacts to make them aware of the ecological value of the area, including the potential for special-status species and their habitat to be present near the Project Area. The WEAP training would cover, at a minimum, the special-status species listed that have the potential to occur in the project area during construction, including but not limited to anadromous fishes.
- Terrabag material would provide 80 percent UV protection at 500 hours, with verifiable data sheets stating UV standards.

### 1.3.7 Post-Construction Habitat Maintenance and Monitoring

Following completion of the proposed action, BALMD would conduct a minimum of five years of maintenance and monitoring of the new habitat features to ensure the vegetation is establishing properly. Site maintenance would occur on an as needed basis and focus on managing noxious weeds and ensuring plants on the riparian bench receive adequate irrigation in order to become established and meet success criteria. Most plant maintenance would be periodic watering plantings on the riparian bench until plants are established. The tide would inundate portions of the levee slope twice per day, during portion of the months the tide would inundate all the way up to the top of the slope and thus provide necessary moisture to wetland bench plants. It is anticipated that maintenance during the first two years would require bi-weekly to monthly site visits during the hot, active growing season (April through September) to ensure proper weed management and irrigation. Subsequent activities during the remaining three years of the maintenance period would occur on a monthly basis and likely diminish as the vegetation establishes in years three, four and five.



**BALMD Levee Erosion Control and Habitat Enhancement Project**

Biological monitoring of the habitat features would occur on an annual basis and begin during the first year following construction. Initial monitoring during the first year would occur in both spring and fall to assess the preliminary condition of the plants relative to meeting overall habitat establishment and survival goals. Subsequent monitoring for the remaining four years of the monitoring period would occur in late summer/early fall.

Plants would be recorded as dead if no viable above ground growth is visible. Dead plants and trees would be replaced as necessary during the first year and annually in subsequent years. Any re-planting would occur either in spring or late fall. Cumulative survival of all plants and trees at the conclusion of the five-year monitoring period would be at least 80 percent.

Invasive weed cover would be estimated visually during annual monitoring. Vegetative cover by invasive species would be less than ten (10) percent of all cover throughout the five-year monitoring period. In the event invasive species cover exceeds the cover criteria during any of the annual monitoring events, maintenance actions would be taken to reduce this cover to less than 10%.



## 2 Methodology

---

### 2.1 Regulatory Overview

Regulated or sensitive resources studied and analyzed herein include special status plant and wildlife species, nesting birds and raptors, sensitive plant communities, jurisdictional waters and wetlands, wildlife movement, and locally protected resources, such as protected trees.

#### 2.1.1 Environmental Statutes

For the purpose of this report, potential impacts to biological resources were analyzed based on the following statutes:

- California Environmental Quality Act (CEQA)
- Federal Endangered Species Act (ESA)
- California Endangered Species Act (CESA)
- Federal Clean Water Act (CWA)
- California Fish and Game Code (CFGF)
- Migratory Bird Treaty Act (MBTA)
- The Bald and Golden Eagle Protection Act
- Porter-Cologne Water Quality Control Act
- Sacramento County General Plan of 2005 – 2030
- Sacramento County Tree Ordinance

See Appendix A for a discussion of the above regulations.

#### 2.1.2 Guidelines for Determining CEQA Significance

The following threshold criteria, as defined by the CEQA Guidelines Appendix G Initial Study Checklist, were used to evaluate potential environmental effects. Based on these criteria, the proposed project would have a significant effect on biological resources if it would:

- a) Have substantial adverse effects, either directly or through habitat modifications, on any species identified as a candidate, sensitive or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service.
- b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, and regulations or by the California Department of Fish and Wildlife or US Fish and Wildlife Service.
- c) Have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means.
- d) 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.



- e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.
- f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional or state habitat conservation plan.

## 2.2 Literature Review

Queries of the U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation system (IPaC; USFWS 2017a, 2020d), CDFW California Natural Diversity Database (CNDDB; CDFW 2017a, 2020a), and the California Native Plant Society (CNPS) Online Inventory of Rare and Endangered Plants of California (CNPS 2017, 2020a) were conducted to obtain comprehensive information regarding state and federally listed species as well as other special status species considered to have potential to occur within the *Rio Vista, California* and *Isleton, California* U.S. Geological Survey (USGS) 7.5-minute topographic quadrangles and the surrounding ten quadrangles (*Courtland, Bruceville, Thornton, Terminous, Bouldin Island, Jersey Island, Antioch North, Birds Landing, Dozier, Liberty Island*). The results of these scientific database queries were compiled into a table that is presented as Appendix B.

In addition, the following resources were reviewed for information about the BSA:

- Aerial photographs of the BSA and vicinity;
- *Rio Vista, California* and *Isleton, California* USGS 7.5-minute topographic quadrangles;
- U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) Web Soil Survey (2017, 2020);
- USFWS Critical Habitat Portal (2017b, 2020b); and
- USFWS National Wetlands Inventory (2017c, 2020c).

On March 30, 2020, updated agency queries of IPaC (USFWS 2020), CNDDB (CDFW 2020), and CNPS (2020) were performed and are incorporated in this analysis.

## 2.3 Field Reconnaissance Survey

Reconnaissance surveys were conducted to document the existing site conditions and to evaluate the potential for presence of sensitive biological resources including sensitive plant and animal species, sensitive plant communities, potentially jurisdictional waters of the U.S. and wetlands, and habitat for federally and state protected nesting birds.

Rincon Biologist Maxwell Markley conducted a field reconnaissance survey on December 1, 2017, to document the existing site conditions and map biological resources present on the site. Weather conditions during the survey included an average temperature of 60 degrees Fahrenheit, with winds of two to five miles per hour and clear skies. Mr. Markley surveyed the entire BSA on foot and recorded all biological resources encountered on site.

An additional reconnaissance level survey was conducted on April 1<sup>st</sup>, 2020, by Rincon Biologist Beth Wilson. Conditions onsite were clear, with a temperature of 55 °F and winds of 3 to 5 miles per hour. Ms. Wilson walked each staging area as accessible and evaluated the current conditions at the three project sites for consistency with the previous survey.



During the surveys, an inventory of all plant and animal species observed was compiled (Appendix C) and an evaluation of potentially jurisdictional aquatic features was conducted. Plant species nomenclature and taxonomy followed *The Jepson Manual: Vascular Plants of California, Second Edition* (Baldwin et al., 2012). All plant species encountered were noted and identified to the lowest taxonomic level necessary to determine rarity. The vegetation classification system used for the analysis is based on *A Manual of California Vegetation, Second Edition* (Sawyer et al., 2009). The vegetation communities were mapped onto aerial imagery depicting the BSA and then later digitized using ArcGIS (ESRI, 2020).

Wildlife identification and nomenclature followed standard reference texts including *Sibley Field Guide to Birds of Western North America* (Sibley, 2003), *Field Guide to Western Reptiles and Amphibians* (Stebbins, 2003), and *Mammals of North America* (Bowers et al., 2004). The habitat requirements for each regionally occurring special status species were assessed and compared to the type and quality of the habitats observed within the BSA during the field survey. Several sensitive species were eliminated from consideration as potential to occur on site due to lack of suitable habitat, lack of suitable soils/substrate, and/or known regional distribution. The relative density of fossorial mammal burrows and soil characteristics throughout the site were also noted.



## **3 Existing Conditions**

---

This section summarizes the results of the reconnaissance-level field survey. Discussions regarding the general environmental setting, vegetation communities present, plants and animals observed, potential special status species issues, and other possible constraints regarding the biological resources on-site are presented below. Representative photographs of the project sites are provided in Appendix D and a complete list of all the plant and animal species observed on-site during the field survey is presented in Appendix C.

### **3.1 Physical Characteristics**

The BSA is located in western Sacramento County where the climate typifies a Mediterranean climate throughout the year. The majority of rainfall occurs during the winter months. Lands surrounding the BSA support primarily agriculture land-uses with the City of Isleton and Rio Vista adjacent to the BSA to the east representing urban land use.

The Proposed Project is located within and along the left bank of the Sacramento River, starting from the confluence of Deep Water Ship Channel upstream to the City of Isleton. Elevations on-site are approximately 0 to 6 feet above mean sea level.

The BSA is within the Sacramento Valley (ScV) geographic subregion of California. The ScV subregion is a component of the larger Great Central Valley geographic region, which occurs within the even larger California Floristic Province (Baldwin et al., 2012).

#### **3.1.1 Watershed and Drainages**

The BSA is in the Beaver Lake-Sacramento River watershed (Hydrologic Unit Code 180201630702) within a well-developed floodplain. The Sacramento River is the only National Wetlands Inventory (NWI) feature mapped within the BSA. The Sacramento River is a permanently flooded riverine system that is tidal in nature. Tidal fresh water covers the substrate throughout the year. Ocean-derived salt concentrations reach 0.5 parts per thousand during the period of average annual low flow and water velocity fluctuates under tidal influence.

NWI features mapped nearby include freshwater emergent wetlands and freshwater forested/shrub wetlands west and east of the BSA and palustrine-farmed wetlands to the south.

#### **3.1.2 Soils**

The NRCS Web Soil Survey of Sacramento County, Western Part, California delineates five soil map units within the BSA: Sailboat silt loam, partially drained, 0 to 2 percent slopes; Valpac variant sandy loam, partially drained, 0 to 2 percent slopes; Laugenour loam, partially drained, 0 to 2 percent slopes, Scribner clay loam, partially drained, 0 to 2 percent slopes, MLRA 16, and Valdez silt loam, drained, 0 to 2 percent slopes, MLRA 16 (USDA NRCS, 2019). Site-specific soil observations of topsoil condition are consistent with those mapped by the NRCS Web Soil Survey. Descriptions of each soil map unit are presented below.



### **Sailboat Silt Loam, Partially Drained, 0 to 2 Percent Slopes**

The Sailboat series consists of very deep, somewhat poorly drained soils that formed in alluvium from mixed sources. Sailboat soils are on natural levees of large rivers and sloughs and on narrow low flood plains of rivers and streams. Slopes are 0 to 2 percent. Elevation ranges from -10 to 140 feet. This soil is somewhat poorly drained, with slow runoff and moderately slow permeability. Occasional flooding occurs in unprotected areas and rare flooding occurs in protected areas during prolonged periods of rainfall in the winter and early spring months. Flooding lasts from 2 to 30 days. Some areas are drained due to ground water overdraft. In areas along major rivers, a water table occurs from December through April at depths of 36 to 60 inches, due to seepage.

Most areas are used for irrigated cropland or orchards. Common crops grown are corn, alfalfa, sugar beets, wheat, asparagus, tomatoes, safflower and pears. Where not cultivated, vegetation consists of annual grasses and forbs. This soil is commonly found on natural levees and flood plains of the Sacramento River and its tributaries in Sacramento and San Joaquin counties.

A typical soil profile has silt loam, clay loam, and loam to about 62 inches.

### **Valpac Variant Sandy Loam, Partially Drained, 0 to 2 Percent Slopes**

The Valpac series consists of very deep, somewhat poorly drained soils formed in alluvium derived from mixed rocks. Valpac soils are on natural levees of high floodplains. Elevation is 5 to 25 feet. Slopes are 0 to 2 percent. This soil map unit is somewhat poorly drained, with slow runoff and moderately slow permeability. These soils are artificially drained. A seasonal water table occurs from December through April at a depth of 36 to 60 inches. These soils are protected by levees and the hazard of flooding is rare.

This soil is typically used for growing irrigated crops such as pears, grapes, wheat, corn, tomatoes and irrigated pasture, and is commonly found in the lower Sacramento Valley.

A typical soil profile has loam, silt loam, sandy loam, and clay loam to about 61 inches.

### **Laugenour Loam, Partially Drained, 0 to 2 Percent Slopes**

The Laugenour series consists of very deep, poorly drained soils formed in material from sedimentary alluvium. The Laugenour soils are on recent alluvial fans and have slopes of 0 to 2 percent. Elevations are 10 to 300 feet. This soil map unit is poorly drained; natural drainage has been improved by levees and drains. Runoff is slow and permeability is moderate. It is subject to frequent flooding where not protected by levees during winter and spring months.

This soil is used for cropland with intensive cultivation for such crops as alfalfa, almonds, corn, grain sorghum, sugar beets and tomatoes, and is commonly found in the lower Sacramento Valley in Central California.

A typical soil profile has sandy loam, loamy sand, and sand to about 82 inches.

### **Scribner Clay Loam, Partially Drained, 0 to 2 Percent Slopes, MLRA 16**

The Scribner series consists of very deep, poorly drained soils formed in fine-loamy alluvium derived from igneous, metamorphic and sedimentary rock. Scribner soils are on backswamps and have slopes 0 to 2 percent. Elevations are 0 to 10 feet. This soil map unit is poorly drained, with medium runoff. A water table occurs from December to April at depths of 20 to 35 inches. These soils are protected by levees and have a rare hazard of flooding.



This soil is mainly used for irrigated cropland such as tomatoes, corn and small grains, and is commonly found in the Sacramento and San Joaquin River delta area.

A typical soil profile has clay loam and sandy clay loam to about 60 inches.

### **Valdez Silt Loam, Drained, 0 to 2 Percent Slopes, MLRA 16**

The Valdez series consists of very deep, poorly drained soils formed in fine-silty alluvium derived from igneous, metamorphic and sedimentary rock. The Valdez soils are on flood plains and have slopes 0 to 2 percent. Elevations are 0 to 20 feet. This soil map unit is poorly drained, with slow to very slow runoff and moderately slow permeability. The water table fluctuates from 3 feet to 5 feet in many drained areas.

This soil is typically used for intensive row and field crops in irrigated areas for alfalfa, orchards, grain, and wildlife. This soil is commonly found along the lower Sacramento River near Suisun Bay and the Sacramento-San Joaquin Delta.

A typical soil profile has silt loam and very fine sandy loam to about 79 inches.

## **3.2 Vegetation**

Four terrestrial vegetation communities or land cover types occur within the BSA: Coast Live Oak Woodland, Black Willow Thicket, Ruderal, and Developed (Table 2). Vegetation was classified and mapped during biological resource survey work conducted on December 1, 2017, and April 1, 2020 to characterize the BSA. Vegetation communities are depicted in Figures 3a-f and discussed in more detail below.

**Table 2 Summary of Vegetation Communities within the BSA**

<b>Vegetation Community</b>	<b>Approximate Acreage within BSA</b>	<b>Approximate Percentage of the BSA</b>
Coast Live Oak Woodland	5.58	28
Black Willow Thicket	0.21	1
Ruderal	7.00	34
Developed	7.13	36

### **Coast Live Oak Woodland**

Riparian Coast Live Oak Woodland occurs within the majority of the BSA. Coast live oak (*Quercus agrifolia*) is the dominant tree species in this community within the BSA. The canopy of coast live oak represented approximately 60% relative cover. Other tree species identified on site included: box elder (*Acer negundo*), valley oak (*Quercus lobata*), edible fig (*Ficus carica*), interior live oak (*Quercus wislizeni*), black walnut (*Juglans hindsii*), Oregon ash (*Fraxinus latifolia*), western sycamore (*Platanus racemosa*), white alder (*Alnus rhombifolia*), black locust (*Robinia pseudoacacia*), and a variety of willow species (*Salix* spp.). The understory is dominated by California rose (*Rosa californica*), blackberry (*Rubus* sp.), scouringrush horsetail (*Equisetum hyemale*), and California wild grape (*Vitis californica*).



Figure 3a Site 1(a) Vegetation Communities





Figure 3a Site 1(b) Vegetation Communities





Figure 3b Site 2(a) Vegetation Communities





Figure 3b Site 2(b) Vegetation Communities

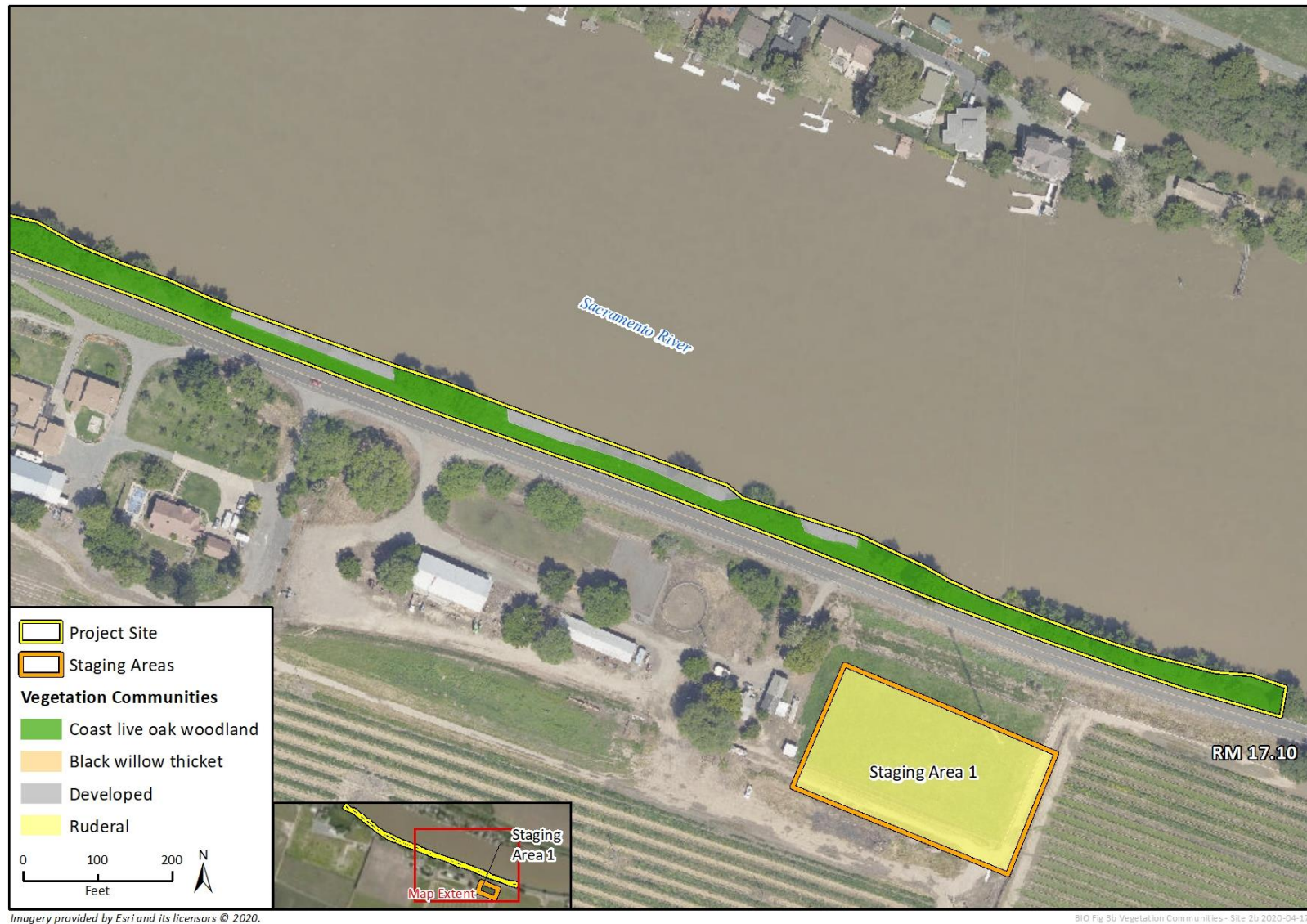




Figure 3c Site 3 Vegetation Communities





Figure 3d Staging Area 3 Vegetation Communities



Imagery provided by Esri and its licensors © 2020.

BIO Fig 3d Vegetation Communities- Staging Area 3 2020-04-17



Figure 3e Staging Area 4 Vegetation Communities



Imagery provided by Esri and its licensors © 2020.

BIO Fig 3e Vegetation Communities - Staging Area 4 2020-04-17



Robertson-Bryan, Inc.

**BALMD Levee Erosion Control and Habitat Enhancement Project**



### **Black Willow Thicket**

Black Willow Thicket occurs within Site 1. Black willow is the dominant tree species. The canopy of Black willow represented approximately 90% relative cover. Other tree species identified on site included: coast live oak, valley oak, and a variety of willow species (*Salix* spp.). The understory is dominated by blackberry and California wild grape.

### **Ruderal**

Ruderal vegetation occurs within the most of the proposed optional staging areas and consists predominantly of non-native annual grasses (recently mowed) and weedy species, such as black mustard (*Brassica nigra*), asparagus fern (*Asparagus* sp.), cheeseweed (*Malva parviflora*), fennel (*Foeniculum vulgare*), and prickly lettuce (*Lactuca serriola*).

### **Developed**

Areas that were considered developed within the BSA consisted of areas where rip rap, concrete-lined riverbank, and utility development existed. These areas contain little vegetation and represent engineered areas with man-made structures present. Additionally, much of the optional staging areas were developed with paved, graveled or landscaped areas.

## **3.3 General Wildlife**

Terrestrial wildlife activity was generally low during the reconnaissance survey. See Appendix C for a full list of species observed in the vicinity of the BSA. Avian species observed included common species such as red tailed hawk (*Buteo jamaicensis*), Canada goose (*Branta canadensis*), mourning dove (*Zenaidura macroura*), turkey vulture (*Cathartes aura*), raven (*Corvus corax*), California scrub jay (*Aphelocoma californica*), and California gull (*Larus californicus*). Small mammal sign consisting of pocket gopher (*Thomomys* sp.) and California ground squirrel (*Otospermophilus beecheyi*) burrows were uncommon and were found intermittently throughout the BSA.



## 4 Sensitive Biological Resources

---

Local, state, and federal agencies regulate special status species and require an assessment of their presence or potential presence to be conducted on-site prior to the approval of any proposed development on a property. This section discusses sensitive biological resources observed on the project site, and evaluates the potential for the project site to support other sensitive biological resources. Assessments for the potential occurrence of special status species are based upon known ranges, habitat preferences for the species, species occurrence records from the CNDDDB, species occurrence records from other sites in the vicinity of the survey area, and previous reports for the project site. The potential for each special status species to occur in the survey area was evaluated according to the following criteria:

- **Absent.** Habitat on and adjacent to the site is clearly unsuitable for the species requirements (foraging, breeding, cover, substrate, elevation, hydrology, plant community, site history, disturbance regime) and/or appropriately-timed protocol or focused surveys have been completed and the species has been determined to be absent.
- **Not Expected.** Habitat on and adjacent to the site is clearly unsuitable for the species requirements (foraging, breeding, cover, substrate, elevation, hydrology, plant community, site history, disturbance regime).
- **Low Potential.** Few of the habitat components meeting the species requirements are present, and/or the majority of habitat on and adjacent to the site is unsuitable or of very poor quality. The species is not likely to be found on the site.
- **Moderate Potential.** Some of the habitat components meeting the species requirements are present, and/or only some of the habitat on or adjacent to the site is unsuitable. The species has a moderate probability of being found on the site.
- **High Potential.** All of the habitat components meeting the species requirements are present and/or most of the habitat on or adjacent to the site is highly suitable. The species has a high probability of being found on the site.
- **Present.** Species is observed on the site or has been recorded (e.g., CNDDDB, other reports) on the site recently (within the last 5 years).

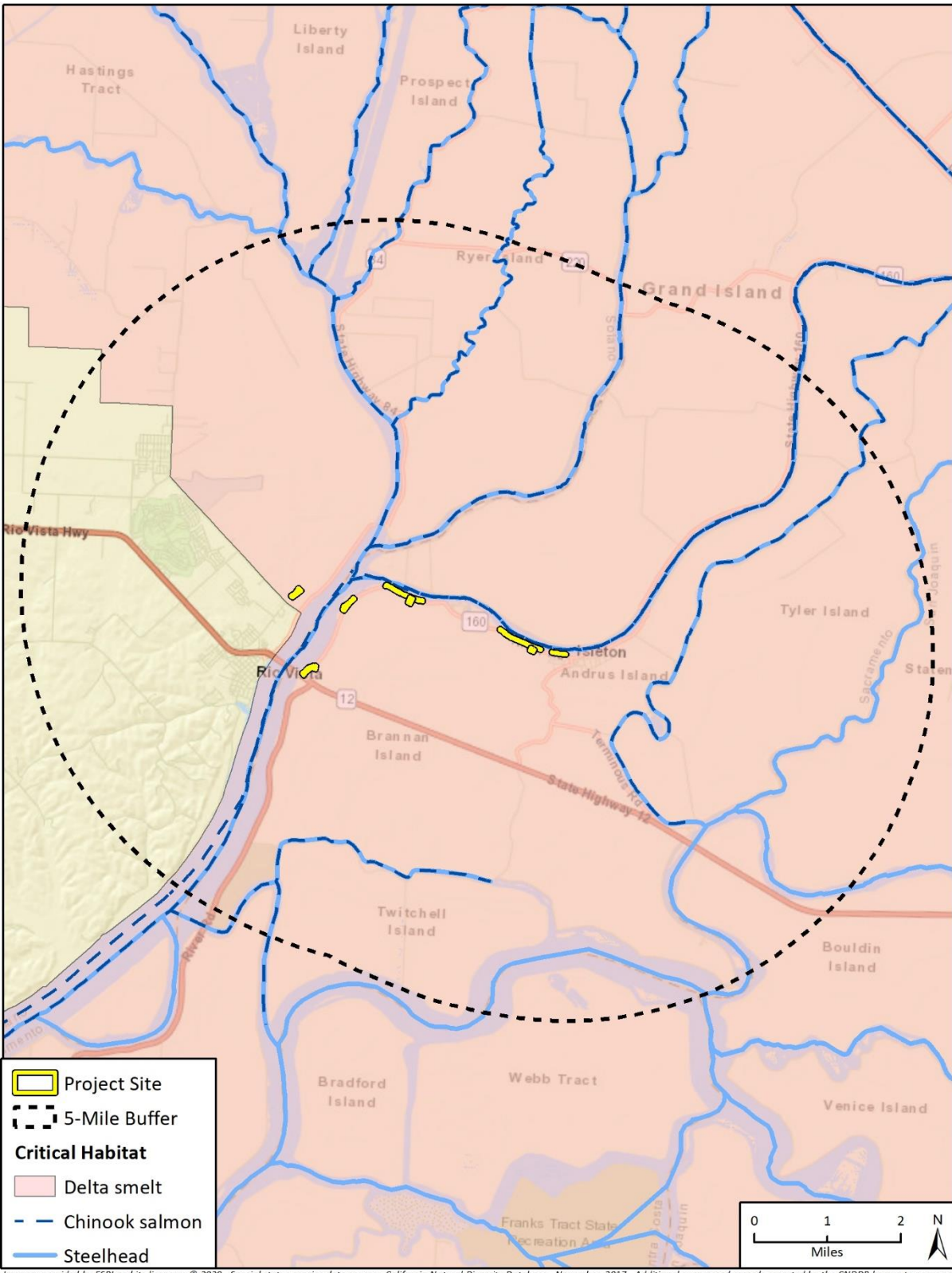
The results of the 12-quad CNDDDB and CNPS searches, the IPaC-generated list of federally listed species, and Rincon's biological expertise resulted in a total of 93 plant and animal species that are known to occur in the region. Of these, 25 species (14 plants and 11 animals) were evaluated as having some potential to occur within the terrestrial portions of the project sites. A complete list of species evaluated for this project can be found in Appendix B. Federally designated critical habitat located within five miles of the BSA are shown in Figure 4.

### 4.1 Special Status Species

For the purpose of this report, special status species are defined as those plants and animals listed, proposed for listing, or candidates for listing as threatened or endangered by the USFWS under the federal ESA; those listed or proposed for listing as rare, threatened, or endangered by the CDFW under CESA; animals designated as "Species of Special Concern" or "Fully Protected" by the CDFW.



**Figure 4 Sensitive Species, Natural Communities, and Designated Critical Habitats**



Imagery provided by ESRI and its licensors © 2020. Special status species data source: California Natural Diversity Database, November, 2017. Additional suppressed records reported by the CNDDB known to occur or potentially occur within this search radius include: American peregrine falcon. For more information please contact the Department of Fish and Game. Critical habitat data source: U.S. Fish and Wildlife Service, September, 2017. Final critical habitat acquired via the USFWS Critical Habitat Portal. It is only a general representation of the data and does not include all designated critical habitat. Contact USFWS for more specific data. NMFS species are not included in this figure.

BIO Fig 4 Critical Habitat 2020-04-13a



Additionally, rookery sites for species that nest colonially, such as egrets and herons, and bat maternity roosts are also treated as special status.

In addition to plants listed under the federal ESA or CESA, special status plants are those with a California Rare Plant Rank (CRPR) of 1 or 2, which are defined as:

- Rank 1A = Plants presumed extinct in California;
- Rank 1B.1 = Rare or endangered in California and elsewhere; seriously endangered in California (over 80% of occurrences threatened/high degree and immediacy of threat);
- Rank 1B.2 = Rare or endangered in California and elsewhere; fairly endangered in California (20-80% occurrences threatened);
- Rank 1B.3 = Rare or endangered in California and elsewhere, not very endangered in California (<20% of occurrences threatened or no current threats known);
- Rank 2 = Rare, threatened or endangered in California, but more common elsewhere;

No locally designated CRPR 3 and 4 species and no type localities or unique vegetation types of which CRPR 3 or 4 species are a component are present in the BSA.

#### 4.1.1 Special Status Plant Species

Based on the database and literature review of records from the *Rio Vista* and *Isleton, California* USGS 7.5-minute topographic quadrangles and the surrounding 10 quadrangles as well as the USFWS IPaC list of federally listed species, 43 special status plant species are known to or have the potential to occur within the regional vicinity of the BSA (Appendix B). Of these, 10 special status plant species may occur on site based on the presence of suitable habitat within or immediately adjacent to the BSA, including the following:

- Bristly sedge (*Carex comosa*); California Rare Plant Rank (CRPR) 2B.1
- Bolander's water-hemlock (*Cicuta maculata* var. *bolanderi*); CRPR 2B.1
- Woolly rose-mallow (*Hibiscus lasiocarpus* var. *occidentalis*); CRPR 1B.2
- Delta tule pea (*Lathyrus jepsonii* var. *jepsonii*); CRPR 1B.2
- Mason's lilaeopsis (*Lilaeopsis masonii*); State Rare, CRPR 1B.1
- Delta mudwort (*Limosella australis*); CRPR 2B.1
- Eel-grass pondweed (*Potamogeton zosteriformis*); CRPR 2B.2
- Sanford's arrowhead (*Sagittaria sanfordii*); CRPR 1B.2
- Marsh skullcap (*Scutellaria galericulata*); CRPR 2B.2
- Side-flowering skullcap (*Scutellaria lateriflora*); CRPR 2B.2

Additionally, two special status plant species are known to be present in the BSA:

- Northern California black walnut (*Juglans hindsii*), CRPR 1B.1
- Suisun Marsh aster (*Symphyotrichum lentum*), CRPR 1B.2

Northern California black walnut was documented in low numbers at Site 1 during the site visit and is intermixed with coast live oak trees in the oak woodland. Suisun Marsh aster is reported from small patches on the levees of Site 1 and Site 2 according to reports in the CNDDDB from 2008 and 2009. This species was not documented during the site surveys; however, they were conducted outside the bloom period for this species.



### 4.1.2 Special Status Wildlife Species

Based on the database and literature review of records from the *Rio Vista, California* and *Isleton, California* USGS 7.5-minute topographic quadrangles and the surrounding 10 quadrangles as well as the USFWS IPaC list of federally listed species, 51 terrestrial special status wildlife species are known to or have the potential to occur within the regional vicinity of the BSA (Appendix B). All sensitive fish species are being addressed under a separate analysis. Of the 51 species evaluated, seven special status wildlife species have some potential to occur on site based on the presence of suitable habitat within the BSA, known species ranges and distributions, recorded occurrence data, or observations made during the field survey. These species include the following:

- Great egret (*Ardea alba*) (rookery sites)
- Great blue heron (*Ardea herodias*) (rookery sites)
- Swainson's hawk (*Buteo swainsoni*); State Threatened (ST)
- White-tailed kite (*Elanus leucurus*); State Fully Protected (FP)
- Song sparrow ("Modesto" population) (*Melospiza melodia*); State Species of Special Concern (SSC)
- Hoary bat (*Lasiurus cinereus*) (maternity roosts)
- Western red bat (*Lasiurus blossevillii*); SSC

## 4.2 Sensitive Plant Communities

Five sensitive plant communities have been documented within the quadrangles queried including and surrounding the BSA: Valley Oak Woodland, Great Valley Mixed Riparian Forest, Stabilized Interior Dunes, Coastal and Valley Freshwater Marsh, and Coastal Brackish Marsh. These sensitive plant communities are not present on site.

## 4.3 Jurisdictional Waters and Wetlands

As described in section 3.1.1, the BSA is located on the left bank of the Sacramento River. No other natural wetlands or waterways occur in the BSA; however, portions of the BSA consists of vegetation communities (i.e. riparian oak woodland and willow thicket) and the constructed levee that would be considered part of the jurisdictional limits of the waters of the state under the CDFW and/or Regional Water Quality Control Board (RWQCB). Portions of the project site within the river up to the top of the levee would also be considered part of the jurisdictional limits of the U.S Army Corps of Engineers (USACE). A full jurisdictional delineation was beyond the scope of this analysis; however, any portions of the project sites that include the river, the developed levee, and the riparian oak woodland and willow thicket (out to the drip-line) would likely fall within the jurisdiction(s) of the USACE, CDFW, and/or RWQCB.

Multiple jurisdictional wetlands occur adjacent to the BSA: freshwater emergent wetlands and freshwater forested/shrub wetlands west of Site 1; and a freshwater forested/shrub wetlands east of Site 1 and west of Site 2; and palustrine-farmed wetlands south of Site 1, Site 2, and Site 3.



## 4.4 Wildlife Movement

Wildlife movement corridors, or habitat linkages, are generally defined as connections between habitat patches that allow for physical and genetic exchange between otherwise isolated animal populations. Such linkages may serve a local purpose, such as providing a linkage between foraging and denning areas, or they may be regional in nature. Some habitat linkages may serve as migration corridors, wherein animals periodically move away from an area and then subsequently return. Others may be important as dispersal corridors for young animals. A group of habitat linkages in an area can form a wildlife corridor network.

The habitats within the link do not necessarily need to be the same as the habitats that are being linked. Rather, the link merely needs to contain sufficient cover and forage to allow temporary inhabitation by ground-dwelling species. Typically, habitat linkages are contiguous strips of natural areas, though dense plantings of landscape vegetation can be used by certain disturbance-tolerant species. Depending upon the species using a corridor, specific physical resources (such as rock outcroppings, vernal pools, or oak trees) may need to be located within the habitat link at certain intervals to allow slower-moving species to traverse the link. For highly mobile or aerial species, habitat linkages may be discontinuous patches of suitable resources spaced sufficiently close together to permit travel along a route in a short period of time.

Regionally, the BSA is not located within an Essential Connectivity Area (ECA) as mapped in the report *California Essential Habitat Connectivity Project: A Strategy for Conserving a Connected California* (2010). ECAs represent principle connections between Natural Landscape Blocks. ECAs are regions in which land conservation and management actions should be prioritized to maintain and enhance ecological connectivity. ECAs are mapped based on coarse ecological condition indicators, rather than the needs of particular species and thus serve the majority of species in each region. Small scale habitat corridors are also present on site and include drainages and other topographic features that facilitate movement.

The BSA is located along the bank of the Sacramento River, and the majority of the site consists of natural riparian vegetation communities associated with the Sacramento River. The Sacramento River links ocean and freshwater habitats, and riparian habitats along the banks of the Sacramento River likely function as important wildlife movement corridors between downstream and upstream natural areas. The project site likely serves as an important wildlife corridor for terrestrial wildlife moving along the Sacramento River.

## 4.5 Resources Protected By Local Policies and Ordinances

Sacramento County regulates tree removal and pruning within its jurisdiction. The project sites include riparian oak woodland and willow thicket habitats with big leaf maple, boxelder, white alder, Oregon ash, black walnut, western sycamore, coast live oak, valley oak, interior live oak, black locust, and black willow. These portions of the project sites include protected trees covered under the Sacramento County Tree Ordinance.



## 5 Impact Analysis and Mitigation Measures

---

### 5.1 Special-Status Species

The Proposed Project would have a significant effect on biological resources if it would:

- a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service. Impacts to fish species regulated by the National Marine Fisheries Service (NMFS) are addressed under a separate cover.

#### 5.1.1 Special Status Plants

The Proposed Project has potential to result in direct impacts to special status plant species. Based on the presence of suitable habitat in the project area, seven (7) special status plant species have a low potential to occur within the project site, three (3) special status species have a moderate potential to occur within the project site, and two species are known to occur (Appendix B).

One of the species that has low potential to occur, Mason's lilaeopsis, is designated as a State rare plant under CESA. This species can occur on mud banks and flats and in marsh and riparian vegetation along erosional zones of creek-banks, sloughs, and rivers, and it is known to occur along the Sacramento River approximately 200 feet west of the BSA. Habitat quality in the location mapped as supporting this species is superior to the conditions within the BSA, but some potentially suitable habitat is present within the BSA. Given the proximity of the site to an extant occurrence, some individuals may be present in the BSA and could be impacted. Although the activity would not fully eliminate the occurrence since a portion of it is offsite, impacts to individuals would be potentially significant without mitigation due to the rarity of this species. The project is not expected to result in permanent loss of habitat due to the restoration of riparian and wetland habitat. After implementation, the Proposed Project would result in beneficial impacts however. Removal of invasive *Arundo donax* and developed areas, and the enhancement of riparian habitat and creation of marsh the Project would create habitat complexity and increase the sites value for special status plants.

Black walnut is present within Site 1 and Suisun Marsh aster is present within Sites 1 and 2. These are not federally or State listed, and impacts to these species would only be considered significant under CEQA if the loss of individuals on the project site(s) represented a population-level impact that would result in a loss of, or risk to the entire regional population. Impacts to these species can be minimized through implementation of measure BIO-1 to ensure that the project does not result in population-level effects.

The remaining potentially occurring species are listed by CNPS as rank 1B.1, 1B.2, 2B.1 or 2B.2. Impacts to these species would only be considered significant under CEQA if the loss of individual on the project site represented a population-level impact that resulted in a loss of, or risk to the entire regional population. Given the small size of the project area, and the presence of extensive areas of similar habitat (i.e., riparian oak woodland and willow thicket) along the banks of the Sacramento River both upstream and downstream from the project sites, impacts to special status plants that may occur on the project sites are unlikely to be considered significant under CEQA. Additionally,



the project will not result in permanent impacts to riparian habitats, and all riparian areas would be restored and enhanced following project restoration activity. As a result, any temporary loss of special status plants would be offset by restoration activity that is incorporated into the project design.

Indirect impacts could occur due to the spread of invasive, non-native species from construction equipment or imported fill materials. Invasive, non-native plant species can out-compete native species and/or alter habitat towards a state that is unsuitable for special status species. For example, the spread of certain weed species can reduce the biodiversity of native habitats through displacement of vital pollinators, potentially eliminating special status plant species. Impacts to special status plants species from invasive weeds are potentially significant because invasive weeds can spread to the extent that they affect rare plants at the local and/or regional population-level.

Implementation of Measure BIO-1 is recommended to reduce potential impacts to special status plant species to a less than significant level.

#### *BIO-1 Special Status Plant Avoidance, Minimization, and Mitigation Measures*

Prior to construction, a qualified biologist shall survey all areas of suitable habitat for special status plant species with potential to occur on the project site. If any are detected, the location of all individual of special status plant species shall be mapped. Where feasible, individuals shall be fenced for avoidance during construction. Where avoidance is not possible, losses shall be offset through inclusion of these species into the restoration planting palette. To the extent feasible, rhizomes of the Suisun Marsh aster and Mason's lilaeopsis shall be salvaged and stored in damp soil and cared for by a qualified biologist or nursery professional until restoration plantings are implemented. Salvage of Mason's lilaeopsis may require additional authorizations from CDFW due to its status as State rare species. Any consultation with CDFW, if this species is found, shall be completed prior to the start of construction in occupied areas, and the applicant shall submit written documentation of the results of such consultations. Black walnut, Mason's lilaeopsis, and Suisun Marsh aster shall be included in the plant palette at a minimum 1 to 1 ratio of individuals planted to individuals removed.

All efforts should be made to avoid the spread or introduction of invasive weeds during implementation of the proposed project. Appropriate best management practices that are intended and designed to curtail the spread of invasive plant species should be implemented during construction. These include, but are not limited to, the following:

- During construction, the project will make all reasonable efforts to ensure imported material is free of invasive plant species.
- 
- Equipment and vehicles must be free of caked on mud and weed seeds/propagules before accessing and leaving the project site
- Landscaping materials should not include invasive, non-native ornamentals as identified by the California Invasive Plant Council (Cal-IPC) Inventory.

### 5.1.2 Special Status Animals and Nesting Birds

The Proposed Project has potential to result in impacts to special status animals. Seven special status animal species, including birds that nest in rookeries and bats that could form maternity colonies, have potential to occur in the BSA based upon known ranges, habitat preferences for the



species, species occurrence records from the CNDDDB, species occurrence records from other sites in the vicinity of the survey area, and previous reports for areas in the vicinity of the BSA.

## State Listed Species

### *Swainson's Hawk*

Swainson's hawk is State listed as Threatened. The larger trees within the site and in the vicinity of the BSA provide suitable nesting habitat for the Swainson's hawk. The CNDDDB contains 11 records of this species within five miles of the project sites, including three nesting records within one mile of the project area from 2000. This species has potential to be present (nesting) within project sites and the immediate vicinity during construction. Direct impacts to Swainson's hawk could occur if the species is nesting within the site(s) or within ½ mile of the project site(s). Direct impacts could include injury to or mortality of individuals through destruction of active nests during tree removal or vegetation trimming, or through nest failure from noise and other disturbance in the vicinity of a nest. Any direct impacts to Swainson's hawk would be considered significant under CEQA. Implementation of the Proposed Project would ultimately be beneficial for Swainson's hawk through enhancement of riparian habitat and creation of marsh habitat.

The project sites do not provide suitable foraging habitat for Swainson's hawk, and project activity would not be expected to have indirect impacts to the species through loss of foraging habitat.

## Species of Special Concern

### *Song Sparrow ("Modesto" population)*

Suitable habitat occurs within the BSA for the song sparrow ("Modesto" population). This species would be expected to nest within the riparian shrubs and trees found on site. Potential impacts to this species, if nesting on site during project activity, include injury or mortality from direct destruction of nests, or nest abandonment from construction activity or noise. These impacts would be considered significant if the regional population were to be adversely affected by the loss of individuals at the project site(s). Given the small size of the project area in comparison to the available nesting habitat in the surrounding region indicates that the loss of individuals at the site(s) is unlikely to result in a population-level effect. Additionally, because the sites will be restored and enhanced, there would be no expected impacts from loss of suitable breeding habitat. Implementation of the Proposed Project would ultimately be beneficial for song sparrow through enhancement of riparian habitat and creation of marsh habitat. Furthermore, implementation of the proposed avoidance and minimization measures described below would avoid impacts to individuals from project activity and would reduce impacts to a less than significant level.

### *Western Red Bat*

The western red bat roosts solitarily most often in the foliage of trees or shrubs (Bolster, 2005) and prefers habitat edges and mosaics for foraging. Western red bats are highly migratory and their winter range includes western lowlands and coastal regions to which they travel during autumn (September-October) and leave during spring (March-May). Some evidence suggests the migration distances in California are fairly short, and red bats have been documented to breed in the Delta along the Sacramento River (Pierson et al 2006). Arousal from hibernation on warm days to feed has been reported, as has periodic foraging during the winter in the San Francisco Bay area. Although generally solitary, red bats appear to migrate in groups and forage in close association with one



another in summer, and form family roosts while rearing young (Bolster 2005). The oak trees and willow riparian areas found throughout the project site can provide suitable roosting sites. Based on the habitat requirements, this species has potential to forage throughout the project site and would have potential to roost in the BSA. Potential impacts to this species, if roosting on site during project activity, include injury or mortality from direct destruction of roosts, or abandonment from construction activity or noise. The project would result in temporary loss of roosting and foraging habitat. The small size of the project area in comparison to the available habitat in the surrounding region indicates that the loss of individuals at the site(s) is unlikely to result in a population-level effect. Additionally, because the sites will be restored and enhanced, there would be no expected permanent impacts from temporary loss of suitable habitat. Implementation of the Proposed Project would ultimately be beneficial for western red bat through enhancement of riparian habitat and creation of marsh habitat. Furthermore, implementation of the proposed avoidance and minimization measures described below would avoid impacts to individuals from project activity and would reduce impacts to a less than significant level.

## **Fully Protected Species**

### *White-tailed Kite*

Suitable habitat occurs within the BSA for the white-tailed kite, a State Fully Protected Species. This species could nest within the riparian habitat present on site. Potential impacts to this species, if nesting during project activity include injury or mortality from nest destruction or nest abandonment. The species forages in undisturbed, open grasslands, meadows, farmlands and emergent wetland. The project site does not provide suitable foraging habitat for this species, and indirect impacts through loss of foraging habitat are not expected. Implementation of the Proposed Project would ultimately be beneficial for white-tailed kite through enhancement of riparian habitat and creation of marsh habitat. Because of the current conservation status of this species, any impact to this species would be considered significant under CEQA. Implementation of the proposed avoidance and minimization measures described below would reduce potential impacts to less than significant.

## **Species Considered but Rejected from Further Analysis**

Three additional species were analyzed in detail but determined to have no potential to occur. These species and the rationale for determining that no impact would occur are presented below.

### *Western Yellow-billed Cuckoo*

Western yellow-billed cuckoo is federally listed as endangered. The willow thickets and riparian oak woodland within the site and in the vicinity of the BSA are comprised of habitat features that have generally been associated with suitable nesting and foraging habitat for the western yellow-billed cuckoo. However, this species prefers a minimum breeding plot size of 15 to– 20 hectares (approximately 37 to 49 acres), and riparian woodland composition is a critical factor for breeding site selection by this species. A woodland dominated by willow, cottonwood, and other broad leaved riparian species (some sycamores, walnuts, elderberries and alders) are essential for cuckoo nesting and foraging. The woodlands on the project sites are dominated by oak, represent woodland patches of too small a size to function effectively as cuckoo breeding habitat, and are in too close proximity to roads and, agricultural fields. The overall lack of habitat complexity (complex multi-tiered canopies, small open patches in between links to larger forested areas, etc.) at the sites



presents very poor quality breeding and foraging habitat for cuckoos. As such, the species is not expected to occur at the project sites, and no impacts to western yellow-billed cuckoo are expected.

### *Giant Garter Snake*

The Sacramento River is too fast moving of a water body to provide suitable habitat for the giant garter snake. This species typically inhabits marshes, sloughs, irrigation canals, rice paddies, ponds, and low-gradient streams. Specifically, giant garter snake prefers stagnant or slow-moving waterbodies with abundant emergent vegetation; consequentially, suitable habitats in the Sacramento Valley are primarily within the rice-growing regions on the valley floor (Halstead et al. 2010). Radio telemetry studies conducted in 2006 (Wylie and Amerallo 2006) show a similar relationship, with the snakes found almost exclusively within the irrigation drainage or in rice fields. These habitats are not present in the BSA. Furthermore, the terrestrial portions of the project sites do not provide any suitable habitat for this species. Suitable terrestrial habitat consists of grassy banks and openings near waterside vegetation for basking, and higher elevation upland habitats for cover and refuge from flood waters during the inactive winter season (United States Fish and Wildlife Service [USFWS] 1999). Suitable giant garter snake habitat must have the following essential components: adequate water during the active season (approximately early spring through mid-fall) to provide adequate permanent water to maintain dense populations of aquatic prey, and emergent hydrophytic vegetation for refugia and foraging during the active season, as well as suitable adjacent upland habitat. These habitat elements are not present in the BSA, and therefore, giant garter snake is not expected to occur within the project site and no impacts are expected. Implementation of the Proposed Project would ultimately be beneficial for GGS through enhancement of riparian habitat and creation of marsh habitat.

### *Western Pond Turtle*

The Sacramento River can provide suitable habitat for the western pond turtle. The species is known to occur in a wide variety of wetland habitats including rivers and streams, lakes, ponds, reservoirs, permanent and ephemeral shallow wetlands, stock ponds, and sewage treatment lagoons (Holland, 1994). Optimal habitat seems to be characterized by the presence of adequate emergent basking sites, emergent vegetation, and the presence of suitable refugia in the form of undercut banks, submerged vegetation, mud, rocks and logs. Holland (1994) notes that "Observations and some habitat use data indicate that turtles may generally avoid areas (particularly in stream habitats) that lack significant refugia." Although the species may occur in the Sacramento River, the project site lacks the typical habitat structure and basking options for this species, and as such, the site is unlikely to support western pond turtle. Impacts to this species are not expected. Implementation of the Proposed Project would ultimately be beneficial for western pond turtle through enhancement of riparian habitat and creation of marsh habitat.

## **Nesting Birds**

Suitable nesting habitat for a wide variety of birds protected under the MBTA and/or the CFGC is present on the project sites and in the vicinity of the BSA. Impacts to nesting birds may include injury or mortality as a result of nest destruction during vegetation clearing, tree removal or trimming, or nest abandonment from construction activity and noise. For impacts to nesting birds not listed under CESA or ESA to be considered significant under CEQA, the impact would have to jeopardize a local or regional population. Given the small size of the project sites and the abundance of similar nesting habitat (i.e., riparian woodland along the Sacramento River) in the area, it is unlikely that impacts to non-listed species would be considered significant under CEQA.



Implementation of the Proposed Project would ultimately be beneficial for nesting birds through enhancement of riparian habitat and creation of marsh habitat. However, implementation of mitigation measure BIO-3 would avoid impacts to nesting birds and as such would reduce potential impacts to a less than significant level.

### **Special Status Animal Avoidance, Minimization, and Mitigation Measures**

Implementation of Measures BIO-2 through BIO-6 are recommended to avoid, reduce, and/or mitigate any potential impacts to special status terrestrial animal species to a less than significant level.

#### *BIO-2 Raptor Avoidance and Minimization Efforts*

With implementation of the proposed avoidance and minimization measures described below, no impacts to Swainson's hawk and white-tailed kite are expected.

- If feasible, all vegetation clearing, tree removal and tree trimming should occur outside of the nesting season (February 15 through August 31).
- If construction activity is scheduled during the nesting season, a qualified biologist should conduct a pre-construction survey for Swainson's hawk, white-tailed kite and active Swainson's hawk and white-tailed kite nests. Surveys should be conducted within two weeks of the start of construction activities that are scheduled to occur during the nesting/breeding season. The survey should include the project area plus a 0.5 mile buffer. The pre-construction survey should be conducted during the time of day when the birds are active and should be of sufficient duration to reliably conclude presence/absence of Swainson's hawk and white-tailed kite nests. A report of the survey results should be submitted to the BALMD prior to issuance of any grading or building permits. As a fully protected species, there is no allowable "take" for white-tailed kite under any circumstances. As a State endangered species, there is no "take" of Swainson's hawk without "take" authorization from CDFW.
- If no active Swainson's hawk or white-tailed kite nests are detected, no additional action is required.
- If active Swainson's hawk nests are observed within 0.5 mile of the project, a minimum 0.25 mile avoidance buffer will be established around each nest. If active white-tailed kite nests are identified within 0.5 mile of the project, a minimum avoidance buffer of 500 feet should be established. Any variance for smaller avoidance buffers should only be allowed with the approval of CDFW and the BALMD. Active nests should be monitored by a qualified biologist during project-related activities. The avoidance buffer should be maintained for the duration of the project, unless the biologist has determined that the young have fledged or are no longer dependent upon the nest and parental care.
- If a Swainson's hawk or white-tailed kite is observed perched or foraging in the project area, all project-related work should cease and the individual will be allowed to leave the project site unimpeded and of its own accord before work may resume.
- Work activities should be avoided within active raptor nest buffers until young birds have fledged and left the nest(s). Readily visible exclusion zones should be established in areas where nests must be avoided.



*BIO-3 Non-Raptor Avoidance and Minimization Efforts.*

- If feasible, removal and/or trimming of trees will be scheduled to occur in the outside of the nesting season during non-breeding fall/winter months (September 1 through February 14), after fledging and before the initiation of the nesting season.
- If project activities will occur between February 15 and August 31, a qualified biologist should conduct pre-construction surveys for nesting birds no more than 14 days prior to construction. The survey should include the entire project site and a 250-foot buffer. If active nests are found, the qualified biologist should establish an appropriate species-specific avoidance buffer of sufficient size to prevent disturbance of the nest by project activity (typically a minimum of 50 feet).
- If no active nests are detected, no additional action is required.
- If applicable (i.e., nests are detected as a result of the pre-construction surveys), the qualified biologist should perform at least two hours of pre-construction monitoring of the nest to characterize “typical” bird behavior. The qualified biologist should monitor the nesting birds and should increase the buffer if the qualified biologist determines the birds are showing signs of unusual or distressed behavior by project activities. Atypical nesting behaviors which may cause reproductive harm include, but are not limited to, defensive flights/vocalizations directed toward project personnel, standing up from a brooding position, and flying away from the nest.
- If applicable, the qualified biologist should have authority to order the cessation of all project activities if the nesting birds exhibit atypical behavior which may cause reproductive failure (nest abandonment and loss of eggs and/or young) until an appropriate buffer is established. To prevent encroachment, the established buffer(s) should be clearly marked by high visibility material. The established buffer(s) should remain in effect until the young have fledged or the nest has been abandoned as confirmed by the qualified biologist. Any sign of nest abandonment should be reported to CDFW within 48 hours.

*BIO-4 General Wildlife Best Management Practices*

The following general wildlife BMPs are required:

- No pets shall be allowed at the project site.
- All trash that may attract predators must be properly contained in covered containers and removed from the work site on a regular basis.
- All refueling, maintenance, and staging of equipment and vehicles shall occur in a location where a spill would not drain toward aquatic habitat. A plan must be in place for prompt and effective response to any accidental spills prior to the onset of work activities. All workers shall be informed of the appropriate measures to take should an accidental spill occur.
- No plastic monofilament netting shall be utilized on-site.

## 5.2 Sensitive Plant Communities

The Proposed Project would have a significant effect on biological resources if it would:

- b) Have a substantial adverse impact on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Wildlife or US Fish and Wildlife Service.



