Root Creek Water District

Water Appropriations Project

Draft Initial Study/ Mitigated Negative Declaration

February 2021

Prepared for:
Julia Berry
Root Creek Water District

Prepared by:
Provost & Pritchard Consulting Group
286 W. Cromwell Ave. Fresno, California 93711

Lead Agency:

Root Creek Water District
P.O. Box 27950
Fresno, CA 93729
info@rootcreek.com

Report Prepared for:

Root Creek Water District
P.O. Box 27950
Fresno, CA 93729

Contact:
Julia Berry
(559) 326-2222

Report Prepared by:

Provost & Pritchard Consulting Group

Briza Sholars, Senior Planner, Project Manager, QAQC
Amy Wilson, Planner
Mark Thompson, GIS
Jackie Lancaster, Administrative Support

Contact:
Briza Sholars
(559) 449-2700

Table of Contents

List of Figures

List of Tables

Acronyms and Abbreviations

AB	Assembly Bill
AE	Applied Earthworks, Inc.
APE	Area of Potential Effect
APN	Assessor's Parcel Number
CAA	Clean Air Act
CalEEMod	California Emissions Estimator Model
CalEPA	California Environmental Protection Agency
Cal/OSHA	California Division of Occupational Safety and Health
CARB	California Air Resources Board
CAAQS	California Ambient Air Quality Standards
CCAA	California Clean Air Act
CCR	California Code of Regulations
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CHRIS	California Historical Resources Information System
CH_4	Methane
CNDDB	California Department of Fish and Wildlife Natural Diversity Database
CO	Carbon Monoxide
CO_2e	Carbon Dioxide Equivalent
CRHR	California Register of Historical Resources
District	Root Creek Water District
DPM	Diesel Particulate Matter
DTSC	Department of Toxic Substance Control
DWR	Department of Water Resources
EIR	Environmental Impact Report
EPA	U.S. Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FMMP	Farmland Mapping and Monitoring Program
GC	Government Code
GHG	Greenhouse Gas
GIS	Geographic Information System
IS	Initial Study
IS/MND	Initial Study/Mitigated Negative Declaration

MMRP .... Mitigation Monitoring & Reporting Program
MND........ Mitigated Negative Declaration
MT CO_2e .... Metric Tons of Carbon Dioxide Equivalent
NAAQS .... National Ambient Air Quality Standards
NAHC .... Native American Heritage Commission
NHPA .... National Historic Preservation Act
ND .... Negative Declaration
NO_2 .... Nitrogen Dioxide
NOX .... Nitrogen Oxide
NPDES........ National Pollutant Discharge Elimination System
NRCS .... Natural Resources Conservation Service
CRHR .... Natural Resources Conservation Service
O_3 .... Ozone
Pb .... Lead
PM_{10} .... Particulate Matter less than 10 microns in diameter
Project........ Water Appropriation
RCWD .... Root Creek Water District
SCH .... State Clearinghouse
SGMA........ Sustainable Goundwater Management Act
SHC .... Streets and Highways Code
SJVAB........ San Joaquin Valley Air Basin
SJVAPCD........ San Joaquin Valley Air Pollution Control District
SO_2 .... Sulfur Dioxide
SSJVIC........ Sulfur dioxide
SWRCB........ State Water Resources Control Board
SWPPP........ Storm Water Pollution Prevention Plan
TAC .... Toxic Air Contaminants
TPY .... Tons Per Year
USACE .... United Sates Army Corp of Engineers
USDA .... U. S. Department of Agriculture
USGS .... U. S. Geological Survey

Chapter 1 Introduction

Provost & Pritchard Consulting Group (Provost & Pritchard) has prepared this Initial Study/Mitigated Negative Declaration (IS/MND) on behalf of Root Creek Water District (RCWD or District) to address the potential environmental effects of the Water Appropriations Project (Project or proposed Project). This document has been prepared in accordance with the California Environmental Quality Act (CEQA), Public Resources Code Section 21000 *et. seq*. The District is the CEQA lead agency for this proposed Project.

The Area of Potential Effect (APE) and the proposed Project are described in detail in the **Chapter 2 Project Description**.

1.1 Regulatory Information

An Initial Study (IS) is a document prepared by a lead agency to determine whether a project may have a significant effect on the environment. California Code of Regulations Title 14 (Chapter 3, Section 15000, *et seq*.)-- also known as the CEQA Guidelines-- Section 15064 (a)(1) states that an environmental impact report (EIR) must be prepared if there is substantial evidence in light of the whole record that the proposed Project under review may have a significant effect on the environment and should be further analyzed to determine mitigation measures or project alternatives that might avoid or reduce project impacts to less than significant levels. Instead of an EIR, a negative declaration (ND) may be prepared if the lead agency finds that there is ***no*** substantial evidence in light of the whole record that the project may have a significant effect on the environment. A ND is a written statement describing the reasons why a proposed project, not otherwise exempt from CEQA, would not have a significant effect on the environment and, therefore, why it would not require the preparation of an EIR (CEQA Guidelines Section 15371). According to CEQA Guidelines Section 15070, a ND or *mitigated* ND shall be prepared for a project subject to CEQA when either:

a. The IS shows there is no substantial evidence, in light of the whole record before the agency, that the proposed Project may have a significant effect on the environment, or

b. The IS identified potentially significant effects, but:

    1. Revisions in the project plans or proposals made by or agreed to by the applicant before the proposed MND and IS is released for public review would avoid the effects or mitigate the effects to a point where clearly no significant effects would occur, and

    2. There is no substantial evidence, in light of the whole record before the agency, that the proposed Project *as revised* may have a significant effect on the environment.

