ELDER CREEK CHANNEL REHABILITATION PROJECT

Initial Study/Proposed Mitigated Negative Declaration

Prepared for
California Department of Water Resources

May 2015

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Prepared for:

California Department of Water Resources
Division of Flood Management
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CHAPTER 1
Introduction

As lead agency under the California Environmental Quality Act (CEQA), the California Department of Water Resources (DWR) has prepared this Draft Initial Study and Notice of Intent to adopt a Mitigated Negative Declaration (MND) to address the environmental consequences of constructing and operating the proposed Elder Creek Channel Rehabilitation Project (proposed Project).

The purpose of the proposed Project is to bring the portion of the channel within the Elder Creek Flood Control Project (Flood Control Project) back to the Army Corps of Engineers' (USACE) 1957 design profile capacity, as part of the Sacramento Flood Control Project. The Flood Control Project provides flood protection to the town of Gerber, adjacent roads, railroads, buildings, and agricultural lands. The Flood Control Project levees are intended to convey a flood of 17,000 cubic feet per second (cfs) with at least three feet of freeboard between the water's surface and the levee crown. Due to vegetative growth and accumulated sediment, the current estimated capacity of the Flood Control Project is 9,000 cfs.

DWR maintains approximately four miles of the Elder Creek channel as part of the Flood Control Project near the town of Gerber in Tehama County. Channel capacity would be restored through the removal of vegetation and sediment from Elder Creek within this four mile section.

The proposed Project will be carried out by DWR's Division of Flood Management, Flood Maintenance Office.

This document includes:

- an IS Environmental Checklist (consistent with Appendix G of the CEQA Guidelines); and
- Proposed Notice of Intent (NOI) to adopt this MND to satisfy CEQA requirements.

Following completion of the required public comment period for the NOI to adopt the MND (including the draft IS), DWR intends to adopt the MND and the Mitigation Monitoring Reporting Program (MMRP) and to approve the proposed Project.

1.1 Purpose of the Mitigated Negative Declaration

This IS/MND was prepared in accordance with the Public Resources Code Section 21000 et seq. (CEQA) and Title 14 of the California Code of Regulations Section 15000 et seq. (CEQA Guidelines). CEQA requires that all State and local government agencies consider the

environmental consequences of projects they propose to carry out, or over which they have discretionary authority, before implementing or approving those projects. DWR would be responsible for implementing the proposed Project and DWR's consideration of and potential approval of the project is addressed in this IS/MND; therefore, DWR is the appropriate CEQA lead agency. The purpose of this IS/ MND is to: (1) determine whether project implementation would result in potentially significant or significant effects to the environment; and (2) incorporate mitigation measures into the proposed Project design, as necessary, to eliminate the project's potentially significant or significant project effects or reduce them to a less-than-significant level.

As specified in the CEQA Guidelines Section 15064(a) if there is substantial evidence (such as the results of an IS) that a project, either individually or cumulatively, may have a significant effect on the environment, the lead agency must prepare an EIR. The lead agency may instead prepare a Negative Declaration if it determines there is no substantial evidence that the project may cause a significant impact on the environment. The lead agency may also prepare an MND if, in the course of the IS analysis, it is recognized that the project may have a significant impact on the environment but that implementing specific mitigation measures would reduce any such impacts to a less-than-significant level (CEQA Guidelines, Section15064(f)(2)).

DWR has prepared this IS to evaluate the potential environmental effects of the proposed Project and has incorporated mitigation measures to reduce or eliminate identified potentially significant project-related impacts. Therefore, a NOI to Adopt a MND has been prepared for this project.

1.2 Summary of Findings

The proposed Project would have no impacts on:

- Land Use and Land Use Planning
- Mineral Resources
- Population and Housing
- Public Services
- Recreation

The proposed Project would result in less-than-significant impacts on the following issue areas:

- Aesthetics
- Agriculture and Forest Resources
- Greenhouse Gas Emissions
- Transportation and Traffic
- Utilities and Service Systems

The proposed Project would have less-than-significant impacts *following* mitigation on:

- Air Quality
- Biological Resources
- Cultural Resources
- Geology, Soils, and Seismicity
- Hazards and Hazardous Materials
- Hydrology and Water Quality
- Noise
- Transportation and Traffic
- Mandatory Findings of Significance

1.3 Document Organization

This document is divided into the following chapters:

Notice of Intent to Adopt a MND. The NOI to Adopt a MND provides notice to responsible and trustee agencies, interested parties, and organizations of DWR's intent to adopt a MND for the proposed Project.

Chapter 1 – Introduction. This provides an introduction to the project, purpose of the IS/Proposed MND, summary of findings, and organization of this IS/Proposed MND.

Chapter 2 – Project Description. This chapter describes the whole action involved, including but not limited to later phases of the project, and any secondary, support, or off-site features necessary for its implementations, as well as general background.

Chapter 3 – Initial Study Environmental Checklist. This chapter presents an analysis of environmental issues identified in the CEQA Environmental Checklist and determines if project implementation would result in no impact, a less-than-significant impact, a less-than-significant impact with mitigation incorporated, or a potentially significant impact on the environment in each of the issue areas. If any impacts were determined to be potentially significant, an EIR would be required. For this project, however, mitigation measures have been incorporated where needed to reduce all potentially significant impacts to a less-than-significant level.

Chapter 4 – References. This chapter lists the references used in preparation of this IS/ Proposed MND.

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CHAPTER 2
Project Description

2.1 Location and Background

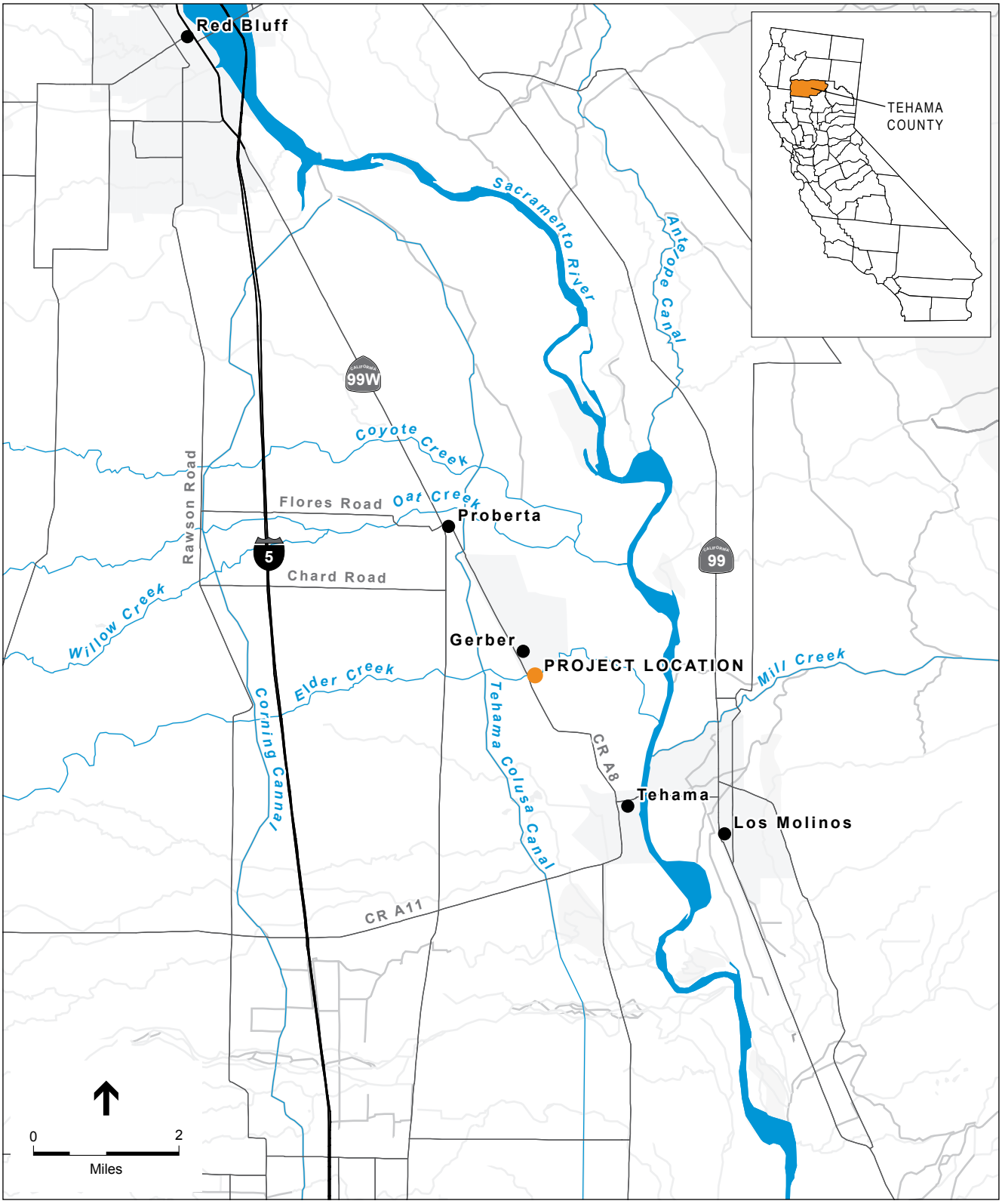
The proposed Project is located near the town of Gerber (**Figure 1**). The Project area is located in the Elder Creek channel beginning approximately 1 mile west of State Route 99 and extending east in and around the channel for approximately 4 miles, ending 1 mile east of Tehama Road (**Figure 2**). Elder Creek is an intermittent stream with flows generally occurring from November through May. From June through October Elder Creek is dry in most years.

The Elder Creek watershed drains runoff from the east side of the North Coast Range and the Sacramento Valley floor into the Sacramento River east of the town of Gerber. The Project provides flood protection to the town of Gerber, major and minor roadways (State Route 99 and County Route A8), rural residents, railroads (Southern Pacific Railroad), agricultural lands, and the Tehama-Colusa Canal.

The Flood Control Act of December 22, 1944, authorized the Elder Creek Channel Improvement and Levee Construction unit of work. This unit is part of the Sacramento River and Major and Minor Tributaries Project and was enacted by Congress. The USACE's October 1, 1959, "Design Memorandum No. 4, Sacramento River and Major and Minor Tributaries, California, Elder Creek General Design" (Design Memorandum) report contains the design details of the Flood Control Project (USACE 1959).

Subsequent to the approval of the Design Memorandum and during final preparation of the contract plans, local downstream landowners raised concerns regarding the potentially detrimental effects that the Project would have on their lands. The April 13, 1960, "Supplement No. 1 to Design Memorandum No. 4 – (General) Channel Improvement and Levee Construction" (USACE 1960) memorandum documents these local concerns along with three alternative plans.

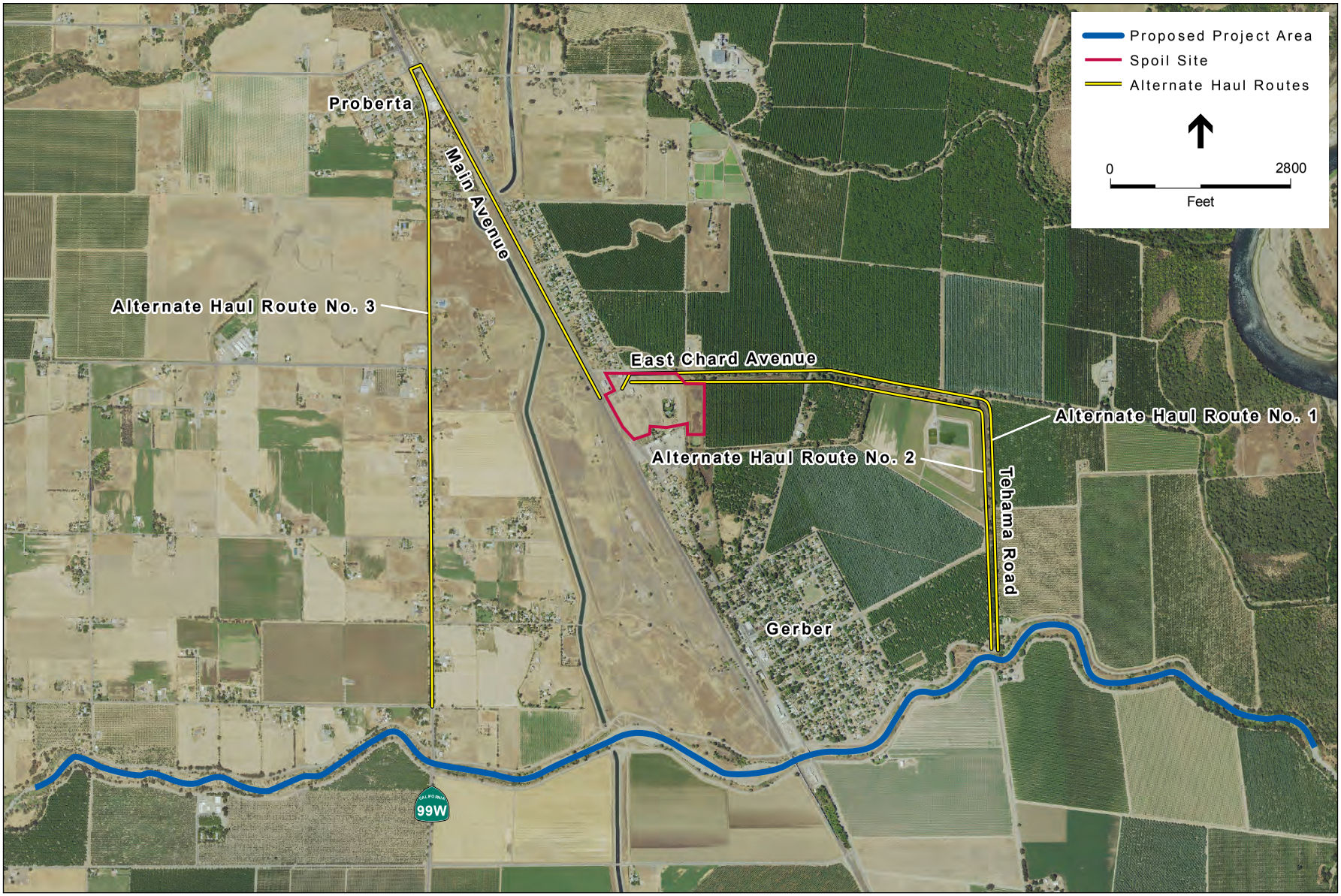
The Operation and Maintenance, Sacramento River and Major and Minor Tributaries Project, California – Operation and Maintenance Manual for Elder Creek from Sacramento River to High Ground (O&M Manual; USACE 1963) gives specific details on the Flood Control Project features as well as specific monitoring and maintenance requirements. Originally published in 1963, the O&M Manual also includes subsequent additions and revisions that were authorized and accepted per federal law.



SOURCE: DeLorme Street Atlas, 2000; ESA, 2015

Elder Creek Channel Rehabilitation . 130028.10

Figure 1
Regional Location



SOURCE: Microsoft, 2014; ESA, 2015

Elder Creek Channel Rehabilitation . 130028.10

Figure 2

Project Study Area

The Flood Control Project work, as covered by the O&M Manual, includes the following:

- The cleared channel of Elder Creek from the Sacramento River upstream for a distance of about 1.25 miles to the westerly Sacramento floodplain.
- The levees along both banks and the improved channel from the westerly Sacramento floodplain upstream about 4.1 miles to high ground (where the levee meets ground and the levee is no longer needed).
- The intermittent irrigation and drainage structures and intermittent bank protection along the levees.

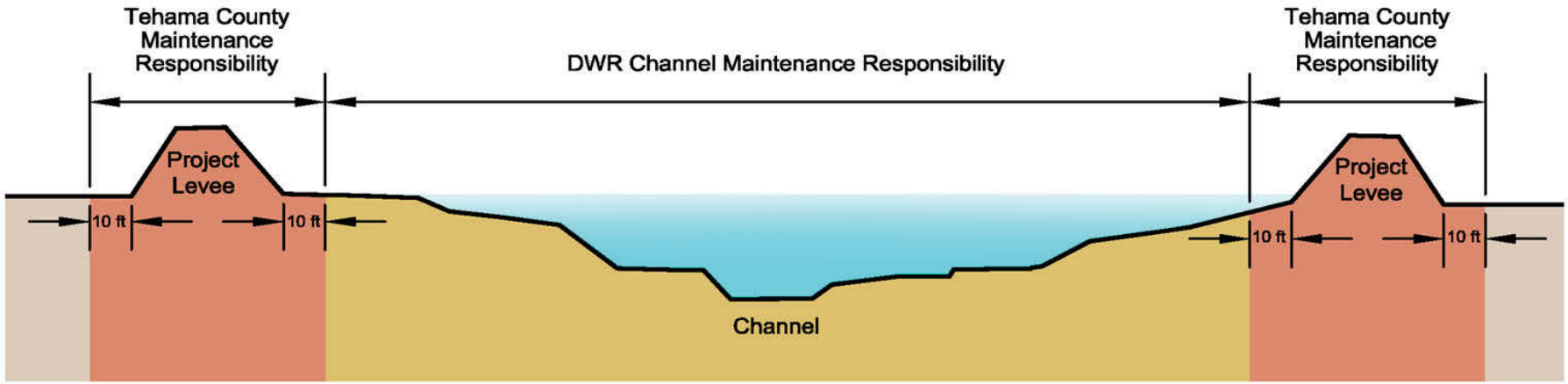
According to Federal Law, local interests are to maintain and operate all levee and appurtenant works at their own expense. The O&M Manual states that the Reclamation Board, which was renamed the Central Valley Flood Protection Board (Board) in 2008 by State legislation, accepted responsibility for operating and maintaining the levees and channel of Elder Creek; this acceptance of responsibility was by a letter dated November 27, 1961. That acceptance letter states that the Board formally accepted the levee improvement and bank protection work along Elder Creek from the Sacramento River overflow area upstream to 1.2 miles above Highway 99, but it does not say anything about accepting channel clearing. The Board's acceptance of the channel clearing must be implied as the O&M Manual is dated 17 months after the acceptance letter.

The maintenance agreement states that DWR is responsible for maintaining the channel section beginning 10 feet from the waterside toe of the levee and extending to 10 feet from the waterside toe of the opposing levee (**Figure 3**). The local maintaining agency responsible for the maintenance of the levees is Tehama County Flood Control and Water Conservation District (TCFCWCD). The TCFWCD is responsible for the levees and the ten-foot corridors along the waterside toes of the levees.

During a routine inspection of the Flood Control Project, the USACE noted some maintenance deficiencies, primarily debris and excess vegetation in the channel that may compromise the integrity or inspectability of the flood control project to pass design flows at stage levels at or below the 1957 design profile, and requested in an August 2006 letter (Department of the Army, Letter to Dan Fua, 14 Aug. 2006, Department of Water Resources. Electronic Copy) that DWR develop a plan to correct these maintenance deficiencies. These deficiencies must be corrected in order to maintain active status for receiving Public Law 84-99 rehabilitation funding.

In 2007 and 2008, DWR Sutter Maintenance Yard performed maintenance to remove arundo (*Arundo donax*) from within the channel using hand tools. Hand tools were used due to the high number of elderberry shrubs (*Sambucus mexicana*), which are habitat for the federally listed elderberry longhorn beetle (*Desmocerus californicus dimorphus*), located throughout the site. Efforts to remove arundo ended in early 2009 due to a number of factors. Since 2009, most of the arundo removed in 2007 and 2008 has returned.

In 2011, DWR produced the *Elder Creek Channel Management Plan* (June 27, 2011), (see **Appendix A**), which consisted of multiple hydraulic modeling scenarios for Elder Creek. The results of the hydraulic analysis show that the current capacity of the channel is 9,000 cfs,



SOURCE: DWR, 2014

Elder Creek Channel Rehabilitation . 130028.10

Figure 3

Levee Management Responsibilities

whereas the 1957 USACE design capacity of Elder Creek is 17,000 cfs. The *Elder Creek Channel Management Plan* (DWR 2011; Appendix A) determined that sediment and vegetation would have to be removed and thereafter managed in key areas in order to restore the channel to its design capacity.

The results from the *Elder Creek Channel Management Plan* and other analyses originally called for the removal of approximately 26 acres of arundo, clearing of vegetation ≤ 4 inches in diameter 21 acres of miscellaneous riparian vegetation, removal or trimming of 308 elderberry shrubs, and removal of 150,000 cubic yards of sediment (see page 2 of the Elder Creek Channel Management Plan). In an effort to minimize the environmental impacts of the proposed Project DWR performed additional hydraulic analyses on the channel. DWR identified a scenario that met the hydraulic design specifications of the O&M Manual while greatly reducing aquatic and terrestrial environmental impacts. The proposed Project is based on this scenario and consists of removing all arundo, [clearing/limbing] 4.05 acres of miscellaneous riparian vegetation, [limbing or relocation of] 1.78 acres of elderberry shrubs (approximately 18 shrubs), and [removal of]100,000 cubic yards of sediment from the channel. In addition, approximately 1.4 acres of mature riparian would be trimmed/limbed and 0.75 acre of elderberry shrubs (approximately 12 shrubs) would be trimmed/limbed (see 3.3.7, *Biological Resources* and **Appendix B**, *Elderberry Survey, Vegetation Thinning, and Sediment Removal Maps*).

2.2 Description of Proposed Project

2.2.1 Project Components

Proposed Project Activities

The proposed Project would be carried out in stages over a period of 5-years, with various components occurring each year. The main components of the project include vegetation removal, sediment removal, disposal and haul of removed materials, revegetation with native grass species, and erosion control. DWR would be performing all aspects of the construction work. Work would begin at the downstream limits of the proposed Project site. It is anticipated that up to 1 mile of channel would be disturbed each season. The work is proposed to begin May 1st and end by October 31 of each year and would pick up where it was left off the previous year and all work is anticipated to be completed by year 5. If dry conditions persist after October 31, in consultation with appropriate agencies, work might continue until wet conditions begin. The amount of work scheduled for any particular work season is dependent on the previous winter storm water impacts, budget constraints, and mitigation requirements. After completion of the Project, DWR will maintain the channel according to the *Elder Creek Channel Rehabilitation Project Long-Term Vegetation Management Plan* (see **Appendix C**).

Vegetation Removal and Herbicide Spot Treatment

Vegetation Management – Masticators, mowers, loaders, excavator, dump trucks, and hand crews would be used to cut and stockpile the vegetation. All arundo and vegetation to be removed

would be cut within 6 inches of the ground and treated with Round-up or other approved herbicide(s). In the areas set for thinning, vegetation less than 4 inches DBH (small trees, shrubs, and vines) would be removed, and remaining vegetation would be limbed up to 8 feet in height. All vegetation would be off hauled to a disposal site (a nearby permitted waste facility) or stockpiled and burned on site.

Elderberry shrubs may be transplanted off-site or removed per environmental requirements discussed further in Chapter 3.3.4 *Biological Resources*. The vegetation removal is needed to meet the flow conveyance capacity requirements as well as to provide a project site that can continue to be maintained by the DWR staff. All disturbed soil would be reseeded with a native herbaceous seed mix specified by the environmental permits.

All arundo would be removed from the project site. Arundo is a very invasive and hardy species that requires additional treatment to ensure re-growth does not occur from the root balls. The DWR staff would remove and/or treat the arundo stumps with herbicides in the spring and fall as needed to ensure they do not re-sprout. All disturbed soil would be replanted with a native herbaceous seed mix specified by the environmental documentation and permits.

Sediment Removal

Sediment removal work would begin at the downstream, east end of the proposed Project area between the months of May to October. DWR would mobilize excavators, dump trucks, and loaders to the site. Soil (excess sediment) would be removed from the channel and loaded into 10 wheel dump trucks or scrapers. Dump trucks and/or scrapers would then transport removed sediment to the spoils location, described below under *Sediment Disposal Site*. All finish grading within the channel would be conducted in a manner that minimizes the potential for depressions to form the following wet season. This Project component has been included to avoid and/or minimize the potential for pooling of water and associated potential for fish stranding.

Construction Considerations

DWR would mobilize pickup trucks and staff to the work site prior to each construction season. DWR staff (including environmental staff) would perform construction staking around the perimeter of the area planned for sediment removal and flagging around the areas designated for vegetation removal/thinning so as to not disturb areas which would not be worked on that year. This would include delineation of site access and haul route locations on-site for the vegetation and the sediment removal for that specific season. Water for dust control during vegetation management and sediment removal/ hauling activities would be obtained from the Gerber Las Flores Community Services District (GLCSD) and stored in water trucks onsite. Staging would be done on site within the channel and/or its right-of-way.

Sediment Disposal Site

The sediment disposal site is located approximately 1 mile just north of Elder Creek near East Chard and Main Avenues (Figure 2) off San Benito Avenue. GLCSD has expressed interest in the

soil and has a willing property owner that is allowing the use of his property for stockpiling the material. The GLCSD has reviewed the soil analysis information and determined they would accept the soil. DWR is currently working on obtaining a Temporary Entry Permit with the Property owner.

Haul Roads, Access Roads, and Staging

The haul routes and access roads for the sediment and vegetation removals would be limited to County Roads, existing levee crown road, channel, and existing right-of-way access points along Elder Creek (Figure 3). No new roadways would be constructed for this project. There are three alternative haul routes and selection of the preferred route would occur each year based on seasonal conditions. When that route is selected, it would be delineated prior to construction beginning and encroachment permits would be obtained through the appropriate municipalities.

The staging areas for the sediment and vegetation removals would be limited to the Elder Creek channel and the existing levee crown and toe roads. No vegetated areas would be disturbed for the purpose of staging materials or equipment.

Construction Equipment

Construction equipment anticipated to be used for this work includes pickup trucks, mowers, masticators, chainsaws, dump trucks, scrapers, excavators, and loaders (see **Table 1**). It is estimated to take approximately 4 weeks to perform the vegetation removal, approximately 2 week to perform any vegetation spot treatments prior to the sediment removal, and approximately 8 weeks to remove the sediment, assuming 5-day work weeks and 10-hour work shifts, however; the work is being planned to take place over an extended period of time based on the potential for resource and schedule conflicts.

TABLE 1
CONSTRUCTION EQUIPMENT AND ANNUAL USAGE

Equipment Type	# of Each	Estimated HP	Hours Used Annually
Vegetation removal			**4 weeks**
pickup trucks (similar to F-150)	2	325	160
mowers	2	171	160
masticators	2	171	160
chainsaws	2	81	160
dump trucks	2	400	160
excavators	2	162	160
loaders	2	97	160
Herbicide Spot Treatment			**2 weeks**
pickup trucks	2	325	80
Sediment Removal			**8 weeks**
dump trucks	2	400	400
excavators	2	162	400
loaders	2	97	400

CHAPTER 3
Environmental Checklist

3.1 Initial Study

1.	**Project Title:**	Elder Creek Channel Rehabilitation Project
2.	**Lead Agency Name and Address:**	California Department of Water Resources Division of Flood Management Flood Maintenance Office 3310 El Camino Ave, Suite 140 Sacramento, CA 95821
3.	**Contact Person and Phone Number:**	Gabrielle Bohrer (916) 574-0369
4.	**Project Location:**	Tehama County, CA
5.	**Project Sponsor's Name and Address:**	Same as above
6.	**General Plan Designation(s):**	Valley Floor Agriculture
7.	**Zoning Designation(s):**	Cropland

8. **Description of Project:** (Describe the whole action involved, including but not limited to later phases of the project, and any secondary, support, or off-site features necessary for its implementation. Attach additional sheets if necessary.)

The proposed Project would be carried out in stages over a 5-year process, with various components occurring each year and overlapping and sometimes repeated from year to year. The main components of the project include vegetation removal, sediment removal, disposal and haul of removed materials, revegetation with native plant species, and erosion control. DWR staff would be performing all aspects of the construction work and would begin work on the downstream limits of the proposed Project. It is anticipated that up to 1 mile of channel would be disturbed each season. Work is proposed to begin May 1 and end by October 31 of each year and would pick up where it was left off the previous year. All work is anticipated to be completed by year 5. DWR workload is dependent on the previous winter storm water impacts, budget constraints, and regulated work windows.

9. Surrounding Land Uses and Setting. (Briefly describe the project's surroundings.)

Agricultural uses, rural residential, recreational land uses

10. Other public agencies whose approval is required (e.g., permits, financing approval, or participation agreement. Indicate whether another agency is a responsible or trustee agency.)

- California Department of Fish and Wildlife (CEQA responsible and trustee agency) – Fish and Game Code Section 1600 Streambed Alteration Agreement
- U.S. Army Corps of Engineers – Clean Water Act Section 404 Permit
- Central Valley Regional Water Quality Control Board (CEQA responsible agency) – Clean Water Act Section 401 Water Quality Certification
- U.S. Fish and Wildlife Service – Endangered Species Act Section 7 Consultation
- National Marine Fisheries Service – Endangered Species Act Section 7 Consultation and Sustainable Fisheries Act Essential Fish Habitat Conservation Recommendations
- California Office of Historic Preservation – National Historic Preservation Act Section 106 Consultation

3.2 Environmental Factors Potentially Affected

The proposed project could potentially affect the environmental factor(s) checked below. The following pages present a more detailed checklist and discussion of each environmental factor.

☐ Aesthetics	☐ Agriculture and Forestry Resources	☒ Air Quality
☒ Biological Resources	☒ Cultural Resources	☒ Geology, Soils and Seismicity
☐ Greenhouse Gas Emissions	☒ Hazards and Hazardous Materials	☒ Hydrology and Water Quality
☐ Land Use and Land Use Planning	☐ Mineral Resources	☒ Noise
☐ Population and Housing	☐ Public Services	☐ Recreation
☒ Transportation and Traffic	☐ Utilities and Service Systems	☐ Mandatory Findings of Significance

DETERMINATION:

On the basis of this initial study:

☐ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☒ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☐ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, no further environmental documentation is required.

Mark List — 5/14/2015

Signature / ACTING CHIEF, FLOOD MAINT OFC. — Date

MARK LIST — CA Dept of

Printed Name — For WATER RESOURCES

3.3 Environmental Checklist

3.3.1 Aesthetics

Issues (and Supporting Information Sources):	*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
1. AESTHETICS — Would the project:				
a) Have a substantial adverse effect on a scenic vista?	☐	☐	☐	☒
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☐	☒
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	☒	☐
d) Create a new source of substantial light or glare which would adversely affect daytime or nighttime views in the area?	☐	☐	☐	☒

Environmental Setting

The proposed Project is located to the south of and adjacent to the unincorporated town of Gerber in Tehama County. Proposed Project activities would occur within the Elder Creek channel for a total of approximately 4 miles. The proposed Project is adjacent to land that is open, low elevation, flat agricultural land situated within the Central Valley.

The Project area is surrounded by row crops, agricultural equipment storage, and scattered rural housing. There are no designated scenic vistas or State-designated scenic highways located in or around the proposed Project area. Notable scenic views in the Project area include Mount Shasta, Mount Lassen, the Sacramento River, and the Coast Range. Tehama County has no officially designated scenic highways.

Discussion

a) **No Impact.** Proposed Project activities would occur in and around the Elder Creek Channel. Permanent changes to the creek channel as a result of the proposed Project, would occur below grade when compared to the surrounding area and would not impede notable scenic views. Therefore, the proposed Project would no effect on a scenic vista; and therefore, no impact would occur.

b) **No Impact.** A review of the current Caltrans Map of Designated State Scenic Highways indicated that there are no officially designated State scenic highways in Tehama County (Caltrans, 2014). Therefore, proposed Project activities would not damage a designated scenic resources and no impact would occur.

c) **Less than Significant Impact.** The proposed Project activities in the creek channel would be similar to the existing creek channel and its ancillary features and therefore would not significantly alter the visual character of the site and its surroundings.

Residents, local workers, and passers-by may view the Project activities for the duration of the proposed Project. However, the construction is temporary, and there would be no permanent visual disturbance. The visual character of the creek would change as a result of the removal of sediment and vegetation; however the majority of vegetation over four inches in diameter breast height would remain and the visual character would not be substantially degraded. This impact would be less-than-significant.

d) **No Impact.** The proposed Project would restore channel capacity by removing sediment and vegetation and would not result in new sources of light; therefore, no new source of light or glare would be created. Proposed Project activities would take place during daylight hours, and artificial lighting would not be required. No impact would occur.

3.3.2 Agricultural and Forest Resources

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
2. AGRICULTURAL AND FOREST RESOURCES — In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Department of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment project; and forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board. **Would the project:**				
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?	☐	☐	☐	☒
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	☒
c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?	☐	☐	☐	☒
d) Result in the loss of forest land or conversion of forest land to non-forest use?	☐	☐	☐	☒
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?	☐	☐	☐	☒

Environmental Setting

Agriculture Resources

The California Department of Conservation (DOC) administers the Farmland Mapping and Monitoring Program (FMMP), California's statewide agricultural land inventory. Through this mapping effort, the DOC classifies farmland under four categories; Prime Farmland, Farmland of Statewide Importance, Unique Farmland, and Farmland of Local Importance. Prime Farmland are those lands with the best combination of physical and chemical features able to sustain long-term agricultural production; Farmland of Statewide Importance is similar to Prime Farmland but with minor shortcomings, including greater slopes or less ability to store soil moisture; Unique Farmland has lesser quality soils and are used for the production of the State's leading agricultural crops; farmland of local importance and lands important to the local agricultural economy as determined by the county board of supervisors and a local advisory committee (DOC 2012). The lands adjacent to the proposed Project area are designated as Prime Farmland.

Agricultural production is the dominant land use in central Tehama County and the lands that surround the Sacramento River. The lands around the proposed Project area are planted in row crops and orchards.

The California Land Conservation Act of 1965, commonly referred to as the Williamson Act, enables local governments to enter into contracts with private landowners for the purpose of restricting specific parcels of land to agricultural or related open-space use. In return, landowners receive property tax assessments which are much lower than normal because they are based upon farming and open-space uses as opposed to full market value. Local governments receive an annual subvention of forgone property tax revenues from the State via the Open Space Subvention Act of 1971.

By State law, only land located in an agricultural preserve is eligible for a Williamson Act contract. In 2010, Tehama County had 789,644 acres enrolled in Williamson Act contracts. Of that, 53,616 acres are classified as Prime Farmland and 736,028 acres are non-prime soils (DOC 2010). The lands adjacent to the proposed Project area are currently in Williamson Act contracts; however, no Williamson Act contracts are within the proposed Project area.

Forestry Resources

There are no forestry resources adjacent to or located in the proposed Project area. The closest is Lassen National Forest, which boundary is approximately 15 miles east of the proposed Project area in Tehama County.

Discussion

a, b) **No Impact.** The proposed Project would occur within the Elder Creek channel in an area that is adjacent to agricultural land. The land adjacent to the creek channel is both Prime Farmland and under Williamson Act Contract. Project activities would not extend beyond the creek channel and right-of-way and therefore would not result in the conversion of farmland to non-agricultural uses. The purpose of the proposed Project is to improve flood protection of the creek and decrease potential flood impacts to surrounding land. With the added protection, this proposed Project implements an objective that is supportive of and beneficial to continued agricultural use of the surrounding lands. No impact would occur.

c) **No Impact.** The proposed Project area does not include forestry resources and would not conflict with zoning or rezoning of forest land. No impact would occur.

d) **No Impact.** The proposed Project area does not include forestry resources, and would not result in the loss of forest land or conversion of forest land to a non-forest use. No impact would occur.

e) **No Impact.** The proposed Project would restore channel capacity to Elder Creek through the removal of vegetation and sediment from within a four mile section. This would bring the channel back to the 1957 profile capacity and help keep flooding of surrounding agricultural lands to a minimum and result in less frequent or less severe flooding The surrounding agricultural land is important farmland and some is under Williamson Act contract, however, Project activities and the restoration of channel capacity would not take additional lands out of production or change the surrounding agricultural land use.

3.3.3 Air Quality

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
3. AIR QUALITY — Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. **Would the project:**				
a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☒	☐
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☒	☐	☐
c) 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 (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	☐	☒	☐	☐
d) Expose sensitive receptors to substantial pollutant concentrations?	☐	☒	☐	☐
e) Create objectionable odors affecting a substantial number of people?	☐	☐	☐	☒

Environmental Setting

The ambient concentrations of air pollutant emissions are determined by the amount of emissions released by pollutant sources and the atmosphere's ability to transport, transform, and dilute such emissions. Natural factors that affect pollutant transport and fate (process by which chemicals move and are transformed in the environment) include terrain, wind, atmospheric stability, and sunlight. Therefore, existing air quality conditions in the proposed Project area are determined by such natural factors as topography, meteorology, and climate, in addition to the types and quantities of emissions released by existing air pollutant sources.

The proposed Project would be located within the Sacramento Valley Air Basin. The local agency with regulatory authority is the Tehama County Air Pollution Control District (TCAPCD), which has jurisdiction in Tehama County. This district is responsible for preparing and implementing plans for the attainment of ambient air quality standards, rules and regulations, adopting and enforcing rules and regulations concerning sources of air pollution, and issuing permits for stationary sources of air pollution. The TCAPCD has developed a tiered approach to significance levels; a project with emissions qualifying it for Level A thresholds would be considered "Potentially Significant" and would require the most basic mitigations. Projects which qualify for Level B would also be considered "Potentially Significant" and would require more extensive mitigations. Projects which qualify for Level C would be considered "Significant" and would require the most extensive application of mitigations. The tiered thresholds for Level A, B and C are given in **Table 2** for a project's estimated emissions of criteria pollutants in pounds per day. These tiered thresholds will be compared to project construction emissions per TCAPCD guidelines.

TABLE 2
TCAPCD EMISSION SIGNIFICANCE THRESHOLDS

Threshold Level	NO_x (lbs/day)	ROG (lbs/day)	PM10 (lbs/day)
Level A Thresholds	≤ 25	≤ 25	≤ 80
Level B Thresholds	> 25	> 25	> 80
Level C Thresholds	>137	>137	>137

SOURCE: TCAPCD, 2009.

The federal Clean Air Act (FCAA) requires the U.S. Environmental Protection Agency (USEPA) to identify National Ambient Air Quality Standards (NAAQS or national standards) to protect public health and welfare. National standards have been established for ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, PM10, PM2.5, and lead. Pursuant to the 1990 Federal Clean Air Act Amendments, the USEPA classifies air basins (or portions thereof) as "attainment", "nonattainment", or "unclassified" for each criteria air pollutants, based on whether or not the NAAQS had been achieved. California has adopted ambient standards that are more stringent than the federal standards for the criteria air pollutants. Under the California Clean Air Act (CCAA) patterned after the FCAA, the California Air Resources Board (CARB) has designated areas as "attainment", "nonattainment", or "unclassified" with respect to the California Ambient Air Quality Standards (CAAQS). Areas that meet ambient air quality standards are classified as "attainment", areas that do not meet these standards are classified as "nonattainment", and areas that have insufficient data to support any designation are considered "unclassified". Tehama County is in attainment or unclassified for all federal standards, except for the Tuscan Buttes area which is nonattainment for 8-hour ozone (CARB, 2014). However, Tehama County is currently designated nonattainment for State ozone and PM10 standards (CARB, 2014).

Discussion

a) **Less than significant impact.** Air quality plans describe air pollution control strategies to be implemented by a city, county, or region. The primary purpose of an air quality plan is to maintain attainment of CAAQS or NAAQS, or to bring an area that does not attain a CAAQS or an NAAQS into compliance with the requirements of the FCAA and CCAA.

The TCAPCD is responsible for formulating and implementing air quality plans to address State and federal planning requirements. The air quality attainment plans and reports present comprehensive strategies to reduce emissions of ROG, NOx, and PM10 from stationary, area, mobile, and indirect sources. Such strategies include the adoption of rules and regulations; enhancement of CEQA participation; adoption of local air quality plans; and implementation of control measures for stationary, mobile, and indirect sources. The proposed Project involves vegetation removal, herbicide application, and sediment removal activities along a portion of Elder Creek. The air quality impacts of the proposed Project would be primarily Project activity-related emissions that are temporary and short term in nature (**Table 3**). Because Project activities that are part of the proposed Project would not substantially increase air pollutant emissions within the Sacramento

Valley Air Basin, as explained in further detail in section b) below, the proposed Project would not interfere with the TCAPCD's plans to achieve or maintain attainment for various air quality pollutants. The proposed Project would not obstruct implementation of applicable air quality plans, and this impact would be less-than-significant.

TABLE 3
UNMITIGATED PROJECT CONSTRUCTION EMISSIONS

	(pounds/day)[1,2]		
Construction Phase	**ROG**	**NOx**	**PM10**
Vegetation Removal – Off-road Equipment Emissions	5.8	58.2	3.4
Vegetation Removal – On-road Vehicle Emissions	0.4	13.5	1.8
Vegetation Removal – Total Emissions	6.2	71.7	5.2
TCAPCD Significance Threshold Level	Level A	Level B	Level A
Herbicide Application – On-road Vehicle Emissions	0.01	0.4	0.08
TCAPCD Significance Threshold Level	Level A	Level A	Level A
Sediment Removal – Off-road Equipment Emissions	1.9	20.7	2.0
Sediment Removal – On-road Vehicle Emissions	0.1	3.7	0.5
Sediment Removal – Total Emissions	2.0	24.4	2.5
TCAPCD Significance Threshold Level	Level A	Level A	Level A

1 Project construction emissions were modeled using CalEEMod for off-road equipment and EMFAC2014 factors for on-road vehicles. See **Appendix D, Air Quality Modeling Calculations,** for additional information.
2 The TCAPCD Threshold Levels are shown in Table 2.

b) **Less than significant impact with mitigation incorporated**. According to the TCAPCD's guidance for CEQA documents, a project could result in adverse air quality effects if temporary, short-term construction-related or operational emissions of criteria air pollutants or precursors would exceed the thresholds of significance established by the TCAPCD (Table 2). In the case of the proposed Project, no long-term operational emissions would occur, and this analysis relates only to Project activities which would result in air emissions that would be "short term" or temporary in duration.

Such emissions, especially fugitive dust emissions, have the potential to represent an impact with respect to air quality. Fugitive dust emissions are primarily associated with site preparation during Project activities involving heavy equipment and vary as a function of such parameters as soil silt content, soil moisture, wind speed, acreage of disturbance area, and miles traveled by construction vehicles on- and off-site. Reactive Organic Gases (ROG) and Nitrogen Oxides (NOx) are ozone precursor emissions and are primarily associated with off-road equipment and on-road vehicle exhaust. Project activities, specifically sediment removal, materials hauling, and other uses of heavy equipment during the proposed Project would result in the temporary generation of criteria pollutant emissions. A detailed equipment list is provided in the Section 2.0, *Project Description*. Off-site vehicle trips related to Project activities would be associated with vegetation and sediment hauling and worker commute trips.

Table 3 presents the predicted equipment emissions from Project activities for the proposed Project. Equipment emissions were estimated by utilizing CalEEMod (Version 2013.2.2) software, which incorporated the equipment and hours listed in the Project Description. On-road vehicle emissions were estimated using EMFAC2014 emission factors.

As shown by comparing Tables 2 and 3, emissions associated with the proposed Project would be within the Level A and Level B thresholds and would be considered potentially significant without mitigation. However, with inclusion of environmental protection measures recommended by the TCAPCD (TCAPCD, 2015) and described below, the proposed Project would not contribute substantially to or violate an established air quality standard and this potential impact would be reduced to a less-than-significant level.

Mitigation Measures

Measure AQ-1: Comply with Diesel Off-road On-line Reporting System. DWR staff and any other workers will be required to have all mobile diesel off-road construction equipment (such as, but not limited to dozers, loaders, dump trucks and excavators) used for the proposed Project to be registered in the California Diesel Off-road On-line Reporting System (DOORS) program and verified as eligible for use in California.

Measure AQ-2: Comply with Portable Equipment Registration Program. DWR staff and any other workers will be required to have all portable diesel equipment greater than 50 horsepower (such as, but not limited to, diesel generators and air compressors) used for the proposed Project either be registered in the California Portable Equipment Registration Program (PERP) program and verified as eligible for use in California or to apply for a permit to operate from the Tehama County APCD.

Measure AQ-3: Fugitive Dust Control. DWR staff and any other workers will be required to implement the following measures to prevent and control fugitive dust emissions:

- Water will be applied by means of truck(s), hoses and/or sprinklers as needed prior to any land clearing or earth movement to minimize dust emission.
- Haul vehicles transporting soil into or out of the Project area onto a State highway shall be covered.
- Water will be applied to disturbed areas a minimum of 2 times per day or more as required.
- On-site vehicles limited to a speed which minimizes dust emissions on unpaved roads.
- Post a publicly visible sign with the telephone number and person to contact regarding dust complaints. This person will respond and take corrective action within 24 hours. The telephone number of the District shall also be visible to ensure compliance with District Rule 4.1 & 4.24 (Nuisance and Fugitive Dust Emissions).

- All visibly dry disturbed soil surface areas of operation shall be treated with a dust palliative agent and/or watered to minimize dust emission.
- All visibly dry disturbed unpaved roads surface areas of operation shall be watered to minimize dust emission.
- Unpaved roads may be graveled to reduce dust emissions.
- Construction workers shall park in designated parking areas(s) to help reduce dust emissions.
- Soil pile surfaces shall be moistened if dust is being emitted from the pile(s). Adequately secured tarps, plastic or other material may be required to further reduce dust emissions.

c) **Less than significant impact with mitigation incorporated.** The proposed Project would not result in a cumulatively considerable net increase of any criteria pollutant for which the affected region is in nonattainment. As noted in section b) above, implementation of all recommended air pollution control measures, including the applicable exhaust reduction and fugitive dust control measures, would ensure that the proposed Project's regional air emissions would be less than significant. The thresholds are designed to assist the region in attaining the applicable CAAQS and NAAQS by reducing potential criteria air pollutant emissions that would otherwise occur without their incorporation into the proposed Project. Therefore, the proposed Project would not substantially contribute to cumulatively considerable air quality effects. When added to other similar existing and proposed future actions, the proposed Project would not contribute substantially to any cumulative air quality effects related to criteria pollutants for which the affected regions are in nonattainment. Therefore, this impact would be less-than-significant with mitigation incorporated.

d) **Less than significant impact with mitigation incorporated.** Sensitive receptors include residences, schools, convalescent homes, and hospitals. The proposed Project would result in short-term construction emissions of a few months each year over a five-year period as the construction activity moves along each segment of Elder Creek. No long-term operational air quality emissions would be associated with the proposed Project. The nearest residences to construction would be in the town of Gerber, with additional scattered rural residences along Elder Creek. During construction, these sensitive receptors and other receptors such as construction workers could be exposed to localized temporary elevated concentrations of fugitive dust and criteria pollutants. As noted in section b), however, emissions and off-site exposure would be minimal with implementation of Mitigation Measures AQ -1, -2, and -3. Therefore, implementation of the proposed Project would not expose sensitive receptors to substantial pollutant concentrations.

e) **No impact.** The proposed Project would not involve creation or construction of materials or facilities that would generate objectionable odors or create new sources of odors in the short term or long term that would affect a substantial number of people. There would be no impact.

3.3.4 Biological Resources

Issues (and Supporting Information Sources):	*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
4. BIOLOGICAL RESOURCES — Would the project:				
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?	☐	☒	☐	☐
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?	☐	☒	☐	☐
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (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?	☐	☐	☐	☒

Environmental Setting

This section presents information on the biological resources present or with the potential to occur on the Project site. This information was gathered from field reconnaissance surveys, as well as from a records search of the California Department of Fish and Wildlife's (CDFW's) California Natural Diversity Database (CNDDB) using a 5-mile radius from the Project site, the U.S. Fish and Wildlife Service (USFWS) sensitive species database for the U.S. Geological Survey (USGS) Gerber and Los Molinos quadrangles, and the California Native Plant Society (CNPS) Rare Plant Inventory for the Gerber quadrangle and the nine surrounding quadrangles. Using this information, as well as its own expertise, Environmental Science Associates and H. T. Harvey & Associates developed a list of special-status species and critical habitat potentially occurring in the Project area.