The Proposed Project would result in impacts to the Sacramento River and adjacent riparian habitats which are under CDFW jurisdiction pursuant to Section 1600 et seq. of the CFGC and are considered sensitive communities under CEQA. Direct impacts are expected to consist of clearing, pruning, and rock installation. However, these impacts are considered temporary and would be offset through implementation of the restoration components of the Proposed Project and therefore, no measures are recommended. Additionally, implementation of the Proposed Project would ultimately be beneficial for sensitive natural communities through enhancement of riparian habitat and creation of marsh habitat.

## 5.3 Jurisdictional Waters and Wetlands

The Proposed Project would have a significant effect on biological resources if it would:

- c) Adversely impact federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) either individually or in combination with the known or probable impacts of other activities through direct removal, filling, hydrological interruption, or other means.

The Proposed Project would result in impacts to features under USACE and RWQCB jurisdictions. Impacts to USACE and RWQCB jurisdictions are expected to consist of vegetation clearing, pruning, and rock installation.

The Proposed Project is anticipated to require a CWA Section 404 Nationwide Permit from the USACE. Likewise, a CWA Section 401 Water Quality Certification from the RWQCB is also anticipated to be required. Impacts to jurisdictional areas are potentially significant without mitigation incorporated; however, because the project is designed as a restoration and enhancement project, and no permanent impacts are anticipated, restoration of all temporary impacts to riparian habitat and implementation of standard BMPs outlined in the project description (Project Environmental Commitments) and measure BIO-4 (above) are considered sufficient to ensure impacts are less than significant under CEQA.

## 5.4 Wildlife Movement

The Proposed Project would have a significant effect on biological resources if it would:

- d) Interfere substantially with the movement of any resident or migratory fish or wildlife species or with established resident or migratory wildlife corridors, or impede the use of wildlife nursery sites.

### **Great Egret and Great Blue Heron**

Great blue herons and great egrets are common year-round residents in California that feed along the margins of estuaries, lakes, and rivers as well as on mudflats, in fields and pastures. Both species roost communally and nest in colonies (rookeries). In California, these species often nest in mixed colonies together (Granholm, S. 1990 in Zeiner et al 1990). Nest sites are typically selected in groves of prominent trees with dense foliage. Rookeries may be occupied for many years, and increase in size as more birds build nests and occupy the site (Vermont Fish and Wildlife Department, 2002). Rookeries are generally located near suitable feeding and foraging habitat for the birds that occupy and nest within the rookery. The nearest rookery reported in the CNDDDB is approximately 5.74 miles



southwest of the BSA on Decker Island. No rookeries were present during the December site visit. The project would result in temporary loss of potential roosting and nesting habitat, but because the sites will be restored and enhanced, there would be no expected impacts from temporary loss of potentially suitable habitat. Implementation of the Proposed Project would ultimately be beneficial for nesting birds through enhancement of riparian habitat and creation of marsh habitat. Furthermore, implementation of the proposed avoidance and minimization measures described above (BIO-3 Non-Raptor Avoidance and Minimization Efforts) would avoid impacts to individuals from project activity and would reduce impacts to a less than significant level.

## Hoary Bat

Hoary bats have widespread distribution and can occur throughout California. This species uses woodland and forest habitats, with openings or clearings, near water. Hoary bats roost in dense foliage of medium to large trees with good cover above the roost. Tree roosts are also used for breeding and rearing young. Individuals wintering in cold climates hibernate, but may be active on warm winter days in California. This species migrates between summer and winter ranges, probably over long distances, but can reside year round in the California Central Valley and the Delta (Harris, 1990; Rainey 2000). Potential impacts to this species, if roosting on site during project activity, include injury or mortality from direct destruction of roosts, or abandonment from construction activity or noise. The project would result in temporary loss of roosting and foraging habitat. The small size of the project area in comparison to the available habitat in the surrounding region indicates that the loss of individuals at the site(s) is unlikely to result in a population-level effect. Additionally, because the sites will be restored and enhanced, there would be no expected permanent impacts from temporary loss of suitable habitat. Implementation of the Proposed Project would ultimately be beneficial for hoary bat through enhancement of riparian habitat and creation of marsh habitat. Furthermore, implementation of the proposed avoidance and minimization measures described below would avoid impacts to individuals from project activity and would reduce impacts to a less than significant level.

The Proposed Project is designed to restore and enhance the levee and associated habitat. As such there will be no long-term change in how the site functions for wildlife movement. Therefore, the Proposed Project would not substantially interfere with the movement of any resident or migratory fish or wildlife species and no measures are recommended. If a hoary bat maternity colony or great blue heron/great egret rookeries are present, project activity could temporarily impede the use of these wildlife nursery sites. Measure BIO-7 is recommended to ensure avoidance of wildlife nursery sites and reduce potential impacts to less than significant.

### *BIO-7 Roosting Bats Impact Avoidance and Minimization*

Prior to construction activities that require removal of trees or large shrubs, a qualified biologist shall conduct a survey of potential bat roosts to determine if roosting bats are present.

- If a bat roost is found, further analysis shall be conducted sufficient to determine the species present and the type of roost (day, night, maternity, etc.).
- If the bats are not part of an active maternity colony, passive exclusion measures may be implemented in close coordination with CDFW prior to removal of the affected vegetation. These exclusion measures may include one-way valves that allow bats to exit the structure but are designed so that the bats may not re-enter if the roost is a cavity roost.
- For non-maternity tree roosts, the roost shall be checked daily until the bats have moved and then vegetation removal can proceed with a monitor present.



- Maternal bat colonies may not be disturbed while young are present and dependent on the roost.

## 5.5 Local Policies and Ordinances

The Proposed Project would have a significant effect on biological resources if it would:

- e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance

The Proposed Project would not conflict with any local policies or ordinances protecting biological resources. However, the project may be subject to the Sacramento County tree ordinance. The extent of riparian disturbance and the number and size of trees that would be removed and/or trimmed has not yet been determined. Once the project plans have been finalized, the exact number, type, size, and locations of trees slated for removal and/or trimming would be determined. A Sacramento County tree permit may be required to remove or prune any public and certain private trees. Some tree pruning and removal can be allowed on private land as part of project development if a Building Permit or Planning Application is in review by Sacramento County Tree Coordinator staff. As specified in the County ordinance, a “tree” shall mean any living native oak tree having at least one trunk of six inches or more in diameter measured four and one-half feet above the ground (dbh), or a multi-trunked native oak tree having an aggregate diameter of ten inches or more, measured at dbh. The project is a restoration project and planting of trees is included as part of the project description. However, removal of specific trees (e.g., black walnut) may require specific replacement mitigation or plantings.

## 5.6 Adopted or Approved Plans

The proposed project would have a significant effect on biological resources if it would:

- f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Conservation Community Plan, or other approved local, regional, or state habitat conservation plan.

The proposed project is not located within the plan areas for any adopted Habitat Conservation Plan, Natural Conservation Community Plan, or other approved local, regional, or state habitat conservation plan. As such, the project would not conflict with the provisions of any such plans.



## 6 Limitations, Assumptions, and Use Reliance

---

This Biological Resources Assessment has been performed in accordance with professionally accepted biological investigation practices conducted at this time and in this geographic area. The biological investigation is limited by the scope of work performed. Biological surveys for the presence or absence of certain taxa have been conducted as part of this assessment but were not performed during a particular blooming period, nesting period, or particular portion of the season when positive identification would be expected if present, and therefore, cannot be considered definitive. The biological surveys are limited also by the environmental conditions present at the time of the surveys. In addition, general biological (or protocol) surveys do not guarantee that the organisms are not present and will not be discovered in the future within the site. In particular, mobile wildlife species could occupy the site on a transient basis, or re-establish populations in the future. Our field studies were based on current industry practices, which change over time and may not be applicable in the future. No other guarantees or warranties, expressed or implied, are provided. The findings and opinions conveyed in this report are based on findings derived from site reconnaissance, jurisdictional areas, review of CNDDDB RareFind3, and specified historical and literature sources. Standard data sources relied upon during the completion of this report, such as the CNDDDB, may vary with regard to accuracy and completeness. In particular, the CNDDDB is compiled from research and observations reported to CDFG that may or may not have been the result of comprehensive or site-specific field surveys. Although Rincon believes the data sources are reasonably reliable, Rincon cannot and does not guarantee the authenticity or reliability of the data sources it has used. Additionally, pursuant to our contract, the data sources reviewed included only those that are practically reviewable without the need for extraordinary research and analysis.



## 7 References

---

- American Ornithologists' Union (AOU). 2010. Check-list of North American Birds. Retrieved from: <http://www.aou.org/checklist/north/>
- Bolster, Betsy C. 2005. *Lasiurus blossevillei* - Western Red Bat: Species Account. Western Bat Working Group Species Accounts Updated at the 2005 Portland Meeting. <http://relicensing.pcwa.net/documents/Library/PCWA-L%20545.pdf>
- Bowers, N., R. Bowers, & K. Kaufman. 2004. Mammals of North America.
- Burt, W.H., and R.P. Grossenheider. 1980. A Field Guide to the Mammals of North America North of Mexico. The Peterson Field Guide Series.
- Calflora. 2009. Information on wild California plants for conservation, education, and appreciation. Berkeley, CA. Updated online and accessed via: <http://www.calflora.org/>.
- California Department of Fish and Wildlife (CDFW). 2017a. California Natural Diversity Database, Rarefind V. Accessed September, 2017 and March 30, 2020.
- \_\_\_\_\_. 2017b, 2019. Special Animals List. Biogeographic Data Branch, California Natural Diversity Database. December 2017 and August 2019.
- \_\_\_\_\_. 2017c. Biogeographic Information and Observation System (BIOS). Retrieved December, 2017 from <http://bios.dfg.ca.gov>
- \_\_\_\_\_. 2017d, 2020. Special Vascular Plants, Bryophytes, and Lichens List. Biogeographic Data Branch, California Natural Diversity Database. December 2017, January 2020.
- California Native Plant Society, Rare Plant Program. 2017. Inventory of Rare and Endangered Plants of California (online edition, v8-03 0.39). Website <http://www.rareplants.cnps.org> [accessed 27 December 2017].
- \_\_\_\_\_. 2020. Inventory of Rare and Endangered Plants of California (online edition, v8-03 0.39). Website <http://www.rareplants.cnps.org> [accessed April 2020].
- Granholm, S. 1990. Life history accounts for species in the California Wildlife Habitat Relationships (CWHR) System: Great Egret (B052) and Great Blue Heron (B051). *in* Zeiner, D.C., W.F.Laudenslayer, Jr., K.E. Mayer, and M. White, eds. 1988-1990. California's Wildlife. Vol. I-III. California Depart. of Fish and Game, Sacramento, California.
- Halstead, B.J., G.D. Wylie, and M.L. Casazza, 2010. Habitat Suitability and Conservation of the Giant Gartersnake (*Thamnophis gigas*) in the Sacramento Valley of California. *Copeia* 2010, No. 4: 591-599.
- Harris, J. 1990. Life history accounts for species in the California Wildlife Habitat Relationships (CWHR) System: Hoary Bat (M034). *in* Zeiner, D.C., W.F.Laudenslayer, Jr., K.E. Mayer, and M. White, eds. 1988-1990. California's Wildlife. Vol. I-III. California Depart. of Fish and Game, Sacramento, California.
- Hickman, J.C. (Ed.). 1993. The Jepson Manual: Higher Plants of California. University of California Press. Berkeley, California.



- Holland, D.C. 1994. The western pond turtle: habitat and history. U.S. Department of Energy, Bonneville Power Administration, Portland, Oregon. 11 chapters + appendices
- Pierson, E.O., W.E. Rainey, and C. Corben. 2006. Distribution and Status of Western Red Bats (*Lasiurus blossevillii*) in California. Calif. Dept. Fish and Game, Habitat Conservation Planning Branch, Species Conservation and Recovery Program Report 2006-04, Sacramento, CA 45 pp.
- Rainey, W. 2000. Range map for Hoary Bat (*Lasiurus cinereus*) M034. Update to Zeiner, D.C., W.F.Laudenslayer, Jr., K.E. Mayer, and M. White, eds. 1988-1990. California's Wildlife. Vol. I-III. California Depart. of Fish and Game, Sacramento, California.
- Sawyer, J. O., T. Keeler-Wolf, and J.M. Evens. 2009. A Manual of California Vegetation, Second Edition. California Native Plant Society, Sacramento, California.
- Stebbins, R. C. 2003. A Field Guide to Western Reptiles and Amphibians. 2nd ed. Houghton-Mifflin Company. Boston, Massachusetts.
- United States Department of Agricultural, Natural Resources Conservation Service (USDA NRCS). 2019. Web Soil Survey. Accessed December 21, 2017. Soil Survey Area: Sacramento County, California. Soil Survey Data: Version 16, Sep 26, 2017. <http://websoilsurvey.nrcs.usda.gov/>.
- United States Fish and Wildlife Service. 1973. The Endangered Species Act of 1973, as amended (16 U.S.C 1531 et seq.).
- \_\_\_\_\_. 1999. Draft Recovery Plan for the Giant Garter Snake. Available online at: [http://ecos.fws.gov/docs/recovery\\_plan/990702b.pdf](http://ecos.fws.gov/docs/recovery_plan/990702b.pdf).
- \_\_\_\_\_. 2000. Guidelines for Conducting and Reporting Botanical Inventories for Federally Listed, Proposed, and Candidate Plants. January 2000.
- \_\_\_\_\_. 2017b, 2020b. Critical Habitat Portal. Available at: <http://criticalhabitat.fws.gov>
- \_\_\_\_\_. 2017c, 2020c. National Wetlands Inventory. Available at: <https://www.fws.gov/wetlands/>
- \_\_\_\_\_. 2020d. Information for Planning and Consultation online project planning tool. Available at: <https://ecos.fws.gov/ipac/>.
- Vermont Fish and Wildlife Department. 2002. Guidelines for Protection and Mitigation of impacts to Great Blue Heron Rookeries in Vermont.
- Western Regional Climate Center. 2016. Climate of California. Available at: [https://wrcc.dri.edu/Climate/narrative\\_ca.php](https://wrcc.dri.edu/Climate/narrative_ca.php)
- Wylie, G. and M. Amarello. 2006. Results of 2006 Monitoring for Giant Garter Snakes (*Thamnophis gigas*) for the Bank Protection Project on the Left Bank of the Colusa Basin Drainage Canal in Reclamation District 108, Sacramento River Bank Protection Project, Phase II. Administrative Report prepared for Environmental Planning Section, U.S. Army Corps of Engineers, Sacramento District.
- Zeiner, D., W.F. Laudenslayer, Jr., and K.E. Mayer (May 1988). California's Wildlife. California Statewide Wildlife Habitat Relationship System, Volumes I, II, & III. California Department of Fish and Wildlife.



## **8 List of Preparers**

---

### **Rincon Consultants, Inc.**

#### *Primary Author*

- Samantha Kehr, Senior Biologist
- David Daitch, PhD, Principal/Senior Ecologist

#### *Technical Review*

- Carie Wingert, MS, Program Manager/Senior Biologist
- Colby J. Boggs, MS, Principal/Senior Ecologist

#### *Graphics*

- Jonathon Schuhrke, GIS Analyst

#### *Field Reconnaissance Survey*

- Max Markley, Associate Biologist
- Elizabeth Wilson, Associate Biologist



*This page intentionally left blank.*



# Appendix A

---

Regulatory Setting



# Regulatory Setting

---

Special-status habitats are vegetation types, associations, or sub-associations that support concentrations of special-status plant or wildlife species, are of relatively limited distribution, or are of particular value to wildlife.

Listed species are those taxa that are formally listed as endangered or threatened by the federal government (e.g. U.S. Fish and Wildlife Service [USFWS]), pursuant to the Federal Endangered Species Act (FESA) or as endangered, threatened, or rare (for plants only) by the State of California (i.e. California Fish and Game Commission), pursuant to the California Endangered Species Act or the California Native Plant Protection Act. Some species are considered rare (but not formally listed) by resource agencies, organizations with biological interests/expertise (e.g. Audubon Society, CNPS, The Wildlife Society), and the scientific community.

The following is a brief summary of the regulatory context under which biological resources are managed at the federal, state, and local levels. A number of federal and state statutes provide a regulatory structure that guides the protection of biological resources. Agencies with the responsibility for protection of biological resources within the project site include:

- U.S. Army Corps of Engineers (wetlands and other waters of the United States)
- Regional Water Quality Control Board (waters of the State)
- U.S. Fish and Wildlife Service (federally listed species and migratory birds)
- California Department Fish and Wildlife (riparian areas and other waters of the State, state-listed species)
- [Add local jurisdictional information, if applicable]
- Sacramento County General Plan of 2005 – 2030
- Sacramento County Tree Ordinance

## U.S. Army Corps of Engineers

Under Section 404 of the Clean Water Act, the U.S. Army Corps of Engineers (USACE) has authority to regulate activities that could discharge fill of material or otherwise adversely modify wetlands or other “waters of the United States.” Perennial and intermittent creeks are considered waters of the United States if they are hydrologically connected to other jurisdictional waters. The USACE also implements the federal policy embodied in Executive Order 11990, which is intended to result in no net loss of wetland value or acres. In achieving the goals of the Clean Water Act, the USACE seeks to avoid adverse impacts and offset unavoidable adverse impacts on existing aquatic resources. Any fill or adverse modification of wetlands that are hydrologically connected to jurisdictional waters would require a permit from the USACE prior to the start of work. Typically, when a project involves impacts to waters of the United States, the goal of no net loss of wetland acres or values is met through compensatory mitigation involving creation or enhancement of similar habitats.

## Regional Water Quality Control Board

The State Water Resources Control Board (SWRCB) and the local Central Coast Regional Water Quality Control Board (RWQCB) have jurisdiction over “waters of the State,” pursuant to the Porter-Cologne Water Quality Control Act, which are defined as any surface water or groundwater,



including saline waters, within the boundaries of the State. The SWRCB has issued general Waste Discharge Requirements (WDRs) regarding discharges to “isolated” waters of the State (Water Quality Order No. 2004-0004-DWQ, Statewide General Waste Discharge Requirements for Dredged or Fill Discharges to Waters Deemed by the U.S. Army Corps of Engineers to be Outside of Federal Jurisdiction). The Central Coast RWQCB enforces actions under this general order for isolated waters not subject to federal jurisdiction, and is also responsible for the issuance of water quality certifications pursuant to Section 401 of the Clean Water Act for waters subject to federal jurisdiction.

### **United States Fish and Wildlife Service**

The USFWS implements the Migratory Bird Treaty Act (16 United States Code [USC] Section 703-711) and the Bald and Golden Eagle Protection Act (16 USC Section 668). The USFWS and National Marine Fisheries Service (NMFS) share responsibility for implementing the Federal Endangered Species Act (FESA) (16 USC § 153 et seq.). The USFWS generally implements the FESA for terrestrial and freshwater species, while the NMFS implements the FESA for marine and anadromous species. Projects that would result in “take” of any federally listed threatened or endangered species are required to obtain permits from the USFWS or NMFS through either Section 7 (interagency consultation with a federal nexus) or Section 10 (Habitat Conservation Plan) of FESA, depending on the involvement by the federal government in permitting and/or funding of the project. The permitting process is used to determine if a project would jeopardize the continued existence of a listed species and what measures would be required to avoid jeopardizing the species. “Take” under federal definition means to harass, harm (which includes habitat modification), pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. Proposed or candidate species do not have the full protection of FESA; however, the USFWS and NMFS advise project applicants that they could be elevated to listed status at any time.

### **California Department of Fish and Wildlife**

The California Department of Fish and Wildlife (CDFW) derives its authority from the Fish and Game Code of California. The California Endangered Species Act (CESA) (Fish and Game Code Section 2050 et. seq.) prohibits take of state listed threatened, endangered or fully protected species. Take under CESA is restricted to direct mortality of a listed species and does not prohibit indirect harm by way of habitat modification. The CDFW also prohibits take for species designated as Fully Protected under the Code.

California Fish and Game Code sections 3503, 3503.5, and 3511 describe unlawful take, possession, or destruction of birds, nests, and eggs. Fully protected birds (Section 3511) may not be taken or possessed except under specific permit. Section 3503.5 of the Code protects all birds-of-prey and their eggs and nests against take, possession, or destruction of nests or eggs.

Species of Special Concern (SSC) is a category used by the CDFW for those species which are considered to be indicators of regional habitat changes or are considered to be potential future protected species. Species of Special Concern do not have any special legal status except that which may be afforded by the Fish and Game Code as noted above. The SSC category is intended by the CDFW for use as a management tool to include these species into special consideration when decisions are made concerning the development of natural lands. The CDFW also has authority to administer the Native Plant Protection Act (NPPA) (Fish and Game Code Section 1900 et seq.). The NPPA requires the CDFW to establish criteria for determining if a species, subspecies, or variety of native plant is endangered or rare. Under Section 1913(c) of the NPPA, the owner of land where a



rare or endangered native plant is growing is required to notify the department at least 10 days in advance of changing the land use to allow for salvage of plant.

Perennial and intermittent streams and associated riparian vegetation, when present, also fall under the jurisdiction of the CDFW. Section 1600 et seq. of the Fish and Game Code (Lake and Streambed Alteration Agreements) gives the CDFW regulatory authority over work within the stream zone (which could extend to the 100-year flood plain) consisting of, but not limited to, the diversion or obstruction of the natural flow or changes in the channel, bed, or bank of any river, stream or lake.

## Local Jurisdiction

### *Sacramento County General Plan of 2005 - 2030*

The Sacramento County General Plan contains policies, programs and maps that form a blueprint for physical development in the unincorporated County. The plan addresses important community issues such as new growth, housing needs and environmental protection. The General Plan was amended and adopted by the Board of Supervisors on November 9, 2011 extending the planning horizon from 2010 to 2030. State law requires that all California counties and cities adopt General Plans which include six mandatory elements (chapters): Land Use, Circulation, Housing, Conservation, Open Space, Noise and Safety. Sacramento County also has seven additional elements: Air Quality, Public Facilities, Hazardous Materials, Agricultural, Scenic Highways, Delta Protection, and the American River Parkway Plan. The Delta Protection Element contains a specific section relating the levees. Goal and objectives contained in the General Plan applicable to the proposed project include the following:

## CONSERVATION ELEMENT

**Goal:** Ensure that a safe, reliable water supply is available for existing and planned urban development and agriculture while protecting beneficial uses of Waters of the state of California, including important associated environmental resources.

**Objective:** *Manage water supply to protect valuable water-supported ecosystems.*

**Objective:** *Mitigate and restore for natural habitat and special status species loss.*

**Goal:** Preserve, enhance and restore special status species habitat in Sacramento County to aid in the recovery of these species.

**Objective:** *Protect and maintain habitat for special status species.*

**Objective:** *Manage and maintain special status species and their respective habitat in a manner that resolves conflicts with adjacent privately owned-land and agricultural operations.*

**Goal:** Preserve, protect, and manage the health and integrity of aquatic resources in Sacramento County.

**Goal:** Preserve, protect, and enhance natural open space functions of riparian, stream and river corridors.

**Objective:** *Manage riparian corridors to protect natural, recreational, economic, agricultural and cultural resources as well as water quality, supply and conveyance.*



**BALMD Levee Erosion Control and Habitat Enhancement Project**

**Objective:** *Maintain levee protection, riparian vegetation, function and topographic diversity by stream channel and bank stabilization projects. AND Stabilize riverbanks to protect levees, water conveyance and riparian functions.*

**Objective:** *Conserve and protect the Sacramento, Cosumnes, Mokelumne and American Rivers to preserve natural habitat and recreational opportunities.*

**Objective:** *Protect and restore natural stream functions.*

**Objective:** *Properly manage and fund the maintenance of rivers and streams to protect and enhance natural functions.*

**Goal:** Sacramento County vegetative habitats preserved, protected, and enhanced.

**Objective:** Heritage and landmark tree resources preserved and protected for their historic, economic, and environmental functions.

**DELTA PROTECTION ELEMENT**

**Goal:** Preserve and protect the natural resources of the Delta. Promote protection of remnants of riparian habitat and aquatic habitat. Encourage compatibility between agricultural practices and wildlife habitat.

**Goal:** Protect and enhance long-term water quality in the Delta for agriculture, municipal, industrial, water-contact recreation, and fish and wildlife habitat uses, as well as all other beneficial uses.

**Goal:** Support the improvement, emergency repair, and long-term maintenance of Delta levees and channels.

**Goal:** Promote levee rehabilitation and maintenance to preserve the land areas and channel configurations in the Delta as consistent with the objectives of the Delta Protection Act.

*Sacramento County Tree Ordinance*

A Sacramento County tree permit is required to remove or prune any public and certain private trees. Public trees are those that occur on any County owned land (parks, building grounds, etc.) and/or within right-of-way areas.

Removing or pruning trees on privately owned land also requires a tree permit in accordance with Zoning Code Regulations (Chapter 5.2.4 Landscape Standards of the Zoning Code) and the County Code (Tree Preservation Ordinance).

A Tree Permit is needed for tree removal or pruning work involving:

- **Select Landscaping Trees:** Any tree located within parking lots and/or the landscaped areas that surround commercial building and/or residential common areas in apartment complexes or homeowner's associations.
- **Native Oaks:** Native oak trees occurring on any property, including on private residential properties.
- **Public Trees:** Trees adjacent to roadways within the County right-of-way or on any County land or parkways.
- **Landmark Trees:** Certain trees that are especially prominent and stately are also considered "landmark trees".



Some tree pruning and removal can be allowed on private land as part of project development if a Building Permit or Planning Application is in review by Sacramento County Tree Coordinator staff. Removal of trees may require replacement mitigation or plantings.



*This page intentionally left blank.*



# Appendix B

---

Special Status Species Evaluation Tables



## Special Status Plant Species in the Regional Vicinity of the Project Site

Scientific Name Common Name	Status Fed/State ESA G-Rank/S-Rank CRPR	Growth Habit and Habitat Requirements	Potential for Impact	Rationale
<i>Astragalus tener</i> var. <i>ferrisiae</i> Ferris' milk-vetch	-/- G2T1/ S1 1B.1	Annual herb; blooms Apr – May. Meadows and seeps (vernally mesic), valley and foothill grassland; Subalkaline flats on overflow land in the Central Valley; usually seen in dry, adobe soil. 2-75 meters.	Not Expected	Suitable habitat absent and appropriate soils do not occur in the BSA.
<i>Astragalus tener</i> var. <i>tener</i> alkali milk-vetch	-/- G2T1/ S1 1B.2	Annual herb; blooms Mar - Jun. Alkaline playas, valley and foothill grassland (adobe clay), vernal pools. Low ground, alkali flats, and flooded lands; in annual grassland. 1-60 meters.	Not Expected	Suitable habitat absent and appropriate soils do not occur in the BSA.
<i>Atriplex cordulata</i> var. <i>cordulata</i> heartscale	-/- G3T2/ S2 1B.2	Annual herb; blooms Apr – Oct. Saline or alkaline chenopod scrub, meadows and seeps, valley and foothill grassland (sandy). Alkaline flats and scalds in the Central Valley. 0-560 meters.	Not Expected	Suitable meadow, seeps, grasslands, flats and scalds and alkaline or saline soil chemistry absent.
<i>Atriplex depressa</i> brittlescale	-/- G2/ S2 1B.2	Annual herb; blooms Apr – Oct. Alkaline clay, chenopod scrub, meadows and seeps, playas, valley and foothill grassland, vernal pools. Usually in alkali scalds or alkaline clay in meadows or annual grassland; rarely associated with riparian, marshes, or vernal pools 1-320 meters.	Not Expected	Suitable habitat absent and appropriate soils do not occur in the BSA.
<i>Atriplex persistens</i> vernal pool smallscale	-/- G2/ S2 1B.2	Annual herb; blooms Jun – Oct. Vernal pools (alkaline). 10-115 meters.	Not Expected	Suitable habitat absent.
<i>Blepharizonia plumosa</i> big tarplant	-/- G1G2/ S1S2 1B.1	Annual herb; blooms Jul – Oct. Valley and foothill grassland. Dry hills & plains in annual grassland. Clay to clay-loam soils; usually on slopes and often in burned areas. 30-505 meters.	Not Expected	Suitable grassland habitats and clay to clay loam soils are absent.



**BALMD Levee Erosion Control and Habitat Enhancement Project**

Scientific Name Common Name	Status Fed/State ESA G-Rank/S-Rank CRPR	Growth Habit and Habitat Requirements	Potential for Impact	Rationale
<i>Brasenia schreberi</i> watershield	-/- G5/ S3 2B.3	Perennial rhizomatous aquatic herb ; blooms Jun – Sep. Marshes and swamps (freshwater). Aquatic plant known from standing or slow-moving water bodies, both natural and artificial, in California. 30-2200 meters.	Not Expected	Suitable habitat absent. Marsh, swamp, and slow-moving water bodies are note present.
<i>California macrophylla</i> round-leaved filaree	-/- G4/ S4 1B.2	Annual herb; blooms Mar – May. Cismontane woodland, valley and foothill grassland in clay soils. 15-1200 meters.	Not Expected	Suitable habitat absent due to lack of appropriate soil conditions.
<i>Carex comosa</i> bristly sedge	-/- G5/ S2 2B.1	Perennial rhizomatous herb; blooms May – Sep Coastal prairie, marshes and swamps (lake margins), valley and foothill grassland. Lake margins, wet places. 0-625 meters.	Low Potential	Although habitat along the river edge is wet, the river edges within the BSA do not support marsh or swamp conditions, and slow moving pools and other habitats similar to lake margins are not present, thus this species has only a low potential to occur.
<i>Centromadia parryi</i> ssp. <i>parryi</i> pappose tarplant	-/- G3T2/ S2 1B.2	Annual herb; blooms May – Nov. Chaparral, coastal prairie, meadows and seeps, marshes and swamps including coastal salt marshes; , valley and foothill grassland; vernally mesic, often alkaline sites . 0-420 meters.	Not Expected	Suitable habitat absent, and site does not have alkaline soil chemistry.
<i>Chloropyron molle</i> ssp. <i>molle</i> soft salty bird's-beak	FE/SR G2T1/ S1 1B.2	Annual herb (hemiparasitic); blooms Jun – Nov. Coastal salt marsh, typically with <i>Distichlis</i> sp., <i>Salicornia</i> spp., <i>Frankenia</i> sp. 0-3 meters.	Not Expected	Suitable habitat absent.



Scientific Name Common Name	Status Fed/State ESA G-Rank/S-Rank CRPR	Growth Habit and Habitat Requirements	Potential for Impact	Rationale
<i>Cicuta maculata</i> var. <i>bolanderi</i> Bolander's water- hemlock	-/- G5T4/ S2? 2B.1	Perennial herb; blooms Jul – Sep. Marshes and swamps, including coastal, fresh, and brackish marshes. 0-200 meters.	Low Potential	Although habitat along the river edge is wet, the river edges within the BSA do not support marsh or swamp conditions and slow-moving shallow water, thus this species has only a low potential to occur.
<i>Cryptantha hooveri</i> Hoover's cryptantha	-/- GH/ SH 1A	Annual herb; blooms Apr – May. Inland dunes and sand hills; valley and foothill grassland on sandy soils. 9-150 meters.	Not Expected	Suitable grassland habitat absent, and dunes are not present. This species is currently not known to have any extant populations in the wild.
<i>Downingia pusilla</i> dwarf downingia	-/- GU/ S2 2B.2	Annual herb; blooms Mar – May. Mesic sites within valley and foothill grassland , vernal pools and some lake margins with a variety of associates. Occurs in several types of vernal pools 1-445 meters.	Not Expected	Suitable habitat absent – no pools or lakes are present and suitable shallow, vernal water bodies do not occur.
<i>Eriogonum nudum</i> var. <i>psychicola</i> Antioch Dunes buckwheat	-/- G5T1 / S1 1B.1	Perennial herb; blooms July – Oct. Interior dunes. Grows on the Antioch Dunes (interior dune system) with <i>Lupinus albifrons</i> , <i>Gutierrezia californica</i> , and introduced grasses and other weeds. Primary host plant for endangered Lange's metalmark butterfly. 0-20 meters.	Not Expected	This site is north of the Antioch dunes, and other dunes or sandhills are not present.
<i>Eriogonum truncatum</i> Mt. Diablo buckwheat	-/- G1/ S1 1B.1	Annual herb; blooms Apr – Sep. Sandy, chaparral, coastal scrub, valley and foothill grassland. 3-350 meters.	Not Expected	Suitable chaparral, scrub, and grassland habitats are absent, and soils are not appropriate sand textures.
<i>Erysimum capitatum</i> var. <i>angustatum</i> Contra Costa wallflower	FE/SE G5T1/ S1 1B.1	Perennial herb; blooms Mar – Jul. Inland dunes. Stabilized dunes near Antioch along the San Joaquin River. 3-20 meters.	Not Expected	This site is north of the Antioch dunes, and suitable dunes or sandhills are not present.



**BALMD Levee Erosion Control and Habitat Enhancement Project**

Scientific Name Common Name	Status Fed/State ESA G-Rank/S-Rank CRPR	Growth Habit and Habitat Requirements	Potential for Impact	Rationale
<i>Eschscholzia rhombipetala</i> diamond-petaled California poppy	-/- G1/ S1 1B.1	Annual herb; blooms Mar – Apr. Valley and foothill grassland, alkaline, clay soils, on slopes and flats. 0-975 meters.	Not Expected	Suitable grassland habitat absent, and clay soils are not present.
<i>Extriplex joaquinana</i> San Joaquin spearscale	-/- G2/ S2 1B.2	Annual herb; blooms Apr – Oct. Alkaline sites, chenopod scrub, meadows and seeps, playas, valley and foothill grassland. In seasonal alkali wetlands or alkali sink scrub with <i>Distichlis spicata</i> , <i>Frankenia</i> sp. 1-835 meters.	Not Expected	Suitable habitat is not present, and alkaline soil chemistry is not reported from the BSA.
<i>Fritillaria liliacea</i> fragrant fritillary	-/- G2/ S2 1B.2	Perennial bulbiferous herb; blooms Feb – Apr. Often on serpentinite, various soils reported though usually on clay. Cismontane woodland, coastal prairie, coastal scrub, valley and foothill grassland. 3-410 meters.	Not Expected	Suitable habitat absent, and neither serpentinite nor clay substrates occur in the BSA.
<i>Gratiola heterosepala</i> Boggs Lake hedge- hyssop	-/SE G2/ S2 1B.2	Annual herb; blooms Apr – Aug. Clay soils. Marshes and swamps, sometimes on lake margins, vernal pools. 4-2375 meters.	Not Expected	Suitable habitat absent – no lakes, vernal pools, marshes or swamps are present, and clay soils are absent from the BSA.
<i>Hibiscus lasiocarpus</i> var. <i>occidentalis</i> wooly rose-mallow	-/- G5T3/ S3 1B.2	Perennial rhizomatous herb (emergent); blooms Jun – Sep. Marshes and swamps (freshwater). Moist, freshwater-soaked riverbanks & low peat islands in sloughs; can also occur on riprap and levees. In California, known from the delta watershed. 0-155 meters.	Moderate Potential	Although marshes, swamps, and peat islands are absent, this species is sometimes reported from levees and riprap, which are present onsite. The nearest extant occurrence is an observation of a single plant on a regularly maintained levee bank in Steamboat Slough, approximately 5 miles to the north (Occurrence 27).



Scientific Name Common Name	Status Fed/State ESA G-Rank/S-Rank CRPR	Growth Habit and Habitat Requirements	Potential for Impact	Rationale
<i>Isocoma arguta</i> Carquinez goldenbush	-/- G1/ S1 1B.1	Perennial shrub; blooms Aug – Dec. Valley and foothill grassland. Alkaline soils and flats. On lower hills, low benches near drainages & on tops & sides of mounds in swale habitat. 1-20 meters.	Not Expected	Suitable habitat absent, and alkaline soils and flats are not present.
<i>Juglans hindsii</i> Northern California black walnut	-/- G1/ S1 CBR	Perennial deciduous tree; blooms Apr – May. Riparian forest, riparian woodland. Few extant native stands remain; widely naturalized. Deep alluvial soil, associated with a creek or stream. Occurrences along the lower Sacramento River are believed to be of natural origin. 0-440 meters.	Present	Black walnut was present within the oak woodland riparian community on site 1.
<i>Lasthenia conjugens</i> Contra Costa goldfields	FE/- G1/ S1 1B.1	Annual herb; blooms Mar – Jun. Valley and foothill grassland, vernal pools, alkaline playas, mesic depressions in cismontane woodland. Vernal pools, swales, low depressions, in open grassy areas. 0-470 meters.	Not Expected	Suitable habitat absent.
<i>Lathyrus jepsonii</i> var. <i>jepsonii</i> Delta tule pea	-/- G5T2/ S2 1B.2	Perennial herb; blooms May – Jul. Marshes and swamps In freshwater and brackish marshes. Often found with Typha, Aster lentus, Rosa californica, Juncus spp., Scirpus, etc. Usually on marsh and slough edges. 0-5 meters.	Low	Although habitat along the river edge is wet, the river edges within the BSA do not support marsh or swamp conditions and slow-moving shallow water, thus this species has only a low potential to occur.
<i>Legenere limosa</i> legenere	-/- G2/ S2 1B.1	Annual herb; blooms Apr – Jun. In beds of vernal pools. 1-880 meters.	Not Expected	Suitable habitat absent – no vernal pools are present in the BSA.
<i>Lepidium latipes</i> var. <i>heckardii</i> Heckard's pepper-grass	-/- G4T1/ S1 1B.2	Annual herb; blooms Mar – May. Valley and foothill grassland, alkaline flats, and sometimes vernal pool edges. Alkaline soils. 2-220 meters.	Not Expected	Suitable grassland and vernal pool habitats are absent, and soils are not alkaline.



**BALMD Levee Erosion Control and Habitat Enhancement Project**

Scientific Name Common Name	Status Fed/State ESA G-Rank/S-Rank CRPR	Growth Habit and Habitat Requirements	Potential for Impact	Rationale
<i>Lilaeopsis masonii</i> Mason's lilaeopsis	-/SR G2/ S2 1B.1	Perennial rhizomatous herb; blooms Apr – Nov. Marshes and swamps (brackish or freshwater), riparian scrub. Can occur in Tidal zones, in muddy or silty soil formed through river deposition or riverbank erosion. In brackish or freshwater. 0-10 meters.	Moderate Potential	Potentially suitable riparian habitat present, and this species is reported from the Sacramento River bank approximately 200 feet west of the BSA (Occurrence 220).
<i>Limosella australis</i> Delta mudwort	-/- G4G5/ S2 2B.1	Perennial stoloniferous herb; blooms May – Aug. Riparian scrub, marshes and swamps. Usually on mud banks of the Delta in marshy or scrubby riparian associations; often with <i>Lilaeopsis</i> <i>masonii</i> . 0-5 meters.	Moderate Potential	Potentially suitable riparian habitat present. This species is reported from the Prospector Island at Coche Slough, approximately 3.8 miles north of BSA
<i>Madia radiata</i> showy golden madia	-/- G3 / S3 1B.1	Annual herb; blooms Mar.- May. Valley and foothill grassland, cismontane woodland. Mostly on adobe clay in grassland or among shrubs. 75-1220 m.	Not Expected	While oak woodlands are present, suitable adobe clay soils are not, and the site lacks grasslands altogether.
<i>Navarretia leucocephala</i> <i>ssp. bakeri</i> Baker's navarretia	-/- G4T2/ S2 1B.1	Annual herb; blooms Apr – Jul. Mesic, cismontane woodland, lower montane coniferous forest, meadows and seeps, valley and foothill grassland, vernal pools; adobe or alkaline soils. 5-1740 meters.	Not Expected	Suitable habitats on appropriate soils are absent. The site lacks adobe and alkaline soils.
<i>Neostapfia colusana</i> Colusa grass	FT/SE G1/ S1 1B.1	Annual herb; blooms May – Aug. Vernal pools. Usually in the bottoms of large, or deep vernal pools; adobe soils. 5-200 meters.	Not Expected	Suitable vernal pool habitat absent, and the site lacks adobe soils.
<i>Oenothera deltoides</i> ssp. <i>howellii</i> Antioch Dunes evening- primrose	FE/SE G5T1/ S1 1B.1	Perennial herb; blooms Mar – Sep. Interior dunes. Remnant river bluffs and sand dunes east of Antioch. 0-30 meters.	Not Expected	Suitable habitat absent – the site lacks dunes and river bluffs with the appropriate sandy substrates. Site is north of Antioch dune system.



Scientific Name Common Name	Status Fed/State ESA G-Rank/S-Rank CRPR	Growth Habit and Habitat Requirements	Potential for Impact	Rationale
<i>Plagiobothrys hystriculus</i> bearded popcornflower	-/- G2/ S2 1B.1	Annual herb; blooms Apr – May. Vernally wet sites, often vernal swales, valley and foothill grassland (mesic), vernal pool margins. 0-274 meters.	Not Expected	Suitable vernally moist swales, pools, and grassland habitats are absent.
<i>Potamogeton zosteriformis</i> eel-grass pondweed	-/- G5/ S3 2B.2	Marshes and swamps (assorted freshwater). Ponds, lakes, slow-moving streams, delta peatlands. 0-1860 meters.	Low Potential	Although habitat along the river edge is wet, the river edges within the BSA do not support marsh or swamp conditions nor slow-moving water, thus this species has only a low potential to occur.
<i>Puccinellia simplex</i> California alkali grass	-/- G3/ S2 1B.2	Annual herb; blooms Mar – May. Alkaline, vernally mesic, sinks, flats, and lake margins, chenopod scrub, meadows and seeps, valley and foothill grassland, vernal pools. 2-930 meters.	Not Expected	Suitable habitat absent and alkaline soil chemistry is not reported from the BSA.
<i>Sagittaria sanfordii</i> Sanford's arrowhead	-/- G3/ S3 1B.2	Perennial rhizomatous herb (emergent); blooms May – Oct. Marshes and swamps (assorted shallow freshwater). In standing or slow-moving freshwater ponds, marshes, and ditches. 0-650 meters.	Low Potential	Although habitat along the river edge is wet, the river edges within the BSA do not support marsh or swamp conditions nor slow-moving water, thus this species has only a low potential to occur. This species is reported from the Sacramento River bank approximately 200 feet west of the BSA where emergent vegetation and marsh is present (Occurrence 84).



**BALMD Levee Erosion Control and Habitat Enhancement Project**

Scientific Name Common Name	Status Fed/State ESA G-Rank/S-Rank CRPR	Growth Habit and Habitat Requirements	Potential for Impact	Rationale
<i>Scutellaria galericulata</i> marsh skullcap	-/ G5/ S2 2B.2	Perennial rhizomatous herb; blooms Jun – Sep. Lower montane coniferous forest, meadows and seeps (mesic), marshes and swamps. 0-2100 meters.	Low Potential	Although habitat along the river edge is wet, the river edges within the BSA do not support marsh or swamp conditions, and mesic coniferous forest or meadow habitats are not present, thus this species has only a low potential to occur.
<i>Scutellaria lateriflora</i> side-flowering skullcap	-/ G5/ S2 2B.2	Perennial rhizomatous herb; blooms Jul – Sep. Meadows and seeps (mesic), marshes and swamps. In the Delta, often found on logs. 0-550 meters.	Low Potential	Although habitat along the river edge is wet, the river edges within the BSA do not support marsh or swamp conditions, or downed submerged logs, thus this species has only a low potential to occur.
<i>Sidalcea keckii</i> Keck's checkerbloom	FE-/ G2/ S2 1B.1	Annual herb; blooms Apr – May. Cismontane woodland, valley and foothill grassland. Grassy slopes in blue oak woodland. On serpentine-derived, clay soils, at least sometimes. 75- 650 meters.	Not Expected	Suitable habitat absent, and neither serpentine nor clay soils are present in the BSA.
<i>Symphyotrichum lentum</i> Suisun Marsh aster	-/ G2/ S2 1B.2	Perennial rhizomatous herb; blooms May – Nov. Marshes and swamps (brackish and freshwater). Most often seen along sloughs with <i>Phragmites</i> , <i>Scirpus</i> , blackberry, <i>Typha</i> , etc., occasionally reported with willow scrub, and persisting on levees with riprap. 0-3 meters.	Present	This species is reported by the CNDDB as occurring on the levee in Site 1 and Site 2 (Occurrences 182 and 174, respectively).
<i>Trifolium hydrophilum</i> saline clover	-/ G2/ S2 1B.2	Marshes and swamps; valley and foothill grassland (mesic, alkaline), vernal pools. 0-300 meters.	Not Expected	Suitable mesic grassland, vernal pool, and marsh habitats are not present, and alkaline soils are not reported from the BSA.



Scientific Name Common Name	Status Fed/State ESA G-Rank/S-Rank CRPR	Growth Habit and Habitat Requirements	Potential for Impact	Rationale
<i>Tuctoria mucronata</i> Crampton's tuctoria	FE/SE G1/ S1 1B.1	Valley and foothill grassland (mesic), vernal pools. Clay bottoms of drying vernal pools and lakes in valley grassland. 5-10 meters.	Not Expected	Suitable habitat absent and clay soils are not present in the BSA.

Regional Vicinity refers to within the Rio Vista and Isleton, California USGS 7.5-minute topographic quadrangles and the surrounding 10 quadrangles of site.

FE = Federally Endangered      FT = Federally Threatened

SE = State Endangered      ST = State Threatened      SR = State Rare

G-Rank/S-Rank = Global Rank and State Rank as per NatureServe and CDFW's CNDDDB RareFind3.

**CRPR (CNPS California Rare Plant Rank)**

1A=Presumed Extinct in California

1B=Rare, Threatened, or Endangered in California and elsewhere

2A=Plants presumed extirpated in California, but more common elsewhere

2B=Plants Rare, Threatened, or Endangered in California, but more common elsewhere

3=Need more information (a Review List)

4=Plants of Limited Distribution (a Watch List)

**CRPR Threat Code Extension**

.1=Seriously endangered in California (over 80% of occurrences threatened / high degree and immediacy of threat)

.2=Fairly endangered in California (20-80% occurrences threatened)

.3=Not very endangered in California (<20% of occurrences threatened)



## Special Status Animal Species in the Regional Vicinity of the Project Site

Scientific Name Common Name	Status Fed/State ESA G-Rank/S-Rank CDFW	Habitat Requirements	Potential for Impact	Potential for Occurrence
<b>Amphibians</b>				
<i>Ambystoma californiense</i> California tiger salamander	-/- G2G3/S2S3 SC	Vernal and seasonal pools and associated grasslands, oak savanna, woodland, and coastal scrub. Needs underground refuges (i.e., small mammal burrows, pipes) in upland areas such as grassland and scrub habitats.	Not Expected	Suitable breeding habitat is absent from project site, and the site only supports small number of small mammal burrows that could function as upland refugia. Although some suitable breeding habitat occurs on Brannan Island, there are no known occurrence within 5 miles of the project.
<b>Birds</b>				
<i>Agelaius tricolor</i> tricolored blackbird	-/CE G2G3/S1S2 SC	Requires open water, protected nesting substrate, and foraging area with insect prey within a few miles of the colony.	Not Expected	Suitable nesting habitat is absent from the project site and does not occur in proximity to the sites.
<i>Ammodramus savannarum</i> grasshopper sparrow	-/- G5/S3	Dense grasslands on rolling hills, lowland plains, in valleys and on hillsides on lower mountain slopes. Favors native grasslands with a mix of grasses, forbs and scattered shrubs. Loosely colonial when nesting.	Not Expected	Suitable grassland habitat absent.
<i>Ardea alba</i> great egret	-/- G5/S4	Freshwater and saltwater habitats. Colonial nesters, typically placing stick nests high in trees, often on islands.	Low	Marginally suitable nesting habitat is present in the riparian communities; however, no sign of nesting colonies was observed during field survey.
<i>Ardea herodias</i> great blue heron	-/- G5/S4	Freshwater and saltwater habitats, from open coasts, marshes, sloughs, riverbanks, and lakes to backyard ponds. Forage in grasslands and agricultural fields. Breeding birds gather in colonies to build stick nests high off the ground, often on islands.	Low	Marginally suitable nesting habitat is present in the riparian communities; however, no sign of nesting colonies was observed during field survey.
<i>Athene cunicularia</i> burrowing owl	-/- G4/S3 SC	Open, dry annual or perennial grasslands, deserts & scrublands characterized by low-growing vegetation. Subterranean nester, dependent upon burrowing mammals, most notably, the California ground squirrel.	Not Expected	Suitable nesting habitat is absent from the project site. Few suitable burrows were observed, and vegetation at the project site is generally too dense to provide suitable foraging for the species.



Scientific Name Common Name	Status Fed/State ESA G-Rank/S-Rank CDFW	Habitat Requirements	Potential for Impact	Potential for Occurrence
<i>Buteo swainsoni</i> Swainson's hawk	-/ST G5/S3	Requires adjacent suitable foraging areas such as grasslands, or alfalfa or grain fields supporting rodent populations. Breeds in grasslands with scattered trees, juniper-sage flats, riparian areas, savannahs, & agricultural or ranch lands.	High	The project site includes suitable nesting habitat for the species within the riparian oak woodland. The CNDDDB includes 11 records from within 5 miles of the project site, including three nesting records from 2000.
<i>Charadrius montanus</i> mountain plover	-/- G3/S2S3 SC	Short grasslands, freshly plowed fields, newly sprouting grain fields, and sometimes sod farms. Short vegetation, bare ground and flat topography. Prefers grazed areas and areas with burrowing rodents.	Not Expected	Suitable nesting habitat is absent from the project site and there are no known occurrences within 5 miles of the project.
<i>Coccyzus americanus occidentalis</i> western yellow-billed cuckoo	FT/SE G5T2T3/S1	Riparian forest nester, along the broad, lower flood-bottoms of larger river systems. Nests in riparian jungles of willow often mixed with cottonwoods, with lower story of blackberry, nettles, or wild grape.	Not Expected	The project site contains high quality riparian oak woodland and willow thicket that provide suitable nesting and foraging habitat for the species; however, the project is outside the known current range for the species.
<i>Elanus leucurus</i> white-tailed kite	-/- G5/S3S4 FP	Occurs throughout most of California's coastal and valley regions excluding the Cascade, Sierra Nevada, Mojave Desert, and Peninsular Ranges. Grasslands, dry farmed agricultural fields, savannahs and relatively open oak woodlands, and other relatively open lowland scrublands.	Moderate	Suitable nesting habitat is present within the riparian vegetation on the project site, and the species is known to occur in the vicinity of the project.
<i>Falco peregrinus anatum</i> American peregrine falcon	-/- G4T4/S3S4 FP	Near wetlands, lakes, rivers, or other water; on cliffs, banks, dunes, mounds; also, man-made structures. Nest consists of a scrape or a depression or ledge in an open site.	Not Expected	The project site does not provide suitable nesting or foraging habitat for this species.
<i>Geothlypis trichas sinuosa</i> saltmarsh common yellowthroat	-/- G5T3/S3 SC	Resident of the San Francisco Bay region, in fresh and saltwater marshes. Requires thick, continuous cover down to the water surface for foraging. Requires tall grasses, tule patches and willows for nesting.	Not Expected	Suitable saltmarsh nesting habitat is absent from the site.



**BALMD Levee Erosion Control and Habitat Enhancement Project**

Scientific Name Common Name	Status Fed/State ESA G-Rank/S-Rank CDFW	Habitat Requirements	Potential for Impact	Potential for Occurrence
<i>Laterallus jamaicensis coturniculus</i> California black rail	-/ST G3G4T1/S1 FP	Inhabits freshwater marshes, wet meadows and shallow margins of saltwater marshes bordering larger bays. Needs water depths of about one inch that does not fluctuate during the year and dense vegetation for nesting habitat.	Not Expected	Suitable marsh nesting habitat is absent from the project site.
<i>Melospiza melodia</i> song sparrow ("Modesto" population)	-/- G5/S3? SC	Resident of the central lower basin of the Central Valley, from Colusa south to Stanislaus County and east of Suisun Marshes. Occurs in freshwater marshes and riparian thickets.	High	The project site includes suitable nesting and foraging habitat in the riparian vegetation communities, and the species was observed foraging on site during the field survey.
<i>Melospiza melodia maxillaris</i> Suisun song sparrow	-/- G5T3/S3 SC	Resident of brackish-water marshes surrounding Suisun Bay. Inhabits cattails, tules and other sedges, and Salicornia; also known to frequent tangles bordering sloughs.	Not Expected	Suitable nesting and foraging habitat is absent from the BSA.
<i>Phalacrocorax auritus</i> double-crested cormorant	-/- G5/S4	Freshwater and saltwater resident. Breed on the coast as well as on large inland lakes. They form colonies of stick nests built high in the trees, often on islands.	Not Expected	Suitable nesting and foraging habitat absent from the BSA.
<i>Riparia</i> bank swallow	-/ST G5/S2	Colonial nester. Nests primarily in riparian and other lowland habitats west of the desert. Requires vertical banks/cliffs with finetextured/ sandy soils near streams, rivers, lakes, ocean to dig nesting holes.	Not Expected	Suitable nesting and foraging habitat are absent from the BSA.
<b>Invertebrates</b>				
<i>Andrena blennospermatis</i> Blennosperma vernal pool andrenid bee	-/- G2/S2	Oligolectic on vernal pool flowers, especially Blennosperma.	Not Expected	Suitable habitat is absent within the BSA.
<i>Anthicus antiochensis</i> Antioch Dunes anthicid beetle	-/- G1/S1	Inhabits interior sand dunes and sand bars along Sacramento River dunes	Not Expected	No suitable dune habitat is present within the BSA or adjacent areas.
<i>Anthicus sacramento</i> Sacramento anthicid beetle	-/- G1/S1	Inhabits sand dunes or other loose, sandy deposits in the Sacramento Delta area and Sacramento Valley.	Not Expected	Suitable dune habitat is not present on the project site



Scientific Name Common Name	Status Fed/State ESA G-Rank/S-Rank CDFW	Habitat Requirements	Potential for Impact	Potential for Occurrence
<i>Apodemia mormo langei</i> Lange's metalmark butterfly	FE/- G5T1/S1	Inhabits stabilized dunes along the San Joaquin River. Endemic to Antioch Dunes, Contra Costa County. Primary host plant is <i>Eriogonum nudum</i> var <i>auriculatum</i> ; feeds on nectar of other wildflowers, as well as host plant.	Not Expected	Suitable habitat absent.
<i>Bombus crotchii</i> Crotch bumble bee	-/CE G3G4/S1S2	Inhabits California open grasslands, scrubland habitats, and adjacent foothills.	Not Expected	Suitable habitat absent.
<i>Bombus occidentalis</i> western bumble bee	-/CE G2G3/S1	Inhabits open meadows and prairies with a diversity of flowers.	Not Expected	Suitable habitat absent.
<i>Branchinecta conservation</i> Conservancy fairy shrimp	FE/- G2/S2	Endemic to the grasslands of the northern two-thirds of the Central Valley; found in large, turbid pools. Endemic to the grasslands of the northern two-thirds of the Central Valley; found in large, turbid pools. Inhabit astatic pools located in swales formed by old, braided alluvium; filled by winter/spring rains, last until June.	Not Expected	Suitable habitat absent.
<i>Branchinecta lynchi</i> vernal pool fairy shrimp	FT/- G3/S3	Endemic to the grasslands of the Central Valley, Central Coast Mountains, and South Coast Mountains. Inhabits, small clear-water sandstone depression pools and grassed swale, earth slump, or basalt flow depression pools.	Not Expected	Suitable habitat absent.
<i>Branchinecta mesovallensis</i> midvalley fairy shrimp	-/- G2/S2S3	Endemic to shallow ephemeral pools, vernal pools, vernal swales, and various artificial ephemeral wetland habitats in the Central Valley	Not Expected	Suitable habitat absent.
<i>Coelus gracilis</i> San Joaquin dune beetle	-/- G1/S1	Inhabits inland sand dunes along western edge of the San Joaquin Valley	Not Expected	Suitable habitat absent.
<i>Desmocerus californicus dimorphus</i> valley elderberry longhorn beetle	FT/- G3T2/S2	Occurs only in the Central Valley of California, in association with blue elderberry ( <i>Sambucus mexicana</i> ). Prefers to lay eggs in elderberries 2-8 inches in diameter; some preference shown for "stressed" elderberries.	Not Expected	Suitable habitat absent.