1.2 Document Format

This IS/MND contains six chapters and four appendices. **Chapter 1 Introduction**, provides an overview of the proposed Project and the CEQA process. **Chapter 2 Project Description**, provides a detailed description of proposed Project components and objectives. **Chapter 3 Impact Analysis**, presents the CEQA checklist and environmental analysis for all impact areas, mandatory findings of significance, and feasible mitigation measures. If the proposed Project does not have the potential to significantly impact a given issue area, the relevant section provides a brief discussion of the reasons why no impacts are expected. If the proposed Project could have a potentially significant impact on a resource, the issue area discussion provides a description of potential impacts, and appropriate mitigation measures and/or permit requirements that would reduce those impacts to a less than significant level. **Chapter 4 Mitigation Monitoring and Reporting Program** (MMRP), provides the proposed mitigation measures, implementation timelines, and the entity/agency responsible for ensuring implementation. Error! Reference source not found., and **Chapter 6** List **of Preparers**.

The Air Quality and Greenhouse Gas Emissions Evaluation Report (CalEEMod Output Files), Biological Resources Assessment, Cultural Resources Inventory Report, and NRCS Soil Resource Report are provided as technical **Appendix A**, **Appendix B**, **Appendix C,** and **Appendix D**, respectively, at the end of this document.

The analyses of environmental impacts in **Chapter 3** are separated into the following categories:

Potentially Significant Impact. This category is applicable if there is substantial evidence that an effect may be significant, and no feasible mitigation measures can be identified to reduce impacts to a less than significant level. If there are one or more "Potentially Significant Impact" entries when the determination is made, an EIR is required.

Less than Significant with Mitigation Incorporated. This category applies where the incorporation of mitigation measures would reduce an effect from a "Potentially Significant Impact" to a "Less than Significant Impact." The lead agency must describe the mitigation measure(s), and briefly explain how they would reduce the effect to a less than significant level (mitigation measures from earlier analyses may be cross-referenced).

Less than Significant Impact. This category is identified when the proposed Project would result in impacts below the threshold of significance, and no mitigation measures are required.

No Impact. This category applies when a project would not create an impact in the specific environmental issue area. "No Impact" answers do not require a detailed explanation if they are adequately supported by the information sources cited by the lead agency, which show that the impact does not apply to the specific project (e.g. the project falls outside a fault rupture zone). A "No Impact" answer should be explained where it is based on project-specific factors as well as general standards (e.g. the project would not expose sensitive receptors to pollutants, based on a project-specific screening analysis).

Chapter 2 Project Description

2.1 Project Background and Objectives

2.1.1 Project Title

Root Creek Water District Water Appropriations Project

2.1.2 Lead Agency Name and Address

Root Creek Water District
P.O. Box 27950
Fresno, CA 93729
info@rootcreek.com

2.1.3 Contact Person and Phone Number

Lead Agency Contact

Julia Berry
(559) 326-2222

CEQA Consultant

Provost & Pritchard Consulting Group
Briza Sholars, Environmental Project Manager
(559) 449-2700

2.1.4 Project Location

The Project is located in Madera County, central California, approximately 172 miles southeast of Sacramento and 148 miles northwest of Bakersfield (see **Figure 2-1)**. The west side of the proposed project APE begins at Road 38 and runs east/northeasterly for 3.5 miles. The north, west, and south sides of the APE borders along agricultural farmland plots. Hwy 41 is 0.39 miles east of the APE. The City of Fresno city limit is located 3.2 miles south of APE. The community of Madera Ranchos is 1.32 miles north of APE. The City of Madera is located approximately 10 miles northwest from APE. See **Table 2-1** for list of affected APN's.

Table 2-1. Affected APN's

Affected APN's				
049-052-005	080-150-006	080-222-052	080-221-040	080-222-024
049-630-001	080-222-023	080-221-051	080-221-047	080-221-046
049-630-002	080-221-055	080-222-020	080-221-049	080-221-059
049-052-006	080-222-028	080-221-053	080-221-044	080-221-057
049-053-013	080-221-056	080-221-041	080-222-021	080-221-058
080-010-012	080-222-029	080-222-026	080-221-043	080-222-027
080-190-001	080-221-052	080-221-054	080-221-045	080-221-042
080-190-005	080-222-025	080-221-039	080-150-008	080-150-005

2.1.5 Latitude and Longitude

The centroid of the Project area is 36.9042, -119.8227.