Elder Creek originates in the coniferous forest of the North Coast Ranges and flows east to enter the Sacramento River approximately 12 miles south of Red Bluff, California. Elder Creek is an intermittent stream with flows generally occurring from November through May. During winter, water from Elder Creek helps to recharge groundwater aquifers. The bed of Elder Creek is composed of sandy soils and gravel bars that typically shift and deposit with the course of

seasonal flows. Adjacent floodplain terraces support native riparian species, including mature valley oak (*Quercus lobata*) and Goodding's willow (*Salix gooddingii*), as well as blue elderberry. The banks of Elder Creek support mixed riparian forest and scrub habitat typical of the Central Valley, as well as a herbaceous understory and substantial stands of non-native vegetation, including arundo, Himalayan blackberry (*Rubus armeniacus*), and tamarisk (*Tamarix* sp.). The surrounding lands support a mosaic of predominately orchards and row crop agriculture interspersed with fallow fields. The Flynn Unit of the Sacramento River National Wildlife Refuge (Refuge) lies adjacent to the downstream end of the Project site.

Habitats

Characteristic habitats of Elder Creek include riparian forest, mixed riparian scrub, herbaceous understory, gravel bars, ruderal habitat, and stands of non-native vegetation dominated by the highly invasive, non-native arundo. The mixed riparian forest habitat on the Project site is composed of Fremont cottonwood (*Populus fremontii*), valley oak, Goodding's willow, red willow (*Salix laevigata*), occasional western sycamore (*Platanus racemosa*), California black walnut (*Juglans californica*), scattered blue oak (*Quercus douglasii*), and associates, including box elder (*Acer negundo*) and blue elderberry. Scattered trees and stands of riparian forest occur throughout the Project site, but the higher quality riparian forest is found toward the downstream end of the Project site adjacent to the Refuge.

Mixed riparian scrub habitat on the Project site is composed of early seral shrubs, including sandbar willow (*Salix exigua*), mule fat (*Baccharis salicifolia*), California wild rose (*Rosa californica*), occasional blue elderberry, and wild grape (*Vitis californica*). The herbaceous understory throughout the Project site comprises a mix of native and non-native species, including creeping wild rye (*Leymus triticoides*), mugwort (*Artemisia douglasiana*), yellow star-thistle (*Centaurea solstitialis*), and non-native grasses and forbs. The bed of Elder Creek is composed of gravel bars and sandy soils that do not support in-channel stream vegetation other than stands of arundo. Portions of the Project site exhibit a moderate amount of human disturbance and ruderal vegetation, particularly near the intersection with the Tehama-Colusa Canal.

The site is also dominated by non-native vegetation, predominately arundo, Himalayan blackberry, tamarisk, tree of heaven (*Ailanthus altissima*), domestic almond (*Prunus dulcis*), and non-native pricklypear cactus (*Opuntia* sp.). Arundo drastically reduces the quality of habitat along Elder Creek. This highly aggressive species forms large, dense stands along the creek and grows in isolated clumps among the sand and gravel bars in the active channel. It provides limited wildlife habitat, and its presence in riparian systems degrades habitat quality.

Overall, riparian habitat quality is mixed throughout the Project site. Some areas of the site support high-quality mature riparian forest with complex structure dominated by native species. Other areas support valley oak regeneration on adjacent riverine terraces and healthy herbaceous understories of creeping wild rye. Riparian habitat quality is very low in other locations and includes dense stands of arundo, Himalayan blackberry, and tamarisk. In other locations, the riparian habitat corridor is relatively narrow, and many areas along the creek's banks support only non-native annual grassland with very little structural complexity.

As with most west-side tributaries, flows within Elder Creek are driven primarily in response to precipitation, and fluctuate in intensity between storm-events and intervening dry periods (VESTRA 2006). Snow melt and run-off play only a minor role in regulating flow levels. The drainage is comprised mainly of fine sedimentary deposits that produce minimal amounts of gravel, but transport large amounts of fine sediment from the headwaters to the lower reaches. As such, there are no deposits with dominant gravel substrate within the intermittent portion of the stream, including within the Project area. This has resulted in a creek bed inundated with fine sediment. The transport and deposition of fine sediments is exacerbated by the flood-control levee system flanking the lower reaches, which directs and concentrates flows to specific areas. While the mass movement of sediment is not unique to Elder Creek, the lateral confinement of the channel by levees prevents lateral scouring (VESTRA 2006). The result is a uniform channel and gradient, atypical of west-side streams, which are usually comprised, at least in part, by a pool and riffle system. As such, the stream bed found in the lower reaches is extremely unstable, lacks in riparian cover, and provides a poor quality of habitat for native fish (Maslin et al. 1997).

Elder Creek supports a moderately diverse population of native and non-native fish species. CSU Chico has conducted sampling for fish populations periodically when the channel is wetted. Some sampling locations were within the Project Area. Results of fishery sampling within Elder Creek showed that at least nine fish species inhabit the creek on a seasonal basis; these species include Chinook salmon (*Oncorhynchus tshawytscha*), steelhead (*Oncorhynchus mykiss*), hardhead (*Mylopharodon conocephalus*), and pikeminnow (*Ptychocheilus grandis*) (Maslin et al. 1997; Sacramento River Watershed Program 2010). The low abundance of non-native species is atypical of the fresh waters of California but can probably be attributed to the flashy, ephemeral nature of the flow regime (Moyle et al. 1996). Within Elder Creek, Chinook salmon have been recorded consistently at low densities throughout the lower reach (Maslin et al. 1999).

Special-status Species

Special-status fish, wildlife, and plant species generally are defined as those species that are legally protected or otherwise considered sensitive by federal, State, or local resource conservation agencies and organizations. They include species covered under the federal Endangered Species Act (ESA) and California Endangered Species Act (CESA), other State and federal laws, and species identified in the CNPS Inventory of Rare and Endangered Vascular Plants in California, particularly those with a California Rare Plant Rank (CRPR) of 1A, 1B, or 2.

A number of special-status fish, wildlife, and plant species can be found, or are known to have occurred historically, in the Project vicinity (**Table 4** and **Figure 4**). Most of the special-status species inhabiting the region are not expected to occur on the Project site because the Project area lacks suitable habitat, the site is outside the range of the species, or the species has been extirpated from the area. These species are discussed in Table 1, and a rationale is provided for their dismissal from further consideration. A few special-status wildlife species are expected to occur on the Project site only as uncommon or rare visitors, migrants, or transients. They are not expected to reside or breed on the site or to occur in high enough numbers to be substantially affected by Project activities. Suitable habitat exists on the Project site for several special-status fish and wildlife species that may reside in or breed on the site or that may otherwise use the site regularly.

TABLE 4
POTENTIAL OCCURRENCE OF SPECIAL-STATUS SPECIES ON THE ELDER CREEK PROJECT SITE

Scientific Name/ Common Name	Status (Federal/State/ CNPS)	Habitat Description/Blooming Period	Potential to Occur in the Project Area
Fish			
Oncorhynchus mykiss Central Valley steelhead DPS	T/SSC/--	Requires cold, freshwater streams with suitable gravel for spawning; rears in seasonally inundated floodplains, rivers, tributaries, and Delta.	Present. Suitable juvenile rearing habitat is seasonally present on Project site when hydraulically connected to the Sacramento River.
Oncorhynchus tshawytscha Central Valley spring-run Chinook salmon ESU	T/T/--	Requires cold, freshwater streams with suitable gravel for spawning; rears in seasonally inundated floodplains, rivers, tributaries, and Delta.	Present. Suitable juvenile rearing habitat is seasonally present on Project site when hydraulically connected to the Sacramento River.
Oncorhynchus tshawytscha Sacramento River winter-run Chinook salmon ESU	E/E/--	Requires cold, freshwater streams with suitable gravel for spawning; rears in seasonally inundated floodplains, rivers, tributaries, and Delta.	Present. Suitable juvenile rearing habitat is seasonally present on Project site when hydraulically connected to the Sacramento River.
Oncorhynchus tshawytscha Central Valley fall-/late fall--run Chinook salmon ESU	SSC/SSC/--	Requires cold, freshwater streams with suitable gravel for spawning; rears in seasonally inundated floodplains, rivers, tributaries, and Delta.	Present. Suitable juvenile rearing habitat is seasonally present on Project site when hydraulically connected to the Sacramento River.
Mylopharodon conocephalus Hardhead	--/SSC/--	Spawning occurs in pools and side pools of rivers and creeks; juveniles rear in pools of rivers and creeks, and shallow to deeper water of lakes and reservoirs.	Present. Suitable habitat is seasonally present on Project site.
Invertebrates			
Branchinecta conservatio Conservancy fairy shrimp	FE/--/--	Found in vernal pools and swales.	Unlikely. No suitable habitat is present on the Project site.
Branchinecta lynchi Vernal pool fairy shrimp	FT/--/--	Found in vernal pool and swales.	Unlikely. No suitable habitat is present on the Project site.
Desmocerus californicus dimorphus Valley elderberry longhorn beetle	FT/--/--	Breeds in and forages exclusively on elderberry shrubs associated with riparian forest.	Present. VELB exit holes were observed in elderberry shrubs on the Project site during protocol-level surveys.
Lepidurus packardi Vernal pool tadpole shrimp	FE/--/--	Found in vernal pools and swales.	Unlikely. No suitable habitat is present on the Project site.
Pacifastacus fortis Shasta crayfish	FE/SE/--	Found in cool, clear, spring-fed waters characterized by clean volcanic cobbles and gravel or sand. Found only in Shasta County.	Unlikely. No suitable habitat is present on the Project site.
Amphibians			
Rana draytonii *California red-legged frog*	FT/--/--	Found in perennial or near-perennial lakes, ponds, reservoirs, slow-moving streams, marshes, bogs, and swamps in lowlands and foothills.	Unlikely. The species has been extirpated from much of its historic range in the Central Valley and the highly ephemeral nature of Elder Creek's flows makes it unsuitable.
Rana sierra *Sierra Nevada yellow-legged frog*	FE/ST/--	Found in lakes, ponds, meadow streams, isolated pools, and sunny riverbanks in the Sierra Nevada mountains.	Unlikely. No suitable habitat is present on the Project site.
Rana boylii *Foothill yellow-legged frog*	--/SSC/--	Found in perennial or near-perennial rocky, slow-moving streams and rivers with open, sunny banks in valley-foothill hardwood, valley-foothill hardwood-conifer, valley-foothill riparian, ponderosa pine, mixed conifer, coastal scrub, mixed chaparral, and wet meadows.	Unlikely. This species is typically found in foothill habitats and is largely absent from lowland habitats including the Central Valley.

TABLE 4 (Continued)
POTENTIAL OCCURRENCE OF SPECIAL-STATUS SPECIES ON THE ELDER CREEK PROJECT SITE

Scientific Name/ Common Name	Status (Federal/State/ CNPS)	Habitat Description/Blooming Period	Potential to Occur in the Project Area
Reptiles			
Actinemys marmorata Western pond turtle	--/SSC/--	Found in slow-moving rivers, streams, lakes, ponds, wetlands, reservoirs, and brackish estuarine waters with deep pools and rocks, logs, and other exposed surfaces for basking.	Low. Elder Creek is generally unsuitable because of its highly ephemeral flows. However, when flows are high, the Sacramento River can create a backwater affect which may provide temporary suitable aquatic habitat in Elder Creek's lower reaches. Because it is known to occur along the Sacramento River its potential occasional presence can't be entirely dismissed.
Thamnophis gigas Giant garter snake	FT/ST/--	Found in marshes, sloughs, drainage canals, irrigation ditches, rice fields, and slow-moving creeks.	Unlikely. No suitable habitat is present on the Project site.
Birds			
Agelaius tricolor Tricolored blackbird	--/SE/--	Nesting habitat includes emergent vegetation, such as cattail and tule; and non-native vegetation, including blackberry, arundo, mustards, thistles, tamarisk, and grain fields.	Low. Marginally suitable habitat is present on the Project site. Himalayan blackberry, tamarisk, and arundo could provide nesting habitat for tricolored blackbirds.
Athene cunicularia Burrowing owl	--/SSC/--	Found in grasslands and ruderal habitat supporting short vegetation structure and abundant small-mammal burrows.	Unlikely. No suitable habitat is present on the Project site. The fallow agricultural fields adjacent to the Project site could support burrowing owl, but the presence of riparian forest and riparian scrub and the lack of ground squirrel burrows along Elder Creek generally preclude the presence of burrowing owl.
Buteo swainsoni Swainson's hawk	--/ST/--	Found in cottonwood riparian forest and isolated trees in open grasslands adjacent to streams and agricultural crops for foraging.	High. In 2013 (CNDDB), two nesting attempts were documented approximately 0.55 mile south of the Project site and 1.3 miles west of the Project site. Suitable habitat is present on the Project site.
Coccyzus americanus occidentalis Western yellow-billed cuckoo	FT/SE/--	Found in cottonwood-willow forest and willow scrub along rivers and streams. May use narrow bands of riparian vegetation adjacent to orchards along the Sacramento River.	Low. Occurrences have been documented along the Sacramento River. Marginally suitable habitat is present on the Project site. Specifically, the Project overlaps 2.5 acres of proposed critical habitat on the north bank of Elder Creek at the downstream limit of the Project site. The remainder of the Project site does not provide suitable cuckoo habitat.
Dendroica petechia Yellow warbler	--/SSC/--	Found in willows, cottonwoods, Oregon ash, and other riparian tree species located near water.	Unlikely. The yellow warbler is largely extirpated as a breeder in the Sacramento Valley. From 1993 through 1999, only five nests of three pairs were found along the Sacramento River in Glenn, Butte, and Tehama counties. Additionally, Elder Creek is generally dry June through November during the yellow warbler breeding season.
Elanus leucurus White-tailed kite	--/FP/--	Nesting habitat includes oak woodlands and isolated trees along marsh edges. Foraging habitat includes grasslands, meadows, and agricultural fields.	Medium. Suitable habitat is present on the Project site.

TABLE 4 (Continued)
POTENTIAL OCCURRENCE OF SPECIAL-STATUS SPECIES ON THE ELDER CREEK PROJECT SITE

Scientific Name/ Common Name	Status (Federal/State/ CNPS)	Habitat Description/Blooming Period	Potential to Occur in the Project Area
Birds (cont.)			
Icteria virens Yellow-breasted chat	--/SSC/--	Nesting habitat includes early seral stage riparian thickets of willows, vine tangles, and dense brush with an open canopy above.	Medium. Suitable habitat is present on the Project site.
Lanius ludovicianus Loggerhead shrike	--/SSC/--	Found in shrubs and low, scattered trees amid grasslands and agricultural fields.	Low. Marginally suitable habitat is present on the Project site
Riparia riparia Bank swallow	--/ST/--	Found along river banks, ocean bluffs, and similar friable cliffs.	Unlikely. No suitable habitat is present on the Project site.
Strix occidentalis caurina Northern spotted owl and critical habitat	FT/--/--	Old-growth forests characterized by a dense, multistory canopy of mature trees, abundant logs, standing snags, and live trees with broken tops.	Unlikely. No suitable habitat is present on the Project site.
Vireo bellii pusillus Least Bell's vireo	FE/SE/--	Nesting habitat includes willows, mulefat, California wild rose, poison-oak, mugwort, and cottonwood.	Unlikely. Suitable habitat is present on the Project site; however, the species has largely been extirpated from the Central Valley. Only two successful nest attempts were observed in the Central Valley in the last 50 years. They were observed in the San Joaquin River National Wildlife Refuge in 2005.
Xanthocephalus xanthocephalus Yellow-headed blackbird	--/SSC/--	Found almost exclusively in tall emergent vegetation, including tules and cattails, and in open and edge areas of wetlands with relatively deep water.	Unlikely. No suitable habitat is present on the Project site. Elder Creek does not support emergent vegetation or water during the months of May through November.
Mammals			
Martes pennant Fisher	CT/C/--	Found in dense coniferous or mixed hardwood forest.	Unlikely. No suitable habitat is present on the Project site.
Lasiurus blossevillii Western red bat	--/SSC/--	Roosts in the foliage of willow, cottonwood, and sycamore trees in riparian areas. Less commonly roosts in orchards.	Medium. Western red bats may roost or raise their young in the foliage of suitable riparian vegetation on the Project site.
Antrozous pallidus Pallid bat	--/SSC/--	Roosts in crevices in rocky outcrops; caves; mines; trees (including bole cavities of oaks, exfoliating ponderosa pine and valley oak bark, deciduous trees in riparian areas, and fruit trees in orchards); and various human structures, such as bridges, barns, and vacant buildings.	Low. The bridges spanning Elder Creek provide limited habitat for day and night roosts but lack the appropriate structures necessary for maternity roosts.
Corynorhinus townsendii Townsend's big-eared bat	--/SSC, CT/--	Roosts in caves or cavelike features, including rock outcrops, mines, natural cavities, and occasionally hollow trees.	Low. The bridges spanning Elder Creek provide limited habitat for day and night roosts but lack the appropriate structures necessary for maternity roosts. Townsend's big-eared bats also may use large cottonwoods and valley oaks as temporary roosts.

TABLE 4 (Continued)
POTENTIAL OCCURRENCE OF SPECIAL-STATUS SPECIES ON THE ELDER CREEK PROJECT SITE

Scientific Name/ Common Name	Status (Federal/State/ CNPS)	Habitat Description/Blooming Period	Potential to Occur in the Project Area
Plants			
Chamaesyce hooveri Hoover's spurge	FT/--/1B.2	Found in vernal pools. Blooms July through September.	Unlikely. No suitable habitat is present on the Project site.
Chamaesyce ocellata ssp. *rattanii* Stony Creek spurge	--/--/1B.2	Found in sandy soils, streambeds and streambanks, and valley grassland. Blooms May through October.	Medium. 45 plants were observed in 2007 on the north bank of Elder Creek approximately 1 mile west of the Project site. Only 15 occurrences in California have been documented in the last 20 years.
Cryptantha crinita Silky cryptantha	--/--/1B.2	Found in rocky volcanic soils, gravelly streambanks, gravel bars, and generally foothill woodland. Blooms April through May.	Low. Suitable habitat is present on the Project site. Occurrences have been documented within 13 miles north and south of the Project site.
Downingia pusilla Dwarf downingia	--/--/1B.2	Found in vernal pools. Blooms March through May.	Unlikely. No suitable habitat is present on the Project site.
Fritillaria pluriflora Adobe-lily	--/--/1B.2	Found in adobe soils, generally serpentine of interior foothills. Blooms February through April.	Unlikely. No suitable habitat is present on the Project site.
Gratiola heterosepala Boggs Lake hedge-hyssop	--/SE/1B.2	Found in shallow water, margins of vernal pools. Blooms April through August.	Unlikely. No suitable habitat is present on the Project site.
Juncus leiospermus var. *ahartii* Ahart's dwarf rush	--/--/1B.2	Found in vernal pool margins, grassland swales, and gopher mounds. Blooms March through May.	Unlikely. No suitable habitat is present on the Project site.
Juncus leiospermus var. *leiospermus* Red Bluff dwarf rush	--/--/1B.2	Found in vernal pool margins, wet places in chaparral, and woodland. Blooms March through May.	Unlikely. No suitable habitat is present on the Project site.
Juglans hindsii Northern California black walnut	--/--/1B.1	Occurs in isolated locations in riparian forest and woodland between 0 and 444 meters in elevation. Blooms April through May.	Unlikely. There are only three extant native stands of this species reported in the CNDDB. The closest know extant occurrence is located in Napa County.
Legenere limosa Legenere	--/--/1B.1	Found in vernal pools and swales. Blooms April through June.	Unlikely. No suitable habitat is present on the Project site.
Paronychia ahartii Ahart's paronychia	--/--/1B.1	Found in well-drained, rocky outcrops; stony, nearly barren clay of swales; and higher ground around vernal pools, volcanic upland, valley grassland, foothill woodland, and freshwater wetlands. Also found on thin, rocky, Tuscan soil that does not exceed 4–6 inches in depth. Blooms March through June.	Unlikely. No suitable habitat is present on the Project site.
Howellia aquatilis Water howellia	FT/--/2B.2	Found in freshwater seasonal wetlands. Blooms in June.	Unlikely. No suitable habitat is present on the Project site.
Orcuttia pilosa Hairy Orcutt grass	FE/SE/1B.1	Found in vernal pools. Blooms May through September.	Unlikely. No suitable habitat is present on the Project site.
Orcuttia tenuis Slender Orcutt grass	FT/SE/1B.1	Found in vernal pools. Blooms May through September.	Unlikely. No suitable habitat is present on the Project site.
Tuctoria greenei Greene's tuctoria	FE/R/1B.1	Found in vernal pools.	Unlikely. No suitable habitat is present on the Project site.

TABLE 4 (Continued)
POTENTIAL OCCURRENCE OF SPECIAL-STATUS SPECIES ON THE ELDER CREEK PROJECT SITE

Scientific Name/ Common Name	Status (Federal/State/ CNPS)	Habitat Description/Blooming Period	Potential to Occur in the Project Area
Critical Habitat / Essential Fish Habitat			
Oncorhynchus mykiss Central Valley steelhead DPS		Critical habitat designation includes accessible waters providing suitable habitat elements.	Critical habitat is present on the Project site.
Oncorhynchus tshawytscha Central Valley spring-run Chinook salmon ESU		Critical habitat designation includes accessible waters providing suitable habitat elements.	Critical habitat is present on the Project site.
Oncorhynchus tshawytscha Sacramento River winter-run Chinook salmon ESU		Critical habitat designation includes accessible waters providing suitable habitat elements.	Critical habitat is present on the Project site.
Oncorhynchus tshawytscha Pacific salmon (Chinook)		Under the Pacific Coast Salmon Fishery Management Plan, the Project site has been designated as essential fish habitat (EFH) for spring-, fall-, late fall- and winter-run Central Valley Chinook salmon (Pacific salmon). These areas serve primarily as a migration corridor and provide non-natal rearing habitat for juvenile salmon (Maslin et al. 1995).	
Chamaesyce hooveri Hoover's spurge		Critical habitat designated in counties throughout California, including Tehama County.	Critical habitat is not present on the Project site.
Coccyzus americanus occidentalis Western yellow-billed cuckoo		Proposed Critical Habitat Unit 2: CA–2 Sacramento River; Colusa, Glenn, Butte, and Tehama counties	A very narrow band (approximately 2.5 acres) of riparian vegetation on the north bank of Elder Creek at the downstream end of the Project site overlaps the edge of proposed critical habitat for western yellow-billed cuckoo.
Orcuttia pilosa Hairy Orcutt grass		Critical habitat designated in counties throughout California, including Tehama County.	Critical habitat is not present on the Project site.
Orcuttia tenuis Slender Orcutt grass		Critical habitat designated in counties throughout California, including Tehama County.	Critical habitat is not present on the Project site.
Tuctoria greenei Greene's tuctoria		Critical habitat designated in counties throughout California, including Tehama County.	Critical habitat is not present on the Project site.

NOTES:

Federal Designation

FT = Federally listed as threatened
FE = Federally listed as endangered
CT = Candidate threatened species
C = Candidate for State listing
R = Rare

State Designation

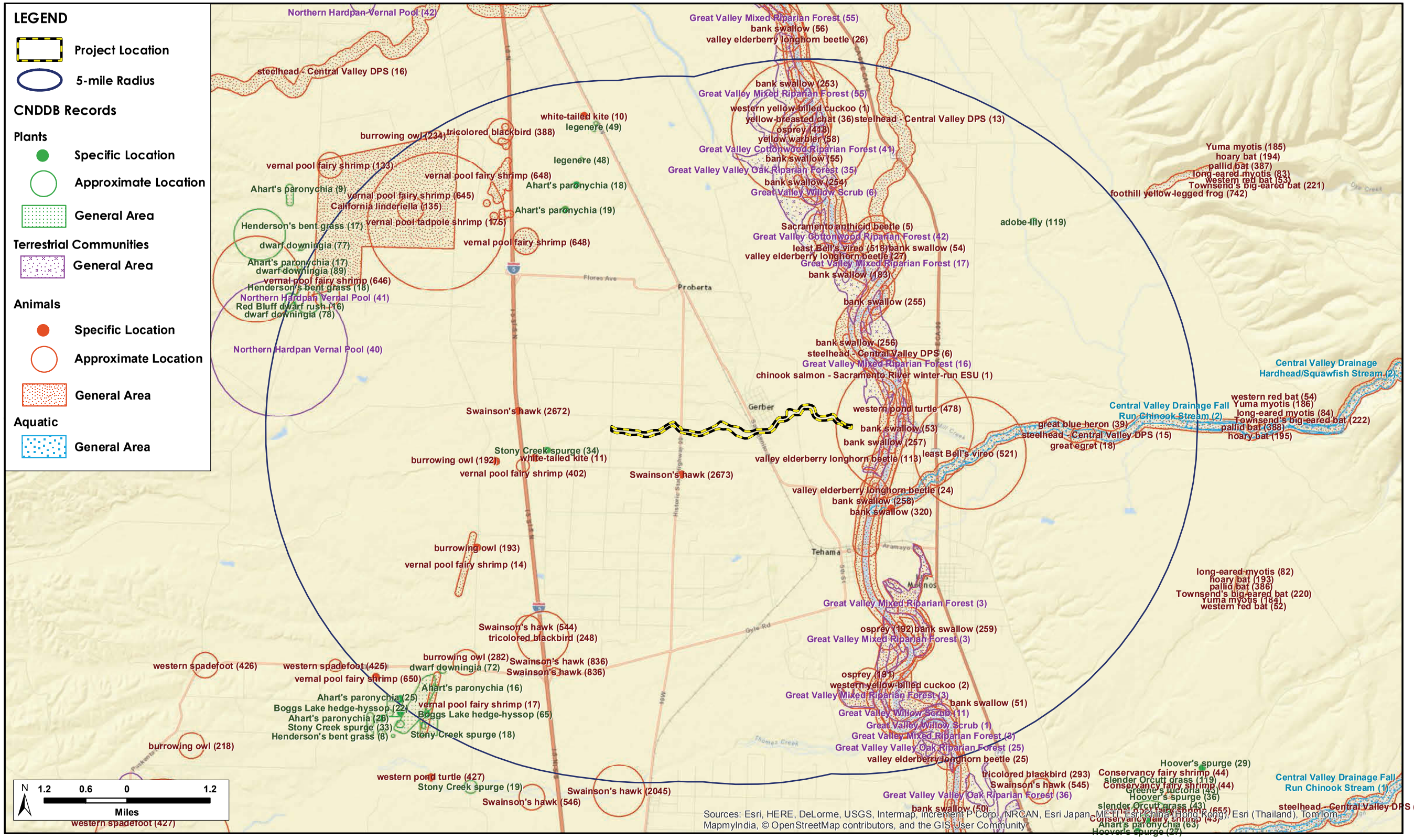
ST = State listed as threatened
SE = State listed as endangered
SSC = California species of special concern
FP = California fully protected species
CT = Candidate threatened specie

California Rare Plant Ranks

List 1B plants are rare, threatened, or endangered in California and elsewhere.
List 2B plants are rare, threatened, or endangered in California but more common elsewhere.
.1 = Seriously threatened in California (over 80% of occurrences threatened / high degree and immediacy of threat).
.2 = Moderately threatened in California (20-80% occurrences threatened / moderate degree and immediacy of threat).

Potential to occur definitions:

Present: Suitable habitat is present and species presence has been documented or can be assumed based on known distribution.
Unlikely: Suitable habitat is generally not present and/or very low quality.
Low: Only marginally suitable habitat is present, generally low quality.
Medium: Some but not all suitable habitat elements are present.
High: Several suitable habitat elements are present and high quality and site is located with known species distribution.



SOURCE: H.T. Harvey & Associates, 2015

Elder Creek Channel Rehabilitation . 130028.10

Figure 4

CNDDB Special-status Species Occurrence

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Special-status Fish

Central Valley Steelhead DPS

The upstream migration of adult steelhead in the mainstem Sacramento River historically started in July, peaked in September, and continues through February or March. Central Valley steelhead spawn mainly from January through March, but spawning has been reported from late December through April (McEwan and Jackson 1996). During spawning, the female digs a redd (gravel nest) in which she deposits her eggs, which are then fertilized by the male. Steelhead fry usually emerge from the gravel 2 to 8 weeks after hatching, between February and May, sometimes extending into June (Barnhart 1986). Newly emerged steelhead fry move to shallow, protected areas along streambanks but move to faster, deeper areas of the river as they grow. Juvenile steelhead rear throughout the year and may spend from 1 to 3 years in freshwater before emigrating to the ocean. Smoltification, the physiological adaptation that juvenile salmonids undergo to tolerate saline waters, occurs in juveniles as they begin their downstream migration. Smolting steelhead generally emigrate from March to June (Barnhart 1986).

Potential for Occurrence on the Project Site. The majority of adult steelhead migrate upstream within the mainstem Sacramento River, with the principal remaining wild populations spawning annually in Deer and Mill creeks within Tehama County (Yoshiyama 1999). Spawning has not been documented in Elder Creek; however Maslin et al. (1997) has noted the species at multiple locations along the lower reach (valley floor) during spring months, including within the Project site. The upper reach of the creek supports resident rainbow trout and may potentially offer value for steelhead (CALFED 1999). As such, the entirety Elder Creek has been designated by NMFS as critical habitat for Central Valley steelhead.

Chinook Salmon

Adult winter-run Chinook salmon (*Oncorhynchus tshawytscha*) leave the ocean and migrate through the Delta into the Sacramento River system from November through July. Salmon migrate upstream past the Red Bluff Diversion Dam (RBDD) on the Sacramento River from mid-December through July, and most of the spawning population has passed RBDD by late June. Winter-run Chinook salmon spawn from mid-April through August, and incubation continues through October. The primary spawning grounds in the Sacramento River are above RBDD. Juvenile winter-run Chinook salmon rear and emigrate in the Sacramento River from July through March (Hallock and Fisher 1985). Juveniles descending the Sacramento River above RBDD from August through October and possibly November are mostly pre-smolts and probably rear in the Sacramento River below RBDD. Winter-run salmon smolts may migrate through the Delta and bay to the ocean from December through as late as May (Stevens 1989). The Sacramento River channel is the main migration route through the Delta.

Spring-run Chinook salmon (*Oncorhynchus tshawytscha*) historically were the second most abundant run of Central Valley Chinook salmon (Fisher 1994). Current surveys indicate that remnant, nonsustaining spring-run Chinook salmon populations may be found in Cottonwood, Battle, Antelope, and Big Chico Creeks (DWR 1997). The Feather River Fish Hatchery sustains the spring-run population on the Feather River, but the genetic integrity of that run is questionable (DWR 1997). Historical records indicate that adult spring-run chinook salmon enter the mainstem

Sacramento River in February and March and continue to their spawning streams, where they then hold in deep, cold pools until they spawn. Spawning occurs in gravel beds in late August through October, and emergence takes place in March and April. Spring-run Chinook salmon appear to emigrate at two different life stages: fry and yearlings. Fry move between February and June, while the yearling spring-run emigrate October to March, peaking in November (Moyle 2002). Juvenile spring-run Chinook salmon may leave their natal streams as fry soon after emergence or rear for several months to a year before migrating as smolts or yearlings (Yoshiyama et al. 1998).

Adult fall-/late fall-run Chinook salmon (*Oncorhynchus tshawytscha*) migrate upstream from July through December and spawn in October through December (Moyle 2002), with the greatest spawning activity typically occurring in November and early December. Seasonal water temperatures are most critical for pre-spawning adults and incubating eggs (primarily September-October) and for juvenile rearing and downstream migration (primarily April-June). After incubating and hatching, the young salmon emerge from the spawning areas as fry. A portion of the fry population migrates downstream soon after emergence, rearing in the downstream river channels and the Delta estuary during the late winter and spring months. The remaining portion of juvenile salmon continue to rear in the upstream systems through the spring months until they have adapted for migration into salt water (smolting), which typically takes place between April and early June.

Potential for Occurrence on the Project Site. Like Central Valley steelhead, the majority of adult Chinook salmon migrate upstream within the mainstem Sacramento River to spawn. While adult spawning has not been documented within Elder Creek, field studies by Maslin et al. (1994-1999) have documented the non-natal rearing of juvenile winter- and spring-run Chinook in the lower reaches during late-winter and early-spring (February to April), including within the Project site. Maslin noted that the smallest juveniles were consistently found nearest the Sacramento River, with larger size classes found further upstream – this suggests juveniles enter Elder Creek for rearing and remain for some time (Maslin et al. 1995). Fall-run Chinook salmon were by far the most common ESU observed within the lower reaches of Elder Creek during Maslin's surveys, while late fall-run Chinook were absent altogether (Maslin et al. 1997). Elder Creek has been designated as critical habitat for winter- and spring-run Chinook salmon by NMFS as well as essential fish habitat (EFH) under the Pacific Coast Salmon Fishery Management Plan. Fall-/late fall-run Chinook salmon are not listed; however, Elder Creek is designated as EFH for these two races of Chinook salmon under the Pacific Coast Salmon Fishery Management Plan.

Hardhead

Hardhead (*Mylopharodon conocephalus*) are widely distributed throughout the low- to mid-elevation streams in the Sacramento and San Joaquin basins, including the Sacramento River system. Undisturbed portions of larger streams at low to middle elevations are preferred by hardhead. Hardhead are able to withstand summer water temperatures above 20ºC; however, they will select lower temperatures when they are available. Hardhead are fairly intolerant of low-oxygenated waters, particularly at higher water temperatures. Pools with sand-gravel substrates

and slow water velocities are the preferred habitat; adult fish inhabit the lower half of the water column, while the juvenile fish remain in the shallow water closer to the stream edges. Hardhead typically feed on small invertebrates and aquatic plants at the bottom of quiet water (Moyle 2002). Hardhead is a State species of special concern.

Potential for Occurrence on the Project Site. Suitable habitat is seasonally present on Project site; therefore, the potential for the species to occur on the Project site is medium.

Special-status Wildlife

Yellow-breasted Chat

The yellow-breasted chat (*Icteria virens*) is a California bird species of special concern. It is distributed throughout the Central Valley, throughout northwestern California, and along the central and southern coasts. Although once numerous throughout the Central Valley, the species is now considered rare or absent as a breeder in much of the Central Valley and Coast Ranges. Populations in the Central Valley are recently more heavily concentrated in the north, including in Shasta County and the upper reaches of the Sacramento River (Comrack et al. 2008). Yellow-breasted chats inhabit early seral stage riparian habitat along streams, rivers, and sloughs. Riparian habitat typically includes a dense understory of shrubs and an open canopy above (Comrack et al. 2008). Stands of blackberry, wild grape, willow, and California wild rose provide suitable nesting habitat for yellow-breasted chat. Although chats will tolerate moderate amounts of grass and other herbaceous vegetation cover, a considerable amount of shrubby vegetation in the shrub and sapling succession al stage is required for suitable habitat. Tall trees including cottonwood and white alder (*Alnus rhombifolia*) are also required as suitable song perches (Dunn and Garrett 1997).

Potential for Occurrence on the Project Site. The potential for yellow-breasted chat to nest on the Project site is medium. Patches of Himalayan blackberry, California wild rose, and shrubby willow thickets may be used as nesting substrate for the species.

Loggerhead Shrike

The loggerhead shrike (*Lanius ludovicianus*) is distributed throughout much of California, except in higher-elevation and heavily forested areas, including the Coast Ranges, the Sierra Nevada, the southern Cascade Range, the Klamath and Siskiyou ranges, and the highest parts of the Transverse Ranges (Humple 2008). Loggerhead shrikes establish breeding territories in open habitats with relatively short vegetation that allows for visibility of prey. They can be found in grasslands; scrub habitats; riparian areas; other open woodlands; ruderal habitats; and developed areas, including golf courses and agricultural fields (Yosef 1996). Loggerhead shrikes require the presence of structures for impaling their prey. These structures most often take the form of thorny or sharp-stemmed shrubs, or barbed wire (Humple 2008). Ideal breeding habitat for loggerhead shrikes comprises short grass habitat with many perches, shrubs or trees for nesting, and sharp branches or barbed wire fences for impaling prey. Shrikes nest earlier than most other passerines, especially in the West where populations are sedentary. The breeding season may begin as early as late February and lasts through July (Yosef 1996).

Potential for Occurrence on the Project Site. The potential for loggerhead shrike to occur on the Project site is low. The site provides marginally suitable nesting habitat for the species. Shrubbier forms of willow, California rose, Himalayan blackberry, and other short-stature shrubs could provide suitable nesting substrate for loggerhead shrike. The adjacent orchards do not offer suitable foraging habitat; however, the fallow fields and agricultural crops provide foraging habitat for loggerhead shrikes.

Tricolored Blackbird

Tricolored blackbirds (*Agelaius tricolor*) were granted emergency listing as endangered under CESA on 3 December 2014. This emergency protection is valid for 180 days while CDFW evaluates the petition and decides whether to recommend permanent listing. The impetus for this listing was, in part, evidence of steep population declines in tricolored blackbird populations based on statewide surveys that documented a 62% population decline over a six year period (from 395,000 in 2008 to 145,000 in 2014 (Meese 2014)). Tricolored blackbirds are found primarily in the Central Valley and in central and southern coastal areas of California. The species is highly colonial in its nesting habits and forms dense breeding colonies that, in some parts of the Central Valley, may consist of up to tens of thousands of pairs. This species nests in a variety of substrates, including flooded emergent wetlands. Historically, most colonies were established in freshwater marshes dominated by cattails (*Typha* sp.) and bulrushes (*Schoenoplectus* spp.). In the absence of these habitats, tricolored blackbirds will nest in Himalayan blackberry, mustards (*Brassica* spp.), thistles (*Circium* spp.), mallows (*Malva* spp.), safflower (*Carthamus tinctorius*), tamarisk (*Tamarix* spp.), elderberry/western poison-oak (*Sambucus* spp. and *Toxicodendron diversilobum*), arundo, and riparian scrublands and forests (Beedy and Hamilton 1999). Large flocks have been documented to nest in grain fields in the Central Valley (Meese 2014). Tricolored blackbirds form large, often multispecies flocks during the nonbreeding period and range more widely than during the breeding season.

Potential for Occurrence on the Project Site. The potential for tricolored blackbird to occur on the Project site is low. The site presents marginally suitable nesting habitat for the species. The streambed does not support suitable emergent wetland vegetation, such as bulrush and cattail; however, the Project site supports large stands of non-native arundo and Himalayan blackberry, which both can provide marginal nesting substrates in the absence of preferred nesting habitat.

Western Yellow-billed Cuckoo and Proposed Critical Habitat

The western yellow-billed cuckoo (cuckoo) (*Coccyzus americanus occidentalis*) is an endangered subspecies of the yellow-billed cuckoo, and has been recognized through designation of a distinct population segment (USFWS 2001). The cuckoo was listed by the State as endangered in 1988 under CESA (California Department of Fish and Game [CDFG] 1998). In 2014 the cuckoo was federally listed as threatened under the ESA and critical habitat was proposed throughout its range, including a 69-mile-long contiguous segment of the Sacramento River from Red Bluff to Colusa (USFWS 2014a, 2014b). Proposed critical habitat comprises such elements as large, contiguous patches (greater than 200 acres in extent and greater than 325 feet in width) of willow-cottonwood riparian woodland with dense canopy and understory structure; an adequate prey

base, including large insect fauna and tree frogs; and a dynamic riverine system that encourages sediment movement and sustained regeneration of mixed-age riparian habitat.

This subspecies was once common throughout California (Grinnell and Miller 1944), but the population has declined over the last 100 years following extensive loss of riparian habitat. In California, cuckoos are consistently found in only a few isolated areas: the Sacramento Valley (between Red Bluff and Colusa), the Feather River (between Gridley and Nicolaus), the South Fork of the Kern River, and in several Lower Colorado River Multi-Species Conservation Program restoration sites on the California side of the lower Colorado River (Gaines and Laymon 1984; Laymon and Halterman 1989; Laymon 1998; Halterman et al. 2001; Dettling and Seavy 2012). Until recently, the Upper Sacramento River was believed to have one of the largest cuckoo populations in California; however, surveys have documented a dramatic decline in this population (Halterman et al. 2001; Dettling and Howell 2011; Dettling et al. 2014).

Nesting occurs between June and August, with the peak occurring from mid-July through early August (Bent 1940; Howe 1986). Cuckoos breed in large blocks of riparian habitat, particularly riparian woodlands with cottonwoods and willows (USFWS 2001). Cuckoos rarely nest in orchards, but nests have been documented in prune, English walnut, and almond orchards (Laymon 1998). Nest sites with a dense canopy closure (averaging 70% closure with 98.6% closure at the nest), large patch size (greater than 50 acres), and a dense understory that provides nest protection and concealment are typically required by the species (Laymon 1998; USFWS 2014b). These large-extent habitat patches are typically cooler, with a more humid environment than the surrounding riparian and upland habitats (USFWS 2014b). Nests are typically well concealed in dense vegetation within approximately 30 feet of the ground (Laymon 1980; Laymon et al. 1997) and placed in locations where they are protected from prevailing winds or rain by thick overhanging branches (Preble 1957; Potter 1980); several nest sites found on the Sacramento River were draped with wild grape (Gaines and Laymon 1984; Laymon 1998). Foraging typically occurs in riparian vegetation, adjacent streams, and, to a lesser extent, orchards adjacent to breeding areas.

Potential for Occurrence on the Project Site. There is a low potential for western yellow-billed cuckoo to occur on the Project site based on habitat suitability and overall population numbers along the Sacramento River from Red Bluff to Colusa. When most of the potentially suitable habitat on the Sacramento River was surveyed in 2010, only 18 individuals were detected (Dettling and Howell 2011). In 2012, only seven to nine cuckoos were detected along the Sacramento River (Dettling and Seavy 2012). Most of the Project site does not support suitable willow-cottonwood riparian forest for the cuckoo; however, the downstream end of the Project site (the lower 0.6 mile of the Project site) supports narrow bands of mature mixed riparian forest adjacent to orchards and the Refuge. The boundary of the proposed critical habitat for western yellow-billed cuckoo overlaps a narrow band of riparian habitat along the north bank of Elder Creek at the downstream end of the Project site. Because cuckoos tend to nest in large extents of habitat with a closed canopy and high humidity, there is low potential for western yellow-billed cuckoos to nest at the edge of this larger block of contiguous suitable mixed riparian forest proposed as critical habitat. However, this habitat may be suitable foraging habitat. Therefore, western yellow-billed cuckoo is considered in this analysis of potential adverse impacts resulting from Project-related activities.

Swainson's Hawk

The Swainson's hawk (*Buteo swainsoni*) is a migratory raptor that was listed by the State as a threatened species under CESA in 1983. An estimated 95% of the State's Swainson's hawk population is located in the Central Valley (Anderson et al. 2007). The hawks arrive on breeding grounds in the Central Valley from early March into mid-April and typically leave their breeding grounds to head south for the winter from mid-August through mid-October (Woodbridge et al. 1995; Fuller et al. 1998; Hoffman and Smith 2003; Kochert et al. 2011).

Swainson's hawks typically nest in mature, dense-canopied cottonwoods, willows, and valley oaks associated with riparian forest habitat and in isolated trees next to agricultural and grassland habitat. Although the Swainson's hawk is not an obligate riparian species because its relationship with riparian habitats is variable, riparian woodlands are a key nesting habitat for the species in the Central Valley (Schlorff and Bloom 1984; Estep 1989). Swainson's hawks forage in grasslands and agricultural lands, including alfalfa fields, disced fields, fallow fields, dryland pasture, beet crops, tomato crops, irrigated pasture, grain crops, other row crops, and other agricultural crops. Orchards and vineyards generally have low value as Swainson's hawk foraging habitat because the height and density of the vegetation prevent the hawks' access to the ground, and the bare ground underneath orchards generally supports low rodent populations (Estep 1989, 2009).

Potential for Occurrence on the Project Site. The Project site provides suitable nesting trees for Swainson's hawk, and the potential for occurrence is high. Two nesting attempts were documented in the region in 2013; one nest was observed approximately 0.55 mile south of the Project site on historic SR 99, and the other nest was observed approximately 1.3 miles west of the Project site along Interstate 5. The cottonwoods and valley oaks that make up the mixed riparian forest along Elder Creek are suitable nesting trees for Swainson's hawk, especially because of their proximity to suitable foraging habitat. The mosaic of fallow fields and agricultural crops adjacent to the Project site could provide suitable foraging habitat for the Swainson's hawk.

White-tailed Kite

The white-tailed kite (*Elanus leucurus*) is a federal species of concern and is a fully protected species in California under California Fish and Game Code Section 3511. It is a year-round resident of the valley lowlands and coastal California (Wintu Audubon Society 1999). White-tailed kites can be found in association with the herbaceous and open stages of a variety of habitat types, including ruderal habitats, open grasslands, meadows, emergent wetlands, and agricultural lands. Stick nests are built near the top of a dense willow, oak, or other tree stand located adjacent to foraging areas. Breeding occurs from February through October, during which time nesting birds are seldom observed more than 0.5 mile from an active nest (Zeiner et al. 1990a).

Potential for Occurrence on the Project Site. The potential for white-tailed kite to occur on the Project site is medium. The oaks, willows, and cottonwood along Elder Creek provide suitable nesting substrate adjacent to marginally suitable foraging habitat. The adjacent orchards have limited value as foraging habitat for white-tailed kite; however, the mosaic of fallow fields and agricultural crops adjacent to Elder Creek are suitable foraging sites.

Western Red Bat

The western red bat (*Lasiurus blossevillii*) is a migratory species that occurs from Shasta County to the Mexico border, west of the Sierra Nevada/Cascade crest and deserts (CDFG 2008). The species prefers sites with a mosaic of habitats that includes trees for roosting and open areas for foraging. Western red bats typically roost solitarily, and both day and night roosts are usually located in the foliage of trees. The species is strongly associated with intact cottonwood and sycamore valley riparian habitats at low elevations, and data also suggest that western red bat populations require fairly extensive stands (greater than 164 feet wide) of riparian forest (Pierson et al. 2006). However, direct observations of roosting behavior in California are limited primarily to collections or sightings that have occurred in fruit orchards (Pierson et al. 2006).

Western red bats breed in August and September, but fertilization does not occur until spring. Young are typically born in late May with litter sizes ranging from one to five young (Wilson and Ruff 1999; Bolster 2005).Young typically are able to fly by September (Zeiner et al. 1990b). Although generally solitary, red bats appear to migrate in groups and forage in close association with one another in summer (Bolster 2005). They forage over a wide assortment of habitat types, including grasslands, shrublands, open woodlands and forests, and croplands.

Potential for Occurrence on the Project Site. The potential for western red bat to occur on the Project site is medium. Western red bats may roost and raise their young in the foliage of large cottonwood, oak, and willow trees on the Project site.