**BALMD Levee Erosion Control and Habitat Enhancement Project**

Scientific Name Common Name	Status Fed/State ESA G-Rank/S-Rank CDFW	Habitat Requirements	Potential for Impact	Potential for Occurrence
<i>Efferia antiochi</i> Antioch efferian robberfly	-/- G1G2/S1S2	Known only from the sand dunes at Antioch and San Joaquin Valley.	Not Expected	Suitable habitat absent.
<i>Elaphrus viridis</i> Delta green ground beetle	FT/- G1/S1	Inhabits the margins of vernal playas and pools with well- defined shorelines. Known only from Jepson Prairie in Solano County.	Not Expected	Suitable vernal pools and playa habitat is absent from the project site.
<i>Eucerceris ruficeps</i> redheaded sphecid wasp	-/- G1G3/S1S2	Central California interior dunes. Nest in hard-packed sand utilizing abandoned halictine bee burrows.	Not Expected	Suitable habitat absent.
<i>Hydrochara rickseckeri</i> Ricksecker's water scavenger beetle	-/- G2?/S2?	Inhabits seasonally ponded wetlands in the San Francisco Bay Area.	Not Expected	Suitable habitat absent.
<i>Hygrotus curvipes</i> curved-foot hygrotus diving beetle	-/- G1/S1	Inhabits alkali vernal pools and other seasonal wetlands or slow-moving streams with pools and fringed with alkali vegetation between the Outer Coast Range and Sacramento Delta.	Not Expected	Suitable habitat absent.
<i>Idiostatus middlekauffi</i> Middlekauff's shieldback katydid	-/- G1G2/S1	Known only from the sand dunes at Antioch and San Joaquin Valley.	Not Expected	Suitable habitat absent.
<i>Lepidurus packardi</i> Vernal pool tadpole shrimp	FE/- G4/S3S4	Inhabits vernal pools and swales in the Sacramento Valley containing clear to highly turbid water. Pools commonly found in grass bottomed swales of unplowed grasslands. Some pools are mud-bottomed & highly turbid.	Not Expected	Suitable habitat absent.
<i>Linderiella occidentalis</i> California linderiella	-/- G2G3/S2S3	Seasonal pools in unplowed grasslands with old alluvial soils underlain by hardpan or in sandstone depressions.	Not Expected	Suitable habitat absent.
<i>Metapogon hurdi</i> Hurd's metapogon robberfly	-/- G1G2/S1S2	Known only from the sand dunes at Antioch and San Joaquin Valley.	Not Expected	Suitable habitat absent.
<i>Myrmosula pacifica</i> Antioch multilid wasp	-/- GH/SH	Known only from the sand dunes at Antioch and San Joaquin Valley.	Not Expected	Suitable habitat absent.



Scientific Name Common Name	Status Fed/State ESA G-Rank/S-Rank CDFW	Habitat Requirements	Potential for Impact	Potential for Occurrence
<i>Perdita scitula</i> <i>antiochensis</i> Antioch andrenid bee	-/- G1T1/S1	Inhabits sand dunes or other loose, sandy deposits with late summer and fall-flowering endemics, such as <i>Gutierrezia</i> , <i>Senecio</i> , and <i>Eriogonum</i> .	Not Expected	Suitable habitat absent.
<i>Philanthus nasalis</i> Antioch specid wasp	-/- G1/S1	Occurs within the boundaries of Antioch Dunes.	Not Expected	Suitable habitat absent.
<i>Sphecodogastra</i> <i>antiochensis</i> Antioch Dunes halictid bee	-/- G1/S1	Restricted to Antioch Dunes. Host plant is <i>Oenothera deltoides howellii</i> . This bee nests in the ground in stabilized sand dunes in open, xeric areas.	Not Expected	Suitable habitat absent.
<b>Mammals</b>				
<i>Lasiurus</i> <i>bloussevillii</i> western red bat	-/- G5/S3 SC	Roosts primarily in trees, less often in shrubs. Roost sites often are in edge habitats adjacent to streams, fields, or urban areas. Preferred roost sites are protected from above, open below, and located above dark ground-cover.	Moderate	The project site supports suitable roosting habitat in the riparian areas. There is a 1999 CNDDDB record from approximately 1.5 miles south of the project site.
<i>Lasiurus cinereus</i> hoary bat	-/- G5/S4	Generally, roosts in dense foliage of medium to large trees. Preferred sites are hidden from above, with few branches below, and have ground cover of low reflectivity. Habitats suitable for bearing young include all woodlands and forests with medium to large-size trees and dense foliage	Moderate	The project site supports suitable roosting habitat in the riparian areas. There is a 1999 CNDDDB record from approximately 1.5 miles south of the project site.
<i>Reithrodontomys</i> <i>raviventris</i> salt-marsh harvest mouse	FE/SE G1G2/S1S2 FP	Only in the saline emergent wetlands of San Francisco bay and its tributaries. Pickleweed is primary habitat. Does not burrow, but builds loosely organized nests. Requires higher areas for flood escape.	Not Expected	Suitable marsh habitat is absent from the project site.
<i>Sylvilagus</i> <i>bachmani</i> <i>riparius</i> riparian brush rabbit	FE/SE G5T1/S1	Inhabits dense, brush areas of Valley riparian forests. Found only along the Stanislaus River in Caswell Memorial State Park, San Joaquin County.	Not Expected	Although suitable riparian habitat is present, the project site is outside of the specie's known current distribution...



**BALMD Levee Erosion Control and Habitat Enhancement Project**

Scientific Name Common Name	Status Fed/State ESA G-Rank/S-Rank CDFW	Habitat Requirements	Potential for Impact	Potential for Occurrence
<i>Taxidea taxus</i> American badger	-/- G5/S3 SC	Most abundant in drier open stages of most shrub, forest, and herbaceous habitats with friable soils. Needs sufficient food, friable soils, and open uncultivated ground. Cannot live in frequently plowed fields. Preys on burrowing rodents.	Not Expected	The project site provide only marginal habitat for the species, and no suitable burrows were observed during field survey.
<b>Reptiles</b>				
<i>Anniella pulchra</i> northern California legless lizard	-/- G3/S3 SC	Sandy or loose loamy soils under sparse vegetation such as coastal dune scrub, pineoak woodlands, desert scrub, sandy washes, and stream terraces with sycamores, cottonwoods, or oaks. Leaf litter under trees and bushes in sunny areas and dunes stabilized with bush lupine and mock heather often indicate suitable habitat.	Moderate	The project site supports suitable riparian oak woodland to support the species.
<i>Arizona elegans occidentalis</i> California glossy snake	-/- G5T2/S2 SC	Inhabits arid scrub, rocky washes, grasslands, chaparral. Generally, prefers open areas with soft or loamy soil.	Not Expected	Suitable arid and open habitat is absent from the project site.
<i>Emys marmorata</i> western pond turtle	-/- G3G4/S3 SC	Rivers, ponds, freshwater marshes; nests in upland areas (sandy banks or grassy open fields) up to 1,640 feet from water.	Not Expected	The Sacramento River in this area is generally too fast moving to support this species. The project site does not support natural sandy banks or open grassy areas.
<i>Thamnophis gigas</i> giant gartersnake	FT/ST G2/S2	Prefers freshwater marsh and low gradient streams. Has adapted to drainage canals & irrigation ditches. This is the most aquatic of the garter snakes in California.	Not Expected	The Sacramento River is too fast moving to support this species. The project site does not contain any suitable marshy habitat. The species may occur in canals on Brannan Island, but is not expected within the project site.
Regional Vicinity refers to within the Rio Vista and Isleton, California USGS 7.5-minute topographic quadrangles and the surrounding 10 quadrangles of site.				
FT = Federally Threatened      SE = State Endangered				
FC = Federal Candidate Species      ST = State Threatened				
FE = Federally Endangered      SR = State Rare				
FS = Federally Sensitive      SS = State Sensitive				
G-Rank/S-Rank = Global Rank and State Rank as per NatureServe and CDFW's CNDDDB RareFind3				
SC = CDFW Species of Special Concern				
FP = Fully Protected				



# Appendix C

---

Floral and Faunal Compendium



**Plant and Animal Species Observed Within the Study Area on December 1, 2017**

Scientific Name	Common Name	Status	Native or Introduced <sup>1</sup>
<b>Plants</b>			
<b>Trees</b>			
<i>Acer macrophyllum</i>	big leaf maple	None	Native
<i>Acer negundo</i>	boxelder	None	Native
<i>Alnus rhombifolia</i>	white alder	None	Native
<i>Ficus carica</i>	edible fig	None	Introduced: Cal-IPC moderate
<i>Fraxinus latifolia</i>	Oregon ash	None	Native
<i>Juglans hindsii</i>	black walnut	None	Native
<i>Platanus racemosa</i>	western sycamore	None	Native
<i>Quercus agrifolia</i>	coast live oak	None	Native
<i>Quercus lobata</i>	valley oak	None	Native
<i>Quercus wislizeni</i>	interior live oak	None	Native
<i>Robinia pseudoacacia</i>	black locust	None	Introduced: Cal-IPC limited
<i>Salix gooddingii</i>	Black willow	None	Native
<b>Shrubs</b>			
<i>Ailanthus altissima</i>	tree of heaven	None	Introduced: Cal-IPC moderate
<i>Baccharis pilularis</i>	coyote bush	None	Native
<i>Rosa californica</i>	California rose	None	Native
<i>Rubus</i> sp.	blackberry	None	Undetermined
<i>Salix exigua</i>	narrow leaf willow	None	Native
<i>Salix lasiandra</i>	pacific willow	None	Native
<i>Salix lasiolepis</i>	arroyo willow	None	Native
<i>Senecio flaccidus</i>	groundsel	None	Native
<i>Toxicodendron diversilobum</i>	poison oak	None	Native
<b>Herbs</b>			
<i>Artemisia douglasiana</i>	California mugwort	None	Native
<i>Brassica nigra</i>	black mustard	None	Introduced: Cal-IPC moderate
<i>Cicuta maculata</i>	water hemlock	None	Native
<i>Cirsium vulgare</i>	bull thistle	None	Introduced: Cal-IPC moderate
<i>Cynara cardunculus</i>	artichoke thistle	None	Introduced: Cal-IPC moderate
<i>Equisetum hyemale</i>	scouringrush horsetail	None	Native
<i>Raphanus raphanistrum</i>	wild raddish	None	Introduced
<i>Vitis californica</i>	California wild grape	None	Native
<b>Grasses</b>			
<i>Arundo donax</i>	giant reed	None	Introduced: Cal-IPC high
<i>Avena</i> sp.	wild oat	None	NA
<i>Bromus</i> sp.	brome	None	NA
<i>Cortaderia selloana</i>	pampas grass	None	Introduced: Cal-IPC high
<i>Cynodon dactylon</i>	Bermuda grass	None	Introduced: Cal-IPC high



**BALMD Levee Erosion Control and Habitat Enhancement Project**

Scientific Name	Common Name	Status	Native or Introduced <sup>1</sup>
<b>Wildlife</b>			
<i>Aphelocoma californica</i>	California scrub jay	None	Native
<i>Buteo jamaicensis</i>	red-tailed hawk	None	Native
<i>Cathartes aura</i>	turkey vulture	None	Native
<i>Corvus corax</i>	raven	None	Native
<i>Larus californicus</i>	California gull	None	Native
<i>Otospermophilus beecheyi</i>	California ground squirrel	None	Native
<i>Thomomys</i> sp.	pocket gopher	None	Native
<i>Zenaida macroura</i>	mourning dove	None	Native

<sup>1</sup>Cal-IPC rankings are from the California Invasive Plant Council (Cal-IPC) Online Inventory



# Appendix D

---

Site Photographs





**Photograph 1.** December 1, 2017, Stairs and pathway to developed dock at Site 3; facing west.



**Photograph 2.** December 1, 2017, Rip rap at Site 3; facing northwest.





**Photograph 3.** December 1, 2017, Developed encampment at Site 3; facing north.



**Photograph 4.** December 1, 2017, Coast live oak woodland at Site 2; facing east.





**Photograph 5.** December 1, 2017, Concrete lined riverbank at Site 2; facing northwest.



**Photograph 6.** December 1, 2017, Concrete lined riverbank at Site 2; facing east.





**Photograph 7.** December 1, 2017, Rip rap at Site 2; facing east.



**Photograph 8.** December 1, 2017, Rip rap at Site 2; facing east.





**Photograph 9.** December 1, 2017, Coast live oak woodland at Site 2; facing west.



**Photograph 10.** December 1, 2017, Rip rap and coast live oak woodland at Site 2; facing northeast.





**Photograph 11.** December 1, 2017, Black locust grove at west end of Site 2; facing northeast.



**Photograph 12.** December 1, 2017, Coast live oak woodland at Site 1; facing west.





**Photograph 13.** December 1, 2017, Black willow thicket at Site 1; facing west.



**Photograph 14.** December 1, 2017, Black willow thicket at Site 1; facing east.





**Photograph 15.** December 1, 2017, Giant reed at Site 1; facing west.



**Photograph 16.** December 1, 2017, Coast live oak woodland at Site 1; facing west.





**Photograph 17.** April 1, 2020, Ruderal habitat at staging area 1, facing south east.



**Photograph 18.** April 1, 2020, Ruderal habitat in the foreground and developed areas in the background at staging area 2, facing south east.





**Photograph 19.** April 1, 2020, Ruderal developed areas on the south side of staging area 2, facing east.



**Photograph 20.** April 1, 2020, a developed parking lot on the west side of staging area 3, facing north.





**Photograph 21.** April 1, 2020, ruderal habitat between the parking lot at staging area 3 and River Road, facing south.



**Photograph 22.** April 1, 2020, ruderal habitat on the left and developed paved area on the right at staging area 4, facing south.





**Photograph 23.** April 1, 2020, the developed paved area on the south end of staging area 4, facing south.



# Appendix E

---

Project Plans



## Appendix D

### Cultural Resources Technical Report





# BALMD Levee Erosion Control and Habitat Enhancement Project

## Phase I Cultural Resources Study

*prepared for*

**Robertson-Bryan, Inc.**

9888 Kent Street

Elk Grove, California 95624

*prepared by*

**Rincon Consultants, Inc.**

4825 J Street, Suite 100

Sacramento, CA 95819

**June 2020**



Please cite this report as follows:

Haas, Hannah and Benjamin Vargas

2020. Phase I Cultural Resources Study for the BALMD Levee Erosion Control and Habitat Enhancement Project. Rincon Project No. 17-04347. On file with the North Central Information Center, Sacramento State University, California.



# Table of Contents

---

Executive Summary .....	i
Unanticipated Discovery of Cultural Resources .....	ii
Unanticipated Discovery of Human Remains .....	ii
1 Introduction .....	1
1.1 Project Location .....	1
1.2 Project Description.....	1
1.3 Area of Potential Effects .....	5
1.4 Regulatory Setting.....	5
1.4.1 Federal .....	5
1.4.2 State .....	6
1.5 Personnel .....	7
2 Natural and Cultural Setting .....	8
2.1 Natural Setting .....	8
2.2.1 Prehistoric Setting.....	8
2.2.2 Ethnographic Setting.....	10
2.2.3 Historic Setting.....	11
3 Background Research .....	13
3.2 California Historical Resource Information System .....	13
3.2.1 Previous Studies .....	13
Table 1. Previous Cultural Resource Studies within a 0.5-Mile Radius of the APE.....	13
3.2.2 Previously Recorded Resources .....	18
Table 2. Previously Recorded Resources within a 0.5-Mile Radius of the APE .....	19
1.1.2 Shipwreck Inventory .....	21
3.3 Native American Scoping .....	22
3.4 Local Historical Group Consultation.....	22
4 Fieldwork .....	23
4.1 Pedestrian Survey Methods.....	23
4.2 Results.....	23
4.2.1 P-34-002109.....	26
4.2.2 P-34-002143.....	27
1.1.3 P-34-005225.....	29
5 Significance Evaluations.....	30



**BALMD Levee Erosion Control and Habitat Enhancement Project**

5.1	Assessment of Integrity.....	30
5.2	P-34-002109.....	30
5.3	P-34-002143.....	31
	P-34-005225.....	31
6	Management Recommendations .....	32
6.1	Unanticipated Discovery of Cultural Resources.....	33
6.2	Unanticipated Discovery of Human Remains .....	33
7	References .....	34

## Figures

Figure 1	APE (part 1) including project site and staging areas .....	3
Figure 2	APE (part 2) including project site and staging areas .....	4
Figure 3	Staging Area at Airport Road in Rio Vista - Inaccessible .....	<b>Error! Bookmark not defined.</b>
Figure 4	Staging Area at Intersection of Highway 12 and River Road .....	24
Figure 5	Staging Area – “Cliff House Fishing Access” Parking Lot.....	24
Figure 6	Staging Area – Second Eastern-Most on River Road, Southern Half .....	25
Figure 7	Staging Area – Second Most-Eastern on River Road, Northern Half .....	25
Figure 8	Staging Area – Eastern-most on River Road .....	26
Figure 9.	View of P-34-002143 from across State Route 160, facing north. ....	<b>Error! Bookmark not defined.</b>
Figure 10.	View of levee and river from bank at eastern end of APE, facing west. ....	<b>Error! Bookmark not defined.</b>
Figure 11.	View of levee and river from western end of APE, facing east. ....	<b>Error! Bookmark not defined.</b>

## Tables

Table 1.	Previous Cultural Resource Studies within a 0.5-Mile Radius of the APE.....	13
Table 2.	Previously Recorded Resources within a 0.5-Mile Radius of the APE .....	19

## Appendices

Appendix A	Records Search Summary
Appendix B	Native American Outreach
Appendix C	Resource Record Updates

---



# Executive Summary

---

Rincon Consultants, Inc. (Rincon) was retained by Robertson-Bryan, Inc., to conduct a Phase I cultural resources study for the Brannan-Andrus Levee Maintenance District (BALMD) Levee Erosion Control and Habitat Enhancement Project near the City of Isleton in Sacramento County. The project consists of erosion control and habitat enhancement at three sites totaling 1.2 miles in length. This cultural resources study includes a cultural resources records search, a Sacred Lands File Search and Native American outreach, a pedestrian survey of the project area and five staging areas, and the preparation of this technical report according to the Archaeological Resources Management Report (ARMR) guidelines. The project must comply with the California Environmental Quality Act (CEQA). Additionally, the project requires Section 404 and Section 408 permits from the United States Army Corps of Engineers (USACE) and therefore must comply with Section 106 of the National Historic Preservation Act (NHPA). Rincon understands that the Brannan-Andrus Levee Maintenance District is the lead agency under CEQA and that the U.S. Army Corps of Engineers is the federal lead agency.

The cultural resource records search and survey identified three previously recorded cultural resources within the project APE P-34-002109, P-34-002143, and P-34-005225. Resource P-34-002109 is recommended ineligible for listing in the CRHR and NRHP. P-34-002109 consists of a historic-era water pump that provides irrigation water through the levee to the adjacent agricultural fields. The pump is not considered a significant cultural resource; thus, the pump requires no further management consideration.

P-34-002143 consists of the Isleton levee, which has been continuously maintained and upgraded since its original construction and thus does not retain integrity. However, the levee remains eligible for the California Register of Historic Resources (CRHR) under Criterion 1 and the National Register of Historic Places (NRHP) under Criterion A for its association with significant events, represented by its alignment and location, which have remained unchanged since its original construction. The current project involves replacement of eroded soils from the levee and adding planting benches by placing terrabags and riprap to the surface of the levee; therefore, the alignment, location, and purpose of the levee would not be altered by the current project. The levee has been continuously maintained and repaired since its original construction and the current proposed project will allow the levee to maintain its original and intended purpose. Thus, the current project would not impact/affect the significance of the resource. No further management is recommended for the levee.

The levee at this location was first constructed in ca. 1870 from peat from a borrow-ditch adjacent to the levee. The original levee was smaller than it is today at 4 feet high, 15 feet between the toes, and 8 feet across the crown (Thompson 2006). The levee was added to every year from 1873-1878. Most of the levee around the island was broken in winter of 1877-1878, and restored in 1878 with soils from outside the levee system. The levee was breached again in February of 1878 and at that point was restored using clamshell dredges taking silt/mining debris that had washed down the river and settled on the channel floor. When the highway was constructed, the levee was raised another two feet and has been continuously maintained, upgraded, and added to as soils have settled and eroded. Soils used to repair the levee since that time have primarily included accumulated silt and clay dredged from the river and from riprap taken from quarries established for that purpose. The levee is currently roughly 25 feet high, 50 feet wide at the base, and 25 feet wide at the crown



(Melvin and Jones 2008). Although the majority of project-related ground disturbance will occur on relatively recent dredging spoils, riprap, and fluvial soils deposited recently in areas that would have been underwater prior to the construction of the levee system, we consider the likelihood of encountering archaeological resources or human remains to be low.

Rincon recommends a finding of ***no adverse effect to historic properties*** under Section 106 of NHPA. Because the project would not cause a substantial adverse change in the significance of the levee or the cultural landscape, Rincon recommends a finding of ***less than significant impact to historical resources*** under CEQA. The archaeological sensitivity of the APE has been identified as low; however, there is always a possibility of encountering unanticipated archaeological resources during ground disturbing activities. Thus, mitigation is recommended in the case of unanticipated cultural resource discoveries. With the incorporation of this measure, impacts to archaeological resources would be ***less than significant with mitigation incorporated*** under CEQA. This recommendation regarding unanticipated archaeological resources does not change the recommended finding of no adverse effect to historic properties under Section 106 of the NHPA.

## Unanticipated Discovery of Cultural Resources

If any prehistoric or historic artifacts, or other indications of archaeological resources such as unusual deposits of stone, bone or shell, stone artifacts, or historic trash deposits or foundations are discovered once ground-disturbing activities are underway, the find(s) shall be immediately evaluated by a qualified archaeologist. If the discovery proves to be NRHP and/or CRHR-eligible, additional work may be warranted, such as data recovery excavation, Native American consultation, and archaeological monitoring to mitigate any adverse effects under the NHPA and/or significant impacts under CEQA. Work may continue on other parts of the APE while historical or unique archaeological resource mitigation takes place on-site.

## Unanticipated Discovery of Human Remains

The discovery of human remains is always a possibility during ground disturbing activities. If human remains are found, the State of California Health and Safety Code Section 7050.5 states that no further disturbance shall occur until the county coroner has made a determination of origin and disposition pursuant to Public Resources Code Section 5097.98. In the event of an unanticipated discovery of human remains, the county coroner must be notified immediately. If the human remains are determined to be prehistoric, the coroner will notify the Native American Heritage Commission (NAHC), which will determine and notify a most likely descendant (MLD). The MLD shall complete the inspection of the site within 48 hours of being granted access and may recommend scientific removal and nondestructive analysis of human remains and items associated with Native American burials.

---



# 1 Introduction

---

Rincon Consultants, Inc. (Rincon) was retained by Robertson-Bryan, Inc., to conduct a Phase I cultural resources study for the Brannan-Andrus Levee Maintenance District (BALMD) Levee Erosion Control and Habitat Enhancement Project (Project) near the City of Isleton in Sacramento County. The project consists of erosion control and habitat enhancement at three sites totaling 1.2 miles in length. This cultural resources study includes a cultural resources records search, a Sacred Lands File Search and Native American outreach, a pedestrian survey, and the preparation of this technical report according to the Archaeological Resources Management Report (ARMR) guidelines. The project must comply with the requirements of the California Environmental Quality Act (CEQA). Additionally, the project requires Section 404 and Section 408 permits from the United States Army Corps of Engineers (USACE) and therefore must comply with Section 106 of the National Historic Preservation Act (NHPA). Rincon understands that the Brannan-Andrus Levee Maintenance District is the lead agency under CEQA and that the USACE is the federal lead agency.

## 1.1 Project Location

The project is subject to Section 106 of the NHPA and is therefore considered an undertaking. The Area of Potential Effect (APE) for an undertaking is defined in 36 Code of Federal Regulations (CFR) 800.16(d) as the “geographic area or areas within which a project may directly or indirectly cause alterations in the character or use of historic properties, if any such property exists.” The project is located on the southern bank of the Sacramento River, on Brannan Island, in Sacramento County, California. The APE consists of three erosion control and habitat enhancement sites that are cumulatively approximately 1.2 miles in length (7,473 linear feet): Station 292+00 to 321+00, RM 15.18L to 14.60L, approximately 2,900 linear feet (LF); Station 197+00 to 230+00, RM 17.00L to 16.36L, approximately 3,300 LF; and Station 179+00 to 189+00, RM 17.34L to 17.13L, approximately 1,000 LF (Figure 1 and Figure 2). Four temporary staging areas along River Road in and near Isleton, California (Figure 1 and Figure 2) will be used during construction.

## 1.2 Project Description

The project is located in Sacramento County, in the primary zone of the Sacramento-San Joaquin Delta (Figure 1). Specifically, the project is located on the left bank of the Sacramento River, on Brannan Island. The sites extend over approximately 1.2 NM of bank, beginning downstream near the confluence of Steamboat Slough, Cache Slough, and the Sacramento River and extending upstream to the City of Isleton (Figure 2).

The project includes three separate erosion control sites:

- Site 1 – Station 292+00 to 321+00, RM 15.18L to 14.60L, approximately 2,900 linear feet (LF)
- Site 2 – Station 197+00 to 230+00, RM 17.00L to 16.36L, approximately 3,300 LF.
- Site 3 – Station 179+00 to 189+00, RM 17.34L to 17.13L, approximately 1,000 LF.

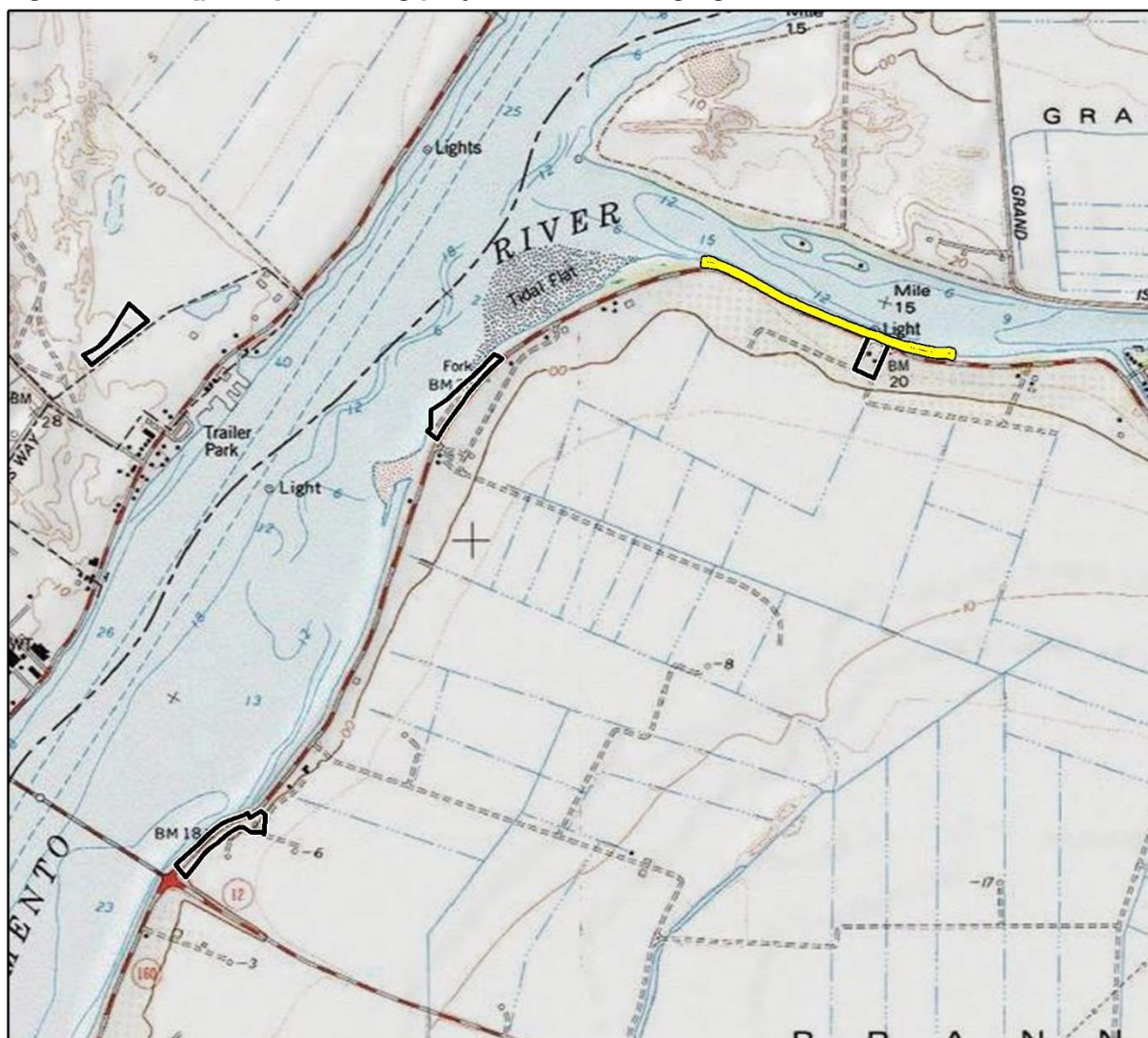


Proposed construction would occur on approximately 1.2 NM of waterside levee and channel margin located on the left bank of the Sacramento River, adjacent to Brannan Island. The Project Area includes the Sacramento River channel, including and between the three erosion control sites, and immediately upstream and downstream of the construction boundaries, where water quality could be impacted.

The Project Area also includes material source, storage, and staging areas (Figure 2). Quarried rock material would be sourced and transported to the project site via rock barge from San Rafael. Clean soil for filling the 'Terrabags' would be obtained on Decker Island and transported by barge to a staging area in Rio Vista, which is the closest location to Decker Island that is accessible by road. A small conveyor will be used to load the transported dirt onto a dump truck. Soil would then be transported by dump truck from the Rio Vista staging area to a Terrabag filling staging area. Mixing of rock and soil, for the 50:50 and 70:30 soil/rock mixes, would also occur on Decker Island, and the mixes would be transported via derrick barge to the project site. Multiple locations may be used for staging construction materials i.e. the Terrabags and container plants, including: an oversized crown area currently under the responsibility of BALMD property near the intersection of River Road (Highway 160) and Highway 12, on the north side of Highway 12; the public parking lot of the Cliff House Fishing Access area near RM 14, a vacant lot on the south side of River Road near RM 14.6, and/or a vacant lot on the south side of River Road near RM 17. Additionally, a boat launch on the west end of Ida Island would be used for launching the work boat that would be used to transport container plants to the erosion repair sites and for other tasks around the project site, as needed.



**Figure 1 APE (part 1) including project site and staging areas**



Imagery provided by National Geographic Society, Esri and its licensors  
© 2020. Rio Vista Quadrangle. T04N R03E S19-21,29. The topographic  
representation depicted in this map may not portray all of the features  
currently found in the vicinity today and/or features depicted in this map  
may have changed since the original topographic map was assembled.

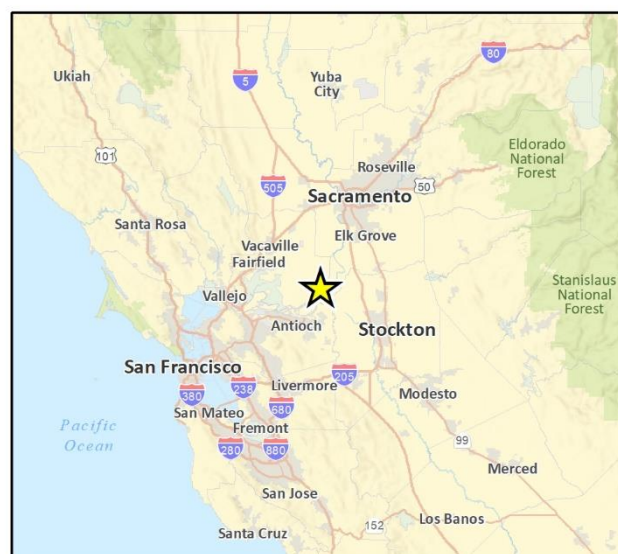
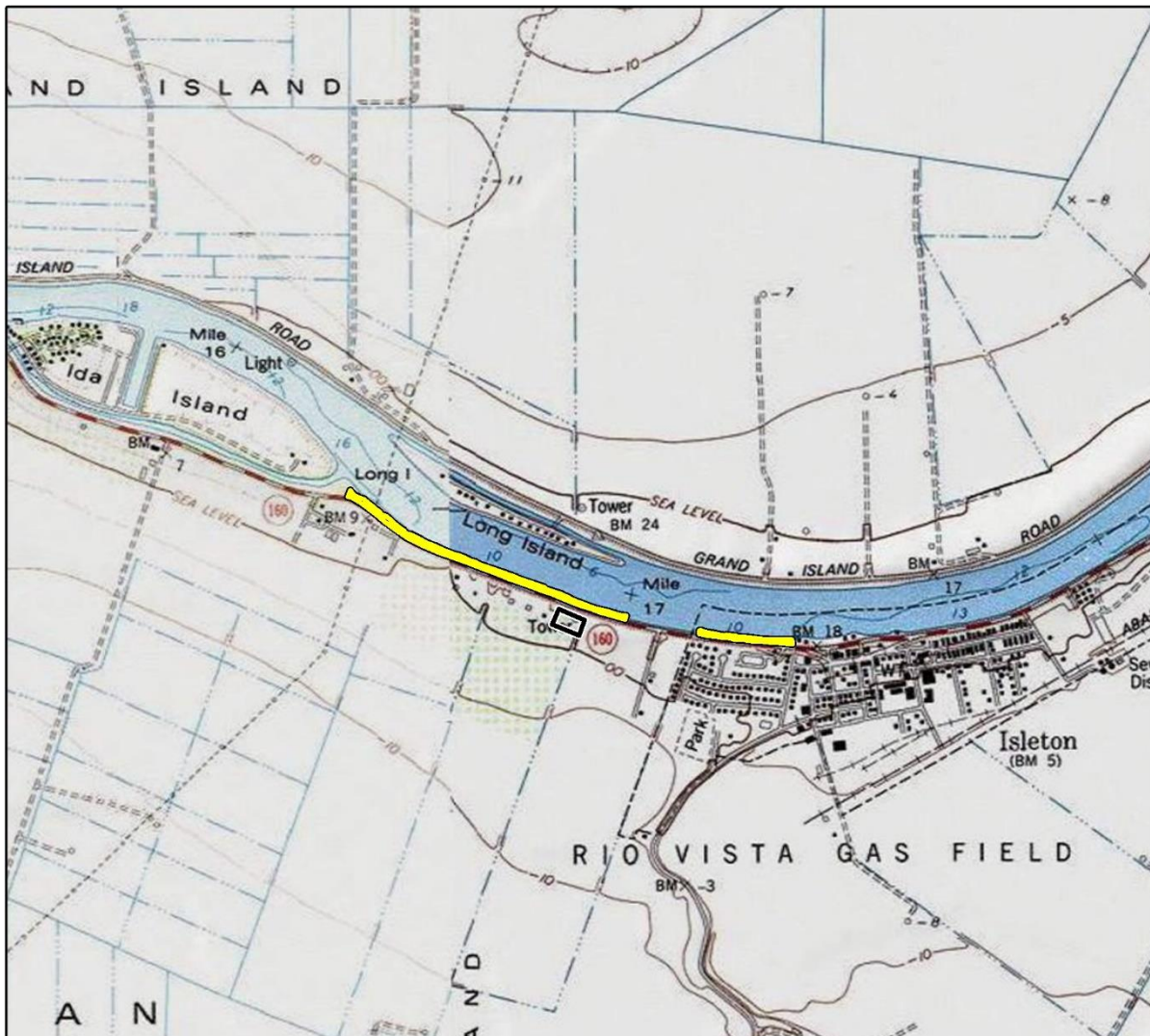




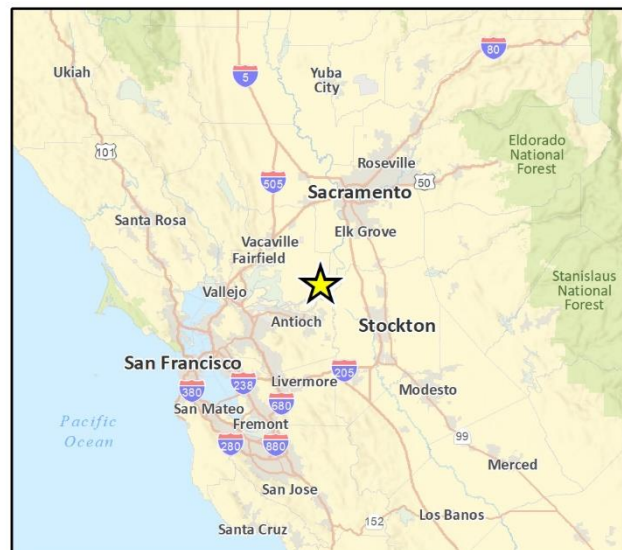
Figure 2 APE (part 2) including project site and staging areas



Imagery provided by National Geographic Society, Esri and its licensors  
© 2020. Rio Vista & Isleton Quadrangle. T04N R03E S26,27. The  
topographic representation depicted in this map may not portray all of the  
features currently found in the vicinity today and/or features depicted in  
this map may have changed since the original topographic map was  
assembled.

 Project Site  
 Staging Area

0 1,000 2,000 Feet



CRFig 1 Proj Location Map



## 1.3 Area of Potential Effects

36 Code of Federal Regulations (CFR) 800.16(d) defines the APE of a project as the “geographic area or areas within which a project may directly or indirectly cause changes in the character or use of historic properties if any such property exists.” The APE includes all areas expected to be affected by the proposed undertaking, including staging and construction areas. The direct APE footprint for the project includes the 1.2-mile levee alignment and five staging area options. Because the project involves habitat restoration and repair of an existing levee, Rincon assumes that no indirect APE is required as the project will not alter the existing setting of the APE. The APE is depicted in Figure 1 and Figure 2.

## 1.4 Regulatory Setting

### 1.4.1 Federal

Cultural resources are considered during federal undertakings chiefly under Section 106 of the NHPA of 1966 (as amended) through one of its implementing regulations, 36 CFR 800 (Protection of Historic Properties), and the National Environmental Policy Act. Properties of traditional religious and cultural importance to Native Americans are considered under Section 101(d)(6)(A) of NHPA. Other federal laws include the Archaeological and Historic Preservation Act of 1974, the American Indian Religious Freedom Act of 1978, the Archaeological Resources Protection Act of 1979, and the Native American Graves Protection and Repatriation Act of 1989, among others.

Section 106 of the NHPA (16 United States Code 470f) requires federal agencies to take into account the effects of their undertakings on any district, site, building, structure, or object included in or eligible for inclusion in the NRHP, and to afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on such undertakings (36 CFR 800.1). Under Section 106, the significance of any adversely affected cultural resource is assessed and mitigation measures are proposed to reduce any impacts to an acceptable level. Significant cultural resources are those resources listed in or are eligible for listing in the NRHP per the criteria listed below (36 CFR 60.4).

According to Section 106, the quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and meet one or more of the following criteria:

- A. Are associated with events that have made a significant contribution to the broad patterns of our history
- B. Are associated with the lives of persons significant in our past
- C. Embody the distinctive characteristics of a type, period, or method of installation, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction
- D. Have yielded, or may be likely to yield, information important in prehistory or history



## 1.4.2 State

### 1.1.1.1 The California Environmental Quality Act

CEQA requires a lead agency to determine whether a project may have a significant effect on historical resources (Public Resources Code [PRC], Section 21084.1) and tribal cultural resources (PRC Section 21074 [a][1][A]-[B]). A historical resource is a resource listed in, or determined to be eligible for listing, in the California Register of Historical Resources (CRHR), a resource included in a local register of historical resources or any object, building, structure, site, area, place, record, or manuscript that a lead agency determines to be historically significant (State CEQA Guidelines, Section 15064.5[a][1-3]).

A resource shall be considered historically significant 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 persons 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 creative individual, or possesses high artistic values; or
- 4) Has yielded, or may be likely to yield, information important in prehistory or history.

In addition, if it can be demonstrated that a project will cause damage to a unique archaeological resource, the lead agency may require reasonable efforts to permit any or all of these resources to be preserved in place or left in an undisturbed state. To the extent that resources cannot be left undisturbed, mitigation measures are required (PRC, Section 21083.2[a], [b], and [c]).

PRC, Section 21083.2(g) defines a unique archaeological resource as an archaeological artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it:

- 1) Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information;
- 2) Has a special and particular quality such as being the oldest of its type or the best available example of its type; or
- 3) Is directly associated with a scientifically recognized important prehistoric or historic event or person.

### 1.1.1.2 Assembly Bill (AB) 52

As of July 1, 2015, California Assembly Bill 52 of 2014 (AB 52) was enacted and expands CEQA by defining a new resource category, "tribal cultural resources." Assembly Bill 52 establishes that "A project with an effect that may cause a substantial adverse change in the significance of a tribal cultural resource is a project that may have a significant effect on the environment" (PRC Section 21084.2). It further states that the lead agency shall establish measures to avoid impacts that would alter the significant characteristics of a tribal cultural resource, when feasible (PRC Section 21084.3). PRC Section 21074 (a)(1)(A) and (B) defines tribal cultural resources as "sites, features, places, cultural landscapes, sacred places, and objects with cultural value to a California Native American tribe" and is:

- a) Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code Section 5020.1(k), or



- b) A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resource Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.

AB 52 also establishes a formal consultation process for California tribes regarding those resources. The consultation process must be completed before a CEQA document can be certified. AB 52 requires that lead agencies “begin consultation with a California Native American tribe that is traditionally and culturally affiliated with the geographic area of the proposed project.” Native American tribes to be included in the process are those that have requested notice of projects proposed within the jurisdiction of the lead agency.

## 1.5 Personnel

Rincon Cultural Resources Principal Investigator Hannah Haas, M.A., Registered Professional Archaeologist (RPA), served as principal investigator for the study and co-authored this report. Ms. Haas meets the Secretary of the Interior’s Professional Qualifications Standards for prehistoric and historic archaeology (NPS 1983). Ms. Haas conducted the cultural resources records search, Native American outreach, pedestrian field survey of the project site, and is the primary author of this report. Rincon archaeologist Elaine Foster, B.A. conducted the pedestrian field survey of the staging areas and serves as a coauthor of this report. GIS Analysts Allysen Valencia prepared the figures found in this report. Rincon Principal and Archaeologist Christopher Duran, MA, RPA, reviewed this report for quality control.



## 2 Natural and Cultural Setting

---

### 2.1 Natural Setting

The APE is located along the Sacramento River in Sacramento County, situated at an average elevation of 2 meters (m) (7 feet [ft]) above mean sea level (AMSL). Native plants within the APE would have included willow, cottonwood, tule, and sycamore as well as various species of oak that would have provided acorns to prehistoric populations (Wallace 1978). Today, the area consists primarily of agricultural fields.

### 2.2 Cultural Setting

#### 2.2.1 Prehistoric Setting

California prehistory is generally divided into three broad time periods: Paleoindian period (ca. 11,550-8,550 B.C.), Archaic Period (8,550 B.C.-A.D. 1100) and Emergent Occupation (A.D. 1000-European Contact) (Fredrickson 1973, 1974; Moratto 1984; Rosenthal et al. 2007). The prehistoric chronological sequence for the Central Valley presented below is based on Rosenthal et al. (2007) and Moratto (1984).

##### 2.2.1.1 Paleoindian Period (11,550-8550 B.C.)

Little is known about the Paleoindian period in the Central Valley. Geoarchaeological studies have demonstrated that erosion and deposition have buried or destroyed early archaeological deposits. Most claims of ancient human occupation have been dismissed by Moratto (1984) based on radiocarbon dating. Currently, the earliest accepted date of human occupation in the Central Valley ranges from 11,550 to 9,550 B.C. and comes from fluted projectile points similar to Clovis points found at sites near Tracy Lake and the Tulare Lake Basin (Rosenthal et al. 2007). The only known Paleoindian site in the Sacramento Valley is a single possible fluted point from near Thomes Creek (Rosenthal et al. 2007).

##### 2.2.1.2 Lower Archaic (8,550-5,550 B.C.)

Climate change at the end of the Pleistocene caused significant periods of alluvial deposition beginning around 9,050 B.C. The Lower Archaic, like the Paleoindian Period, is represented only by limited isolated finds. One isolated flaked stone crescent was identified on an ancient alluvial fan west of Orland in the Sacramento Valley (Rosenthal et al. 2007). No other Lower Archaic sites have been identified within the Sacramento Valley.

Typical Lower Archaic artifacts include flaked stone crescents and stemmed points. The identification of projectile points and a diverse faunal assemblage at KER-116, (the only Lower Archaic site identified in the Central Valley to date), point to hunting being an important subsistence activity (Rosenthal et al. 2007). Milling tools and plant remains are largely absent in the valley, thus plant use during the Lower Archaic remains unclear. Several foothill sites contain milling implements and evidence of the use of nut crops such as acorn and pine (Lajeunesse and Pryor 1996). The relationship between foothill and valley floor adaptations is largely unknown during the Lower Archaic. However, distinct adaptations are apparent in the Middle Archaic, and it is possible that these divergent traditions first emerged in the Lower Archaic (Rosenthal et al. 2007).



### 2.2.1.3 Middle Archaic (5,550-550 B.C.)

The Middle Archaic began with substantial climate change to much warmer, drier conditions. Fans and floodplains stabilized after an initial period of deposition in 5,550 B.C. Archaeological deposits dating to the Middle Archaic are rare in the Central Valley proper due to these geomorphic changes. In the Sacramento Valley, one site with an early Middle Archaic component has been identified but has not been excavated (Rosenthal et al. 2007). The late Middle Archaic, however, is relatively well-represented in the Sacramento Valley and Delta. Late Middle Archaic sites point to diverse adaptations and the emergence of organized subsistence practices and residential stability along river corridors by 6,000 years ago. The typical pattern of the Middle Archaic has been identified as the Windmill Pattern, first identified on old levee ridges adjacent to freshwater marshes near the confluence of the Mokelumne and Cosumnes rivers. This pattern is represented by extended burials oriented to the west and a sophisticated material culture (Rosenthal et al. 2007). Middle Archaic sites are relatively common in the foothills surrounding the Central Valley and show relatively little change from the Lower Archaic (McGuire 1995).

During this time, the mortar and pestle become more widespread suggesting a shift toward more intensive subsistence practices. Fishing technologies, such as bone gorges, hooks, and spears, also appear during the Middle Archaic suggesting a new focus on fishing. Several other technologies become apparent during this time, particularly in the northern San Joaquin and southern Sacramento Valleys (Rosenthal et al. 2007). Baked-clay impressions of twined basketry, simple pottery, and other baked clay objects have been found at several sites. Personal adornment items also became more frequent. Exchange with outside groups is evidenced by the presence of obsidian, shell beads and ornaments (Rosenthal et al. 2007; Moratto 1984). Trade also seemed to be focused on utilitarian items such as obsidian or finished obsidian tools from at least five separate sources (Moratto 1984).

### 2.2.1.4 Upper Archaic (550 B.C. – A.D. 1100)

The Upper Archaic began with the onset of the Late Holocene, marked by a cooler, wetter climate. The Upper Archaic is better represented in the archaeological record than earlier periods. Cultural diversity was more pronounced and is marked by contrasting material cultures throughout the valley (Rosenthal et al. 2007).

During this period, numerous specialized technologies were developed such as bone tools and implements, manufactured goods such as *Olivella* and *Haliotis* beads and ornaments, well-made ceremonial blades, and ground-stone plummets. Beginning after circa 2,700 years ago, lower Sacramento Valley settlements shifted to a pattern of large, mounded villages, now identified as the Berkeley Pattern. Berkeley Pattern sites in the Delta region typically contain large amounts of habitation debris and features suggestive of long-term occupation (Rosenthal et al. 2007).

Upper Archaic period economies varied by region throughout the Central Valley. Economies were primarily focused on seasonal resources such as acorns, salmon, shellfish, rabbits, and deer (Rosenthal et al. 2007). In the Sacramento Valley, sites exhibit heavy use of mortars and pestles and a reliance on acorns.

### 2.2.1.5 Emergent Occupation (A.D. 1100- Historic)

The stable climatic conditions of the Upper Archaic continued into the Emergent Period. In the Delta Region, this period is associated with the Augustine Pattern (Rosenthal et al. 2007). After A.D. 1000, many of the technologies identified during the Archaic disappeared to be replaced by cultural



traditions recorded at European contact. The bow and arrow replaced the atlatl as the preferred hunting method sometime between A.D. 1000 and 1300.

Increased social complexity is evidenced by increased variation in burial types and offerings and larger residential communities. Grave offerings such as shell beads, ornaments, and ritually “killed” mortars and pestles are often found in association with burials. In the Sacramento Valley and Delta regions, diverse and sophisticated fishing technology is often recovered from Emergent Period sites, including various types of harpoons, fish hooks, gorges, and netting (Rosenthal et al. 2007). Pottery was produced at several sites in the lower Sacramento Valley, known as Cosumnes brownware. Baked clay human and animal effigies have also been identified at several sites in the region during this time.

As with the Archaic Period, Emergent Period economies varied geographically, though throughout the Central Valley fishing and plant harvesting increased in importance. Most Emergent residential sites contain diverse faunal assemblages containing mammal and bird remains and large amounts of fish bone. After ca. 1,000 years ago, the mortar and pestle become the dominant tool type and small seeds increase in archaeological deposits over time (Rosenthal et al. 2007).

### 2.2.2 Ethnographic Setting

The APE is located in the traditional tribal territory of the Plains Miwok, members of the larger Miwokan subgroup of the Utian language family inhabiting an area along the lower reaches of the Mokelumne and Cosumnes rivers and both banks of the Sacramento River roughly from Rio Vista north to Freeport (Levy 1977). Plains Miwok subsistence practices centered on the use of acorns and of seeds as primary plant food sources and on hunting of mule deer, tule elk, pronghorn antelope, and various species of waterfowl. Hunting was typically done with a sinew-backed bow and arrow. Fishing was a particularly important activity for the Plains Miwok, primarily with various types of nets. Seines were used in large rivers and sloughs where the pace of water flow was slow. Hook and line was typically used to take sturgeon, while harpoons were the most common implement for salmon fishing (Levy 1977).

The Plains Miwok made both twined and coiled basketry, usually from will and redbud. They also manufactured tule mats used as floor covering. Woven blankets were often made of rabbit skin strips or feathers attached to cordage woven from plant fibers. Tule balsa rafts were crafted and used to navigate rivers and sloughs (Levy 1977).

Plains Miwok settlements typically included thatched, conical houses and semisubterranean earth-covered dwellings in winter, constructed by higher-status families. Houses generally had a central hearth and an earth oven for cooking purposes. Large, semisubterranean assembly houses were constructed for use as a ritual and social gathering place. In summer, a circular brush hut was constructed for use in mourning ceremonies. Other structures included sweathouses for curing disease and purification prior to hunting, small conical structures used by menstruating women, and grinding houses built over bedrock mortars to permit food processing in inclement weather. Acorn granaries were constructed for long-term acorn storage (Levy 1977).

Political organization centered on small tribelets of approximately 300 to 500 people and several distinct settlements. Each tribelet was headed by a chief, and each settlement had a representative of the chief overseeing local affairs. Chiefs acted as advisors and managed use of natural resources by preventing trespassing on tribelet territory and determining the appropriate time to begin acorn harvest each season. The chief also arbitrated any disputes and sanctioned the punishment of criminal offenders.



Miwok social organization followed the moiety pattern, with all living things belonging to one of two categories: land and water. Moieties were typically exogamous and played an important role in many ceremonies (Levy 1977).

### 2.2.3 Historic Setting

The post-Contact history of California is generally divided into three periods: the Spanish period (1769–1822), the Mexican period (1822–1848), and the American period (1848–present). Each of these periods is briefly described below.

#### 2.2.3.1 Spanish Period (1769–1822)

In 1542, Juan Rodriguez Cabrillo led the first European expedition to observe what is now called southern California. For more than 200 years, Cabrillo and other Spanish, Portuguese, British, and Russian explorers sailed the Alta (upper) California coast and made limited inland expeditions, but they did not establish permanent settlements (Bean 1968; Rolle 2003).