2.1.6 General Plan Designation

The General Plan Land Use designation is A-Ag, AE-Exclusive Ag, OS-Open Space, LDR-Low Density Residential.

2.1.7 Zoning

The Zoning designation is AE-20 (Exclusive Agriculture, 20-Acre Minimum) Agriculture, Open Space, Residential.

2.1.8 Description of Project

2.1.8.1 District Background

The Root Creek Water District (RCWD or District), located in southern Madera County, was formed to address the declining groundwater table in southeastern Madera County and to ensure a long term reliable water supply for all water users within RCWD. The District originally consisted of approximately 9,230 acres. Upon formation, the District began the process of addressing groundwater overdraft by monitoring and analyzing groundwater conditions and determining the water needs of the District. Ultimately, an urban development project located within the District, Gateway Village (now called Riverstone) provided financing for the acquisition of surface water supplies. Gateway Village was approved by the Madera County Board of Supervisors on September 11, 2007 and the District secured surface water supply is sufficient to reverse the groundwater deficit for the entire District.

In 2014, the California Legislature passed the Sustainable Groundwater Management Act (SGMA) that was signed into law by Governor Brown. The act requires that all groundwater basins in the state develop a "Groundwater Sustainability Agency" ("GSA") by June 30, 2017, a plan for groundwater sustainability by June 30, 2020 and achieve sustainability on or before 2040. RCWD elected to be the GSA and prepared a Groundwater Sustainability Plan ("GSP"). From the commencement of the District formation process in 1994, RCWD and its landowners have been working to achieve essentially the same goals that are outlined in SGMA. The RCWD water plan adopted in 2007 includes substantive components of a local Groundwater Sustainability Plan required by SGMA to be in place by 2020. RCWD expects to have a fully implemented management plan and sustainable groundwater decades before most areas in the state. Most significantly, the RCWD plan does not require fallowing or retirement of any land either within or outside the District other than the planned land conversion change from agriculture to the municipal uses related to Riverstone. The most valuable benefit all District landowners receive from RCWD is achieving early compliance with SGMA and maintaining the necessary local groundwater balance without devaluing property or reducing either agricultural productivity or urban development of land within the District.

The majority of the RCWD water demand and water deliveries now, and for the foreseeable future, will continue to be for agricultural irrigation. The District will also provide urban utility services to the Riverstone urban development, consisting of over 2,000 acres. At build-out, the Riverstone community is projected to include about 6,578 dwelling units, parks, schools, and commercial development. RCWD will provide water, wastewater, and stormwater management services to Riverstone.

To fulfill the District's commitment to balance the groundwater supply to support all current and projected water uses within RCWD, the District pursued long-term water supply, water storage, and water conveyance (or "wheeling) contracts with the Madera Irrigation District and Westside Mutual Water Company. Other agreements and/or permitting to allow for the importation of surface water supplies were executed with the

Friant Water Users Authority, Chowchilla Water District, and the United States Bureau of Reclamation. Imported water will be delivered from Millerton Lake to the agricultural users via Madera Irrigation District Lateral 6.2 to RCWD's turnout into a 48-inch gravity pipeline that feeds the agricultural water distribution system in the RCWD service area. The pipeline was constructed in 2014 and delivered the first water supplies that summer.

2.1.8.2 Project Background:

Madera County prepared an EIR for the Gateway Village project SCH # 2005091071(Now Riverstone) in 2007, which identified potential improvements to Root Creek.

2.1.8.3 Project Description

The proposed project is to divert flows from Root Creek in southeastern Madera County by constructing the Root Creek Water Appropriations Project (Project). The Project includes construction of six control structures across a 3.5-mile segment of Root Creek. At each proposed control structure there will be a flashboard riser and embankments varying in height, which will include culverts and control gates intended to control the water level and flow through the embankments at a capacity of up to 550 cfs.

The project will integrate flexibility in passing large water flows due to the storm flows variation in magnitude. The project proposes six infiltration basins, which will capture storm water runoff within the Root Creek Channel. The project includes excavation within the channel to build the proposed embankments and use Root Creek's natural surface elevations as the north and south embankments. A lift station and pump will be constructed at infiltration basin 5 to take additional demand from Root Creek and into an existing basin. The project will integrate existing pipe connections to existing irrigation facilities, which include gate valves, meters, strainers, and vaults, approximately 1,585 linear feet of pipe, along with four outlet structures into the infiltration basins that will deliver water for recharge purposes when not being used to capture storm water. Fencing along with gates will surround infiltration basins 1, 2 and 3 to prevent harm to residents from Riverstone and Rolling Hills subdivisions when these areas are converted to a recreational parkway in the future.

The proposed project infiltration basins will have the ability to store and reregulate storm waters, percolate storm water to the underground for increasing the local water supplies, minimize the flooding downstream of the project, and provide for catchment of silt loading that moves through the system which then deposits and accumulates downstream. Implementation of the Project would intercept a significant portion of the flows from the watershed and utilize this resource by recharging the supply to the aquifer.