Pallid Bat

The pallid bat (*Antrozous pallidus*) is found throughout California with the exception of the northwestern corner of the State and the high Sierra Nevada (Hall 1981; Zeiner et al. 1990b). It is a colonial species with colonies ranging in size from a few individuals to more than 100 but usually consisting of at least 20 individuals (Wilson and Ruff 1999; Sherwin and Rambaldini 2005). Pallid bats are most commonly found in oak savanna and in open dry habitats with rocky areas, trees, buildings, or bridge structures that are used for roosting (Zeiner et al. 1990b; Ferguson and Azerrad 2004). Day and night roosts include crevices in rocky outcrops and cliffs; caves; mines; trees (e.g., basal hollows of coast redwoods (*Sequoia sempervirens*) and giant sequoias (*Sequoiadendron giganteum*), bole cavities of oaks, exfoliating ponderosa pine (*Pinus ponderosa*) and valley oak bark, deciduous trees in riparian areas, and fruit trees in orchards); and various human structures, such as bridges, barns, porches, bat boxes, and human-occupied as well as vacant buildings (Sherwin and Rambaldini 2005). Typically, pallid bats use separate day and night roosts (Hermanson and O'Shea 1983). In general, day roosts are more enclosed, protected spaces than are night roosts, which often are located in open buildings, porches, garages, highway bridges, and mines. Roosts generally have unobstructed entrances/exits and are located high above the ground, are warm, and are inaccessible to terrestrial predators (Sherwin and Rambaldini 2005). Maternity colonies in California may be active from May through October (Gannon 2003). Pallid bat roosts are very susceptible to human disturbance, and urban development has been cited as the most significant factor contributing to the species' regional decline (Miner and Stokes 2005).

Potential for Occurrence on the Project Site. The potential for pallid bats to occur on the Project site is low. Pallid bats may roost in bole cavities of mature oaks or cottonwoods or in crevices on the bridges and railroad trestles spanning Elder Creek. The bridges were inspected by a DWR bat biologist and were found to lack suitable structures used by crevice-dwelling bats for maternity colonies. Pallid bats could use the small crevices as day or night roosts but are unlikely to use them as maternity sites.

Townsend's Big-eared Bat

The Townsend's big-eared bat (*Corynorhinus townsendii*) is associated with a variety of different habitat types, including coniferous forests, deserts, native prairies, riparian communities, active agricultural areas, and coastal habitats (Sherwin and Piaggio 2005). The distribution is strongly correlated with the availability of roosting habitat and the absence of human disturbance at roost sites (Pierson and Rainey 1998; Sherwin and Piaggio 2005). Although the bat is usually a cave-dwelling species, known roost sites include limestone caves, lava tubes, and hollow trees, as well as anthropogenic structures, such as the attics of buildings or old abandoned mines (Williams 1986; Sherwin and Piaggio 2005). The Townsend's big-eared bat is a colonial species, with females aggregating in spring at maternity colonies to begin their breeding season. Maternity colonies in California may be active from March through September (Pierson and Rainey 1998). Females typically give birth to one young, and both females and young show a high fidelity to their group and their specific roost site (Pearson et al. 1952). They forage primarily on small moths and feed both in flight and by gleaning insects from foliage (Zeiner et al. 1990b).

Potential for Occurrence on the Project Site. The potential for Townsend's big-eared bats to be found on the Project site is low. The species roosts primarily in caves and mines, less frequently on bridges and in buildings, and rarely in trees (Johnston et al. 2004). As stated above, the bridges and railroad trestles spanning Elder Creek could potentially be used as temporary roost sites for Townsend's big-eared bats but are not likely to be used as maternity sites.

Western Pond Turtle

The western pond turtle (*Actinemys marmorata*) is a California species of special concern. It is found in ponds, streams, and other wetland habitats in the Pacific slope drainages of California and northern Baja California, Mexico (Bury and Germano 2008). The species occurs in a wide range of both permanent and intermittent aquatic environments (Jennings et al. 1992). The central California population was historically present in most drainages on the Pacific slope (Jennings and Hayes 1994), but streambed alterations and other sources of habitat destruction, exacerbated by frequent drought events, have caused substantial population declines throughout most of the species' range (Stebbins 2003).

Ponds, slack-water pools, and slow streams with suitable basking sites (such as logs, rocks, mats of floating vegetation, or open mud banks) are an important habitat component for this species, and western pond turtles do not occur commonly along high-gradient streams. In their aquatic habitat, they are associated with areas that contain underwater refugia, such as rocks or submerged vegetation (Hays et al. 1999). Western pond turtles frequently move between aquatic and upland habitats (Rathbun et al. 2002) in spring and summer. Western pond turtles deposit

eggs in upland areas up to 1,300 feet from adjacent watercourses (Jennings and Hayes 1994). Western pond turtles typically become active in March and return to overwintering sites by October or November (Jennings et al. 1992).

Potential for Occurrence on the Project Site. The potential for western pond turtle to occur on the Project site is low. Because it is an intermittent stream, Elder Creek is typically dry from June through October and therefore would not provide the proper aquatic habitat for pond turtles during those months. During periods of high flows, however, the Sacramento River can flood parts of the downstream portion of Elder Creek, which could occasionally provide ephemeral habitat for western pond turtle.

Valley Elderberry Longhorn Beetle

Valley elderberry longhorn beetle was formally listed by USFWS as threatened in 1980. Critical habitat was also designated at this time. A VELB recovery plan was published by USFWS in 1984, and conservation guidelines were issued by USFWS in 1999. The VELB is endemic to the Central Valley of California and adjacent Sierra Nevada foothill regions (Barr 1991). The species inhabits riparian and upland habitats where its host plant, the elderberry (*Sambucus* spp.), grows.

The entire VELB life cycle depends on the elderberry shrub. After mating, the female lays her eggs in the crevices of the elderberry bark. Upon hatching (after approximately 10 days), the larvae bore into the pith of the shrub and feed inside the stems. Larvae remain in the elderberry stems for 1–2 years, until they mature. VELB emerge during spring as adults through exit holes they create as larvae. Adult beetles are active from March through June (USFWS 1984; Barr 1991). They are herbivores, feeding on elderberry foliage, flowers, and nectar until they mate and complete their life cycle. VELB are usually found at low densities in patches of elderberry shrubs (Talley et al. 2007). Populations typically occur as discrete clusters distributed along river reaches. Local aggregations of VELB are influenced by habitat patch characteristics, such as the size of the patch, presence of large shrubs and diversity of stem sizes, and habitat connectivity (Talley 2007; Talley et al. 2007).

Potential for Occurrence on the Project Site. Potential VELB exit holes have been documented in two elderberry shrubs to be trimmed or removed from the Project site; therefore, beetles may be present on the Project site.

Special-status Plants

Stony Creek Spurge

Stony Creek spurge (*Chamaesyce ocellata* ssp. *rattanii*) is an annual prostrate plant in the family Euphorbiaceae that is endemic to California. It inhabits gravel or sandy soils of valley grasslands and chaparral below 100 meters in the northern Sacramento Valley, specifically in Glenn and Tehama counties. The bloom period is May through October. This species has a CRPR of 1B.2, which means that it is rare, threatened, or endangered in California and elsewhere.

Potential for Occurrence on the Project Site. The potential for Stony Creek spurge to occur on the Project site is medium. A search of the CNDDB returned 35 occurrences of this plant in

California. Of these 35 occurrences, only 15 were observed in the last 20 years. The most recent record of Stony Creek spurge in the vicinity of the Project site was documented in 2007 and was an observation of 45 plants along the northern bank of Elder Creek approximately 1 mile upstream of the Project site. Three additional observations were recorded adjacent to or within Thomes Creek, approximately 6 miles south of the Project site. Because Stony Creek spurge is an annual plant adapted to the gravel and sandy soils of intermittent stream channels, there is potential for it to occur along the stream channel in the Project site.

Silky Cryptantha

Silky cryptantha (*Cryptantha crinita*) is an annual herb in the Boraginaceae family. It occurs on rocky volcanic soils and gravelly streambeds in cismontane woodland, lower montane coniferous forest, riparian forest, riparian woodland, and valley and foothill grassland. Its bloom period is April through May. This species has a CRPR of 1B.2, which means that it is rare, threatened, or endangered in California and elsewhere.

Potential for Occurrence on the Project Site. The potential for silky cryptantha to occur on the Project site is low. According to the CNDDB, silky cryptantha is known from 46 occurrences in the Tehama County region, half of which were observed within the last 20 years. One occurrence was documented in a streambed approximately 12 miles southeast of the Project site in 2007. Another occurrence was documented in 2007 near Red Bluff, California, approximately 13 miles north of the Project site. Both occurrences, as well as older observations, were documented in gravelly streambeds or sites with sandy soils similar to the habitat provided by Elder Creek. The potential for silky cryptantha to occur on the Project site is low because of the rarity of the species and because the Project site is at the lower end of the elevation range of this species. The bed of Elder Creek, however, provides suitable habitat for the plant, and occurrences have been documented in streambeds north and southeast of the Project site.

Wetlands and Waters of the United States

Areas meeting the regulatory definition of “waters of the United States” (i.e., jurisdictional waters) are subject to the jurisdiction of U.S. Army Corps of Engineers (USACE) under provisions of Section 404 of the Clean Water Act (1972). Activities in jurisdictional waters are regulated by USACE. The State Water Resources Control Board (SWRCB) is the State agency (together with the Regional Water Quality Control Boards [RWQCBs]) charged with implementing water quality certification in California under Section 401 of the Clean Water Act.

DWR biologists conducted a wetland delineation for the Project site and prepared a draft Determination of Wetlands and Other Waters. Wetlands potentially subject to USACE jurisdiction under Section 404 of the Clean Water Act were delineated in accordance with the 1987 Corps of Engineers Wetlands Delineation Manual (Environmental Laboratory 1987) and the Arid West Region supplement (USACE 2008). The extent of “other waters” subject to USACE jurisdiction was determined to be approximately 52.10 acres based on the ordinary high-water mark. Any construction activity conducted in these jurisdictional waters requires permits from USACE and RWQCB under Sections 404 and 401 of the Clean Water Act, respectively.

Discussion

The following discussion of potential Project impacts on biological resources focuses on proposed activities within the Elder Creek channel and staging areas. The proposed haul routes and the sediment disposal site are highly altered environments that do not support sensitive habitat or special-status species; therefore, there would be no potential for significant impacts and these are not discussed below.

a) **Less than significant with mitigation incorporated**.

Nesting Birds, Including Yellow-Breasted Chat and Loggerhead Shrike

Migratory birds, including raptors, are known or may nest in the vicinity of the Project site. The riparian corridor provides suitable nesting and foraging habitat for a variety of species. In addition, the bridges and trestles spanning Elder Creek may provide suitable nesting substrate for swallows and other birds. As stated above, migratory birds are protected under the Migratory Bird Treaty Act (MBTA) and the California Fish and Game Code. Yellow-breasted chats and loggerhead shrikes, two species that could be present on the Project site, are protected under the MBTA and are considered California bird species of special concern by CDFW.

The anticipated work window for the Project extends from 1 May through 31 October. This schedule overlaps with much of the breeding season for most nesting birds (generally, 1 March through 31 August) and raptors (generally, 15 January through 15 September). Direct and indirect impacts on migratory birds could occur during all stages of the Project: vegetation removal, vegetation thinning, and sediment excavation. Direct impacts on nesting birds resulting from Project-related activities could include the removal of nests and eggs, mortality of nestlings, and abandonment of the nest. Indirect impacts on nesting birds could result from removal of potential nesting and foraging habitat, as well as from general disturbance, including exposure to noise, vibration, and dust.

As stated above, the removal of arundo throughout the Project site would enhance the value of the existing riparian habitat for nesting birds and raptors, thus minimizing the potential adverse impacts of implementing the Project. Even with this benefit, Project activities could still potentially have a substantial adverse impact on nesting birds and raptors unless mitigation is incorporated. The following mitigation measures would be implemented to address this potentially significant impact.

Mitigation Measures

Measure BIO-1: Conduct Work outside Nesting Season. If feasible, Project-related activities will be conducted outside of the nesting season (15 January through 15 September for nesting birds and raptors). If Project-related activities cannot be conducted outside of the nesting season, the following additional mitigation measures will be implemented.

Measure BIO-2: Avoid Bridges and Trestles. To avoid impacts on birds potentially nesting on the bridges and trestles that span Elder Creek, Project-related

activities, including those involving vehicle and heavy equipment traffic, will be avoided near these structures. If these areas cannot be avoided, the following mitigation measures will be implemented.

Measure BIO-3: Conduct Preconstruction Surveys. Before each annual construction season, a qualified biologist will conduct preconstruction surveys for nesting birds, including raptors, on the Project site to ensure that no nests would be disturbed during Project construction. Surveys will be conducted no more than 1 week before the initiation of Project-related activities in any given area. Because work would be phased, surveys would be conducted before each phase of the Project begins (i.e., before the beginning of every annual work window). The surveys can be limited to the portions of the annual work area where activities would occur, as well as the area within a 250-foot buffer for raptors and a 50-foot buffer for birds other than raptors. During each survey, the biologist will inspect all potential nesting habitats (e.g., trees, shrubs, bridges, trestles, utility poles, and ruderal habitat) in and immediately adjacent to the impact areas for nests. If a lapse in Project-related work of 1 week or longer occurs, another focused survey will be conducted before Project work can be reinitiated.

Measure BIO-4: Maintain Qualified Biologist On Site. A qualified biologist will be available on an on-call basis during all Project activities. If a sensitive species is encountered during construction, activities will cease until appropriate corrective measures have been completed or it has been determined that the species will not be harmed. If needed a qualified biologist will be maintained on site during vegetation removal and trimming activities, as well as during sediment removal activities, to ensure the protection of biological resources.

Measure BIO-5: Implement Nest Protection. If an active nest is found sufficiently close to the work area (i.e., typically within 250 feet for raptors or 50 feet for birds other than raptors), a qualified biologist will determine the extent of a disturbance-free buffer zone to be established around the nest to ensure that no nests of species protected by the MBTA and California Fish and Game Code would be disturbed during Project construction. No new Project-related activities (i.e., activities that were not ongoing when the nest was established) will be performed within the buffer until the young have fledged or the nest has been determined to be inactive by a qualified biologist.

Reductions in the standard buffers (i.e., to buffers less than 50 feet for birds other than raptors and less than 250 feet for raptors) may be allowed where circumstances suggest that the birds would not abandon the active nest with a reduced buffer size. A qualified biologist will determine whether reducing the buffer is likely to substantially increase disturbance of nesting birds, taking into account the presence or absence of dense vegetation, type of work activities, topography, and structures that would block Project activities from view; the life history and behavior of the bird species in question; and the nature of the proposed activity. If a reduced buffer is implemented, the biologist will monitor bird behavior in relation to work activities to ensure that the birds do not exhibit abnormal nesting behavior that may cause reproductive failure (e.g., nest abandonment and loss of eggs and/or young).

Implementing these mitigation measures along with Measure BIO-33 (see below) would reduce the potentially significant impact on nesting birds to a less-than-significant level.

Tricolored Blackbird

Tricolored blackbirds are protected under the MBTA and the California Fish and Game Code and recently were emergency-listed as an endangered species under CESA. Because the work window for the Project overlaps with the breeding season for tricolored blackbird (generally, mid-March through early August [Beedy and Hamilton 1999]), Project activities could potentially have direct and indirect impacts on the species. Direct and indirect impacts on nesting tricolored blackbirds could occur during all stages of the Project: vegetation removal, vegetation thinning, and sediment excavation. Direct impacts on nesting tricolored blackbirds resulting from Project-related activities could include the removal of nests and eggs, mortality of nestlings, and abandonment of the nest. Indirect impacts on tricolored blackbirds could result from removal of potential nesting habitat (specifically, Himalayan blackberry, young willow thickets, and California wild rose), as well as from general disturbance, including exposure to noise, vibration, and dust.

Because the population of tricolored blackbirds in California has declined by approximately 44% from 2011 to 2014 (Meese 2014), potential Project-related impacts are not expected, but any impact would be significant to the greater population of tricolored blackbirds in the State. The following mitigation measures would be implemented to address this potentially significant impact.

> **Measure BIO-6: Conduct Work outside Nesting Season (Tricolored Blackbird).** If feasible, Project activities will be conducted outside of the nesting season for tricolored blackbird (mid-March through early August [Beedy and Hamilton 1999]). If work cannot be conducted outside the breeding season of the tricolored blackbird, the following additional mitigation measures will be implemented.
>
> **Measure BIO-3: Conduct Preconstruction Surveys.** Preconstruction surveys for nesting tricolored blackbirds will be conducted as described previously for Mitigation Measure BIO-3. If more specific guidance is developed as a result of the CESA emergency listing, that guidance will be used to direct surveys for nesting tricolored blackbirds.
>
> **Measure BIO-4: Maintain Qualified Biologist On Site.** If needed, a qualified biologist will be on-site as described for Mitigation Measure BIO-4 above.
>
> **Measure BIO-7: Implement Nest Protection (Tricolored Blackbird).** If an active nest is detected on the Project site during the surveys discussed above, a 250-foot no-disturbance buffer will be established around the nest. No work will occur within the 250-foot buffer until the nest is determined to have fledged or failed. Reductions in the standard buffer size will be discussed with and may be approved by CDFW. A qualified biologist will be on site to monitor known nests to ensure that Project-related activities do not affect nest success.

Implementing these mitigation measures along with Measure BIO-33 (see below) would reduce the potentially significant impact on tricolored blackbirds to a less-than-significant level.

Western Yellow-billed Cuckoo

Western yellow-billed cuckoos are protected under the MBTA, California Fish and Game Code, and ESA. Because the work window for the Project overlaps with the breeding season for the western yellow-billed cuckoo (1 June through 31 August), Project activities could potentially have direct and indirect impacts on this species. Direct and indirect impacts on nesting cuckoos could occur during all stages of the Project: vegetation removal, vegetation thinning, and sediment excavation. Direct impacts on nesting western yellow-billed cuckoos resulting from Project-related activities could include the removal of nests and eggs, mortality of nestlings, and abandonment of the nest. Indirect impacts on cuckoos could result from removal and trimming of potential nesting and foraging habitat (specifically, cottonwood-willow riparian forest), as well as from general disturbance, including noise, vibration, and dust.

Approximately 2.5 acres of riparian habitat along the north bank of Elder Creek on the Project site is proposed as critical habitat for the western yellow-billed cuckoo. No sediment excavation activities are proposed in this area. Thus, no riparian vegetation would be removed; however, DWR proposes to trim a narrow band of this riparian vegetation to help facilitate flow capacity of the channel.

As stated above, the removal of arundo throughout the Project site would enhance the value of the existing riparian habitat for western yellow-billed cuckoo, thus minimizing the potential adverse impacts of implementing the Project. Removal of non-native vegetation in suitable habitat is identified as a valuable management tool for the recovery of the cuckoo. Even with this benefit, Project activities could still potentially have a substantial adverse impact on cuckoos unless mitigation is incorporated. The following mitigation measures would be implemented to address this potentially significant impact.

Recent surveys have documented a decline of cuckoo populations along the Sacramento River (Dettling and Seavy 2012). Thus, potential Project-related impacts on the western distinct population segment of the yellow-billed cuckoo could be significant. The following mitigation measures would be implemented to address this potentially significant impact.

> **Measure BIO-8: Conduct Work outside Nesting Season (Cuckoo).** If feasible, Project-related activities will be conducted outside of the breeding season of the western yellow-billed cuckoo (1 June through 31 August). If work cannot be conducted outside the cuckoo breeding season, the following additional mitigation measures will be implemented.
>
> **Measure BIO-9: Conduct Preconstruction Surveys (Cuckoo).** A qualified biologist will conduct surveys for western yellow-billed cuckoo in suitable habitat located in the downstream 1-mile portion of the Project site. Surveys will be conducted in accordance with the current standard cuckoo survey protocol from A Natural History Summary and Survey Protocol for the Western Yellow-billed Cuckoo Population (Halterman et al. 2011) or with the most current applicable survey standards as they are released. The current guidance recommends six surveys during the breeding season, the first and last of which are optional. The surveys will be conducted according the following schedule:

- Preconstruction survey (optional): late May through mid-June
- Survey 1: mid-June through late June
- Survey 2: early July through mid-July
- Survey 3: mid-July through late July
- Survey 4: early August through mid-August
- Survey 5 (optional): mid-August through mid-September

Surveys will be conducted annually as long as construction activities, including those involving heavy equipment or vehicle traffic, occur along the downstream mile of the Project site. If work is completed on the downstream mile of the Project site and no construction activities will occur within that mile during subsequent years, no additional surveys for cuckoos will be required.

Measure BIO-4: Maintain Qualified Biologist On Site. If needed, a qualified biologist will be on-site as described for Mitigation Measure BIO-4 above.

Measure BIO-10: Implement Nest Protection (Cuckoo). If an active nest is detected on or within 500 feet of the Project site, a 500-foot no-disturbance buffer will be established around the nest. No work will be conducted within the 500-foot buffer until the nest is determined to have fledged or failed. Reductions in the standard buffer size will be discussed and may be approved by CDFW and USFWS. A qualified biologist will be on site to monitor known nests to ensure that Project-related activities do not affect nest success.

Implementing these mitigation measures and removing non-native arundo along with Measure BIO-33 (see below) would reduce the potentially significant impact on western yellow-billed cuckoo to a less-than-significant level.

Swainson's Hawk and White-tailed Kite

Swainson's hawks are protected under the MBTA and the California Fish and Game Code and are designated as a threatened species under CESA. White-tailed kites are protected under the MBTA and are a fully protected species under the California Fish and Game Code. Because the work window overlaps with the breeding season for these raptors (generally, 1 March through 15 September for Swainson's hawk and February through October for white-tailed kite), Project activities could potentially have direct and indirect impacts on Swainson's hawks and white-tailed kites. Direct and indirect impacts could occur during all stages of the Project: vegetation removal, vegetation thinning, and sediment excavation. Direct impacts on nesting Swainson's hawks and white-tailed kites could include the removal of nests and eggs, mortality of nestlings, and abandonment of the nest from Project-related disturbance. Indirect impacts could result from removal of potential nesting habitat (specifically cottonwoods, oaks, and willows), as well as from general disturbance, including exposure to noise, vibration, and dust. The habitats on the Project site do not provide forage value for Swainson's hawk or white-tailed kites, so implementing the Project would not result in loss of foraging habitat.

As stated above, the removal of arundo throughout the Project site would enhance the value of the existing riparian habitat for Swainson's hawk and white-tailed kite, thus minimizing the potential adverse impacts of implementing the Project. Even with this benefit, Project activities could still potentially have a substantial adverse impact on Swainson's hawk and white-tailed kite unless mitigation is incorporated. The following mitigation measures would be implemented to address this potentially significant impact.

The following mitigation measures would be implemented to address this potentially significant impact on Swainson's hawk and white-tailed kite. They were developed using the CDFW Staff Report Regarding Mitigation for Impacts to Swainson's Hawks in the Central Valley (1994) and include suggested mitigation measures from the Recommended Timing and Methodology for Swainson's Hawk Nesting Surveys in California's Central Valley (Swainson's Hawk Technical Advisory Committee [SHTAC] 2000).

Measure BIO-11: Conduct Work outside Nesting Season (Swainson's Hawk and White-tailed Kite). If feasible, Project activities will be conducted outside of the nesting season for Swainson's hawk and white-tailed kite (March through October for Swainson's hawk and February through October for white-tailed kite). If work cannot be conducted outside the breeding season for Swainson's hawk and white-tailed kite, the following additional mitigation measures will be implemented.

Measure BIO-12: Conduct Preconstruction Surveys (Swainson's Hawk and White-tailed Kite). Preconstruction nesting surveys will be conducted by a qualified biologist in accordance with the Recommended Timing and Methodology for Swainson's Hawk Nesting Surveys in California's Central Valley (SHTAC 2000). Surveys will be conducted within 1 week before the start of work during each annual work window (1 May through 31 October). The following list provides the recommended timing of survey periods and the number of surveys to be conducted during each period. To meet the minimum level of protection for the species, as prescribed by the guidance above, surveys should be completed for at least the two survey periods immediately before a project's initiation. The surveys will be conducted according the following schedule:

- Survey 1 (optional): January through March 20 (one survey)
- Survey 2: March 20 through April 5 (three surveys)
- Survey 3: April 5 through April 20 (three surveys)
- Survey 4: April 21 through June 10 (monitor known nest sites only; no new surveys initiated)
- Survey 5: June 10 through July 30 (postfledging) (three surveys)

Measure BIO-4: Maintain Qualified Biologist On Site. If needed, a qualified biologist will be on site as described for Mitigation Measure BIO-4 above.

Measure BIO-13: Implement Nest Protection (Swainson's Hawk and White-tailed Kite). If nesting Swainson's hawks or white-tailed kites are identified, work will not occur within one-quarter mile of the nest until the young has fledged the nest. No intensive new disturbances (e.g., heavy equipment operation associated with construction) or other Project-related activities that may cause nest

abandonment or forced fledging should be initiated within one-quarter mile (buffer zone) of an active nest for Swainson's hawk and white-tailed kite. Buffers will be maintained until a qualified biologist has determined that the young have fledged and are no longer reliant on the nest or parental care for survival. If construction or other Project-related activities that may cause nest abandonment or forced fledging are necessary in the buffer zone, a qualified biologist will monitor the nest site to determine whether the nest has been abandoned.

Measure BIO-14: Mitigate for Removal of Nest Trees (Swainson's Hawk and White-tailed Kite). A nest tree is defined as a nest that was used one out of the last 5 years (CDFG 1994). Nest trees will not be removed unless avoidance measures are determined to be infeasible. If a nest tree must be removed, a management authorization will be obtained and consultation with CDFW as necessary. The tree removal period will be after all juvenile birds have fledged the nest. If work that may cause nest abandonment or forced fledging are necessary in the buffer zone, a qualified biologist will monitor the nest site to determine whether the nest has been abandoned. If it has been abandoned, and if the nestlings are still alive, recovery and hacking (controlled release of captive-reared young) of nestling(s) will be required.

Implementing these mitigation measures along with Measure BIO-33 (see below) would reduce the impact on Swainson's hawk and white-tailed kite to a less-than-significant level.

Special-status Bats

Western red bats, Townsend's big-eared bats, and pallid bats are California species of special concern. In addition, Townsend's big-eared bats are proposed as a candidate for listing as a threatened species under the ESA. Direct and indirect impacts on bats could occur during all stages of the Project: vegetation removal, vegetation thinning, and sediment excavation. Potential direct impacts on bats include mortality of individuals caused by removing trees used as maternity sites. This would generally apply to western red bats but could potentially extend to pallid bats, also. Foliage-roosting bats, including the western red bat, are solitary in nature and difficult to detect. Females give birth in late spring to early summer, and the young are able to fly after 6–8 weeks. This time is especially critical for western red bats because it is difficult for the mother to fly with her young, especially as they grow, if her roost is disturbed (Gilbert pers. comm.; Stains 1965). Removing tree roosts during the breeding season therefore may have a significant impact on breeding western red bats. Potential indirect impacts on bats include the removal of habitat and general disturbance, including exposure to noise, dust, and vibration.

DWR biologists inspected the bridges and trestles spanning Elder Creek and determined that they do not support the structures commonly used by crevice-dwelling bats for maternity roosts. Bats may, however, use the bridges and trestles as temporary day or night roosts.

As stated above, the removal of arundo throughout the Project site would enhance the value of the existing riparian habitat, thus minimizing the potential adverse impacts of implementing the Project. Even with this benefit, Project activities could still potentially have a substantial adverse impact on bats unless mitigation is incorporated. The following mitigation measures would be implemented to address this potentially significant impact.

Measure BIO-15: Conduct Work outside Breeding Season (Bats). If feasible, work will be conducted outside the breeding season for bats (generally, 1 April to 31 August) to avoid potential impacts on breeding bats. If it is not possible to conduct work outside the breeding season, the following additional mitigation measures will be implemented.

Measure BIO-16: Avoid Bridges and Trestles (Bats). To avoid impacts on bats potentially roosting on the bridges and trestles that span Elder Creek, Project-related activities, including those involving vehicle and heavy equipment traffic, will be avoided near these structures. If these areas cannot be avoided, the following mitigation measures will be implemented.

Measure BIO-17: Conduct Preconstruction Surveys (Bats). Annual preconstruction surveys for roosting bats will be conducted within 15 days before any Project-related activities begin. The surveys will be conducted by a qualified bat biologist and will focus on detecting bats that may be roosting in trees or on the bridges spanning Elder Creek. if trees cannot be removed by the end of March because of permit conditions or the timing of Project approvals, roost entrances could be blocked following eviction of the bats to reduce the likelihood that active maternity roosts are present.

Measure BIO-4: Maintain Qualified Biologist On Site. If needed, a qualified biologist will be on site as described for Mitigation Measure BIO-4 above.

Measure BIO-18: Remove Day Roosts outside Breeding Season. If a day roost of any bat species is found in a tree that is to be completely removed, individual bats will be safely evicted under the direction of a qualified bat biologist. Eviction will occur at night between 1 September and 31 March but will not occur during long periods of inclement or cold weather (as determined by the bat biologist) when prey are not available or bats are in torpor. Exclusion is to be done selectively, and only to the extent necessary, to prevent mortality to the colony.

Measure BIO-19: Implement Protective Measures for Maternity Roosts. Although the potential for a maternity roost on the Project site is low, if a maternity roost of any bat species is present, the bat biologist will determine the extent of a no-disturbance buffer (typically, 100 feet) around the active roost that will be maintained to ensure protection of the roost. This buffer will be maintained from 1 April until the young are flying, typically after 31 August.

If western red bats are detected during surveys within the breeding season or are suspected to be roosting in the foliage of trees on the Project site, CDFW will be consulted to determine the appropriate measures to ensure that females and young incapable of flight are not affected by vegetation trimming or removal activities. This may involve not removing trees that provide suitable roosting habitat between the time when females give birth and when young are capable of flight (generally May through 31 August).

Implementing these mitigation measures along with Measure BIO-33 (see below) would reduce the potentially significant impact on special-status bats to a less-than-significant level.

Western Pond Turtle

The potential for western pond turtle to occur on the Project site is low. Because it is an intermittent stream, Elder Creek is typically dry from June through October and therefore would not provide the proper aquatic habitat for pond turtles during those months. During periods of high flows, however, the Sacramento River can back up and flood parts of the downstream portion of Elder Creek, which could provide suitable aquatic habitat for western pond turtle.

Direct impacts, including mortality of individuals or destruction of nests and eggs, could occur during sediment removal activities. Indirect impacts on western pond turtle could occur if potentially suitable basking habitat (e.g., logs and rocks) are removed from the Project site.

The following mitigation measures would be implemented to address this potentially significant impact on western pond turtle.

> **Measure BIO-20: Conduct Preconstruction Surveys (Western Pond Turtle).** A qualified biologist will conduct a preconstruction survey for western pond turtles and their nests before each annual work window.
>
> **Measure BIO-4: Maintain Qualified Biologist On Site.** If needed, a qualified biologist will be on site as described for Mitigation Measure BIO-4 above.
>
> **Measure BIO-21: Implement Nest Protection (Western Pond Turtle).** If a western pond turtle nest is observed during preconstruction surveys or Project-related activities, it will be avoided to the extent feasible. If avoidance is feasible, a no-disturbance buffer will be established around the nest to ensure the protection of the eggs. If it is not feasible to avoid the nest, CDFW will be consulted to determine the appropriate measures (e.g., excavating and reburying the nest outside of impact areas) to ensure nest protection.
>
> **Measure BIO-22: Relocate Western Pond Turtles.** If western pond turtles are observed during Project-related activities, activities in the vicinity will cease until appropriate corrective measures have been implemented or it has been determined that the individual will not be harmed. If it is determined that the individual would be harmed by ongoing activities, a qualified biologist may move the western pond turtle to suitable habitat downstream of the Project site.
>
> **Measure BIO-23: Avoid Potential Basking Sites.** Impacts on potential basking structures (e.g., logs and rocks) will be avoided whenever feasible.

Implementing these mitigation measures would reduce the potentially significant impact on western pond turtle to a less-than-significant level.

Valley Elderberry Longhorn Beetle

The Project site supports healthy stands of blue elderberry in various geomorphic positions along the bed and banks of the Elder Creek riparian corridor. Project impacts on VELB habitat were quantified by DWR in accordance with USFWS's VELB conservation

mitigation guidelines (USFWS 1999). Impacts would include the removal of up to 18 elderberry shrubs, the limbing of up to 10 other shrubs, and the potential removal of up to five additional shrubs. DWR's staff conducted protocol-level surveys of the 28 known shrubs that would be affected. **Table 5** provides a summary of the number of stems, by size class that would be affected on the 28 shrubs. In the table, the shrubs are presented in two groups: those located within 5 feet of arundo and those located more than 5 feet away from arundo. Because 10 shrubs would be limbed and not removed, the actual number of stems affected by the Project likely would be less than shown in the table.

TABLE 5
NUMBER OF ELDERBERRY STEMS
POTENTIALLY AFFECTED AMONG 28 SURVEYED SHRUBS

Elderberry Stem Size	Number of Elderberry Stems Affected
Elderberry Shrubs Located More Than 5 feet from Arundo	
Stems with VELB Exit Holes	
1–3 inches in diameter	13
3–5 inches in diameter	5
>5 inches in diameter	0
Stems with No VELB Exit Holes	
1–3 inches in diameter	190
3–5 inches in diameter	59
>5 inches in diameter	39
Elderberry Shrubs Located within 5 Feet of Arundo	
Stems with VELB Exit Holes	
1–3 inches in diameter	1
3–5 inches in diameter	2
>5 inches in diameter	3
Stems with No VELB Exit Holes	
1–3 inches in diameter	170
3–5 inches in diameter	70
>5 inches in diameter	51

NOTE: VELB = valley elderberry longhorn beetle.

VELB is protected as a threatened species under the federal ESA. The potential Project-related direct impact on VELB includes the removal of 18 elderberry shrubs, the trimming or thinning of an additional 10 elderberry shrubs, and the potential removal of up to five additional shrubs. Indirect impacts on VELB would be associated with ground disturbance and noise in the vicinity of the shrubs, and dust accumulation on elderberry foliage.

Projects affecting VELB habitat (i.e., elderberry shrubs) are required to mitigate impacts based on the number of stems greater than 1 inch in diameter at ground level that would be affected by Project activities, the presence or absence of VELB exit holes in affected stems, and the supporting habitat (riparian or nonriparian) (USFWS 1999). Elderberry shrubs with one or more stems greater than 1 inch in diameter at ground level that would be affected by Project activities typically are transplanted to a conservation site, in

accordance with USFWS's VELB conservation guidelines (1999). However, DWR and USFWS are currently negotiating the transplanting of shrubs that would be affected by this project. There is concern that elderberry shrubs located within and near arundo thickets would transfer arundo to elderberry transplant sites. In addition, DWR and USFWS are negotiating reduced mitigation, at 50% of the standard ratios, for all elderberry shrubs located within 5 feet of arundo. This is because the habitat value for VELB is lower for elderberry shrubs within/near arundo thickets compared to shrubs that are in VELB mitigation site/banks (free of arundo). To illustrate how this reduced mitigation ratio affects the number of credits that DWR is required to secure, mitigation requirements were first calculated according to the standard ratios presented in the conservation guidelines (1999) and then were calculated based on reduced ratios for elderberry shrubs located within 5 feet of arundo.

Based on the standard mitigation requirements presented in the conservation guidelines (1999), it is estimated that a total of 389 VELB credits would be required to mitigate impacts on VELB habitat. In accordance with the guidelines, each credit occupies 1800 square feet (0.041 acre) of planting space, which would result in 16.07 acres of elderberry restoration when multiplied by the 389 credits required. **Table 6** provides a breakdown of how the VELB credit requirement was determined. It includes stem impact data from the 28 shrubs DWR surveyed, as well as an estimate of stems (based on data collected on the shrubs that were surveyed) that may be affected on five additional elderberry shrubs.

TABLE 6
STANDARD VELB MITIGATION REQUIREMENTS

Stem Size (inches)	Number of Stems Affected	Required Ratio of Elderberry Seedlings[1]	Required Ratio of Native Plants[2]	Required Number of Elderberry Seedlings	Required Number of Associated Native Plants
VELB Exit Holes Present					
1–3	14	4:1	2:1	56	112
3–5	7	6:1	2:1	42	84
>5	3	8:1	2:1	24	48
No VELB Exit Holes Present					
1–3	360	2:1	1:1	720	720
3–5	129	3:1	1:1	387	387
>5	90	4:1	1:1	360	360
Totals				**1589**	**1711**
Total required additional plantings (elderberry seedlings and native plants) for the 28 surveyed shrubs:					3330
Estimated total number of additional plantings required if five additional shrubs are affected:					589
Estimated total number of required plantings for up to 33 elderberry shrubs affected:					3889
Estimated total number of VELB credits required[3]:					**389**
Estimated total number of acres required for up to 33 elderberry shrubs affected:					**16.07**

NOTES: USFWS = U.S. Fish and Wildlife Service; VELB = valley elderberry longhorn beetle.

1 Ratios correspond to the number of elderberry seedlings to be planted per elderberry stem affected.
2 Ratios correspond to the number of native plantings required per elderberry seedling planted.
3 VELB credits assume ten plantings per habitat unit.

SOURCE of mitigation ratios: USFWS VELB conservation guidelines (1999).

With a 50% mitigation ratio for all elderberry shrubs located within 5 feet of arundo, it is estimated that a total of 277 VELB credits (or 11.44 acres of elderberry restoration) would be required to mitigate impacts on VELB habitat. **Table 7** provides a breakdown of how the VELB credit requirement was determined based on reduced mitigation ratios. It includes stem impact data from the 28 shrubs DWR surveyed, as well as an estimate of stems that may be affected on five additional elderberry shrubs.

TABLE 7
REDUCED VELB MITIGATION REQUIREMENTS

Elderberry Stem Size	Number of Stems Affected	Required Ratio of Elderberry Seedlings[1]	Required Ratio of Native Plants[2]	Required Number of Elderberry Seedlings	Required Number of Associated Native Plants
Elderberry Shrubs Located More Than 5 feet from Arundo (Standard Mitigation Ratio)					
VELB Exit Holes Present					
1–3 inches in diameter	13	4:1	2:1	52	104
3–5 inches in diameter	5	6:1	2:1	30	60
>5 inches in diameter	0	8:1	2:1	0	0
No VELB Exit Holes Present					
1–3 inches in diameter	190	2:1	1:1	380	380
3–5 inches in diameter	59	3:1	1:1	177	177
>5 inches in diameter	39	4:1	1:1	156	156
Total				**795**	**877**
Total number of required additional plantings (elderberry seedlings and native plants) for the 28 surveyed shrubs:					1,672
Elderberry Shrubs Located within 5 Feet of Arundo (Half Standard Mitigation Ratio)					
VELB Exit Holes Present					
1–3 inches in diameter	1	2:1	1:1	2	2
3–5 inches in diameter	2	3:1	1:1	6	6
>5 inches in diameter	3	4:1	1:1	12	12
No VELB Exit Holes Present					
1–3 inches in diameter	170	1:1	.5:1	170	85
3–5 inches in diameter	70	1.5:1	.5:1	105	52.5
>5 inches in diameter	51	2:1	.5:1	102	51
Total number of required plantings (elderberry seedlings and associated native plants) for shrubs within 5 feet of arundo:				**397**	**208.50**
Total number of required plantings for shrubs located within 5 feet of arundo:					**605.50**
Total number of required plantings for shrubs located more than 5 feet from arundo:					**1,672**
Estimated total number of additional plantings required if five additional shrubs are affected:					**491.8**
Estimated total number of required plantings for up to 33 elderberry shrubs affected:					**2,769.3**
Estimated total number of VELB credits required for up to 33 elderberry shrubs affected[3]:					**277**
Estimated total number of acres required for up to 33 elderberry shrubs affected:					**11.44**

NOTES: USFWS = U.S. Fish and Wildlife Service; VELB = valley elderberry longhorn beetle.

1 Ratios correspond to the number of elderberry seedlings to be planted for each elderberry stem affected.
2 Ratios correspond to the number of native plantings required for each elderberry seedling planted.
3 VELB credits assume ten plantings for each habitat unit.

SOURCE of mitigation ratios: USFWS VELB conservation guidelines (1999).

The following mitigation measures, from the USFWS Conservation Guidelines for the Valley Elderberry Longhorn Beetle (1999), would be implemented to reduce the potentially significant impact on VELB:

Measure BIO-24: Flag Elderberry Shrubs. All elderberry plants on the Project site will be identified with flagging before the start of Project-related activities.

Measure BIO-25: Increase Worker Awareness. Work crews will be educated on the appearance of elderberry, the importance of its conservation, and the means to protect it during Project-related activities.

Measure BIO-26: Remove Arundo by Hand. Arundo or riparian vegetation within 5 feet of the dripline of any elderberry shrub will be removed by hand. Heavy equipment will be used only at a distance of more than 5 feet from the dripline of elderberry shrubs that will not otherwise be disturbed.

Measure BIO-4: Maintain Qualified Biologist On Site. A qualified biologist will be on site as described for Mitigation Measure BIO-4 above.

Measure BIO-27: Purchase Elderberry Credits, Plant Offsite or Purchase Credits in Accordance with USFWS Endangered Species Act Biological Opinion for VELB at an approved Mitigation Bank or Site. All elderberry shrubs to be removed or trimmed or thinned will be replaced according to the USFWS Conservation Guidelines for the Valley Elderberry Beetle (1999) as stated below:

1) Elderberry stems measuring 1.0 inch or greater in diameter at ground level that will be adversely affected (i.e., transplanted or destroyed) will be replaced with elderberry seedlings or cuttings at a ratio ranging from 1:1 to 8:1 (new plantings to affected stems).

2) A mix of native plants will be planted at ratios ranging from 1:1 to 2:1 (native tree/plant species to each elderberry seedling or cutting).

3) The conservation area will be protected in perpetuity as habitat for the VELB through weed control, pesticide buffers, endowments, litter control, fencing and signage.

4) At least 1,800 square feet will be provided for each transplanted elderberry plant. As many as 10 conservation plantings (i.e., elderberry cuttings or seedlings and/or associated native plants) may be planted within the 1,800-square-foot area with each transplanted elderberry, and an additional 1,800 square feet will be provided for every additional 10 conservation plants.

5) The conservation area will be monitored for a period of either 10 consecutive years or for 7 years over a 15-year period. The applicant may elect either 10 years of monitoring, with surveys and reports every year, or 15 years of monitoring, with surveys and reports on years 1, 2, 3, 5, 7, 10, and 15.

If 33 elderberry shrubs are removed from the Project site and/or trimmed or thinned, the mitigation measures described above would require the Project

applicant to secure 277 credits at an approved conservation bank or to plant 11.44 acres of VELB habitat at an offsite location, in accordance with USFWS guidelines (1999).

Implementing these mitigation measures and conservation guidelines would reduce the potentially significant impact on VELB to a less-than-significant level.

Special-status Plants

No special-status plant occurrences have been reported on the Project site; however, the potential for their occurrence on the Project site cannot be dismissed because protocol-level surveys have not been conducted, suitable habitat is present, and searches of the CNDDB have returned records of the plants in the region. The potential for occurrence of these plants is discussed above.

Implementing the Project would result in the disturbance of the bed and banks of Elder Creek, which could support habitat for Stony Creek spurge and silky cryptantha. Disturbance or removal of these plants would be considered a potentially significant impact because of their rarity in California as defined by the CNPS rare plant inventory.

The following mitigation measures would be implemented to reduce this potentially significant impact on Stony Creek spurge and silky cryptantha.

Measure BIO-28: Conduct Preconstruction Surveys (Plants). A qualified botanist will conduct annual, focused surveys for Stony Creek spurge and silky cryptantha on the Project site during the bloom periods and before the implementation of Project-related activities. The bloom period for Stony Creek spurge is May through October, and the bloom period for silky cryptantha is April through May.

Measure BIO-29: Install Buffers around Plant Populations. Fencing will be installed a minimum of 100 feet from the location of special-status plants, and no Project activity will be permitted in the area occupied by special-status plants or the 100-foot buffer area around these plants. If it is not feasible to entirely avoid affecting special-status plants on the Project site, Mitigation Measures BIO-31 and BIO-32 will be implemented.

Measure BIO-30: Avoid Use of Chemicals. Insecticides, herbicides, fertilizers, and other chemicals that might harm special-status plants will not be used within 100 feet of the plants.

Measure BIO-31: Consult and Comply with CDFW. If special-status plant populations are found on the Project site and it is not feasible to avoid them during Project-related activities, the Project applicant will consult with CDFW to determine the appropriate mitigation measures for any population that may be affected by implementing the Project. Appropriate mitigation measures may include the creation of alternative onsite or offsite populations through seed collection and dispersal, preservation and enhancement of existing populations, restoration or creation of suitable habitat, purchase of credits at an approved mitigation bank, if available, or

other mitigation measures. If offsite compensation includes dedication of conservation easements, purchase of mitigation credits, or other offsite conservation measures, the details of these measures will be included in the mitigation plan and must occur with full endowments for management in perpetuity. The plan will include information on responsible parties for long-term management, holders of conservation easements, long-term management requirements, and other details, as appropriate, for the preservation of long-term viable populations.

Implementing these mitigation measures would reduce the potentially significant impact on special-status plants to a less-than-significant level.

Special-status Fish

The portion of Elder Creek within the Project sites provides seasonal habitat for several special-status fish species (as described above). Additionally, Elder Creek is designated as critical habitat for several fish species listed under the federal ESA and as EFH for Pacific salmon under the Magnuson-Stevens Fishery Conservation and Management Act (as amended).

Construction within Elder Creek is scheduled to take place only when the channel is dry. As a result, habitat would be seasonally unavailable and no fish would be present; therefore, there would be no impacts to fish species during construction activities. The potential exists, however, for contaminants such as fuels, oils, hydraulic fluids, and other chemicals/compounds used during sediment and vegetation removal activities to be introduced accidentally through spills into the Elder Creek channel directly and/or incrementally from haul routes and staging areas. If these contaminants were to be accidentally released into the channel and remained (i.e., not cleaned-up or otherwise removed) in sufficient concentrations, they could be toxic to fish and prey organisms during subsequent re-wetting of the channel during winter/spring. However, as discussed Section 3.3.6, *Geology, Soils, and Seismicity* (see below), Mitigation Measure GEO-1 would require DWR to adhere to requirements of a Construction General Permit from the SWRCB prior to initiating earth disturbing activities. Among other things, the conditions of the Permit would include the development and implementation of a Stormwater Pollution Prevention Plan (SWPPP) with best management practices (BMPs) and a hazardous materials management plan. Compliance with the Construction General Permit, including the implementation of the BMPs described in the SWPPP, would ensure that the potential for the release and exposure of construction-related contaminants would be avoided and/or minimized.

It is also possible that there could be a temporary loss in EFH or critical habitat in Elder Creek between construction years. However, current habitat is only seasonally available for fish and it is unlikely that any alterations to habitat as a result of Project implementation would reduce or degrade habitat functions. Additionally, because the Project would result in a substantial reduction in fine sediment and would be focused on removal of invasive vegetation cover (arundo) that does not provide USFWS (1992) defined shaded riverine aquatic (SRA) habitat functions, any changes in the quality

habitat would be expected to be very small. Lastly, the proposed Project would require that all finish grading within the channel be conducted in a manner that minimizes the potential for depressions to form the following wet season. This Project component would avoid and/or minimize the potential for fish stranding.

Implementing the mitigation measure and conservation guidelines would reduce the potentially significant impact on special-status fish species to a less-than-significant level.

b) **Less than significant with mitigation incorporated.** Implementing the Project would remove non-native vegetation, which provides substantially lower habitat values than native vegetation and can, in many cases, lower habitat values in a riparian corridor through displacement of native species. In the interest of full disclosure, this discussion addresses the non-native vegetation present on the Project site that would be affected by vegetation thinning and removal. The areas affected encompass 1.48 acres of non-native woody vegetation (0.89 acre of Himalayan blackberry thinned and 0.59 acre of mixed non-native woody vegetation removed), 3.88 acres of herbaceous vegetation dominated by non-native species (0.67 acre thinned and 3.21 acres removed), and 4.27 acres of arundo (0.89 acre thinned and 3.38 acres removed). These areas would be re-seeded with a native herbaceous seed mix. Impacts associated with the removal of non-native vegetation would be less than significant (or beneficial) and no mitigation would be required.