Gaspar de Portolá and Franciscan Father Junipero Serra established the first Spanish settlement in Alta California at Mission San Diego de Alcalá in 1769. This was the first of 21 missions erected by the Spanish between 1769 and 1823. Portolá continued north, eventually reaching the San Francisco Bay in 1769. In 1772, Pedro Fages led the first Europeans to enter the San Joaquin Valley (Wallace 1978; Johnson et al. 1993). Fages led a small expedition into the southernmost part of the valley, stopping at a village on the shores of Buena Vista Lake, before heading towards San Luis Obispo (Wallace 1978). The next European to enter the valley was Francisco Garcés in 1776 (Wallace 1978). In the early 1800s, numerous expeditions were made into the Central Valley to search for land for new missions or to recapture runaway neophytes (Hoover et al. 2002). However, the Spanish never succeeded in taking control of the region and no missions were established in the Central Valley.

During this period, Spain also deeded ranchos to prominent citizens and soldiers, though very few in comparison to the subsequent Mexican Period. To manage and expand their herds of cattle on these large ranchos, colonists enlisted the labor of the surrounding Native American population (Engelhardt 1927). Very few of the Central Valley tribes came under the control of the Spanish missions or ranchos. However, numerous runaway neophytes fled to the Central Valley, influencing local populations (Wallace 1978). The increased local population and contact with diseases brought by Europeans greatly reduced the Native American population (McCawley 1996).

#### 2.2.3.2 Mexican Period (1822–1848)

The Mexican Period commenced when news of the success of the Mexican Revolution (1810-1821) against the Spanish crown reached California in 1822. This period was an era of extensive interior land grant development and exploration by American fur trappers west of the Sierra Nevada Mountains. Beginning in 1833, mission lands were conferred as rancho grants. Governor Pío Pico and his predecessors made more than 600 rancho grants between 1833 and 1846, putting most of the state's lands into private ownership for the first time (Gumprecht 1999). A few ranchos were established in the Sacramento Valley, including Rancho Los Ulpinos just across the Sacramento River from the western terminus of the APE (Kyle 2002). The most successful rancho in the Delta region was owned by John Marsh and located at the foot of Mount Diablo (Bean and Rawls 1983).

The Mexican Period also saw the initial settlement of what was to become the City of Sacramento, with the arrival of John Sutter in 1839 (Bean and Rawls 1983). Sutter established New Helvetia, which was to become a focal point of American settlement in the coming years.



### 2.2.3.3 American Period (1848–Present)

The American Period officially began with the signing of the Treaty of Guadalupe Hidalgo in 1848, in which the United States agreed to pay Mexico \$15 million for the conquered territory, including California, Nevada, Utah, and parts of Colorado, Arizona, New Mexico, and Wyoming. Settlement of southern California increased dramatically in the early American Period.

The discovery of gold in northern California in 1848 led to the California Gold Rush, though the first California gold was previously discovered in Placerita Canyon near the San Fernando Mission in 1842 (Guinn 1915; Workman 1935:26). Later, in 1848, James Marshall discovered gold while overseeing the construction of Sutter's Mill at Coloma. The discovery of gold led to an explosion in population and to the eventual establishment of the State of California. In 1850, California was admitted into the United States and by 1853, the population of California exceeded 300,000. Thousands of settlers and immigrants continued to move into the state, particularly after the completion of the transcontinental railroad in 1869.

The city of Sacramento was laid out by Sutter's son, John Sutter, Jr., in 1848 and by January the first cabins had been built. By October, the settlement had reached a resident population of roughly 2,000 and the settlement was incorporated in the following year. In 1854, Sacramento was established as the capitol of California (Kyle 2002). Sacramento served as a major center of commerce and as a supply distribution center during the Gold Rush. By 1869, the Central Pacific Railroad was constructed in Sacramento and communication between the City and the rest of the country was opened with the introduction of the Pony Express and the advent of the telegraph (County of Sacramento 2017). By the end of World War I, the Sacramento area became a major aviation center with an airfield and pilot training school and aviation has remained an important component of the area's economy. The County today has a diverse economy, with the federal and state governments serving as a major employer.

### 2.2.3.4 Local History

The community of Isleton was established in 1874 by Josiah Pool and John Brocas (Gudde 1998). In 1875, large numbers of Chinese and Japanese immigrants settled much of Isleton, drawn by the numerous agricultural jobs in the Delta (City of Isleton 2017; Isleton Brannan Andrus Historical Society 2017). Today, the Isleton Chinese District and Japanese District are each listed on the National Register of Historic Places (NRHP). Isleton was a thriving commerce center in the early 20th century due to its location on the Sacramento River. Construction of the levees brought additional settlers drawn by the employment opportunity associated with levee construction. Numerous steamboats navigated the Sacramento River between San Francisco and Sacramento via Steamboat Slough, passing near Isleton. The replacement of steamboats by automobiles as a primary means of transportation led to the decline of the city. Today, Isleton is made up of roughly 850 residents and is known for its fishing and boating opportunities.



## 3 Background Research

### 3.2 California Historical Resource Information System

Rincon archaeologist Hannah Haas conducted a search of cultural resource records housed at the California Historical Resources Information System (CHRIS), North Central Information Center (NCIC) at Sacramento State University on November 28, 2017. In 2020, the project description and APE were modified and an updated search was conducted by NCIC staff on April 21, 2020. The revised APE extends outside the area covered by NCIC, thus on April 20, 2020, the Northwest Information Center (NWIC) located at Sonoma State University, conducted a search of their records in relation to the project site. The searches were conducted to identify all previous cultural resources work and previously recorded cultural resources within a 0.5-mile radius of the APE. The CHRIS search included a review of the National Register of Historic Places (NRHP), the California Register of Historical Resources (CRHR), the California Points of Historical Interest list, the California Historical Landmarks list, the Archaeological Determinations of Eligibility list, the California State Lands Commission Shipwreck Database, and the California State Historic Resources Inventory list. The records search also included a review of all available historic USGS 7.5-, 15-, and 30-minute quadrangle maps.

#### 3.2.1 Previous Studies

The cultural resources records search identified a total of 32 previous studies within the search radius, nine of which included portions of the APE (S-000149, S-007140, S-001784, S-005055, S-008661, S-009174, S-009176, S-009326, and S-009988; Table 1).

**Table 1. Previous Cultural Resource Studies within a 0.5-Mile Radius of the APE**

Report Number	Author	Year	Title	Relationship to APE
S-000052	Seldomridge, J. and C. Smith-Madsen	1976	<i>Cultural Resources Reconnaissance: Sacramento River Deep Water Ship Channel (Collinsville to Sacramento)</i>	Outside
S-000074	Peak & Associates, Inc.	1983	<i>Cultural Resources Assessment of the Proposed Extension of Sixth Street in Isleton, Sacramento County, CA</i>	Outside
S-000095	R.F. King	1974	<i>A Report on the Status of Generally Available Data Regarding Archaeological, Ethnographic, and Historical Resources within a Five-Mile-Wide Corridor Through Portions of Colusa, Yolo, Solano, and Contra Costa Counties, California</i>	Outside
S-000149	Johnson, J. J.	1974	<i>Reconnaissance Archaeological Survey of 151 Locations on the Sacramento River Drainage from Elder Creek in the North and Rio Vista in the South</i>	<b>Within</b>



Robertson-Bryan, Inc.

**BALMD Levee Erosion Control and Habitat Enhancement Project**

Report Number	Author	Year	Title	Relationship to APE
S-000315	Weaver, R.	1987	<i>Cultural Resources Survey, Sacramento River Bank Protection Unit 41, Sacramento, Solano, and Yolo Counties, California</i>	Outside
S-000848	Fredrickson, D.	1977	<i>A Summary of Knowledge of the Central and Northern California Coastal Zone and Offshore Areas, Vol. III, Socioeconomic Conditions, Chapter 7: Historical &amp; Archaeological Resources</i>	Outside
S-001740	Shapiro, W. and K. Syda	1997	<i>An Addendum Archaeological Assessment within the BALMD, Sacramento County, California. Part of the Cultural Resources Inventory and Evaluation for the U.S. Army C.O.E., Sac. District, PL 84-99, Levee Rehabilitation</i>	<b>Within</b>
S-001784	Shapiro, W. and K. Syda	1997	<i>An Archaeological Assessment within the Brannan Andrus Levee Main Dist., Sacramento County, California. Part of the Cultural Resources Inventory and Evaluation for the U.S. Army Corps of Engineers, Sacramento District, PL 84-99 Levee Rehab</i>	<b>Within</b>
S-002537	Peak, M.	2000	<i>Letter Report for: Sprint PCS Site No. SF33XC283-D, Oxbow Marina</i>	Outside
S-004168	Derr, E. H.	1997	<i>Cultural Resources Report: Isleton City Hall, Sacramento County, California</i>	Outside
S-004169	Jensen, P. M.	2002	<i>Addendum to the City of Isleton Sewer Replacement Project, Archaeological Inventory Survey, City of Isleton, Sacramento County, California</i>	Outside
S-004172	Boyer, B. L.	1990	<i>Records Search to Determine the Presence of Archaeological and/or Historical Sites in the Area of Isleton, Sacramento County, California</i>	Outside
S-005208	Greenway, G. and Soule, W.	1977	<i>Sacramento-San Joaquin Delta Investigations: Cultural Resources Reconnaissance</i>	Outside
S-005055	Seldomridge, J. and Smith-Madsen, C.	1976	<i>Cultural Resources Reconnaissance: Sacramento River Deep Water Ship Channel (Collinsville to Sacramento)</i>	<b>Within</b>
S-006454	U.S. Department of Homeland Security and FEMA	2004	<i>Sacramento County Flood Hazard Mitigation, Sacramento County Department of Water Resources</i>	Outside
S-006556	PAR Environmental	2005	<i>Archaeological Survey of Craven Ranch</i>	Outside



**BALMD Levee Erosion Control and Habitat Enhancement Project**

Report Number	Author	Year	Title	Relationship to APE
S-007083	PAR Environmental	2005	<i>A Cultural Resource Investigation of the East Waterfront Neighborhood Tentative Map Area, Isleton, Sacramento County, California</i>	Outside
S-007137	Larkin, R.	2005	<i>Cultural Resource Survey Proposed 14-Acre Residential Development Isleton, CA</i>	Outside
S-007875	Deitz, F.	1999	<i>Cultural Resources Assessment within Reclamation District 3, Sacramento County, California (Sac 25)</i>	Outside
S-008198	King, E.	2006	<i>Cultural Resources Survey of Approximately 60 Acres for Levee Maintenance Activities on Brannan Island, Sacramento County, California</i>	<b>Adjacent</b>
S-008661	Bell, D.	2006	<i>Archaeological Survey of Fourteen Sites along the Sacramento River and Steamboat Slough for the 2006 Sacramento River Bank Protection Project – Sacramento, Yolo, Solano, and Sutter Counties, California</i>	<b>Within</b>
S-009173	Littlefield, R.	1979	<i>Archaeological Evaluation of a Proposed Curve Elimination on State Route 160 (P.M. 2.5/2.8)</i>	Outside
S-009174	Waugh, G.	1989	<i>Negative Archaeological Survey Report 10-Sac-160 P.M. 7.4/10.3</i>	<b>Within</b>
S-009176	Hibbard, C. and Page, S.	1993	<i>Negative Archaeological Survey Report 10-Sac-160, P.M. L7.2/L 10.3)</i>	<b>Within</b>
S-009182	Hale, M., Nilsson, E., and Kelly, M.	1993	<i>Cultural Resources Survey Sacramento River Systems Evaluation Phase IV, Sacramento and Solano Counties, California (Contract No. DACWO5-92-P-1771)</i>	Outside
S-009326	Leach-Palm, L., Larson, B., Brandy, P., King, J., Harman, L., and Mikkelsen, P.	2008	<i>Cultural Resources Inventory of Caltrans District 3 Rural Conventional Highways in Butte, Colusa, El Dorado, Glenn, Nevada, Placer, Sacramento, Sierra, Sutter, Yolo, and Yuba Counties</i>	<b>Within</b>
S-009462	Miller, T.	1977	<i>Identification and Recording of Prehistoric Petroglyphs in Marin and Related Bay Area Counties</i>	Outside
S-009795	Jackson, T.	1986	<i>Late Prehistoric Obsidian Exchange in Central California</i>	Outside



Robertson-Bryan, Inc.

**BALMD Levee Erosion Control and Habitat Enhancement Project**

Report Number	Author	Year	Title	Relationship to APE
S-009988	Martinez, A., Arrington, C. and Sikes, N.	2008	<i>Cultural Resources Survey for the Levee Repair Project at 16 Locations in Glenn, Sacramento, Solano, Sutter, Yolo, and Yuba Counties, California</i>	<b>Within</b>
S-010427	Truman, E.	2009	<i>AJJ &amp; M Marks Survey Area</i>	Outside
S-012160	Maniery, M.	1991	<i>National Register of Historic Places Significance Evaluation of Walnut Grove Branch Line Railroad, Sacramento County, California</i>	Outside
S-012166	Werner, R.	1998	<i>A Cultural Resources Investigation of the Proposed Isleton Sewer Improvements Project, (State Revolving Fund No. C-06-4566-110) City of Isleton, Sacramento County, California</i>	Outside
S-012394	ICF International	2012	<i>Historic Properties Treatment Plan Sacramento River Band Protection Project</i>	Outside
S-012790	Owens, K.	1991	<i>Sacramento-San Joaquin Delta, California: Historical Resources Overview</i>	Outside
S-015793	Holman, M.	1992	<i>Archaeological Archival Research and Field Inspection of the Proposed Rio Vista Marina Study Area, Rio Vista, Solano County, California (letter report)</i>	Outside
S-017835	Suchey, J.	1975	<i>Biological Distance of Prehistoric Central California Populations Derived from Non-Metric Traits of the Cranium</i>	Outside
S-027048	Sterling, D. and Holson, J.	2003	<i>Archaeological Survey and Literature Review for the Calpine Natural Gas Company, City of Rio Vista Gas Gathering System, Solano County, California</i>	<b>Adjacent to staging area</b>
S-030204	Gillette, D.	2003	<i>The Distribution and Antiquity of the California Pecked Curvilinear Nucleated (PCN) Rock Art Tradition</i>	Outside
S-030907	McMorris, C.	2004	<i>Caltrans Historic Bridge Inventory Update: Metal Truss, Moveable, and Steel Arch Bridges, Contract: 43A0086, Task Order: 01, EA: 43-984433, Volume I: Report and Figures</i>	Outside
S-032596	Milliken, R., King, J., and Mikkelsen, P.	2006	<i>The Central California Ethnographic Community Distribution Model, Version 2.0, with Special Attention to the San Francisco Bay Area, Cultural Resources Inventory of Caltrans District 4 Rural Conventional Highways</i>	Outside



**BALMD Levee Erosion Control and Habitat Enhancement Project**

Report Number	Author	Year	Title	Relationship to APE
S-033032	McLean, D.	1999	<i>Results and Recommendations for Cultural Resource Assessment of the Connector Road Project in the County of Solano, California (letter report)</i>	Outside
S-033600	Meyer, J. and Rosenthal, J.	2007	<i>Geoarchaeological Overview of the Nine Bay Area Counties in Caltrans District 4</i>	Outside
S-038066	Jensen, S.	2011	<i>Archaeological Inventory Survey, Rio Vista Flood Wall Project, c. 1600 Linear Corridor, Solano County, California</i>	Outside
S-038635	Lydecker, A.	2010	<i>Cultural Resources Remote Sensing Survey and Diver Investigations at Selected Target Locations, Sacramento River Bank Protection Project (SRBPP), Sacramento River and Tributaries</i>	Outside
S-038637	Havelaar, C., Cascella, M., Ambacher, P., and Roark, G.	2012	<i>Historic Properties Treatment Plan, Sacramento River Bank Protection Project</i>	Outside
S-049780	Byrd, B., Whitaker, A., Mikkelsen, P., and Rosenthal, J.	2017	<i>San Francisco Bay-Delta Regional Context and Research Design for Native American Archaeological Resources, Caltrans District 4</i>	Outside

Source: North Central Information Center, November 2017

### 1.1.1.3 Study 000149

Study 000149, prepared by J. Johnson in 1974, consists of an archaeological survey of 151 separate locations along the Sacramento River and included portions of the western alignment of the current APE. The study did not identify any resources within the current APE.

### 1.1.1.4 Study 001740

Study 001740, prepared by W. Shapiro and K. Syda in 1997, consists of an addendum archaeological assessment, including a field inspection of 33 areas along the Brannan Andrus Levee. No prehistoric resources were identified. Two historical resources were identified, neither of which fall within the current APE.

### 1.1.1.5 Study 001784

Study 001784, conducted by W. Shapiro and K. Syda in 1997, consists of an archaeological assessment of fifteen areas along the Brannan Andrus Levee. No prehistoric resources were identified, but three historic resources were identified. None of these resources are within the current APE.



#### 1.1.1.6 Study 005055

Study 005055, conducted by J. Seldomridge and C. Smith-Madsen in 1976, consists of a cultural resources investigation of the Sacramento River for the Sacramento River Deep Water Ship Channel Project. Nine one-half mile sections of the river between miles 15 and 47.2 were randomly selected for survey. One potential and two definite prehistoric resources were identified. No historic resources were identified. The report also found that water control maintenance likely either destroyed or buried most of the potential cultural resources in the area. This study did not identify any resources within the current APE.

#### 3.2.1.1 Study 008661

Study 008661, conducted by D. Bell in 2006, consists of an archaeological survey of fourteen critical levee erosion repair locations on the Sacramento River and Steamboat Slough and included a portion of the easternmost alignment of the project APE. The study did not identify any resources within the current APE.

#### 1.1.1.7 Study 009174

Study 009174, conducted by G. Waugh and J. Schulte in 1989, reports the results of an archaeological survey of areas of Route 160. No cultural resources were located during field survey, and findings were therefore negative.

#### 1.1.1.8 Study 009176

Study 009176, conducted by C. Hibbard, V. Lee, and M. J. Marquez in 1993, includes a cultural resources survey of areas of route 160 proposed to be rehabilitated and widened. No cultural resources were identified during field survey.

#### 3.2.1.2 Study 009326

Study 009326, prepared by L. Leach-Palm, P. Mikkelsen, P. Brandy, J. King, and L. Hartman in 2008 consists of a cultural resources survey along rural conventional highways in California Department of Transportation (Caltrans) District 3. The study identified and recorded resources P-34-002109 and P-34-002143 within the current APE, discussed in further detail below.

#### 3.2.1.3 Study 009988

Study 09988, prepared by A. Martinez, C. Arrington, and N. Sikes in 2008, consists of a cultural resources inventory for 16 levee erosion repair locations along the Sacramento River. The study did not identify any resources within the current APE.

### 3.2.2 Previously Recorded Resources

The cultural resources study identified a total of 25 cultural resources within the search radius, three of which are located within the APE (P-34-002109, P-34-002143, and P-34-05225; Table 2). Each resource located in the APE is discussed in further detail below.



**BALMD Levee Erosion Control and Habitat Enhancement Project****Table 2. Previously Recorded Resources within a 0.5-Mile Radius of the APE**

Primary Number	Trinomial	Resource Type	Description	Recorder(s) and Year(s)	NRHP/CRHR Status	Relationship to APE
P-34-001352	N/A	Historic building	Cottage-style single-family residence	D. Livingstone 2004	Recommended ineligible	Outside
					NR[HP] Status Code 3S: Appears eligible for NR[HP] as an individual property through survey evaluation	
P-34-001541	N/A	Historic building	Isleton City Hall and Fire House	G. Peterson 1994		Outside
P-34-002109	N/A	Historic site	Water pump platform and pipe	B. Larson and R. Flores 2007	NR[HP] Status Code 7: Not evaluated for NR[HP] or CR[HR]	<b>Within</b>
P-34-002110	N/A	Historic site	Isleton water distribution system	K. Tremaine and J. Lopez 2016; B. Larson and R. Flores 2007	NR[HP] Status Code 7: Not evaluated for NR[HP] or CR[HR]	Outside
P-34-002114	N/A	Historic Structure	Irrigation siphon or pump	Bryan Larson, Rebecca Flores, JRP Historical Consulting 2007	Not evaluated	Outside
P-34-002143	N/A	Historic site	Isleton Levee	K. Tremaine and J. Lopez 2016; A. Martinez and P. Hanes 2008; S. Melvin and J. Freeman 2008; Monica Nolte, Jacqueline Wait, Margaret Mitchell, Wendy Pierce, CA Department of Water Resources 2016 and 2017; Kim Tremaine, John Lopez, Tremaine and Associates, Inc. 2016;	Determined eligible	<b>Within</b>
P-34-002351	N/A	Historic district	Isleton Chinese and Japanese Commercial Districts	M. Maniery and J. Cunningham 1990	Listed on the NRHP	Outside
P-34-002473	N/A	Historic building	Isleton Oriental School	K. Fujita 1972	Listed on the NRHP	Outside
P-34-004444	N/A	Historic Object	Small vessel-like object	Panamerican Consultants Inc. 2009	Not evaluated	Outside



Primary Number	Trinomial	Resource Type	Description	Recorder(s) and Year(s)	NRHP/CRHR Status	Relationship to APE
P-34-004445	N/A	Historic Object	Small wooden barge	Panamerican Consultants Inc. 2009	Not evaluated	Outside
P-34-004446	N/A	Historic Object	Possible sunken structure	Panamerican Consultants Inc. 2009	Not evaluated	Outside
P-34-005111	CA-SAC-001228H	Historic site	Railroad berms and wood pilings	M. Hale and R. Bevill 1992	Not evaluated	Outside
P-34-005225	N/A	District	Tribal cultural landscape	Kim Tremain, Tremaine and Associates Inc. 2018	Eligible for NRHP/CRHR	<b>Within</b>
P-48-000911	N/A	Object	Potential remains of a dock or barge	Panamerican Consultants, Inc. 2009	Unknown	Outside
P-48-000937	N/A	Object	Remains of the Dredge Sacramento	Panamerican Consultants, Inc. 2009	Unknown	Outside
P-48-000939	N/A	Object	Dutra Yard	Panamerican Consultants, Inc. 2009	Unknown	Outside
P-48-000940	N/A	Object	Potential vessel with complex dipole signature	Panamerican Consultants, Inc. 2009	Unknown	Outside
P-48-000941	N/A	Object	Potential vessel with complex dipole signature	Panamerican Consultants, Inc. 2009	Unknown	Outside
P-48-000942	N/A	Object	Vessel-like object	Panamerican Consultants, Inc. 2009	Unknown	Outside
P-48-000943	N/A	Object	Hull-like structure	Panamerican Consultants, Inc. 2009	Unknown	Outside
P-48-000944	N/A	Object	Small work vessel	Panamerican Consultants, Inc. 2009	Unknown	Outside
P-48-000945	N/A	Object	Wrecked vessel	Panamerican Consultants, Inc. 2009	Unknown	Outside
P-48-000946	N/A	Object	Iron-hulled vessel with riveted hull planking	Panamerican Consultants, Inc. 2009	Unknown	Outside
P-48-000950	N/A	Object	Possible watercraft	Panamerican Consultants, Inc. 2009	Unknown	Outside
P-48-000952	N/A	Object	Barge-like structure	Panamerican Consultants, Inc. 2009	Unknown	Outside

### 3.2.2.1 P-34-002109

Resource P-34-002109, recorded in 2007 by B. Larson and R. Flores, consists of a water pump platform and pipe that provides irrigation water from the Sacramento River to neighboring agricultural fields. The pump is located on the bank of the Sacramento River on the north side of the levee where it lifts water through the levee via a welded steel pipe. The feature is thought to date to the first half of the twentieth century based on its construction methods. The resource was not



evaluated during its initial recording and was given an NRHP status code of 7: Not evaluated for NRHP or CRHR.

### 3.2.2.2 P-34-002143

Resource P-34-002143, was originally recorded in 2008 by S. Melvin and J. Freeman and updated by A. Martinez and P. Hanes in 2008 and by K. Tremaine and J. Lopez in 2016. P-34-002143 consists of the Isleton Levee Section extending from the southern tip of Brannan Island to the bridge just north of Isleton on Andrus Island. This section of the levee was originally raised in 1870 and eventually rebuilt in 1878 and in 1886. It has been continuously maintained and upgraded since 1936. In 2006, under Study 008198 for a levee repair project similar to the current project, the levee was presumed eligible for the NRHP under Criterion A for its association with significant events (King 2006). The study concluded that repairs to the levee would not affect the resource or its significance because it would not alter its geometry, location, or purpose. According to an agreement with SHPO from 2006 for the levee repair project, the levee system has been assumed eligible for listing in the NRHP but that repairs to the levee would not have an adverse effect to the resource because the levee would retain its original configuration. The State Historic Preservation Office (SHPO) concurred with this finding. In 2016, the resource record for the levee was updated by K. Tremaine and J. Lopez in 2016 who stated that the resource has been argued as significant for its association with significant events as a representation of early examples of swampland reclamation and in allowing the foundation of the town of Isleton. Tremaine and Lopez stated, however, that the resource has lost integrity due to numerous rebuilding episodes and modifications.

### 1.1.1.9 P-34-005225

Resource P-34-005225 was recently recorded by K. Tremaine in 2018 and consists of a Tribal Cultural Landscape encompassing a narrow corridor of the Lower Sacramento River from Mokelumne River at Collinsville to the Feather River at Verona. This area, known to the Nisenan as *Hoyo Sayo/Tah Sayo* and to the Plains Miwok as *Waka-ce/Waka-Ly*, is characterized by waterways, tule habitat, fisheries, and wildlife utilized by local native peoples. Characteristics still present include the Sacramento river and the accompanying animal population (fish, shellfish, and waterfowl), riparian plant life, and tule habitat. K. Tremaine considered this resource eligible for the NRHP and CRHR under Criterion A/1 because the landscape is associated with cultural practices and beliefs of the Nisenan and Plains Miwok and maintains the cultural identity of their living descendants, contributing to broader patterns of prehistory. This resource encompasses the project APE.

### 1.1.2 Shipwreck Inventory

The CHRIS records searches included a review of the California State Lands Commission Shipwreck Database. A total of 12 shipwrecks are listed in Sacramento County. In 1985, the State Lands Commission compiled an inventory of sunken vessels of historical significance and published the results in 1988 in *A Map and Record Investigation of Historical Sites and Shipwrecks Along the Sacramento River between Sacramento City and Sherman Island*. While specific locations are not included, five wrecks were reported in the general vicinity of the APE, in or near Cache Slough, including the schooner *Bianca*, the propeller *Fanny Ann* (possibly recovered), the sloop *FW*



*Crawford*, the *Nevada*, and the steamer *Pet* (possibly recovered). No wrecks are known to be directly within the APE.

### 3.3 Native American Scoping

Rincon requested a review of the Sacred Lands File (SLF) by the Native American Heritage Commission on November 21, 2017. The NAHC sent a response on November 29, 2017 stating that a search of the SLF was completed with negative results. The NAHC also provided a list of 10 Native American contacts who may have knowledge regarding cultural resources of Native American origin at the APE. Rincon prepared and mailed informal outreach letters to each of these contacts on December 8, 2017.

On December 14, 2017 Antonio Ruiz of the Wilton Rancheria responded to the outreach letter requesting consultation with the lead agency and additional information about the project. On December 15<sup>th</sup>, Rincon archaeologist Hannah Haas responded to inform Mr. Ruiz that the BALMD would be sending Assembly Bill 52 of 2014 (AB 52) consultation letters separately and to provide information on the project and the findings of this study. Mr. Ruiz responded to request additional information on the levee system and project and to state that if there is no record of the origin of the soils used to construct the levee, then there is potential to encounter Native American cultural resources or human remains within the levee soils. Ms. Haas responded to Mr. Ruiz to provide the known construction history of the levee and additional project details. As of December 25<sup>th</sup>, 2017 Mr. Ruiz has not responded.

Rincon sent an updated request to the NAHC on March 20, 2020, requesting an SLF search of the updated APE and a contact list of Native American groups and/or individuals culturally affiliated with the area. Rincon received results on March 24, 2020 indicating that the SLF search was negative. Due to social distancing measures in place because of COVID-19, Rincon emailed letters to each contact rather than hard-copy letters. Emails were sent to each contact on March 24, 2020. All Native American outreach documentation for the project can be found in Appendix B of this report and is summarized below.

No additional responses concerning the general project APE have been received as of the date of this report. Rincon assumes that Section 106 consultation will be continued and carried out by the lead federal agency.

### 3.4 Local Historical Group Consultation

On November 27, 2017 Rincon prepared and mailed letters to each of the following groups: City of Isleton Planning Department, Brannan-Andrus Historical Society/Isleton Museum, Rio Vista Museum, City of Rio Vista Community Development Department, and the Sacramento County Historical Society. Follow up letters were sent via email on March 23, 2020. The Sacramento County Historical Society does not have a listed email and was called on March 20, 2020. The Director of Community Development for the City of Rio Vista has changed. A voicemail was left requesting the contact information for the new Director. As of the date of this report, no responses have been received. Rincon assumes that Section 106 consultation will be continued/carried out by the lead federal agency.



## 4 Fieldwork

---

### 4.1 Pedestrian Survey Methods

Rincon archaeologist Hannah Haas conducted the pedestrian survey of the project construction footprint on December 5, 2017. Ms. Haas surveyed the APE by driving the length of the proposed levee repairs and walking a single transect parallel to the levee where vegetation and access permitted. The top of the levee is occupied almost entirely by State Route (SR) 160 with no shoulder and steeply sloping banks, making pedestrian survey of much of the project alignment difficult to impossible due to safety concerns. Rincon archaeologist Elaine Foster conducted the pedestrian survey of the staging areas on March 27, 2020. Where accessible, Ms. Foster surveyed the staging areas using transects spaced 10 to 15 meters apart. Where inaccessible and/or paved, Ms. Foster observed each staging area from fence lines and examined any unpaved areas. The archaeologists examined all exposed ground surfaces for artifacts (e.g., flaked stone tools, tool-making debris, stone milling tools, ceramics, fire-affected rock [FAR]), ecofacts (marine shell and bone), soil discoloration that might indicate the presence of a cultural midden, soil depressions, and features indicative of the former presence of structures or buildings (e.g., standing exterior walls, postholes, foundations) or historic debris (e.g., metal, glass, ceramics). Ground disturbances such as burrows and drainages were visually inspected. Survey notes were prepared by the surveyor and are available upon request.

### 4.2 Results

The APE spans segments of an existing levee that carries SR 160 and includes five possible staging areas. Ground visibility along the length of the levee was very poor due to vegetation and riprap (Figure 1 and Figure 2). No prehistoric resources have been identified within or near the APE as a result of the field survey or records search, and as a historically-constructed and continuously repaired and modified levee none are likely to exist. Three previously recorded cultural resources have been identified within the APE: P-34-002109 (a historic irrigation feature), P-34-002143 (the levee itself), and P-34-005225 (Sacramento River Tribal Cultural Landscape). No newly recorded resources were identified during the pedestrian survey. The three previously recorded resources are discussed in further detail below.

The staging area located at the intersection of Highway 12 and River Road is paved with 0% ground visibility and appears to consist of an abandoned road alignment (Figure 3). The staging area at the “Cliff House Fishing Access” consisted of an asphalt paved parking lot with zero ground visibility surrounded by thick blackberry bushes (Figure 4). The southern half of the second easternmost staging area consisted of compacted gravel with large pieces of equipment and construction trucks (Figure 5). The northern half of the site consisted of a dense grassy area (Figure 6) with patches of burnt ground and a line of cacti at the edge. Visibility was poor, less than 10%. At the very edge of the area, near the cacti, there was no grass and visibility was excellent 80-90%. Refuse including various types of glass fragments, porcelain, ceramics, plastic, terra cotta, miscellaneous metal, and fragments of garbage bags were observed in in this area. The majority of the refuse present was clearly modern in origin. The easternmost staging area on River Road was in use as a goat pen at the time of survey (Figure 7). The archaeologist observed visible areas from the surrounding fence line for cultural resources, and none were identified.



**Figure 3 Staging Area at Intersection of Highway 12 and River Road**



**Figure 4 Staging Area – “Cliff House Fishing Access” Parking Lot**





**Figure 5 Staging Area – Second Eastern-Most on River Road, Southern Half**



**Figure 6 Staging Area – Second Most-Eastern on River Road, Northern Half**





**Figure 7 Staging Area – Eastern-most on River Road**



#### 4.2.1 P-34-002109

Resource P-34-002109 was relocated during the current survey in the same condition as its original recording. The pump and pipe may date to the same period of construction of the house and agricultural property on the opposite side of the levee, which dates to 1940 (Sacramento County Assessor's Office 2017). However, the pump is located on a separate parcel from the adjacent buildings, thus the association is unclear. The house and associated outbuildings were outside of the purview of the survey that originally recorded this resource and are not on the current APE. Thus, they have thus not been included in the site record or update, nor have they been evaluated as part of the current project.

**Figure 8. View of P-34-002143 from across State Route 160, facing north.**





#### 4.2.2 P-34-002143

Resource P-34-002143 consists of the levee to be maintained by the proposed project. The levee was originally recorded in 2008 and a small section east of the current project alignment was updated in 2016. The levee has been argued as significant for its contribution to broad patterns of local and state history and allowing for the settlement of the town of Isleton and surrounding agricultural activities. The surface of the levee is occupied almost entirely by SR 160. Both banks of the levee are covered in dense vegetation and riprap.



**Figure 9. View of levee and river from bank at eastern end of APE, facing west.**



**Figure 10. View of levee and river from western end of APE, facing east.**





### 1.1.3 P-34-005225

Resource P-34-005225 (Figure 9 and Figure 10) consists of a narrow corridor of the environment of the Lower Sacramento River area from Mokelumne River at Collinsville to the Feather River at Verona. Characteristics include waterways, tule habitat, fisheries, and other wildlife. This environment was utilized by the Nisenan and Plains Miwok for subsistence, spiritual, and cultural activities. This landscape has remained for thousands of years and has significance prehistorically and historically. The levee proposed to be repaired by the project is encompassed by this cultural landscape; although, it was originally raised in 1870 and has been repaired and maintained over the years, so in its current form was not part of the original landscape and may no longer contain original soils.



## 5 Significance Evaluations

---

Resources recorded and/or updated as part of the current study were evaluated for NRHP and CRHR eligibility.

As detailed in the Regulatory Setting (Section 1.3), a resource is considered a historic property under 36 CFR 800 if the quality of significance in American history, architecture, archaeology, engineering, or culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and that:

- A. Are associated with events that have made a significant contribution to the broad patterns of our history; or
- B. Are associated with the lives of persons significant in our past; or
- C. Embody the distinctive characteristics of a type, period, or method of installation, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
- D. Have yielded, or may be likely to yield, information important in prehistory or history

A cultural resource is considered historically significant and eligible for 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 persons 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 creative individual, or possesses high artistic values; or
- 4) Has yielded, or may be likely to yield, information important in prehistory or history.

### 5.1 Assessment of Integrity

Although many sites may provide pertinent information to the research questions listed above, a site must also maintain integrity of location, design, setting, materials, workmanship, feeling, and association. Integrity is a property's ability to "convey its significance." The assessment of integrity is the final step in the evaluation of a resource. Should a resource meet any of the CRHR and/or NRHP criteria, but that resource lacks sufficient integrity, the resource may not qualify for listing. The integrity of each resource is considered during NRHP and CRHR evaluations.

### 5.2 P-34-002109

Resource P-34-002109 consists of a historic-era irrigation pump and pipe that carries Sacramento River water from the river across the levee to agricultural fields on the other side. The resource cannot be identified to be associated with events that have made a significant contribution to broad patterns of California's history (Criteria 1/A) and is not associated with the lives of significant persons in California's past (Criteria 2/B). The pump is a standard irrigation pump channeled via pipe through the levee, which are ubiquitous throughout the agricultural areas of the Delta and thus



does not embody any distinctive characteristics (Criteria 3/C). The resource is not likely to yield any important information to history as a simple irrigation pump with no significant engineering features (Criteria 4/D). Thus, the resource is not considered eligible for listing in the CRHR and NRHP under all four criteria (1-4; A-D).

### 5.3 P-34-002143

Resource P-34-002143 consists of the levee separating the Sacramento River from Brannan Island. The resource is associated with events that have made a significant contribution to patterns in history by allowing for the founding of the town of Isleton and the agricultural activities of Brannan Island and by contributing to the settlement of the Delta region (Criteria 1/A; King 2006, Tremaine and Lopez 2016). Earthen levees of similar construction are ubiquitous throughout the Delta region. As a continuously maintained and upgraded levee, the resource has lost integrity of design, materials, and workmanship (Tremaine and Lopez 2016). Although the levee has lost integrity of design, materials, and workmanship, its alignment and purpose has not changed since its original construction and it thus retains integrity of location, setting, feeling, and association. The levee remains eligible for the CRHR and NRHP under Criterion 1/A.

### P-34-005225

Resource P-34-005225 consists of the Sacramento River Tribal Cultural Landscape, a narrow area located in the Lower Sacramento River environment from area Mokelumne River at Collinsville to the Feather River at Verona. Characteristics include waterways, tule habitat, fisheries, and other wildlife. This resource was evaluated by Tremaine in 2018 for listing in the NRHP and CRHR and therefore has not been reevaluated here. Tremaine recommended the resource as eligible for listing in the NRHP and CRHR under Criterion 1/A and stated that it retains sufficient integrity to convey that significance (Tremaine 2018). Rincon concurs with this previous recommendation that P-34-005225 remains eligible under Criterion 1/A.



## 6 Management Recommendations

---

The cultural resource records search and survey identified three previously recorded cultural resources, P-34-002109, P-34-002143, and P-34-005225. Resource P-34-002109 is recommended ineligible for listing in the CRHR and NRHP. P-34-002109 consists of a historic-era water pump that provides irrigation water through the levee to the adjacent agricultural fields. The pump is not considered a significant cultural resource; thus, no further management is recommended for the pump.

P-34-002143 consists of the Isleton levee, which has been continuously maintained and upgraded since its original construction and thus does not retain integrity. However, the levee remains eligible for the CRHR under Criterion 1 and NRHP under Criterion A for its association with significant events, represented by its alignment and location, which have remained unchanged since its original construction. The current project involves replacement of eroded soils from the levee and adding planting benches by placing terrabags and riprap to the surface of the levee. Such alterations would be consistent with the continuous maintenance and repair to which the levee has been subject since its original construction. The elements of the levee that convey its significance—its alignment, location, and purpose—would not be altered by the current project. As a result, modifications made as part of the project would not affect the physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of an historical resource would be materially impaired. Thus, the current project would not impact the significance of the resource. No further management is recommended for the levee.

P-34-005225 consists of the Sacramento River Tribal Cultural Landscape, which is considered eligible for NRHP and CRHR. This resource encompasses a narrow area of the Lower Sacramento River environment from area Mokelumne River at Collinsville to the Feather River at Verona. Characteristics include waterways, tule habitat, fisheries, and other wildlife. This resource is associated with cultural practices and beliefs of the Nisenan and Plains Miwok, maintaining the continuing cultural identity of the living descendants. While the environment has been developed over the last century, it maintains several defining characteristics and significance. The current project is intended to repair an existing levee that has been in place since 1870 and would not change any defining characteristics of the cultural landscape; therefore, the current project would not impact the significance of the resource. No further management is recommended for the cultural landscape.

The project would also involve the use of off-site staging areas. Use of these areas would be temporary and would not include the demolition of any built environment resources or subsurface excavation. No cultural resources are present on the staging areas. As a result, the use of the proposed staging areas would not impact cultural resources.

The levee at this location was first constructed in ca. 1870 from peat from a borrow-ditch adjacent to the levee. The original levee was smaller than it is today at 4 feet high, 15 feet between the toes, and 8 feet across the crown (Thompson 2006). The levee was added to every year from 1873-1878. Most of the levee around the island was broken in winter of 1877-1878, and restored in 1878 with soils from outside the levee system. The levee was breached again in February of 1878 and at that point was restored using clamshell dredges taking silt/mining debris that had washed down the river and settled on the channel floor. When the highway was constructed, the levee was raised another two feet and has been continuously maintained, upgraded, and added to as soils have settled and



eroded. Soils used to repair the levee since that time have primarily included accumulated silt and clay dredged from the river and from riprap taken from quarries established for that purpose. The levee is currently roughly 25 feet high, 50 feet wide at the base, and 25 feet wide at the crown (Melvin and Jones 2008). Although the majority of project-related ground disturbance will occur on relatively recent dredging spoils, riprap, and fluvial soils deposited recently in areas that would have been underwater prior to the construction of the levee system, we consider the likelihood of encountering archaeological resources or human remains to be low.

Rincon recommends a finding of ***no adverse effect to historic properties*** under Section 106 of NHPA. Because the project would not cause a substantial adverse change in the significance of the levee or the cultural landscape, Rincon recommends a finding of ***less than significant impact to historical resources*** under CEQA. The archaeological sensitivity of the APE has been identified as low; however, there is always a possibility of encountering unanticipated archaeological resources during ground disturbing activities. Thus, mitigation is recommended in the case of unanticipated cultural resource discoveries. With the incorporation of this measure, impacts to archaeological resources would be ***less than significant with mitigation incorporated*** under CEQA. This recommendation regarding unanticipated archaeological resources does not change the recommended finding of no adverse effect to historic properties under Section 106 of the NHPA.

## 6.1 Unanticipated Discovery of Cultural Resources

If any prehistoric or historic artifacts, or other indications of archaeological resources such as unusual deposits of stone, bone or shell, stone artifacts, or historic trash deposits or foundations are discovered once ground-disturbing activities are underway, the find(s) shall be immediately evaluated by a qualified archaeologist. If the find is determined to be a historical or unique archaeological resource, contingency funding and a time allotment to allow for implementation of avoidance measures or appropriate mitigation shall be made available, as provided in §15064.5 of the CEQA Guidelines. Work may continue on other parts of the APE while historical or unique archaeological resource mitigation takes place on-site.

## 6.2 Unanticipated Discovery of Human Remains

The discovery of human remains is always a possibility during ground disturbing activities. If human remains are found, the State of California Health and Safety Code Section 7050.5 states that no further disturbance shall occur until the county coroner has made a determination of origin and disposition pursuant to Public Resources Code Section 5097.98. In the event of an unanticipated discovery of human remains, the county coroner must be notified immediately. If the human remains are determined to be prehistoric, the coroner will notify the Native American Heritage Commission (NAHC), which will determine and notify a most likely descendant (MLD). The MLD shall complete the inspection of the site within 48 hours of notification and may recommend scientific removal and nondestructive analysis of human remains and items associated with Native American burials.



## 7 References

---

Bean, Walton

- 1968 *California: An Interpretive History*. McGraw-Hill Book Company, New York.

Engelhardt, Zephyrin, O.F.M.

- 1927 *San Fernando Rey, the Mission of the Valley*. Franciscan Herald Press, Chicago.

Fredrickson, David A.

- 1973 *Early Cultural of the North Coast Ranges, California*. Ph.D. dissertation, University of California, Davis.
- 1994 Spatial and Cultural Units in Central California Archaeology. In *Toward a New Taxonomic Framework for Central California Archaeology: Essays by James A. Bennyhoff and David A. Fredrickson*, assembled and edited by Richard E. Hughes.

Guinn, J. M.

- 1915 *A History of California and an Extended History of Los Angeles and Environs*, Vol.1. Historic Record Company, Los Angeles.

Gumprecht, Blake

- 1999 *The Los Angeles River: Its Life, Death, and Possible Rebirth*. Johns Hopkins University Press, Baltimore.

Isleton Chamber of Commerce

- 2017 History. Accessed online, <http://www.isletonchamber.com/history/>.

Isleton, City of

- 2017 Welcome to the City of Isleton. Accessed online, <http://cityofisleton.com/about.html>.

Johnson, Stephen, Gerald Haslam, and Robert Dawson

- 1993 *The Great Central Valley: California's Heartland*. University of California Press, Berkely.

Jones, Terry L., and Kathryn A. Klar

- 2007 *California Prehistory: Colonization, Culture, and Complexity*. AltaMira Press, New York.

Kyle, Douglas

- 2002 *Historic Spots in California*. 5th ed. Revised by Douglas E. Kyle. Palo Alto, CA: Stanford University Press.

Lajeunesse, R. M. and J. M. Pryor

- 1996 "SkyRocket Appendices." Report on file, department of Anthropology, California State University, Fresno.



Levy, Richard B.

- 1977 Tidal Marsh, Oak Woodlands, and Cultural Florescence in the Southern San Francisco Bay Region. In *Handbook of North American Indians*, edited by Robert E Heizer, pp.485–495. Luomala, Katherine

McCawley, William

- 1996 *The First Angelinos: The Gabrielino Indians of Los Angeles*. Malki Museum/Ballena Press Cooperative Publication, Banning or Novato, California.

McGuire, Kelly R.

- 1995 Test Excavations at CA-FRE-61, Fresno County, California. Occasional Papers in Anthropology No 5. Museum of Anthropology, California State University, Bakersfield.

Melvin, Steven and Jarma Jones

- 2008 Resource Record for P-34-002143. On file at the North Central Information Center, Sacramento State University, California.

Moratto, Michael J.

- 1984 *California Archaeology*. Coyote Press, Salinas, California.

Rolle, Andrew

- 2003 *California: A History*. Revised and expanded sixth edition. Harlan Davidson, Inc., Wheeling, Illinois.

Rosenthal, Jeffrey, Gregory White, and Mark Sutton

- 2007 The Central Valley: A View from the Catbird's Seat. In *California Prehistory: Colonization, Culture, and Complexity*, edited by Terry L. Jones and Kathryn A. Klar, pp. 147-164. AltaMira Press, Lanham Maryland.

SacDelta.com

- 2017 History of the Delta. Accessed online, <http://www.sacdelta.com/hist.html>.

Sacramento, County of

- 2017 County History. Accessed online, <http://www.saccounty.net/Government/Pages/CountyHistory.aspx>.

Sacramento County Assessor's Office

- 2017 Sacramento County Assessor Parcel Viewer. Accessed online, <http://assessorparcelviewer.saccounty.net/jsviewer/assessor.html>.

Thompson, John

- 2006 Early Reclamation and Abandonment of the Central Sacramento-San Joaquin Delta. In *Sacramento Historic Journal* 6(1-4):41-72.



Wallace, William

- 1978 Post-Pleistocene Archaeology, 9000 to 2000 B.C. In California, edited by R. F. Heizer.  
Handbook of North American Indians, Vol. 8, W. C. Sturtevant, general editor,  
Smithsonian Institution, Washington D.C. pp. 25–36.

Workman, Boyle

- 1935 *The City that Grew*. Southland Publication Co., Los Angeles.



# Appendix A

---

## Records Search Summary



## Report List

Report No.	Other IDs	Year	Author(s)	Title	Affiliation	Resources
000052		1976	Jeffry Seldomridge and Connie Smith-Madsen	Cultural Resources Reconnaissance: Sacramento River Deep Water Ship Channel (Collinsville to Sacramento).		
000074		1983	Peak & Associates, Inc.	Cultural Resources Assessment of the Proposed Extension of Sixth Street in Isleton, Sacramento County, CA.		
000149		1974	Johnson, Jerald J.	Reconnaissance Archeological Survey of 151 Locations on the Sacramento River Drainage from Elder Creek in the North and Rio Vista in the South.		34-000356
000315		1987	Weaver, Richard	Cultural Resources Survey, Sacramento River Bank Protection Unit 41, Sacramento, Solano and Yolo Counties, California.		
001740		1997	Shapiro, William and Keith Syda	An Addendum Archaeological Assessment Within the B.A.L.M.D., Sacramento County, California. Part of the Cultural Resources Inventory and Evaluation for the U.S. Army C.O.E/, Sac. Distirct, PL 84-99 Levee Rehabilitation		
001784		1997	Shapiro, William and Keith Syda	An Archaeological Assessment Within the Brannan Andrus Levee Main. Dist.,Sacramento County, California. Part of the Cultural Res. Inventory and Eval. for the U.S. Army Corps of Engineers, Sacramento District, PL 84-99 Levee Rehab	U.S. Army Corps of Engineers, Sac. District Planning Div., 1325 J St., Sacramento, CA 95814.	
002537		2000	Peak, Melinda	Letter Report for: Sprint PCS Site No. SF33XC283-D, Oxbow Marina		
004168		1997	Derr, Eleanor H.	Cultural Resources Report: Isleton City Hall, Sacramento County, California		
004169		2002	Jensen, Peter M.	Addendum to the City of Isleton Sewer Replacement Project, Archaeological Inventory Survey City of Isleton, Sacramento County, California		
004172		1990	Boyer, Barry L.	Record Search to Determine the Presence of Archaeological and/or Historical Sites in the Area of Isleton Sacramneto County, California		
006454		2004	US Department of Homeland Security and FEMA	Sacramento County Flood Hazard Mitigation, Sacramento County Department of Water Resources	US Department of Homeland Security	34-001347, 34-001348, 34-001349, 34-001350, 34-001351, 34-001352
006556		2005	PAR Environmental	Archaeological Survey of Craven Ranch		



## Report List

Report No.	Other IDs	Year	Author(s)	Title	Affiliation	Resources
007083		2005	PAR	A Cultural Resource Investigation of the East Waterfront Neighborhood Tentative Map Area, Isleton, Sacramento County, California	PAR	34-000925, 34-000927, 34-001524, 34-001525, 34-001526
007129		1994	Peterson, Dan	Historical Evaluation Determination of Eligibility and Statement of Effect Isleton City Hall and Fire House 100 Second Street Isleton, CA		34-001541
007137		2005	Larkin, Robert	Cultural Resource Survey Proposed 14-Acre Residential Development Isleton, CA		
007875		1999	Frank Deitz	Cultural Resources Assessment within Reclamation District 3, Sacramento County, California (Sac 25)	US Army Corps of Engineers	
008198		2006	Erin King	Cultural Resources Survey of Approximately 60 Acres for Levee Maintenance Activities on Brannan Island, Sacramento County, California	Tetra Tech, Inc.	
008661		2006	Daniel Bell	Archeological Survey of Fourteen Sites along the Sacramento River and Steamboat Slough for the 2006 Sacramento River Bank Protection Project- Sacramento, Yolo, Solano and Sutter Counties, California	U.S. Army Corps of Engineers, Sacramento District	
009173		1979	Roy A. Littlefield	Archaeological Evaluation of a Proposed Curve Elimination on State Route 160 (P.M. 2.5/2.8)	Caltrans	
009182		1993	Mark R. Hale, Elena Nilsson, and Michael S. Kelly	Cultural Resources Survey Sacramento River Systems Evaluation phase IV, Sacramento and Solano Counties, California (Contract No. DACWO5-92-P-1771)	Dames & Moore	34-005111



## Report List

Report No.	Other IDs	Year	Author(s)	Title	Affiliation	Resources
009326		2008	L. Leach-Palm	Cultural Resources Inventory of Caltrans District 3 Rural Conventional Highways in Butte, Colusa, El Dorado, Glenn, Nevada, Placer, Sacramento, Sierra, Sutter, Yolo, and Yuba Counties	Far Western	09-000045, 09-000108, 09-000109, 09-000144, 09-000145, 09-000232, 09-000400, 09-000632, 09-000637, 09-000638, 09-000701, 09-000704, 09-000705, 09-000769, 09-000773, 09-000809, 09-000853, 09-000906, 09-000907, 09-000908, 09-000912, 09-000913, 09-000917, 09-001151, 09-001283, 09-001708, 09-001741, 09-001789, 09-001822, 09-001894, 09-001910, 09-002534, 09-002575, 09-002835, 09-003317, 09-003605, 09-003828, 09-003840, 09-003880, 09-004042, 09-004128, 09-004161, 09-004311, 09-004443, 09-004444, 09-004445, 09-004446, 09-004448, 09-004449, 09-004450, 09-004451, 09-004453, 09-004454, 09-004455, 09-004456, 09-004457, 09-004458, 09-004459, 09-004460, 09-004461, 09-004462, 09-004463, 09-004464, 09-004465, 09-004466, 09-004467, 09-004469, 09-004470, 09-004471, 09-004472, 09-004473, 09-004474, 09-004475, 09-004476, 09-004477, 09-004478, 09-004479, 09-004480, 09-004481, 09-004484, 29-000032, 29-000041, 29-000067, 29-000103, 29-000108, 29-000265, 29-000348, 29-000349, 29-000355, 29-000370, 29-000505, 29-000584, 29-000585, 29-000586, 29-000732, 29-000823, 29-000839, 29-000879, 29-001154, 29-001422, 29-001500, 29-001594, 29-001809, 29-002274, 29-002628, 29-002743, 29-002880, 29-003048, 29-003050, 29-003051, 29-003052, 29-003053, 29-003054, 29-003055, 29-003056, 29-003057, 29-003058, 29-003059, 29-003060, 29-003061, 29-003062, 29-003063, 29-003064, 29-003065, 29-003066, 29-003067, 29-003068, 29-003069, 29-003070, 29-003071, 31-000131, 31-000132, 31-000134, 31-000139, 31-000147, 31-000148, 31-000149, 31-000159,



## Report List

Report No.	Other IDs	Year	Author(s)	Title	Affiliation	Resources
						31-000279, 31-000280, 31-000964, 31-001261, 31-001262, 31-001279, 31-001454, 31-001455, 31-001457, 31-001686, 31-001742, 31-001745, 31-001840, 31-001852, 31-001862, 31-001888, 31-001889, 31-001895, 31-001899, 31-001930, 31-002386, 31-002705, 31-002706, 31-002707, 31-002708, 31-002791, 31-002792, 31-003276, 31-003352, 31-003353, 31-003354, 31-003355, 31-003356, 31-003357, 31-003358, 31-003359, 31-003360, 31-003361, 31-003362, 31-003363, 31-003364, 31-003365, 31-003366, 31-003367, 34-000075, 34-000078, 34-000089, 34-000096, 34-000160, 34-000355, 34-000489, 34-000606, 34-000662, 34-000868, 34-000869, 34-001029, 34-001497, 34-001524, 34-001525, 34-001609, 34-002102, 34-002103, 34-002104, 34-002105, 34-002106, 34-002107, 34-002108, 34-002109, 34-002110, 34-002111, 34-002112, 34-002113, 34-002114, 34-002115, 34-002116, 34-002117, 34-002118, 34-002119, 34-002120, 34-002121, 34-002122, 34-002123, 34-002124, 34-002125, 34-002126, 34-002127, 34-002128, 34-002129, 34-002130, 34-002131, 34-002132, 34-002133, 34-002134, 34-002135, 34-002136, 34-002137, 34-002138, 34-002139, 34-002140, 34-002141, 34-002142, 34-002143, 58-000046, 58-000219, 58-000222, 58-000597, 58-000644, 58-000645, 58-001159, 58-001208, 58-001351, 58-001755, 58-002224, 58-002225, 58-002228, 58-002229, 58-002230, 58-002231, 58-002232, 58-002233, 58-002234, 58-002955
009988		2008	Amanda L. Martinez, Cindy J. Arrington, and Nancy E. Sikes	Cultural Resources Survey for the Levee Repair Project at 16 Locations in Glenn, Sacramento, Solano, Sutter, Yolo, and Yuba Counties, California	SWCA Environmental Consultants	



## Report List

Report No.	Other IDs	Year	Author(s)	Title	Affiliation	Resources
012160	Other -	1991	Mary L. Maniery	National Register Of Historic Places Significance Evaluation of Walnut Grove Branch Line Railroad, Sacramento County, California.	PAR Environmental Services, Inc.	
012166		1998	Roger H. Werner	A Cultural Resources Investigation of the Proposed Isleton Sewer Improvements Project, (State Revolving Fund No. C-06-4566-110) City of Isleton, Sacramento County, California	ASI Archaeology and Cultural Resources Management	



# Appendix B

---

## Native American Outreach



## NATIVE AMERICAN HERITAGE COMMISSION

March 24, 2020

Courtney Montgomery, Archaeologist  
Rincon Consultants, Inc.