This linear 107-acre study area extends approximately 125 feet to either side of the creek channel. (The total area of the APE is 107 Acres. The APE boundary is 125 ft on each side, from creek to APE boundary, meaning the entire width of the APE is approximately 250 ft). Approximately 9,000 cubic yards of dirt will be excavated from the channel and used for each levee. (1,500 cubic yards at each of the six proposed levee locations.) Grading will be balanced on site.

2.1.8.1 Construction, Operation and Maintenance

The proposed Project will take approximately three months to be constructed and is expected to be completed by the end of December 2021. The following equipment is anticipated: crane, concrete trucks, excavator, gasoline generator, skid steer, compactor, loader, dump truck, haul truck, and water truck. Approximately 12,000 non-native trees will be removed as part of the Project. All construction activities will be performed within a dry channel.

Generally, construction would occur between the hours of 7:00 a.m. and 5:00 p.m., Monday through Friday, excluding holidays. Post-construction activities would include system testing, commissioning, and site clean-up. Construction would require temporary staging and storage of materials and equipment. Staging areas would be located onsite.

Operation and maintenance of the Project would be performed by RCWD's existing maintenance staff. Activities will include patrolling and operating water and flow control facilities manually and by use of Supervisory Control and Data Acquisition (SCADA) equipment. Maintenance Activities are proposed to include weed and rodent control, minor earthwork, and grading to restore project grades, as well as lubrication and exercising of water control gates, painting and graffiti removal, and electrical and SCADA repairs.

2.1.9 Surrounding Land Uses and Setting

Historically, land uses within the District have been comprised of agriculture and local farmsteads. However, long term planning goals include urbanization of some of the land within the District's boundaries. Other urban developments in the vicinity, such as Rolling Hills and Madera Ranchos have experienced ongoing water quality issues and declining groundwater levels.

The community development project, Riverstone (formerly Gateway Village) is located within RCWD at the southwest corner of the intersection of State Route 41 and Avenue 12. At buildout, Riverstone is planned to consist of approximately 6,600 residential homes across eight distinct districts, community clubhouses, schools, parks, trails, and other community amenities.

Additionally, the Project APE is surrounded by agricultural lands, most of which are currently in agricultural production currently planted in orchard (almond, pistachio, and olive) crops.

2.1.10 Other Public Agencies Whose Approval May Be Required

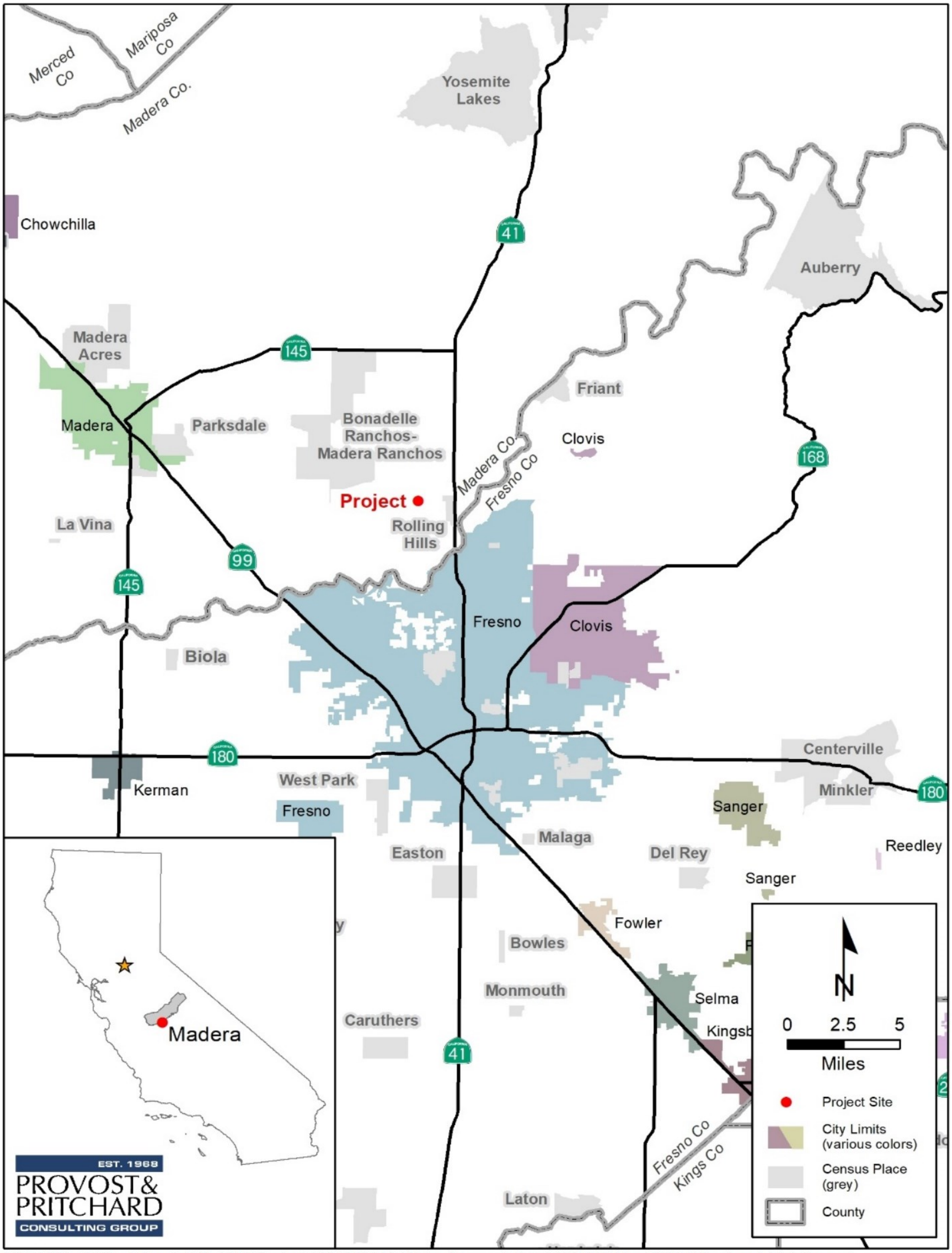
Permits that may be required:

- State Water Resources Control Board – National Pollutant Discharge Elimination System (NPDES) Construction General Permit
- San Joaquin Valley Air Pollution Control District – Rules and Regulations (Regulation VIII, Rule 9510, Rule 4641)

2.1.11 Consultation with California Native American Tribes

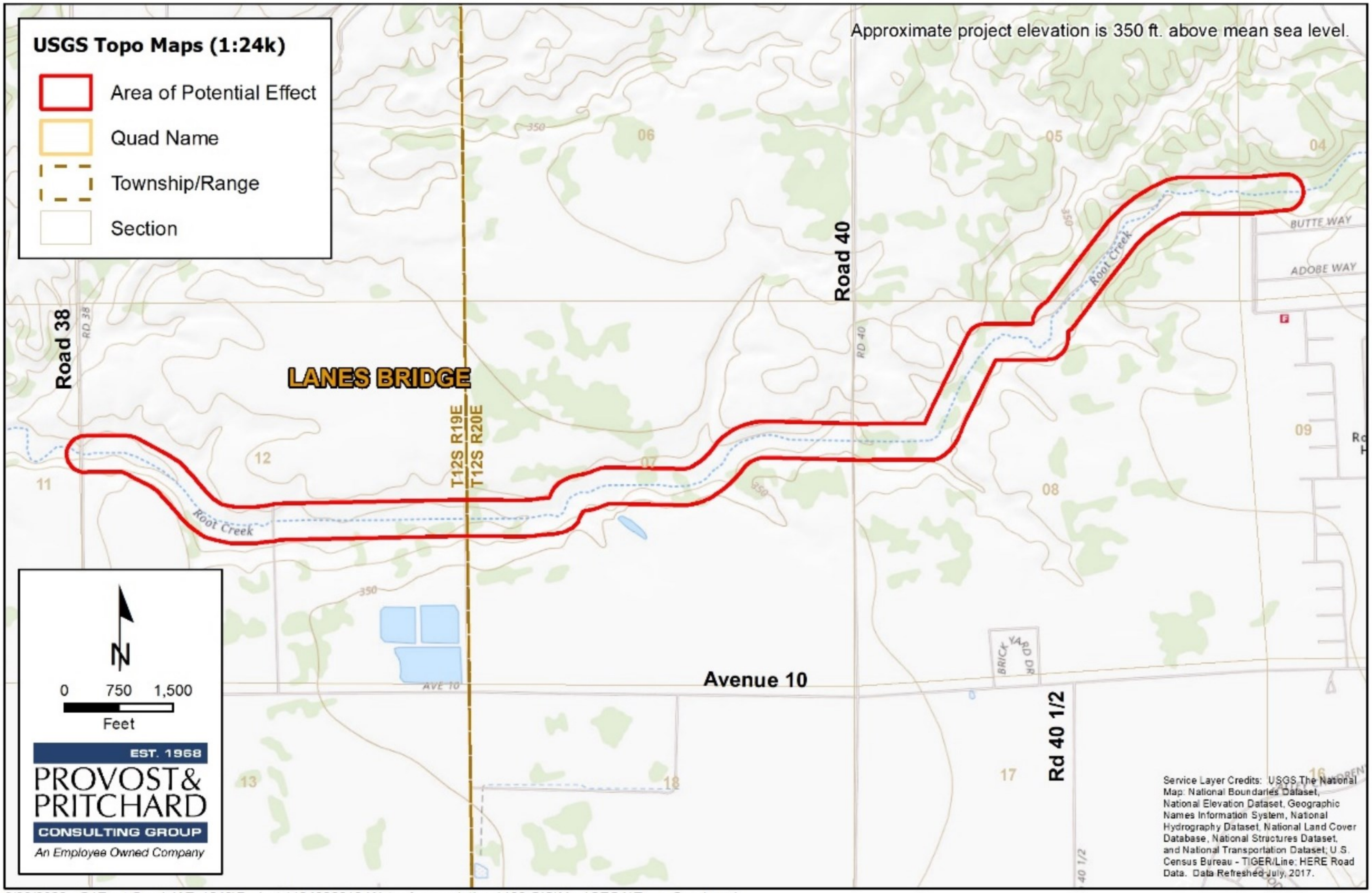
Assembly Bill 52 (AB 52; codified at Public Resources Code Section 21080.3.1, *et seq.*) requires that a lead agency, within 14 days of determining that it would undertake a project, must notify in writing any California Native American Tribe traditionally and culturally affiliated with the geographic area of the project if that Tribe has previously requested notification about projects in that geographic area. The notice must briefly describe the project and inquire whether the Tribe wishes to initiate request formal consultation. Tribes have 30 days from receipt of notification to request formal consultation. The lead agency then has 30 days to initiate the consultation, which then continues until the parties come to an agreement regarding necessary mitigation or agree that no mitigation is needed, or one or both parties determine that negotiation occurred in good faith, but no agreement would be made.