The removal and trimming of native riparian habitat along Elder Creek could present a substantial adverse impact without mitigation. The initial Project design included the removal of 21 acres of native riparian vegetation. DWR remodeled the hydraulic design of the Project to reduce environmental impacts. The new proposed Project design would remove approximately 3.113 acres of mature riparian forest and 0.926 acre of riparian scrub habitat. Additionally, approximately 0.864 acre of mature riparian forest and 0.536 acre of riparian scrub habitat would be trimmed. Trimming would remove branches up to 8 feet in height to help facilitate proper conveyance of stream flow in the channel.

The portions of riparian forest proposed for removal and trimming would include mature cottonwoods, valley oaks, blue oaks, walnut trees, and Goodding's willows. The riparian scrub habitat on the Project site comprises early-seral to mid-seral stage riparian vegetation, including sandbar willow, mule fat, California wild rose, occasional blue elderberry, and wild grape. Non-native vegetation, including arundo and Himalayan blackberry, is scattered throughout these habitats and reduces the quality of the native riparian habitat for fish and wildlife species. As discussed above, the removal of non-native woody and herbaceous vegetation is not considered a significant impact and therefore does not require mitigation. However, the removal and trimming of riparian native forest and riparian scrub habitats could result in a potentially significant impact without mitigation.

The following mitigation measures would be implemented to address this significant impact on riparian habitat.

Measure BIO-32: Obtain and Comply with a Streambed Alteration Agreement. A streambed alteration agreement will be obtained from CDFW under Section 1602 of the California Fish and Game Code. Activities that result in the diversion or obstruction of the natural flow of a stream, substantially change its bed, channel, or bank, or use any materials (including vegetation) from the streambed require that the Project applicant enter into a streambed alteration agreement with CDFW. Streambed alteration agreements contain avoidance and minimization measures to reduce potential impacts to less-than-significant levels.

Measure BIO-33: Plant Riparian Habitat and/or Secure Conservation Bank Credits. Riparian habitat will be planted at an offsite location at a ratio of 1:1 (acres of riparian habitat removed to acres of riparian habitat planted). Alternatively, credits could be purchased from an approved conservation bank in the service area that provides riparian mitigation credits. Based on the approximate acreages of riparian forest and riparian scrub proposed for removal, approximately 3.113 acres of riparian forest and approximately 0.926 acres of riparian scrub habitat will be planted or secured in the form of credits from a mitigation bank.

Implementing these mitigation measures would reduce the potentially significant impact on riparian habitat to a less-than-significant level.

c) **Less than significant with mitigation incorporated.** Sediment excavation activities will temporarily affect 3.88 acres of open water subject to USACE and RWQCB jurisdiction, as defined in Section 404 and Section 401 of the Clean Water Act, respectively. The excavation of sediment in Elder Creek will temporarily affect 3.88 acres of jurisdictional waters of the United States. Temporary impacts on jurisdictional waters do not require compensatory mitigation; however, they do require that the necessary authorizations be obtained, as listed below.

The following mitigation measures would be implemented to address this potentially significant impact on jurisdictional waters.

Measure BIO-34: Perform Grading. Grading and sediment removal activities will be conducted in a way that is geomorphically sound and allows proper water flow under the 1957 USACE design specifications.

Measure BIO-35: Obtain and Comply with Necessary Permits. In compliance with Sections 404 and 401 of the Clean Water Act, necessary authorizations from USACE and RWQCB would be obtained before the start of the Project.

Measure BIO-36: Mitigate Permanent Impacts on Jurisdictional Waters. In compliance with State and federal permits, compensatory mitigation will be implemented if there are permanent impacts on jurisdictional waters at a 1:1 ratio through a mitigation bank, in-lieu fee mitigation, or permittee-responsible mitigation.

Measure BIO-37: Implement Water Quality Best Management Practices. Best management practices will be implemented to avoid and minimize impacts on water quality (see also Mitigation Measure GEO-1).

Implementing these mitigation measures would reduce the potentially significant impact on federally protected wetlands to a less-than-significant level.

d) **Less than significant.** As discussed on Chapters 1 and 2, the Project designs went through several refinements to reduce and avoid potential Project impacts on habitat and fish and wildlife species. Migratory birds and bats have the potential to occur on the Project site. Project-related activities have the potential to impede the use of native nursery sites (nesting areas and maternity colonies) for these species. However, implementing the mitigation measures for potential impacts on the species detailed above, coupled with implementing the avoidance and minimization measures included in the Project design, would reduce impacts associated with use of native wildlife nursery sites to less-than-significant levels. Because implementing the Project would affect small, discrete areas of habitat at a time, and because habitat is available adjacent to the annual work area, the impact on migratory wildlife corridors would be less than significant.

e) **No impact.** The Project area is located in the Tehama County General Plan area. The Tehama County General Plan (2009) identifies many goals, policies, and implementation measures relating to the preservation and enhancement of natural resources. In particular, the Open Space and Conservation Element supports the restoration of native oak woodlands, elimination of invasive species, preservation of riparian habitat, and protection of water quality and waterways in the county. Project objectives, Project design elements, and mitigation measures are consistent with the goals, policies, and measures of the general plan. For these reasons, no impact regarding conflict with local policies or ordinances protecting biological resources would occur.

f) **No impact.** DWR has several plans and programs in place or that are in the planning process. The Central Valley Flood Protection Plan (CVFPP), developed by DWR in 2012, is a critical document that guides management of flood risk along the Sacramento River and San Joaquin River systems. The CVFPP proposes a systemwide investment approach for sustainable, integrated flood management in areas currently protected by facilities of the State Plan of Flood Control. As part of the CVFPP, DWR developed a Conservation Framework that focuses on promoting ecosystem functions and multi-benefit projects. The Conservation Framework identifies opportunities for integrated flood management projects that can, in addition to improving public safety, enhance riparian habitats, provide connectivity of habitats, restore riparian corridors, improve fish passage, and reconnect the river and floodplain. The Project provides multiple benefits. It will maintain vegetation and remove sediment to reduce the risk of flood and concurrently, remove invasive species and increase habitat. DWR's Feather River Regional Environmental Planning Program is developing an HCP which will cover flood management activities including those in the proposed project area. The regional permitting effort's holistic approach will focus on integrating ecosystem improvements into flood risk management projects. Additionally, DWR is in the process of developing an Evaluation of Environmental Permitting for Operation and Maintenance (EEPOM). EEPOM will develop a strategy for comprehensive environmental compliance for

facilities (e.g. levees, channels, and structures) that DWR is responsible for maintaining within the Sacramento River Flood Control Project. There is no conflict between the proposed project and any of the above plans or programs. No impact would occur.

3.3.5 Cultural Resources

Issues (and Supporting Information Sources):	*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
5. CULTURAL RESOURCES — Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource as defined in Section15064.5?	☐	☐	☐	☒
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to Section15064.5?	☐	☒	☐	☐
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☒	☐
d) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☒	☐	☐

Environmental Setting

Efforts to identify cultural resources within the proposed Project footprint and surrounding area consisted of a records search, archival research, a cultural resources survey, and consultation with Native Americans.

AECOM staff conducted a records search for the proposed Project on June 10, 2014, at the Northeastern Information Center (NEIC) of the California Historical Resource Information Center in Chico, California (NEIC File #W14-79); an earlier record search was conducted on February 2, 2014. The records search included a review of all recorded cultural resources and cultural resources reports within a 0.25-mile radius of the proposed Project area of potential effects (APE). The records search also included a review of the Historic Property Data File, National Register, California Register, California Historical Landmarks, California Inventory of Historical Resources, and California Points of Historical Interest.

A pedestrian field survey of the Archaeological APE was conducted on February 24 and 25, 2014, by AECOM archaeologists who meet the Secretary of the Interior's Professional Qualifications Standards for Archaeology. An AECOM architectural historian who meets the Secretary of the Interior's Professional Qualifications Standards for Architectural History conducted a pedestrian survey of the Architectural APE on February 25, 2013.

AECOM sent a request via email to the Native American Heritage Commission (NAHC) on February 14, 2014, for a search of their sacred lands file of the project area as well as a list of Native American representatives who may have knowledge pertaining to cultural resources within the project area. The NAHC responded on February 21, 2014, stating that their search of their sacred lands file did not identify any Native American cultural resources in the immediate project area. The NAHC response also included a list of Native American representatives, whom AECOM contacted via letter March 3, 2014. No responses have been received.

AECOM prepared documentation for the proposed Project that describes the methods and results of the research and field survey. The documentation also provides an analysis of impacts and management recommendations (AECOM 2014).

The following background setting discussion is summarized from the AECOM technical memorandum completed in support of the project in June 2014. Additional detail and specific references can be found in that document.

Prehistoric Setting

The proposed Project is located in the northern Sacramento Valley, a part of the broader Central Valley of California. Prior to 5,550 cal B.C., evidence of human occupation of the Central Valley is known mainly from isolated finds along the shorelines of ancient lakes. By 5,550 cal B.C. (the Middle Archaic Period), the foothill and valley floor groups had distinct and separate adaptations. Sites on the valley floor were occupied year round and technological assemblages suggest a growing reliance on fishing. Regional trade was widespread during the Middle Archaic Period, as evidenced by obsidian, shell beads, and ornaments from outside the valley that are commonly recovered from sites.

Following the Middle Archaic Period, climatic changes at the start of the Upper Archaic Period (550 cal B.C. to cal A.D 1100) resulted in a cooler, wetter, and more stable environment. During the Upper Archaic Period, regional variations were more common and focused on resources that could be processed in bulk, such as acorns, salmon, shellfish, rabbits, and deer. Shell bead trade and technological specialization increased.

During the Emergent Period (cal A.D. 1000-present), many Archaic Period technologies and cultural traditions disappeared throughout the Central Valley. Practices very similar to those observed by later European explorers appeared at this time. The bow and arrow replaced the dart and atlatl in hunting tool kits and manufacturing centers were decentralized.

Ethnographic Setting

The project is located in the traditional territory of the Nomlaki; more specifically the puymok (easterners) of the River Nomlaki. Nomlaki is the name of the dialect spoken by the people. Nomlaki is itself a dialect of the Wintuan language and closely related to Wintu and Patwin, dialects/groups that border Nomlaki to the north and south. Almost all ethnographic information on the Nomlaki, including the River Nomlaki, comes from individuals belonging to the Hill Nomlaki.

Nomlaki lived in villages consisting of 25 to 100 individuals, usually related through a male line. Village chiefdoms were generally hereditary, but subject to approval by males in the village. There was a major village named Tehemet east of the project area where Elder Creek joins the Sacramento River. The nuclear family was the basic economic unit though resources were shared with other village members. Good that were often traded included shell beads, furs, and especially black bear pelt which were used as funeral shrouds.

The most important Nomlaki foods included acorns, grass sees and tubers, deer, elk, rabbit and other small game, birds, and fish. Nomlaki moved to different areas dependent on the season. The bow and arrow was used for hunting as were mahogany clubs, nets, snares, slings, and traps. Numerous varieties of acorn were used as were several types of seeds and tubers. Other parts of the diet included mushrooms, manzanita berries, other wild fruits, and pine nuts.

Tools and technology made by the Nomlaki include sinew-backed bows made of imported yew or juniper, arrow points made of flint or obsidian, spears with flint or obsidian points, elkhide armor, harpoons, slings, mahogany throwing sticks, various nets, snares, and deadfalls. Twined and coiled baskets that were used for gathering, cooking, and storage were also made as were rabbit-skin blankets. Clothing was made of hide and inner tree bark and sandals of elkhide.

Historic Setting

Tehama County. Tehama County was created from sections of Colusa, Butte, and Shasta counties in 1856. Red Bluff became the county seat in 1857. Agricultural was always important to the development of Tehama County. The earliest crops planted were wheat and in 1857, there were more than 5,000 acres planted. In the 1890s, when the wheat crops in California failed, orchards were planted. The orchards included olives and walnuts. Cattle and sheep ranching were also important industries in the early years of Tehama County. Sheep ranching began in 1844, and grew steadily until the 1930s when ranchers began to lose money because of overgrazing and the restrictions placed on grazing on public lands. By 1960, most of the large herds were decreasing. The cattle industry in contrast was strong from the 1860s until the 1970s. Today agricultural continues to be an important economic driver in Tehama County.

Town of Gerber. Gerber is situated north of Elder Creek and approximately nine mile south of Red Bluff. The land was originally part of the Rancho de las Flores Mexican land grant, which was issued in 1844 to William George Chard. In 1862, Chard sold two tracts of land north of Elder Creek to Alfred Logan. A plat was filed in 1910, by Edward H. Gerber, a trustee for the Tehama Investment Company. The town was slow to develop. This changed in 1916, when the Southern Pacific Railroad (SPRR) moved some of its operations from Red Bluff to Gerber. The railroad needed an engine house, icing facility, and repair shops for its newer engines. With these new facilities Gerber became a stopover for train crews, which spurred the development of more housing and commercial businesses in the area. A post office was established in 1916, a library in 1927, and a volunteer fire department in the 1950s. SPRR closed its facilities in 1965. In 2006, the town formed a chamber of commerce and its business district included a market, a restaurant, a realtor's office, post office, appliance store, fire department, and a recycling center.

Flood Control. Early gold miners relied primarily on placer mining techniques. In 1852, hydraulic mining, which washed away entire hillsides and caused a considerable amount of debris to collect in the Sacramento River, was introduced and became the leading mining technique. This resulted in a raised riverbed along the Sacramento River, increased frequency of seasonal flooding, and debris ruined farmland, greatly affecting local farmers. In response to the extensive flooding, private landowners constructed levees near their farms. These levees, however, proved ineffective. The California Legislature tried to coordinate a levee system and control levee

construction through creation of the Swamp Land Commission in 1861, which gave drainage districts the power to construct levees. It would become the responsibility of State engineers to design the levees for each district. Between the 1860s and 1870s private owners constructed expansive levee systems, however, the levees repeatedly failed.

It was not until 1911 that the California Debris Commission designed a flood control plan that encompassed more than just levees. In 1917 the Flood Control Act passed, requiring the USACE to work with state governments and local levee districts and providing $5.6 million to construct flood control facilities on the Sacramento River. This Sacramento River Flood Control Project (SRFCP) began in 1918, and marked the first expansive flood control efforts on the Sacramento River and was the first time Congress appropriated funds for the specific purpose of flood control.

In 1936, Congress passed the 1936 Flood Control Act, which established the federal government's responsibility for flood control and solidified the authority of the USACE. By 1944, the SRFCP was nearly 90 percent complete with 980 miles of levees constructed. The 1944 Flood Control Act authorized the Sacramento Major and Minor Tributaries Project, a modification and extension of the SRFCP that would include reservoir storage by providing flood protection to unprotected or partially protected regions along the Sacramento River. As part of the modified SRFCP, the State authorized levee construction and channel enlargements for the Sacramento River's minor tributaries, including the Elder Creek Channel Improvement and Levee Construction work. This was a flood control project to construct four miles of new levees along Elder Creek in Tehama County from about one mile west of Highway 99 (now State Route 99) to the overflow area of the Sacramento River. The work included construction of the levees on both banks of the creek by the USACE. Prior to this, there were no project levees along Elder Creek. The existing levees were locally constructed and deficient in elevation. The entire Elder Creek project was completed in 1961. Per the 1944 Flood Control Act, upon completion, maintenance and operation was transferred to the State reclamation board, today known as the Central Valley Flood Protection Board.

Discussion

a) **No impact.** One built environment resource, a segment of the Elder Creek Levee, is located in the APE. AECOM staff evaluated this resource for the NRHP and the CRHR and recommended it ineligible for listing. No other historical resources were identified within the APE, therefore no impact to historical resources is anticipated as a result of the project.

b) **Less than significant with mitigation incorporated.** No new archaeological resources were identified as a result of the pedestrian survey. Staff noted the two archaeological resources identified during the records search, CA-TEH-51 and CA-TEH-750 (P-51-000750), but no evidence of CA-TEH-51 could be identified during the survey and CA-TEH-750 (P-51-000750) has apparently been destroyed since it was first reported.

In light of the proximity and historic presence of known prehistoric archaeological resources, it is possible that there are undiscovered archaeological resources present

which could be exposed by construction-related activities. To reduce potentially significant impacts to archaeological resources to a less-than-significant level, Mitigation Measure Cultural-1 will be implemented.

Mitigation Measure

Mitigation Measure CUL-1: Halt Ground-Disturbing Construction Activities if Cultural Materials are Discovered. If cultural materials are encountered during Project activities, all earth-moving activity within 100 feet of the find will cease until a qualified archaeologist can assess the nature and significance of the find. Work may continue elsewhere within the proposed Project area while an appropriate course of action is determined in consultation with DWR.

c) **Less-than-significant impact.** Paleontology is defined as a science dealing with the life of past geological periods as known from fossil remains. Paleontological resources include fossil remains, as well as fossil localities and formations, which have produced fossil material in other nearby areas. Few paleontological resources have been found throughout the unincorporated regions of Tehama County. These include a mastodon jaw bone fossil found near the Red Bank Creek in the central portion of Tehama County, a mastodon leg bone found along Mill Creek in the central region of the County, and a bone fragment from an ancient humpless camel found near Paskenta (Tehama County 2008). It is unlikely that buried sediments of high paleontological potential would be encountered during construction; therefore, earth-moving activities associated with the project would have a less-than-significant impact.

d) **Less-than-significant with mitigation incorporated**. Project activities are not anticipated to disturb any human remains, including those interred outside of formal cemeteries, but there is still the potential for an unexpected discovery. To avoid or reduce impacts to human remains, Mitigation Measure CUL-2 will be implemented.

Mitigation Measure

Measure CUL-2: Addressing the Discovery of Human Remains. If human remains are discovered, State Health and Safety Code Section 7050.5 states that further disturbances and activities will stop in any area or nearby area suspected to overlie remains, and the County Coroner contacted. Pursuant to the California Public Resources Code (PRC) Section 5097.98, if the remains are thought to be Native American, the coroner will notify the Native American Heritage Commission (NAHC), which will then notify the Most Likely Descendent (MLD). The MLD, together with DFM, will determine the appropriate, respectful treatment and disposition of the remains.

3.3.6 Geology, Soils, and Seismicity

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
6. GEOLOGY, SOILS, AND SEISMICITY — Would the project:				
a) Expose people or structures to 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.)	☐	☐	☒	☐
ii) Strong seismic ground shaking?	☐	☐	☒	☐
iii) Seismic-related ground failure, including liquefaction?	☐	☐	☒	☐
iv) Landslides?	☐	☐	☒	☐
b) Result in substantial soil erosion or the loss of topsoil?	☐	☒	☐	☐
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?	☐	☐	☒	☐
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?	☐	☐	☒	☐
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?	☐	☐	☐	☒

Environmental Setting

The proposed Project is located within the Great Valley Geomorphic province. The province includes the area known as the Great Central Valley of California, which extends approximately 400 miles north to south and 50 miles east to west. The Great Central Valley is encompassed by the Coast Ranges (metamorphic), the Klamath Ranges (metamorphic), the Cascade Range (volcanic) and the Sierra Nevada (granitic and metamorphic). The majority of rocks and deposits found within the province are sedimentary. According to the U.S. Geological Survey, sedimentary rocks are formed from pre-existing rocks or pieces of once living organisms. They form from deposits that accumulate on the Earth's surface. Sedimentary rocks often have distinctive layering or bedding.

The northern Sacramento Valley in general is not characterized by an abundance of active faulting. Tehama County is located within an area of low seismic activity relative to other areas of California. The County is exposed to minimal seismic hazards due to its geographic location (Tehama County 2008). The 1994 *Fault Activity Map*, prepared by the California Division of

Mines and Geology (now the California Geological Survey), indicates no active or potentially active faults within Tehama County (Tehama County 2008). The closest active fault systems are the Hat Creek fault zone, located about 65 miles northeast of the proposed Project in Shasta County, and the Bartlett Springs fault, located about 55 miles southeast of the proposed Project in Mendocino County.

Parts of Tehama County may experience earth-shaking associated with seismic events outside the County. A review of seismic activity over the past 100 years is included in the 1974 Seismic Safety Element and states the following: "The planning area (Tehama County) has experienced only minor earthquakes within the area and secondary impacts from earthquakes centered out of the area. Projections of future impacts from seismic activity are from low to moderate" (Tehama County 2008). As a result, geologic hazards associated with seismic activity, such as liquefaction and seiche (earthquake generated waves), have a low probability of occurring within Tehama County. Never the less, although no active faults are mapped in the County, there exists the potential for minor, localized earth shaking events, such as precursors to eruptive activity of Mount Lassen.

Potentially, the most significant seismic source in the region is the Cascadia Subduction Zone, located offshore of northern California, Oregon and Washington. This zone is considered capable of generating earthquakes of magnitude 8.0 to 9.0. Due to fault geometry and the great area of potential rupture surface, long duration and intense shaking from such an earthquake could result in potential damage to the Tehama County area (Tehama County 2008).

The soil within the Elder Creek channel is composed almost entirely of the riverwash unit (USDA 1967). Soil units that are adjacent to Elder Creek include Columbia silt loam, Perkins gravelly loam, Tehama loam, Wyo loam, Yolo loam, and Yolo loam, clay loam substratum. These soils are generally deep and moderately well-drained to well-drained. Slopes are typically 0 to 3 percent. Runoff from these soils is generally slow to moderate with a slight to no erosion hazard.

Riverwash consists of channels of intermittent streams and of active streams where the water is high. The areas are made up of deposits of sand and gravel, some of which are mined. Areas of riverwash have no agricultural value.

Liquefaction is the process where the soil is transformed to a fluid form during intense and prolonged ground shaking. Areas most prone to liquefaction are those that are water saturated and consist of relatively uniform sands that are loose to medium density. Granular layers underlying certain areas in the Sacramento Valley have higher relative densities and thus have moderate liquefaction potential. The risk of liquefaction does exist within the proposed Project area due to the presence of sandy soils.

Expansive soils are characterized by the ability to undergo significant volume change (shrink and swell) as a result of variation in soil moisture content. Soil moisture content can change due to many factors, including perched groundwater, landscape irrigation, rainfall, and utility leakage. The soils in the proposed Project area have a slight to moderate swell potential.

No areas of substantial subsidence have been identified within Tehama County, although potential subsidence areas within the County were identified in the 1974 Tehama County General Plan Seismic Safety Element (Tehama County, 2008).

Discussion

a.i, ii, iii, iv) **Less than Significant Impact.** The proposed Project area is not located in an Alquist-Priolo Earthquake Fault Zone, as defined by the California State Department of Conservation, Geological Survey (CGS, formerly the Division of Mines and Geology), and no active or potentially active faults exist on, or in the immediate vicinity of the site (Tehama County, 2008). Therefore, the proposed Project would not expose people or structures to seismic risks. The potential for surface fault rupture, strong seismic ground shaking, and seismic-related ground failure including liquefaction would be less-than-significant. No mitigation is required.

b) **Less than Significant Impact.** Construction of the proposed Project would involve ground-disturbing construction activities, including vegetation clearing and sediment removal. As described, the soils within the creek channel and those adjacent to the channel have slight to no active erosion potential. Removing sediment from the creek channel would not result in the loss of top soil and any underlying top soil would have a low potential for erosion. Disturbed areas could be exposed to erosion caused by wind or early-season rainfall events. Effects of wind erosion are evaluated in Chapter 3.3.3 Air Quality and water quality effects are evaluated in Chapter 3.3.9 Hydrology and Water Quality. As such, erosion or loss of topsoil has the potential to occur during construction of the proposed Project, especially during periods of sediment and vegetation removal and other activities involving heavy equipment use in the creek channel. Implementation of Mitigation Measure Geo-1, below, would reduce this potential impact to a less-than-significant level.

Mitigation Measure

Measure GEO-1: Prepare and Implement a SWPPP. The proposed Project involves greater than 1 acre of land disturbance and, therefore, requires completion of a SWPPP detailing measures to control soil erosion and waste discharges from the construction areas and submittal of a Notice of Intent (NOI) to the SWRCB for coverage under the 2009-0009-DWQ Permit for stormwater discharges associated with general construction activity. The SWPPP would include an erosion control and restoration plan, a water quality monitoring plan, a hazardous materials management plan, and post construction BMPs. The BMPs would be maintained until all areas disturbed during construction have been adequately stabilized.

The specific BMPs that would be incorporated into the SWPPP would be determined during the final stages of the proposed Project design. However, the SWPPP is likely to include one or more of the following standard practices which are commonly used during the construction and post-construction phases of projects:

- *Soil and Vegetation Disturbance*: Minimize ground and vegetation disturbance during proposed Project construction by establishing designated equipment staging areas, spoils and soil stockpile areas, and equipment exclusion zones prior to the commencement of any construction activity.
- *Hazardous Materials*: Use and store hazardous materials, such as vehicle fuels and lubricants, in designated staging areas located away from surface waters according to local, State, and federal regulations as applicable. Implement a spill prevention and control plan that specifies measures that would be used to prevent, control, and clean up hazardous material spills.
- All contractors conducting construction-related work will be required to implement the SWPPP to control soil erosion and waste discharges of other construction-related contaminants. The general contractor and subcontractor(s) conducting the work will be responsible for constructing or implementing the SWPPP, regularly inspecting measures, and maintaining the BMPs in good working order.

Implementation of these standard BMP measures in accordance with the SWPPP would ensure that the potential impact of soil erosion or the loss of topsoil during construction is less than significant.

c, d) **Less than Significant Impact.** As described previously, the proposed Project area contains soils that are known to have liquefaction potential and slight to moderate shrink-swell potential. However, no new buildings or habitable structures would be constructed as part of the proposed Project. Therefore there would be no impacts to life or property as a result of the proposed Project.

e) **No Impact.** The proposed Project would not involve the generation of sewage or wastewater that would require onsite treatment, no septic systems or alternative wastewater disposal systems would be necessary. There would be no impact.

3.3.7 Greenhouse Gas Emissions

Issues (and Supporting Information Sources):	*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
7. GREENHOUSE GAS EMISSIONS — Would the project:				
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☐	☐	☒	☐
b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	☐	☐	☒	☐

GHG Emissions Analysis

In May 2012, DWR adopted the DWR Climate Action Plan-Phase I: Greenhouse Gas Emissions Reduction Plan (GGERP), which details DWR's efforts to reduce its greenhouse gas (GHG) emissions, consistent with Executive Order S-3-05 and the Global Warming Solutions Act of 2006 (Assembly Bill (AB) 32). DWR also adopted the Initial Study/Negative Declaration prepared for the GGERP in accordance with the CEQA Guidelines review and public process. Both the GGERP and Initial Study/Negative Declaration are incorporated herein by reference and are available at: http://www.water.ca.gov/climatechange/CAP.cfm. The GGERP provides estimates of historical (back to 1990), current, and future GHG emissions related to operations, construction, maintenance, and business practices (e.g. building-related energy use). The GGERP specifies aggressive 2020 and 2050 emission reduction goals and identifies a list of GHG emissions reduction measures to achieve these goals.

DWR specifically prepared its GGERP as a "Plan for the Reduction of Greenhouse Gas Emissions" for purposes of CEQA Guidelines Section 15183.5. That section provides that such a document, which must meet certain specified requirements, "may be used in the cumulative impacts analysis of later projects." Because global climate change, by its very nature, is a global cumulative impact, an individual project's compliance with a qualifying GHG Reduction Plan may suffice to mitigate the project's incremental contribution to that cumulative impact to a level that is not "cumulatively considerable." (See CEQA Guidelines, Section 15064, (h)(3).)

More specifically, "[l]ater project-specific environmental documents may tier from and/or incorporate by reference" the "programmatic review" conducted for the GHG emissions reduction plan. "An environmental document that relies on a greenhouse gas reduction plan for a cumulative impacts analysis must identify those requirements specified in the plan that apply to the project, and, if those requirements are not otherwise binding and enforceable, incorporate those requirements as mitigation measures applicable to the project." (CEQA Guidelines Section 15183.5, (b)(2).)

Section 12 of the GGERP outlines the steps that each DWR project will take to demonstrate consistency with the GGERP. These steps include: (1) analysis of GHG emissions from construction of the proposed Project, (2) determination that the construction emissions from

the project do not exceed the levels of construction emissions analyzed in the GGERP, (3) incorporation into the design of the project DWR's project level GHG emissions reduction strategies, (4) determination that the project does not conflict with DWR's ability to implement any of the "Specific Action" GHG emissions reduction measures identified in the GGERP, and (5) determination that the project would not add electricity demands to the State Water Project (SWP) system that could alter DWR's emissions reduction trajectory in such a way as to impede its ability to meet its emissions reduction goals.

Consistent with these requirements, a GGERP Consistency Determination Checklist is attached documenting that the project has met each of the required elements.

Determination

Based on the analysis provided in the GGERP and the demonstration that the proposed Project is consistent with the GGERP (as shown in Appendix B of the Consistency Determination Checklist), DWR as the lead agency has determined that the proposed Project's incremental contribution to the cumulative impact of increasing atmospheric levels of GHGs is less than cumulatively considerable and, therefore, less than significant.

3.3.8 Hazards and Hazardous Materials

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
8. HAZARDS AND HAZARDOUS MATERIALS — Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☒	☐	☐
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?	☐	☒	☐	☐
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☒	☐
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?	☐	☐	☐	☒
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 for people residing or working in the project area?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☒	☐
h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☒	☐

Environmental Setting

The proposed Project area is within Tehama County and is near the unincorporated area of Gerber. The closest school, which is a sensitive receptor, to the proposed Project, is Gerber School, approximately 1 mile north.

Hazardous Materials

Materials and waste may be considered hazardous if they are poisonous (toxicity), can be ignited by open flame (ignitability), corrode other materials (corrosivity), or react violently, explode or generate vapors when mixed with water (reactivity). The term “hazardous material” is defined in law as any material that, because of quantity, concentration, or physical or chemical characteristics, poses a significant present or potential hazard to human health and safety or to the

environment[1]. In some cases past uses can result in spills or leaks of hazardous materials to the ground, resulting in soil and groundwater contamination. The use, storage, transportation and disposal of hazardous materials are subject to numerous federal, State and local laws and regulations.

Information about hazardous materials sites in the proposed Project area was collected by conducting a review of the California Environmental Protection Agency's (CalEPA) Cortese List Data Resources (Cortese List) and the State Water Resources Control Board's GeoTracker list. The Cortese List includes data resources that provide information regarding the facilities or sites identified as meeting the Cortese List requirements. The Cortese List is updated at least annually, in compliance with California regulations (California Code Section 65964.6(a)(4)) and includes federal superfund sites, State response sites, non-operating hazardous waste sites, voluntary cleanup sites, and school cleanup sites. The GeoTracker list shows Underground Storage Tanks (UST).

Based on a review of the Cortese List conducted in January 2015, two listed sites that were related to past underground storage tank use are located within 0.5 mile of the proposed Project activities; however, both of the sites have been remediated and are no longer active (DTSC, 2014). In addition, none of the sites listed were identified to be within the proposed Project area for the proposed creek channel Project activities.

Fire Suppression

The proposed Project area is located within a Local Responsibility Area (LRA) where Tehama County is responsible for fire suppression. The California Department of Forestry and Fire Protection (CAL FIRE) has determined that within the LRA, Tehama County has mostly Moderate or Unzoned Fire Hazard Severity Zones (MFHSZ) (CAL FIRE 2007).

Discussion

a) **Less than Significant Impact with Mitigation Incorporated.** Construction activities associated with the proposed Project would require the use of limited amounts of commonly used materials such as diesel, gasoline, solvents, hydraulic fluid, grease, and herbicides, and other compounds not considered acutely hazardous or hazardous when used in small quantities.

The types and quantities of materials to be used could pose a significant risk to the public and/or the environment. However, implementation of Mitigation Measure HW-1, below, which includes development and implementation of a plan to safely store potentially hazardous materials away from waterways and sensitive receptors and handle them according to local, State, and federal regulations, would reduce this potential impact to less than significant.

[1] State of California, Health and Safety Code, Chapter 6.95, Section 25501(o).

Mitigation Measure

Measure HAZ-1: Prior to construction, DWR will prepare a hazardous materials management plan that would be implemented to ensure that all staff transport, store, handle and dispose of construction-related hazardous materials in a manner consistent with the relevant local, State, and federal regulations and guidelines. At minimum, these include those recommended and enforced by the Department of Transportation, the Regional Water Quality Control Board, and County Fire Department, and the Tehama County Department of Environmental Health. DWR will ensure that staff immediately control the source of any leak and immediately contain any spill utilizing appropriate spill containment and countermeasures identified within the plan. If required by the County Fire Department, Tehama County Department of Environmental Health, or any other regulatory agency, containment media will be collected and disposed of at an off-site facility approved to accept such media.

b) **Less than Significant Impact with Mitigation Incorporated.** As described above in impact discussion a), hazardous materials such as vehicle fuels, oils, and other vehicle maintenance fluids would be transported and used during construction. Inadvertent spills of these hazardous materials could cause water, soil, or groundwater contamination. Improperly maintained equipment could leak fluids during construction and while parked. Grading or excavation could generate airborne particulates. However, as described in Mitigation Measure HAZ-1, because a plan would be prepared that will ensure adherence to local, State, and federal laws and regulations which govern the transport, use, storage, handling and disposal of hazardous materials, use of hazardous materials associated with the proposed Project's Project activities would be minimized and/or avoided.

c) **Less than Significant Impact.** Hazardous materials such as fuels, oils, and other vehicle maintenance fluids would be on site during construction, creating the potential for a spill or accident to occur. Hazardous materials could also be transported near and around the proposed Project area while materials are being hauled. The transportation of hazardous materials is regulated by State and federal law. In addition, because the proposed Project site is more than one-quarter mile away from an existing or proposed school, this impact would be less than significant.

d) **No Impact.** The Project is not located on a site included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 (Cortese List) and therefore would not create a significant hazard to the public or the environment from identified hazardous materials sites. No known hazardous materials exist within the proposed Project area. Therefore, no impact would occur.

e, f) **No Impact.** The nearest public airport is the Red Bluff Municipal Airport which is over 6 miles northwest of the proposed Project area. The nearest private airport facility is the Rancho Tehama Airport, located over 8 miles northwest of the proposed Project area. No structures would be erected within airport property or within 2 miles of a public or

private use airport that would impede or impair airport operations. Therefore, no impact would occur.

g) **Less than Significant Impact.** The proposed Project would result in small amounts of construction traffic (primarily haul of sediment and vegetation) along roadways that may be used by emergency vehicles. However, given the relatively low traffic volumes and similarity to existing traffic patterns and vehicle use, alternative routes are anticipated to be readily available. This impact would be less than significant.

h) **Less than Significant Impact**. Project activities, which involve heavy diesel equipment which could spark a fire, would be located in an area where the risk of wildland fire is considered to be moderate; however, the Project activities would occur within the creek channel where riparian vegetation is present and adjacent lands are irrigated agriculture. The vegetation and land use types have a low potential for wildland fires and is not expected to expose people or structures to a significant risk of loss, injury or death involving wildland fires. This impact would be less than significant.

3.3.9 Hydrology and Water Quality

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
9. HYDROLOGY AND WATER QUALITY — Would the project:				
a) Violate any water quality standards or waste discharge requirements?	☐	☒	☐	☐
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☐	☒
c) Substantially alter the existing drainage pattern of a site or area through the alteration of the course of a stream or river, or by other means, in a manner that would result in substantial erosion or siltation on- or off-site?	☐	☐	☐	☒
d) Substantially alter the existing drainage pattern of a site or area through the alteration of the course of a stream or river, or by other means, substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site?	☐	☐	☐	☒
e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☐	☒
f) Otherwise substantially degrade water quality?	☐	☒	☐	☐
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☒
h) Place within a 100-year flood hazard area structures that would impede or redirect flood flows?	☐	☐	☐	☒
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☐	☒
j) Expose people or structures to a significant risk of loss, injury or death involving inundation by seiche, tsunami, or mudflow?	☐	☐	☐	☒

Environmental Setting

Elder Creek is part of the Tehama West Watershed. The Tehama West Watershed includes four principal streams (Reeds, Red Bank, Thomes, and Elder Creeks) and several minor tributaries that drain from the west side of Tehama County to the Sacramento River. In contrast to waters flowing from the Sierra Nevada and Southern Cascade Range in eastern Tehama County, streams on the westside lack areas of significant snowpack, and hydrology is mostly rainfall-driven. Streams show rapid response to storms, and flow levels fluctuate greatly between storm periods and intervening dry spells. Of the major drainages, Thomes Creek has an annual average flow of 295 cfs, followed by

Elder Creek at 100 cfs and Red Bank Creek at 49 cfs. All streams typically go dry or near dry by July in the lower reaches, and significant surface flows do not return until late fall. Although there is some surface water diversion (less than 5,000 acre-feet annually), groundwater is the primary water supply for municipal and agricultural uses in the watershed. The Tehama County Flood Control and Water Conservation District is the authorized groundwater management agency for this area (SacRiver, 2014).

In general, surface water quality in the watershed is good. DWR and USGS have recorded elevated levels of some constituents (dissolved metals, pH, and temperature), but these are considered the result of natural conditions of climate and geology. The principal issue is sediment loading and transport rates. Most westside streams carry high levels of suspended and bedload sediment, particularly during storm runoff events. These sediment loads cause changes in channel morphology and affect aquatic life and their habitat (SacRiver, 2014).

Dam failure, which is the collapse or failure of an impoundment that causes significant downstream flooding, is a potential hazard for Tehama County. Flooding of the area below the dam may occur as a result of structural failure of the dam, overtopping, or a seiche (earthquake generated waves). The collapse and structural failure of a dam may be caused by a severe storm, earthquakes, or internal erosion of piping caused by embankment and foundation leakage. Larger dams that would inundate significant portions of the county include the Shasta Dam (in Shasta County), Red Bluff Diversion Dam on the Sacramento River and Black Butte Dam on Stony Creek. The areas within the County most threatened by dam inundation are the incorporated and unincorpo- rated areas along the Sacramento River corridor, including Red Bluff and Tehama (Tehama County, 2008).

Discussion

a, f) **Less-than-Significant Impact with Mitigation Incorporated.** Exposed slopes and graded contours during construction could be subject to rainfall and erosion and could cause temporary discharges of sediment and other contaminants in stormwater runoff to surrounding areas. Even though soils within the Project are characterized as having a low erosion potential, sediments and other pollutants could result in degradation of receiving water quality in the Sacramento River and downstream creeks at levels above applicable water quality standards. However, as discussed Section 3.3.6 Geology, Soils, and Seismicity, Mitigation Measure GEO-1 would require DWR to adhere to requirements of the NPDES Construction General Permit from the SWRCB prior to initiating earth disturbing activities. Among other things, the conditions of the Permit include mandatory implementation of BMPs concerning erosion control and preparation of a SWPPP. Compliance with the Construction General Permit, including the implementation of BMPs described in the SWPPP, would ensure that the potential impact of soil erosion or the loss of topsoil during construction would be avoided and/or minimized and is less than significant with mitigation incorporated.

b) **No Impact.** The proposed Project would not alter hydrology or groundwater recharge such that the groundwater table would be altered. There would be no additional

impervious surfaces created as part of the proposed Project that would reduce surface area capable of percolation. Therefore, no impact would occur.

c, d) **No Impact.** The proposed Project would not alter the existing drainage pattern of the area, which is the stormwater runoff/flood flows that run easterly through the existing creek channel. Restoration of the channel's capacity, through the removal of vegetation and sediment, would better accommodate runoff and minimize flood potential. As described previously, the proposed Project would not result in substantial erosion or siltation on- or off-site post-construction. By restoring the creek channel to the USACE's 1957 profile design capacity, drainage would be more thoroughly contained by the creek channel. There would be no impact.

e) **No Impact.** The proposed Project activities in the creek channel would not increase the amount of impervious surface and would not increase the amount or rate of runoff. In addition, maintenance activities would actually better accommodate runoff and minimize flood potential. Therefore, there would be no impact.

g, h) **No Impact.** There would be no housing constructed as part of the proposed Project, nor would there be a change in the 100-year flood hazard area or impediment of flows. Therefore, no impact would occur.

i) **No Impact.** The proposed Project would enhance flood capacity in the existing creek channel and would as a result reduce risk of flooding in the surrounding area. Furthermore, as described in checklist items g and h, the proposed Project would not place any new structures in a flood hazard zone. Therefore, no persons or structures would be exposed to a significant risk associated with flooding due to levee failure or dam inundation and no impact would occur.

j) **No Impact.** The proposed Project would enhance flood capacity in the existing creek channel and would as a result reduce risk of flooding in the surrounding area. Furthermore, as described in checklist items g and h, the proposed Project would not place any new structures in a flood hazard zone. Therefore, no persons or structures would be exposed to a significant risk associated with inundation by a seiche, tsunami or mudflow and no impact would occur.

3.3.10 Land Use and Land Use Planning

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
10. LAND USE AND LAND USE PLANNING — Would the project:				
a) Physically divide an established community?	☐	☐	☐	☒
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☐	☒
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☐	☐	☒

Environmental Setting

Land use character in the surrounding communities, including the town of Gerber, consists of scattered residences along rural county roads, small rural communities, an elementary school, interstate and State highway corridors, Southern Pacific Railroad, and water conveyance via the creek.

According to the 2009 Tehama County General Plan, the proposed Project area is designated as an agriculture zone with the adjacent unincorporated town of Gerber including urban and general commercial (Tehama County, 2009). Major land uses surrounding the proposed Project area include agriculture such as row crops and orchards and residential land in the town of Gerber.

Discussion

a) **No impact.** The proposed Project would include in-channel clearing of vegetation and sediments to bring the channel within the Flood Control Project back to the O&M Manual 1957 design profile capacity of Elder Creek. Although some temporary construction-related traffic disturbances affecting county road access could occur, proposed Project activities would not physically divide an established community and would not occur within the city limits of Gerber. Therefore, no impact would occur.

b) **No impact.** Private properties in the vicinity of, the Project area are on land currently designated by Tehama County as agriculture and urban. Project activities would be limited to the creek channel and although staging and vehicle movement would occur, these activities would be temporary and would not conflict with existing land use. There would be no conversion of existing land uses and the proposed Project would not result in conflict with local or State regulations. No impact would occur.

c) **No impact.** There are no applicable habitat conservation plans or natural community conservation plans in the Project area; therefore, the proposed Project would not conflict with the provisions of any adopted Habitat Conservation Plan or Natural Community Conservation Plan. No impact would occur.

3.3.11 Mineral Resources

Issues (and Supporting Information Sources):	*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
11. MINERAL RESOURCES — Would the project:				
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?	☐	☐	☐	☒
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?	☐	☐	☐	☒

Environmental Setting

Historically, gold mining was largely responsible for the establishment of Tehama County. Although some dredge mining still takes place, as well as a small amount of gold panning, the resource is essentially depleted and these activities are largely recreational. Gold mining no longer plays a major role in the County's economy. The majority of Tehama County's mineral wealth is derived from the extraction of non-metallic sand, gravel, and volcanic cinder, which are used primarily by local paving and construction industries. Other mineral resources found in the County include aragonite, borax, chalcopyrite, chromite, copper, cristobalite, galena, garnet, opal, pectolite, penninite, sassolite, and Wallstonite. Of these, chromite offers the most possibilities for development. There is one gravel mining site within the general vicinity of the proposed Project footprint; however, it is not within the proposed Project area.

Discussion

a, b) **No impact.** The proposed Project would not involve excavation of, or impede the recovery of, a known mineral resource within the Project area. All construction would occur within the Elder Creek channel, which is not considered a feasible mineral recovery site; therefore, there is no availability of mineral resources in the proposed Project footprint. There are also no existing mineral resource recovery sites in the proposed Project area. No impact would occur.

3.3.12 Noise

Issues (and Supporting Information Sources):	*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
12. NOISE — Would the project:				
a) Result in Exposure of persons to, or generation of, noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☒	☐	☐
b) Result in Exposure of persons to, or generation of, excessive groundborne vibration or groundborne noise levels?	☐	☐	☒	☐
c) Result in A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☒
d) Result in A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☒	☐	☐
e) For a project located within an airport land use plan area, or, where such a plan has not been adopted, in an area within two miles of a public airport or public use airport, would the project expose people residing or working in the area to excessive noise levels?	☐	☐	☐	☒
f) For a project located in the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

Environmental Setting

Noise can be generally defined as unwanted sound. Sound is defined as any pressure variation in air that the human ear can detect. Sound, traveling in the form of waves from a source, exerts a sound pressure level (referred to as sound level) which is measured in decibels (dB), with zero dB corresponding roughly to the threshold of human hearing and 120 to 140 dB corresponding to the threshold of pain. Sound pressure fluctuations can be measured in units of hertz (Hz), which correspond to the frequency of a particular sound. Typically, sound does not consist of a single frequency, but rather a broad band of frequencies varying in levels of magnitude (sound power). The sound pressure level, therefore, constitutes the additive force exerted by a sound corresponding to the frequency/sound power level spectrum.

The typical human ear is not equally sensitive to all frequencies of the audible sound spectrum. As a consequence, when assessing potential noise impacts, sound is measured using an electronic filter that de-emphasizes the frequencies below 1,000 Hz and above 5,000 Hz in a manner corresponding to the human ear's decreased sensitivity to low and extremely high frequencies instead of the frequency mid-range. This method of frequency weighting is referred to as A-weighting and is expressed in units of A-weighted decibels (dBA). Frequency A-weighting follows an international standard methodology of frequency de-emphasis and is typically applied to community noise measurements. For this reason, the A-weighted sound level has become the standard tool of environmental noise assessment.

The effects of noise on people can be placed into three categories:

- subjective effects of annoyance, nuisance, dissatisfaction;
- interference with activities such as speech, sleep, learning; and
- physiological effects such as hearing loss or sudden startling.

Environmental noise typically produces effects in the first two categories. Workers in industrial plants generally experience noise in the last category. There is no completely satisfactory way to measure the subjective effects of noise, or the corresponding reactions of annoyance and dissatisfaction. A wide variation exists in the individual thresholds of annoyance, and different tolerances to noise tend to develop based on an individual's past experiences with noise.

Stationary "point" sources of noise, including stationary mobile sources such as idling vehicles, attenuate (lessen) at a rate of 6 dBA to 7.5 dBA per doubling of distance from the source, depending upon environmental conditions (i.e., atmospheric conditions and noise barriers, either vegetative or manufactured, etc.). Widely distributed noises, such as a large industrial facility spread over many acres or a street with moving vehicles (a "line" source), would typically attenuate at a lower rate, approximately 3 to 4.5 dBA per doubling distance from the source (also dependent upon environmental conditions) (Caltrans, 1998).

Community noise is commonly described in terms of the "ambient" noise level, which is defined as the all-encompassing noise level associated with a given noise environment. A common statistical tool to measure the ambient noise level is the average, or equivalent, sound level (Leq) over a given time period (usually one hour). The Day-Night Average Level (Ldn) is based upon the average noise level over a 24-hour day, with an additional 10 decibel weighing applied to noise occurring during nighttime (10:00 p.m. to 7:00 a.m.) hours. The nighttime penalty is based upon the assumption that people react to nighttime noise exposures as though they were twice as loud as daytime exposures.

Pursuant to the Tehama County General Plan, acceptable traffic-related and non-transportation noise levels range from 60 to 65 dBA Ldn and 50 dBA Leq during the day, respectively, for all residential land uses (Tehama County, 2009). The Noise Element of the General Plan considers the adoption of a County-wide noise control ordinance that would restrict construction activities to certain hours; however, at this time, Tehama County does not have an adopted noise ordinance.