Via Email to: [cmontgomery@rinconconsultants.com](mailto:cmontgomery@rinconconsultants.com)

Re: BALMD Levee Project, Solano County

Dear Ms. Montgomery:

A record search of the Native American Heritage Commission (NAHC) Sacred Lands File (SLF) was completed for the information you have submitted for the above referenced project. The results were negative. However, the absence of specific site information in the SLF does not indicate the absence of cultural resources in any project area. Other sources of cultural resources should also be contacted for information regarding known and recorded sites.

Attached is a list of Native American tribes who may also have knowledge of cultural resources in the project area. This list should provide a starting place in locating areas of potential adverse impact within the proposed project area. I suggest you contact all of those indicated; if they cannot supply information, they might recommend others with specific knowledge. By contacting all those listed, your organization will be better able to respond to claims of failure to consult with the appropriate tribe. If a response has not been received within two weeks of notification, the Commission requests that you follow-up with a telephone call or email to ensure that the project information has been received.

If you receive notification of change of addresses and phone numbers from tribes, please notify me. With your assistance, we can assure that our lists contain current information.

If you have any questions or need additional information, please contact me at my email address: [Sarah.Fonseca@nahc.ca.gov](mailto:Sarah.Fonseca@nahc.ca.gov).

Sincerely,



Sarah Fonseca  
Associate Governmental Program Analyst

Attachment



CHAIRPERSON  
**Laura Miranda**  
*Luiseño*

VICE CHAIRPERSON  
**Reginald Pagaling**  
*Chumash*

SECRETARY  
**Merri Lopez-Keifer**  
*Luiseño*

PARLIAMENTARIAN  
**Russell Attebery**  
*Karuk*

COMMISSIONER  
**Marshall McKay**  
*Wintun*

COMMISSIONER  
**William Mungary**  
*Paiute/White Mountain Apache*

COMMISSIONER  
**Joseph Myers**  
*Pomo*

COMMISSIONER  
**Julie Tumamait-Stenslie**  
*Chumash*

COMMISSIONER  
**[Vacant]**

EXECUTIVE SECRETARY  
**Christina Snider**  
*Pomo*

**NAHC HEADQUARTERS**  
1550 Harbor Boulevard  
Suite 100  
West Sacramento,  
California 95691  
(916) 373-3710  
[nahc@nahc.ca.gov](mailto:nahc@nahc.ca.gov)  
[NAHC.ca.gov](http://NAHC.ca.gov)



## Native Americans Consulted

Local Group/Government Contact	Rincon Coordination Efforts	Response to Coordination Efforts
<p>Cortina Rancheria – Kletsel Dehe Band of Wintun Indians Charlie Wright, Chairperson PO Box 1630 Williams, CA 95987 (530) 473-3274 Office (530) 473-3301 Fax</p>	<p>Call: 3/24/2020 – message left requesting email. Physical letters not sent due to Covid-19 concerns.</p>	
<p>The Confederated Villages of Lisjan Corrina Gould, Chairperson 10926 Edes Avenue Oakland, CA 94603 <a href="mailto:cvltribe@gmail.com">cvltribe@gmail.com</a> 510-575-8408</p>	<p>Letter: 3/24/2020 - emailed</p>	
<p>United Auburn Indian Community of the Auburn Rancheria Gene Whitehouse, Chairperson 10720 Indian Hill Road Auburn, CA 95603 <a href="mailto:bguth@auburnrancheria.com">bguth@auburnrancheria.com</a> 530-883-2390 Office 530-883-2380 Fax</p>	<p>Letter: 3/24/2020 – emailed</p>	
<p>Yocha Dehe Wintun Nation Anthony Roberts, Chairpersn PO Box 18 Brooks, CA 95606 <a href="mailto:aroberts@yochadehe-nsn.gov">aroberts@yochadehe-nsn.gov</a> 530-796-3400 530-796-2143 Fax</p>	<p>Letter: 3/24/2020 - emailed</p>	





**Rincon Consultants, Inc.**

4825 J Street, Suite 200  
Sacramento, California 95819

916 706 1374 OFFICE AND FAX

info@rinconconsultants.com  
www.rinconconsultants.com

March 20, 2020

Cortina Rancheria – Kletsel Dehe Band of Wintun Indians  
Charlie Wright, Chairperson  
P.O. Box 1630  
Williams, CA 95987

**Subject: Cultural Study for the BALMD Levee Maintenance Project near Isleton, Sacramento County, CA**

Dear Chairperson Wright:

Rincon Consultants, Inc. (Rincon) was retained by Robertson-Bryan, Inc. to conduct a cultural resources study for the Brannan-Andrus Levee Maintenance District (BALMD) Levee Erosion Control and Habitat Enhancement Project (project) located near Isleton in Sacramento County, California. The project requires an update to the existing studies based on the revised project description, including three new staging areas, depicted in the enclosed figure.

As part of the process of identifying cultural resources issues for this project, Rincon contacted the Native American Heritage Commission (NAHC) and requested a Sacred Lands File (SLF) search and a list of Native American tribal organizations and individuals who may have knowledge of sensitive cultural resources in or near the project area. The SLF results came back negative. This letter serves to inform you of our understanding of the project, and to inquire about your knowledge of potential cultural resources that may be impacted by this project.

If you have knowledge or concerns about cultural resources that may exist within or near the project site, please contact me at 916-706-1374, extension 230, or at [hhaas@rinconconsultants.com](mailto:hhaas@rinconconsultants.com). Thank you for your assistance.

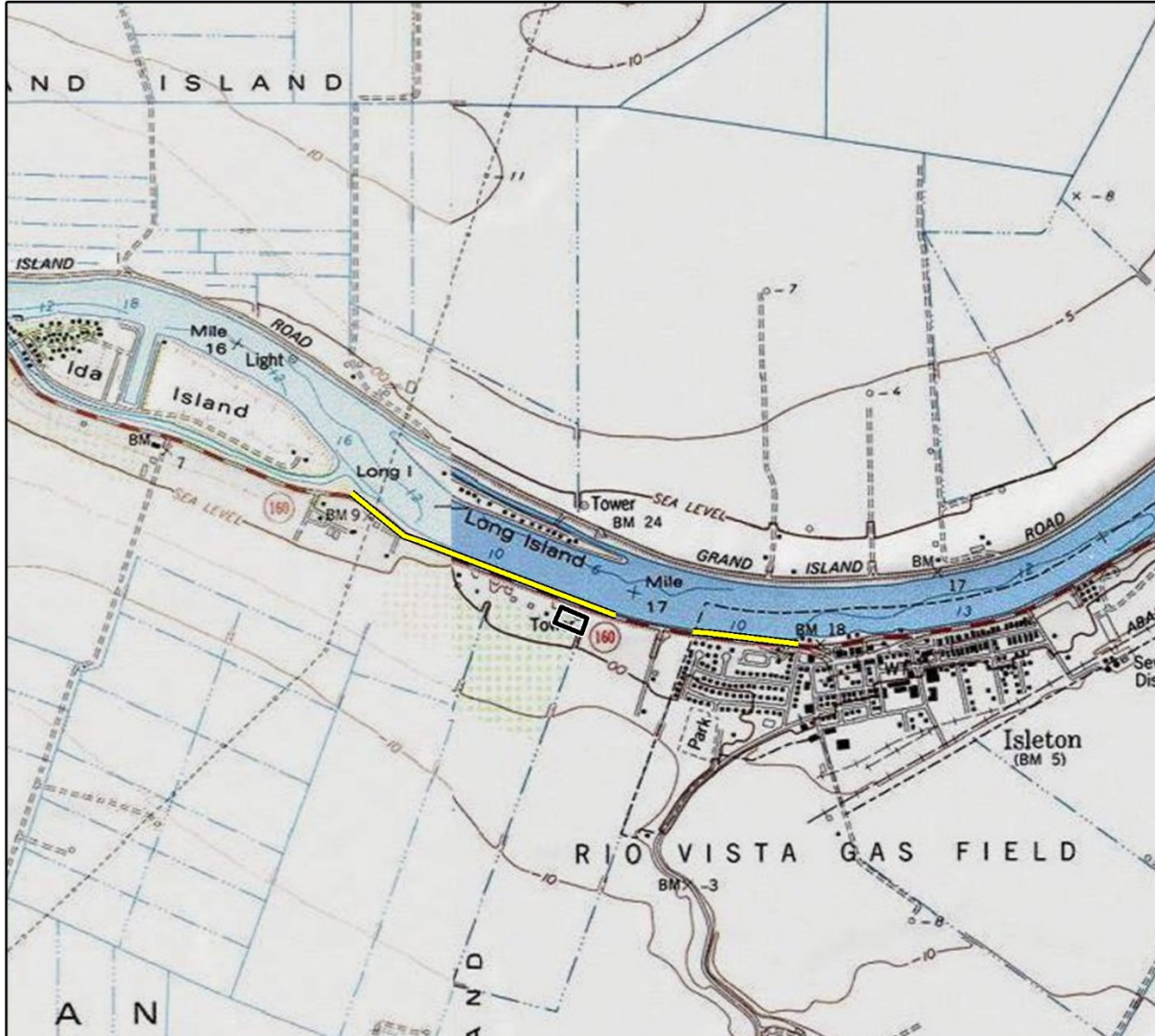
Sincerely,

A handwritten signature in dark ink, reading "Hannah Haas", with a stylized, cursive script.

Hannah Haas, M.A., RPA  
Senior Archaeologist & Project Manager

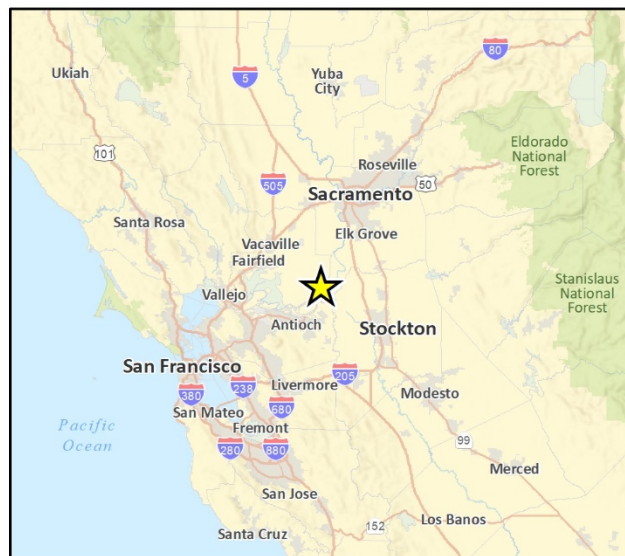
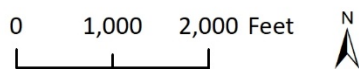
Enclosure: Project Location Map





Imagery provided by National Geographic Society, Esri and its licensors  
© 2020. Rio Vista & Isleton Quadrangle. T04N R03E S26,27. The  
topographic representation depicted in this map may not portray all of the  
features currently found in the vicinity today and/or features depicted in  
this map may have changed since the original topographic map was  
assembled.

- Project Site
- Staging Area







**Rincon Consultants, Inc.**

4825 J Street, Suite 200  
Sacramento, California 95819

916 706 1374 OFFICE AND FAX

info@rinconconsultants.com  
www.rinconconsultants.com

March 20, 2020

The Confederated Villages of Lisjan  
Corrina Gould, Chairperson  
10926 Edes Avenue  
Oakland, CA 94603  
cvltribe@gmail.com

**Subject: Cultural Study for the BALMD Levee Maintenance Project near Isleton, Sacramento County, CA**

Dear Chairperson Gould:

Rincon Consultants, Inc. (Rincon) was retained by Robertson-Bryan, Inc. to conduct a cultural resources study for the Brannan-Andrus Levee Maintenance District (BALMD) Levee Erosion Control and Habitat Enhancement Project (project) located near Isleton in Sacramento County, California. The project requires an update to the existing studies based on the revised project description, including three new staging areas, depicted in the enclosed figure.

As part of the process of identifying cultural resources issues for this project, Rincon contacted the Native American Heritage Commission (NAHC) and requested a Sacred Lands File (SLF) search and a list of Native American tribal organizations and individuals who may have knowledge of sensitive cultural resources in or near the project area. The SLF results came back negative. This letter serves to inform you of our understanding of the project, and to inquire about your knowledge of potential cultural resources that may be impacted by this project.

If you have knowledge or concerns about cultural resources that may exist within or near the project site, please contact me at 916-706-1374, extension 230, or at [hhaas@rinconconsultants.com](mailto:hhaas@rinconconsultants.com). Thank you for your assistance.

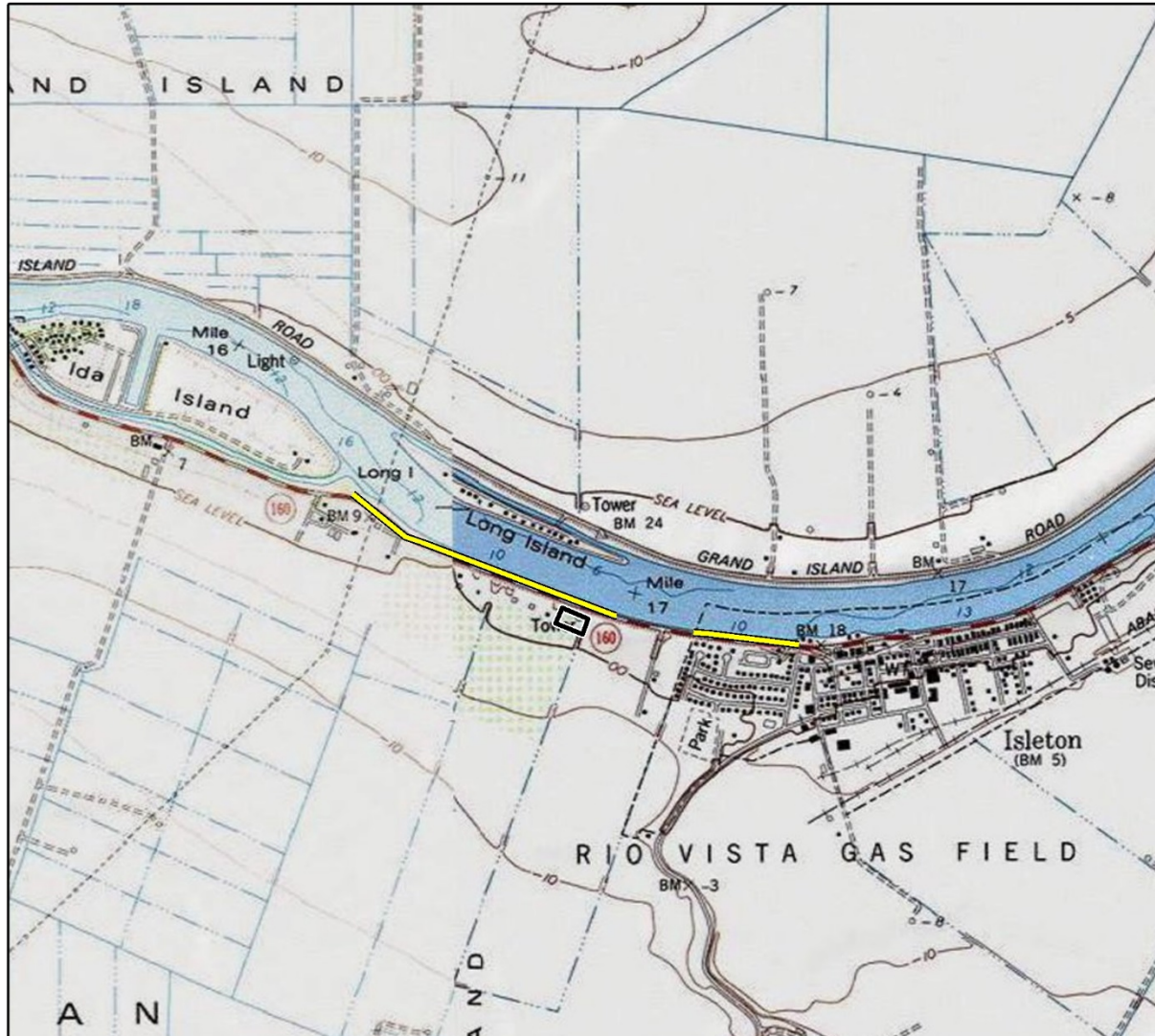
Sincerely,

A handwritten signature in dark ink that reads "Hannah Haas". The signature is fluid and cursive, with the first name and last name clearly distinguishable.

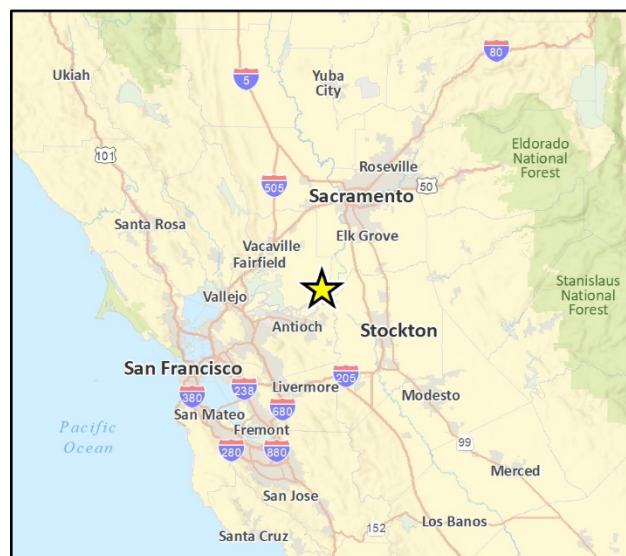
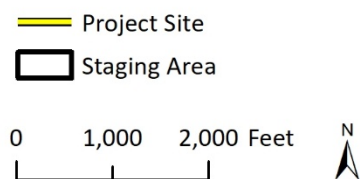
Hannah Haas, M.A., RPA  
Senior Archaeologist & Project Manager

Enclosure: Project Location Map





*Imagery provided by National Geographic Society, Esri and its licensors  
© 2020. Rio Vista & Isleton Quadrangle. T04N R03E S26,27. The  
topographic representation depicted in this map may not portray all of the  
features currently found in the vicinity today and/or features depicted in  
this map may have changed since the original topographic map was  
assembled.*







**Rincon Consultants, Inc.**

4825 J Street, Suite 200  
Sacramento, California 95819

916 706 1374 OFFICE AND FAX

info@rinconconsultants.com  
www.rinconconsultants.com

March 20, 2020

Yocha Dehe Wintun Nation  
Anthony Roberts, Chairperson  
P.O. Box 18  
Brooks, CA 95606  
aroberts@yochadehe-nsn.gov

**Subject: Cultural Study for the BALMD Levee Maintenance Project near Isleton, Sacramento County, CA**

Dear Chairperson Roberts:

Rincon Consultants, Inc. (Rincon) was retained by Robertson-Bryan, Inc. to conduct a cultural resources study for the Brannan-Andrus Levee Maintenance District (BALMD) Levee Erosion Control and Habitat Enhancement Project (project) located near Isleton in Sacramento County, California. The project requires an update to the existing studies based on the revised project description, including three new staging areas, depicted in the enclosed figure.

As part of the process of identifying cultural resources issues for this project, Rincon contacted the Native American Heritage Commission (NAHC) and requested a Sacred Lands File (SLF) search and a list of Native American tribal organizations and individuals who may have knowledge of sensitive cultural resources in or near the project area. The SLF results came back negative. This letter serves to inform you of our understanding of the project, and to inquire about your knowledge of potential cultural resources that may be impacted by this project.

If you have knowledge or concerns about cultural resources that may exist within or near the project site, please contact me at 916-706-1374, extension 230, or at [hhaas@rinconconsultants.com](mailto:hhaas@rinconconsultants.com). Thank you for your assistance.

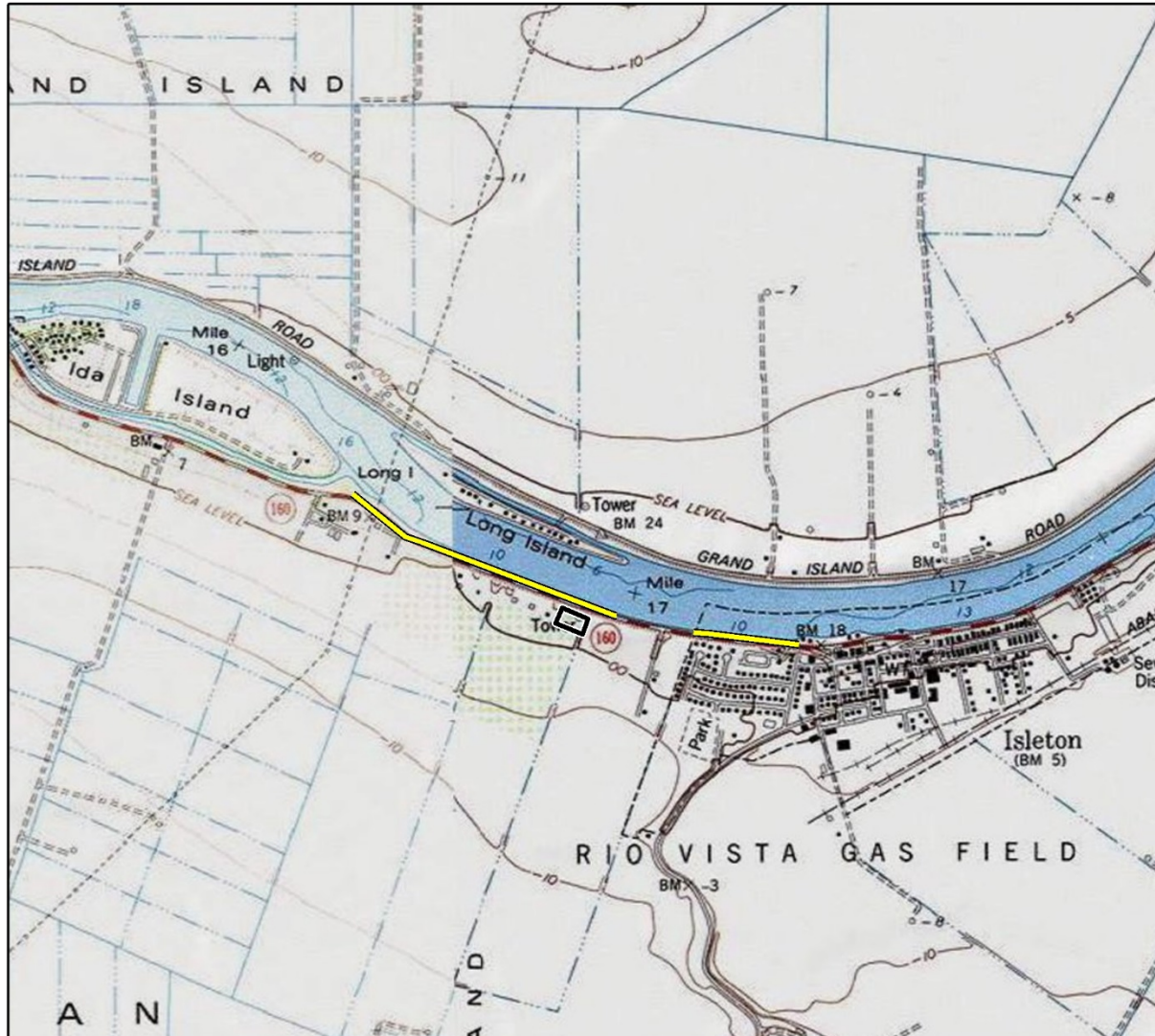
Sincerely,

A handwritten signature in dark ink, reading "Hannah Haas", with a stylized, cursive script.

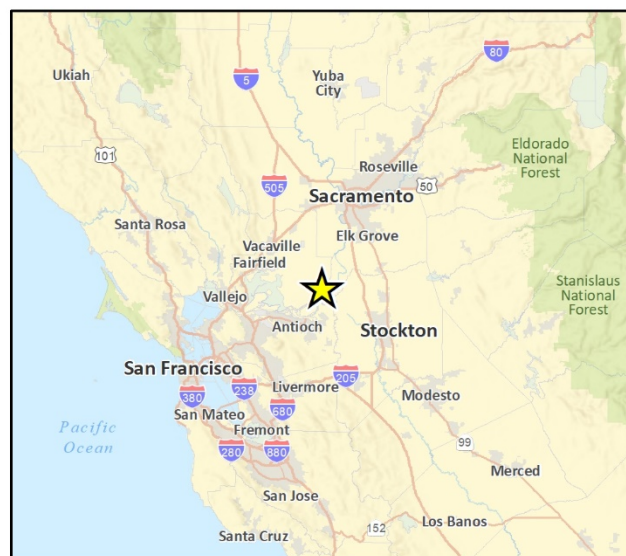
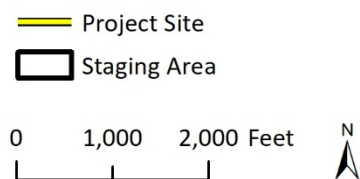
Hannah Haas, M.A., RPA  
Senior Archaeologist & Project Manager

Enclosure: Project Location Map





Imagery provided by National Geographic Society, Esri and its licensors  
© 2020. Rio Vista & Isleton Quadrangle. T04N R03E S26,27. The  
topographic representation depicted in this map may not portray all of the  
features currently found in the vicinity today and/or features depicted in  
this map may have changed since the original topographic map was  
assembled.







**Rincon Consultants, Inc.**

4825 J Street, Suite 200  
Sacramento, California 95819

916 706 1374 OFFICE AND FAX

info@rinconconsultants.com  
www.rinconconsultants.com

March 20, 2020

United Auburn Indian Community of the Auburn Rancheria  
Gene Whitehouse, Chairperson  
10720 Indian Hill Road  
Auburn, CA 95603  
bguth@auburnrancheria.com

**Subject: Cultural Study for the BALMD Levee Maintenance Project near Isleton, Sacramento County, CA**

Dear Chairperson Whitehouse:

Rincon Consultants, Inc. (Rincon) was retained by Robertson-Bryan, Inc. to conduct a cultural resources study for the Brannan-Andrus Levee Maintenance District (BALMD) Levee Erosion Control and Habitat Enhancement Project (project) located near Isleton in Sacramento County, California. The project requires an update to the existing studies based on the revised project description, including three new staging areas, depicted in the enclosed figure.

As part of the process of identifying cultural resources issues for this project, Rincon contacted the Native American Heritage Commission (NAHC) and requested a Sacred Lands File (SLF) search and a list of Native American tribal organizations and individuals who may have knowledge of sensitive cultural resources in or near the project area. The SLF results came back negative. This letter serves to inform you of our understanding of the project, and to inquire about your knowledge of potential cultural resources that may be impacted by this project.

If you have knowledge or concerns about cultural resources that may exist within or near the project site, please contact me at 916-706-1374, extension 230, or at hhaas@rinconconsultants.com. Thank you for your assistance.

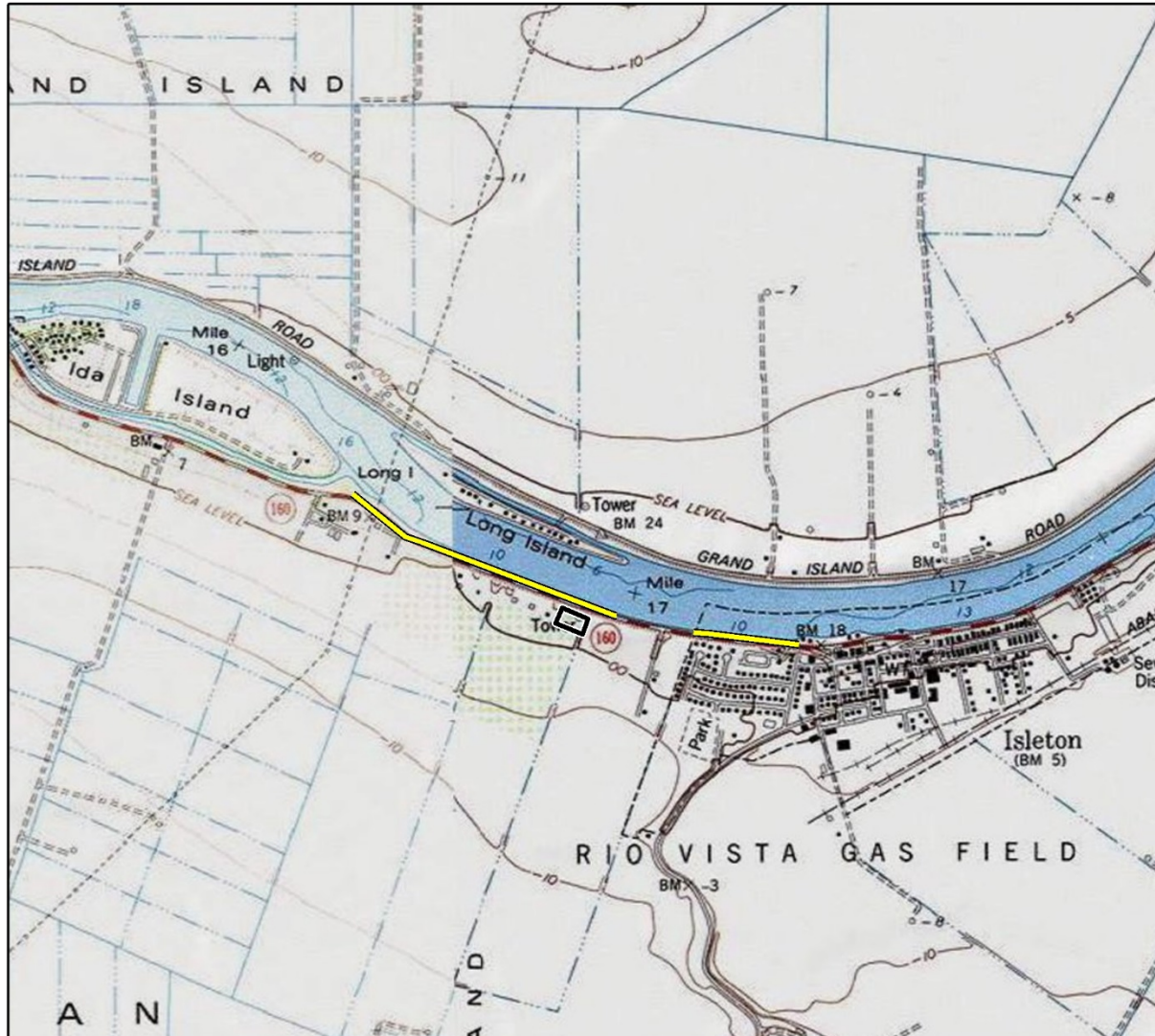
Sincerely,

A handwritten signature in dark ink that reads "Hannah Haas". The signature is fluid and cursive, with the first name and last name clearly distinguishable.

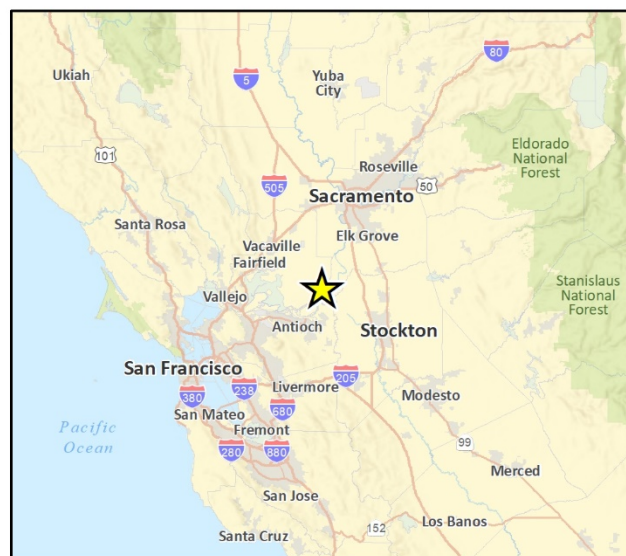
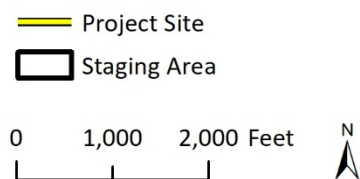
Hannah Haas, M.A., RPA  
Senior Archaeologist & Project Manager

Enclosure: Project Location Map





Imagery provided by National Geographic Society, Esri and its licensors  
© 2020. Rio Vista & Isleton Quadrangle. T04N R03E S26,27. The  
topographic representation depicted in this map may not portray all of the  
features currently found in the vicinity today and/or features depicted in  
this map may have changed since the original topographic map was  
assembled.





Brannan-Andrus Levee Maintenance District (BALMD) Levee Erosion Control & Habitat Enhancement Project

**Table 1**  
**Historic Groups Consulted**

Local Group/Government Contact	Rincon Coordination Efforts	Response to Coordination Efforts
City of Isleton James Gates, Planning Dept. 101 2 <sup>nd</sup> Street Isleton, CA 95641 916-777-7770	11/27/17: Letter sent via U.S. Mail	
Brannan-Andrus Historical Society at the Isleton Museum 17 Main Street P.O. Box 933 Isleton, CA 95641 916-623-5775 <a href="mailto:info@isletonhistory.org">info@isletonhistory.org</a>	11/27/17: Letter sent via U.S. Mail	
Rio Vista Museum 16 N. Front Street Rio Vista, California 94571 707-374-5169	11/27/17: Letter sent via U.S. Mail	
City of Rio Vista Issac George, Community Development Director 1 Main Street Rio Vista, CA 94571 707-374-6451 ext. 1104	11/27/17: Letter sent via U.S. Mail	
Sacramento County Historical Society 5380 Elvas Avenue, Suite 213 Sacramento, CA 95819 916-572-9858 Contact email through website	11/27/17: Letter sent via U.S. Mail	





**Rincon Consultants, Inc.**

4825 J Street, Suite 200  
Sacramento, California 95819

916 706 1374 OFFICE AND FAX

info@rinconconsultants.com  
www.rinconconsultants.com

November 27, 2017  
Project No. 17-04347

Brannan-Andrus Historical Society,  
Isleton Museum  
17 Main Street  
P.O. Box 933  
Isleton, CA 95641

**Subject: Brannan-Andrus Levee Maintenance District (BALMD) Levee Erosion Control and  
Habitat Enhancement Project, City of Isleton, Sacramento County, California**

To Whom it May Concern:

Rincon Consultants has been retained to conduct a cultural resources study for BALMD's proposed Levee Erosion Control and Habitat Enhancement Project. The proposed project consists of erosion control and habitat enhancement at three sites that are cumulatively 1.4 miles in length, located on the left bank of the Sacramento River, on Brannan Island, starting from the confluence of Deep Water Ship Channel upstream to the City of Isleton. Improvements would include grading and placement of fill to construct a new levee slope and planting benches, planting of native plants to enhance the habitat, and a minimum of five years of monitoring and maintenance to ensure successful plant establishment.

The project is subject to the California Environmental Quality Act, the National Environmental Policy Act, and Section 106 of the National Historic Preservation Act. Rincon is currently working in the study area to identify any cultural resource issues for the proposed project. We are writing to provide you with an opportunity to be involved in the Section 106 process as a consulting party. If you or your organization have any knowledge or specific concerns regarding cultural resources in the project area, please respond by telephone at 805-644-4455 ext. 76 or by email to [szgurrola@rinconconsultants.com](mailto:szgurrola@rinconconsultants.com). Thank you for your assistance.

Sincerely,

Susan Zamudio-Gurrola  
Architectural Historian

*Enclosure: Project Location Map*





**Rincon Consultants, Inc.**

4825 J Street, Suite 200  
Sacramento, California 95819

916 706 1374 OFFICE AND FAX

info@rinconconsultants.com  
www.rinconconsultants.com

November 27, 2017  
Project No. 17-04347

James Gates  
City of Isleton Planning Dept.  
101 2nd Street  
Isleton, CA 95641

**Subject: Brannan-Andrus Levee Maintenance District (BALMD) Levee Erosion Control and  
Habitat Enhancement Project, City of Isleton, Sacramento County, California**

Dear Mr. Gates:

Rincon Consultants has been retained to conduct a cultural resources study for BALMD's proposed Levee Erosion Control and Habitat Enhancement Project. The proposed project consists of erosion control and habitat enhancement at three sites that are cumulatively 1.4 miles in length, located on the left bank of the Sacramento River, on Brannan Island, starting from the confluence of Deep Water Ship Channel upstream to the City of Isleton. Improvements would include grading and placement of fill to construct a new levee slope and planting benches, planting of native plants to enhance the habitat, and a minimum of five years of monitoring and maintenance to ensure successful plant establishment.

The project is subject to the California Environmental Quality Act, the National Environmental Policy Act, and Section 106 of the National Historic Preservation Act. Rincon is currently working in the study area to identify any cultural resource issues for the proposed project. We are writing to provide you with an opportunity to be involved in the Section 106 process as a consulting party. If you or your organization have any knowledge or specific concerns regarding cultural resources in the project area, please respond by telephone at 805-644-4455 ext. 76 or by email to [szgurrola@rinconconsultants.com](mailto:szgurrola@rinconconsultants.com). Thank you for your assistance.

Sincerely,

A handwritten signature in blue ink, reading "Susan Zamudio-Gurrola". The signature is fluid and cursive, with the first name "Susan" being more prominent.

Susan Zamudio-Gurrola  
Architectural Historian

*Enclosure: Project Location Map*





**Rincon Consultants, Inc.**

4825 J Street, Suite 200  
Sacramento, California 95819

916 706 1374 OFFICE AND FAX

info@rinconconsultants.com  
www.rinconconsultants.com

November 27, 2017  
Project No. 17-04347

Issac George  
City of Rio Vista  
Community Development Director  
1 Main Street  
Rio Vista, CA 94571

**Subject: Brannan-Andrus Levee Maintenance District (BALMD) Levee Erosion Control and  
Habitat Enhancement Project, City of Isleton, Sacramento County, California**

Dear Mr. George:

Rincon Consultants has been retained to conduct a cultural resources study for BALMD's proposed Levee Erosion Control and Habitat Enhancement Project. The proposed project consists of erosion control and habitat enhancement at three sites that are cumulatively 1.4 miles in length, located on the left bank of the Sacramento River, on Brannan Island, starting from the confluence of Deep Water Ship Channel upstream to the City of Isleton. Improvements would include grading and placement of fill to construct a new levee slope and planting benches, planting of native plants to enhance the habitat, and a minimum of five years of monitoring and maintenance to ensure successful plant establishment.

The project is subject to the California Environmental Quality Act, the National Environmental Policy Act, and Section 106 of the National Historic Preservation Act. Rincon is currently working in the study area to identify any cultural resource issues for the proposed project. We are writing to provide you with an opportunity to be involved in the Section 106 process as a consulting party. If you or your organization have any knowledge or specific concerns regarding cultural resources in the project area, please respond by telephone at 805-644-4455 ext. 76 or by email to [szgurrola@rinconconsultants.com](mailto:szgurrola@rinconconsultants.com). Thank you for your assistance.

Sincerely,

Susan Zamudio-Gurrola  
Architectural Historian

*Enclosure: Project Location Map*





**Rincon Consultants, Inc.**

4825 J Street, Suite 200  
Sacramento, California 95819

916 706 1374 OFFICE AND FAX

info@rinconconsultants.com  
www.rinconconsultants.com

November 27, 2017  
Project No. 17-04347

Rio Vista Museum  
16 N. Front Street  
Rio Vista, California 94571

**Subject: Brannan-Andrus Levee Maintenance District (BALMD) Levee Erosion Control and Habitat Enhancement Project, City of Isleton, Sacramento County, California**

To Whom it May Concern:

Rincon Consultants has been retained to conduct a cultural resources study for BALMD's proposed Levee Erosion Control and Habitat Enhancement Project. The proposed project consists of erosion control and habitat enhancement at three sites that are cumulatively 1.4 miles in length, located on the left bank of the Sacramento River, on Brannan Island, starting from the confluence of Deep Water Ship Channel upstream to the City of Isleton. Improvements would include grading and placement of fill to construct a new levee slope and planting benches, planting of native plants to enhance the habitat, and a minimum of five years of monitoring and maintenance to ensure successful plant establishment.

The project is subject to the California Environmental Quality Act, the National Environmental Policy Act, and Section 106 of the National Historic Preservation Act. Rincon is currently working in the study area to identify any cultural resource issues for the proposed project. We are writing to provide you with an opportunity to be involved in the Section 106 process as a consulting party. If you or your organization have any knowledge or specific concerns regarding cultural resources in the project area, please respond by telephone at 805-644-4455 ext. 76 or by email to [szgurrola@rinconconsultants.com](mailto:szgurrola@rinconconsultants.com). Thank you for your assistance.

Sincerely,

A handwritten signature in blue ink, reading "Susan Zamudio-Gurrola". The signature is fluid and cursive, with the first name "Susan" being more prominent.

Susan Zamudio-Gurrola  
Architectural Historian

*Enclosure: Project Location Map*





**Rincon Consultants, Inc.**

4825 J Street, Suite 200  
Sacramento, California 95819

916 706 1374 OFFICE AND FAX

info@rinconconsultants.com  
www.rinconconsultants.com

November 27, 2017  
Project No. 17-04347

Sacramento County Historical Society  
5380 Elvas Avenue, Suite 213  
Sacramento, CA 95819

**Subject: Brannan-Andrus Levee Maintenance District (BALMD) Levee Erosion Control and Habitat Enhancement Project, City of Isleton, Sacramento County, California**

To Whom it May Concern:

Rincon Consultants has been retained to conduct a cultural resources study for BALMD's proposed Levee Erosion Control and Habitat Enhancement Project. The proposed project consists of erosion control and habitat enhancement at three sites that are cumulatively 1.4 miles in length, located on the left bank of the Sacramento River, on Brannan Island, starting from the confluence of Deep Water Ship Channel upstream to the City of Isleton. Improvements would include grading and placement of fill to construct a new levee slope and planting benches, planting of native plants to enhance the habitat, and a minimum of five years of monitoring and maintenance to ensure successful plant establishment.

The project is subject to the California Environmental Quality Act, the National Environmental Policy Act, and Section 106 of the National Historic Preservation Act. Rincon is currently working in the study area to identify any cultural resource issues for the proposed project. We are writing to provide you with an opportunity to be involved in the Section 106 process as a consulting party. If you or your organization have any knowledge or specific concerns regarding cultural resources in the project area, please respond by telephone at 805-644-4455 ext. 76 or by email to [szgurrola@rinconconsultants.com](mailto:szgurrola@rinconconsultants.com). Thank you for your assistance.

Sincerely,

A handwritten signature in blue ink, reading "Susan Zamudio-Gurrola". The signature is fluid and cursive, with the first name "Susan" being more prominent.

Susan Zamudio-Gurrola  
Architectural Historian

*Enclosure: Project Location Map*



# Appendix C

---

## Resource Record Updates



**CONTINUATION SHEET**

\*Recorded by: H. Haas

\*Date: 12/6/2017

☐ Continuation

☒ Update

Resource P-43-002109 consists of a historic-era water pump and pipe located on the water side of the earthen levee supporting State Route 160. The pump and pipe supplies water from the Sacramento River to the agricultural fields on the opposite side of the levee. Although the construction date is unknown, the pump and pipe likely date to the same period of construction of the house and agricultural property on the opposite side of the levee which dates to 1940 (Sacramento County Assessor's Office 2017). However, the pump is located on a separate parcel from the adjacent buildings, thus the association is unclear. The pump and pipe appear unchanged since their original recording in 2008.

Resource P-34-002109 does not appear to be eligible for listing in the California Register of Historical Resources, the National Register of Historic Places, or local significance under any of the significance criteria. The property does not appear to be associated with any events that have made a significant contribution to broad patterns of history (Criteria 1/A) and is not known to be associated with the lives of significant persons in California's past (Criteria 2/B). The pump is a standard irrigation pump channeled via pipe through the levee, which are ubiquitous throughout the agricultural areas of the Delta and thus does not embody any distinctive characteristics (Criteria 3/C). The resource is not likely to yield any important information to history as a simple irrigation pump with no significant engineering features (Criteria 4/D). Thus, the resource is not considered eligible for listing in the CRHR.

References:

Haas, Hannah and Benjamin Vargas. 2017. Phase I Cultural Resources Study for the BALMD Levee Erosion Control Habitat Enhancement Project. On file with the North Central Information Center, Sacramento State University.

Sacramento County Assessor's Office. 2017. Sacramento County Assessor Parcel Viewer. Accessed online, <http://assessorparcelviewer.saccounty.net/jsviewer/assessor.html>.



State of California - The Resources Agency  
DEPARTMENT OF PARKS AND RECREATION  
**PRIMARY RECORD**

Primary # P-34-2109  
HRI # \_\_\_\_\_  
Trinomial \_\_\_\_\_  
NRHP Status Code 7

Other Listings \_\_\_\_\_  
Review Code \_\_\_\_\_ Reviewer \_\_\_\_\_ Date \_\_\_\_\_

Page 1 of 5

\*Resource Name or #: JSA002

**P1. Other Identifier:**

\*P2. Location: ☐ Not for Publication ☒ Unrestricted \*a. County: Sacramento

\*b. USGS Quad: Rio Vista (1978); T R, Sec. 0;

c. Address: Isleton

d. UTM: Zone 10; 620388 mE/ 4225006 mN NAD83 Datum

**e. Other Locational Data:**

The feature is located on the west (left) side of State Route (SR) 160 at postmile 3.7, partially within the highway right-of-way and three meters from the edge-of-pavement. From the intersection of SR 160 and A Street in Isleton, travel southbound 0.9 miles to the mailbox at 15041 SR 160 on the south (right) side of the highway (site datum). The resource is located on the embankment below the north side of the highway directly opposite the site datum.

APN: 157-0100-091, 157-0100-045, 157-0100-092

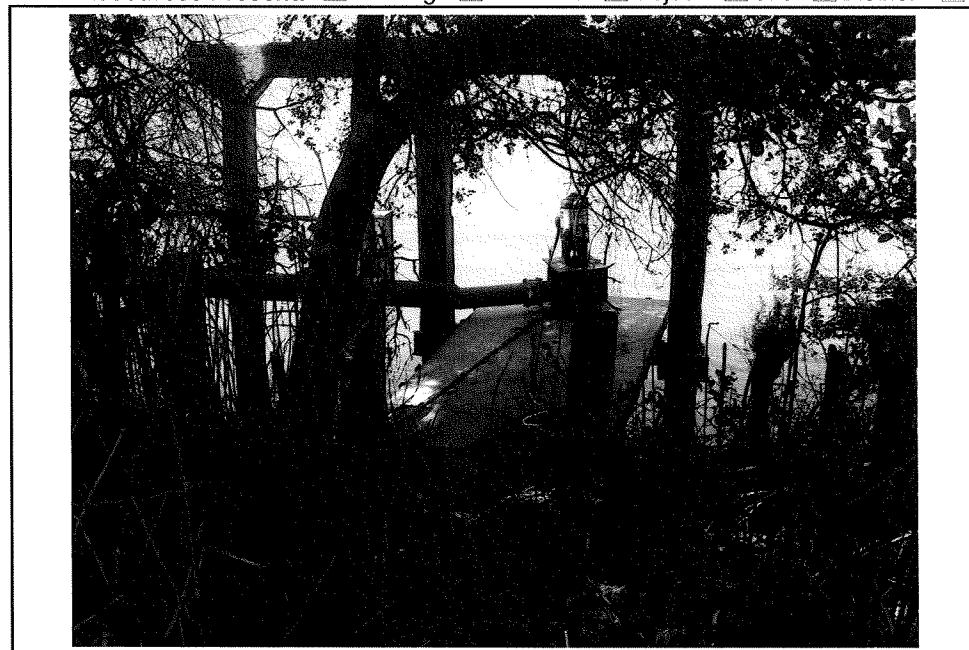
This resource is in the Wetlands landgrant.

**\*P3a. Description:**

This resource consists of a water pump platform and pipe that provides irrigation water and/or drainage to several agricultural parcels at 15041-15051 State Route 160. The feature was encountered during the Caltrans District 3 Rural Conventional Highways Inventory, which was restricted to the highway right-of-way. The pump is located on the banks of the Sacramento River on the north side of the levee that carries the highway. It lifts river water through the levee via a welded steel pipe to pear orchards surrounding an historic-period residence that county property records indicate was built in 1940. Only the water pump platform and pipe appear to encroach within the study area for this project and are formally recorded herein; the residence lies beyond the limits of the survey. The construction date of the water pump feature is indeterminate, but its appearance and materials (i.e., board-formed concrete) suggest that it was originally built during the first half of the twentieth century. (See Continuation Sheet)

\*P3b. Resource Attributes: HP11 Engineering Structure

\*P4. Resources Present: ☐ Building ☒ Structure ☐ Object ☐ Site ☐ District ☐ Element of District ☐ Other (Isolates, etc.)



**\*P5b. Description of Photo:**

JSA-002-3, camera facing north, photograph taken from the edge of SR 160.

**\*P6. Date Constructed/Age & Sources:**

☒ Historic ☐ Prehistoric ☐ Both  
Unknown

**\*P7. Owner and Address:**

Evelyn Silva, 15041 Highway 160  
Isleton, CA 95641

**\*P8. Recorded by:**

Bryan Larson & Rebecca Flores, JRP  
Historical Consulting, LLC. 1490 Drew  
Ave. Suite 110 Davis, CA 95618

\*P9. Date Recorded: 6/15/2007

\*P10. Survey Type:  
Reconnaissance

\*P11. Citation: Leach-Palm et al. 2008, Cultural Resources Inventory of Caltrans District 3 Rural Conventional Highways in Butte, Colusa, El Dorado, Glenn, Nevada, Placer, Sacramento, Sierra, Sutter, Yolo, and Yuba counties.

\* Attachments: ☐ None ☒ Location Map ☒ Sketch Map ☒ Continuation Sheet ☐ Building, Structure, and Object Record  
☐ Archaeological Record ☐ District Record ☐ Linear Feature Record ☐ Milling Station Record ☐ Rock Art Record  
☐ Artifact Record ☐ Photograph Record ☐ Other:



State of California - The Resources Agency  
DEPARTMENT OF PARKS AND RECREATION  
**CONTINUATION SHEET**

Primary # p-34-2109  
HRI # \_\_\_\_\_  
Trinomial \_\_\_\_\_

Page 2 of 5

\*Resource Name or #: JSA002

\*Recorded By: Bryan Larson & Rebecca Flores, JRP Historical Consulting. \*Date: 6/15/2007 ☒ Continuation ☐ Update

P3a. Description (continued):

This resource consists of a roughly eight-foot by 20-foot metal platform that extends into the Sacramento River, at the end of which is mounted a small "Unidrive" water pump. Running in a line parallel to and about six feet from shore are four 12-inch square concrete pilings that taper toward the top. The pilings stand about twenty feet high above the waterline and are connected along the top by a concrete cross beam. The metal platform is clipped to the two center pilings near the end where the pump is mounted. Four more concrete pilings, each measuring 12-inch square and six feet tall, are located at the shoreline; two of these anchor the metal platform. A two-foot wide by ten-foot long steel ramp provides access from the levee slope to the pump platform.

A welded steel water pipe connected to the water pump traverses the levee in a southwesterly direction and rises toward the highway. The pipe is about 12 inches in diameter at the pump and platform, at which point it widens to about 16 inches in diameter. The pipe enters the levee about eight feet below the roadway and re-emerges on the southern side of the levee where it is obscured from view by heavy growth.

References:

First American Real Estate Solutions online database, Sacramento County, Property Record for Assessor's Parcel Numbers, accessed July 2007.

USGS. Isleton, 7.5-minute topographical map. Washington: USGS, 1910.

USGS. Isleton, 7.5-minute topographical map. Washington: USGS, 1952.