The District has not received any written correspondence from a Tribe pursuant to Public Resources Code Section 21080.3.1 requesting notification of proposed projects. All Tribal correspondence is discussed in further detail in sections **3.5** and **3.18** of **Chapter 3** Impact Analysis.



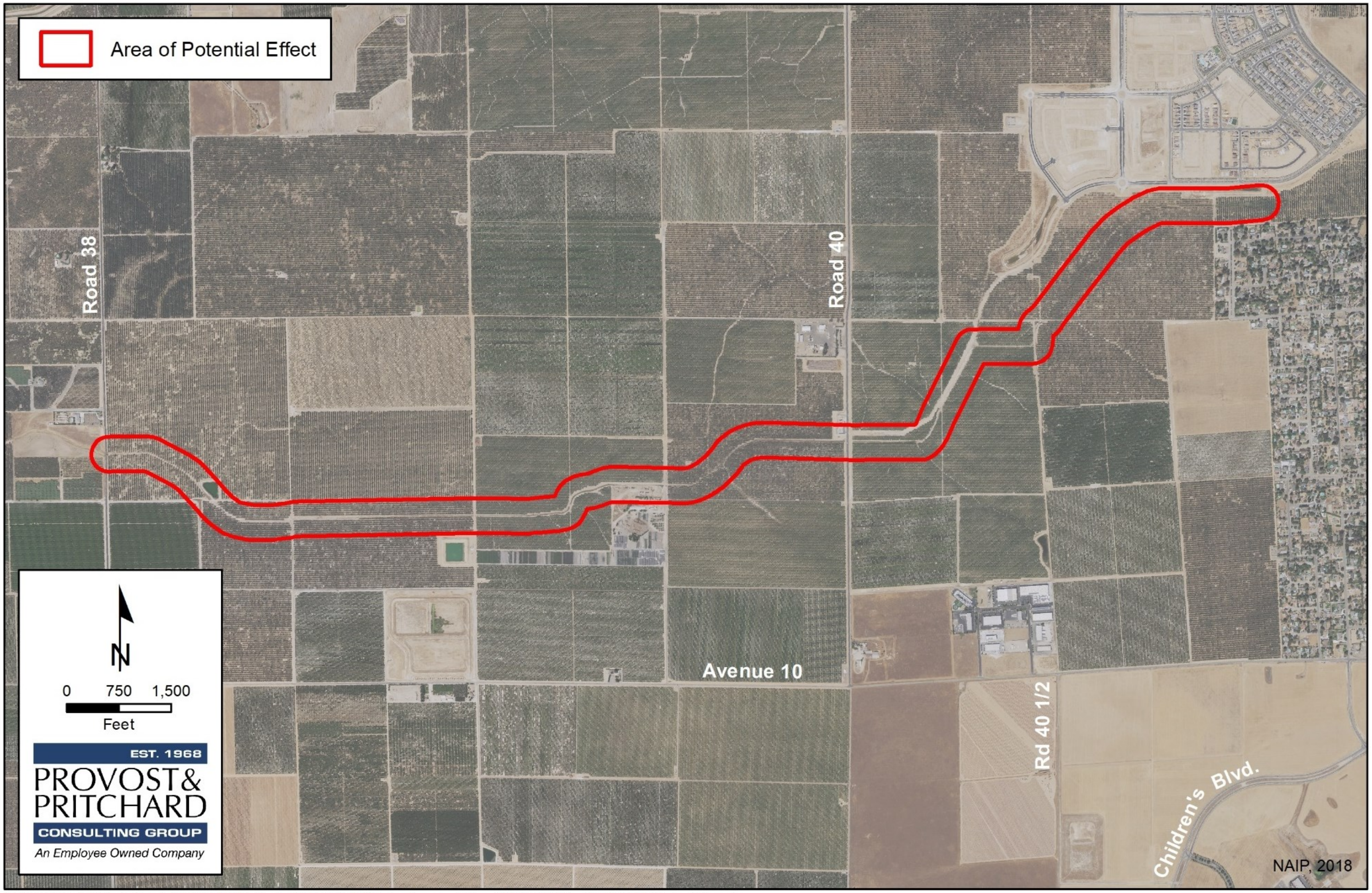
6/29/2020: G:\Root Creek WD-1249\Projects\124920019-Water Appropriations\400 GIS\Map\CEQA\Regional_Vicinity.mxd