The area surrounding the proposed Project is characterized by roadway and rural agricultural noise. These include low-volume traffic noise from tractors, large trucks, and other farm equipment, both on and off-road passenger vehicles. The nearest noise-sensitive receptors to the proposed Project are residences located north of Worthington Avenue in the town of Gerber, the closest of which is about 100 feet away.

Vibration Setting

Vibration is an oscillatory motion through a solid medium in which the motion's amplitude can be described in terms of displacement, velocity, or acceleration. As described in the Federal Transit Administration's (FTA) *Transit Noise and Vibration Impact Assessment* (FTA, 2006),

ground-borne vibration can be a serious concern for nearby neighbors of a transit system route or maintenance facility, causing buildings to shake and rumbling sounds to be heard. In contrast to airborne noise, ground-borne vibration is not a common environmental problem. It is unusual for vibration from sources such as buses and trucks to be perceptible, even in locations close to major roads. Some common sources of ground-borne vibration are trains, buses on rough roads, and construction activities such as blasting, pile driving and operating heavy earth-moving equipment.

There are several different methods that are used to quantify vibration. The peak particle velocity (PPV) is defined as the maximum instantaneous peak of the vibration signal. The PPV is most frequently used to describe vibration impacts to buildings. The root mean square (RMS) amplitude is most frequently used to describe the effect of vibration on the human body. The RMS amplitude is defined as the average of the squared amplitude of the signal. Decibel notation (Vdb) is commonly used to measure RMS. The decibel notation acts to compress the range of numbers required to describe vibration. Typically, ground-borne vibration generated by man-made activities attenuates rapidly with distance from the source of the vibration. Sensitive receptors for vibration include structures (especially older masonry structures), people (especially residents, the elderly and sick), and vibration sensitive equipment.

The effects of ground-borne vibration include movement of the building floors, rattling of windows, shaking of items on shelves or hanging on walls, and rumbling sounds. In extreme cases, the vibration can cause damage to buildings. Building damage is not a factor for most projects, with the occasional exception of blasting and pile-driving during construction. Annoyance from vibration often occurs when the vibration levels exceed the threshold of perception by only a small margin. A vibration level that causes annoyance will be well below the damage threshold for normal buildings. The FTA thresholds of architectural damage for conventional sensitive structures and human annoyance is 0.2 in/sec PPV and 80 VdB, respectively (FTA, 2006).

Discussion

a) **Less than significant impact with mitigation incorporated.** Short-term construction-source noise would include vegetation removal, sediment excavation, and material transport. Onsite construction equipment would include mowers, chainsaws, masticators, loaders, and excavators. Representative noise levels for individual equipment are shown in **Table 8**.

Based on their distance from the proposed Project site, residential receptors are anticipated to experience noise levels substantially greater than existing noise levels during daytime Project activities. Project activities, including off-road equipment use and hauling of vegetation and sediment materials associated with the proposed Project would be temporary in nature, but could exceed General Plan standards for non-transportation noise sources and would be potentially significant. Implementation of Mitigation Measure Noise-1 would reduce noise exposure to nearby receptors and ensure impacts are less than significant.

TABLE 8
TYPICAL NOISE LEVELS FROM CONSTRUCTION EQUIPMENT OPERATIONS

Construction Equipment	Noise Exposure Level, dBA @ 50 Feet
Backhoe	80
Grader	85
Loader	85
Saw	76
Heavy Diesel Truck	88

SOURCES: Federal Transit Administration, 2006.

Mitigation Measures

Measure NOISE-1: DWR will implement the following noise reduction controls during construction activities:

- Construction activities will be limited to the daytime hours of 7 a.m. to 7 p.m.
- Equipment and trucks used for project construction will be properly maintained and equipped with all feasible noise control, such as mufflers, in accordance with manufacturers' specifications.
- DWR will designate an onsite complaint and enforcement manager to track and respond to noise complaints. Signs will be posted at the construction site that include permitted construction days and hours and contact number for the onsite complaint manager as well as for DWR in the event of noise complaints.

b) **Less-than-significant impact.** The proposed Project's construction activities have the potential to result in varying degrees of temporary ground-borne vibration, depending on the specific construction equipment used and activities involved. Vibration generated by construction equipment spreads through the ground and diminishes in magnitude with increases in distance. Typical reference vibration levels for various pieces of equipment are listed below in **Table 9**. The proposed Project would not result in significant building vibration (exceeding 0.2 PPV) or human annoyance (exceeding 80 Vdb) at the nearest receptors. Therefore, the impact is less than significant.

TABLE 9
VIBRATION VELOCITIES FOR CONSTRUCTION EQUIPMENT

Equipment/Activity	PPV at 25 ft (inches/second)[a]	PPV at nearest receptor to the Project	RMS at 25 ft (Vdb)[b]	RMS at nearest receptor to the Project
Large Bulldozer	0.089	0.01 (at 100 feet)	87	69 (at 100 feet)
Loaded Trucks	0.076	0.03 (at 50 feet)	86	77 (at 50 feet)

NOTES:
[a] Buildings can be exposed to ground-borne vibration levels of 0.2 PPV without experiencing structural damage.
[b] The human annoyance response level is 80 Vdb.

c) **No impact**. The proposed Project would not result in long-term operations. Therefore, there would be no substantial permanent increase in ambient noise levels and there would be no impact.

d) **Less than significant impact with Mitigation Incorporated.** As discussed above in impact (a), temporary on-site construction operations would result in noise levels that would be less than significant with implementation of Mitigation Measure NOISE-1.

e-f) **No impact.** The proposed Project area is not within an airport land use plan or within 2 miles of a public airport, or within the vicinity of a private airstrip. There would be no exposure to excessive noise levels from aircraft, therefore, there would be no impact.

3.3.13 Population and Housing

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
13. POPULATION AND HOUSING — Would the project:				
a) Induce substantial 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)?	☐	☐	☐	☒
b) Displace substantial numbers of existing housing units, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

Environmental Setting

Population

The nearest town to the proposed Project is the unincorporated town of Gerber in Tehama County. It is located adjacent to the proposed Project and had a population of 1,060 people in 2010 (U.S. Census Bureau, 2010).

Housing

Housing types near the proposed Project area include rural ranch houses and single family houses.

Discussion

a) **No Impact.** No new homes, businesses, road extensions, or other infrastructure for development are proposed as part of the proposed Project. The proposed Project would restore channel capacity and ensure flood protection to the town of Gerber, adjacent roads, railroads, buildings, and agricultural lands. The proposed Project would employ existing DWR staff and therefore would not induce population growth in the area and would not affect nearby towns. Therefore, no impact would occur.

b, c) **No Impact.** The proposed Project would be limited to the creek channel and spoils site and would not require new land easements. Therefore, it would not displace any existing housing, or generate additional demand for housing within the surrounding counties. In addition, it would not displace or increase the number of residents or permanent workers No impact would occur.

3.3.14 Public Services

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
14. PUBLIC SERVICES — Would the project:				
a) Result in substantial adverse physical impacts associated with the provision of, or the 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 following public services:				
i) Fire protection?	☐	☐	☐	☒
ii) Police protection?	☐	☐	☐	☒
iii) Schools?	☐	☐	☐	☒
iv) Parks?	☐	☐	☐	☒
v) Other public facilities?	☐	☐	☐	☒

Environmental Setting

Fire Protective Services

The proposed Project is located in a Local Responsibility Area in Tehama County. One battalion is responsible for areas within the area. The Tehama County Fire Department, Battalion 2, consists of five fire stations—Red Bluff, Bend, El Camino, Los Molinos, and Vina, and one helitack base that includes a staffed helicopter.

Law Enforcement Services

The Tehama County Sheriff's Department provides law enforcement in the unincorporated areas of Tehama County and the City of Tehama. The Sheriff is the chief law enforcement officer of the County, with jurisdiction throughout the unincorporated County, the incorporated cities, and State owned property. In Tehama County the Sheriff's Department and the Office of Emergency Services are combined. The Tehama County Sheriff's Department has a paid staff of 119, consisting of 78 officers, 13 Sheriff service officers, eight dispatch personnel, and 20 support personnel. The Sheriff's Department headquarters is located at 502 Oak Street in the City of Red Bluff (Tehama County 2008).

The California Highway Patrol (CHP) provides traffic regulation enforcement, emergency management, and assistance on State roadways and other major roadways in unincorporated portions of Tehama County. The only CHP office in Tehama County is located at 2550 Main Street in Red Bluff (Tehama County 2008).

Schools and Libraries

The nearest school is Gerber School (grades K-8) approximately1 mile north of the Project area. No other schools are located within 3 miles of the proposed Project area. The nearest library is the Los Molinos Branch library, 3 miles southeast.

Discussion

a.i-v) **No Impact.** As described under Section 3.3.13, the proposed project would not result in the construction of any new facilities or population that would generate a need for new or physically altered government facilities. Therefore, there would be no change in the demand for police and fire protection and community amenities such as schools and parks or that which currently exists and no impact would occur.

3.3.15 Recreation

Issues (and Supporting Information Sources):	*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
15. RECREATION — Would the project:				
a) Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facilities would occur or be accelerated?	☐	☐	☐	☒
b) Include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment?	☐	☐	☐	☒

Environmental Setting

As described in Section 2.0, *Project Description*, Elder Creek is an intermittent stream with flows generally occurring from November through May. From June through October, Elder Creek is dry in most years in the downstream reach that includes the Project area. The nearest park to the Project area is Gerber Park, located in the unincorporated town of Gerber approximately 0.5 mile north of the creek. The park includes children's play equipment, open sports field, baseball field, swimming pool, and picnic area.

Discussion

a, b) **No Impact.** There are no federal, State, regional or other parks within the proposed Project area. As described under checklist item 13, the proposed project would not result in the construction of any new facilities or population; therefore, there would be no increased use of parks or recreational facilities over that which currently occurs proposed Project activities would occur during the time when the creek would be dry, the proposed Project would not affect the fishing and rafting opportunities downstream. In addition, there would be no recreational facility expansion or construction as a result of the proposed Project Therefore, no impact would occur.

3.3.16 Transportation and Traffic

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
16. TRANSPORTATION AND TRAFFIC — Would the project:				
a) Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?	☐	☒	☐	☐
b) Conflict with an applicable congestion management program, including, but not limited to, level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?	☐	☒	☐	☐
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location, that results in substantial safety risks?	☐	☐	☐	☒
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☒	☐
e) Result in inadequate emergency access?	☐	☒	☐	☐
f) Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?	☐	☒	☐	☐

Environmental Setting

Highways

The proposed Project occurs just over 1 mile east of Interstate-5 and 1 mile west of State Route 99 in Tehama County.

County Roadways/Traffic Types

Traffic patterns along county-owned and local roads are related to remote residential and agricultural land uses. Roads within and adjacent to the proposed Project area are rural, two to four lane roads serving mainly agricultural and rural residential land uses and are maintained by Tehama County. East Chard Avenue, which passes north of the town of Gerber, is part of the haul route and connects directly to the spoil site, has a level of service standard as a minor collector roadway, according to the Tehama County General Plan Circulation Map (Tehama County 2008). County Road 99 and San Benito Avenue are major collector roadways. Collectors (both major and minor) provide a linkage between local streets and minor roads and higher volume arterial streets and State and regional highways. Collector streets serve a variety of functions ranging from providing access to individual properties to conveying higher volumes of traffic to and between higher volume arterial and highway travel routes. Average daily traffic at San Benito

Avenue over Elder Creek is 2,886 cars per day. According to the Tehama County General Plan, the roadways in the Project area have service levels of A and B.

Airports

The nearest public airport is the Red Bluff Municipal Airport which is over 6 miles northwest of the proposed Project area. The nearest private airport facility is the Rancho Tehama Airport, located over 8 miles northwest of the proposed Project area.

Discussion

a,b,e,f) **Less than significant with mitigation incorporated.** Project activities would intermittently and temporarily generate increases in vehicle trips by construction workers and construction vehicles on area roadways seasonally. Because Project activities would occur within the proposed Project area and some truck trips for hauling spoils materials, activities would not result in a significant reduction in the number of, or the available width of, travel lanes on local roads except during times of transportation of equipment and materials along local and major roadways to and from the construction site and staging areas. The proposed Project would result in truck trips during the excavation process to remove sediment and vegetation from the creek channel. During this approximately 10 week time period annually, no more than a maximum of 14 vehicles would be used (hauling and channel clearing equipment described in Section 2.2.10 *Construction Equipment*), and a maximum of 4 vehicles for hauling and transport would be on the road at any given time. The proposed Project would only result in a minimal increase traffic levels along the local roadways, which are already operation at acceptable levels A and B, exclusively during Project activities, and would not result in decreased LOS. Nevertheless, project activities could result in a temporary reduction in the number of, or the available width of, travel lanes on local roads. This would be a potentially significant impact. The following mitigation measure would be implemented to address this potentially significant impact.

Mitigation Measure

Measure TRAFF-1: Develop and Implement Traffic Control Plan. If required, a traffic control plan will be drafted and presented to Tehama County for approval and implementation. The traffic control plan would ensure that bridge abutments located long the haul route will be protected (i.e., K-Rails, sand bags, flagging, space allowance) as approved by DWR in consultation with Tehama County.

c) **No Impact.** The proposed Project would not involve aircraft, nor would the proposed Project result in structures that would intrude into aircraft flight paths or air traffic spaces. Therefore, the proposed Project would have no impact on air traffic patterns that results in substantial safety risks. Therefore, no impact would occur.

d) **Less than significant impact.** Project construction activities would not result in new design features on roads in the area. Further, the proposed Project would not result in in potential traffic safety hazards for vehicles, bicyclists and pedestrians on public roadways

due to the intermittent and temporary construction activities. Project activities are on-going, though sporadic, and would not result in new or more severe increase in the wear-and-tear on the designated haul routes used by construction vehicles to access the proposed Project area.

3.3.17 Utilities and Service Systems

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
17. UTILITIES AND SERVICE SYSTEMS — Would the project:				
a) Conflict with wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☐	☒
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
c) Require or result in the construction of new storm water drainage facilities, or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☒	☐
e) Result in a determination by the wastewater treatment provider that would serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	☒
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☒	☐
g) Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☐	☒

Environmental Setting

The Gerber-Las Flores Community Services District (GLFCSD) provides water, wastewater, lighting, levee and fire protection services within the proposed Project area. Water is provided by three wells that have a maximum pumping capacity of two million gallons per day. Currently, the 420 water connections have an average daily use of 340,000 gallons (Tehama County, 2008). Wastewater service is provided to approximately 500 connections. The GLFCSD uses surface treatment ponds to treat the daily average of 84,000 gallons of wastewater. The wastewater system is capable of processing 134,000 gallons per day. Community wastewater disposal outside of these areas is handled primarily by septic tank and leach field systems or by seepage pits.

Residents of the unincorporated regions of Tehama County obtain their electrical service from Pacific Gas and Electric (PG&E). PG&Ealso provides natural gas to customers within the unincorporated portions of the Planning Area (Tehama County 2008).

There are several purveyors providing cable television and other cable related services (i.e., internet) to the County's Planning Area. Cable fibers are generally co-located and installed concurrently with other utility infrastructure (Tehama County 2008). There are several purveyors (i.e., SBC, Comcast, etc.) providing telephone service to Tehama County. Telephone facilities in

the Planning Area include both aerial and underground fiber and copper transmission lines (Tehama County 2008).

The Tehama County Sanitary Landfill Association (TCSLA) serves as the planning and reporting agency for the entire county under the California Integrated Waste Management Act (IWMA). The TCSLA oversees private waste management services for all areas of Tehama County except for the Cities of Red Bluff and Corning. The TCSLA has contracted with Green Waste of Tehama, a private franchise of Green Waste Recovery Inc., to oversee the waste management services for the county. Waste management services include operation of the county landfill and three transfer stations as well as curbside waste pickup that include an extensive recycling effort (Tehama County 2008).

Tehama County and the City of Red Bluff jointly own the Tehama County/Red Bluff Sanitary Landfill, a 159-acre site located approximately 2.5 miles northwest of the City of Red Bluff. The landfill has a maximum permitted daily capacity of 400 tons per day (TPD), with an average daily loading of 216 TPD. Phase II of the landfill will remain open with an estimated closing date of 2025 (Tehama County 2008).

Discussion

a) **No Impact.** The proposed Project would not generate wastewater during implementation of the proposed channel activities. As such, there would be no exceedance of RWQCB wastewater treatment requirements. Therefore, no impact would occur.

b, c, e) **No Impact.** As described under checklist item 13, the proposed Project would not result in the construction of any new facilities or population that would generate a need for new or physically altered water, wastewater, or stormwater facilities. The proposed Project would restore the channel capacity of Elder Creek and would not require any long-term water supplies, nor generate wastewater during its operation. During construction, water would be used for a short time to allow for dust suppression, but that water would be brought to the construction area in water trucks by the DWR and provided by the GLFCSD. The proposed Project does not include facilities which would generate new storm water drainage needs or an expansion of existing water storage for storm water/flood waters. Project activities would improve the currently impaired flood-capacity of the creek without significantly modifying the current condition of the environment. No water, wastewater, or stormwater facilities would need to be expanded or constructed for the temporary construction needs; therefore, no impact would occur.

d) **Less than Significant.** The proposed Project would require minimal water supply during construction activities. Water supply required during construction activities would be provided by a water truck and would be sourced from local municipal supply. Water demand would be temporary and minor and therefore potential impacts associated with availability of water supplies would be less than significant. The implementation of the proposed Project would not require water nor would it require any new surface water supplies. This impact would be less than significant.

f) **Less than Significant.** The proposed Project would generate construction-related debris from vegetation removal, which would either be burned on site or hauled off to the applicable local solid waste facilities with sufficient capacity. As described in the Project Description, the excavated sediment would be hauled to an arranged sediment disposal site for stockpiling. This impact would be less than significant.

g) **No Impact.** The proposed Project would generate construction-related debris from vegetation removal, which would either be burned on site or hauled off to the applicable local solid waste facilities in accordance with federal, State, and local regulations as described in Section 3.3.3, *Air Quality*. Therefore, no impact would occur.

3.3.18 Mandatory Findings of Significance

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
18. MANDATORY FINDINGS OF SIGNIFICANCE — Would the project:				
a) Have the potential to 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?	☐	☒	☐	☐
b) 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)?	☐	☒	☐	☐
c) Have environmental effects that would cause substantial adverse effects on human beings, either directly or indirectly?	☐	☒	☐	☐

Discussion

a) **Less than significant impact with Mitigation Incorporated.** The proposed Project would be temporary in nature and involve work activities at existing flood control facilities, i.e., the Elder Creek channel, to remedy channel capacity deficiencies and better accommodate existing flood conditions providing a net beneficial effect to the surrounding area. Specifically, the improvements would improve the reliability of the creek channel to contain flood/stormwater flows and riparian habitat. 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 or restrict the range of rare or endangered plants or animals; or, eliminate important examples of the major periods of California history or prehistory. As discussed in the analyses provided in this Initial Study, adherence to federal, State, and local regulations, various environmental protection measures implemented as part of the proposed Project, and proposed mitigation measures AQ-1, -2, -3, BIO-1 through BIO-37, CUL-1, CUL-2, GEO-1, HAZ-1, -2, NOISE-1, and TRAFF-1 would reduce all potentially significant impacts to biological and cultural resources, as well as to other issue areas, to less-than-significant levels.

b) **Less-than-significant impact with mitigation incorporated.** As noted throughout this document, the potential impacts of the proposed Project are largely restricted to temporary and short-term construction-related impacts and are site-specific. As noted above, all of the potential direct and indirect impacts of the proposed Project were determined to be fully avoided or reduced to a less-than-significant level with

incorporation of mitigation measures AQ-1, -2, -3, BIO-1 through BIO-37, CUL-1, CUL-2, GEO-1, HAZ-1, -2, NOISE-1, and TRAFF-1. As a result, the potential impacts of the proposed Project are not considered cumulatively considerable, and impacts would be less than significant with mitigation incorporated.

c) **Less-than-significant impact with mitigation incorporated.** The potential impacts of the proposed Project are temporary and short-term impacts, Project-related impacts, and are site-specific. These impacts are all localized to the proposed Project site and may include limited adverse effects on air quality, biological resources, cultural resources, water quality/soils, hazardous materials, and noise. However, the proposed Project would not include any activities or uses that may cause substantial adverse effects on human beings, either directly or indirectly, or on the physical environment. The proposed Project has been designed to meet the DWR flood engineering standards and would incorporate adherence to local codes and regulations as conditions of project approval. Compliance with applicable local, State, and federal standards, as well as incorporation of project mitigation measures, would result in less-than-significant impacts.

CHAPTER 4
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APPENDIX A

Elder Creek Channel Management Plan

Memorandum

Date : June 27, 2011

To : Mark List, Chief
Maintenance Support Branch
Flood Maintenance Office
Division of Flood Management
Joint Operations Center, Room 146
3310 El Camino Avenue
Sacramento, California 95821-6308

Todd L. Hillaire, Chief
Flood Management Section
Northern Region Office

From : **Department of Water Resources**

Subject: Elder Creek Channel Management Plan

This memorandum presents a channel management plan to restore the design capacity and water surface profiles with respect to compliance criteria for the Elder Creek Flood Control Project (Project) as requested by the Division of Flood Management. The Project is a component of the United States Army Corps of Engineers' (USACE) Sacramento River and Major and Minor Tributaries Project. The actions, analysis, results, and potential impacts are discussed in detail within this plan.

The Project's compliance criteria is based on passing the design flow at or below the water-surface elevations as shown on USACE's drawing number 50-10-3334: "Levee and Channel Profiles." This drawing, originally dated March 15, 1957, is referred to as the 1957 Profile. A letter sent by USACE on August 14, 2006, to the Reclamation Board (now the Central Valley Flood Protection Board) specifically stated that projects with significant vegetation will meet compliance criteria when a hydraulic analysis shows the design flow is conveyed while meeting the Operation and Maintenance (O&M) Manual's freeboard requirements. Freeboard is defined as the difference between the top of the levee and the design water-surface elevation. The Project's design capacity is 17,000 cubic feet per second (cfs).

The analysis and conclusions for this plan are based on cross sectional surveys conducted between the fall of 2007 and spring of 2008, vegetation assessments completed during the winters of 2008 and 2011, and the existing-condition hydraulic model as presented in the April 2010 memorandum report "Elder Creek Flood Control Project Compliance with United States Army Corps of Engineers 1957 Channel Profile." The vegetation assessment incorporates the *Arundo donax* (Arundo) removal during the fall 2007 field season, which has essentially re-grown. The backwater effects from the Sacramento River are represented by the 1957 Profile's downstream water surface elevation. The existing-condition evaluation determined that only 6,490 feet, or 29 percent, of the Project's total length (22,290 feet) met the compliance criteria. The existing condition capacity of the Project is 9,000 cfs.

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A series of channel management actions were evaluated with the existing-condition hydraulic model to assess their effect towards meeting the compliance criteria. These actions, presented in the order of increasing scope and complexity, are:

1. Existing condition (no action)
2. Arundo removal
3. Full vegetation removal
4. Arundo removal with sediment removal
5. Full vegetation removal with sediment removal
6. Arundo removal with sediment removal and limited full vegetation removal

Sediment removal was determined through an iterative process of applying channel and overbank excavations as needed. The process started with the smallest excavation first and then increased excavations systematically within the confines of the levees until either compliance criteria was met or no further reductions in water-surface elevations within the existing levee alignment could be reasonably achieved to meet compliance. A cross-section comparison between Actions 1 and 6 are shown in Appendix G and present the limits of sediment removal. In some instances, increasing excavation and vegetation reached a limit because conveyance is a function of velocity, wetted perimeter, slope, channel and overbank roughness, and downstream conditions.

The hydraulic evaluation clearly shows none of these actions fully meeting the compliance criteria throughout the Project (Table 7). Additional compliance improvements can be gained by raising levees up to 0.5 feet, which will need further evaluation. Action 6 provides the greatest gain toward meeting the compliance criteria. Areas needing vegetation removal and sediment removal (excavation) are delineated by cross section in Tables 6 and 7. With levee raising, this action meets compliance along 20,850 feet, or 94 percent, of the Project. This action would require a 3,400 feet of cumulative levee raising along both banks to minimize vegetation and sediment removal and achieve compliance. The resulting Project capacity for this action with levee raising is 14,000 cfs.

The extent of vegetation and sediment removal for Action 6 is shown in Appendix B. This action consists of removing 26 acres of Arundo, 21 acres of vegetation, 308 elderberry shrubs, and 150,000 cubic yards of material from the channel and overbank areas between the levees. The impacts with this action are significant and will require environmental surveys, assessments, consultation, permits, and environment impact documents. Preliminary riparian vegetation and elderberry mitigation areas have been delineated and total about 10 acres along the creek (see Appendix B); however, the extent and mitigation ratios have not been determined because they require more detailed environmental surveys and consultation.

Recommendations for the next steps in the evaluation process include environmental surveys and high-water staking. Environmental surveys will refine the potential impacts and mitigation needs. High-water staking and flow measurements are needed to calibrate the hydraulic model with regard to the effects of vegetation roughness.

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REPORT DATA

The supporting data and hydraulic models for this evaluation are available on the DVD-ROM disk included with this report. Files are in AutoCAD 2010, ArcGIS 9.3, Word 2007, Excel 2007, and HEC-RAS 4.1 software formats. Information concerning the pertinent data used in preparation of this report can be obtained by contacting:

California Department of Water Resources
Northern Region Office
2440 Main Street
Red Bluff, California 96080

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INTRODUCTION

The Department of Water Resources (DWR) has channel maintenance responsibility for the Elder Creek Flood Control Project (the Project). During a routine inspection of the Project, the United States Army Corps of Engineers (USACE) noted some maintenance deficiencies, primarily debris and excess vegetation in the channel, and requested in a March 2007 letter that DWR develop a plan to correct these maintenance deficiencies. These deficiencies must be corrected in order to maintain active status for receiving Public Law 84-99 rehabilitation funding. As part of the effort to develop this plan, DWR's Division of Flood Management requested that the Northern Region Office develop a channel management plan to determine the actions needed for managing vegetation and sediment with respect to meeting the Project's compliance criteria.

This plan presents actions and evaluates their effects on managing vegetation, removing sediment, and modifying the channel, where needed, to achieve project compliance for existing conditions. The evaluation covers the effects ranging from singular actions (vegetation removal) to combined actions (Arundo removal and sediment removal) to meet compliance. Existing conditions are represented by 2007-2008 topography data, 2008 and 2011 vegetation assessments, and 2008 aerial photography.

PROJECT COMPLIANCE CRITERIA

The existing conditions and actions proposed in this plan are evaluated in accordance with the channel's ability to contain the Project's design flood flow of 17,000 cubic feet per second (cfs) with respect to the USACE's drawing number 50-10-3334: "Levee and Channel Profiles." This drawing was originally dated March 15, 1957, with revisions occurring in September 1962, February 1969, and August 1969. This profile drawing is referred to as the 1957 Profile. This plan also evaluates achieving project compliance based upon O&M Manual freeboard requirements per the USACE's April 1963 "Operations and Maintenance (O&M) Manual for Elder Creek, from Sacramento River to High Ground, Sacramento River and Minor Tributaries Project, California" (USACE 1963). Freeboard is defined as the difference between the top of the levee and the design water-surface elevation.

A letter sent by USACE on August 14, 2006, to the Board provides clarification of the State's O&M responsibilities. According to the Code of Federal Regulations, Title 33, Section 208.10, allowable vegetation in the floodway shall not affect the capability of the Project to convey design flows within the specified levels of freeboard. In addition, the channels are to pass design flows at stage levels at or below the 1957 Profile. Projects with significant vegetation will meet compliance criteria when a hydraulic analysis shows the design flow is conveyed while meeting O&M Manual freeboard requirements (Appendix A).

The channel management actions will be evaluated according to the less restrictive criteria of meeting either the 1957 Profile or O&M Manual freeboard requirements.

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PROJECT DESCRIPTION AND HISTORY

Elder Creek originates on the eastern slopes of the Coast Range Mountains at a maximum elevation of 5,800 feet. From its headwaters, Elder Creek runs in an easterly to north-easterly direction down to and across the Sacramento Valley floor. Just prior to joining the Sacramento River, Elder Creek turns and flows in a south-easterly direction. The Creek passes just south of the town of Gerber (Figure 1).

The Flood Control Act of December 22, 1944, authorized the Elder Creek Channel Improvement and Levee Construction unit of work. This unit is part of the Sacramento River and Major and Minor Tributaries Project and was enacted by Congress. The USACE's October 1, 1959, "Design Memorandum No. 4, Sacramento River and Major and Minor Tributaries, California, Elder Creek General Design" (Design Memorandum) report contains the design details of the flood control project (USACE 1959). Table 1 summarizes the hydraulic design, and Table 2 summarizes the levees and channel improvement.

Table 1. 1959 Hydraulic Design Summary

Project Design Flow	17,000 cfs
Frequency of Exceedance of Project Design Flow	Once in 50 years
Freeboard	3 feet
Standard Project Flood (top of Levee)	20,000 cfs
Frequency of Exceedance of Standard Project Flood	Once in 100 years
Starting Water Surface Elevation (WSEL) at Station 72+98, which coincides with about 100,000 cfs in Sacramento River	225.0 feet COE
Channel Roughness for Stations 72+98 to 266+50	0.035
Channel Roughness for Stations 274+50 to upstream end of project levees	0.040
Overbank Roughness	0.045
Note: USACE datum is 3.0 feet below National Geodetic Vertical Datum of 1929 (NGVD 29).	

Subsequent to the approval of the Design Memorandum and during final preparation of the contract plans, local downstream landowners raised concerns regarding the potentially detrimental effects that the Project would have on their lands. The April 13, 1960, "Supplement No. 1 to Design Memorandum No. 4 – (General) Channel Improvement and Levee Construction" (USACE 1960) memorandum documents these local concerns along with three alternative plans. The alternative that was recommended for approval included enlarging roughly 600 feet of restricted channel immediately downstream of the levees along with vegetation clearing and snagging of the channel downstream to the Sacramento River.

The O&M Manual gives specific details on the Project features as well as specific monitoring and maintenance requirements. Originally published in 1963, the O&M Manual also includes subsequent additions and revisions that were authorized and accepted per Congressional Law. The Project work, as covered by the O&M Manual, includes the following:

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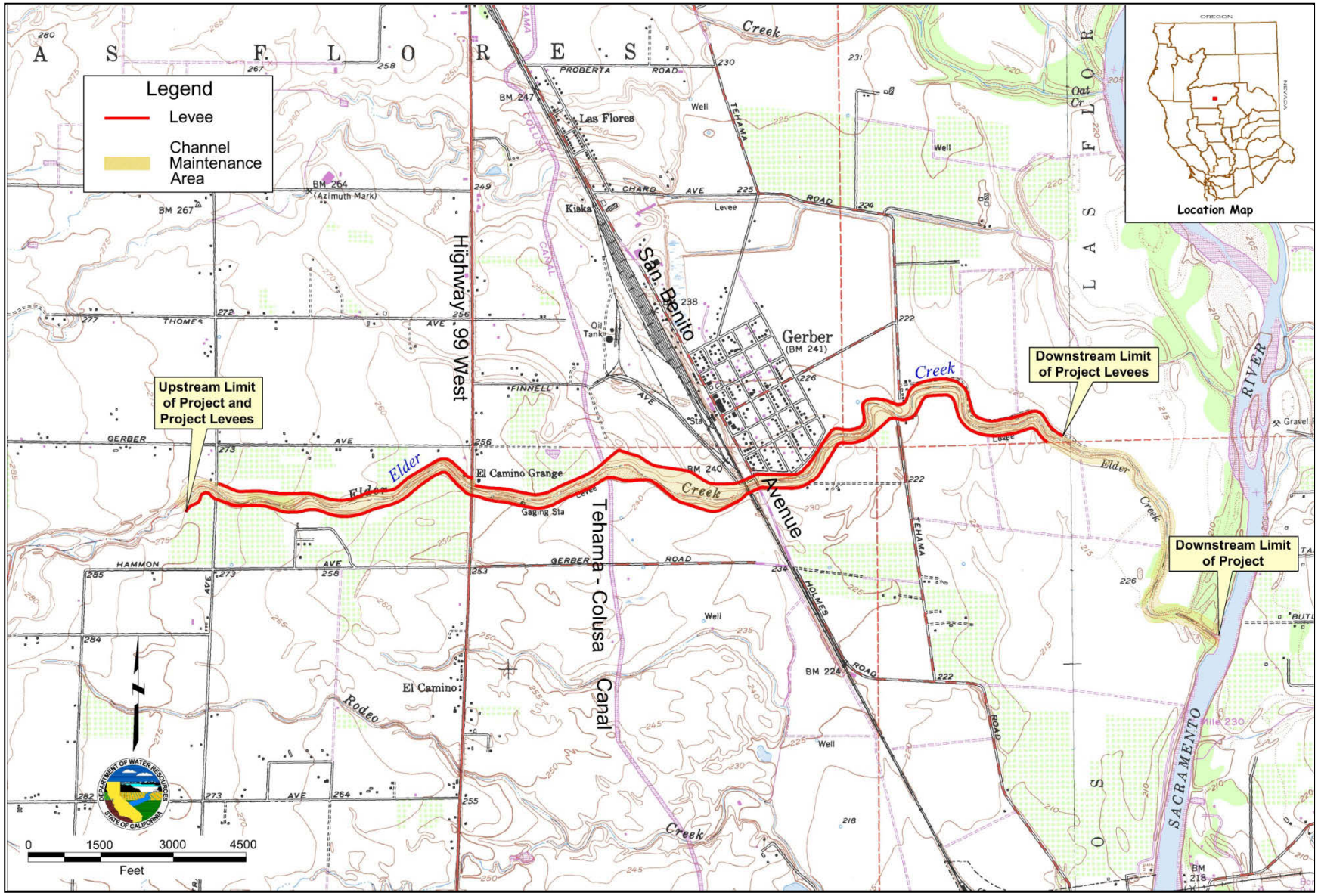

Figure 1. Elder Creek Flood Control Project

Table 2. 1959 Levees and Channel Improvement Summary (Design Memorandum)

Improvement	Location
Left Levee	Stations 84+50 to 288+29
Right Levee	Stations 87+00 to 299+29
Right Bank Spoil Levee	Stations 72+98 to 86+00
Levee Crown	12-foot wide with 10-foot wide patrol road
Levee Slopes	3:1 Waterside, 2:1 Landside
Right bank channel excavation as per Typical Design Cross Section 78+16	Stations 72+98 to 88+50
Channel enlargement due to degrading (excavation) for levee borrow as per Typical Design Cross Section 103+70	Stations 88+50 to 140+30
Channel enlargement using 150-foot bottom width and 20-foot low water channel as per Typical Design Cross Section 157+25	Stations 140+30 to 186+00
Channel transition of 150-foot to 130-foot bottom width	Stations 186+00 to 190+00
Channel enlargement using 130-foot bottom width and 20-foot low water channel as per Typical Design Cross Section 219+00	Stations 190+00 to 219+00
Channel transition of 130-foot to 100-foot bottom width	Stations 219+00 to 227+50
Channel enlargement using 100-foot bottom width and 20-foot low water channel	Stations 227+50 to 235+00
Channel enlargement due to degrading (excavation) for levee borrow and gravel bar removal as per Typical Design Cross Section 270+00	Stations 235+00 to upstream end of project levees

- The cleared channel of Elder Creek from the Sacramento River upstream for a distance of about 1.25 miles to the westerly Sacramento floodplain.
- The levees along both banks and the improved channel from the westerly Sacramento floodplain upstream about 4.1 miles to high ground.
- The intermittent irrigation and drainage structures and intermittent bank protection along the levees.

The Project provides flood protection to the town of Gerber, adjacent roads, railroads, buildings, and agricultural lands. The Project levees provide an O&M Manual freeboard requirement of at least 3 feet during a flood of 17,000 cubic feet per second (cfs).

According to Congressional Law, local interests are to maintain and operate all levee and appurtenant works at their own expense. The O&M Manual states that the Reclamation Board, which was renamed the Central Valley Flood Protection Board (Board) in 2008 by State legislation, accepted responsibility for operating and maintaining the levees and channel of Elder Creek; this acceptance of responsibility was by a letter dated November 27, 1961. That acceptance letter actually states that the Board formally accepted the levee improvement and bank protection work along Elder Creek from the Sacramento River overflow area upstream to 1.2 miles above Highway 99W, but it does not say anything about accepting channel clearing. The Board's acceptance of the channel clearing must be implied as the O&M Manual is dated 17 months after the acceptance letter.

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The maintenance agreement in effect as of the date of this memorandum states that DWR is responsible for maintaining the channel section beginning 10 feet from the waterside toe of the levee and extending to 10 feet from the waterside toe of the opposing levee. The local maintaining agency responsible for the maintenance of the levees and their ten-foot corridors along the waterside toes of the levees is the Tehama County Flood Control and Water Conservation District (TCFCWCD).

RESOURCE ASSESSMENT

This section characterizes the existing conditions for the channel and overbank areas between the levees with regard to vegetation and sediment.

Riparian Assessment

The vegetation between the levees of Elder Creek was delineated using the United States Department of Agriculture's Farm Service Agency's' aerial imagery from the National Agriculture Imagery Program for the 2006 (NAIP 2006) and 2009 (NAIP 2009), both of which cover agricultural growing season. This aerial photography was printed at a scale 1:1000 for mapping the features in the field. The aerial extent of vegetation types were initially drawn directly onto the maps during field visits and later incorporated into a geographic information system (GIS) as feature class polygons to represent the species and extents of the vegetation, where possible. The approximate center of each polygon was located using a Garmin GPS hand-held unit. GIS was then used to quantify the acreage of the polygons that were depicted. Any significant differences between the hand-drawn polygons and the NAIP imagery were verified through re-visits to the locations in question.

The following plant species occur within the Project.

<u>Invasive non-native vegetation</u>
Arundo donax (giant reed, Carrizo, Spanish cane, wild cane, giant cane)
Juglans californica (California black walnut)
*Rubus discolor (*Himalayan blackberry)
Tamarix ramosissima (tamarisk, saltcedar)

<u>Native vegetation</u>
Populus fremontii (Fremont's cottonwood)
Quercus sp. Oak - probably *Q. lobata* (valley oak)
Salix exigua (sandbar willow)
Salix gooddingii (Goodding's willow)
Salix lasiolepus (Arroyo willow)
Sambucus mexicana (Central Valley elderberry)

Arundo dominates the understory or is a significant component of many riparian areas along Elder Creek. This highly aggressive species forms large, very dense clumps that can extend to 20 feet in height, exceeding 30 feet in ideal conditions. Several large clumps have formed extensive stands, some of which extend for hundreds of feet along the riparian zone. Isolated clumps of Arundo were even found within the active channel, especially in sand and gravel bars. Within the Project between Cross Sections 7425 and

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29710, these is 18.3 acres of Arundo. Another 7.7 acres of Arundo exists in the channel between Cross Section 7425 and the Sacramento River.

Arundo flowers in late-summer with upright, feathery plumes about one to two feet in length. However, the seeds are rarely fertile, so the plants reproduce primarily through underground rhizomes. These rhizomes are tough and fibrous, often forming a knotty and spreading mat that penetrates the soil up to three feet in depth (Alden 1998; Mackenzie 2004). Stem and rhizome pieces less than two inches long and containing a single node can readily sprout under a variety of conditions. This vegetative growth appears to be well adapted to floods, which can break up individual Arundo clumps. The pieces can then sprout and colonize further downstream.

Arundo is considered to have very low wildlife value because it is believed that no species of wildlife currently in California uses it to any great extent. No wildlife species are known to eat any parts of the plant. Furthermore, it is believed that no bird species are known to use the plant for nesting, forage, or perching. This results in very limited resources being provided by the native plants that are crowded-out or replaced by Arundo (Mackenzie 2004). Roosting by larger birds, such as raptors, is impossible on the highly flexible stems.

In some areas, the understory is dominated by the invasive Himalayan blackberry. This invasive, non-native plant can form large impenetrable thickets that can reach heights up to 10 feet and cover areas up to 75 feet in length. Small hardwood trees, primarily oaks and willows, are a significant contributor to the density of the understory in some of the larger stands. Accounted for individually, each small tree or clump is normally neutral or low in effect in terms of increasing channel or floodplain roughness; however, in large numbers within the understory, in combination with the larger trees, their effect on increasing channel roughness, thus effecting flow, could be significant.

The sandbar willow dominates some areas along the stream edges, but most willow stands in the Project suffer from aggressive encroachment of the Arundo stands. Willow stands can extend along a stream's edge for hundreds of feet and provide abundant habitat for bird and small mammal species.

The Central Valley elderberry exists in many areas along Elder Creek, mostly as single shrubs with some found in clusters. They mostly occupy areas of the middle to the upper end of the overbank; although at least one cluster was found at the edge of the active channel. There are 676 distinct shrubs with stems diameters greater than one inch at the base, the type of habitat for the valley elderberry longhorn beetle *Desmocerus californicus dimorphus* (VELB), a species listed by United States Department of the Interior's Fish and Wildlife Service (USFWS) as Threatened.

Woody vegetation (for example oaks, walnuts, cottonwoods, and large willows) can be a significant contributor to forested riparian habitats. Within the study area, Fremont's cottonwood is relatively rare, with numerous walnuts and some oaks dominating the woody vegetation. The oaks could not be identified to species because of the absence of leaves. However, they were most likely valley oak, one of the most common oak species associated with riparian areas. The larger willows, such as the Goodding's willow, were found primarily in the zone of the channel's edge up to the middle of the overbank.

Vegetative Effects on Channel Roughness

The riparian vegetation density was evaluated for its effect on overbank roughness (the ability to restrict flow for hydraulic modeling representation) from the edge of the active channel to the top of the bank for the length of each riparian assessment reach. Each reach covers the distance extending halfway to the next cross section, both downstream and upstream. For example, the reach for Cross Section 29250 (as shown in Appendix B) extends from half the distance to Cross Section 28995 in the downstream direction to half the distance to Cross Section 29480 in the upstream direction. The right and left banks were evaluated separately for each reach.

Roughness is represented in the hydraulic modeling as the Manning's roughness coefficients (n values). Low roughness coefficients, such as 0.035, represent sand/gravel channels where as dense stands of Arundo have roughness values up to 0.20, thus highly restricting flow.

This assessment roughly divided overbank vegetation into six categories: (1) no vegetation, (2) small willows and hardwood saplings, (3) large hardwood trees, (4) brushy willows and small hardwoods, (5) dense blackberry thickets, and (6) large giant reed clumps. Typical overbank roughness coefficients ranged from 0.045 in areas with grasses or no vegetation to 0.20 in areas with extensive Arundo clumps. Assessments for each of these categories also depended on the relative density and extent of the stand under consideration. Isolated trees, for example, would have a low roughness estimate because each tree trunk taken individually would be a very small percentage of the total cross section. However, an extensive, dense stand of brushy willows and hardwood saplings, normally low, would have a high roughness when considered altogether.

The existing condition of the riparian vegetation resulted in a number of reaches with overbank roughness coefficients ranging from 0.08 to 0.2 as listed in Appendix C. Most of these high estimates were the direct result of the presence or dominance in the riparian areas by Arundo.

Stream Vegetation Conditions within Watershed

Channel conditions upstream of the Project show much of the same mix of riparian vegetation. To assess the presence and relative abundance of Arundo above the Project, visual surveys were conducted along the creek. Road crossings and levee roads were the main points of contact with the creek. Vegetation was mainly accessed via road crossings and roadsides adjacent to the creek.

Arundo was found at all of the available access points along the creek as shown in Figure 2. Abundance and density of the stands never approached that of the stands at the lower end of the creek. However, the abundance of Arundo stands and isolated clumps are more than adequate to re-colonize the downstream portions of the creek.

During field surveys, the NAIP 2009 aerial imagery was used. The bright green signature on the aerial imagery consistently indicated presence of Arundo in Elder Creek upstream of the Project as shown in Figure 2. Following this signature on NAIP 2009 aerial imagery, large clumps of Arundo were visible as far upstream as the creek's branching point in the foothills along Lowrey Road. The uppermost location of Arundo on the North Fork appears near Colyear Road. On the Middle Fork, the uppermost location of Arundo appears on a disturbed terrace at about elevation 900 feet, roughly a mile southwest of Lowrey

Cemetery. The uppermost location of the Arundo signature on the South Fork appears near the community of Lowrey at elevation 900 feet.

No past, current, or planned Arundo removal activities exist within the Elder Creek watershed as a whole or in any portion (CDWR 2008). The Tehama County Resource Conservation District is the only agency likely to address this problem and has no resources, plans, or experience in Arundo removal.

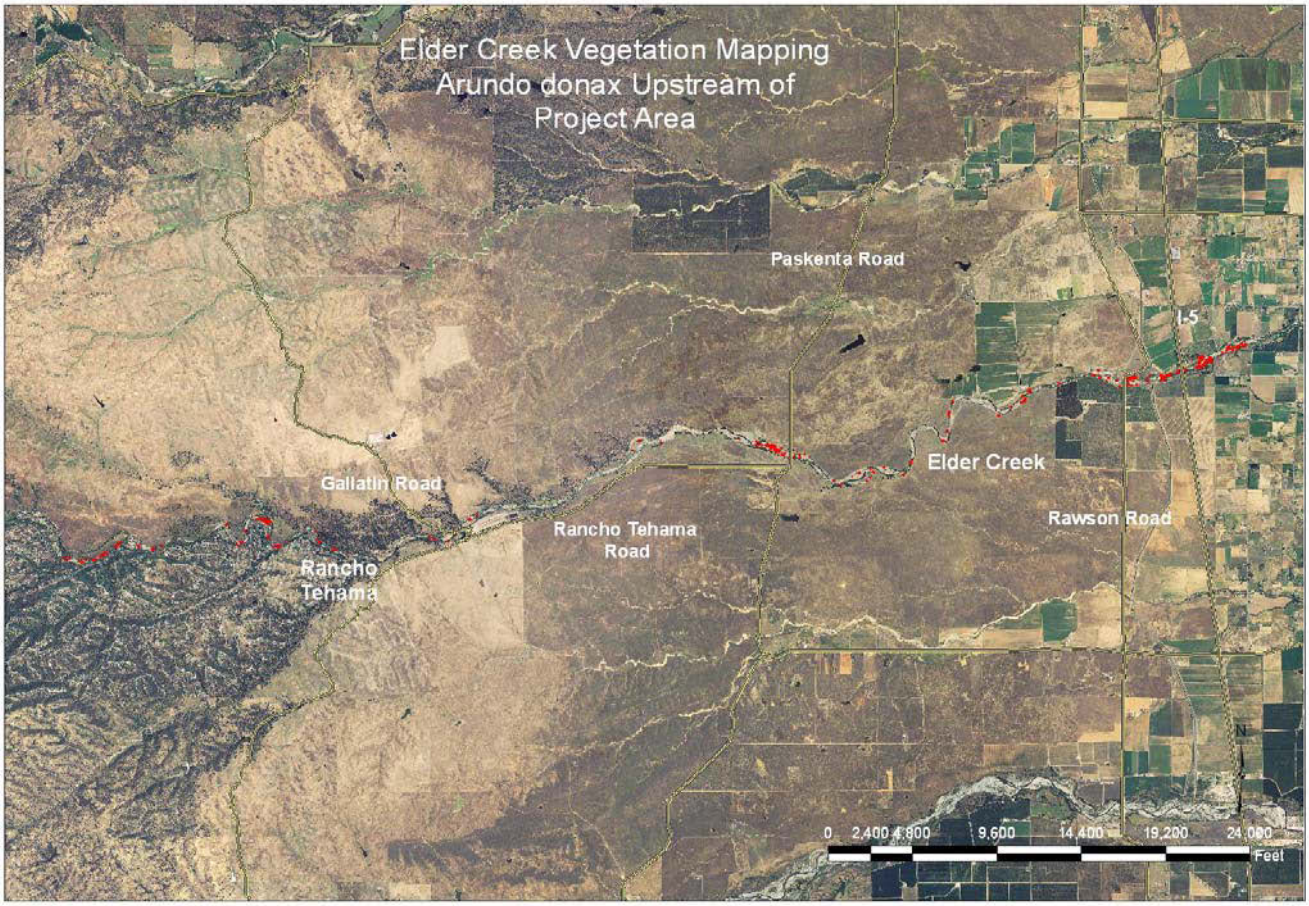


Figure 2. Presence of Arundo Upstream of the Project

Vegetation Management – Efforts-to-Date

In 2007, DWR's Flood Maintenance Office started the Elder Creek Arundo Removal Project (Arundo Removal Project) in 2007. Figure 3 shows the area of removal for the first year of the four year project, which had limited success. The stalks of several plants were cut down to the level of the root wad and removed from the immediate area for burning. Crews from the California Conservation Corps (CCC) cut the Arundo stalks down to the root wad and removed them from the immediate areas for burning. However, this effort became unsustainable because the CCC crews were constantly reassigned to fight fires. Many of the clumps that were treated have since re-sprouted and become as large as they were previously. Since that time, no efforts to continue the Arundo removal have been made by DWR primarily due to budgetary problems.