Page 3 of 5

\*Resource Name or #: JSA002

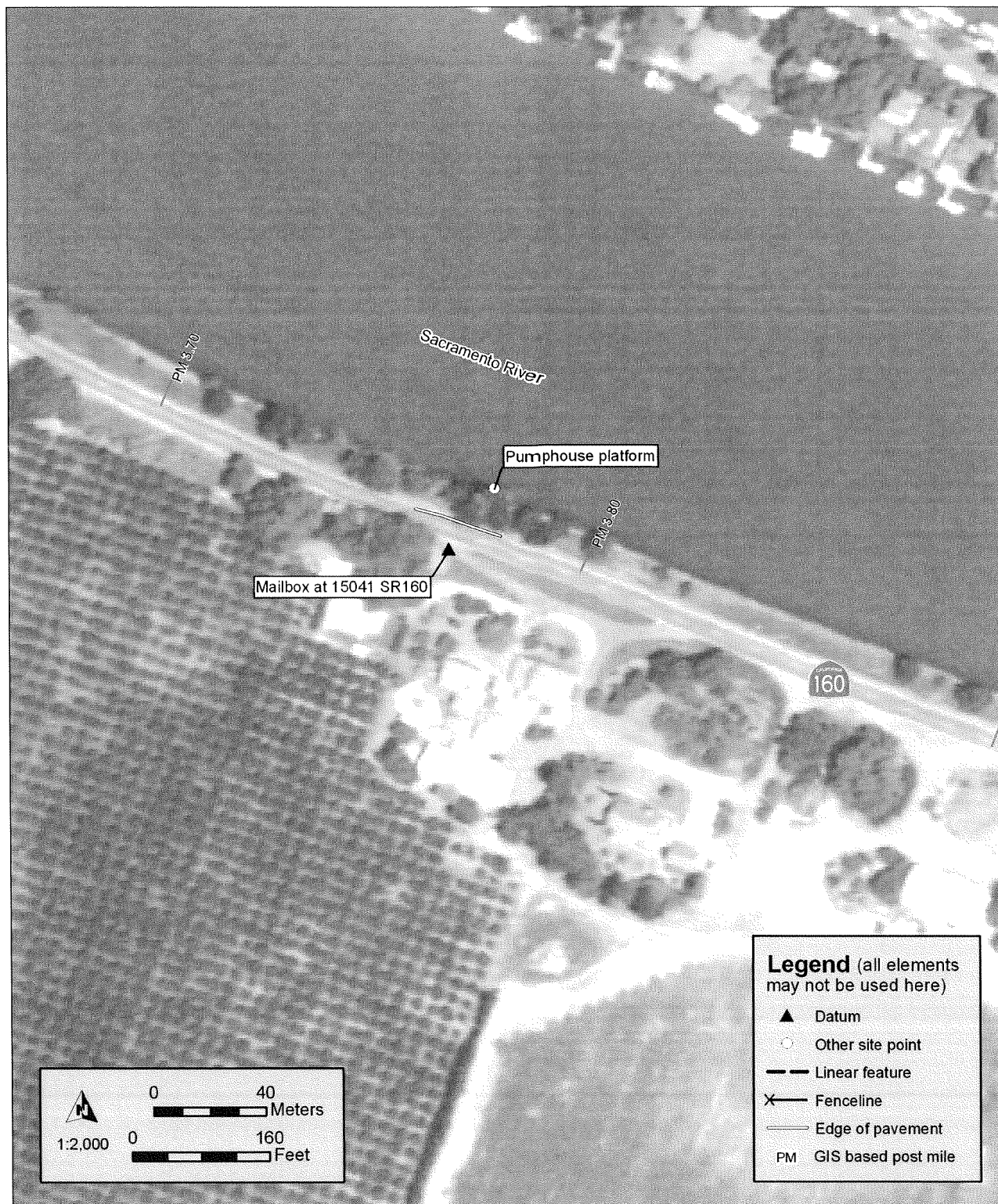
\*Recorded By: Bryan Larson & Rebecca Flores, JRP Historical Consulting

\*Date: 6/15/2007 ☐ Continuation ☐ Update



JSA-002-019, view of water pipe where it enters levee on the north side of SR 160, camera facing northeast.





Sketch map is based on 2007 GPS data collected within the highway right-of-way.



State of California - The Resources Agency  
DEPARTMENT OF PARKS AND RECREATION  
**LOCATION MAP**

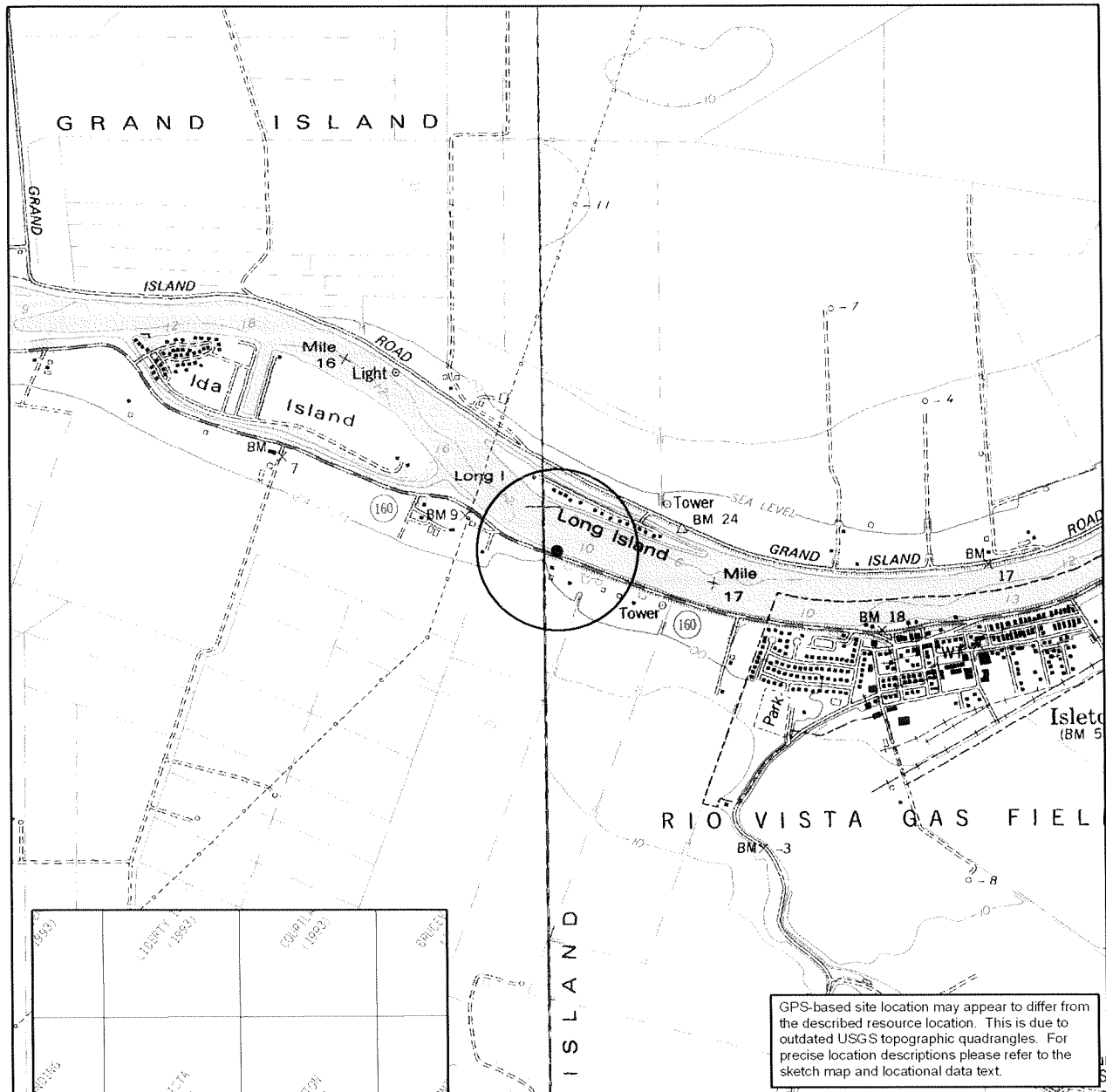
Primary # P-34-2109  
HRI # \_\_\_\_\_  
Trinomial \_\_\_\_\_

Page 5 of 5

\*Resource Name or #: JSA002

\*Map Name: Rio Vista (1978)

\*Year:



Key to USGS 7.5' quads depicted

SCALE 1:24,000



**CONTINUATION SHEET**

\*Recorded by: H. Haas

\*Date: 12/7/2017

☐ Continuation

☒ Update

Resource P-34-002143 consists of an earthen levee separating the Sacramento River from Brannan and Andrus islands. This update includes segments of the levee on Brannan Island from the western edge of the City of Isleton to the west following State Route 160 (see attached map). The current project proposes maintenance and habitat enhancement along the water-side of the levee. The levee has been continuously maintained, repaired, and modified since its original construction. It appears to be in a similar state to its original recording in 2008 and the most recent segment update in 2016.

In 2006, the levee was presumed eligible for listing in the National Register of Historic Places (NRHP) under Criterion A for its association with significant events. It was determined, however, that the project, which involved repairs to the levee, would not affect the resource because the geometry, location, and purpose of the levee would not be altered. The State Historic Preservation Office (SHPO) concurred with this finding.

In the 2016 update, Tremaine and Lopez describe the levee as significant for its contribution to broad patterns of local and state history by allowing the settlement of Brannan and Andrus Islands and the surrounding agricultural activities. They state, however, that the levee has been rebuilt and modified numerous times since its original construction and thus does not retain integrity of design, materials, or workmanship.

References:

Haas, Hannah and Benjamin Vargas. 2017. Phase I Cultural Resources Study for the BALMD Levee Erosion Control and Habitat Enhancement Project. On file with the North Central Information Center, Sacramento State University.



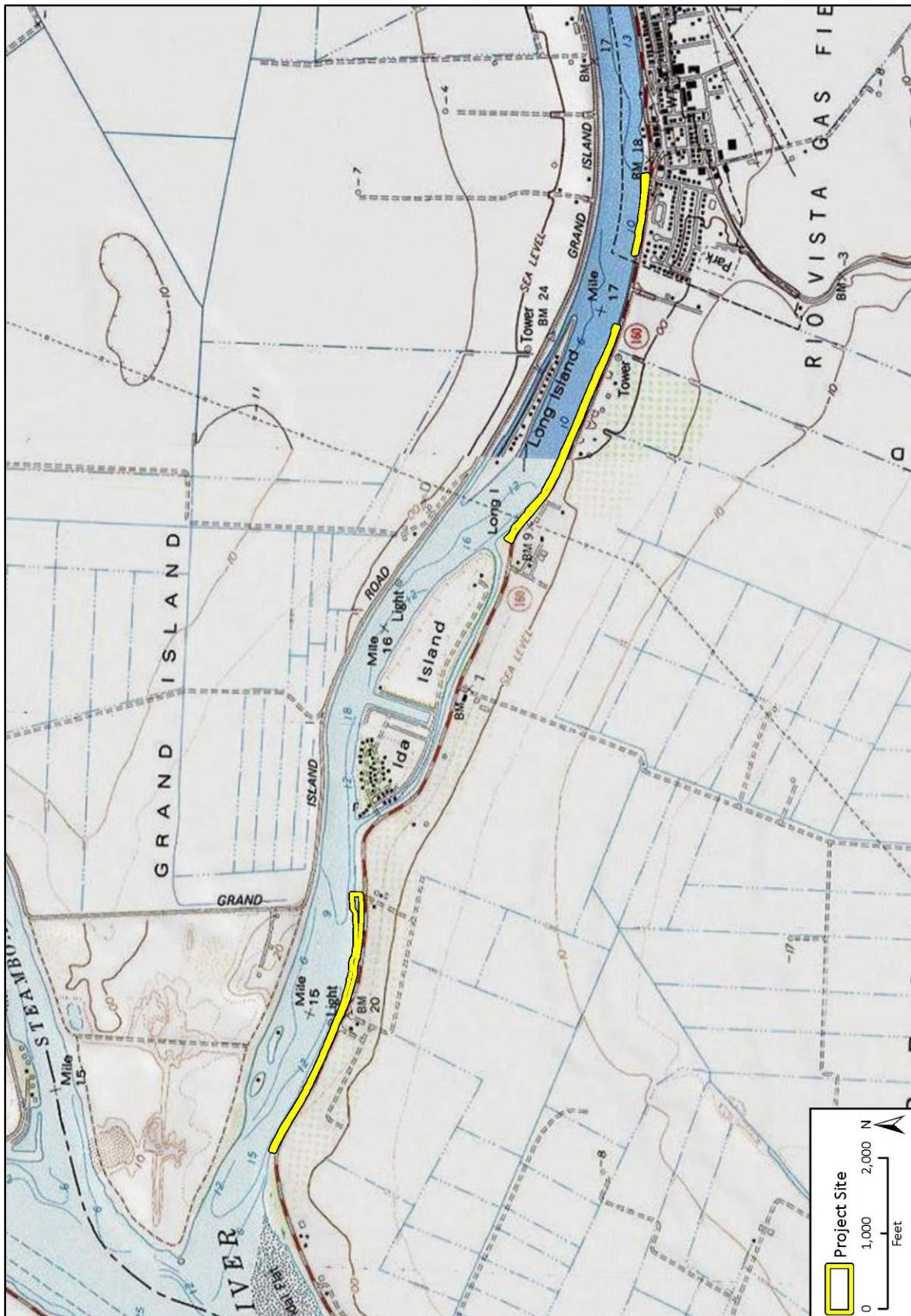


Fig. 1 Project Location  
Imagery provided by National Geographic Society, ESRI and its licensors © 2017. Rio Vista & Isleton Quadrangles  
The topographic representation depicted in this map may not portray all of the features currently found in the vicinity today and/or features depicted in this map may have changed since the original topographic map was assembled.



## CONTINUATION SHEET

Page 1 of 3

\*Resource Name or # JSA100 (Levee Segment B)

\*Recorded by: Kim Tremaine and John Lopez

\*Date: November 23, 2016

☐ Continuation ☒ Update

### P3a. Description (updated): Isleton Levee Section

Segment B section - UTM center point: 621662.5mN 4224759.8mE

The entirety of levee segment B, from the southern tip of Brannan Island to the bridge just north of Isleton on Andrus Island, was first recorded by JRP in 2008. A small section of levee segment B past the City of Isleton for a distance of 494 feet (see aerial photo in next Continuation Sheet). It is currently roughly 170 feet wide and 10 feet tall (see cross section in Continuation Sheet 3 of 3). This section of the levee is located 1.1 miles southwest of the Isleton Bridge.

The Isleton section of levee, between A and B streets, was originally within Reclamation District No. 8, managing the upper half of Andrus Island. The levee in this area was raised in 1870, one year before the rest of the levee was raised on the lower half of Andrus Island, using monies appropriated from the Swamp Land Fund (Garone 2015). Given the construction date, it is likely that the work was conducted by hand and built with peat blocks manually cut and placed using Chinese labor.

The lower half of Andrus Island was eventually rebuilt between 1882 and 1893 after repeated inundations between 1878 and 1886 (Thompson & Dutra 1983, in Garone 2015). It is not known whether this rebuilding extended to Isleton. The work was completed using a clamshell dredge, taking clay and alluvial materials dredged from the river channel to make the levees more stable.

In 1919, bids for constructing the highway between Isleton and the Rio Vista Bridge were being accepted, with specifications calling for the levee to be raised another two feet (Sacramento Union, 7 October 1919). In 1936, levee segment B was finally assessed as up to the standard of the Sacramento Flood Act established by Congress in 1917. Since this time, the Isleton segment of levee has undergone continued maintenance and likely countless minor upgrades.

The Isleton levee Section is argued significant for its association with events that have contributed to the broad patterns of local and state history, representing one of the earliest examples of swampland reclamation that soon transformed the Central Valley, especially the Delta, into prime agricultural land. This section was also instrumental in permitting the founding of the town of Isleton and protecting the highly productive asparagus crops that thrived on Andrus Island. Despite its significance, however, its integrity of design, materials, and workmanship has been lost, having been rebuilt and modified countless times over the last century.

#### References Cited:

Garone, P. 2015 Managing the Garden: Agriculture, Reclamation, and Restoration in Sacramento-San Joaquin Delta. Prepared as part of the Delta Narratives Project under a grant from the California Delta Protection Commission.



## CONTINUATION SHEET

Page 1 of 3

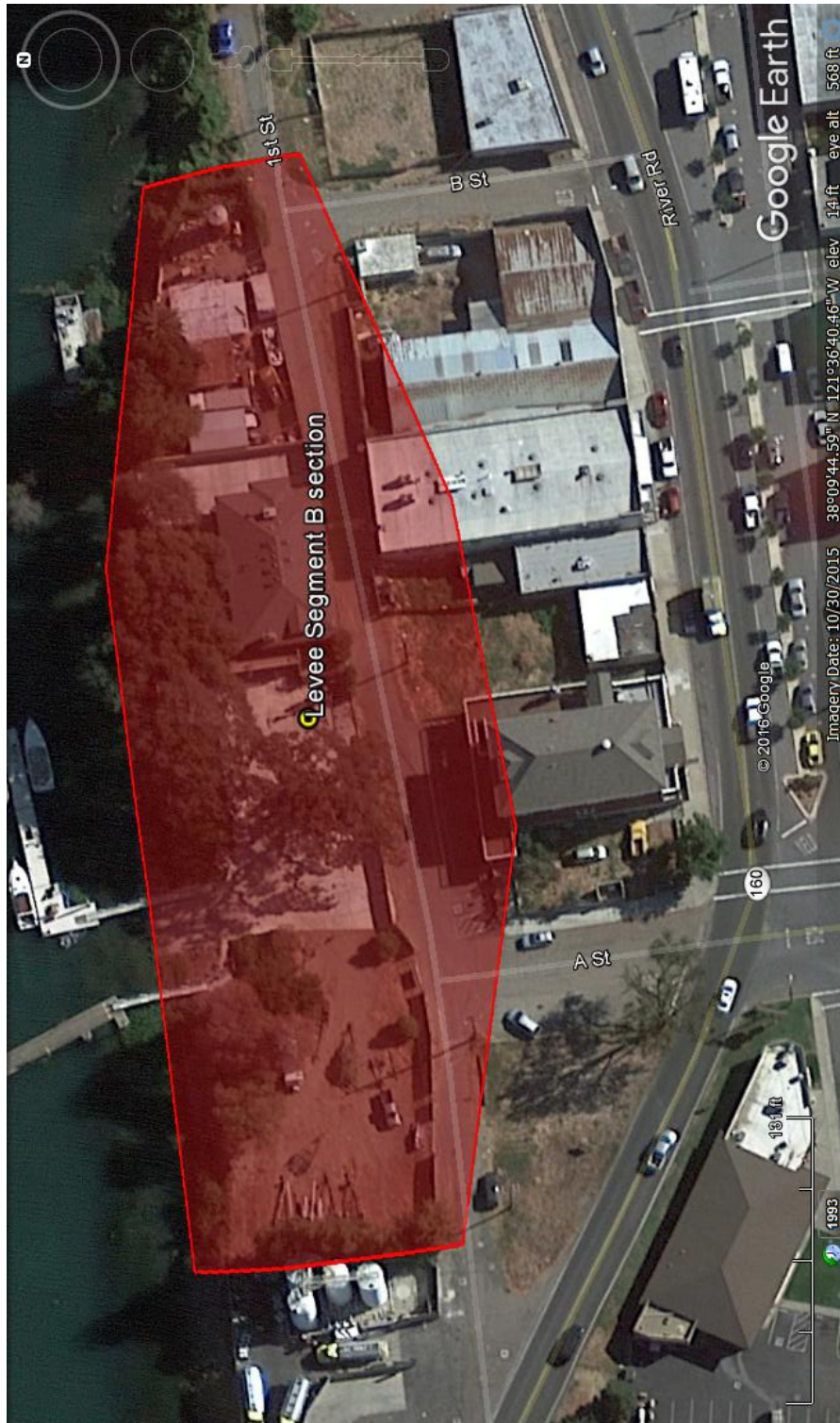
\*Resource Name or # JSA100 (Levee Segment B)

\*Recorded by: Kim Tremaine and John Lopez

\*Date: November 23, 2016

☐ Continuation ☒ Update

P5b. Description of Photo: Aerial view of Isleton levee section





## CONTINUATION SHEET

Page 1 of 3

\*Resource Name or # JSA100 (Levee Segment B)

\*Recorded by: Kim Tremaine and John Lopez

\*Date: November 23, 2016

☐ Continuation ☒ Update

P5b. Description of Photo: Elevation profile of Isleton levee section





State of California — The Resources Agency  
DEPARTMENT OF PARKS AND RECREATION  
**CONTINUATION SHEET**

Primary # P-34-002143  
HRI#  
Trinomial

Page 1 of 1

\*Resource Name or # (Assigned by recorder) JSA-100

\*Recorded by: Amanda Martinez and Philip Hanes

\*Date: Aug 26, 2008 ☐ Continuation ☒ Update

This historic-era resource was originally recorded by Melvin and Freeman in February 2008 and includes four segments of the earthen levee on the east and west banks of the Sacramento River between Sherman Island on the south and Freeport on the north. The recorded segments are situated along State Route (SR) 160 and SR 160L. Although the precise date for each of the segments is uncertain, they were each part of the Sacramento River Flood Control Plan established by Congress in 1917. The U.S. Army Corps of Engineers has rebuilt and improved the levees on numerous occasions since that time. At the time of their recordation, the four segments of the 25 to 40-foot wide earthen levee were in good condition.

SWCA surveyed and photo-documented the portion of the levee on the eastern bank of the Sacramento River between UTM coordinates 615115m East, 4221183m N and 614998m East, 4220884m and between UTM coordinates 613452m East, 4216655m N and 613408m East, 4216419m North zone 10 NAD 83 as part of a intensive survey for a levee repair project proposed by the U.S. Army Corps of Engineers and the State of California Reclamation Board. As part of the bank protection measures to prevent ongoing stream bank erosion, levee improvement will include heightening, widening, etc.

At the time of SWCA's survey on August 26, 2008, the levee was in the same condition as recorded by Melvin and Freeman in February 2008.



Overview of levee and SR 160 (view to north; 8-26-08)

Recorded by: SWCA Environmental Consultants, 3840 Rosin Court, Suite 130, Sacramento, CA 95834

Report Citation: A. Martinez and N.E. Sikes. 2008. Cultural Resources Survey for the Levee Repair Project at 20 Locations in Colusa, Sacramento, Sutter, Tehama, and Yolo Counties, California



State of California - The Resources Agency  
DEPARTMENT OF PARKS AND RECREATION  
**PRIMARY RECORD**

Primary # P-34-2143  
HRI # \_\_\_\_\_  
Trinomial \_\_\_\_\_  
NRHP Status Code 7

Other Listings \_\_\_\_\_  
Review Code \_\_\_\_\_ Reviewer \_\_\_\_\_ Date \_\_\_\_\_

Page 1 of 23

\*Resource Name or #: JSA100

**P1. Other Identifier:** Sacramento River Levees

**\*P2. Location:** ☐ Not for Publication ☒ Unrestricted **\*a. County:** Sacramento

**\*b. USGS Quad:** Various (see Linear Feature Records); T07N R04E, Sec. 24; MDB&M

**c. Address:**

**d. UTM:** Zone 10; 613435 mE/ 4217447 mN NAD83 Datum

**e. Other Locational Data:**

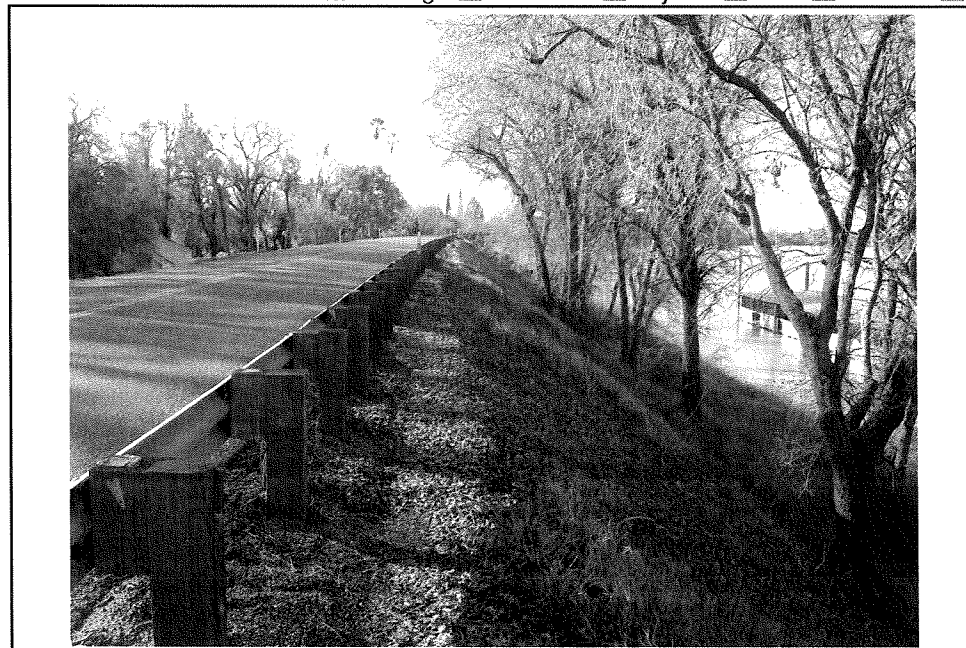
This form records four levee segments along State Route (SR) 160 and SR 160L on the east and west sides of the Sacramento River between SR 160L postmile 4.2 and SR 160 postmile 33.25. The feature is located on both sides of the highway, partially within the highway right-of-way and abutting the edge-of-pavement. See Linear Feature Records for specific locational data for each segment.

**\*P3a. Description:**

This form documents four segments of the levee on the east and west banks of the Sacramento River between Sherman Island on the south and Freeport on the north. The resource was studied as part of the Caltrans District 3 Rural Roads Inventory, which was restricted to the state highway right-of-way. Only the segments of the levee that actually intersect or carry State Route 160 roadbed were documented. They are recorded on the attached Linear Feature Records as segments "A" through "D". Although the construction dates and histories of these levees vary by locale, they are united by the fact that they are so-called "project levees," meaning that they were part of the Sacramento River Flood Control Plan, established by Congress in 1917. The US Army Corps of Engineers has rebuilt and improved each levee to "project standards" since that time. (See Continuation Sheets for individual histories.)

**\*P3b. Resource Attributes:** HP11 Engineering structure

**\*P4. Resources Present:** ☐ Building ☒ Structure ☐ Object ☐ Site ☐ District ☐ Element of District ☐ Other (Isolates, etc.)



**\*P5b. Description of Photo:**

JSA100-A-4-S, representative view of levee that carries SR 160 the Sacramento River south of Freeport.

**\*P6. Date Constructed/Age & Sources:**

☒ Historic ☐ Prehistoric ☐ Both  
Various - see P3a. "Description"

**\*P7. Owner and Address:**

Private and State of California, 400 P  
St. 3110, Sacramento, CA 95814

**\*P8. Recorded by:**

S. Melvin & J. Freeman, JRP Historical  
Consulting, LLC. 1490 Drew Ave. Suite  
110 Davis, CA 95618

**\*P9. Date Recorded:** 2/4/2008

**\*P10. Survey Type:**

Reconnaissance

**\*P11. Citation:** Leach-Palm et al. 2008, Cultural Resources Inventory of Caltrans District 3 Rural Conventional Highways in Butte, Colusa, El Dorado, Glenn, Nevada, Placer, Sacramento, Sierra, Sutter, Yolo, and Yuba counties.

**\* Attachments:** ☐ None ☒ Location Map ☐ Sketch Map ☒ Continuation Sheet ☐ Building, Structure, and Object Record  
☐ Archaeological Record ☐ District Record ☒ Linear Feature Record ☐ Milling Station Record ☐ Rock Art Record  
☐ Artifact Record ☐ Photograph Record ☐ Other:

DPR523A (1/95)

\*Required Information

9326



State of California - The Resources Agency  
DEPARTMENT OF PARKS AND RECREATION  
**LINEAR FEATURE RECORD**

Primary # P-34-2143  
HRI # \_\_\_\_\_  
Trinomial \_\_\_\_\_

Page 2 of 23

\*Resource Name or #: JSA100

L1. Historic and/or Common Name: Sacramento River Levee

L2a. Portion Described: ☐ Entire Resource ☒ Segment ☐ Point Observation Designation: Segment A

L2b. Location of Point or Segment:

USGS Quad: Jersey Island (1978); Segment A

This segment is on SR 160L between postmiles 4.2 and 6.38. It is located on Sherman Island on the east side of the Sacramento River. From the intersection of SR 160L and SR 12 near Rio Vista, drive 4.42 miles south on SR 160L to postmile 6.38 (segment datum) marking the north end of the feature.

L3. Description:

This resource is an earthen levee that carries SR 160L along the east bank of the Sacramento River on Sherman Island. The levee carries the highway between postmiles 4.2 and 6.38. The segment was recorded at a sample location at postmile 6.38, where the highway goes on/off the levee at the north end of the segment. The levee has steeply sloped banks on both sides and a flat top almost entirely occupied by the highway roadbed. Trees and other vegetation grow on both sides of the levee banks.

L4. Dimensions:

- a. Top Width: 40 feet
- b. Bottom Width: 50 feet
- c. Height or Depth: 20 feet
- d. Length of Segment: 2.2 miles

L5. Associated Resources:

L4e. Sketch of Cross-Section:

Facing: South

Not to scale

Levee

L6. Setting:

Agricultural fields to the east, Sacramento River to the west.

L7. Integrity Considerations:

Unknown.

L8b. Description of Photo, Map, or Drawing

JSA100-F-1-S, camera facing south from north end of segment, SR 160L visible at left, on top of levee

L9. Remarks:

L10. Form Prepared By:

Steven Melvin and Jarma Jones, JRP  
Historical Consulting.

L11. Date: 2/4/2008





State of California - The Resources Agency  
DEPARTMENT OF PARKS AND RECREATION  
**LINEAR FEATURE RECORD**

Primary # P-34-2143  
HRI # \_\_\_\_\_  
Trinomial \_\_\_\_\_

Page 3 of 23

\*Resource Name or #: JSA100

**L1. Historic and/or Common Name:** Sacramento River Levee

**L2a. Portion Described:** ☐ Entire Resource ☒ Segment ☐ Point Observation **Designation:** Segment B

**L2b. Location of Point or Segment:**

USGS Quad: Jersey Island (1978); Rio Vista (1978); Isleton (1978): This segment is on Brannan Island on the east bank of the Sacramento River. It begins on the south at SR 160L postmile 7.5 and runs north to SR 160L postmile 10.38. It resumes a short distance to the north at SR 160 postmile 0.3 and extends north to postmile 5.85. (The break between post mile 10.36 and 0.3 results from a realignment of SR160 away from the levee, which is not depicted on the USGS quadrangle).

**L3. Description:**

This resource is an earthen levee that carries SR 160L and SR 160 along the south and east bank of the Sacramento River on Brannan Island. The levee carries the highway for the entire length of the 8.5-mile long segment between SR 160L postmile 7.5 and SR 160 postmile 5.85, with the exception of two short breaks at the intersection of SR 12 and within the town of Isleton, where the highway goes off then back onto the levee. This segment was recorded at a sample location at postmile 4.8 at the east end of Isleton. The levee has steeply sloped banks on both sides and a flat top almost entirely occupied by the highway roadbed. Trees and other vegetation grow on both sides of the steep levee banks.

**L4. Dimensions:**

- a. Top Width: 25 feet
- b. Bottom Width: 50 feet
- c. Height or Depth: 25 feet
- d. Length of Segment: 8.5 miles

**L5. Associated Resources:**

**L4e. Sketch of Cross-Section:**

**Facing: East**

Not to scale



**L6. Setting:**

Sacramento River on the north and west side of the levee; mixture of agricultural land and residential and commercial buildings on the south and east sides.

**L7. Integrity Considerations:**

Unknown.



**L8b. Description of Photo, Map, or Drawing**

JSA100-D-1, camera facing east, SR 160 at left on the crest of the levee.

**L9. Remarks:**

**L10. Form Prepared By:**

Steven Melvin and Jarma Jones, JRP  
Historical Consulting.

**L11. Date:** 2/4/2008



State of California - The Resources Agency  
DEPARTMENT OF PARKS AND RECREATION  
**LINEAR FEATURE RECORD**

Primary # P-34-2143  
HRI # \_\_\_\_\_  
Trinomial \_\_\_\_\_

Page 4 of 23

\*Resource Name or #: JSA100

**L1. Historic and/or Common Name:** Sacramento River Levee

**L2a. Portion Described:** ☐ Entire Resource ☒ Segment ☐ Point Observation **Designation:** Segment C

**L2b. Location of Point or Segment:**

USGS Quad: Isleton (1978)

This segment is on Grand Island on the west bank of the Sacramento River. It begins on the south at SR 160 postmile 6.0 and runs north to postmile 19.82. The levee carries the highway along the entire length of the segment..

**L3. Description:**

This resource is an earthen levee that carries SR 160 along the west bank of the Sacramento River on Grand Island. This segment was recorded at a sample location at postmile 11.55 near the intersection of SR 220 in the town of Ryde. The levee has steeply sloped banks on both sides and a flat top almost entirely occupied by the highway roadbed. The banks on the river side of the levee is characterized by growth of tule, grass, and occasional trees. The banks on the land side are more heavily overgrown with trees and brush.

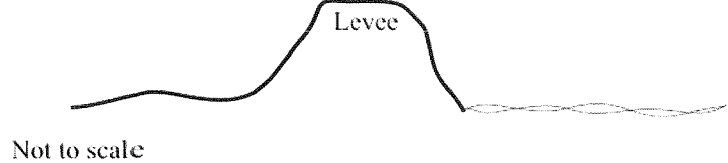
**L4. Dimensions:**

- a. Top Width: 25 feet
- b. Bottom Width: 50 feet
- c. Height or Depth: 30 feet
- d. Length of Segment: 14 miles

**L5. Associated Resources:**

**L4e. Sketch of Cross-Section:**

**Facing:** North



**L6. Setting:**

Sacramento River on the east and south sides; mixture of agricultural lands and residential and commercial buildings on the north and west sides.

**L7. Integrity Considerations:**

Unknown.

**L8b. Description of Photo, Map, or Drawing**

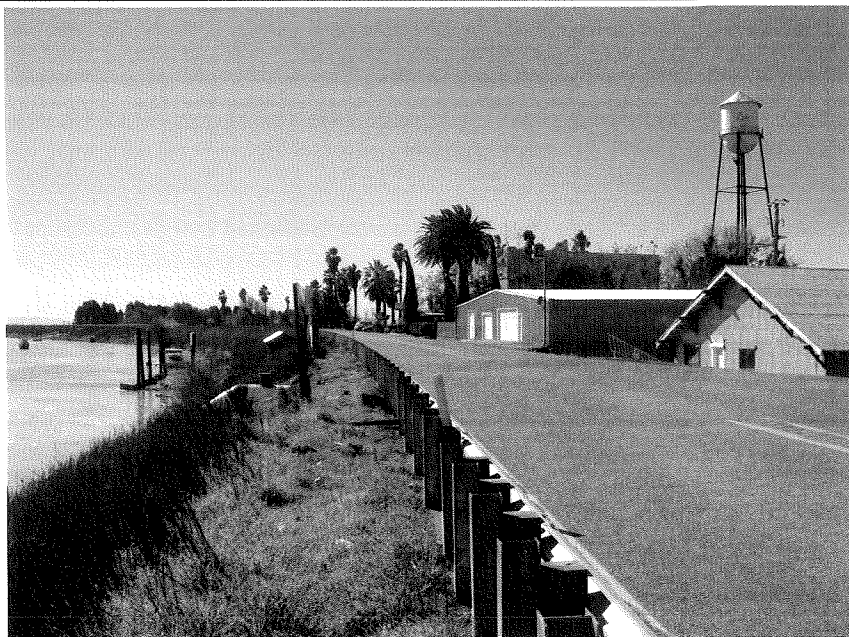
JSA101-2, view of levee through Ryde, camera facing south along SR 160.

**L9. Remarks:**

**L10. Form Prepared By:**

Steven Melvin and Jarma Jones, JRP  
Historical Consulting.

**L11. Date:** 2/4/2008





State of California - The Resources Agency  
DEPARTMENT OF PARKS AND RECREATION  
**LINEAR FEATURE RECORD**

Primary # P-34-2143  
HRI # \_\_\_\_\_  
Trinomial \_\_\_\_\_

Page 5 of 23

\*Resource Name or #: JSA100

**L1. Historic and/or Common Name:** Sacramento River Levee

**L2a. Portion Described:** ☐ Entire Resource ☐ Segment ☒ Point Observation **Designation:** Segment D

**L2b. Location of Point or Segment:**

USGS Quad: Courtland (1978); Clarksburg 1967; photorevised 1980)

This segment is on Randall Island on the east bank of the Sacramento River. It begins on the south at SR 160 postmile 20.0 near Courtland and extends north to postmile 33.25 near Freeport.

**L3. Description:**

This resource is an earthen levee that carries SR 160 along the south and east bank of the Sacramento River on Randall Island. The levee carries the highway for the entire length of the 13.25-mile long segment between Courtland and Freeport, with the exception of two breaks in the segment where the highway goes off/on the levee between postmiles 22.45 and 24.4, and again between postmiles 26.1 and 26.35 in the town of Hood. This segment was recorded at a sample location at postmile 26.35 at the north end of Hood. The levee has steeply sloped banks on both sides and a flat top almost entirely occupied by the highway roadbed. The banks of the levee are covered with tule, grass, trees, and brush.

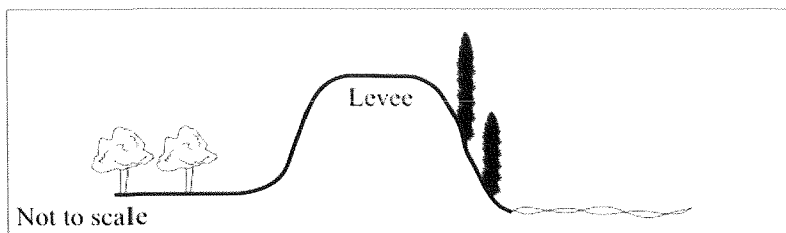
**L4. Dimensions:**

- a. Top Width: 25 feet
- b. Bottom Width: 50 feet
- c. Height or Depth: 25-30 feet
- d. Length of Segment: 13.25 miles

**L5. Associated Resources:**

**L4e. Sketch of Cross-Section:**

**Facing: North**



**L6. Setting:**

Sacramento River on the north and west side of the levee; mixture of agricultural land and residential and commercial buildings on the south and east sides.

**L7. Integrity Considerations:**

Unknown.

**L8b. Description of Photo, Map, or Drawing**

JSA100-B-2, just north of Hood, camera facing north showing SR 160 along the levee crest.

**L9. Remarks:**

**L10. Form Prepared By:**

Steven Melvin and Jarma Jones, JRP  
Historical Consulting.

**L11. Date:** 2/4/2008





State of California - The Resources Agency  
DEPARTMENT OF PARKS AND RECREATION  
**CONTINUATION SHEET**

Primary # P-34-2143  
HRI # \_\_\_\_\_  
Trinomial \_\_\_\_\_

Page 6 of 23

\*Resource Name or #: JSA100

\*Recorded By: Steven J. Melvin & Joseph Freeman, JRP Historical Consultin \*Date: 2/4/2008 ☒ Continuation ☐ Update

P3a. Description (continued):

It is not known precisely when the levees were built at the sites recorded on this form. Construction of levees along the Sacramento River south of Sacramento, and throughout the Delta, occurred in phases over more than a hundred years. Frequently old levees were raised or reinforced, resulting in a levee comprised of many generations of construction. In other cases segments of levees were completely replaced. Documenting the detailed construction history of the levee segments recorded on this form is beyond the scope of this project. Rather, the following is a general history of levee development along this part of the Sacramento River and at the points surveyed.

Levee construction throughout the Delta began in the 1850s by individuals who had settled on the naturally occurring high lands adjacent to the river. These were hand-built levees, three to five feet high, which were capable of withstanding only modest floods. In the 1860s, reclamation moved from being the work of individuals, to that of reclamation districts (RDs), and reclamation companies. Increased organization was accompanied by increased mechanization and, beginning in the 1870s, massive dredges of various types began building new levees and enhancing the old levees

In 1910, California began to study flooding on the Sacramento River, which included an evaluation of existing levees along the Sacramento River. The resulting report, known as the Jackson Report, recommended a system of levees and bypasses to manage high water which incorporated some extant levees and built others where necessary. In 1917, Congress adopted the Sacramento River Flood Control Plan (SRFCP) and all levees in the system after that time were gradually brought up to a "project standard" design by the US Army Corps of Engineers (USACE). All of the levees recorded on this form became elements of the SRFCP at this time, and have remained part so to the present. The USACE has undertaken all construction projects on these levees since that time (Thompson 1957; Thompson 1983).

Segment A - UTM end points: 613445mE, 4217469mN - 611401mE, 421547mN

Levee construction on Sherman Island began in the late 1850s. By 1859, local property owners constructed small peat levees of three to four feet in height, with a base width of about eight feet, along the banks of the Sacramento River and Mayberry Slough. In 1865, these owners formed Reclamation District No. 54 on lands east of Mayberry Slough. By June 1867, RD 54 had expended \$8,931.65 on levee construction and estimated an additional \$8,573.85 was needed to complete the work (Thompson and West 1880; California Commissioner of Public Works 1895).

RD 54 employed Chinese laborers for levee construction. The laborers excavated tule sod, or peat, from the interior of the islands. Walls averaged twelve feet at the base and measured between three and five feet high. The 49 miles of levee work was completed in April 1869, making Sherman Island the first of the peat islands to be completely encircled with levees. (California Commissioner of Public Works 1895; Thompson 1983)

Following several floods in the 1870s, Sherman Island landowners regrouped in 1879 to form RD 341 out of several earlier districts. Under district engineer R.E. Johnson, in 1894 RD 341 began reconstructing Sherman Island levees at various locations. Along the Sacramento River, Johnson recommended levees with riverside slopes of 1:4 gradient and 1:3 gradient for the landside with eight-foot wide crowns. It is unclear if RD 341 followed all of the recommendations proposed by Engineer Johnson, during the first decade of the twentieth century. (Thompson and West 1880; Johnson 1894; Bonte 1930)

The Jackson Report assessed the river levees of these three districts as not up to project standards in 1911. RD 341 levee system has undergone systematic modification and rehabilitation throughout the 20th century. The levees appear to have reached their current dimensions and appearance by the 1940s, though there have been many improvement and emergency repair projects at various locations on the levee into the 2000s.



State of California - The Resources Agency  
DEPARTMENT OF PARKS AND RECREATION  
**CONTINUATION SHEET**

Primary # P-34-2143  
HRI # \_\_\_\_\_  
Trinomial \_\_\_\_\_

Page 7 of 23

\*Resource Name or #: JSA100

\*Recorded By: Steven J. Melvin & Joseph Freeman, JRP Historical Consultin \*Date: 2/4/2008 ☒ Continuation ☐ Update

P3a. Description (continued):

Segment B - UTM end points: 614168mE, 4219118mN - 623272mE, 4225776

This segment of levee runs along the east and south banks of the Sacramento River on Brannan Island. In 1871, the Tidelands Reclamation Company undertook a large-scale levee construction project on the island using dredges. The company built levees 25 feet wide at the base, four feet wide at the crown, and six feet high, and had completely encircled the island by 1873. The subsequent Jackson Report in 1911 called for the demolition of the extant levees at this location, and for widening the Sacramento River channel in this area. By 1918, however, the levee demolition and river widening had not yet been completed. RD 2067, which formed in 1924, comprised all 7,262 acres of Brannan Island and took over maintaining and upgrading the levees. By 1930, the levees were of "ample cross section constructed to a height well above the estimated high water plane," and, in 1936, were assessed as up to SRFCP standards. Since that time there has been upgrading and maintenance projects undertaken on the Sacramento River levees, although it is not known if such projects have occurred at this site (US House of Representatives 1911; Reclamation Board 1916, 1918; Bonte 1930; USACE 1941; Thompson 1957; Thompson 1983).

Segment C - UTM end points: 624622mE, 4240507mN - 623083mE, 4225881mN

This levee segment is located on the west and north banks of the Sacramento River on Grand Island. Levee construction began on Grand Island in the 1850s when landowners hired a brigade of workers to undertake the task. Using shovel and wheelbarrow, they constructed a twelve mile long levee with a thirteen foot base and a three foot crown. The structure enhanced the natural alluvial levee and offered a measure of protection for the island's riverside parcels. This early levee did not, however, completely encircle the island and the interior lowlands still flooded regularly (Thompson 1957).

Following this early effort, the landowners on Grand Island formed one of the first reclamation districts in California: Reclamation District (RD) 3 in 1861 comprising about 17,000 acres. The district continued to construct new levees and improve old ones in the ensuing years using hand-labor and, beginning in the 1870s, mechanized dredgers. By 1872, the island had levees which were eight feet high and about 35 feet wide at the base. The island was fully reclaimed by 1895 (Boyd 1903; Bonte 1930; Thompson 1957; Thompson 1983).

Jackson's 1911 report evaluated the levee along this segment and declared it up to SRFCP standards. A 1916 report noted that RD 3's 17 miles of Sacramento River levee were "completed to approved grade". In 1917, Congress adopted the SRFCP and all levees in the system after that time were gradually brought up to a "project standard" design by the US Army Corps of Engineers (USACE). By 1941, however, the USACE regarded the levee at this point as not up to project grade and section. Since that time there has been upgrading and maintenance projects undertaken on the levees of RD 3 although it is not known if, or when, such projects have occurred at this site Reclamation Board 1916; US House of Representatives 1911; Bonte 1930; USACE 1941).

Segment D - UTM end points: 624443mE, 4242117mN - 630884mE, 4256203mN

This segment of levee is located on the east bank of the Sacramento River, and includes Randall Island and points north as far as Freeport. The levee is a component of several reclamation districts. At the south end, near Courtland, the levee lies within the boundaries of reclamation districts 551, 755, and 813. Formed in 1872, RD 551 was one of the earliest districts in this part of the Delta. By 1885, a road ran along the current alignment of Highway 160 and the land was divided into agricultural parcels, most less than 160 acres. In 1893, RD 551 reorganized to include neighboring districts 205, 257, 362, and 367. RD 551 included Randall Island until 1904 when landowners on the island formed their own district, RD 755. A 1904 photograph of RD 551 shows substantial levee with dirt road on top. RD 813 formed in 1910 and incorporated RD 433 and part of RD 254 to make a 2,550 acre district. These reclamation districts carried out any improvements, repairs, or new construction to the levees at this location from the time of their formation (Bonte 1930; Shepard 1885; Thompson 1957; Thompson 1983).

The Jackson Report assessed the river levees of these three districts as not up to project standards in 1911. In 1916, the river levees of RD 755 and RD 551 were up to flood control standards, but those of RD 813, however, were not, and were still deficient in 1918. In 1936, the US Army Corps of Engineers again found the riverfront levee in RD 813 as not up to SRFCP standards, while it was up to standard in the other two districts. The USACE made improvements to the river levees of RD 813 by 1943. Since that time there has been upgrading and maintenance projects undertaken on the Sacramento River levees although it is not known if such projects have occurred at this site (Reclamation Board 1916, 1918; US House of Representatives 1911; USACE 1941, 1943)



State of California - The Resources Agency  
DEPARTMENT OF PARKS AND RECREATION  
**CONTINUATION SHEET**

Primary # P-34-2143  
HRI # \_\_\_\_\_  
Trinomial \_\_\_\_\_

Page 8 of 23

\*Resource Name or #: JSA100

\*Recorded By: Steven J. Melvin & Joseph Freeman, JRP Historical Consultin \*Date: 2/4/2008 ☒ Continuation ☐ Update

P3a. Description (continued):

The segment of the levee near Hood was once part of RD 746. Local landowners established the district in 1903 comprising 135 acres and including part of former RD 418. The date of creation or exact boundaries of the earlier district is unknown, but there was a river levee at this location in 1903 and a road along the river's edge. In 1911, the Jackson Report rated the levees of RD 746 as of insufficient height for SRFCP project standards. By 1930, the river levee of RD 746 was described as "of ample height and section." In 1936, the US Army Corps of Engineers described the levee at JSA 101 as up to "project grade and section" for the SRFCP. Since that time there has been upgrading and maintenance projects undertaken on the Sacramento River levees although it is not known if such work has occurred at this location (Boyd 1903; US House of Representatives 1911; Bonte 1930; USACE 1941; Board of Reclamation 1969).

The north end of the levee segment, near Freeport, passes through RD 744 and RD 824. The former district, about one mile downriver from the survey location, was established in 1903 and comprised 1,618 acres. A 1918 report referred to the levees of RD 744 as "old and well established" and "recently" completed to permit construction on their crowns of the Sacramento County Concrete Highway. RD 824 began in 1911 and encompassed 463 acres including the town of Freeport (Boyd 1903; Shepard 1885; Jackson 1908; USGS 1906).

The river levees along the Sacramento River's east bank from RD 824 south ten miles to Hood were evaluated by the Jackson Report as not up to SRFCP standards in 1916. Two years later, the levee was brought up to project standards, but roughly half of this ten-mile segment remained inadequate. By 1930, the levee along the river of districts 744 and 824 were described in 1930 as "of ample height and section" and "adequately levied." A subsequent evaluation in 1936 regarded the levee at Site 1 as up to "project grade and section." for the SRFCP. Since that time there has been upgrading and maintenance projects undertaken on the Sacramento River levees although it is not known if such projects have occurred at this site (US House of Reclamation 1911; Bonte 1930; USACE 1941; Reclamation Board 1969; Kelley 1989; Reclamation Board 1916, 1918).

References:

Bonte, Harmon S. Financial and General Data Pertaining to Irrigation, Reclamation and Other Public Districts in California. California Department of Public Works Bulletin No. 37. Sacramento: Division of Water Resources, 1930.

Boyd, J.C. Map of Sacramento County. San Francisco: Britton and Rey, 1903.

California Commissioner of Public Works. Report of the Commissioner of Public Works to the Governor of California. Sacramento: A. J. Johnston, Supt. State Printing, 1895.

Jackson, Thomas. Map of Sacramento River, Sheet 7. Washington: USACE, 1908.

Johnson, R. E. "Report on Sherman Island Reclamation District No. 341, Sacramento Co., California, June 1, 1894." Reclamation District 341 Records in the Board of Supervisors Records of Sacramento County. Sacramento Archives and Museum Collection Center, Sacramento, California.

Kelley, Robert. Battling the Inland Sea. Berkeley: University of California Press, 1989.

Reclamation Board of California. Fourth Biennial Report of the Reclamation Board of California. Sacramento: Reclamation Board of California, 1918.

Reclamation Board of California. Reclamation and Flood Protection. Sacramento: Reclamation Board of California, 1969.

Reclamation Board of California. Report of the Reclamation Board of California. Sacramento: Reclamation Board of California, 1916.

Shepard, Fred A. Official Map of Sacramento County. San Francisco: Britton and Rey, 1885.

Thompson and West. History of Sacramento County, California. Oakland: Thompson and West, 1880.

Thompson, John and Edward Dutra. The Tule Breakers. Stockton: The Stockton Corral of Westerners International, 1983.

Thompson, John. The Settlement Geography of the Sacramento/San Joaquin Delta, California. Ph.D. diss., Stanford University, 1957.



State of California - The Resources Agency  
DEPARTMENT OF PARKS AND RECREATION  
**CONTINUATION SHEET**

Primary # P-34-2143  
HRI # \_\_\_\_\_  
Trinomial \_\_\_\_\_

Page 9 of 23

\*Resource Name or #: JSA100

\*Recorded By: Steven J. Melvin & Joseph Freeman, JRP Historical Consultin \*Date: 2/4/2008 ☒ Continuation ☐ Update

U.S. House of Representatives. Document No. 81, 62nd Congress, 1st Session. Flood Control Sacramento and San Joaquin River Systems, California. 1911.

USACE. Sacramento River Flood Control Project. Washington: USACE, 1943.

USACE. Sacramento River Within Existing Flood Control Project. Washington: USACE, 1941.

USGS. Map of Sacramento Valley, Sheet M. Washington: USGS, 1906.