Figure 2-1. Regional Vicinity Map



6/30/2020 : G:\Root Creek WD-1249\Projects\124920019-Water Appropriations\400 GIS\Map\CEQA\Topo_Quad.mxd

Figure 2-2. Topographic Quadrangle Map



6/18/2020 : G:\Root Creek WD-1249\Projects\124920019-Water Appropriations\400 GIS\Map\CEQA\APE_Aerial.mxd

Figure 2-3. Area of Potential Effect Map

Environmental Factors Potentially Affected

The environmental factors checked below would be potentially affected by this project, as indicated by the checklist and subsequent discussion on the following pages.

☐ Aesthetics	☐ Agriculture Resources	☐ Air Quality
☒ Biological Resources	☒ Cultural Resources	☐ Energy
☒ Geology/Soils	☐ Greenhouse Gas Emissions	☐ Hazards & Hazardous Materials
☐ Hydrology/Water Quality	☐ Land Use/Planning	☐ Mineral Resources
☐ Noise	☐ Population/Housing	☐ Public Services
☐ Recreation	☐ Transportation/Traffic	☒ Tribal Cultural Resources
☐ Utilities/Service Systems	☐ Wildfire	☒ Mandatory Findings of significance

DETERMINATION: (To be completed by the Lead Agency)

On the basis of this initial evaluation:

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

☒ I find that although the proposed project could have a significant effect on the environment, there would 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 would 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, nothing further is required.

Julia Berry
Signature

2/11/2021
Date

Julia Berry
Printed Name/Position

Chapter 3 Impact Analysis

3.1 Aesthetics

Table 3-1. Aesthetics Impacts

Aesthetics				
Except as provided in Public Resources Code Section 21099, would the project:	Potentially Significant Impact	Less than Significant With Mitigation Incorporated	Less than Significa nt Impact	No Impact
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) In non-urbanized areas substantially degrade the existing visual character or quality of public views of the site and its surroundings? (Public views are those that are experienced from publicly accessible vantage point). If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality?	☐	☐	☒	☐
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☒	☐

3.1.1 Environmental Setting

The Project is located in the southern Madera County in the Central San Joaquin Valley. Lands in the vicinity consist of relatively flat irrigated farmlands and the rural residences. Agricultural practices in the vicinity consist of row crop and orchard cultivation. The APE is located approximately 47 miles east of the Coastal Range and approximately 14 miles west of the foothills of the Sierra Nevada. Neither of these foothills or mountain ranges are typically visible from the vantage point of the APE. Rural roadways and local water distribution canals are in the immediate vicinity. The proposed Project would be consistent with the aesthetics of the area.

The Project will consist of replacement and installation of new culverts, gates and basins. A preliminary investigation of Root Creek and potential alterations of these modified existing structures is expected to require preparation of an Application to Appropriate Water that will be intentionally recharged at the sites. Neither the temporary construction activities nor proposed permanent turnouts would affect a scenic vista and when the Project is completed it would be visually consistent with the surrounding agricultural and water infrastructure.

3.1.2 Impact Assessment

a) Have a substantial adverse effect on a scenic vista?

No Impact. The primary scenic vista in the region is the Sierra Nevada foothills to the east. The Project would not interfere with public views of the Sierra Nevada foothills during construction or operation as all Project related activity would be restricted to the APE (Figure 2-3) Furthermore, the APE does not stand out from its surroundings in any remarkable fashion. There would be no impacts.

b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?

No Impact. The Scenic Highway Program[1] was created to preserve and protect scenic highway corridors from change would diminish the aesthetic value of lands adjacent to highways. A highway may be officially designated "scenic" depending upon how much of the natural landscape can be seen by travelers, the scenic quality of the landscape, and the extent to which development intrudes upon the traveler's enjoyment of the view. There are no designated scenic highway sections at or near the Project site. There would be no impact

c) Would the project, in non-urbanized areas, substantially degrade the existing visual character or quality of public views of the site and its surroundings? (Public views are those that are experienced from publicly accessible vantage point). If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality?

Less than Significant Impact. The APE is primarily surrounded by agricultural uses and water infrastructure in a non-urbanized setting. The current visual character of the APE is agricultural plots and related water infrastructure. Construction of the water diversion infrastructure would not substantially affect the visual characteristics of the area. Additionally, the Project does not conflict with the onsite zoning designation. The impacts would be less than significant.

d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?