All of the Arundo was not completely removed within the highlighted area, with many stands or clumps still existing. The process was time-consuming in that removal occurred

by hand with afterwards application of herbicides to the freshly cut stalks. If the Arundo is removed only within the Project, it could rapidly (probably within two years) re-establish from the source material in the upstream of the Project. Removal of Arundo in the upper reaches of Elder Creek is imperative if it is to be eradicated from the system.

Once Arundo is eradicated by cutting and spraying, the treated area needs on-going management through annual visitation and re-spraying as needed for a minimum period of three years in order to fully eradicate the plants within the area, as is commonly done in other watersheds with similar Arundo issues. After three years, bi-annual checking and spraying would be necessary to find and eradicate recruitment from upstream sources.

Kelly Moroney with USFWS has experience with their Arundo removal project on national wildlife refuge lands in the Sacramento Valley. In his telephone conversation with Tom Boullion, DWR Environmental Scientist, on June 1, 2011, he offered to lend his crew and expertise to the removal of the Arundo in lower Elder Creek. His crews have had extremely high success rates in killing Arundo but have not solved the problem of removing the biomass. They primarily burn the Arundo stumps and have not tried other methods, which are currently under investigation.

When asked, USFWS expressed support for removing Arundo immediately downstream of the Project. This has the potential to reduce backwater effects. By removing Arundo, especially on the left bank where the USFWS' refuge is located, flood flows could more easily access the floodplain to provide relief to the channel. The results of this scenario are unknown because the backwater effects caused by the Sacramento River need to be better understood with hydraulic modeling.

Sediment

Elder Creek traverses across the western foothills and Sacramento Valley as it drains to the Sacramento River. Traversing across the valley affects the sediment supply in that the long, low gradient of Elder Creek results in discharges of mostly clay, silt, and fine gravel to the Sacramento River (CDWR 2007).

The stream channel contains active areas of sediment movement throughout the Project. Lateral migration has occurred to minimal degrees with some cutting of banks and need for erosion repairs. Typical point bars have formed on bends where minimal vegetation re-growth suggests sufficient flow velocities to cause movement during high flow events, which tend to be flashy in nature. The Project predominantly consists of uniformly spaced levees with some intermixed areas of expanded floodplain benches between the levees. The changes in floodplain bench width results in expansion and contraction zones. The expansion zones experience low flow velocities where sediments deposit, thus raising the channel and floodplain elevation and effecting flow capacity.

Above the Highway 99W Bridge, the channel invert has degraded somewhat with several gravel bars forming in the channel near cross sections 26280 and 27460 as the channel moves into a reach of expansion and then contraction. The Highway 99W Bridge creates a backwater effect that can result in deposition of material. Between Highway 99W and the Union Pacific Railroad Bridge, the widened channel results in material deposition as velocities decrease. Below the San Benito Avenue Bridge, zones of deposition and scouring have occurred.

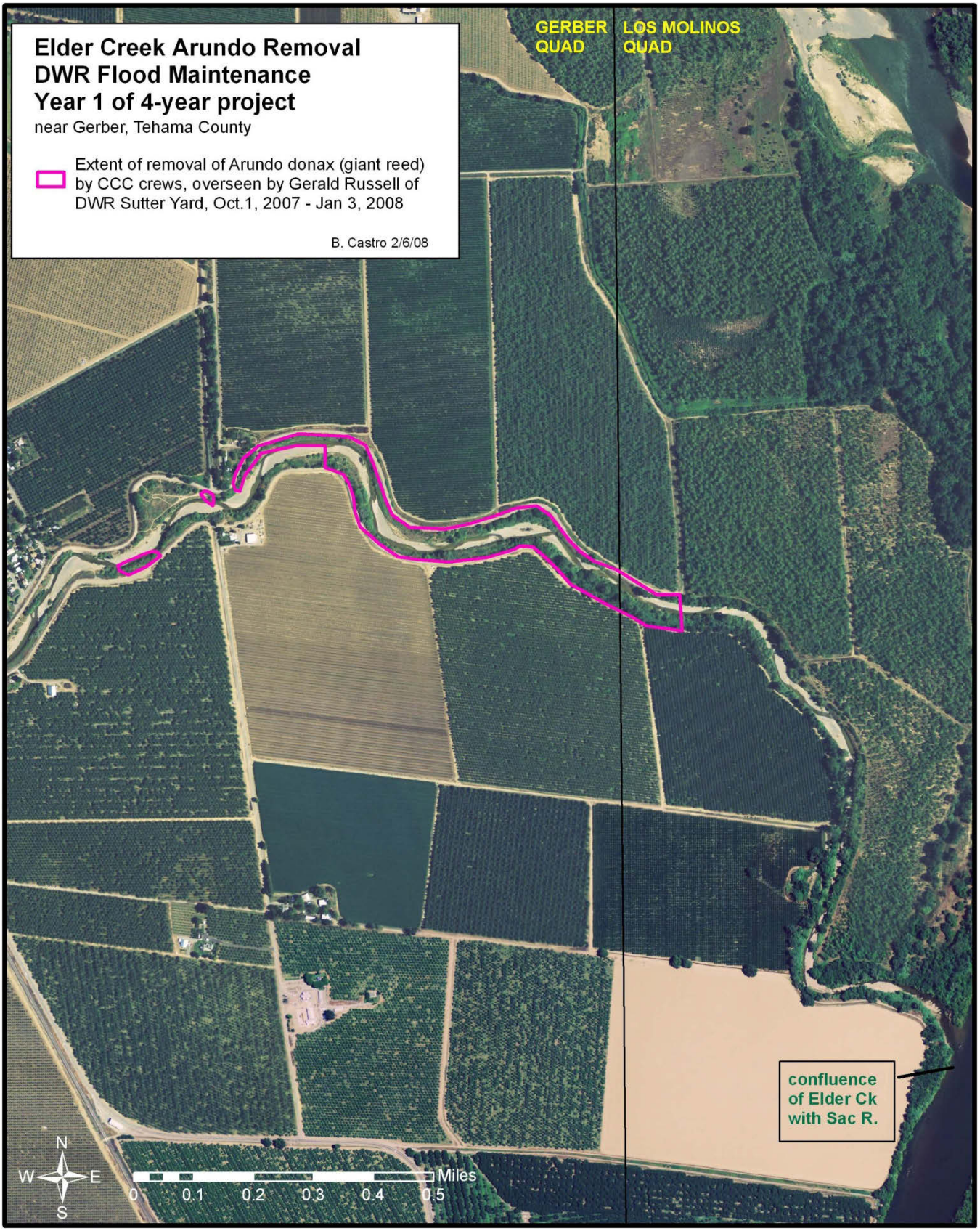


Figure 3. Extent of the Arundo removal along Elder Creek in 2007

EXISTING-CONDITION EVALUATION

Hydrology

Elder Creek has a watershed area of about 150 square miles at the confluence of the Sacramento River. The average annual precipitation varies from over 55 inches in the higher elevations of the watershed to 20 inches on the valley floor (TCRCD 2006). Much of the precipitation occurs as snow in the upper watershed area during the winter that provides runoff during the spring and early summer months. Flow in Elder Creek responds quickly to precipitation events that occur mostly as rainfall over a large portion of the watershed.

The streamflow gaging stations on Elder Creek are listed in Table 3. The Elder Creek at Gerber gaging station was operated by the United States Geological Survey (USGS) from 1949 until 1979. It was moved 150 feet downstream of the original location in September 1961 after the channel was straightened and widened by USACE.

Table 3. Existing and Discontinued Streamflow Gaging Stations

Station Name	Operating Agency	Station Number	Latitude*	Longitude*	Period of Record
Elder Creek at Gerber	USGS	11380500	40.0514	-122.1647	1949 - 1979
Elder Creek near Paskenta	USGS	11379500	40.0234	-122.5108	1948 - Present

*Decimal degrees

At the Elder Creek near Gerber gage location, the stream is considered intermittent, with flow generally occurring from November through July; otherwise, the summer and early fall months of August through October are dry in most years.

Hydraulic Modeling – Existing Condition Results

Recent efforts to evaluate the Project's existing-condition performance are summarized in the April 14, 2010, memorandum report titled "Elder Creek Flood Control Project Compliance with United States Army Corps of Engineers 1957 Channel Profile" (Project Compliance Memo). In that effort, the USACE's HEC-RAS hydraulic modeling program was used to simulate Elder Creek's conditions and calculate water surface profiles. This one-dimensional hydraulic modeling program calculates water surface profiles for steady, gradually varied flow. Cross sections, reach lengths, downstream water surface elevations, Manning's "n" roughness coefficients, and the geometry of bridges are used to model hydraulic conditions at each cross section. That analysis assumed unobstructed flows, did not account for the effects of floating debris, and did not evaluate sediment transport characteristics such as scour and deposition. The existing-condition model was not calibrated because no high-water mark and streamflow measurement data were available; thus, visual observations of the vegetation and ground surface were used to assign roughness coefficients to the cross sections.

This evaluation uses new, high-resolution aerial photography obtained from the Department's Central Valley Floodplain Evaluation and Delineation Program. This aerial photography represents 2008 conditions and was used to update the channel roughness values and refine the top of levee data. The top of levee is represented by the waterside edge of the levee road. Similar to the Project Compliance Memo, the HEC-RAS model for this existing-condition evaluation shows that the 1957 Profile is encroached upon in many

locations as listed in Table 4. The existing conditions reflect extensive vegetation along the overbanks and floodplain benches within the levee system. Table 4 highlights cross sections that are out of compliance with the 1957 Profile and encroach upon the O&M Manual freeboard requirement, including levee overtopping. Those areas out-of-compliance are color-coded to identify the magnitude (significance) of non-compliance. The cross-section locations and plots are shown in Appendices B and D, respectively.

For existing conditions, non-compliance with the 1957 Profile occurs along 16,730 feet, or 75 percent, of the total reach length (22,290 feet). For the left bank levee, non-compliance with the O&M Manual freeboard requirement occurs along 13,860 feet, or 66 percent, of the total left bank levee length (20,860 feet). For the right bank levee, the non-compliance with the O&M Manual freeboard requirement occurs along 16,470 feet, or 78 percent, of the total right bank levee length (21,190 feet). Altogether, compliance with either requirement occurs along 6,490 feet, or 29 percent, of the Project, thus resulting in 16,350 feet of the Project being non-compliant.

The HEC-RAS model was also run with flows ranging from 8,000 to 17,000 cfs in 1,000 cfs increments in order to determine the channel capacity at each cross section with respect to both the 1957 Profile and to maintain the O&M Manual freeboard requirement of three feet. As listed in Table 5, the capacity results show the greatest compliance deficiency occurring at Cross Section 9000, where the existing-condition capacity relative to the 1957 Profile is 9,000 cfs. Relative to the O&M Manual freeboard requirement, the existing-condition capacity is limited to 8,000 cfs at Cross Section 9000.

In Figure 4, the 1957 Profile water-surface elevation does not show any impacts associated with the three bridges crossing Elder Creek. The HEC-RAS model for existing conditions shows otherwise; it shows that the bridges do create an impact to the water-surface elevation. It is unrealistic to expect that these bridges with their abutments and piers would cause no backwater effects; thus, the 1957 Profile appears to be inaccurate in these locations and may affect efforts to meet compliance.

The modeling effort shows a significant restriction in the channel below Cross Section 9000 in comparison to the Project's design and as-built conditions (see Appendix F). A considerable difference between the design, as-built, and current condition for Cross Section 7950 exists and results in significant backwater effects upstream resulting in levee encroachment and overtopping. The right bank existing condition for this cross section includes considerable material deposition and riparian growth that severely restricts flow. The aerial photographs in Appendix E show much less vegetation in 1969 than in current conditions. Supplement No. 1 to the USACE's Design Memorandum No. 4 discusses an approved Project addendum that includes enlarging the constricted channel through this section and downstream about 600 feet. It also includes channel clearing to the mouth of the Sacramento River.

Where levee overtopping occurs, lateral weirs were defined in the model to reflect existing conditions and not overestimate encroachment of freeboard conditions on upstream cross sections by trying to contain all flow in the channel. Levee overtopping on the lower 700 to 800 feet of the left bank levee was verified by Ernie Ohlin, manager of the Tehama County Flood Control and Water Conservation District (TCFCWCD 2008). Actions by TCFCWCD during high-water events have included anchoring straw bales to minimize damage. This observation confirms the general results of the hydraulic model. The levee overtopping at

Table 4. Hydraulic Modeling Results for Elder Creek Channel Management Actions

OBJECTIVE: Achieve compliance with either 1: USACE 1957 Profile, or 2: USACE Operation and Maintenance (O&M) Manual 3 ft of freeboard criteria

WSEL = Water-Surface Elevation Frbrd = Freeboard Elevation: NAVD 88 = USED - 0.6 ft
Starting WSEL for modeling from 1957 Profile = 225.8 ft NAVD
Design Flow = 17,000 cfs per 1957 Profile and O&M Manual
1957 Profile WSEL: Interpolated from USACE Drawing 50-10-3334

Compliance Color Scheme

1957 Profile (WSEL - 1957 WSEL):	<=0.0, no encroachment	0.0 - 0.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 3.0	> 3.0
Freeboard (O&M = 3 ft):	3.00+	3.0 - 2.5, raise levee	2.5 - 2.0	2.0 - 1.5	1.5 - 1.0	1.0 - 0.0	<=0.0, levee overtopped

Excavation Location
Complete Vegetation Removal Location

DEFINITIONS OF CHANNEL MANAGMENT ACTIONS

1. Existing Condition: Existing geometry with existing vegetation, channel n = 0.035 to 0.06 and overbank n = 0.045 to 0.20.
2. Arundo Removal: All Arundo removed, channel n = 0.035 to 0.06 and overbank n = 0.045 to 0.15.
3. Vegetation Removal: Complete vegetation removal to Design Conditions, channel n = 0.035 and overbank n = 0.045.
4. Arundo Removal with Excavation: All Arundo removed along with some areas of channel and overbank excavation. Channel n = 0.035, overbank excavation n = 0.045, remaining overbank n = 0.045 to 0.15.
5. Vegetation Removal with Excavation: Complete vegetation removal to Design Conditions along with some areas of channel and overbank excavation. Channel n = 0.035 and overbank n = 0.045.
6. Arundo and Veg Removal with Excavation: All Arundo removed along with some areas of complete vegetation removal, channel and overbank excavation, or a combination of both. Channel n = 0.035, overbank excavation n = 0.045, remaining overbank n = 0.045 to 0.15. Full veg removal channel n = 0.035 and overbank excavation n = 0.045.

River Station/ Cross Section	1957 Profile WSEL (ft)	ACTION 1 Existing Condition WSEL (ft)	WSEL - 1957 WSEL (ft)	L. Levee Frbrd (ft)	R. Levee Frbrd (ft)	ACTION 2 Arundo Removal WSEL (ft)	WSEL - 1957 WSEL (ft)	L. Levee Frbrd (ft)	R. Levee Frbrd (ft)	ACTION 3 Vegetation Removal WSEL (ft)	WSEL - 1957 WSEL (ft)	L. Levee Frbrd (ft)	R. Levee Frbrd (ft)	ACTION 4 Arundo Removal with Excavation WSEL (ft)	WSEL - 1957 WSEL (ft)	L. Levee Frbrd (ft)	R. Levee Frbrd (ft)	ACTION 5 Vegetation Removal with Excavation WSEL (ft)	WSEL - 1957 WSEL (ft)	L. Levee Frbrd (ft)	R. Levee Frbrd (ft)	ACTION 6 Arundo and Veg Removal with Excavation WSEL (ft)	WSEL - 1957 WSEL (ft)	L. Levee Frbrd (ft)	R. Levee Frbrd (ft)	River Station/ Cross Section
29710	274.71	274.80	0.09		4.23	271.93	-2.78		7.10	270.96	-3.75		8.07	272.00	-2.71		7.03	270.99	-3.72		8.04	272.01	-2.70		7.02	29710
29250	273.50	275.50	2.00		2.09	272.97	-0.53		4.62	272.12	-1.38		5.47	273.03	-0.47		4.56	272.14	-1.36		5.45	273.03	-0.47		4.56	29250
28740	272.14	273.73	1.59	1.65	1.84	270.35	-1.79	5.03	5.22	269.95	-2.19	5.43	5.62	270.47	-1.67	4.92	5.11	270.00	-2.14	5.38	5.57	270.48	-1.66	4.90	5.09	28740
28130	270.43	267.81	-2.62	5.36	5.76	267.24	-3.19	5.93	6.33	266.42	-4.01	6.75	7.15	266.77	-3.66	6.40	6.80	266.27	-4.16	6.90	7.30	266.74	-3.69	6.43	6.83	28130
27460	268.55	268.72	0.17	2.99	2.62	267.05	-1.50	4.66	4.29	265.98	-2.57	5.73	5.36	266.38	-2.17	5.33	4.96	265.74	-2.81	5.97	5.60	266.33	-2.22	5.38	5.01	27460
27150	267.67	268.81	1.14	2.30	2.10	267.09	-0.58	4.02	3.82	266.01	-1.66	5.10	4.90	266.41	-1.26	4.70	4.50	265.76	-1.91	5.35	5.15	266.36	-1.31	4.75	4.55	27150
26280	265.22	266.72	1.50	2.14	1.73	264.85	-0.37	4.01	3.60	263.85	-1.37	5.01	4.60	263.35	-1.87	5.51	5.10	263.24	-1.98	5.62	5.21	263.19	-2.03	5.67	5.26	26280
25910	264.17	267.04	2.87	0.54	0.28	265.00	0.83	2.58	2.32	263.84	-0.33	3.74	3.48	263.46	-0.71	4.12	3.86	263.21	-0.96	4.37	4.11	263.29	-0.88	4.29	4.03	25910
25320	262.50	265.03	2.53	0.75	0.13	264.08	1.58	1.70	1.08	263.13	0.63	2.65	2.03	261.88	-0.62	3.90	3.28	262.36	-0.14	3.42	2.80	261.60	-0.90	4.18	3.56	25320
24880	261.25	260.76	-0.49	3.86	3.09	261.04	-0.21	3.58	2.81	260.95	-0.30	3.67	2.90	260.92	-0.33	3.70	2.93	260.69	-0.56	3.93	3.16	260.59	-0.66	4.03	3.26	24880
24250	259.46	258.74	-0.72	4.07	3.37	258.47	-0.99	4.34	3.64	258.09	-1.37	4.72	4.02	259.16	-0.30	3.65	2.95	258.39	-1.07	4.42	3.72	258.53	-0.93	4.29	3.58	24250
23740	258.02	259.55	1.53	1.35	1.47	258.90	0.88	2.00	2.12	258.42	0.40	2.48	2.60	258.82	0.80	2.08	2.20	258.36	0.34	2.54	2.66	258.39	0.37	2.51	2.63	23740
23070	256.13	258.05	1.92	1.72	1.41	257.05	0.92	2.72	2.41	256.64	0.51	3.13	2.82	256.91	0.78	2.86	2.55	256.52	0.39	3.25	2.94	256.57	0.44	3.20	2.89	23070
22890	255.71	257.75	2.04	2.67	3.06	256.56	0.85	3.86	4.25	256.11	0.40	4.31	4.70	256.39	0.68	4.03	4.42	255.98	0.27	4.44	4.83	256.04	0.33	4.38	4.77	22890
22865	255.65	257.91	2.26	3.96	3.78	256.77	1.12	5.10	4.92	256.06	0.41	5.81	5.63	256.60	0.95	5.27	5.09	255.93	0.28	5.94	5.76	255.99	0.34	5.88	5.70	22865
HWY 99W	Bridge																									HWY 99W
22825	255.56	257.38	1.82	5.03	4.82	256.07	0.51	6.34	6.13	255.22	-0.34	7.19	6.98	255.88	0.32	6.53	6.32	255.04	-0.52	7.37	7.16	255.12	-0.44	7.29	7.08	22825
22680	255.22	255.22	0.00	4.01	3.62	255.21	-0.01	4.02	3.63	254.78	-0.44	4.45	4.06	254.90	-0.32	4.33	3.94	254.50	-0.72	4.73	4.34	254.63	-0.59	4.60	4.21	22680
22290	254.31	254.61	0.30	3.15	3.24	254.57	0.26	3.19	3.28	254.19	-0.12	3.57	3.66	254.36	0.05	3.40	3.49	254.01	-0.30	3.75	3.84	254.17	-0.14	3.59	3.68	22290
21660	252.84	253.45	0.61	2.47	2.52	253.13	0.29	2.79	2.85	252.69	-0.15	3.23	3.28	253.02	0.18	2.90	2.95	252.66	-0.18	3.26	3.31	252.92	0.08	3.00	3.05	21660
21100	251.54	251.26	-0.28	3.41	3.39	251.50	-0.04	3.17	3.15	251.11	-0.43	3.56	3.54	251.51	-0.03	3.16	3.14	251.08	-0.46	3.59	3.57	251.66	0.12	3.01	2.99	21100
20480	250.05	249.00	-1.05	3.70	4.27	248.69	-1.36	4.01	4.58	248.67	-1.38	4.03	4.60	248.58	-1.47	4.12	4.69	248.56	-1.49	4.14	4.71	248.58	-1.47	4.12	4.69	20480
19980	248.85	247.48	-1.37	4.11	4.61	247.48	-1.37	4.11	4.61	247.42	-1.43	4.17	4.67	247.16	-1.69	4.43	4.93	247.14	-1.71	4.45	4.95	247.15	-1.70	4.44	4.94	19980
19450	247.57	247.26	-0.31	6.23	2.83	247.05	-0.52	6.44	3.04	246.86	-0.71	6.63	3.23	246.60	-0.97	6.89	3.49	246.46	-1.11	7.03	3.63	246.60	-0.97	6.89	3.49	19450
18800	245.99	245.93	-0.06	2.98	2.73	245.69	-0.30	3.22	2.97	245.46	-0.53	3.45	3.20	244.83	-1.16	4.08	3.83	244.72	-1.27	4.19	3.94	244.83	-1.16	4.08	3.83	18800
18300	244.79	245.66	0.87	1.46	1.82	245.35	0.56	1.77	2.13	245.08	0.29	2.04	2.40	244.09	-0.70	3.03	3.39	243.93	-0.86	3.19	3.55	244.08	-0.71	3.04	3.40	18300
17650	243.22	245.42	2.20	1.15	0.77	245.11	1.89	1.46	1.08	244.87	1.65	1.70	1.32	243.65	0.43	2.92	2.54	243.54	0.32	3.03	2.65	243.65	0.43	2.92	2.54	17650
17200	242.13	245.15	3.02	0.86	0.00	244.80	2.67	1.21	0.35	244.54	2.41	1.47	0.61	243.30	1.17	2.71	1.85	243.18	1.05	2.83	1.97	243.29	1.16	2.72	1.86	17200
16850	241.14	243.61	2.47	2.03	1.31	243.32	2.18	2.32	1.60	243.23	2.09	2.41	1.69	241.75	0.61	3.89	3.17	241.55	0.41	4.09	3.37	241.74	0.60	3.90	3.18	16850
16785	240.96	243.79	2.83	2.98	2.67	243.48	2.52	3.29	2.98	243.31	2.35	3.46	3.15	241.78	0.82	4.99	4.68	241.58	0.62	5.19	4.88	241.77	0.81	5.00	4.69	16785
UPRR	Bridge																									UPRR
16745	240.88	243.15	2.27	3.81	3.63	243.05	2.17	3.91	3.73	242.88	2.00	4.08	3.90	241.11	0.23	5.85	5.67	240.86	-0.02	6.10	5.92	241.09	0.21	5.87	5.69	16745
16650	240.74	243.07	2.33	2.28	0.41	242.94	2.20	2.41	0.54	242.72	1.98	2.63	0.76	241.00	0.26	4.35	2.48	240.73	-0.01	4.62	2.75	240.98	0.24	4.37	2.50	16650
16535	240.57	242.92	2.35	1.85	1.86	242.70	2.13	2.07	2.08	242.60	2.03	2.17	2.18	240.32	-0.25	4.45	4.46	240.28	-0.29	4.49	4.50	240.30	-0.27	4.47	4.48	16535
San Benito Ave	Bridge																									San Benito Ave
16495	240.51	242.74	2.23	2.10	2.06	242.50	1.99	2.34	2.30	242.27	1.76	2.57	2.53	239.89	-0.62	4.95	4.91	239.54	-0.97	5.30	5.26	239.87	-0.64	4.97	4.93	16495
16360	240.33	242.02	1.69	2.59	1.95	241.68	1.35	2.99	2.29	241.32	0.99	3.35	2.65	239.72	-0.61	4.95	4.25	239.43	-0.90	5.24	4.54	239.69	-0.64	4.98	4.28	16360
15690	239.42	241.19	1.77	3.92	0.88	240.73	1.31	4.38	1.34	240.41	0.99	4.70	1.66	238.86	-0.56	6.25	3.21	238.59	-0.83	6.52	3.48	238.83	-0.59	6.28	3.24	15690
15340	238.94	240.28	1.34	4.44	1.25	239.94	1.00	4.78	1.59	239.46	0.52	5.26	2.07	238.53	-0.41	6.19	3.00	238.31	-0.63	6.41	3.22	238.49	-0.45	6.23	3.04	15340
14850	238.28	239.51	1.23	3.99	1.22	239.25	0.97	4.25	1.48	238.77	0.49	4.73	1.96	237.93	-0.35	5.57	2.80	237.79	-0.49	5.71	2.94	237.89	-0.39	5.61	2.84	14850
14170	237.35	237.83	0.48	3.49	2.17	237.78	0.43	3.54	2.22	237.51	0.16	3.81	2.49	236.17	-1.18	5.15	3.83	235.91	-1.44	5.41	4.09	236.09	-1.26	5.23	3.91	14170
13810	236.86	237.44	0.58	2.82	1.65	237.26	0.40	3.00	1.83	236.88	0.02	3.38	2.21	235.97	-0.89	4.29	3.12	235.74	-1.12	4.52	3.35	235.88	-0.98	4.38	3.21	13810
12900	235.63	236.33	0.70	2.09	2.09	236.14	0.51	2.28	2.28	235.71	0.08	2.71	2.71	234.74	-0.89	3.68	3.68	234.48	-1.15	3.94	3.94	234.58	-1.05	3.84	3.84	12900
12460	235.03	236.00	0.97	2.38	1.35	235.79	0.76	2.59	1.56	235.35	0.32	3.03	2.00	234.22	-0.81	4.16	3.13	233.99	-1.04	4.39	3.36	234.03	-1.00	4.35	3.32	12460
11870	234.03	234.92	0.89	1.50	1.78	234.86	0.83	1.56	1.84	234.57	0.54	1.85	2.13	233.18	-0.85	3.24	3.52	233.11	-0.92	3.31	3.59	233.11	-0.92	3.31	3.59	11870
11010	232.54	234.05	1.51	0.54	1.76	233.88	1.34	0.71	1.93	233.57	1.03	1.02	2.24	232.19	-0.35	2.40	3.62	232.09	-0.45	2.50	3.72	232.09	-0.45	2.50	3.72	11010
10220	231.17	233.09	1.92	0.62	0.04	232.82	1.65	0.89	0.31	232.33	1.16	1.38	0.80	231.00	-0.17	2.71	2.13	230.84	-0.33	2.87	2.29	230.84	-0.33	2.87	2.29	10220
9630	230.15	232.41	2.26	0.04	-0.25	232.12	1.97	0.33	0.04	231.69	1.54	0.76	0.47	230.33	0.18	2.12	1.83	230.14	-0.01	2.31	2.02	230.14	-0.01	2.31	2.02	9630
9000	229.06	232.35	3.29	-1.39	-1.77	232.02	2.96	-1.06	-1.44	231.60	2.54	-0.64	-1.02	229.90	0.84	1.06	0.68	229.74	0.68	1.22	0.84	229.74	0.68	1.22	0.84	9000
8730	228.60	231.21	2.61	-0.63	-0.34	231.10	2.50	-0.52	-0.23	230.53	1.93	0.05	0.34	229.27	0.67	1.31	1.60	229.08	0.48	1.51	1.80	229.08	0.48	1.51	1.80	8730
8320	227.79	229.84	2.05	-1.42		229.90	2.11	-1.48		229.26	1.47	-0.84		228.66	0.87	-0.24		228.50	0.71	-0.08		228.50	0.71	-0.08		8320
7950	226.96	225.12	-1.84			225.52	-1.44			226.07	-0.89			227.00	0.04			227.02	0.06			227.02	0.06			7950
7425	225.80	225.80	0.00			225.80	0.00			225.80	0.00			225.80	0.00			225.80	0.00			225.80	0.00			7425

Total Reach Length (ft)	22290	20860	21190	22290	20860	21190	22290	20860	21190	22290	20860	21190	22290	20860	21190	22290	20860	21190
Total Non-Compliant Length (ft)	16730	13860	16470	13760	10230	13670	12080	7810	11970	5970	5870	6450	3990	4300	5260	5350	4850	5340
% Non-Compliant	75%	66%	78%	62%	49%	65%	54%	37%	56%	27%	28%	30%	18%	21%	25%	24%	23%	25%

Non-Compliance Length by Color Scheme (ft)

1750	2260	2300	2260	2420	1760	4230	1380	2720	2980	2660	3260	2700	2510	2770	3850	3060	2850
3720	3400	2360	5190	1740	3830	3000	1450	4810	2590	2030	1390	890	610	1300	1100	610	1300
2210	1790	4420	1770	1820	3330	1900	1270	1300	400	0	1350	400	340	740	400	340	740
4580	1710	2740	2450	950	2160	1760	1920	550	0	790	0	0	450	0	0	450	0
3620	3520	3250	2090	2130	1800	1190	950	2140	0	0	450	0	0	450	0	0	450
850	1180	1400	0	1180	790	0	840	450	0	390	0	0	390	0	0	390	0

Note: Lengths are calculated by River Station as half the distance to the upstream cross section - half the distance to the downstream cross section

Table 5. Elder Creek Capacity Summary for Channel Maintenance

OBJECTIVE: Achieve compliance with either 1: USACE 1957 Profile, or 2: USACE Operation and Maintenance (O&M) Manual 3 ft of freeboard criteria

Summary based upon running HEC-RAS with flows ranging from 8000 cfs to 17000 cfs
WSEL = Water-Surface Elevation , Starting WSEL for modeling from 1957 Profile = 225.8 ft NAVD
Design Flow = 17,000 cfs per 1957 Profile and O&M Manual
1957 Profile WSEL: Interpolated from USACE Drawing 50-10-3334

Capacity Meets Design Flow

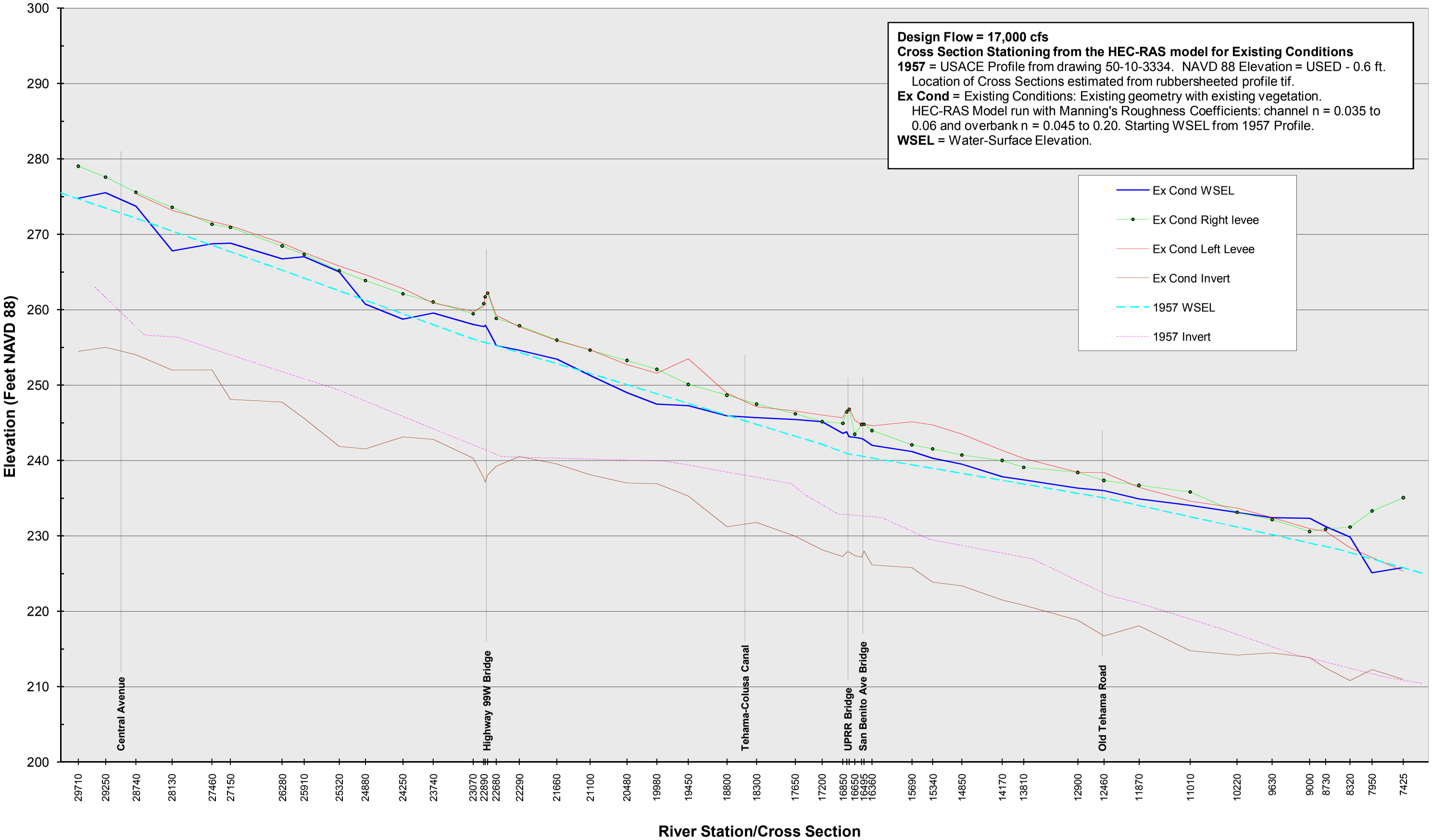
DEFINITIONS OF CHANNEL MANAGMENT ACTIONS

1. Existing Condition: Existing geometry with existing vegetation, channel n = 0.035 to 0.06 and overbank n = 0.045 to 0.20.
2. Arundo Removal: All Arundo removed, channel n = 0.035 to 0.06 and overbank n = 0.045 to 0.15.
3. Vegetation Removal: Complete vegetation removal to Design Conditions, channel n = 0.035 and overbank n = 0.045.
4. Arundo Removal with Excavation: All Arundo removed along with some areas of channel and overbank excavation. Channel n = 0.035, overbank excavation n = 0.045, remaining overbank n = 0.045 to 0.15.
5. Vegetation Removal with Excavation: Complete vegetation removal to Design Conditions along with some areas of channel and overbank excavation. Channel n = 0.035 and overbank n = 0.045.
6. Arundo and Veg Removal with Excavation: All Arundo removed along with some areas of complete vegetation removal, channel and overbank excavation, or a combination of both. Channel n = 0.035, overbank excavation n = 0.045, remaining overbank n = 0.045 to 0.15. Full veg removal channel n = 0.035 and overbank excavation n = 0.045.

	ACTION 1 Existing Condition Capacity Relative to		ACTION 2 Arundo Removal Capacity Relative to		ACTION 3 Vegetation Removal Capacity Relative to		ACTION 4 Arundo Removal with Excavation Capacity Relative to		ACTION 5 Vegetation Removal with Excavation Capacity Relative to		ACTION 6 Arundo and Veg Removal w Excavation Capacity Relative to	
River Station/ Cross Section	1957 Profile WSEL (cfs)	O&M Freeboard (cfs)	1957 Profile WSEL (cfs)	O&M Freeboard (cfs)	1957 Profile WSEL (cfs)	O&M Freeboard (cfs)	1957 Profile WSEL (cfs)	O&M Freeboard (cfs)	1957 Profile WSEL (cfs)	O&M Freeboard (cfs)	1957 Profile WSEL (cfs)	O&M Freeboard (cfs)
29710	16000	17000	17000	17000	17000	17000	17000	17000	17000	17000	17000	17000
29250	14000	15000	17000	17000	17000	17000	17000	17000	17000	17000	17000	17000
28740	14000	14000	17000	17000	17000	17000	17000	17000	17000	17000	17000	17000
28130	17000	17000	17000	17000	17000	17000	17000	17000	17000	17000	17000	17000
27460	16000	16000	17000	17000	17000	17000	17000	17000	17000	17000	17000	17000
27150	15000	15000	17000	17000	17000	17000	17000	17000	17000	17000	17000	17000
26280	14000	14000	17000	17000	17000	17000	17000	17000	17000	17000	17000	17000
25910	12000	13000	15000	15000	17000	17000	17000	17000	17000	17000	17000	17000
25320	13000	12000	14000	13000	15000	15000	17000	17000	17000	16000	17000	17000
24880	17000	17000	17000	16000	17000	16000	17000	16000	17000	17000	17000	17000
24250	17000	17000	17000	17000	17000	17000	17000	16000	17000	17000	17000	17000
23740	14000	14000	15000	14000	16000	15000	15000	15000	16000	15000	16000	15000
23070	13000	14000	14000	15000	15000	16000	15000	16000	16000	16000	15000	16000
22890	13000	16000	15000	17000	15000	17000	15000	17000	16000	17000	16000	17000
22865	12000	17000	14000	17000	15000	17000	14000	17000	16000	17000	16000	17000
HWY 99W	Bridge											
22825	13000	17000	15000	17000	17000	17000	16000	17000	17000	17000	17000	17000
22680	17000	17000	17000	17000	17000	17000	17000	17000	17000	17000	17000	17000
22290	16000	17000	16000	17000	17000	17000	16000	17000	17000	17000	17000	17000
21660	15000	15000	16000	16000	17000	17000	16000	16000	17000	17000	16000	17000
21100	17000	17000	17000	17000	17000	17000	17000	17000	17000	17000	16000	16000
20480	17000	17000	17000	17000	17000	17000	17000	17000	17000	17000	17000	17000
19980	17000	17000	17000	17000	17000	17000	17000	17000	17000	17000	17000	17000
19450	17000	16000	17000	17000	17000	17000	17000	17000	17000	17000	17000	17000
18800	17000	16000	17000	16000	17000	17000	17000	17000	17000	17000	17000	17000
18300	15000	13000	15000	14000	16000	14000	17000	17000	17000	17000	17000	17000
17650	12000	12000	13000	13000	13000	13000	16000	16000	16000	16000	16000	16000
17200	11000	11000	11000	11000	11000	12000	14000	14000	14000	14000	14000	14000
16850	11000	13000	12000	13000	12000	13000	15000	17000	16000	17000	15000	17000
16785	11000	16000	11000	16000	11000	17000	15000	17000	15000	17000	15000	17000
UPRR	Bridge											
16745	12000	17000	12000	17000	12000	17000	16000	17000	17000	17000	16000	17000
16650	12000	11000	12000	11000	12000	11000	16000	15000	17000	16000	16000	15000
16535	11000	14000	12000	14000	12000	14000	17000	17000	17000	17000	17000	17000
San Benito Ave	Bridge											
16495	12000	14000	12000	15000	12000	15000	17000	17000	17000	17000	17000	17000
16360	13000	14000	13000	15000	14000	16000	17000	17000	17000	17000	17000	17000
15690	13000	12000	13000	13000	14000	13000	17000	17000	17000	17000	17000	17000
15340	14000	13000	14000	13000	15000	14000	17000	17000	17000	17000	17000	17000
14850	14000	13000	14000	13000	15000	14000	17000	16000	17000	16000	17000	16000
14170	15000	14000	15000	14000	16000	15000	17000	17000	17000	17000	17000	17000
13810	15000	13000	16000	14000	16000	14000	17000	17000	17000	17000	17000	17000
12900	15000	14000	15000	15000	16000	16000	17000	17000	17000	17000	17000	17000
12460	14000	13000	15000	13000	16000	14000	17000	17000	17000	17000	17000	17000
11870	14000	13000	14000	13000	15000	13000	17000	17000	17000	17000	17000	17000
11010	12000	11000	13000	11000	14000	12000	17000	15000	17000	15000	17000	15000
10220	12000	10000	12000	11000	13000	11000	17000	14000	17000	15000	17000	15000
9630	11000	9000	12000	10000	12000	10000	16000	13000	17000	14000	17000	14000
9000	9000	<8000	10000	<8000	10000	<8000	14000	10000	15000	10000	15000	10000
8730	10000	<8000	11000	9000	11000	9000	14000	11000	15000	11000	15000	11000
8320	11000	<8000	11000	<8000	12000	<8000	13000	<8000	14000	<8000	14000	<8000
7950	15000		15000		15000		15000		15000		15000	
7425	12000		13000		15000		16000		16000		16000	

Total Reach Length (ft)	22290	22290	22290	22290	22290	22290	22290	22290	22290	22290	22290	22290
Length of Reach at 17000 cfs Capacity	4840.0	4870	7820	7510	9500	9220	16060	13920	18040	15100	16680	15030
Min Capacity	9000	<8000	10000	<8000	10000	<8000	13000	<8000	14000	<8000	14000	<8000

Figure 4. Elder Creek Profile Comparison for 1957 Profile and Existing Conditions



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the downstream end of the Project is the result of a reduced channel cross-sectional area that occurs as the levees transition into the adjacent grade.

CHANNEL MANAGEMENT ACTIONS

Channel maintenance can be achieved through two general categories of actions, one being vegetation management and the other sediment removal. This section defines each action listed in Table 6. A general objective is to meet compliance first through vegetation management and then sediment removal as needed. For this analysis, all actions are conceptual to assess their results and impacts.

Table 6. Channel Management Action Summary

Action	Description of Condition
1	Existing condition (no action)
2	All Arundo removed
3	Complete vegetation removal to design conditions
4	All Arundo removed along with some areas of channel and overbank excavation
5	Complete vegetation removal to as-built conditions along with some areas of channel and overbank excavation
6	All Arundo removed along with some areas of complete vegetation removal, channel and overbank excavation, or a combination of both

Vegetation Management

The vegetation management Actions 2 and 3 listed in Table 6 cover complete Arundo removal (non-native species) and complete vegetation removal. The objective of these actions is to remove the non-native vegetation with high roughness coefficients first, and then remove all remaining vegetation as a potential action. These two efforts define the limit to the improvements that are provided by vegetation management.

The effects of these actions were evaluated by modifying the roughness coefficients in the HEC-RAS model for existing conditions, which is Action 1, or no action (existing condition). The roughness coefficients included assigned values as high as 0.20 for Arundo and were decreased depending on how much vegetation remained after removal. Tables of Manning's roughness coefficients for Actions 1, 2, and 3 are listed in Appendix C. Vegetation removal other than Arundo is applied only to the expected inundation area at each cross section. Each cross section is a typical representation of the channel reach extending one-half the distance to the next upstream and downstream cross sections. Any vegetation removal for a cross section to meet compliance will generally apply over that reach. The as-built condition of no vegetation except grass in the overbank is represented by a roughness coefficient of 0.045.

Action 1 represents the existing-condition evaluation while Action 3 represents the removal of all vegetation to reflect the as-built- condition. Arundo has the highest roughness coefficient, and its removal results in the most dramatic reduction in water-surface elevations. Once Arundo is removed, the effects of managing other vegetation types, such as removing all non-native vegetation, non-riparian vegetation, and all vegetation except elderberry, become less significant because their removal results in only small, incremental decreases in roughness.

Plan views in Appendix E show a comparison of aerial photographs taken in 1958, 1969 and 2008. The existing-condition photography is represented by CVFED 2008 imagery and is in NAD 83, Universal Transverse Mercator Zone 10 (UTM 10) coordinates. The 1958 and 1969 aerial slides were taken by the Department for the purposes of land use classification. These slides were photographed and rectified to the same coordinate system as the CVFED 2008 imagery for historical comparison of channel alignment and the extent of vegetation in Elder Creek. Comparing these photographs shows how vegetation and other factors that influence water surface elevations have changed significantly from 1969 to 2008, however, the 2008 vegetation resembles the 1958 pre-project condition. It is apparent from examining the aerial photographs as well as reviewing the USACE's Design Memorandum No. 4 and the O&M Manual that USACE did remove vegetation from Elder Creek throughout the levee reach and downstream to the confluence with the Sacramento River.

Sediment Removal

Sediment removal includes removing built-up sediment deposition and excavating channel and overbanks as needed to meet channel capacity. These actions are evaluated in combination with vegetation management to determine the most effective approach for meeting the Project's compliance criteria. The objective for this action is to minimize sediment removal or excavation.

The typical design and bridge cross sections as shown on Plates III and V in the USACE's Design Memorandum No. 4 and the as-built O&M cross sections were scanned and rectified to NAVD 88 elevations. A comparison of the design and as-built cross sections to the nearest existing-condition cross section is presented in Appendix F. This comparison indicates differences between existing conditions and as-built conditions. The greatest difference in conditions occurs at the downstream end of the Project. At Cross Section 7950, it appears that excavation wasn't done as per the as-built drawings.

In the HEC-RAS program, the user can define channel modification evaluations by cross section. At each cross section, the typical design and as-built cross section became a guide for sizing of the low-flow channel and overbank excavations. The primary objective was to minimize the lowering of the channel invert, thus preserving the overall channel slope and maintaining the channel's dynamic equilibrium. Upon completion of the sediment removal action, a new geometry for the hydraulic model was created (see Appendix G).

Sediment removal, or channel excavation, is an iterative process starting with the least invasive excavation and increasing excavations systematically within the confines of the levees until either compliance or no further reductions in the water surface elevation could be achieved. Channel excavation locations are represented by cross section in Table 4. There is a limit to the benefits of channel excavation, which is not only a function of cross sectional area, velocity, and wetted perimeter, but it is dependent on slope, roughness, and downstream conditions. In some cases, increasing the excavation can result in increased water-surface elevations due to changes in conveyance. The bridges across Elder Creek are controlling structures where excavation improvements are limited.