State of California - The Resources Agency  
DEPARTMENT OF PARKS AND RECREATION  
**LOCATION MAP**

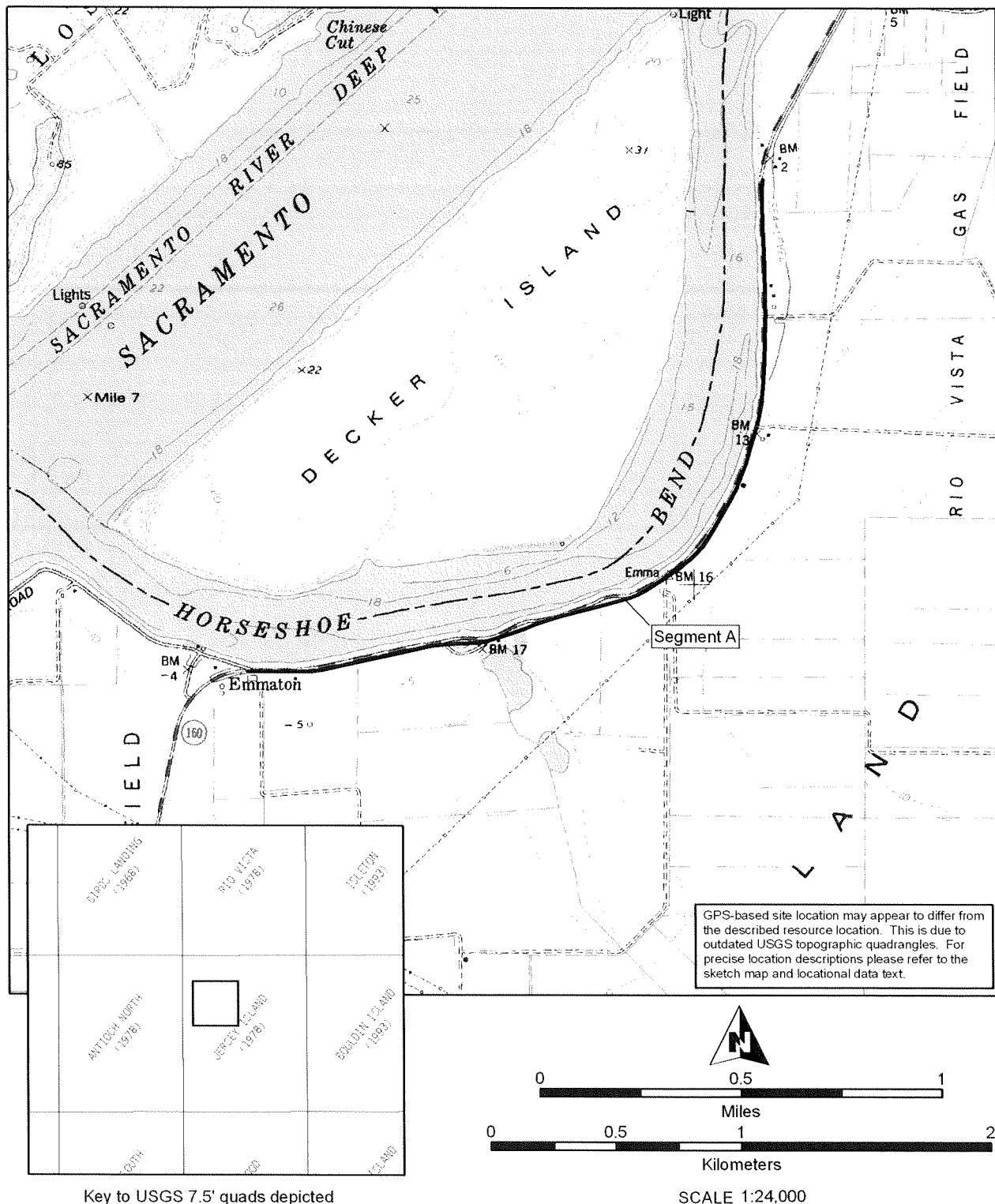
Primary # P-34-2143  
HRI # \_\_\_\_\_  
Trinomial \_\_\_\_\_

Page 9 of 23

\*Resource Name or #: JSA100

\*Map Name: Jersey Island (1978)

\*Year:





State of California - The Resources Agency  
DEPARTMENT OF PARKS AND RECREATION  
**LOCATION MAP**

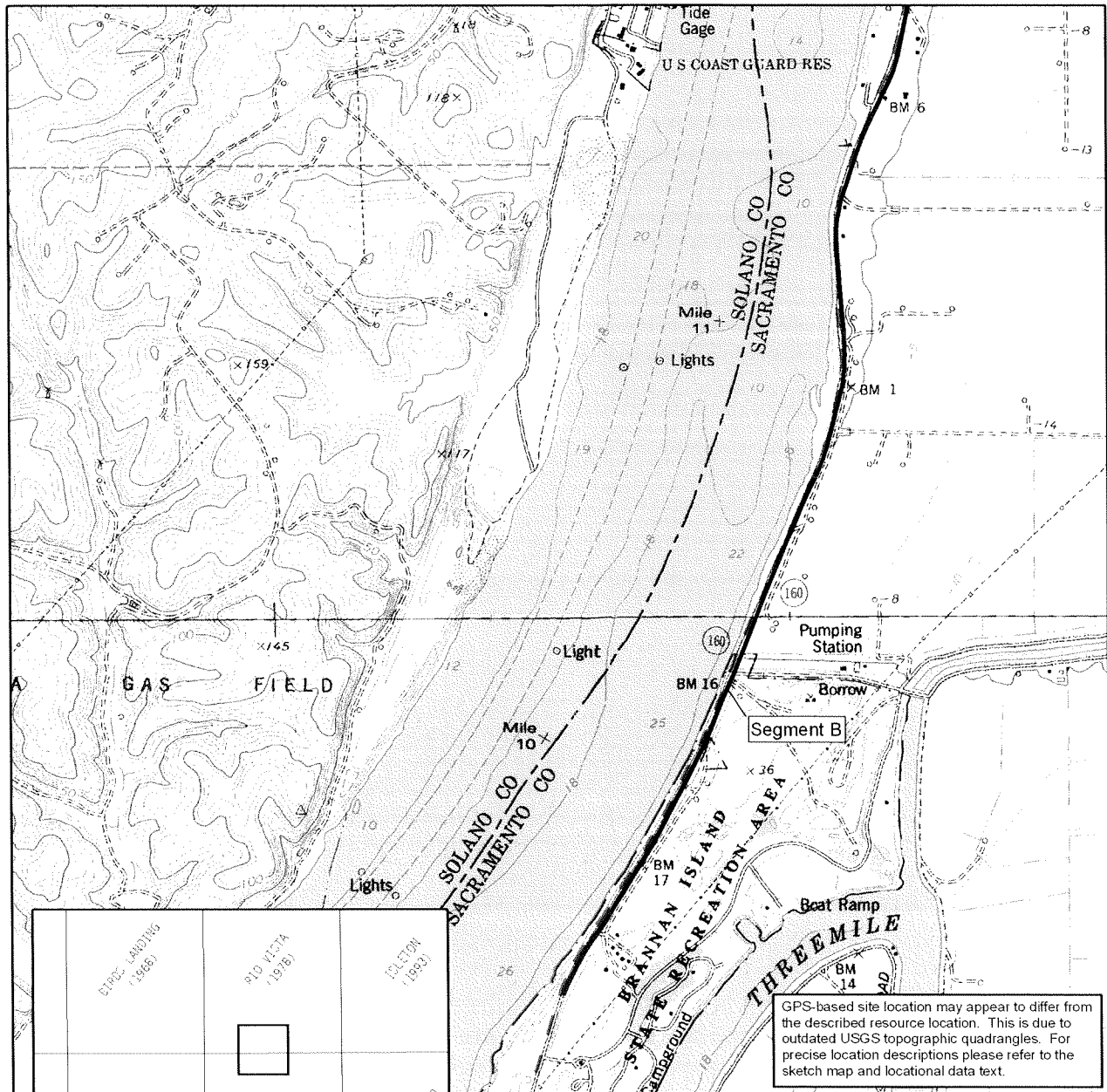
Primary # P-34-2143  
HRI # \_\_\_\_\_  
Trinomial \_\_\_\_\_

Page 10 of 23

\*Resource Name or #: JSA100

\*Map Name: Rio Vista (1978), Jersey Island (1978)

\*Year:





State of California - The Resources Agency  
DEPARTMENT OF PARKS AND RECREATION  
**LOCATION MAP**

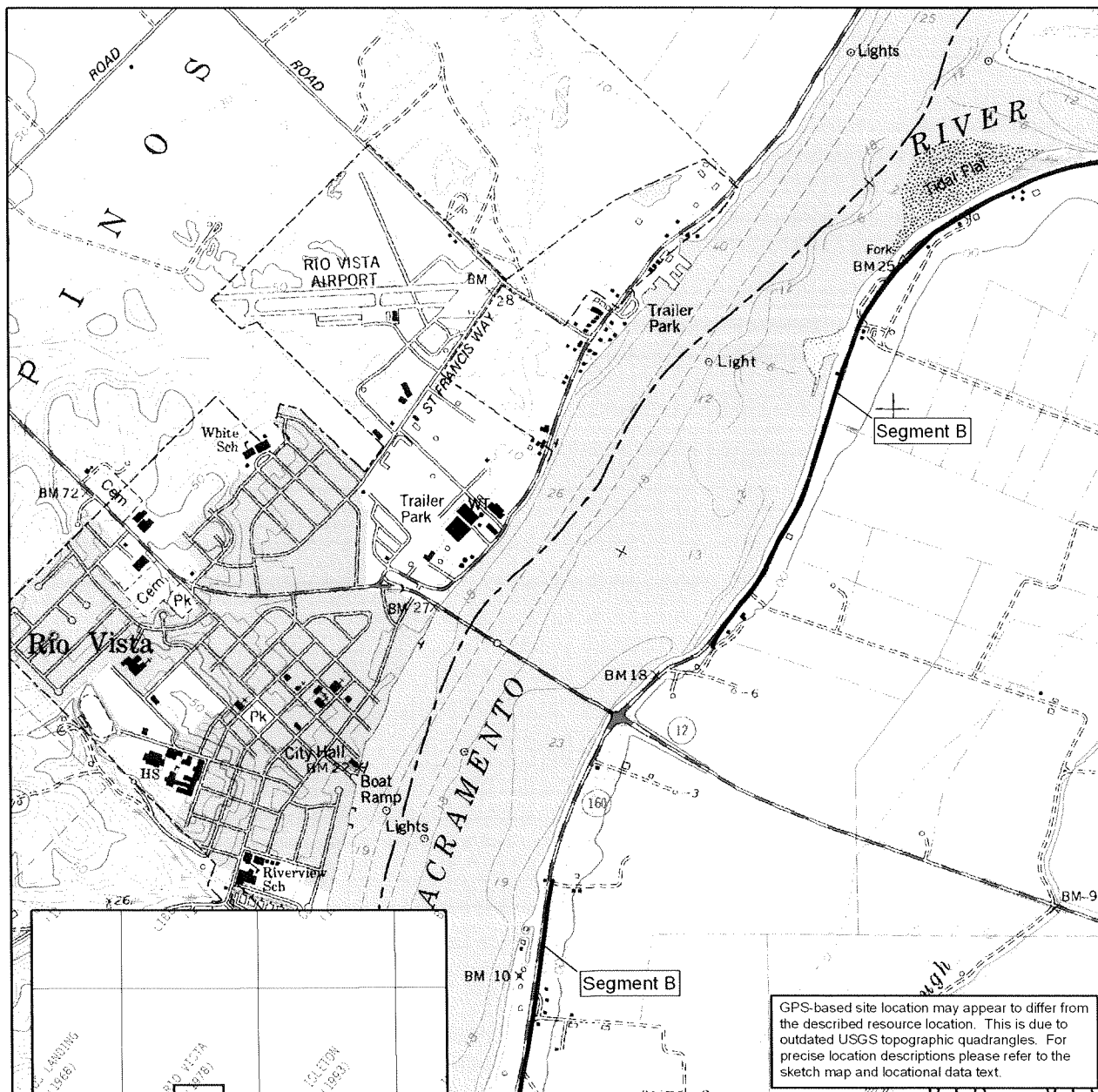
Primary # 0-34-2143  
HRI # \_\_\_\_\_  
Trinomial \_\_\_\_\_

Page 11 of 23

\*Resource Name or #: JSA100

\*Map Name: Rio Vista (1978)

\*Year:



Key to USGS 7.5' quads depicted

Sketch map is based on 2007 GPS data collected within the highway right-of-way.



State of California - The Resources Agency  
DEPARTMENT OF PARKS AND RECREATION  
**LOCATION MAP**

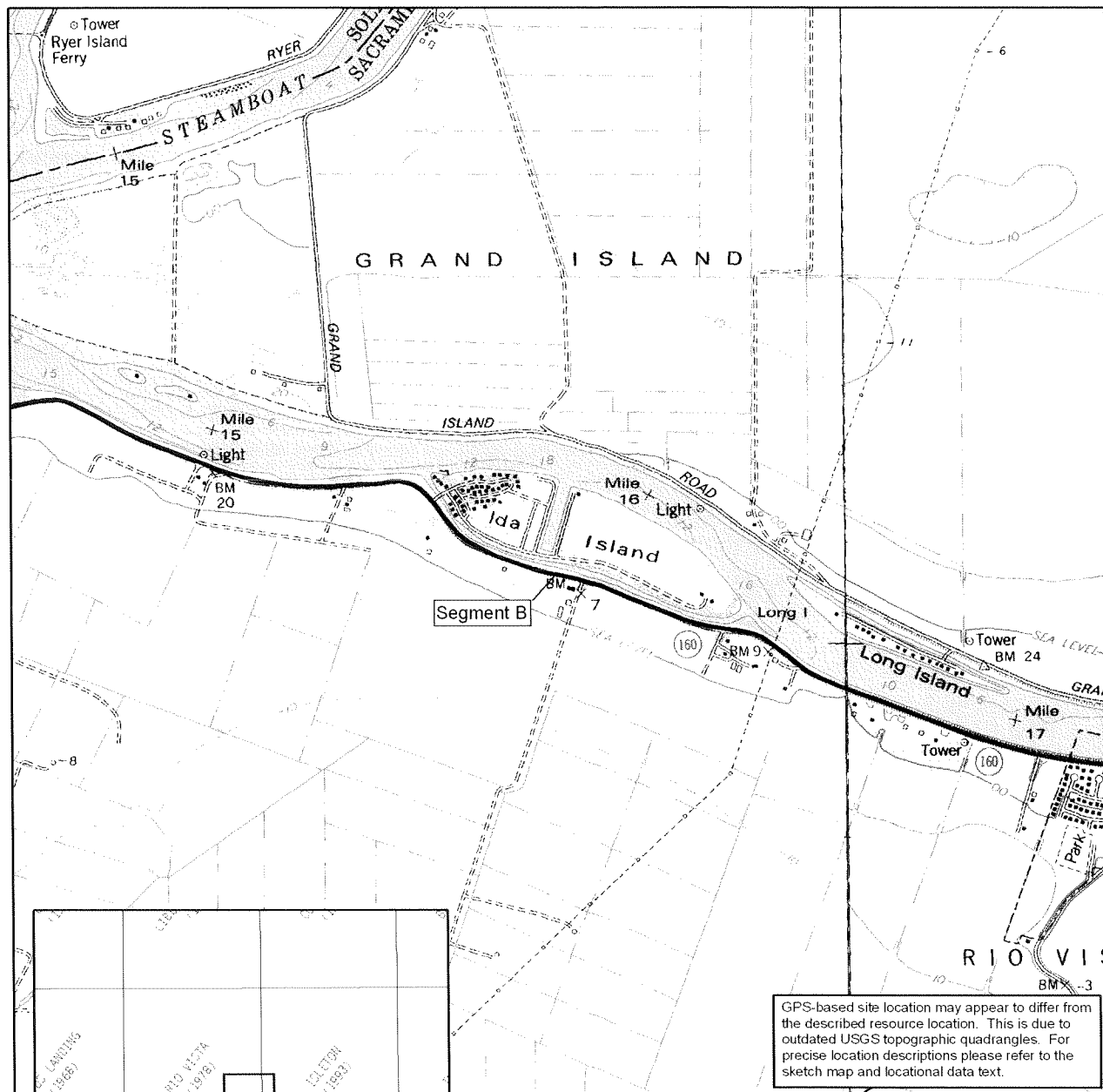
Primary # p-34-2143  
HRI # \_\_\_\_\_  
Trinomial \_\_\_\_\_

Page 12 of 23

\*Resource Name or #: JSA100

\*Map Name: Isleton (1978; photorevised 1993), Rio Vista (1978)

\*Year:



Key to USGS 7.5' quads depicted

Sketch map is based on 2007 GPS data collected within the highway right-of-way.



State of California - The Resources Agency  
DEPARTMENT OF PARKS AND RECREATION  
**LOCATION MAP**

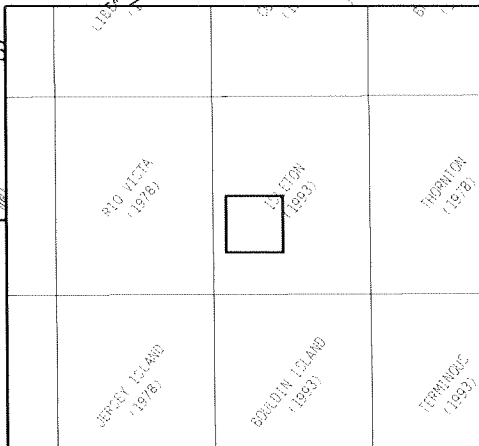
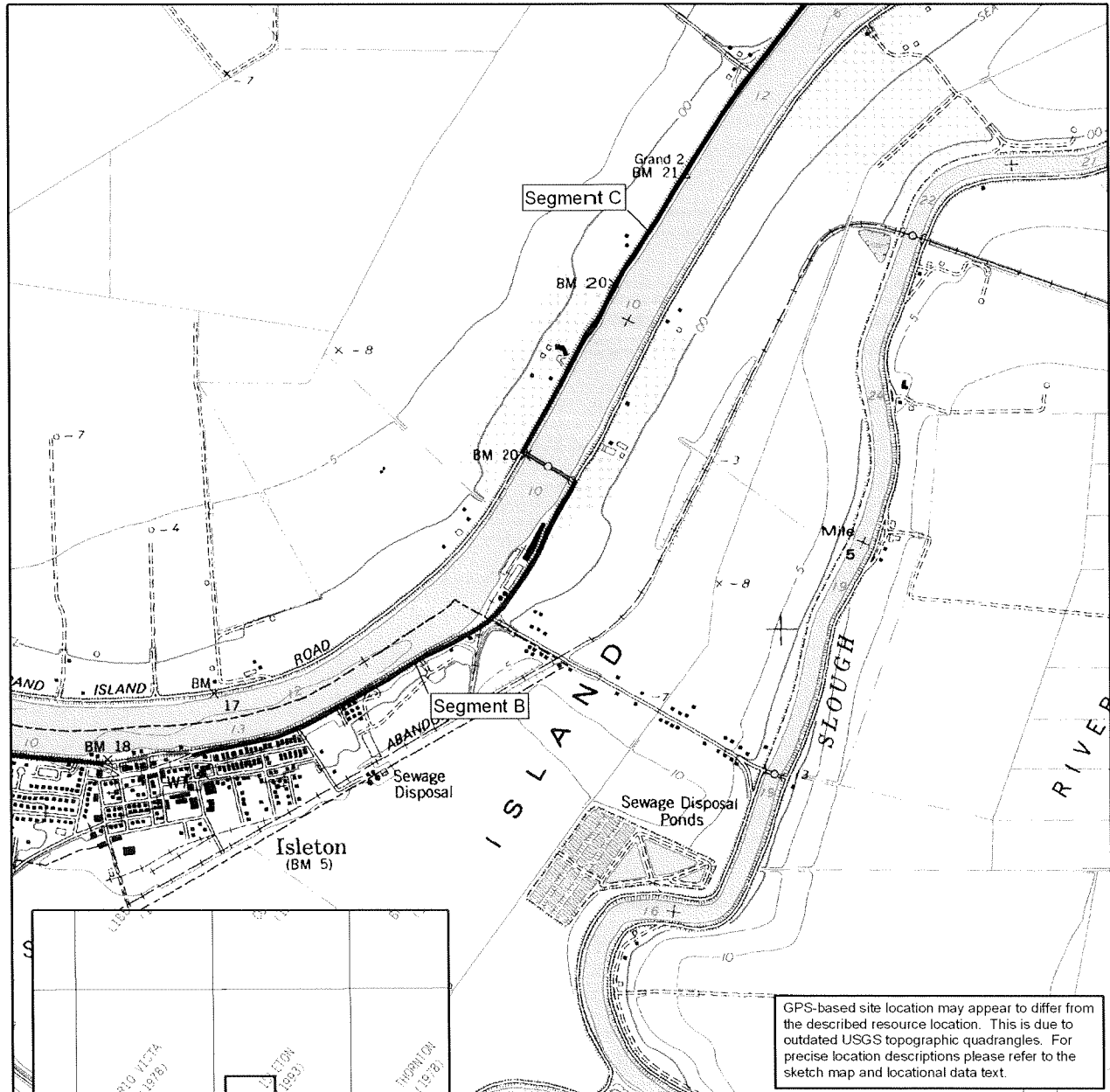
Primary # D-34-2143  
HRI # \_\_\_\_\_  
Trinomial \_\_\_\_\_

Page 13 of 23

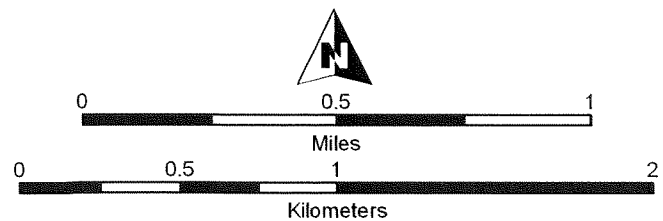
\*Resource Name or #: JSA100

\*Map Name: Isleton (1978; photorevised 1993)

\*Year:



Key to USGS 7.5' quads depicted



SCALE 1:24,000

Sketch map is based on 2007 GPS data collected within the highway right-of-way.



State of California - The Resources Agency  
DEPARTMENT OF PARKS AND RECREATION  
**LOCATION MAP**

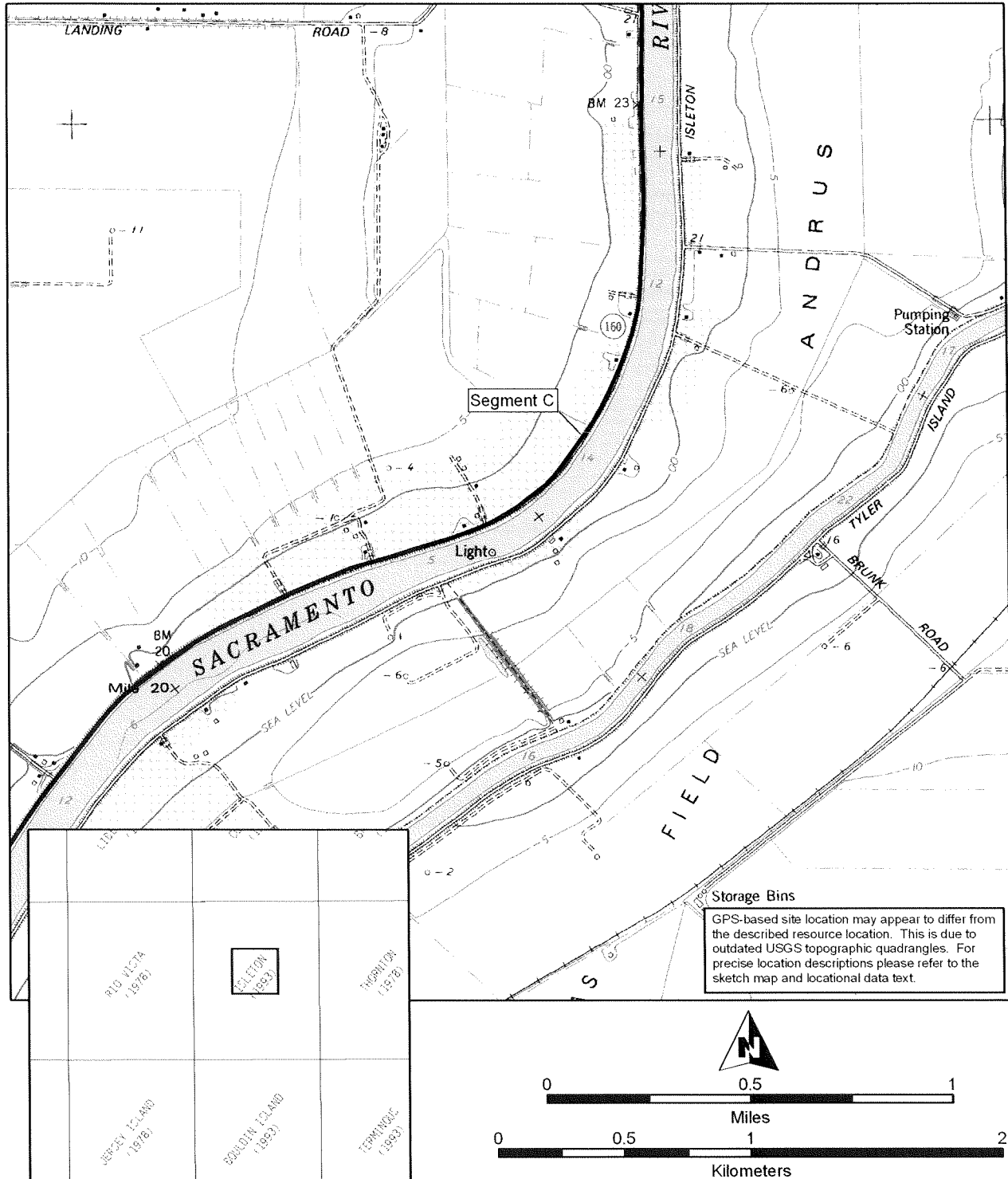
Primary # p-34-2143  
HRI # \_\_\_\_\_  
Trinomial \_\_\_\_\_

Page 14 of 23

\*Resource Name or #: JSA100

\*Map Name: Isleton (1978; photorevised 1993)

\*Year:





State of California - The Resources Agency  
DEPARTMENT OF PARKS AND RECREATION  
**LOCATION MAP**

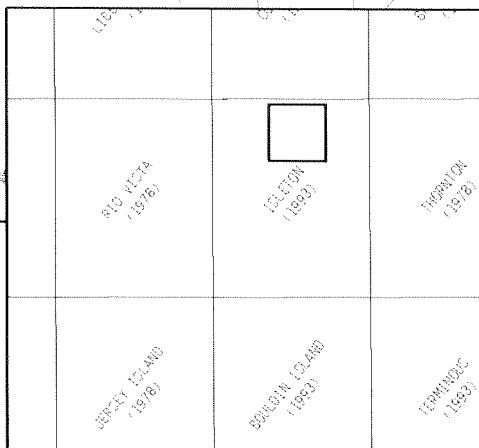
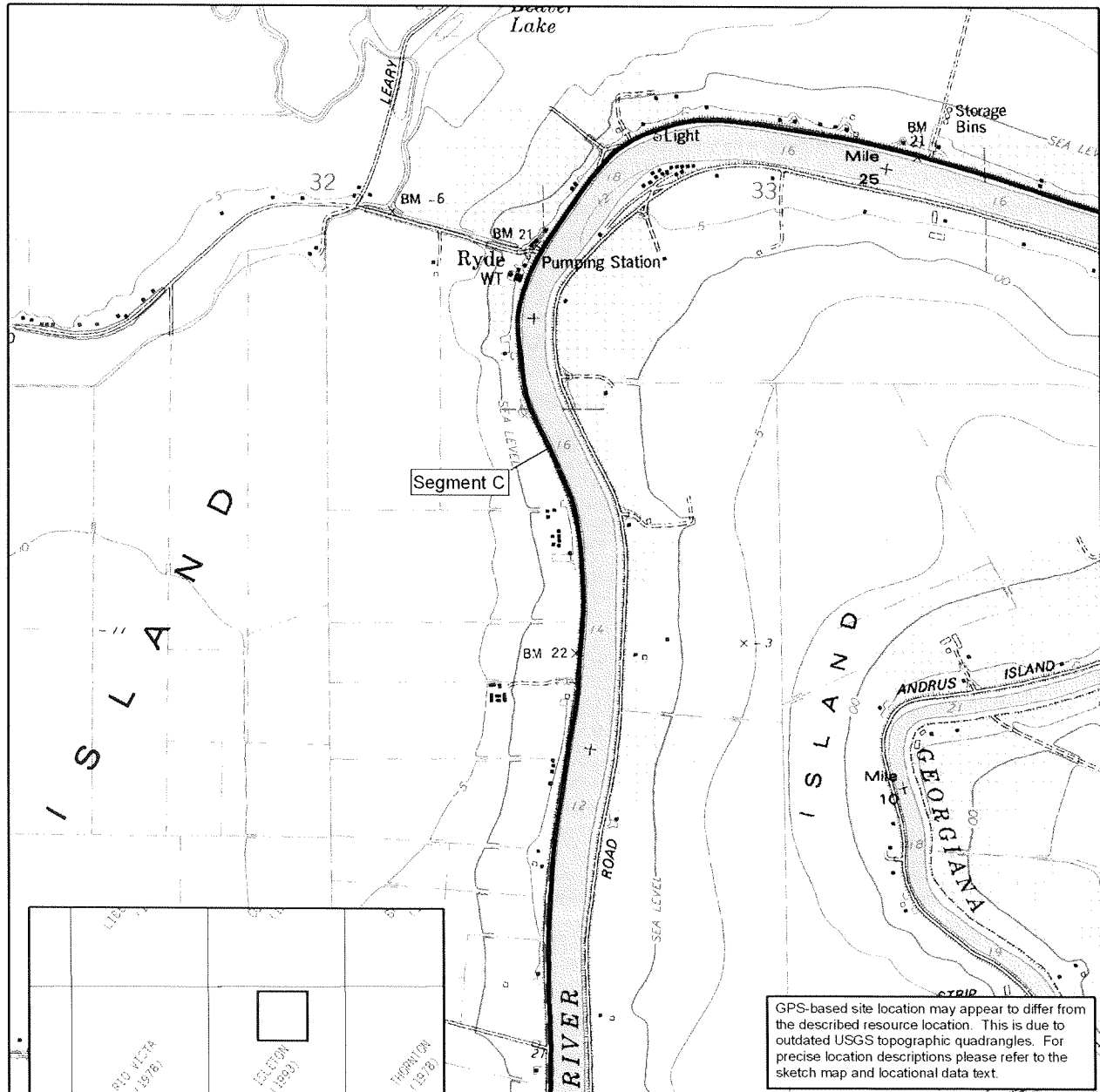
Primary # P-34-2143  
HRI # \_\_\_\_\_  
Trinomial \_\_\_\_\_

Page 15 of 23

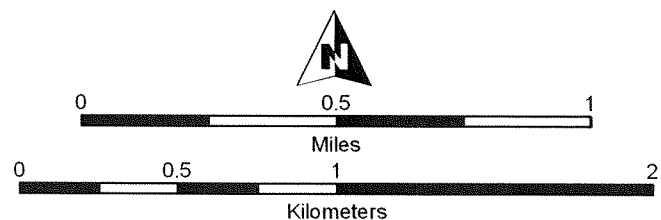
\*Resource Name or #: JSA100

\*Map Name: Isleton (1978; photorevised 1993)

\*Year:



Key to USGS 7.5' quads depicted



SCALE 1:24,000



State of California - The Resources Agency  
DEPARTMENT OF PARKS AND RECREATION  
**LOCATION MAP**

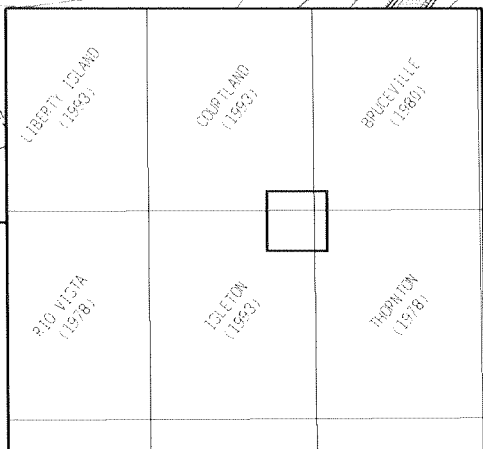
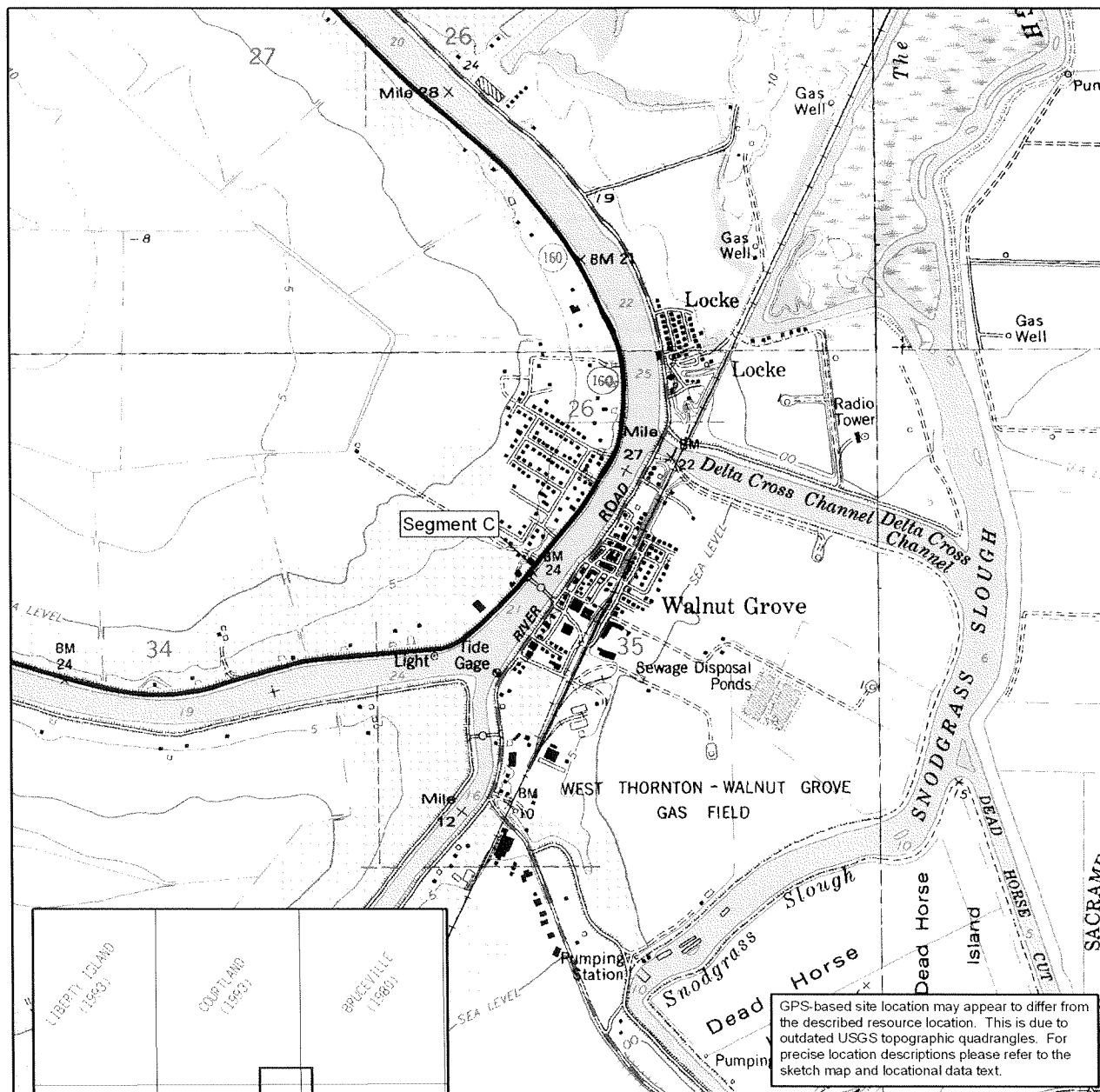
Primary # P-34-2143  
HRI # \_\_\_\_\_  
Trinomial \_\_\_\_\_

Page 16 of 23

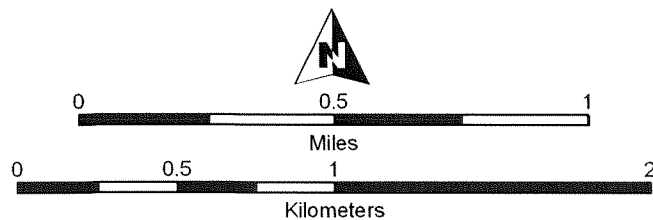
\*Resource Name or #: JSA 100

\*Map Name:

\*Year:



Key to USGS 7.5' quads depicted



SCALE 1:24,000



State of California - The Resources Agency  
DEPARTMENT OF PARKS AND RECREATION  
**LOCATION MAP**

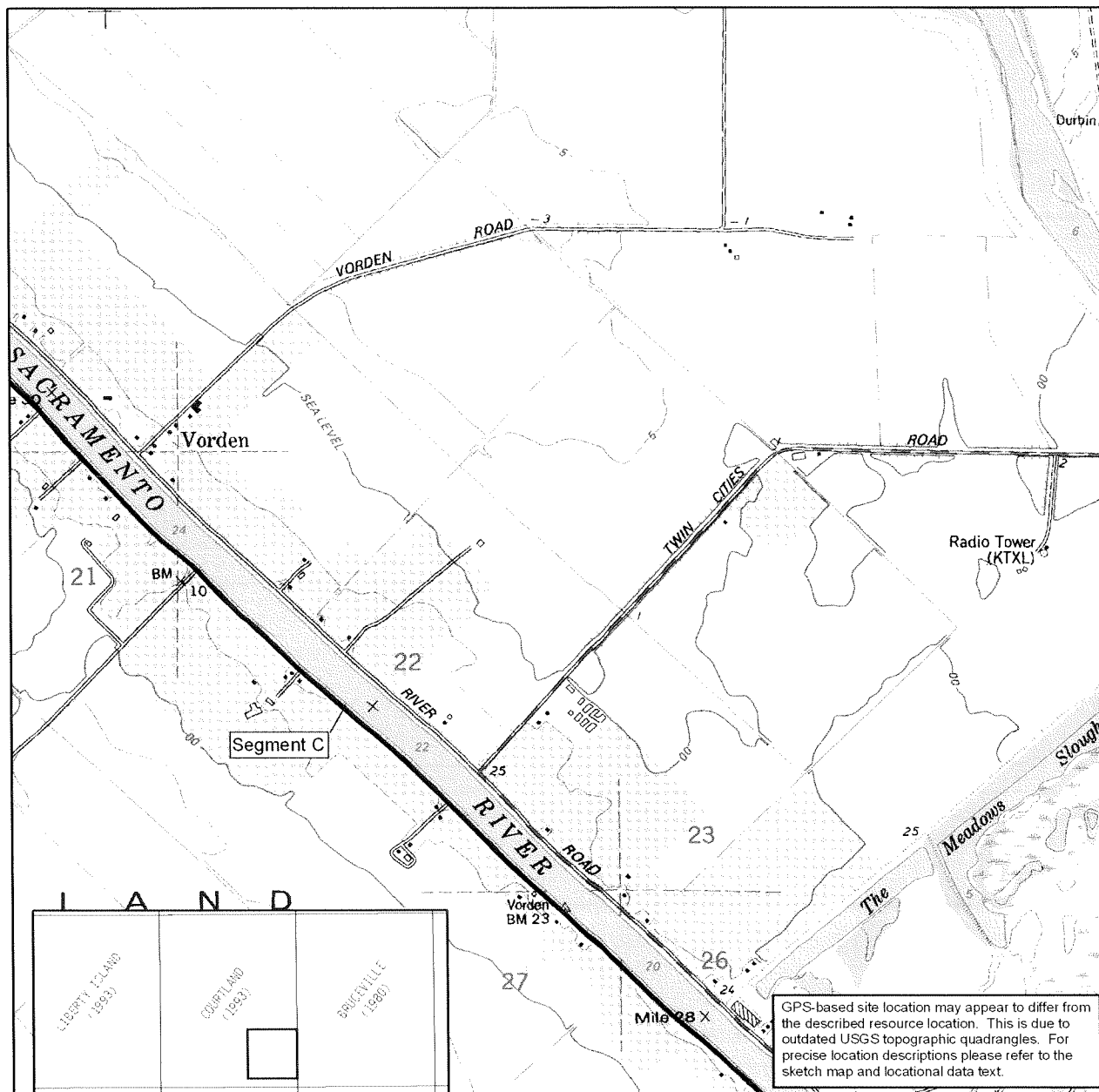
Primary # P-34-2143  
HRI # \_\_\_\_\_  
Trinomial \_\_\_\_\_

Page 17 of 23

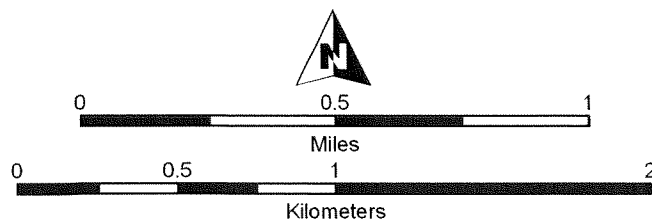
\*Resource Name or #: JSA100

\*Map Name: Courtland (1978; photorevised 1993)

\*Year:



Key to USGS 7.5' quads depicted



SCALE 1:24,000



State of California - The Resources Agency  
DEPARTMENT OF PARKS AND RECREATION  
**LOCATION MAP**

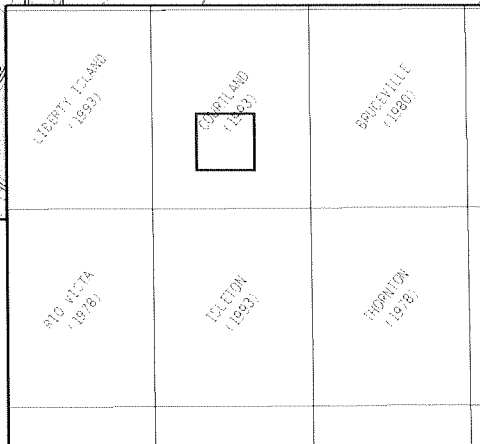
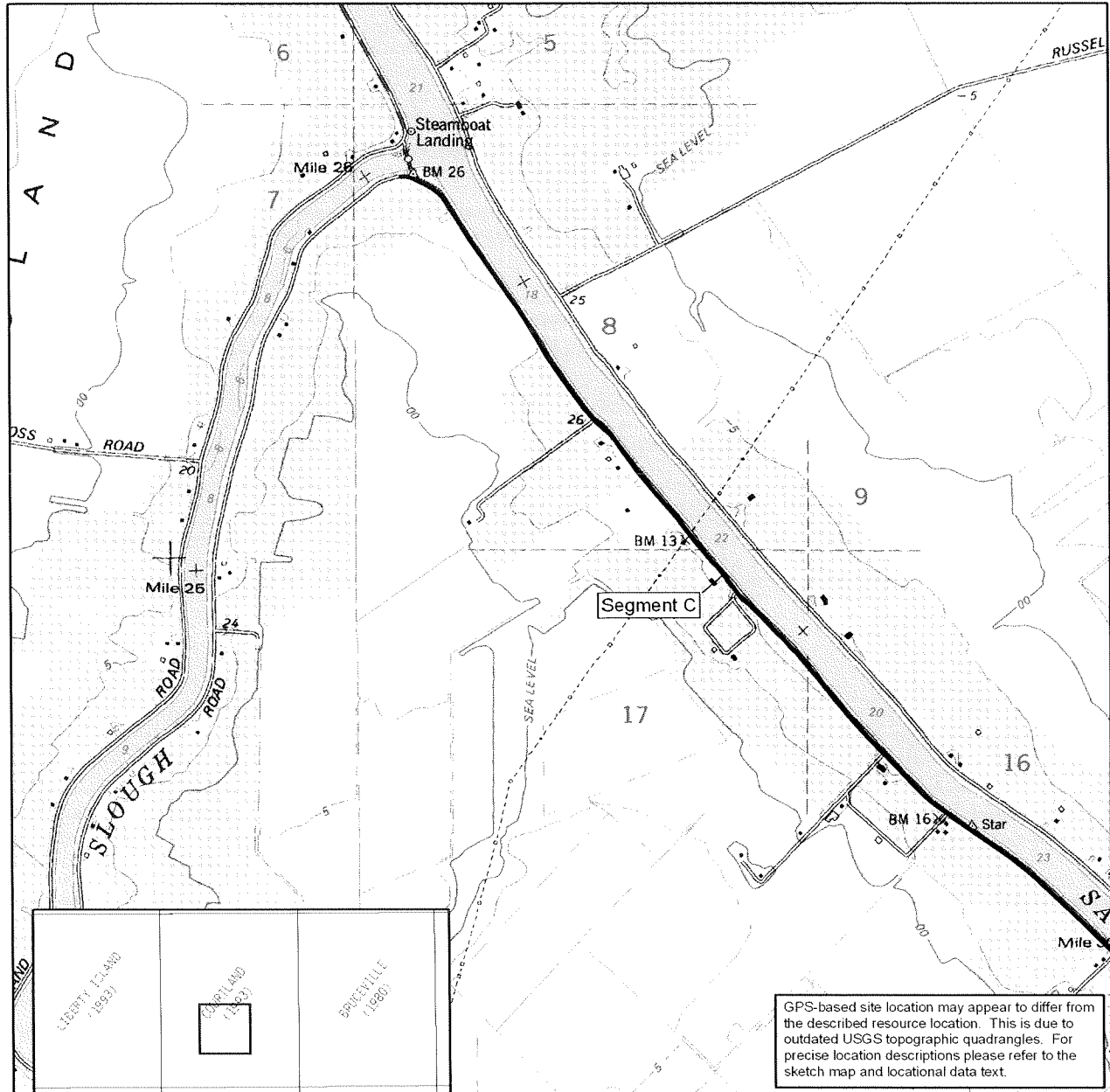
Primary # P-34-2143  
HRI # \_\_\_\_\_  
Trinomial \_\_\_\_\_

Page 18 of 23

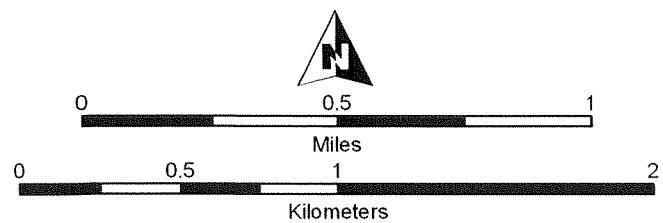
\*Resource Name or #: JSA100

\*Map Name: Courtland (1978; photorevised 1993)

\*Year:



Key to USGS 7.5' quads depicted



SCALE 1:24,000



State of California - The Resources Agency  
DEPARTMENT OF PARKS AND RECREATION  
**LOCATION MAP**

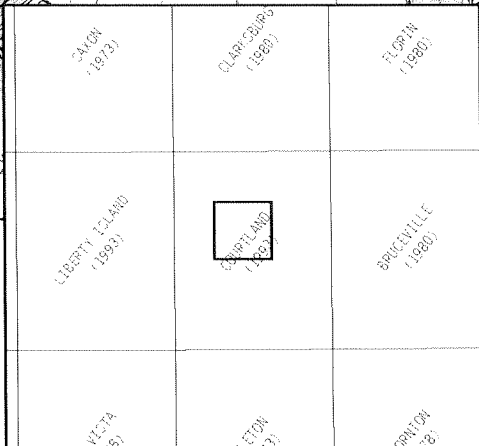
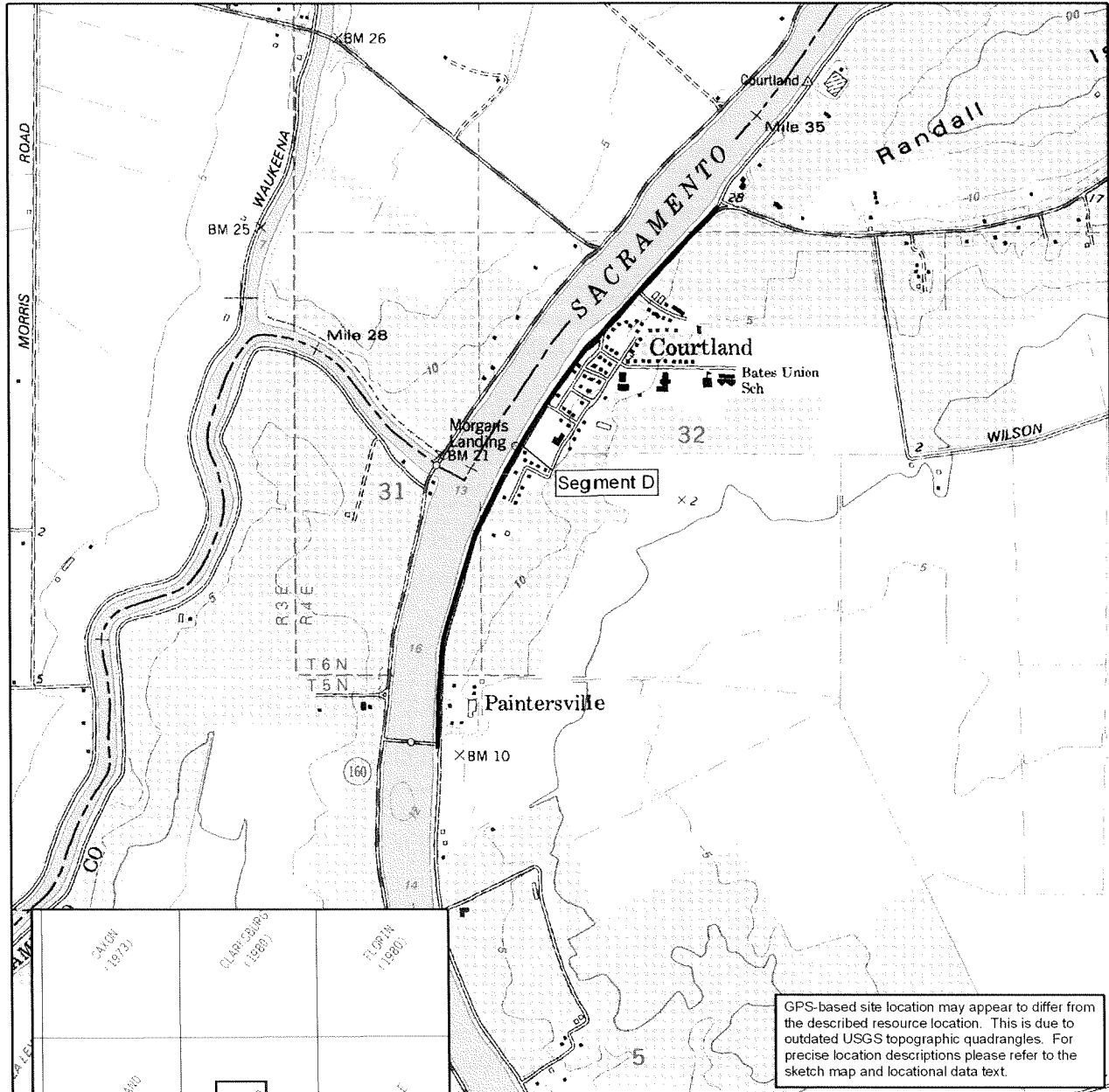
Primary # P-34-2143  
HRI # \_\_\_\_\_  
Trinomial \_\_\_\_\_

Page 19 of 23

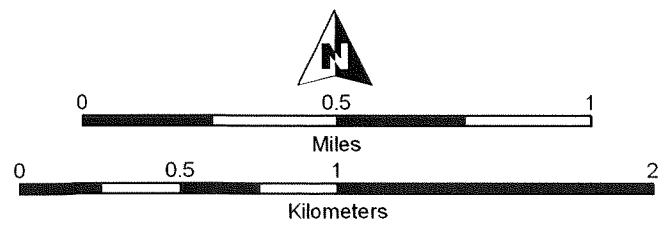
\*Resource Name or #: JSA100

\*Map Name: Courtland (1978; photorevised 1993)

\*Year:



Key to USGS 7.5' quads depicted



SCALE 1:24,000



State of California - The Resources Agency  
DEPARTMENT OF PARKS AND RECREATION  
**LOCATION MAP**

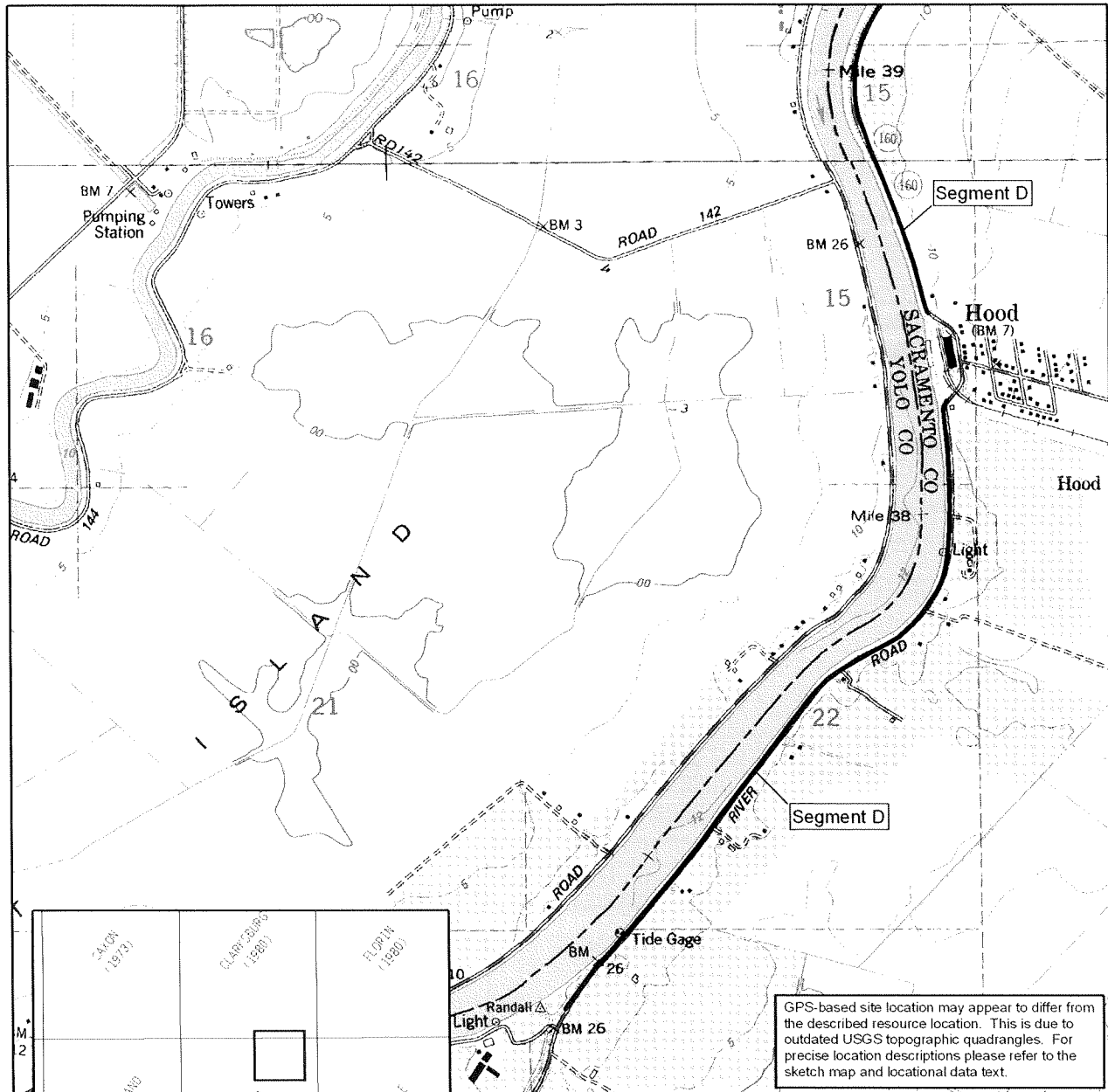
Primary # P-34-2143  
HRI # \_\_\_\_\_  
Trinomial \_\_\_\_\_

Page 20 of 23

\*Resource Name or #: JSA100

\*Map Name: Clarksburg (1967; photorevised 1980), Courtland (1978; photorevised 1993)

\*Year:



GPS-based site location may appear to differ from the described resource location. This is due to outdated USGS topographic quadrangles. For precise location descriptions please refer to the sketch map and locational data text.

Key to USGS 7.5' quads depicted

SCALE 1:24,000



State of California - The Resources Agency  
DEPARTMENT OF PARKS AND RECREATION  
**LOCATION MAP**

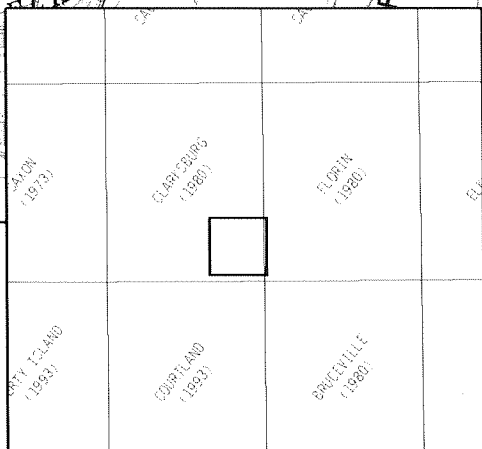
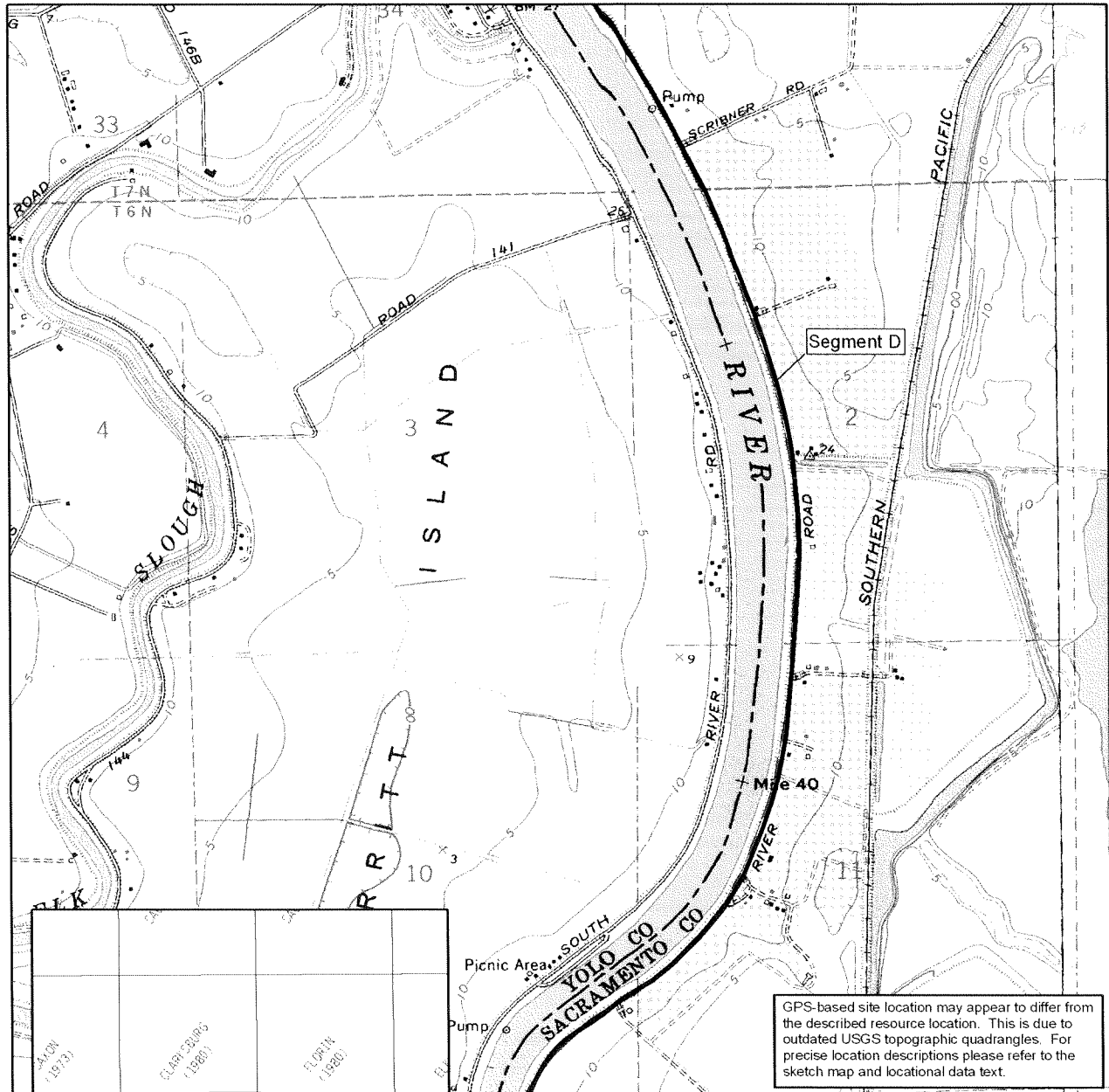
Primary # P-34-243  
HRI # \_\_\_\_\_  
Trinomial \_\_\_\_\_

Page 21 of 23

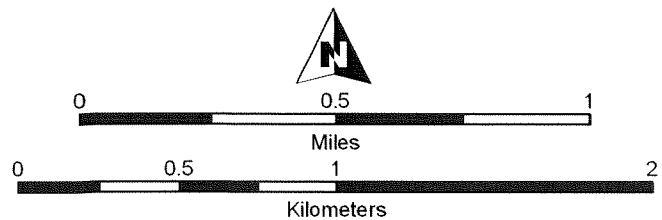
\*Resource Name or #: JSA100

\*Map Name: Clarksburg (1967; photorevised 1980)

\*Year:



Key to USGS 7.5' quads depicted



SCALE 1:24,000



State of California - The Resources Agency  
DEPARTMENT OF PARKS AND RECREATION  
**LOCATION MAP**

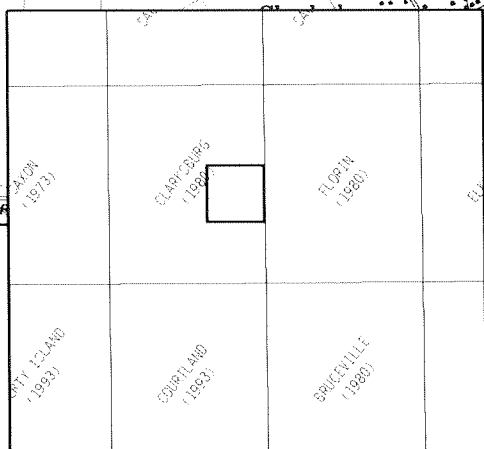
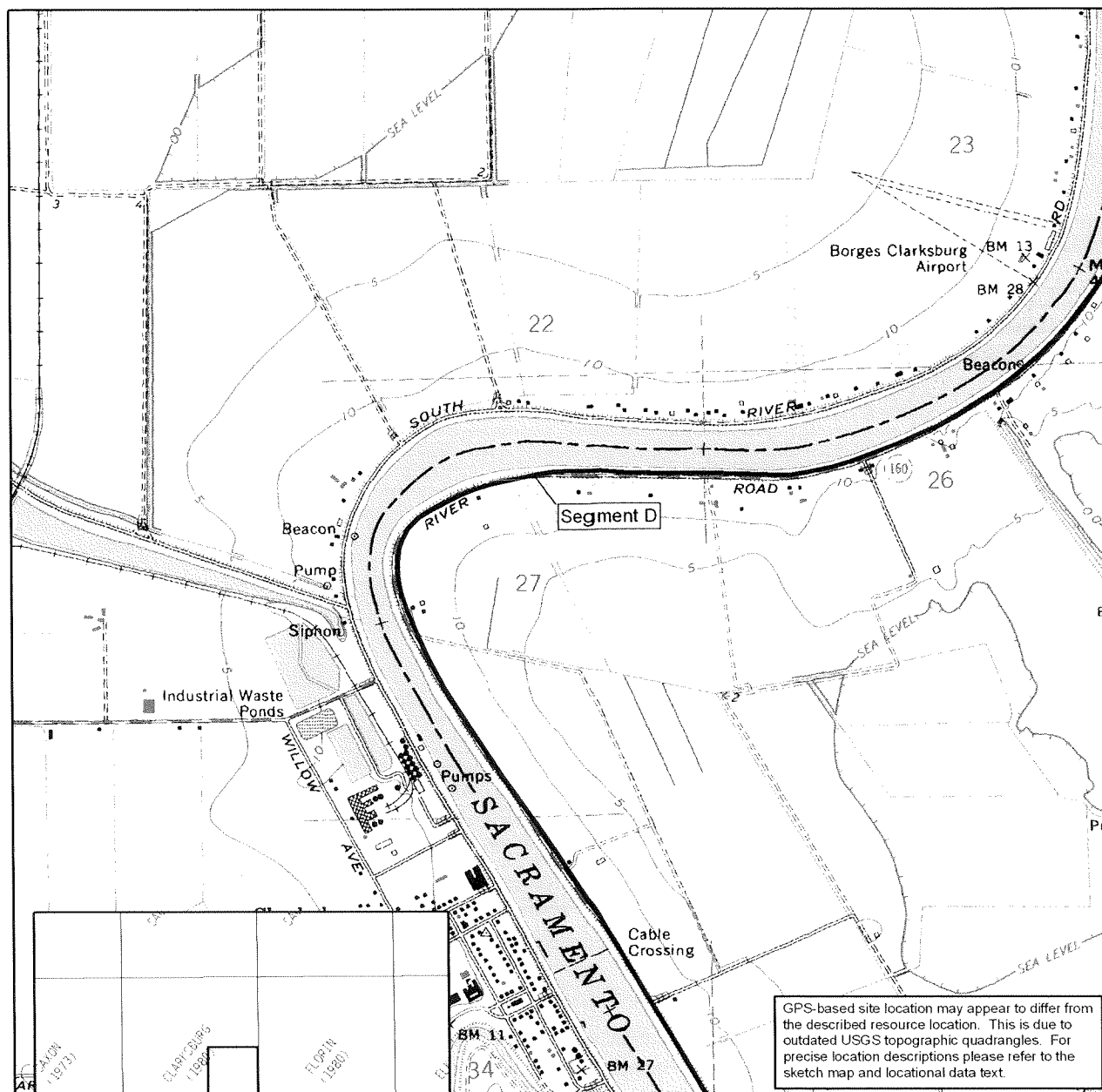
Primary # P-34-2143  
HRI # \_\_\_\_\_  
Trinomial \_\_\_\_\_

Page 22 of 23

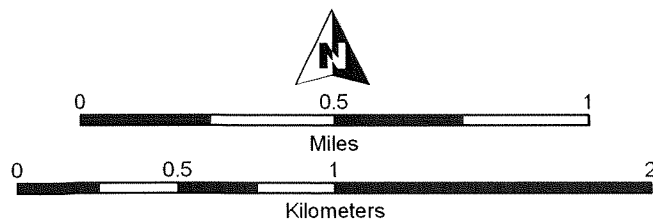
\*Resource Name or #: JSA100

\*Map Name: Clarksburg (1967; photorevised 1980)

\*Year:



Key to USGS 7.5' quads depicted



SCALE 1:24,000



## LOCATION MAP

Primary # P-34-2143

HRI # \_\_\_\_\_

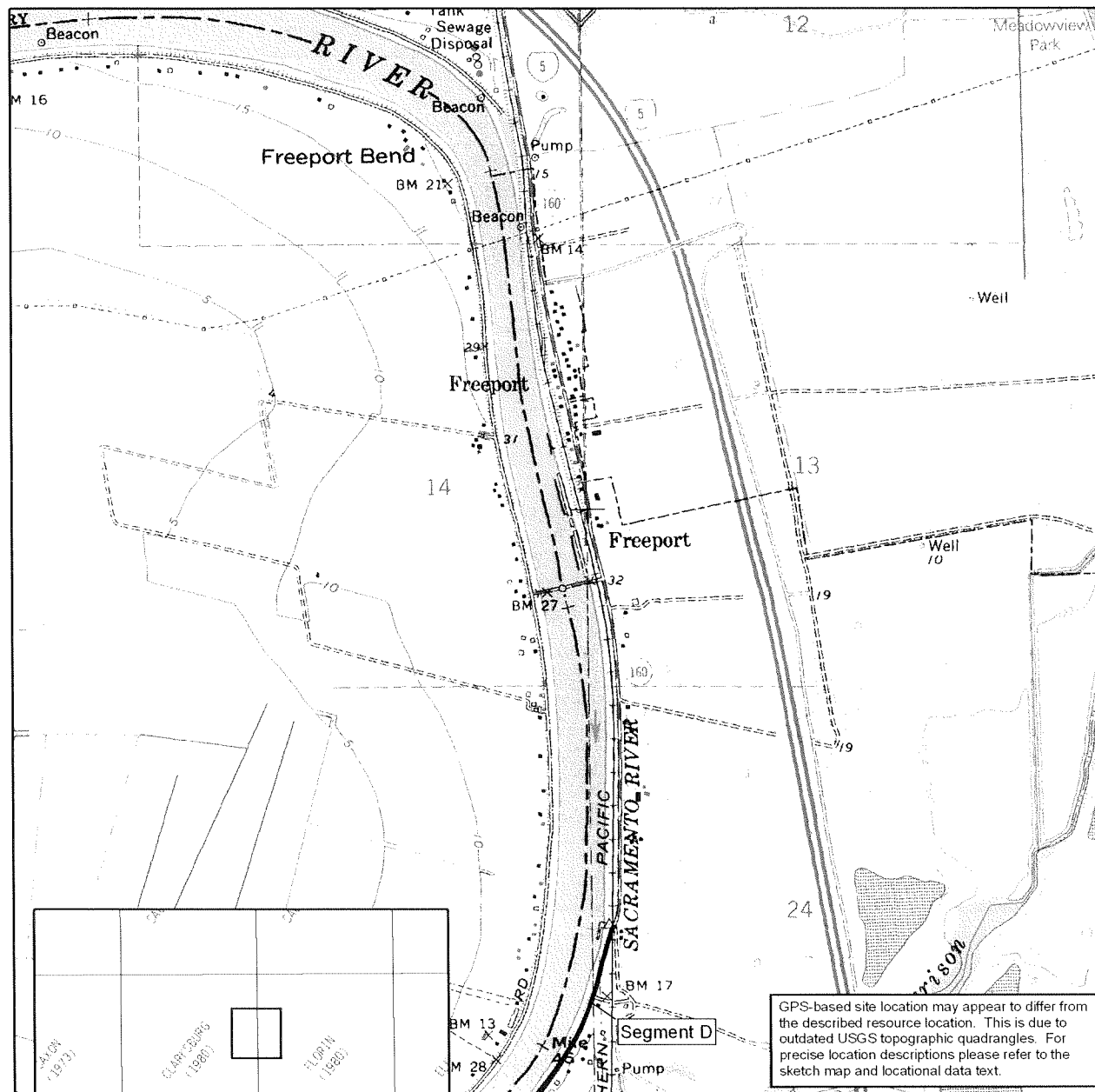
Trinomial \_\_\_\_\_

Page 23 of 23

\*Resource Name or #: JSA100

\*Map Name: Clarksburg (1967; photorevised 1980), Florin (1968; photorevised 1980)

\*Year:



Key to USGS 7.5' quads depicted

SCALE 1:24,000



## Appendix E

### Construction Noise and Noise Measurement Data



Freq Weight : A  
 Time Weight : FAST  
 Level Range : 40-100  
 Max dB : 87.4 - 2017/12/05 13:21:24  
 Level Range : 40-100  
 SEL : 97.7  
 Leq : 68.2

No. s	Date Time	(dB)				
1	2017/12/05 13:10:50	75.0	75.6	71.4	69.5	68.5
6	2017/12/05 13:10:55	65.6	64.9	63.2	62.3	59.1
11	2017/12/05 13:11:00	57.4	55.6	50.8	45.9	43.4
16	2017/12/05 13:11:05	44.6	56.1	49.6	46.0	46.1
21	2017/12/05 13:11:10	48.0	50.2	55.7	62.0	71.8
26	2017/12/05 13:11:15	81.7	71.2	65.2	62.4	61.6
31	2017/12/05 13:11:20	61.0	60.8	59.6	60.3	59.1
36	2017/12/05 13:11:25	58.5	58.1	62.7	65.3	71.0
41	2017/12/05 13:11:30	78.5	69.7	63.7	58.2	50.1
46	2017/12/05 13:11:35	48.2	46.3	45.8	50.0	48.7
51	2017/12/05 13:11:40	42.7	39.8	38.0	37.0	37.0
56	2017/12/05 13:11:45	38.9	39.9	40.8	42.0	45.1
61	2017/12/05 13:11:50	47.0	48.5	46.5	51.3	58.7
66	2017/12/05 13:11:55	66.7	75.9	70.6	63.7	61.4
71	2017/12/05 13:12:00	68.3	76.5	70.5	64.6	64.0
76	2017/12/05 13:12:05	57.9	54.6	53.3	51.1	50.8
81	2017/12/05 13:12:10	51.5	49.8	47.0	45.2	44.5
86	2017/12/05 13:12:15	44.7	45.7	45.4	50.5	47.6
91	2017/12/05 13:12:20	43.5	46.7	46.0	50.5	51.5
96	2017/12/05 13:12:25	52.8	55.5	56.4	57.7	61.2
101	2017/12/05 13:12:30	68.2	74.5	73.7	71.1	67.9
106	2017/12/05 13:12:35	66.7	75.4	77.4	71.6	68.4
111	2017/12/05 13:12:40	63.3	60.4	64.5	61.4	53.6
116	2017/12/05 13:12:45	53.4	51.2	48.0	46.4	42.2
121	2017/12/05 13:12:50	42.4	40.8	40.2	40.0	41.3
126	2017/12/05 13:12:55	40.8	40.8	39.6	40.5	41.4
131	2017/12/05 13:13:00	42.2	46.1	49.2	55.7	60.2
136	2017/12/05 13:13:05	67.1	75.2	69.5	64.4	59.6
141	2017/12/05 13:13:10	57.0	55.5	59.7	65.5	78.2
146	2017/12/05 13:13:15	74.4	64.3	61.2	56.8	56.2
151	2017/12/05 13:13:20	53.5	50.0	49.0	47.2	44.0
156	2017/12/05 13:13:25	42.8	41.4	41.2	39.9	40.2
161	2017/12/05 13:13:30	43.2	40.8	39.0	37.6	37.2
166	2017/12/05 13:13:35	38.0	35.9	38.8	38.9	36.5
171	2017/12/05 13:13:40	40.2	37.4	36.9	38.6	36.8
176	2017/12/05 13:13:45	35.0	36.0	42.1	40.8	41.9
181	2017/12/05 13:13:50	41.6	37.7	42.0	43.2	38.6
186	2017/12/05 13:13:55	39.2	41.4	43.7	41.4	43.6
191	2017/12/05 13:14:00	46.1	45.7	50.4	57.7	66.6
196	2017/12/05 13:14:05	77.8	71.4	65.9	59.4	56.4
201	2017/12/05 13:14:10	54.1	51.5	54.3	58.9	57.6
206	2017/12/05 13:14:15	60.4	66.8	73.9	76.3	69.9
211	2017/12/05 13:14:20	65.3	62.1	55.6	51.7	51.4
216	2017/12/05 13:14:25	50.0	48.2	44.8	45.2	48.2
221	2017/12/05 13:14:30	50.2	54.2	58.4	63.8	69.0
226	2017/12/05 13:14:35	76.2	76.4	69.0	64.6	61.2
231	2017/12/05 13:14:40	59.7	57.8	62.0	70.1	79.2
236	2017/12/05 13:14:45	67.5	61.6	63.5	69.0	76.2
241	2017/12/05 13:14:50	77.5	69.1	64.9	62.1	56.1
246	2017/12/05 13:14:55	52.8	50.9	51.2	47.1	46.4
251	2017/12/05 13:15:00	49.7	51.2	44.8	40.6	37.7
256	2017/12/05 13:15:05	46.4	38.8	52.7	38.3	42.4
261	2017/12/05 13:15:10	43.7	42.0	41.5	41.8	40.1
266	2017/12/05 13:15:15	48.9	46.9	42.0	36.5	36.3
271	2017/12/05 13:15:20	36.5	41.7	40.6	39.0	41.5
276	2017/12/05 13:15:25	41.7	46.5	58.6	51.9	59.3
281	2017/12/05 13:15:30	68.0	76.1	69.7	65.0	60.0
286	2017/12/05 13:15:35	58.1	54.6	53.9	48.5	48.9
291	2017/12/05 13:15:40	46.6	41.6	41.6	43.8	41.9
296	2017/12/05 13:15:45	40.2	39.2	39.2	39.2	43.3
301	2017/12/05 13:15:50	42.7	45.8	41.7	43.3	46.2
306	2017/12/05 13:15:55	44.3	47.4	51.9	58.1	67.2
311	2017/12/05 13:16:00	79.2	74.3	65.7	58.1	54.4
316	2017/12/05 13:16:05	54.4	51.5	51.4	50.3	48.7
321	2017/12/05 13:16:10	45.8	45.5	45.0	44.1	43.7
326	2017/12/05 13:16:15	42.8	39.7	40.6	42.7	43.2
331	2017/12/05 13:16:20	45.7	47.4	53.0	59.8	68.0
336	2017/12/05 13:16:25	75.6	72.8	82.2	72.2	65.3
341	2017/12/05 13:16:30	64.5	59.8	57.4	54.3	52.7
346	2017/12/05 13:16:35	50.2	49.2	48.7	48.6	45.6
351	2017/12/05 13:16:40	48.2	48.0	46.5	45.4	45.8
356	2017/12/05 13:16:45	45.7	44.0	43.5	44.2	57.1
361	2017/12/05 13:16:50	44.4	44.7	43.1	41.9	42.0
366	2017/12/05 13:16:55	42.3	42.4	41.4	40.6	41.4
371	2017/12/05 13:17:00	40.4	39.7	41.0	39.8	41.4
376	2017/12/05 13:17:05	41.5	44.1	44.8	43.9	45.7
381	2017/12/05 13:17:10	45.0	44.4	44.4	50.4	48.6
386	2017/12/05 13:17:15	54.2	61.3	71.4	78.1	68.9
391	2017/12/05 13:17:20	65.0	62.9	78.5	74.6	68.4
396	2017/12/05 13:17:25	64.2	67.1	74.3	82.6	80.1
401	2017/12/05 13:17:30	76.5	73.4	75.1	74.9	72.4
406	2017/12/05 13:17:35	66.4	62.5	60.0	59.2	57.3
411	2017/12/05 13:17:40	57.2	56.1	55.1	53.9	53.4
416	2017/12/05 13:17:45	53.3	53.2	54.4	61.1	67.6
421	2017/12/05 13:17:50	75.7	75.8	72.3	74.3	77.7



426	2017/12/05	13:17:55	70.1	66.1	65.7	61.6	58.8
431	2017/12/05	13:18:00	57.8	55.8	53.0	53.9	53.4
436	2017/12/05	13:18:05	53.4	53.1	57.6	63.7	70.7
441	2017/12/05	13:18:10	74.4	70.5	64.1	59.8	62.8
446	2017/12/05	13:18:15	71.7	74.2	65.6	61.8	57.3
451	2017/12/05	13:18:20	55.4	54.6	49.6	49.3	47.4
456	2017/12/05	13:18:25	46.4	46.8	44.7	41.9	42.5
461	2017/12/05	13:18:30	43.2	42.5	45.0	49.3	49.1
466	2017/12/05	13:18:35	49.3	48.9	52.4	57.2	61.0
471	2017/12/05	13:18:40	63.9	70.2	73.6	71.2	65.6
476	2017/12/05	13:18:45	64.1	60.1	58.1	54.0	51.0
481	2017/12/05	13:18:50	50.9	50.2	52.0	56.0	60.7
486	2017/12/05	13:18:55	68.6	75.3	69.1	67.2	74.3
491	2017/12/05	13:19:00	77.9	71.8	66.8	61.1	63.5
496	2017/12/05	13:19:05	75.0	74.3	67.4	62.1	59.4
501	2017/12/05	13:19:10	68.3	79.2	72.3	72.2	79.2
506	2017/12/05	13:19:15	71.2	75.8	71.8	67.2	67.6
511	2017/12/05	13:19:20	76.1	70.0	67.8	60.3	55.9
516	2017/12/05	13:19:25	54.2	52.0	51.3	50.7	50.6
521	2017/12/05	13:19:30	49.3	50.7	50.9	50.5	50.9
526	2017/12/05	13:19:35	51.8	51.0	53.1	53.6	55.0
531	2017/12/05	13:19:40	57.9	59.4	62.0	67.6	78.4
536	2017/12/05	13:19:45	75.4	79.8	74.8	67.9	63.9
541	2017/12/05	13:19:50	62.1	58.9	55.9	54.5	52.7
546	2017/12/05	13:19:55	55.2	56.7	57.2	54.1	54.3
551	2017/12/05	13:20:00	57.7	59.7	66.2	73.0	78.9
556	2017/12/05	13:20:05	70.3	75.1	75.7	76.4	75.7
561	2017/12/05	13:20:10	74.0	80.7	72.9	69.9	74.2
566	2017/12/05	13:20:15	79.6	77.1	72.4	67.9	63.7
571	2017/12/05	13:20:20	59.7	57.9	57.4	55.2	54.9
576	2017/12/05	13:20:25	52.1	52.0	50.7	51.5	51.3
581	2017/12/05	13:20:30	48.8	51.1	52.2	52.1	52.6
586	2017/12/05	13:20:35	54.7	56.7	60.0	61.9	66.1
591	2017/12/05	13:20:40	74.7	74.6	68.3	64.9	61.4
596	2017/12/05	13:20:45	58.1	53.2	52.1	51.6	52.1
601	2017/12/05	13:20:50	54.7	60.5	62.9	69.2	77.7
606	2017/12/05	13:20:55	72.3	65.5	61.5	54.9	51.5
611	2017/12/05	13:21:00	50.2	50.1	51.8	51.2	48.2
616	2017/12/05	13:21:05	46.9	46.0	47.2	54.1	47.8
621	2017/12/05	13:21:10	49.4	53.1	57.8	64.2	69.6
626	2017/12/05	13:21:15	80.5	76.1	69.2	63.1	61.6
631	2017/12/05	13:21:20	61.7	66.9	76.8	86.5	77.3
636	2017/12/05	13:21:25	70.8	70.9	68.9	67.3	62.8
641	2017/12/05	13:21:30	59.8	57.4	56.2	56.6	55.5
646	2017/12/05	13:21:35	53.8	54.0	53.7	51.4	48.3
651	2017/12/05	13:21:40	48.0	50.7	55.7	49.9	49.3
656	2017/12/05	13:21:45	47.3	47.7	44.5	43.5	45.9
661	2017/12/05	13:21:50	45.4	45.0	45.7	48.1	52.3
666	2017/12/05	13:21:55	57.1	63.1	69.8	79.0	70.0
671	2017/12/05	13:22:00	65.1	61.8	56.3	53.0	49.8
676	2017/12/05	13:22:05	48.1	48.2	46.1	47.6	46.9
681	2017/12/05	13:22:10	45.2	44.6	44.5	43.3	43.4
686	2017/12/05	13:22:15	46.0	45.1	41.4	41.6	43.2
691	2017/12/05	13:22:20	41.3	43.0	46.3	45.3	47.5
696	2017/12/05	13:22:25	42.5	43.4	44.9	47.4	50.6
701	2017/12/05	13:22:30	56.9	63.9	73.9	76.4	67.6
706	2017/12/05	13:22:35	63.1	57.8	57.7	62.8	74.3
711	2017/12/05	13:22:40	75.7	66.4	62.4	58.4	55.5
716	2017/12/05	13:22:45	51.4	48.8	47.2	49.8	46.4
721	2017/12/05	13:22:50	44.6	42.8	42.3	41.1	41.3
726	2017/12/05	13:22:55	42.1	43.6	42.6	42.8	45.9
731	2017/12/05	13:23:00	44.6	42.9	42.5	43.6	40.2
736	2017/12/05	13:23:05	40.3	39.4	39.5	41.9	39.9
741	2017/12/05	13:23:10	44.5	45.6	42.9	42.9	45.2
746	2017/12/05	13:23:15	45.3	43.8	45.7	50.3	52.0
751	2017/12/05	13:23:20	52.0	53.8	56.9	59.7	62.4
756	2017/12/05	13:23:25	65.3	72.7	76.2	71.1	64.3
761	2017/12/05	13:23:30	60.8	59.2	64.1	70.6	73.9
766	2017/12/05	13:23:35	67.8	64.2	60.8	56.5	53.1
771	2017/12/05	13:23:40	52.6	50.3	51.4	51.5	53.4
776	2017/12/05	13:23:45	58.4	65.6	76.7	69.5	64.0
781	2017/12/05	13:23:50	58.0	54.2	50.1	48.5	50.6
786	2017/12/05	13:23:55	51.8	54.7	58.5	60.1	63.5
791	2017/12/05	13:24:00	71.8	77.6	71.9	65.6	63.5
796	2017/12/05	13:24:05	60.1	54.8	52.4	50.7	47.8
801	2017/12/05	13:24:10	46.6	44.1	43.2	42.3	45.1
806	2017/12/05	13:24:15	43.7	41.5	42.9	43.6	41.5
811	2017/12/05	13:24:20	41.6	43.1	46.1	45.5	45.9
816	2017/12/05	13:24:25	45.3	47.1	49.4	53.9	55.3
821	2017/12/05	13:24:30	58.0	60.7	66.0	72.8	72.5
826	2017/12/05	13:24:35	68.1	65.6	59.7	54.1	52.6
831	2017/12/05	13:24:40	49.6	50.3	55.7	58.7	67.3
836	2017/12/05	13:24:45	78.9	76.2	66.2	61.6	56.6
841	2017/12/05	13:24:50	54.5	53.8	53.8	52.7	51.9
846	2017/12/05	13:24:55	49.0	46.5	45.0	46.6	46.5
851	2017/12/05	13:25:00	46.7	51.1	45.1	43.1	40.3
856	2017/12/05	13:25:05	42.0	40.5	41.9	42.8	41.8
861	2017/12/05	13:25:10	41.4	39.6	39.1	40.6	38.5
866	2017/12/05	13:25:15	38.2	37.4	39.9	38.7	37.0
871	2017/12/05	13:25:20	41.8	43.4	38.4	36.4	37.7
876	2017/12/05	13:25:25	49.8	37.7	38.1	38.0	37.4
881	2017/12/05	13:25:30	36.6	36.6	37.5	37.3	40.2
886	2017/12/05	13:25:35	42.3	41.4	42.0	41.5	40.7
891	2017/12/05	13:25:40	41.0	42.1	44.4	43.4	46.7
896	2017/12/05	13:25:45	48.5	49.8	51.4	50.3	53.5



## Ambient Noise Survey Data Sheet

**Instructions:** Document noise measurement locations with a photo of the site, including the noise meter. Additionally, take notes on general and secondary noise sources, including the instantaneous noise level if possible. As a reminder, A/C weighting should be set to "A" and generally response time should be set to "fast." For additional information, please review the *Noise Measurement Protocol* in the pelican case.

**Project Name:** BALMD Jeece **Job Number:** \_\_\_\_\_  
**Date:** 12/4/17 **Operator Name:** Kari Zajac

### Measurement #1

**Location:** on 160 on segment 2 **Begin time:** 12:16 **Finish time:** 12:31  
**Measurement No.:** 1 **Wind (mph):** 6 **Direction:** W  
**Cloud Cover Class:** Overcast (>80%) ☐ Light (20-80%) ☐ Sunny (<20%) ☒  
**Calibration (dB):** Start: 94.4 End: 94.4  
**Primary Noise Sources:** vehicles **Distance:** \_\_\_\_\_  
**Secondary Noise Sources:** birds  
**Notes:** \_\_\_\_\_

**Traffic Count:** Passenger Cars: |||||  
Medium to Heavy Duty Trucks (3 axles): |||| Heavy Duty Trucks (4+ axles): 1

**Instantaneous Noise Sources/Levels** (e.g., airplane, bus airbrake, etc.): \_\_\_\_\_

**Leq:** 68.2 **SEL:** 97.7 **Lmax:** 87.4 **Lmin:** 34.8 **PK:** \_\_\_\_\_  
**L(05):** 75.6 **L(10):** 71.9 **L(50):** 52.7 **L(90):** 40.0 **L(95):** 38.7  
**Response:** Slow ☐ Fast ☒ Peak ☐ Impulse ☐

### Measurement #2

**Location:** \_\_\_\_\_ **Begin time:** \_\_\_\_\_ **Finish time:** \_\_\_\_\_  
**Measurement No.:** \_\_\_\_\_ **Wind (mph):** \_\_\_\_\_ **Direction:** \_\_\_\_\_  
**Cloud Cover Class:** Overcast (>80%) ☐ Light (20-80%) ☐ Sunny (<20%) ☐  
**Calibration (dB):** Start: \_\_\_\_\_ End: \_\_\_\_\_  
**Primary Noise Sources:** \_\_\_\_\_ **Distance:** \_\_\_\_\_  
**Secondary Noise Sources:** \_\_\_\_\_  
**Notes:** \_\_\_\_\_

**Traffic Count:** Passenger Cars: \_\_\_\_\_  
Medium to Heavy Duty Trucks (3 axles): \_\_\_\_\_ Heavy Duty Trucks (4+ axles): \_\_\_\_\_

**Instantaneous Noise Sources/Levels** (e.g., airplane, bus airbrake, etc.): \_\_\_\_\_

**Leq:** \_\_\_\_\_ **SEL:** \_\_\_\_\_ **Lmax:** \_\_\_\_\_ **Lmin:** \_\_\_\_\_ **PK:** \_\_\_\_\_  
**L(05):** \_\_\_\_\_ **L(10):** \_\_\_\_\_ **L(50):** \_\_\_\_\_ **L(90):** \_\_\_\_\_ **L(95):** \_\_\_\_\_  
**Response:** Slow ☐ Fast ☐ Peak ☐ Impulse ☐



# Roadway Construction Noise Model (RCNM),Version 1.1

Report date 3/18/2020

Case Description BALMD Levee Project - Site Demobilization

## ---- Receptor #1 ----

Description Land Use	Baselines (dBA)		
	Daytime	Evening	Night
Mobile Home Residential	68	55	45

Description	Impact Device	Usage(%)	Equipment		Receptor Distance (feet)	Estimated Shielding (dBA)
			Spec Lmax (dBA)	Actual Lmax (dBA)		
Pickup Truck	No	40			75	85

## Results

Equipment	Calculated (dBA)		Noise Limits (dBA)				
	*Lmax	Leq	Day Lmax	Leq	Evening Lmax	Leq	Night Lmax
Pickup Truck	70.4	66.4	N/A	N/A	N/A	N/A	N/A
Total	70.4	66.4	N/A	N/A	N/A	N/A	N/A

\*Calculated Lmax is the Loudest value.



# Roadway Construction Noise Model (RCNM),Version 1.1

Report date 3/20/2020

Case Descr BALMD Levee Proejct - Installation of Plants

## ---- Receptor #1 ----

Description Land Use	Baselines (dBA)		
	Daytime	Evening	Night
Mobile Hor Residential	68	55	45

Description	Impact Device	Usage(%)	Equipment		Receptor Distance (feet)	Estimated Shielding (dBA)
			Spec Lmax (dBA)	Actual Lmax (dBA)		
Work Boat	No	50			72	85
Water Truck	No	50			70	85
Hydroseeding Truck	No	40			80	85

## Results

Equipment	Calculated (dBA)		Noise Limits (dBA)				
	*Lmax	Leq	Day Lmax	Leq	Evening Lmax	Leq	Night Lmax
Work Boat	67.4	64.4	N/A	N/A	N/A	N/A	N/A
Water Truck	65.4	62.4	N/A	N/A	N/A	N/A	N/A
Hydroseeding Truck	75.4	71.4	N/A	N/A	N/A	N/A	N/A
Total	75.4	72.6	N/A	N/A	N/A	N/A	N/A

\*Calculated Lmax is the Loudest value.



# Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 6/23/2020

Case Description: BALMD Levee Project - Levee Construction and Encroachment

## ---- Receptor #1 ----

Description Land Use	Baselines (dBA)		
	Daytime	Evening	Night
Mobile Home Residential	68	55	45

Description	Impact Device	Usage(%)	Equipment		Receptor Distance (feet)	Estimated Shielding (dBA)
			Spec Lmax (dBA)	Actual Lmax (dBA)		
Barge	No	30		78	85	0
Barge	No	30		78	85	0
Barge	No	30		78	85	0
Barge	No	30		78	85	0
Work Boat	No	50		72	85	0
Excavator	No	40		80.7	85	0
Generator	No	50		80.6	85	0
Work Boat	No	50		72	85	0
Tug Boat	No	40		87	85	0
Front End Loader	No	40		79.1	85	0
Tug Boat	No	40		87	85	0
Vibratory Pile Driver	No	20		100.8	85	0

## Results

Equipment	Calculated (dBA)			Noise Limits (dBA)			
	*Lmax	Leq	Day Lmax	Leq	Evening Lmax	Leq	Night Lmax
Barge	73.4	68.2	N/A	N/A	N/A	N/A	N/A
Barge	73.4	68.2	N/A	N/A	N/A	N/A	N/A
Barge	73.4	68.2	N/A	N/A	N/A	N/A	N/A
Barge	73.4	68.2	N/A	N/A	N/A	N/A	N/A
Work Boat	67.4	64.4	N/A	N/A	N/A	N/A	N/A
Excavator	76.1	72.1	N/A	N/A	N/A	N/A	N/A
Generator	76	73	N/A	N/A	N/A	N/A	N/A
Work Boat	67.4	64.4	N/A	N/A	N/A	N/A	N/A
Tug Boat	82.4	78.4	N/A	N/A	N/A	N/A	N/A
Front End Loader	74.5	70.5	N/A	N/A	N/A	N/A	N/A
Tug Boat	82.4	78.4	N/A	N/A	N/A	N/A	N/A
Vibratory Pile Driver	96.2	89.2	N/A	N/A	N/A	N/A	N/A
Total	96.2	90.2	N/A	N/A	N/A	N/A	N/A

\*Calculated Lmax is the Loudest value.



# Roadway Construction Noise Model (RCNM),Version 1.1

Report date 3/18/2020

Case Descr BALMD Levee Proejct - Mobilization

## ---- Receptor #1 ----

Description Land Use	Baselines (dBA)		
	Daytime	Evening	Night
Mobile Hor Residential	68	55	45

Description	Impact Device	Usage(%)	Equipment		Receptor Distance (feet)	Estimated Shielding (dBA)
			Spec Lmax (dBA)	Actual Lmax (dBA)		
Pickup Truck	No	40		75	85	0
Flat Bed Truck	No	40		74.3	85	0

## Results

Equipment	Calculated (dBA)		Noise Limits (dBA)				
	*Lmax	Leq	Day Lmax	Leq	Evening Lmax	Leq	Night Lmax
Pickup Truck	70.4	66.4	N/A	N/A	N/A	N/A	N/A
Flat Bed Truck	69.6	65.7	N/A	N/A	N/A	N/A	N/A
Total	70.4	69.1	N/A	N/A	N/A	N/A	N/A

\*Calculated Lmax is the Loudest value.



# Roadway Construction Noise Model (RCNM),Version 1.1

Report date 3/23/2020

Case Descr BALMD Levee Proejct - Site Prep

## ---- Receptor #1 ----

Description Land Use	Baselines (dBA)		
	Daytime	Evening	Night
Mobile Hor Residential	68	55	45

Description	Impact Device	Usage(%)	Equipment		Receptor Distance (feet)	Estimated Shielding (dBA)
			Spec Lmax (dBA)	Actual Lmax (dBA)		
Chain Saw	No	20		83.7	85	0
Chain Saw	No	20		83.7	85	0
Flail Mower	No	50		90	85	0
Wood Chipper	No	40		118	85	0
Flat Bed Truck	No	40		74.3	85	0

## Results

Equipment	Calculated (dBA)		Noise Limits (dBA)				
	*Lmax	Leq	Day Lmax	Leq	Evening Lmax	Leq	Night Lmax
Chain Saw	79.1	72.1	N/A	N/A	N/A	N/A	N/A
Chain Saw	79.1	72.1	N/A	N/A	N/A	N/A	N/A
Flail Mower	85.4	82.4	N/A	N/A	N/A	N/A	N/A
Wood Chipper	113.4	109.4	N/A	N/A	N/A	N/A	N/A
Flat Bed Truck	69.6	65.7	N/A	N/A	N/A	N/A	N/A
Total	113.4	109.4	N/A	N/A	N/A	N/A	N/A

\*Calculated Lmax is the Loudest value.



# Roadway Construction Noise Model (RCNM),Version 1.1

Report date 3/23/2020

Case Descr BALMD Levee Proejct - Terra Bag Placement

## ---- Receptor #1 ----

Description Land Use	Baselines (dBA)		
	Daytime	Evening	Night
Mobile Hor Residential	68	55	45

Description	Impact Device	Usage(%)	Equipment		Receptor Distance (feet)	Estimated Shielding (dBA)
			Spec Lmax (dBA)	Actual Lmax (dBA)		
Barge	No	30		78	85	0
Barge	No	30		78	85	0
Barge	No	30		78	85	0
Barge	No	30		78	85	0
Work Boat	No	50		72	85	0
Excavator	No	40		80.7	85	0
Generator	No	50		80.6	85	0
Work Boat	No	50		72	85	0
Front End Loader	No	40		79.1	85	0
Tug Boat	No	40		87	85	0
Tug Boat	No	40		87	85	0

## Results

Equipment	Calculated (dBA)		Noise Limits (dBA)				
	*Lmax	Leq	Day Lmax	Leq	Evening Lmax	Leq	Night Lmax
Barge	73.4	68.2	N/A	N/A	N/A	N/A	N/A
Barge	73.4	68.2	N/A	N/A	N/A	N/A	N/A
Barge	73.4	68.2	N/A	N/A	N/A	N/A	N/A
Barge	73.4	68.2	N/A	N/A	N/A	N/A	N/A
Work Boat	67.4	64.4	N/A	N/A	N/A	N/A	N/A
Excavator	76.1	72.1	N/A	N/A	N/A	N/A	N/A
Generator	76	73	N/A	N/A	N/A	N/A	N/A
Work Boat	67.4	64.4	N/A	N/A	N/A	N/A	N/A
Front End Loader	74.5	70.5	N/A	N/A	N/A	N/A	N/A
Tug Boat	82.4	78.4	N/A	N/A	N/A	N/A	N/A
Tug Boat	82.4	78.4	N/A	N/A	N/A	N/A	N/A
Total	82.4	83.4	N/A	N/A	N/A	N/A	N/A

\*Calculated Lmax is the Loudest value.



# Roadway Construction Noise Model (RCNM),Version 1.1

Report date 3/20/2020

Case Descr BALMD Levee Proejct - Terra Bag Placement

## ---- Receptor #1 ----

Description Land Use	Baselines (dBA)		
	Daytime	Evening	Night
Mobile Hor Residential	68	55	45

Description	Impact Device	Usage(%)	Equipment		Receptor Distance (feet)	Estimated Shielding (dBA)
			Spec Lmax (dBA)	Actual Lmax (dBA)		
Forklift	No	50		85.3	85	0
Forklift	No	50		85.3	85	0
Dump Truck	No	40		76.5	85	0
Compactor (ground)	No	20		83.2	85	0
Boom Truck	No	40		80	85	0

## Results

Equipment	Calculated (dBA)		Noise Limits (dBA)				
	*Lmax	Leq	Day Lmax	Leq	Evening Lmax	Leq	Night Lmax
Forklift	80.7	77.7	N/A	N/A	N/A	N/A	N/A
Forklift	80.7	77.7	N/A	N/A	N/A	N/A	N/A
Dump Truck	71.8	67.9	N/A	N/A	N/A	N/A	N/A
Compactor (ground)	78.6	71.6	N/A	N/A	N/A	N/A	N/A
Boom Truck	75.4	71.4	N/A	N/A	N/A	N/A	N/A
Total	80.7	81.8	N/A	N/A	N/A	N/A	N/A

\*Calculated Lmax is the Loudest value.



Activity and Number of Personnel	Number of Work Days	Equipment	Duration of Use (Hours/Day)	Quantity	Maximum Sound Level at 50 feet (A-weighted decibels [dBA])	Usage Factor (%)	Equivalent Noise Level (8 hour) at 50 feet (dBA)
Survey (2 people) Phase 1 to 3	250	1-Survey Trucks (Gasoline)	10	1	74	10	64
Grading Phase 1 (14 people)	185	2-Dozer (Diesel)	10	2	85	40	92
		2-Loader (Diesel)	10	2	80	40	
		4-Scraper (Diesel)	10	4	85	40	
		2-Grader (Diesel)	10	2	85	40	
		4-Water Truck (Diesel)	10	4	80	40	
		1-Tool Truck (Gasoline)	10	1	75	40	
		3-Pickup 4x4 (Gasoline)	10	3	75	10	
		20- Haul Truck (Gasoline)	10	10	80	17	
Fencing Phase 1 Block Wall (16 people)	60	1-Bobcat (Diesel)	10	1	80	40	85
		1-Forklift (Propane)	10	1	80	40	
		1-4x4 Backhoe (Diesel)	10	1	80	40	
	15	1-Concrete Pump (Diesel)	2	1	82	75	
	60	1-Flatbed Truck (Gasoline)	2	1	75	40	
	60	1-Crewcab Truck (Gasoline)	2	1	75	20	
Civil Phase 1 (60 people)	140	3-Excavator (Diesel)	10	3	85	40	92
		3-Foundation Auger (Diesel)	10	3	85	20	
		6-Backhoes (Diesel)	10	6	80	40	
		3-Dump Truck (Diesel)	6	3	80	17	
		3-Skip Loader (Diesel)	10	3	80	40	
		3-Water Truck (Diesel)	10	3	80	40	
		4-Bobcat Skid Steer (Diesel)	10	4	80	40	
		4-Forklift (Propane)	6	4	80	40	
	45	2-17-Ton Crane (Diesel)	5	2	80	16	
	20	1- Concrete Pump Truck (Diesel)	5	1	81	75	
	140	4-Tool Truck (Gasoline)	3	4	75	10	



Activity and Number of Personnel	Number of Work Days	Equipment	Duration of Use (Hours/Day)	Quantity	Maximum Sound Level at 50 feet (A-weighted decibels [dBA])	Usage Factor (%)	Equivalent Noise Level (8 hour) at 50 feet (dBA)
Mechanical Electrical Equipment Rooms Phase 1 (50 people)	120	2-Carry-all Truck (Gasoline)	3	2	75	20	89
		5-Tool Truck (Gasoline)	2	5	75	10	
		1-Stake Truck (Gasoline)	5	1	75	10	
	60	1-20-Ton Crane (Diesel)	5	1	81	16	
	40	1- Concrete Pump Truck (Diesel)	5	6	81	75	
	120	3-Forklift (Propane)	5	3	80	40	
	60	2-Backhoes (Diesel)	10	2	80	40	
	60	1-Loader (Diesel)	10	1	80	40	
	60	2-Bobcat Skid Steer (Diesel)	10	2	80	40	
	60	2-Manlifts (Propane)	10	2	75	10	
	120	400 Kilowatt (KW) Generator (Diesel)	12	1	82	50	
Electrical Phase 1 (50) people)	260	4-Scissor Lifts (Propane)	5	4	75	20	84
		4-Manlifts (Propane)	5	4	75	20	
		3-Reach Manlift (Propane)	5	3	75	20	
		2-15-Ton Crane (Diesel)	5	2	80	16	
	80	1-20-Ton Crane (Diesel)	10	1	81	16	
	100	1-50-Ton Crane (Diesel)	8	1	83	16	
	60	1-100-Ton Crane (Diesel)	8	1	85	16	
	260	1-Flatbed Truck (Gasoline)	5	1	74	40	
		2-Tool Trailer	3	2			
		3-Forklift(Propane)	6	3	80	40	
		3-Crew Trucks(Gasoline)	2	3	75	20	
Wiring Phase 1 (50 people)	90	3-Manlift (Propane)	5	3	75	10	77
		2-Tool Trailer	3	2			
		3-Forklift (Propane)	3	3	80	40	
Maintenance Crew Equipment Check Phase 1 (5 people)	65	2-MaintenanceTrucks (Gasoline)	5	2	75	10	66
Testing Phase 1 (9 people)	200	4-Crew Truck (Gasoline)	3	4	75	20	70



Activity and Number of Personnel	Number of Work Days	Equipment	Duration of Use (Hours/Day)	Quantity	Maximum Sound Level at 50 feet (A-weighted decibels [dBA])	Usage Factor (%)	Equivalent Noise Level (8 hour) at 50 feet (dBA)
Asphalting Phase 1 (15 people)	30	2-Paving Roller (Diesel)	5	2	80	20	82
		2-Stake Truck (Gasoline)	5	2	75	20	
		1-Dump Truck (Diesel)	5	6	80	17	
		1-Asphalt Curb Machine (Diesel)	3	1	80	20	
Test and Maintenance Building Phase 1 (50 people)	150	2-Carry-all Truck (Gasoline)	3	2	75	20	88
		5-Tool Truck (Gasoline)	2	5	75	20	
		1-Stake Truck (Gasoline)	5	1	75	20	
	60	1-20-TonCrane (Diesel)	5	1	81	16	
	40	1- Concrete Pump Truck (Diesel)	5	6	81	75	
	150	3-Forklift (Propane)	5	3	80	40	
	60	2-Backhoes (Diesel)	10	2	80	40	
	30	1-Loader (Diesel)	10	1	80	40	
	60	2-Bobcat Skid Steer (Diesel)	10	2	80	40	
		2-Manlifts (Propane)	10	2	75	10	
Control Building Phase 1 (50 people)	180	2-Carry-all Truck (Gasoline)	3	2	75	20	88
		5-Tool Truck (Gasoline)	2	5	75	20	
		1-Stake Truck (Gasoline)	5	1	75	20	
	60	1-20-Ton Crane (Diesel)	5	1	81	16	
	40	1- Concrete Pump Truck (Diesel)	5	6	81	75	
	180	3-Forklift (Propane)	5	3	80	40	
	60	2-Backhoes (Diesel)	10	2	80	40	
	30	1-Loader (Diesel)	10	1	80	40	
	60	2-Bobcat Skid Steer (Diesel)	10	2	80	40	
	60	2-Manlifts (Propane)	10	2	75	10	
Electrical Demo Phase 2 (20 people)	25	2-Manlifts (Propane)	6	2	75	10	81
		3-Reach Lift (Propane)	6	3	75	10	
		1-15-Ton Crane (Diesel)	6	1	80	16	
		1-50-Ton Crane (Diesel)	6	1	83	16	



Activity and Number of Personnel	Number of Work Days	Equipment	Duration of Use (Hours/Day)	Quantity	Maximum Sound Level at 50 feet (A-weighted decibels [dBA])	Usage Factor (%)	Equivalent Noise Level (8 hour) at 50 feet (dBA)
Electrical Demo Phase 2 (cont.) (20 people)	25	2-Tool Trailer	5	2			81
		2-Forklift (Propane)	6	2	80	40	
		3-Crew Trucks (Gasoline)	2	3	75	20	
Civil Demo/Grading Phase 2 (14 people)	40	2-Excavator (Diesel)	10	2	81	40	90
		2-Backhoes (Diesel)	10	2	80	40	
		3-Dump Truck (Diesel)	10	3	80	40	
		2-Skip Loader (Diesel)	10	2	80	40	
		2-Water Truck (Diesel)	10	2	75	40	
		2-Bobcat Skid Steer (Diesel)	10	2	80	40	
		2-Forklift (Propane)	6	2	80	40	
		2-Dozer (Diesel)	10	2	82	40	
		2-Loader (Diesel)	10	2	80	40	
		2-Scraper (Diesel)	10	2	84	40	
		1-Grader (Diesel)	10	1	83	40	
		3-Water Truck (Diesel)	10	3	75	40	
Civil Installation Phase 2 (20 people)	60	2-Excavator (Diesel)	10	2	81	40	89
		2-Foundationauger (Diesel)	10	2	85	20	
		2-Backhoes (Diesel)	10	2	80	40	
		3-Dump Truck (Diesel)	10	3	80	40	
		2-Skip Loader (Diesel)	10	2	80	40	
		1-Water Truck (Diesel)	10	1	75	40	
		2-Bobcat Skid Steer (Diesel)	10	2	80	40	
		2-Forklift (Propane)	5	2	80	40	
		1- Concrete Pump Truck (Diesel)	10	3	81	75	
		1-Tool Trailer	5	1			



Activity and Number of Personnel	Number of Work Days	Equipment	Duration of Use (Hours/Day)	Quantity	Maximum Sound Level at 50 feet (A-weighted decibels [dBA])	Usage Factor (%)	Equivalent Noise Level (8 hour) at 50 feet (dBA)
Electrical Phase 2 Including Wiring (50 people)	80	2-Scissor Lifts (Propane)	10	2	75	10	84
		3-Manlifts (Propane)	10	3	75	10	
		3-Reach Lift (Propane)	10	3	75	10	
		1-15-Ton Crane (Diesel)	6	1	80	16	
		1-50-Ton Crane (Diesel)	10	1	83	16	
		1-100-Ton Crane (Diesel)	10	1	85	16	
		2-Tool Trailer	10	2			
		3-Forklift (Propane)	6	3	80	40	
		3-Crew Trucks (Gasoline)	5	3	75	20	
		1-Flatbed Truck (Gasoline)	6	1	75	40	
Maintenance Crew Equipment Check Phase 2 (3 people)	25	2-Maintenance Trucks (Gasoline)	5	2	75	20	69
Testing Phase 2 (9 people)	100	4-Crew Truck (Gasoline)	3	4	75	20	70
Civil Demo/Grading Phase 3 (75 people)	100	3-Excavator (Diesel)	10	3	81	40	93
		4-Backhoes (Diesel)	10	4	80	40	
		4-Dump Truck (Diesel)	10	4	80	40	
		3-Skip Loader (Diesel)	10	3	80	40	
		2-Water Truck (Diesel)	10	2	75	40	
		4-Bobcat Skid Steer (Diesel)	10	4	80	40	
		4-Forklift (Propane)	10	4	80	40	
		3-Dozer (Diesel)	10	3	82	40	
		2-Loader (Diesel)	10	2	80	40	
		6-Scraper (Diesel)	10	6	84	40	
		2-Grader (Diesel)	10	2	83	40	
		4-Water Truck (Diesel)	10	4	75	40	
		30-Haul Truck (Gasoline)	10	10	76	17	