It is worth noting that USACE removed the vegetation restriction at the lower end of the Project and cleared vegetation to the confluence of the Sacramento River. The resulting

condition from this 1961 work is considered more optimal than what could potentially be done today.

Channel Maintenance Actions Evaluation

The results for the all channel management actions are listed in Table 4, which shows the resulting water-surface elevation (WSEL) for each action and the variance from the 1957 Profile and amount of left and right bank levee freeboard. The color scheme identifies the degree of non-compliance.

Arundo removal, or Action 2, offers some improvement in comparison to the existing condition in terms of total reach length being non-compliant. A 13 percent improvement for compliance with the 1957 profile is achieved, thus reducing non-compliance to 62 percent for the Project. Similarly, improvements of 17 and 13 percent were achieved for the left and right bank levee freeboard, respectively; however, non-compliance was still at 51 percent for the left bank levee freeboard and 63 percent for the right bank levee freeboard. Even with some limited improvement, this action does not provide considerable improvement toward meeting compliance.

Full vegetation removal, or Action 3, offers additional improvements but confines non-Arundo vegetation to narrow areas above the Project's inundation area for the design flow. In many cases, because the inundation area includes some portion of the levee, no vegetation remains. This action offers a 21 percent improvement for compliance with the 1957 Profile in contrast with existing condition; however, 54 percent of the reach length remains non-compliant. Non-compliance for the WSEL ranges from 0.26 to 2.54 feet. Similarly, levee freeboard non-compliance reduces by 28 and 21 percent for the left bank and right bank levee freeboard, respectively; however, 40 percent of the left bank and 55 percent of the right bank still remain in non-compliance. Non-compliance with the O&M freeboard requirement ranges from 0.03 to 4.48 feet. This action provides an incremental improvement, but it clearly does not solve the non-compliance problem. Removing all vegetation clearly indicates that sediment is a major contributing issue for non-compliance.

The results of Actions 2 and 3 show the limits for the effects of vegetation management. The effects of removing the remainder of the non-native vegetation (non-Arundo) and removing all vegetation except elderberries can be implied to fall somewhere between these limits.

The sediment removal action was evaluated with three vegetation management options for the purpose of determining a final action as listed in Table 6. First, Action 4 combines sediment removal with Arundo removal to evaluate the improvements for limited vegetation management. As shown in Table 4, a gray color scheme indicates the cross section where sediment removal, or excavation, was applied. The aerial extent of sediment removal is shown in Appendix B. The change in cross-sectional area for sediment removal is shown in Appendix G. The analysis showed that about 150,000 cubic yards of sediment and overbank material need to be removed. This combined action resulted in a 48 percent reduction in non-compliance with the 1957 Profile, thus, only 27 percent of the reach length remained non-compliant. Similarly, a 37 and 45 percent improvement was achieved for the left and right bank levee freeboard, respectively; however, non-compliance still remained at 31 percent for both the left bank and right bank levee freeboard.

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Next, Action 5 combines sediment removal with the full vegetation removal action at all cross sections. Table 4 lists the cross sections where vegetation and sediment removal occur. This action results in removing 150,000 cubic yards of sediment. This combined action resulted in a 57 percent reduction in non-compliance with the 1957 Profile, thus, only 18 percent of the reach length remained non-compliant. Similarly, a 45 and 51 percent reduction in levee freeboard non-compliance was achieved for the left bank and right bank, respectively; however, non compliance sill remained at 23 and 25 percent for the left bank and right bank levee freeboard, respectively. The excavated sediment volume is 150,000 cubic yards.

Finally, Action 6 combines Arundo removal with sediment and full vegetation removal applied only at needed cross sections. Table 4 lists the cross sections where vegetation and sediment removal occur. The aerial extent of both vegetation and sediment removal is shown in Appendix B. Appendix G shows the cross sections and their excavated areas for this action. This action results in removing 21 acres of riparian vegetation and 150,000 cubic yards of sediment. This combined action resulted in a 51 percent reduction in non-compliance with the 1957 Profile, thus, only 24 percent of the reach length remained non-compliant. Similarly, a 42 and 50 percent reduction in levee freeboard non-compliance was achieved for the left bank and right bank, respectively; however, non compliance sill remained at 26 percent for both the left bank and right bank levee freeboard.

The modeling results show that all of the actions alone cannot fully met compliance for the entire project. For some cross sections, these actions result in non-compliance by 0.5 feet or less. This need for an additional 0.5 feet of levee height to meet the O&M Manual freeboard requirement could be accomplished through levee raising. A primary assumption was made that adding 0.5 feet would not be a significant issue for the levee geometry where the levee would need to be rebuilt to accommodate this height and meeting levee geometry and integrity standards. However, it was outside the scope of the effort to assess the geometry of the levee as well as the structural integrity of the levee for raising the levee height by this nominal amount. Raising the levee height reduces the need for additional excavation.

With minimal levee raising as an included action, the amount of non-compliance is further reduced as shown by the summary of channel management actions listed in Table 7. The table shows cross sections meeting compliance, needing levee raising to meet compliance, or lacking compliance. When including this minimal levee raise, the compliance for Actions 5 and 6 increases to 91 percent for the Project, thus leaving 9 percent, or 2,030 feet, of the Project in non-compliance. The trade-off with minimal levee raising is the limited amount of complete vegetation removal within the Project in contrast to Action 5 where mitigation for vegetation removal will be required.

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Table 7. Elder Creek Channel Management Summary

OBJECTIVE: Achieve compliance with either 1: USACE 1957 Profile, or 2: USACE Operation and Maintenance (O&M) Manual 3 ft of freeboard criteria

WSEL = Water-Surface Elevation Frbrd = Freeboard Elevation: NAVD 88 = USED - 0.6 ft
Starting WSEL for modeling from 1957 Profile = 225.8 ft NAVD
Design Flow = 17,000 cfs per 1957 Profile and O&M Manual
1957 Profile WSEL: Interpolated from USACE Drawing 50-10-3334

Compliance Color Scheme

Achieves compliance with the 1957 Profile or O&M Freeboard	Achieve compliance by raising one or both levees up to 0.5 feet	Not Compliant

Excavation Location
Complete Vegetation Removal Location

DEFINITIONS OF CHANNEL MANAGMENT ACTIONS

1. **Existing Condition: Existing geometry with existing vegetation, channel n = 0.035 to 0.06 and overbank n = 0.045 to 0.20.**
2. **Arundo Removal: All Arundo removed, channel n = 0.035 to 0.06 and overbank n = 0.045 to 0.15.**
3. **Vegetation Removal: Complete vegetation removal to Design Conditions, channel n = 0.035 and overbank n = 0.045.**
4. **Arundo Removal with Excavation: All Arundo removed along with some areas of channel and overbank excavation. Channel n = 0.035, overbank excavation n = 0.045, remaining overbank n = 0.045 to 0.15.**
5. **Vegetation Removal with Excavation: Complete vegetation removal to Design Conditions along with some areas of channel and overbank excavation. Channel n = 0.035 and overbank n = 0.045.**
6. **Arundo and Veg Removal with Excavation: All Arundo removed along with some areas of complete vegetation removal, channel and overbank excavation, or a combination of both. Channel n = 0.035, overbank excavation n = 0.045, remaining overbank n = 0.045 to 0.15. Full veg removal channel n = 0.035 and overbank excavation n = 0.045.**

River Station/ Cross Section	ACTION 1 Existing Condition	ACTION 2 Arundo Removal	ACTION 3 Vegetation Removal	ACTION 4 Arundo Removal with Excavation	ACTION 5 Vegetation Removal with Excavation	ACTION 6 Arundo and Veg Removal with Excavation	River Station/ Cross Section
29710	Meets O&M Freeboard	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	29710
29250	Not Compliant	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	29250
28740	Not Compliant	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	28740
28130	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	28130
27460	Raise Both Levees	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	27460
27150	Not Compliant	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	27150
26280	Not Compliant	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	26280
25910	Not Compliant	Not Compliant	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	25910
25320	Not Compliant	Not Compliant	Not Compliant	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	25320
24880	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	24880
24250	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	24250
23740	Not Compliant	Not Compliant	Not Compliant	Not Compliant	Raise Both Levees	Raise Both Levees	23740
23070	Not Compliant	Not Compliant	Raise Right Levee	Raise Both Levees	Raise Right Levee	Raise Right Levee	23070
22890	Raise Left Levee	Not Compliant	Meets O&M Freeboard	Meets O&M Freeboard	Meets O&M Freeboard	Meets O&M Freeboard	22890
22865	Meets O&M Freeboard	Not Compliant	Meets O&M Freeboard	Meets O&M Freeboard	Meets O&M Freeboard	Meets O&M Freeboard	22865
HWY 99W Bridge							HWY 99W Bridge
22825	Meets O&M Freeboard	Not Compliant	Meets 1957 Profile	Meets O&M Freeboard	Meets 1957 Profile	Meets 1957 Profile	22825
22680	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	22680
22290	Meets O&M Freeboard	Not Compliant	Meets 1957 Profile	Meets O&M Freeboard	Meets 1957 Profile	Meets 1957 Profile	22290
21660	Not Compliant	Not Compliant	Meets 1957 Profile	Raise Both Levees	Meets 1957 Profile	Meets O&M Freeboard	21660
21100	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	Raise Right Levee	21100
20480	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	20480
19980	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	19980
19450	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	19450
18800	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	18800
18300	Not Compliant	Not Compliant	Not Compliant	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	18300
17650	Not Compliant	Not Compliant	Not Compliant	Raise Both Levees	Raise Right Levee	Raise Both Levees	17650
17200	Not Compliant	Not Compliant	Not Compliant	Not Compliant	Not Compliant	Not Compliant	17200
16850	Not Compliant	Not Compliant	Not Compliant	Meets O&M Freeboard	Meets O&M Freeboard	Meets O&M Freeboard	16850
16785	Raise Both Levees	Not Compliant	Meets O&M Freeboard	Meets O&M Freeboard	Meets O&M Freeboard	Meets O&M Freeboard	16785
UPRR Bridge							UPRR Bridge
16745	Meets O&M Freeboard	Not Compliant	Meets O&M Freeboard	Meets O&M Freeboard	Meets 1957 Profile	Meets O&M Freeboard	16745
16650	Not Compliant	Not Compliant	Not Compliant	Not Compliant	Meets 1957 Profile	Raise Right Levee	16650
16535	Not Compliant	Not Compliant	Not Compliant	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	16535
San Benito Ave Bridge							San Benito Ave Bridge
16495	Not Compliant	Not Compliant	Raise Both Levees	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	16495
16360	Not Compliant	Not Compliant	Raise Right Levee	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	16360
15690	Not Compliant	Not Compliant	Not Compliant	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	15690
15340	Not Compliant	Not Compliant	Not Compliant	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	15340
14850	Not Compliant	Not Compliant	Not Compliant	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	14850
14170	Not Compliant	Not Compliant	Not Compliant	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	14170
13810	Not Compliant	Not Compliant	Not Compliant	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	13810
12900	Not Compliant	Not Compliant	Raise Both Levees	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	12900
12460	Not Compliant	Not Compliant	Not Compliant	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	12460
11870	Not Compliant	Not Compliant	Not Compliant	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	11870
11010	Not Compliant	Not Compliant	Not Compliant	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	11010
10220	Not Compliant	Not Compliant	Not Compliant	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	10220
9630	Not Compliant	Not Compliant	Not Compliant	Not Compliant	Meets 1957 Profile	Meets 1957 Profile	9630
9000	Not Compliant	Not Compliant	Not Compliant	Not Compliant	Not Compliant	Not Compliant	9000
8730	Not Compliant	Not Compliant	Not Compliant	Not Compliant	Not Compliant	Not Compliant	8730
8320	Not Compliant	Not Compliant	Not Compliant	Not Compliant	Not Compliant	Not Compliant	8320
7950	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	Not Compliant	Not Compliant	Not Compliant	7950
7425	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	Meets 1957 Profile	7425

Total Reach Length (ft)	22290	22290	22290	22290	22290	22290	**Total Reach Length (ft)**
Compliant Length (ft)	6490	9330	10460	17380	18690	18000	**Compliant Length (ft)**
Left Levee Raise Length (ft)	650	600	760	1570	590	1140	**Left Levee Raise Length (ft)**
Right Levee Raise Length (ft)	540	650	1590	1570	1570	2260	**Right Levee Raise Length (ft)**
Not Compliant Length (ft)	15160	12310	10240	3330	2030	2030	**Not Compliant Length (ft)**

Note: Lengths are calculated by River Station as half the distance to the upstream cross section - half the distance to the downstream cross section

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VEGETATION MANAGEMENT METHODS

There are many methods of managing vegetation that are suited to specific situations, like Elder Creek. The management for a particular site depends on the long-term objectives, site characteristics, environmental considerations, landowner and public concerns, adjacent land uses, and availability of resources. There are two main management strategies available to DWR in Elder Creek, mechanical and chemical.

Mechanical Control

Mechanical control uses physical processes to disrupt a plant's life cycle, which may include cutting, mowing, masticating, and excavation. It's often used in areas where chemical control is not appropriate because of:

- environmental considerations such as water courses
- non target species that are present
- weeds that are too advanced or tall for chemical control
- public relations issues such as where burn-out is undesirable or proximity of residential areas/sites

Chemical Control

Chemical control includes the use of various herbicide methods to provide selective or complete control of vegetation. Herbicides are used to treat stumps left after mowing or slashing to reduce suckering. This form of treatment is the least expensive form of vegetation control and provides the least chance of worker injury. Herbicides are a popular method of vegetation management for the following reasons:

- control can be selective or non selective depending on the product and application technique is used
- selective use may improve habitat for wildlife and promote the growth of compatible species
- less re-sprouting of target species occurs than with other brush control techniques
- results in little or no disturbance of the soil
- facilitates long term control as compared to other methods

Improper use of herbicides can pose serious environmental problems. Potential effects on fish or wildlife or contamination of domestic water can occur if improper equipment or application techniques are used. There are also public relations issues about the use of herbicides in the environment. The use of herbicides is a privilege, not a guarantee. Applicators must be certified and conduct their business according to prescribed standards. In order to select the most effective herbicide for a given situation, applicators must understand not only the biology of the plant but how the herbicide controls the plant. The following section discusses the various factors of herbicides.

Herbicides are classified according to selectivity, mode of action, timing of application, and residual effectiveness. Herbicides control weeds selectively or non-selectively. Selective herbicides only control the targeted weed species where as non-selective herbicides control all plants depending on the product chosen. The mode of action is the method by which the herbicide controls the targeted weed species, either by contact or systemic. Contact herbicides kill only the part of the plant that the herbicide comes into contact. There is relatively little movement of the herbicide within the plant. Contact herbicides are

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effective in controlling annuals but are not effective in controlling perennials as only the top portion of the plant is "burned off" while the underground root structure is not affected. On the other hand, systemic herbicides move (translocate) from the place of contact (above or below ground) throughout the plant. Effects may not show up for several days or weeks although the plant has stopped growing. Too much herbicide on the leaves may kill the leaf cells too quickly and prevent translocation to the site of action in the plant.

Herbicides are also classified according to when they are applied (timing of application). Pre-plant herbicides are applied to the soil prior to seeding or transplanting and are usually incorporated into the soil. Pre-emergent herbicides are applied after seeding of the crop but prior to weed or crop emergence. Pre-emergence may be to prior to germination of either the weed or the crop. Post-emergent herbicides are applied after the crop and the weeds have emerged. These herbicides also control established weed species.

An herbicide's residual effectiveness refers to how long it remains active in the soil to control weeds over time. Residual herbicides can remain active for several weeks to several years. Non-residual herbicides are quickly broken down in the soil and will not affect weeds germinating after application. They are broken down by microorganisms, sunlight or chemical degradation.

There are special considerations for residual herbicides. Residual herbicides can remain in the soil for a long period of time. This makes them more susceptible to move off site through leaching and erosion. Problems that can develop are damage to trees and shrubs when roots are either in or grow into the treatment area. A buffer zone between the application site and nearby vegetation should be listed on the label. If not, the buffer should be 1/2 times the height of the vegetation. Groundwater can be contaminated if the treatment site is located in an area with a high water table and coarse gravelly soil. Certain desirable plant species will be suppressed by residual herbicides. This limits future use of the area, therefore present use of the site must coincide with the length of time that the residual herbicide is active. Persistence can vary with product, rate, formulation, concentration, weather and soil conditions. Steep slopes should be avoided as this leads to erosion and runoff of the herbicide product. This can be a problem when looking at treatment areas next to roadsides, railways, brooks, and ponds. When using a residual herbicide, a site specific plan is needed to ensure no adverse impact to the environment. The site specific plan should include: soil type, structure, and pH; proximity to water bodies; site drainage patterns; and surrounding land ownership/use.

Vegetative Removal

The channel management actions range from removing all Arundo to limited or complete removal of all vegetation within the stream and along the banks.

Non-Native Species Removal

Arundo will probably require a combination of two methods to eliminate it. First, a chemical spray or hand application of a common herbicide, such as Polaris/Habitat, to kill the plant and then mechanical removal of the stalks and possibly the root wad. Removing the biomass to increase flow efficiency in the channel is a requirement, thus the stalks would primarily have to be cut by hand due to the proximity of elderberries. Chainsaws can be used on some stalks, once the clump has been checked for native species.

The Department attempted this on a small scale through the aforementioned Arundo Removal Project. The stalks were cut first using hand-tools, and then the herbicide was applied to the tips of the cut stalks, which is a time consuming process. Sutter Yard's Gerald Russell, who was the Arundo Removal Project's herbicide applicator, found that if the application was delayed too long (in terms of minutes, not hours or days), then the hydraulic pressure from the roots wouldn't allow the herbicide to be absorbed. The delay between cutting and application was caused by the need to meet the required minimum distance between the point of application and unprotected persons in the vicinity, such as the California Conservation Corps (CCC) crews. Russell came up with a variation of that method in which the stalks were cut and removed. Then, once the minimum distance was attained, Russell would re-cut the stalks an inch or two below the previous cut to freshly expose the plant. This variation met with limited success. However, for many of the treated Arundo clumps, re-sprouting from the roots occurred, indicating that the herbicide failed to kill the entire plant. One treated clump was observed three months after treatment to have sprouted and returned to roughly 60 percent of its former height.

According to Kelly Moroney of USFWS, simple foliar application to the plant in the late summer to early fall is the most effective means for killing the plant, including the roots. It is during this period that the plant is drawing in its resources in preparation for dormancy. The herbicide is drawn in rapidly and systemically kills the plant, including the roots. Because Elder Creek is typically dry from July through October, this may facilitate the plant's dormancy, and the lack of flow eliminates the potential for herbicide application impacts to aquatic species.

There are several methods to consider for removing the dead Arundo skeletons. The first method is to leave the dead Arundo in place to deteriorate naturally. This method does not clear the channel for hydraulic efficiency. The second method is to burn the dead stems and leaves 30 days after they have been sprayed with herbicides. This removes the above ground dead biomass and makes further spraying easier, if it becomes necessary. Burning has the potential for air quality impacts and inadvertent spread of fire; however, the root wads will remain. A third method could involve mechanical shredding and chipping of the skeletons and above-ground root wads, also known as mastication, after the tops have died.

Disposal of the masticated biomass is problematic. There are a few options that need investigation. One option is to allow the biomass to remain within the channel to be washed away in the seasonal rains when the creek rises. The next option could be considered a version of the first method of allowing natural disposal (deterioration, inundation) to occur. Mastication would rid the channel of hard points (i.e., root wads) and require no transportation of the material. However, this option may meet with some resistance from regulatory agencies because of the large input of organic debris, possibly still bearing some herbicide traces, into the Sacramento River.

The second option is to find a disposal site for the organic debris, treating it like any other material requiring disposal. DWR has not investigated any disposal sites in the area, and most of the surrounding land use, primarily urban and orchards, would exclude disposing the material nearby. Transportation of the material to the disposal site (and subsequent return trips) will also need to be considered. Another disposal option is to investigate the biomass market. There several biomass companies using biomass for fuel synthesis or power generation (for example Wheelabrator). The biomass energy industry in California

currently consists of 29 operating power plants located throughout the state, representing a total of 600 MW of generating capacity. As for biofuels, there are no concrete figures readily available at this time, however, a large number of companies, including some municipalities, produce biofuels and biodiesels.

In some areas, the understory is dominated by the invasive Himalayan blackberry. This invasive, non-native plant can form large impenetrable thickets reaching heights of 10 feet and extents of 75-feet across. All along Elder Creek, extensive areas of Himalayan blackberry exist along the middle to upper bank. These thickets were not mapped at the time of the field visits. While these thickets do have wildlife value, they also choke out native plants, including the native blackberry and the elderberry.

Removing Himalayan blackberry would require herbicide application to kill the plants as well as mechanical removal of the canes (stems). Disposal of the debris would probably require burning because it is dangerous to handle by workers for any length of time.

RESOURCE IMPACTS, REQUIRMENTS, AND MITIGATION

The number and types of affected species provides the basis for evaluating the potential impacts, permits and requirement, and need for mitigation.

Affected Species

Elderberries

A large number of elderberries exist within the Project, totaling 676 distinct shrubs with stems greater than one inch in diameter at the base. Any construction within 100' of an elderberry would need the approval of USFWS and require various protection measures, including a 100-foot protection zone, orange "ESA" fencing, signage, and daily monitoring.

Of these 676, there are 518 elderberry shrubs, or 77 percent, within the inundation zone of the Project's design capacity for the Arundo removal with sediment removal and limited full vegetation removal action. If full vegetation removal through the Project is need, then all 518 elderberry shrubs would be impacted. Otherwise, the area proposed for excavation includes removing 82 elderberries, or 12 percent of the total with the Project. The area proposed for limited, full vegetation removal includes removing 226 elderberries, or 33 percent of the total within the Project. Altogether, the combined areas of excavation and vegetation removal for this action would adversely affect 308 elderberries, or 46 percent of the total with the Project and would require mitigation in the form of transplanting.

The USFWS protocols (July 9, 1999) require the transplantation of each and every elderberry shrub that will be adversely affected. In addition, every elderberry adversely impacted would require additional plantings of new elderberries in a ratio of 1:2 in an established conservation area of at least 1800 sq. ft. Monthly monitoring of the conservation area for transplant survival would be necessary to demonstrate compliance, which is usually recommended for a period last 3 to 5 years.

Regardless of the care taken, some limited environmental impacts can be expected. One potential adverse impact is accidental damage to elderberries. The problem is that the Arundo has overgrown many elderberries, rendering the elderberry virtually invisible; thus,

accidental damage to the shrub might occur. To mitigate for such an event, a formal incidental take consultation with USFWS would have to be completed.

Native Riparian Vegetation
Riparian vegetation in general is protected by CDFG. Any removal of riparian vegetation requires a Lake and Streambed Alteration Agreement (CDFG Code, 1600 et seq.). Native riparian vegetation is present all along the stream corridor of Elder Creek.

There are some number of oaks, walnuts, and cottonwoods within the Project that have not yet been mapped. There are also large stringers of willows along the stream banks. These trees are typical of native riparian systems in California. Within the Project, cottonwoods (*Populus fremontii*) are relatively rare. Numerous walnuts and oaks dominate the woody vegetation. Most of the oaks are probably the valley oak *Quercus lobata*, one of the most common oak species associated with riparian areas. The larger willows, such as the Goodding's willow, were found primarily from the channel edge up to the middle of the overbank. The sandbar willow seems to dominate some areas along the stream edges, but most willow stands are suffering from encroachment from aggressive Arundo stands.

Raptor nesting
Removal of the riparian vegetation would probably require the removal of large, mature trees found in many of the riparian areas of Elder Creek. The removal of these types of trees could adversely impact the potential nesting and foraging habitats of the bald eagle and the Swainson's hawk, two species known to occur in the general area. Both species prefer large trees for nesting, the bald eagle near open fish-bearing water and the Swainson's hawk near open land near riparian areas. Both of these conditions exist along Elder Creek.

Yellow-legged and red-legged frogs, Western pond turtle
Suitable aquatic and semi-aquatic habitat for the northwestern pond turtle (Federal Species of Concern and state Species of Special Concern), the foothill yellow-legged frog (Federal Species of Concern and state Species of Special Concern), and the California red-legged frog (Federal Threatened and state Species of Special Concern) does exist along Elder Creek. There is a high likelihood of the presence of the northwestern pond turtle and the foothill yellow-legged frog, since both of these species are widespread in distribution and have been found in many of the drainages of the Sacramento Valley. Surveys could be required by USFWS. The California red-legged frog has a lower possibility of occurrence, with present populations disjunct and isolated in the higher elevations of the Sierra Nevada, Klamath, and Coastal mountain ranges. However, suitable habitat could exist within the Project, thus surveys to current protocols could be required by USFWS. Removal of vegetation and excavation of sediment from the channel and floodplain would adversely affect habitat for all three of these species and increase habitat for non-native aquatic wildlife and fish species that prey on or compete with these species (for example the bullfrog).

Since a detailed vegetation survey has not yet been completed, a preliminary GIS analysis using the NAIP 2010 aerial imagery indicates that quite a bit of the non-Arundo, non-elderberry vegetation will be adversely impacted in the stream riparian corridor by excavation or vegetation removal. The area of the design flow inundation (17,000 cfs) shows a large amount of streamside and bank vegetation that would be inundated under those high-flow conditions.

The proposed amount of riparian vegetation along Elder Creek to be removed could be considered a significant impact by CDFG. Under the California Environmental Quality Act, Public Resources Code (CEQA), the definition of project requiring the preparation of an Environmental Impact Report (EIR) is: any action directly undertaken by a public agency (state, local, special district); may cause a significant impact: not described in a Statutory Exemption; not described in a Categorical Exemption; not covered adequately in a previous environmental impact report (EIR), Program EIR, or Master EIR; or no fair argument exists for the potential of a significant impact

The proposed removal of the riparian vegetation alone would be enough to trigger the preparation of an EIR.

Impacts

The environmental impacts to native vegetation will be significant and adverse. The proposal to excavate the channel and clear the riparian vegetation for Project maintenance could have potentially significant adverse impacts to a large variety of plants, fish and wildlife, including special status species.

Numerous elderberry shrubs, habitat for a federally listed threatened species, will require transplantation by certified nursery personnel or other professionals accepted by USFWS. Survival rates of the transplanted plants vary but are, on the whole, good. The primary issue of concern to USFWS is the large number of plants affected and all suitable habitats. To date, none of these shrubs have been surveyed to USFWS protocols. The impact of this action would probably trigger a formal consultation with USFWS.

Direct effects of removing the native riparian vegetation would translate into removal of habitats supporting populations of wildlife species in proportion to their value as habitat for those species. Oak mast is an important food source for many wildlife species.

Another direct impact would be the removal of streamside vegetation that shade the water surface, and thus reduce water temperature. These refugia shelter anadromous fish in the mainstem Sacramento River. Elder Creek has been reported to harbor anadromous fish when water levels are sufficient. The impact of streamside vegetation removal could trigger a formal consultation with the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NOAA Fisheries) if it decided that the creek could be potential but temporary habitat.

Partial and temporary direct impacts could occur outside the levees of the Project and include some loss and disturbance to vegetation. These impacts would occur from staging, spoils deposition, access and movement of equipment, and other factors associated with construction for the maintenance actions.

Environmental Assessments and Permit Needed

The environmental review to date has focused only on mapping Arundo and elderberry. As the maintenance actions are further evaluated for implementation, environmental assessments, consultation, and permitting will be needed. A preliminary list of these assessments and permitting processes are listed in Table 8.

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Table 8. Environmental Assessments and Permitting Needs

Species	**Permit Action Necessary**	**Agency**
Oncorhynchus tshawytscha Central Valley Chinook salmon, winter run	Formal consultation	NOAA Fisheries, CDFG
Oncorhynchus tshawytscha, Central Valley Chinook salmon spring run	Formal consultation	NOAA Fisheries, CDFG
Onchorynchus mykiss Central Valley steelhead	Formal consultation	NOAA Fisheries
Buteo swainsoni Swainson's hawk	Formal consultation, nest tree survey	CDFG
Haliaeetus leucocephalus Bald eagle	Formal consultation, nest tree survey	USFWS, CDFG
Thamnophis gigas Giant garter snake	Formal consultation, habitat & presence/absence survey	USFWS
Rana aurora draytonii California red-legged frog	Formal consultation, habitat & presence/absence survey	USFWS
Desmocerus californicus dimorphus Valley elderberry longhorn beetle	Formal consultation, habitat & presence/absence survey	USFWS

Mitigation

The loss of native riparian vegetation, as yet not quantified, would require in-kind mitigation as part of mitigation for riparian vegetation loss. DFM recently cited riparian mitigation costs in excess of $25,000 per acre (D. Bogener, per. comm.). Additional costs associated with Endangered Species Act (ESA) are also likely.

The proposed channel maintenance actions in this report for Elder Creek could affect a variety of special status species, many of which would require special-status surveys and formal consultations with California Department of Fish and Game, USFWS, and NOAA Fisheries. These consultations would be required if the presence of a listed species within the Project is known, or if surveys indicate that a listed species is present. If habitat suitable for a listed species is found within the Project, and the Project lies within the known range of a species, then the presence of a listed species is assumed by the regulatory agency unless proved otherwise, thus requiring a consultation. Additionally, a CEQA/NEPA document would have to be developed for submission to the state and federal governments for approval. Even after consultation, there is no guarantee that any of these regulatory agencies would agree to any project actions that could adversely affect special-status species.

Potential mitigation sites identified through this effort are shown in Appendix B. The mitigation sites cover impacts to riparian vegetation and elderberry and include 3.5 acres specifically for riparian vegetation mitigation, 3.8 acres specifically for elderberry mitigation,

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and 2.9 acres for both riparian vegetation and elderberry mitigation. Additional investigation and consultation is need to determine the sufficiency of these sites and the mitigation needs for the preferred channel management action.

CONCLUSIONS

The hydraulic modeling results for existing conditions show that Elder Creek cannot convey the Project's design flow of 17,000 cfs in accordance with the compliance criteria of either the 1957 Profile or the O&M Manual freeboard requirement. A series of channel management actions with increasing complexity and severity were modeled to evaluate the most effective approach to meeting compliance.

The evaluation shows that progress towards meeting the compliance criteria can be achieved through complete Arundo removal and limited full vegetation removal and sediment removal action (Action 6). Action 6 includes removing 18.3 acres of Arundo, 21 acres of riparian vegetation, and 150,000 cubic yards of sediment. Furthermore, levee raising by no more than 0.5 feet would substantially improve Project compliance without necessarily rebuilding the levees. Additional studies are needed to determine the integrity and geometry of the levees prior to moving forward with this action. This action reduces non-compliance to the downstream most cross sections. The combination of the uncertainty of Sacramento River backwater effects as a boundary condition for modeling and the configuration of the channel are contributors to the degree of non-compliance and levee overtopping.

The vegetation mapping for Arundo and elderberry shows significant presence of each throughout the project. Previous efforts by the Department to remove Arundo were unsuccessful. Any new effort needs improved, less time-consuming methods of spray application and debris removal, all of which needs to be accomplished in late-summer and fall when the channel is dry and the Arundo is preparing for dormancy. The impacts will be significant because of the quantities of riparian vegetation, elderberry, and sediment removal, thus requiring extensive mitigation areas potentially beyond those identified with the Project. The minimal levee raising could reduce the extent of vegetation impacts and mitigation areas need.

RECOMMENDATIONS

This evaluation is based on an un-calibrated, existing-condition hydraulic model. Prior to implementing more detailed designs for channel excavation, vegetation management, and levee raising, we recommend that the Department measure and profile stake a high-water event. A high-water event with a magnitude of between 5,000 to 10,000 cfs at Gerber would improve the representation of channel roughness values. The high flow event measurement must be coupled by instantaneous high water staking every 0.25 miles. This would provide a flow and surface water profile for calibrating the existing condition hydraulic model for the Project, which would also guide the determination of how much vegetation management, sediment removal, and levee raising would need to occur for meeting the compliance criteria.

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APPENDIX B

Elderberry Survey, Vegetation Thinning, and Sediment Removal Maps

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

Elder Creek Channel Rehabilitation Project
Elderberry Survey Maps

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Elderberry 2014
Vegetation Thinning
Sediment Removal

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Department of Water Resources
Division of Flood Management
Flood Maintenance Office

Created by Melanie Powers 9/25/14

SOURCE: Department of Water Resources, 2014

Elder Creek Channel Rehabilitation . 130028.10

Figure B-1

Elderberry Survey, Vegetation Thinning, and Sediment Removal Maps

Elder Creek Channel Rehabilitation Project
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Elderberry 2014
Vegetation Thinning
Sediment Removal

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SOURCE: Department of Water Resources, 2014

Figure B-2
Elderberry Survey, Vegetation Thinning, and Sediment Removal Maps

Elder Creek Channel Rehabilitation Project
Elderberry Survey Maps

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Elderberry 2014
Vegetation Thinning
Sediment Removal

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SOURCE: Department of Water Resources, 2014

Figure B-3
Elderberry Survey, Vegetation Thinning, and Sediment Removal Maps

Elder Creek Channel Rehabilitation Project
Elderberry Survey Maps

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Elderberry 2014
Vegetation Thinning
Sediment Removal

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SOURCE: Department of Water Resources, 2014

Figure B-4
Elderberry Survey, Vegetation Thinning, and Sediment Removal Maps

Elder Creek Channel Rehabilitation Project
Elderberry Survey Maps

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Elderberry 2014
Vegetation Thinning
Sediment Removal

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Figure B-5
Elderberry Survey, Vegetation Thinning, and Sediment Removal Maps

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Elder Creek Channel Rehabilitation Project
Elderberry Survey Maps

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Elderberry 2014
Vegetation Thinning
Sediment Removal

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SOURCE: Department of Water Resources, 2014

Elder Creek Channel Rehabilitation . 130028.10

Figure B-6

Elderberry Survey, Vegetation Thinning, and Sediment Removal Maps

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Elder Creek Channel Rehabilitation Project
Elderberry Survey Maps

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Elderberry 2014
Vegetation Thinning
Sediment Removal

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SOURCE: Department of Water Resources, 2014

Figure B-7
Elderberry Survey, Vegetation Thinning, and Sediment Removal Maps

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Elder Creek Channel Rehabilitation Project
Elderberry Survey Maps

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Elderberry 2014
Vegetation Thinning
Sediment Removal

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Figure B-8
Elderberry Survey, Vegetation Thinning, and Sediment Removal Maps

Elder Creek Channel Rehabilitation Project
Elderberry Survey Maps

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Elderberry 2014
Vegetation Thinning
Sediment Removal

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Figure B-9
Elderberry Survey, Vegetation Thinning, and Sediment Removal Maps

Elder Creek Channel Rehabilitation Project
Elderberry Survey Maps

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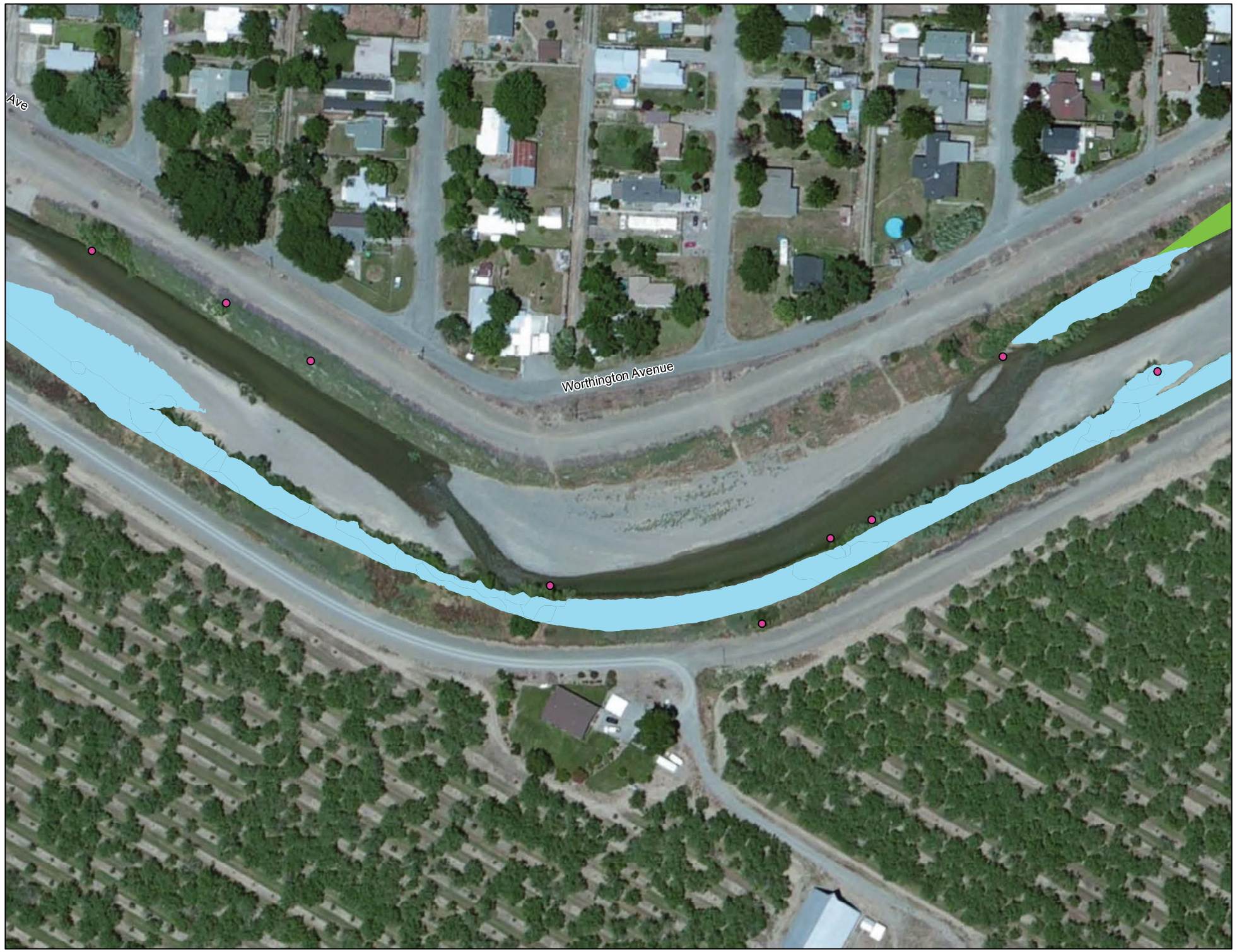

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Elderberry 2014
Vegetation Thinning
Sediment Removal

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Figure B-10
Elderberry Survey, Vegetation Thinning, and Sediment Removal Maps

Elder Creek Channel Rehabilitation Project
Elderberry Survey Maps

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Elderberry 2014
Vegetation Thinning
Sediment Removal

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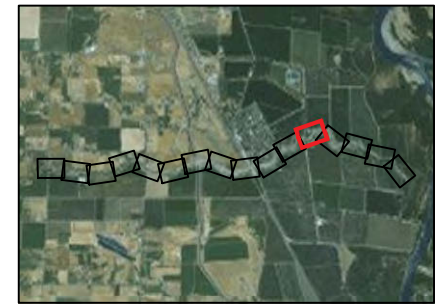
SOURCE: Department of Water Resources, 2014

Figure B-11
Elderberry Survey, Vegetation Thinning, and Sediment Removal Maps

Elder Creek Channel Rehabilitation Project
Elderberry Survey Maps



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Elderberry 2014
Vegetation Thinning
Sediment Removal

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Figure B-12
Elderberry Survey, Vegetation Thinning, and Sediment Removal Maps

Elder Creek Channel Rehabilitation Project
Elderberry Survey Maps

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Elderberry 2014
Vegetation Thinning
Sediment Removal

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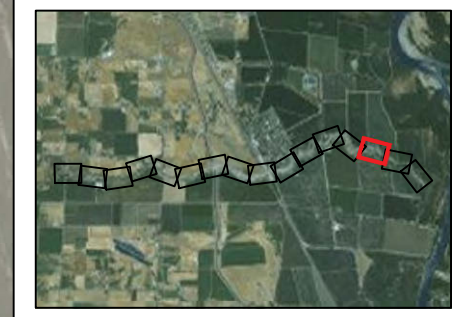
Figure B-13
Elderberry Survey, Vegetation Thinning, and Sediment Removal Maps

Elder Creek Channel Rehabilitation Project
Elderberry Survey Maps



Page 14

Elderberry 2014
Vegetation Thinning
Sediment Removal

0 40 80 160 240 320
Feet

Department of Water Resources
Division of Flood Management
Flood Maintenance Office

Created by Melanie Powers 9/25/14

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

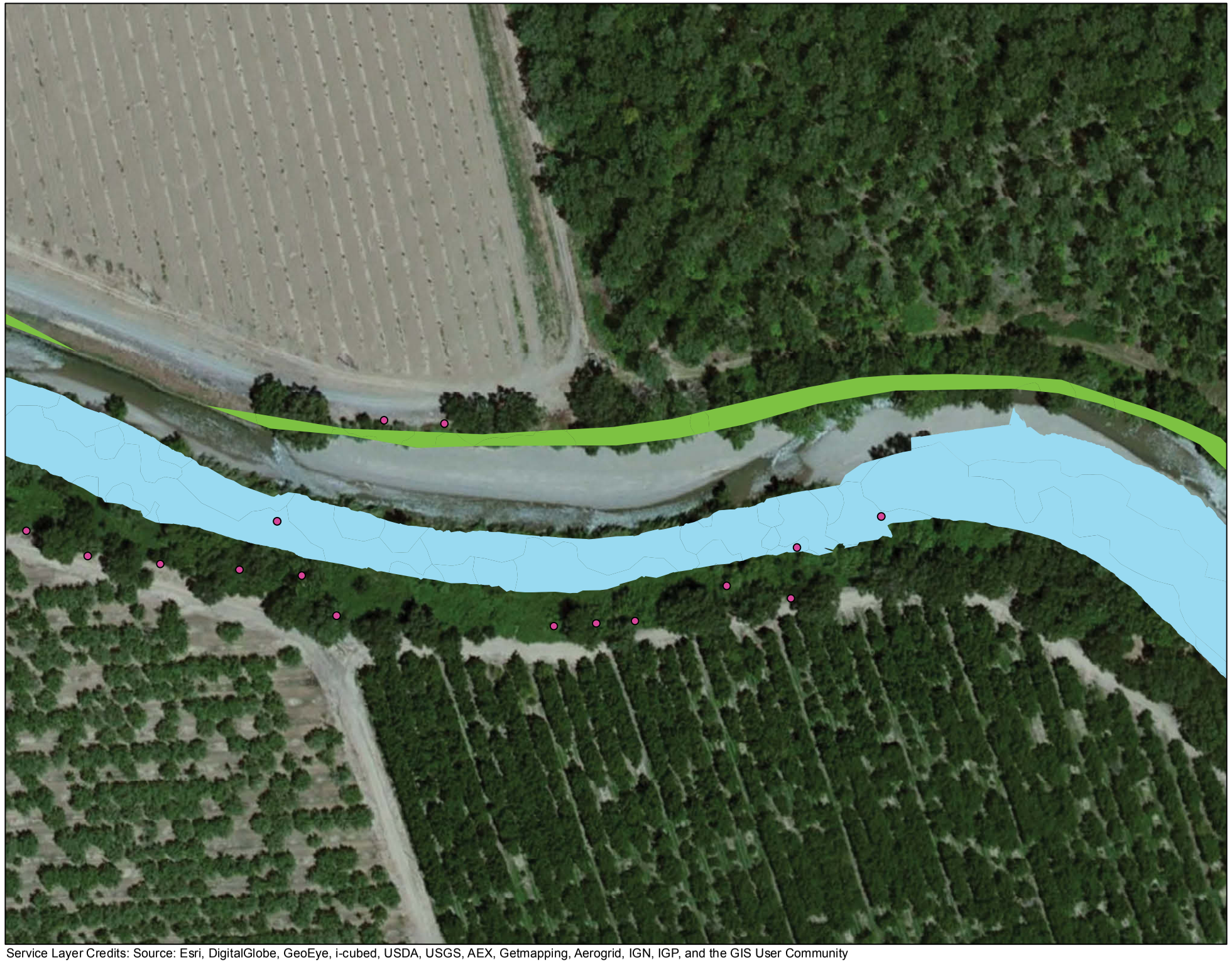
SOURCE: Department of Water Resources, 2014

Elder Creek Channel Rehabilitation . 130028.10

Figure B-14

Elderberry Survey, Vegetation Thinning, and Sediment Removal Maps

Elder Creek Channel Rehabilitation Project
Elderberry Survey Maps



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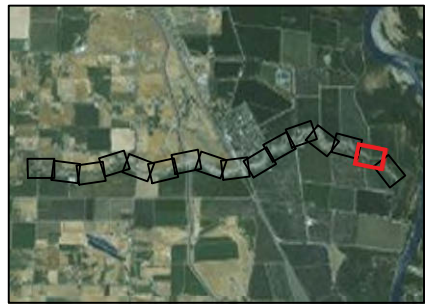


Page 15

Elderberry 2014
Vegetation Thinning
Sediment Removal

0 40 80 160 240 320 Feet

Department of Water Resources
Division of Flood Management
Flood Maintenance Office

Created by Melanie Powers 9/25/14

SOURCE: Department of Water Resources, 2014

Figure B-15
Elderberry Survey, Vegetation Thinning, and Sediment Removal Maps

Elder Creek Channel Rehabilitation Project
Elderberry Survey Maps

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

Page 16

Elderberry 2014
Vegetation Thinning
Sediment Removal

0 40 80 160 240 320
Feet

Department of Water Resources
Division of Flood Management
Flood Maintenance Office

Created by Melanie Powers 9/25/14

SOURCE: Department of Water Resources, 2014

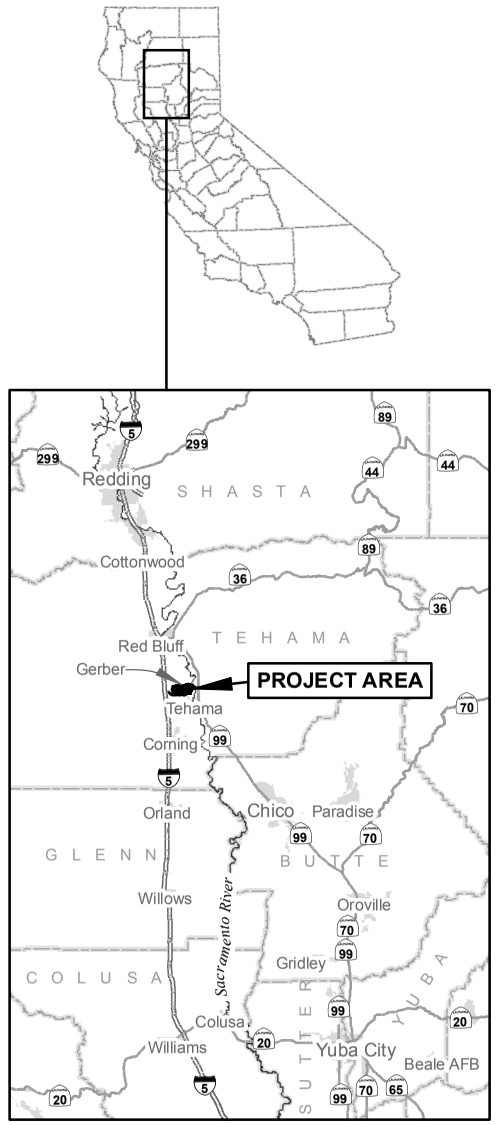
Elder Creek Channel Rehabilitation . 130028.10

Figure B-16

Elderberry Survey, Vegetation Thinning, and Sediment Removal Maps

APPENDIX C

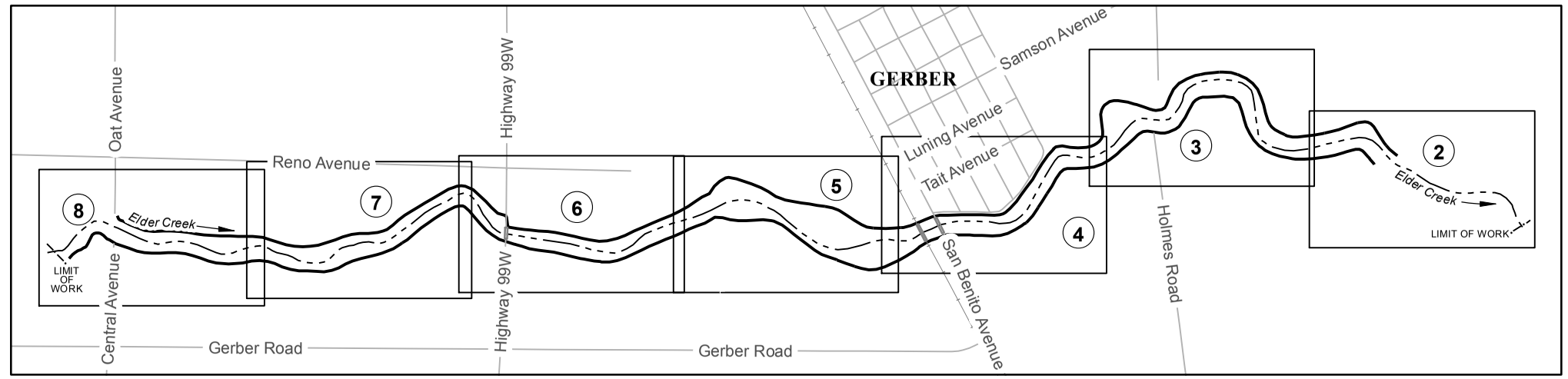
Elder Creek Channel Rehabilitation Project Long-Term Vegetation Management Plan



VICINITY MAP

0 10 20 30 40

Miles



LOCATION MAP - SHEET INDEX

DRAWINGS FOR:

ELDER CREEK CHANNEL REHABILITATION PROJECT
LONG-TERM VEGETATION MANAGEMENT PLAN

PREPARED FOR:

DEPARTMENT OF WATER RESOURCES
DIVISION OF FLOOD MANAGEMENT
FLOOD MAINTENANCE OFFICE

General Notes

This Elder Creek Long-term Vegetation Management Plan (Plan) represents an approach to future channel maintenance for the Elder Creek Flood Control Project, a component of the United States Army Corps of Engineers' (USACE) Sacramento River and Major and Minor Tributaries Project. The approach and layout provided in this Plan are required for vegetation management after completion of the Elder Creek Channel Rehabilitation Project (Project). Completion of the Project will restore the flood control project's design capacity.

Vegetation management refers to the removal of flow-restricting vegetation within the flood control channel. Removal of vegetation is done through selective trimming, mowing, burning, spraying, and other related methods. All work is to be done in accordance with State and federal environmental regulations, including applicable sensitive species work windows. Native riparian vegetation areas not removed by the Project shall be preserved.

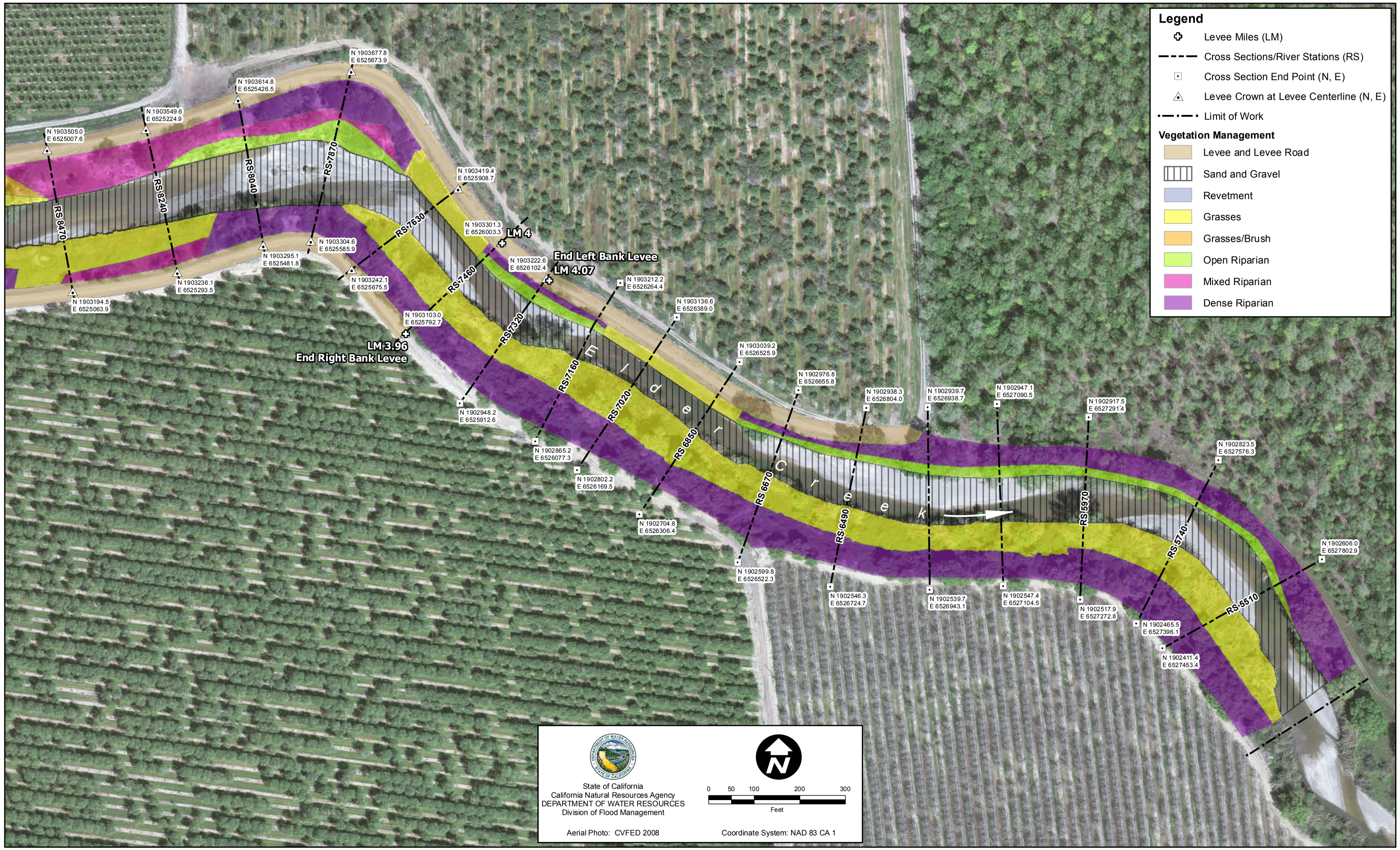
Vegetation management areas will be reassessed if extensive habitat in the channel is removed by natural disturbances. Habitats are dynamic and will not remain in perpetuity by DWR.

The general approach to vegetation management must include the following:

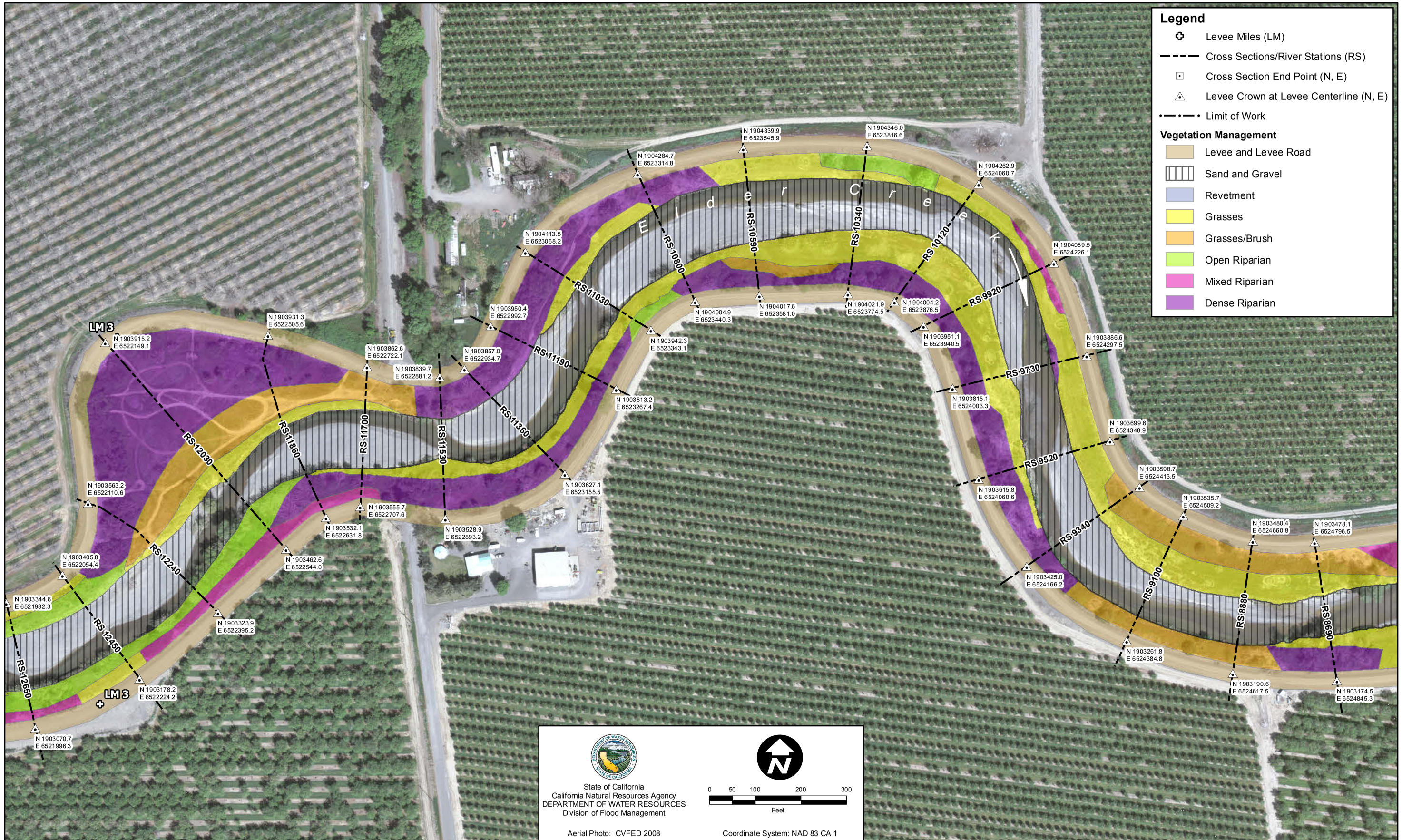
1. The maintenance agreement in effect states that DWR is responsible for maintaining the channel section beginning 10 feet from the waterside toe of the levee and extending to 10 feet from the waterside toe of the opposing levee. The local maintaining agency responsible for the maintenance of the levees and their 10-foot corridors along the waterside toe of the levees is the Tehama County Flood Control and Water Conservation District.
2. Avoid all elderberries. Vegetation management around elderberries shall only be as near as the drip line with hand crews per regulatory approval.
3. Remove all Aruno Donax.
4. Remove invasive species where practical.
5. Vegetation management categories represent vegetation density and are typical of the vegetative state at the time of Project completion.
6. Vegetation management area boundaries are approximate and represent transition areas between vegetation management categories.
7. Vegetation management areas represent the ground, not the overhanging canopy.
8. The goal in riparian zones is to establish a mature upper-story riparian canopy.

The channel must be maintained according to the plan views in this document and the following vegetation management category descriptions:

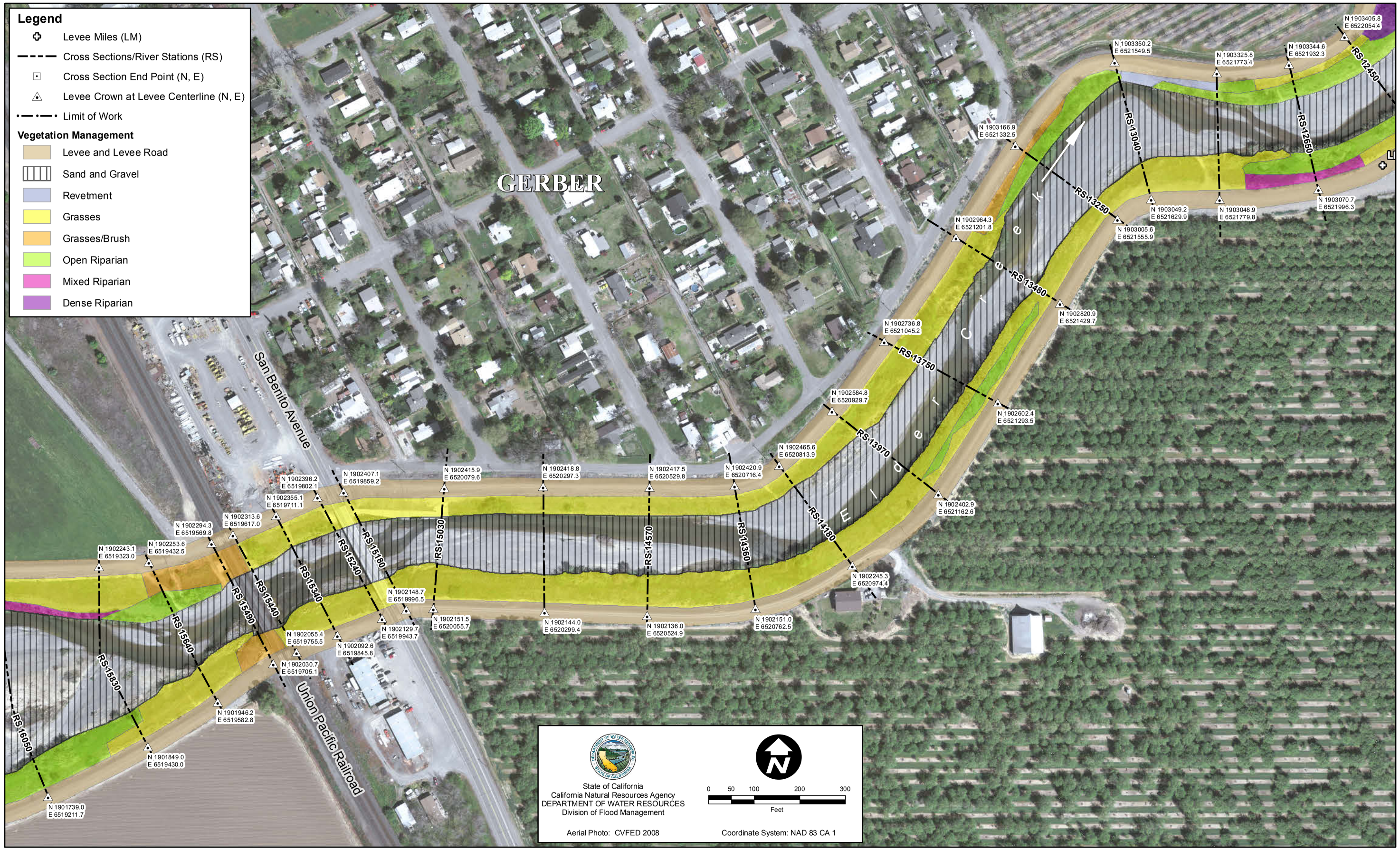
- Sand and Gravel: Stream bottom should be clear of all vegetation. Select woody debris could remain for fishery needs where it does not 1) alter the flow path and induce bank erosion or 2) become mobilized and impinged on the Union Pacific Railroad bridge.
- Revetment: Bank paving (concrete) or rock riprap bank protection.
- Grasses: Grass with existing, scattered trees of 4-inch diameter or greater, no closer than 50 feet on-center, and limbed up to the design capacity water-surface elevation.
- Grasses\Brush: Grasses with scattered brush.
- Open Riparian: Grasses with trees of 4-inch diameter or greater, limbed up to the design capacity water-surface elevation, and no closer than 10 feet on center. Brush should be minimal and scattered.
- Mixed Riparian: Contains a mix of trees, pruned willows, scattered brush, and grasses.
- Dense Riparian: Allow native vegetation (trees, shrubs, vines, or grasses) to develop into established riparian vegetation that includes either riparian forest, shrub, or grassland.



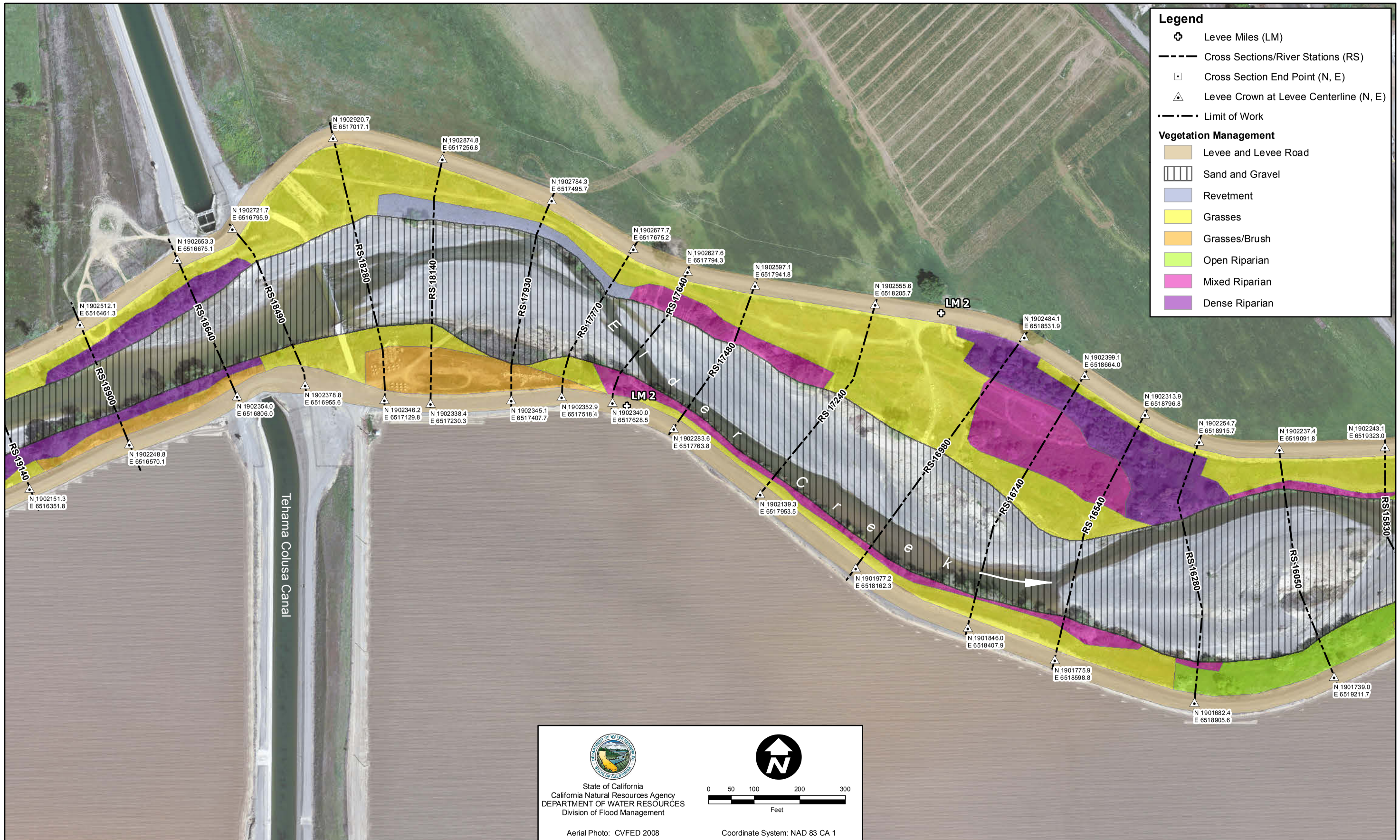
ELDER CREEK LONG-TERM VEGETATION MANAGEMENT PLAN



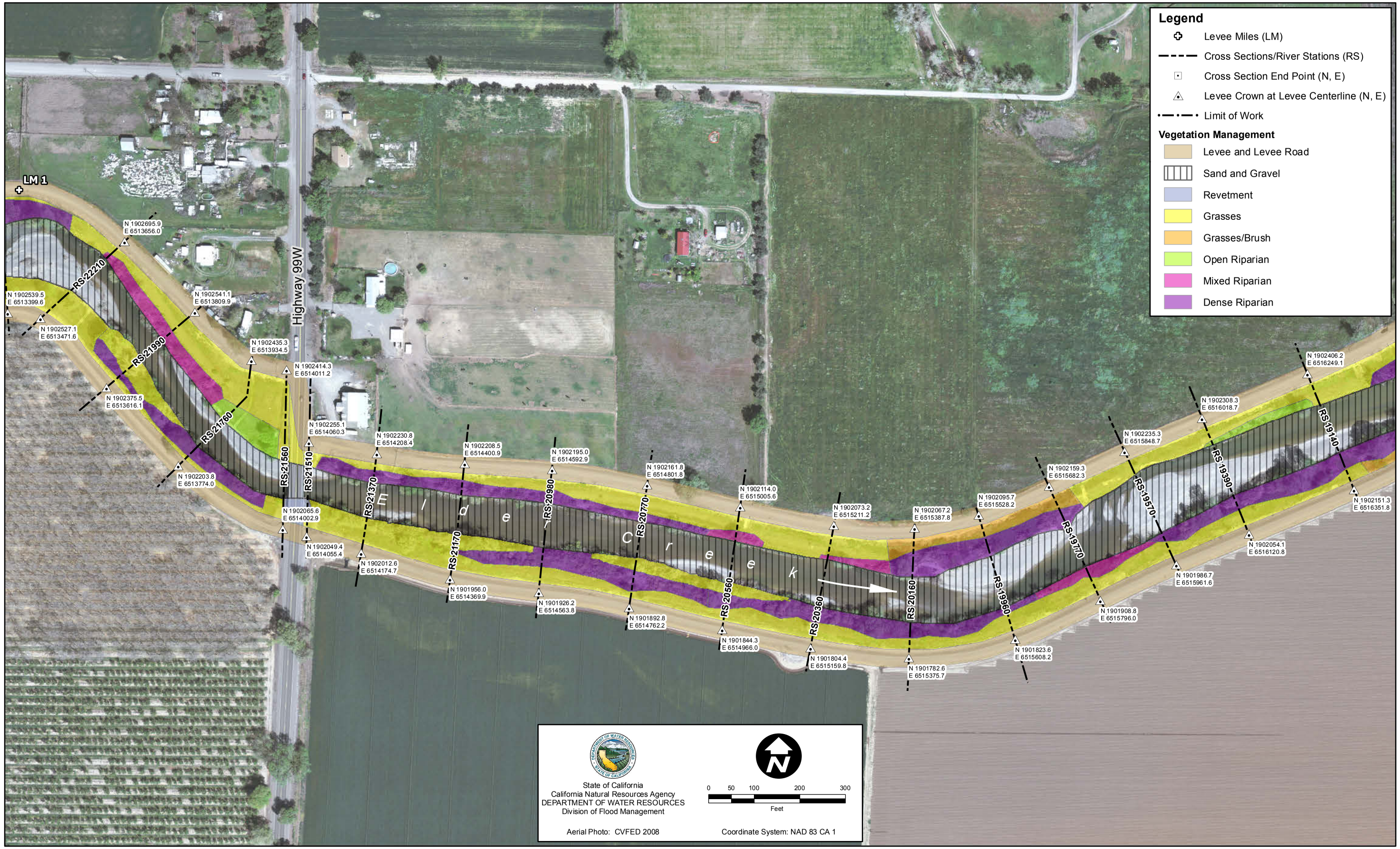
ELDER CREEK LONG-TERM VEGETATION MANAGEMENT PLAN



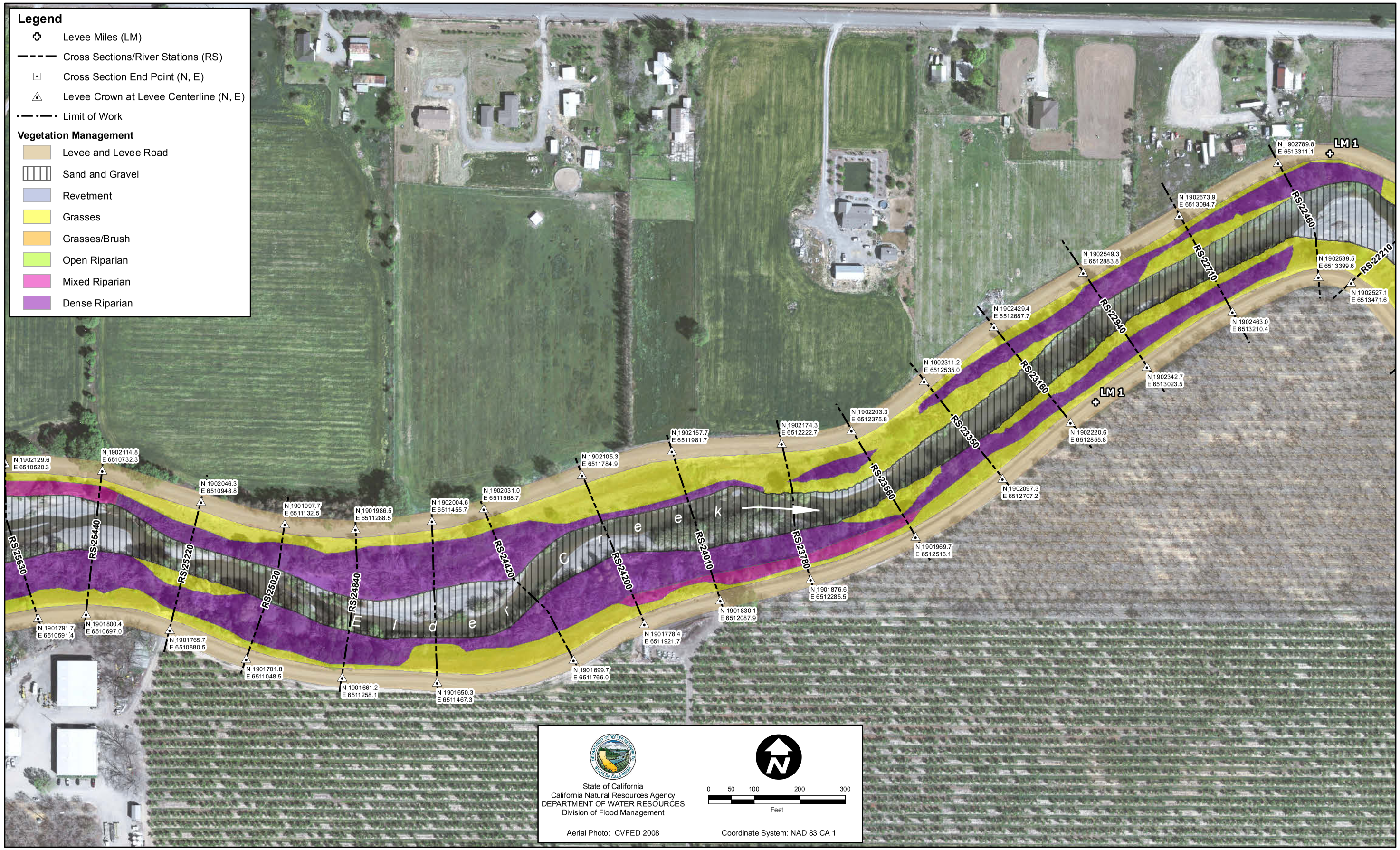
ELDER CREEK LONG-TERM VEGETATION MANAGEMENT PLAN



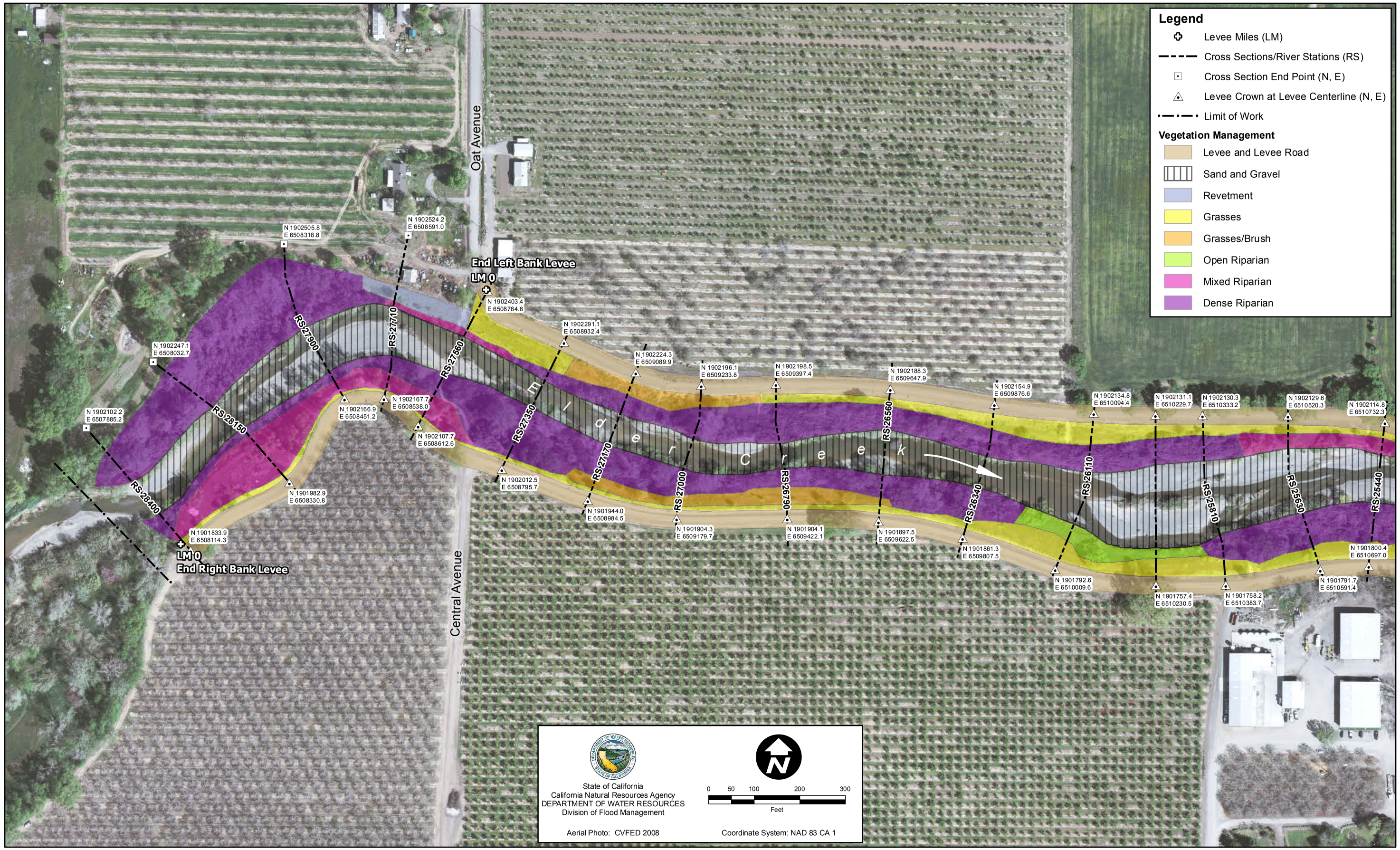
ELDER CREEK LONG-TERM VEGETATION MANAGEMENT PLAN



ELDER CREEK LONG-TERM VEGETATION MANAGEMENT PLAN



ELDER CREEK LONG-TERM VEGETATION MANAGEMENT PLAN



ELDER CREEK LONG-TERM VEGETATION MANAGEMENT PLAN

APPENDIX D

Air Quality Modeling Calculations

Elder Creek

Tehama County, Summer

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
User Defined Industrial	23.00	User Defined Unit	0.00	0.00	0

1.2 Other Project Characteristics

Urbanization	Rural	**Wind Speed (m/s)**	3.1	**Precipitation Freq (Days)**	68
Climate Zone	3			**Operational Year**	2016
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - Assuming 23 acres will be disturbed (19 acres Arundo, 3.1 acres misc vegetation, elderberry, and sediment removal)

Construction Phase - Phases based on Project Description

Trips and VMT - Trips modeled separately with EMFAC2014 factors

Off-road Equipment - Amounts and Hours based on Project Description."Other Construction Equipment" used to represent Masticators and Mowers. "Concrete/Industrial Saws" used to represent chainsaws

Off-road Equipment - No offroad equipment assumed for herbicide phase

Off-road Equipment - Equipment type, unit amount, and hours per day based on Project Description. 1x Grader was added (zero hrs/day) to access "Dust from Material Movement" Tab

Grading - Assuming 10 acres total could be disturbed during sediment removal phase

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	0.00	20.00
tblConstructionPhase	NumDays	0.00	10.00
tblConstructionPhase	NumDays	0.00	40.00
tblConstructionPhase	PhaseEndDate	5/29/2015	5/31/2015
tblConstructionPhase	PhaseEndDate	6/12/2015	6/13/2015
tblConstructionPhase	PhaseEndDate	8/7/2015	8/8/2015
tblGrading	AcresOfGrading	0.00	10.00
tblGrading	MaterialExported	0.00	100,000.00
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Graders
tblOffRoadEquipment	OffRoadEquipmentType		Other Construction Equipment
tblOffRoadEquipment	OffRoadEquipmentType		Concrete/Industrial Saws
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	2.00
tblOffRoadEquipment	UsageHours	8.00	0.00
tblOffRoadEquipment	UsageHours	8.00	0.00
tblOffRoadEquipment	UsageHours	8.00	0.00
tblOffRoadEquipment	UsageHours	8.00	10.00
tblOffRoadEquipment	UsageHours	8.00	0.00
tblProjectCharacteristics	OperationalYear	2014	2016
tblProjectCharacteristics	UrbanizationLevel	Urban	Rural
tblTripsAndVMT	HaulingTripNumber	12,500.00	0.00
tblTripsAndVMT	WorkerTripNumber	28.00	0.00
tblTripsAndVMT	WorkerTripNumber	5.00	0.00
tblTripsAndVMT	WorkerTripNumber	13.00	0.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2015	5.8012	58.1510	36.4712	0.0539	0.7067	3.4473	3.4473	0.0955	3.2336	3.2336	0.0000	5,531.9484	5,531.9484	1.4249	0.0000	5,561.8708
Total	**5.8012**	**58.1510**	**36.4712**	**0.0539**	**0.7067**	**3.4473**	**3.4473**	**0.0955**	**3.2336**	**3.2336**	**0.0000**	**5,531.9484**	**5,531.9484**	**1.4249**	**0.0000**	**5,561.8708**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2015	5.8012	58.1510	36.4712	0.0539	0.7067	3.4473	3.4473	0.0955	3.2336	3.2336	0.0000	5,531.9484	5,531.9484	1.4249	0.0000	5,561.8708
Total	**5.8012**	**58.1510**	**36.4712**	**0.0539**	**0.7067**	**3.4473**	**3.4473**	**0.0955**	**3.2336**	**3.2336**	**0.0000**	**5,531.9484**	**5,531.9484**	**1.4249**	**0.0000**	**5,561.8708**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	2.3000e-004	2.0000e-005	2.4100e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005		5.0300e-003	5.0300e-003	1.0000e-005		5.3300e-003
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Total	**2.3000e-004**	**2.0000e-005**	**2.4100e-003**	**0.0000**	**0.0000**	**1.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**1.0000e-005**		**5.0300e-003**	**5.0300e-003**	**1.0000e-005**	**0.0000**	**5.3300e-003**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	2.3000e-004	2.0000e-005	2.4100e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005		5.0300e-003	5.0300e-003	1.0000e-005		5.3300e-003
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Total	**2.3000e-004**	**2.0000e-005**	**2.4100e-003**	**0.0000**	**0.0000**	**1.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**1.0000e-005**		**5.0300e-003**	**5.0300e-003**	**1.0000e-005**	**0.0000**	**5.3300e-003**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Vegetation Removal	Site Preparation	5/3/2015	5/31/2015	5	20	
2	Herbicide Spot Treatment	Site Preparation	6/1/2015	6/13/2015	5	10	
3	Sediment Removal	Site Preparation	6/14/2015	8/8/2015	5	40	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Sediment Removal	Excavators	2	10.00	162	0.38
Sediment Removal	Graders	1	0.00	174	0.41
Vegetation Removal	Graders	1	0.00	174	0.41
Sediment Removal	Tractors/Loaders/Backhoes	2	10.00	97	0.37
Vegetation Removal	Other Construction Equipment	4	8.00	171	0.42
Vegetation Removal	Concrete/Industrial Saws	2	8.00	81	0.73
Herbicide Spot Treatment	Graders	1	0.00	174	0.41
Vegetation Removal	Excavators	2	8.00	162	0.38
Herbicide Spot Treatment	Tractors/Loaders/Backhoes	1	0.00	97	0.37
Vegetation Removal	Tractors/Loaders/Backhoes	2	8.00	97	0.37

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Herbicide Spot Treatment	2	0.00	0.00	0.00	16.80	6.60	20.00	LD_Mix	HDT_Mix	HHDT
Vegetation Removal	11	0.00	0.00	0.00	16.80	6.60	20.00	LD_Mix	HDT_Mix	HHDT
Sediment Removal	5	0.00	0.00	0.00	16.80	6.60	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Vegetation Removal - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Off-Road	5.8012	58.1510	36.4712	0.0539		3.4473	3.4473		3.2336	3.2336		5,531.9484	5,531.9484	1.4249		5,561.8708
Total	**5.8012**	**58.1510**	**36.4712**	**0.0539**	**0.0000**	**3.4473**	**3.4473**	**0.0000**	**3.2336**	**3.2336**		**5,531.9484**	**5,531.9484**	**1.4249**		**5,561.8708**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Vendor					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Worker					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Total					**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**			**0.0000**			**0.0000**

3.2 Vegetation Removal - 2015

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Off-Road	5.8012	58.1510	36.4712	0.0539		3.4473	3.4473		3.2336	3.2336	0.0000	5,531.9484	5,531.9484	1.4249		5,561.8708
Total	**5.8012**	**58.1510**	**36.4712**	**0.0539**	**0.0000**	**3.4473**	**3.4473**	**0.0000**	**3.2336**	**3.2336**	**0.0000**	**5,531.9484**	**5,531.9484**	**1.4249**		**5,561.8708**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Vendor					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Worker					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Total					**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**			**0.0000**			**0.0000**

3.3 Herbicide Spot Treatment - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**		**0.0000**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Vendor					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Worker					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Total					**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**			**0.0000**			**0.0000**

3.3 Herbicide Spot Treatment - 2015

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Vendor					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Worker					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Total					**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**			**0.0000**			**0.0000**

3.4 Sediment Removal - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.7067	0.0000	0.7067	0.0955	0.0000	0.0955			0.0000			0.0000
Off-Road	1.9423	20.7425	14.6620	0.0210		1.2719	1.2719		1.1702	1.1702		2,207.6068	2,207.6068	0.6591		2,221.4471
Total	**1.9423**	**20.7425**	**14.6620**	**0.0210**	**0.7067**	**1.2719**	**1.9786**	**0.0955**	**1.1702**	**1.2656**		**2,207.6068**	**2,207.6068**	**0.6591**		**2,221.4471**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Vendor					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Worker					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Total					**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**			**0.0000**			**0.0000**

3.4 Sediment Removal - 2015

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.7067	0.0000	0.7067	0.0955	0.0000	0.0955			0.0000			0.0000
Off-Road	1.9423	20.7425	14.6620	0.0210		1.2719	1.2719		1.1702	1.1702	0.0000	2,207.6068	2,207.6068	0.6591		2,221.4471
Total	**1.9423**	**20.7425**	**14.6620**	**0.0210**	**0.7067**	**1.2719**	**1.9786**	**0.0955**	**1.1702**	**1.2656**	**0.0000**	**2,207.6068**	**2,207.6068**	**0.6591**		**2,221.4471**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Vendor					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Worker					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Total					**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**			**0.0000**			**0.0000**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Unmitigated					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
User Defined Industrial	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
User Defined Industrial	14.70	6.60	6.60	0.00	0.00	0.00	0	0	0

LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH

4.4 Fleet Mix

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	2.3000e-004	2.0000e-005	2.4100e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005		5.0300e-003	5.0300e-003	1.0000e-005		5.3300e-003
Unmitigated	2.3000e-004	2.0000e-005	2.4100e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005		5.0300e-003	5.0300e-003	1.0000e-005		5.3300e-003

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	2.3000e-004	2.0000e-005	2.4100e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005		5.0300e-003	5.0300e-003	1.0000e-005		5.3300e-003
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**2.3000e-004**	**2.0000e-005**	**2.4100e-003**	**0.0000**		**1.0000e-005**	**1.0000e-005**		**1.0000e-005**	**1.0000e-005**		**5.0300e-003**	**5.0300e-003**	**1.0000e-005**		**5.3300e-003**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	2.3000e-004	2.0000e-005	2.4100e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005		5.0300e-003	5.0300e-003	1.0000e-005		5.3300e-003
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**2.3000e-004**	**2.0000e-005**	**2.4100e-003**	**0.0000**		**1.0000e-005**	**1.0000e-005**		**1.0000e-005**	**1.0000e-005**		**5.0300e-003**	**5.0300e-003**	**1.0000e-005**		**5.3300e-003**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Vegetation

Elder Creek -- On-Road Emission Calculations

Emissions = Vehicle Type x Emission Factor x Miles/Trip x Trips/Day

Note: Trip length takes into account round trips
Mobile Emissions Associated with Worker and Haul Truck trips in 2015

Paved Road lbs/VMT Entrained PM10
0.001479769

Unpaved Road lbs/VMT Entrained PM10
0.044362729

Vegetation Removal

LHDT

Miles/Trip	Trips/Day	Miles/Day	Emission Factors		
20.00	10	200.00	ROG	Nox	PM10
	2015 emissions (grams/day)		23.32548	893.2479	4.358135
	2015 emissions (pounds/day)		0.05	1.97	0.39
	2015 emissions (tons/year)		0.00	0.02	0.00
		Assumes Ops for 4 weeks/year			

HDT

Miles/Trip	Trips/Day	Miles/Day	Emission Factors		
32.00	20	640.00	ROG	Nox	PM10
	2015 emissions (grams/day)		170.7566	5218.499	74.00128
	2015 emissions (pounds/day)		0.38	11.50	1.38
	2015 emissions (tons/year)		0.00	0.12	0.01
		Assumes Ops for 4 weeks/year			

Herbicide Sot Application

LHDT

Miles/Trip	Trips/Day	Miles/Day	Emission Factors		
20.00	2	40.00	ROG	Nox	PM10
	2015 emissions (grams/day)		4.665096	178.6496	0.871627
	2015 emissions (pounds/day)		0.01	0.39	0.08
	2015 emissions (tons/year)		0.00	0.00	0.00
		Assumes Ops for 2 weeks/year			

Sediment Removal

LHDT

Miles/Trip	Trips/Day	Miles/Day	Emission Factors		
20.00	4	80.00	ROG	Nox	PM10
	2015 emissions (grams/day)		9.330192	357.2992	1.743254
	2015 emissions (pounds/day)		0.02	0.79	0.16
	2015 emissions (tons/year)		0.00	0.02	0.00
		Assumes Ops for 8 weeks/year			

HDT

Miles/Trip	Trips/Day	Miles/Day	Emission Factors		
4.00	40	160.00	ROG	Nox	PM10
	2015 emissions (grams/day)		42.68914	1304.625	18.50032
	2015 emissions (pounds/day)		0.09	2.88	0.35
	2015 emissions (tons/year)		0.00	0.06	0.01
		Assumes Ops for 8 weeks/year			

EMFAC2014 - Emission Factors for Tehama County Year 2015

calendar_y	season_m	sub_area	vehicle_cla	temperatur	relative_hu	process	speed_tim	pollutant	emission_rate
2015	Summer	Tehama (S	LHD1	50	50	RUNEX	45	HC	0.124597
2015	Summer	Tehama (S	LHD1	50	50	RUNEX	45	CO	1.556356
2015	Summer	Tehama (S	LHD1	50	50	RUNEX	45	NOx	4.841522
2015	Summer	Tehama (S	LHD1	50	50	RUNEX	45	SOx	0.005218
2015	Summer	Tehama (S	LHD1	50	50	RUNEX	45	PM	0.022787
2015	Summer	Tehama (S	LHD1	50	50	RUNEX	45	TOG	0.163182
2015	Summer	Tehama (S	LHD1	50	50	RUNEX	45	ROG	0.135091
2015	Summer	Tehama (S	LHD1	50	50	RUNEX	45	CO2	535.2318
2015	Summer	Tehama (S	LHD1	50	50	RUNEX	45	CH4	0.017112
2015	Summer	Tehama (S	LHD1	50	50	RUNEX	45	PM10	0.022585
2015	Summer	Tehama (S	LHD1	50	50	RUNEX	45	PM2_5	0.021587
2015	Summer	Tehama (S	LHD2	50	50	RUNEX	45	HC	0.082234
2015	Summer	Tehama (S	LHD2	50	50	RUNEX	45	CO	0.760099
2015	Summer	Tehama (S	LHD2	50	50	RUNEX	45	NOx	4.090957
2015	Summer	Tehama (S	LHD2	50	50	RUNEX	45	SOx	0.005336
2015	Summer	Tehama (S	LHD2	50	50	RUNEX	45	PM	0.021143
2015	Summer	Tehama (S	LHD2	50	50	RUNEX	45	TOG	0.114437
2015	Summer	Tehama (S	LHD2	50	50	RUNEX	45	ROG	0.098164
2015	Summer	Tehama (S	LHD2	50	50	RUNEX	45	CO2	553.2217
2015	Summer	Tehama (S	LHD2	50	50	RUNEX	45	CH4	0.007564
2015	Summer	Tehama (S	LHD2	50	50	RUNEX	45	PM10	0.020996
2015	Summer	Tehama (S	LHD2	50	50	RUNEX	45	PM2_5	0.020081
2015	Summer	Tehama (S	T7 Tractor	50	50	RUNEX	45	HC	0.210682
2015	Summer	Tehama (S	T7 Tractor	50	50	RUNEX	45	CO	1.103881
2015	Summer	Tehama (S	T7 Tractor	50	50	RUNEX	45	NOx	8.153905
2015	Summer	Tehama (S	T7 Tractor	50	50	RUNEX	45	SOx	0.015257
2015	Summer	Tehama (S	T7 Tractor	50	50	RUNEX	45	PM	0.116325
2015	Summer	Tehama (S	T7 Tractor	50	50	RUNEX	45	TOG	0.30374
2015	Summer	Tehama (S	T7 Tractor	50	50	RUNEX	45	ROG	0.266807
2015	Summer	Tehama (S	T7 Tractor	50	50	RUNEX	45	CO2	1599.22
2015	Summer	Tehama (S	T7 Tractor	50	50	RUNEX	45	CH4	0.012393
2015	Summer	Tehama (S	T7 Tractor	50	50	RUNEX	45	PM10	0.115627
2015	Summer	Tehama (S	T7 Tractor	50	50	RUNEX	45	PM2_5	0.110625