Less than Significant Impact. Lighting impacts would be negligible because construction would be required to occur during the hours of 7:00 am to 7:00 pm on any day except Saturday or Sunday or between 9:00 am to 5:00 pm on Saturday and Sunday.[2] No new lighting in the area is proposed as part of the Project. Additional vehicular traffic after construction would be limited to operation and maintenance on an as-needed basis which would be performed during daylight hours, except in an unforeseen emergency situation. Therefore, the Project would not create a new source of substantial light or glare that would adversely affect day or nighttime views in the area or be inconsistent with existing conditions. The impacts would be less than significant.

[1] (State of California Legislative Information, 2014) Accessed March 18, 2019.
[2] (Madera County Municipal Code) Accessed July 20, 2020.

3.2 Agriculture and Forestry Resources

Table 3-2. Agriculture and Forestry Resources Impacts

Agriculture and Forest Resources				
Would the project:	**Potentially Significant Impact**	**Less than Significant With Mitigation Incorporated**	**Less than Significant Impact**	**No Impact**
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☒	☐
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?	☐	☐	☐	☒

3.2.1 Environmental Setting

Land use in the area is predominantly agricultural including annual crops, vineyard orchards, and other semi-agricultural uses or agricultural related infrastructure. Almonds, grapes, and pistachios are the top crops in addition to milk from local dairies. The Project would take place on either side of a 3.5 mile stretch Root Creek allowing for intentional recharge of excess water flows. Land classifications in the area from the California Department of Conservation (CDC) include Prime Farmland, Farmland of State Importance, Semi-Agricultural and Rural Commercial, and Unique Farmland. See **Figure 3-1**. Several nearby properties are under the Williamson Act and would not be affected by the proposed project. No changes in Williamson Act contract status are associated with the Project. The Project is in support of and an accessory to existing agricultural operations.

The surrounding land is zoned Agricultural, Open Space and Residential by Madera County. No changes in agricultural designation are proposed.

3.2.2 Impact Assessment

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?

Less than Significant Impact. The Farmland Mapping and Monitoring Program produces maps and statistical data used for analyzing impacts to California's agriculture resources. These maps are updated on a biennial basis with the use of a computer mapping system, aerial imagery, public review, and field reconnaissance. The farmland maps identify eight land use categories, five of which are agriculture related: prime agriculture, farmland of statewide importance, unique farmland, farmland of local importance, and grazing land. The land use categories onsite and in the proximity of the Project are summarized below:

- *UNIQUE FARMLAND (U): Farmland of lesser quality soils used for the production of the state's leading agricultural crops. This land is usually irrigated, but may include non-irrigated orchards or vineyards as found in some climatic zones in California. Land must have been cropped at some time during the four years prior to the mapping date.*
- *PRIME FARMLAND (P): Farmland with the best combination of physical and chemical features able to sustain long term agricultural production. This land has the soil quality, growing season, and moisture supply needed to produce sustained high yields. Land must have been used for irrigated agricultural production at some time during the four years prior to the mapping date.*
- *FARMLAND OF STATEWIDE IMPORTANCE (S): Farmland similar to Prime Farmland but with minor shortcomings, such as greater slopes or less ability to store soil moisture. Land must have been used for irrigated agricultural production at some time during the four years prior to the mapping date.*
- *FARMLAND OF LOCAL IMPORTANCE (L): Land of importance to the local agricultural economy as determined by each county's board of supervisors and a local advisory committee.*
- *URBAN AND BUILT-UP LAND (D): Land occupied by structures with a building density of at least 1 unit to 1.5 acres, or approximately 6 structures to a 10-acre parcel. This land is used for residential, industrial, commercial, construction, institutional, public administration, railroad and other transportation yards, cemeteries, airports, golf courses, sanitary landfills, sewage treatment, water control structures, and other developed purposes.*

As demonstrated in **Figure 3-1**, the FMMP for Madera County designates the site of the Project as predominantly Unique Farmland. Implementation of the water diversion project would help meet existing agriculture irrigation demands during the irrigation season when limited surface water is available, especially during times of a drought. Properties north of the Project are considered Prime Farmland and Farmland of State Importance. East of the Project is considered Prime Farmland. South is considered Farmland of Local Importance, Prime Farmland, and Farmland of State Importance. Lastly, West of the Project is considered Farmland of Local Importance and Prime Farmland (See **Figure 3-1**). The APE has been zoned Agriculture, and Open Space and designated for Agriculture and Open Space uses by the Madera County General Plan. Water recharge uses are considered to be consistent with an Agricultural use. The impact would be less than significant.

b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?

No Impact. The Project APE is zoned AE-20 (Exclusive Agriculture, 20-acre minimum) and OS (Open Space). There are also some slivers of residentially zoned parcels that are included within the Project area for technical survey purposes, however no Project work will take place on these portions of land. None of the parcels in the Project area or adjacent to the Project are under Williamson Act contract. Water basins and recharge uses are consistent with Agricultural and Open Space zoning. Implementation of the Project would not result in a conflict with existing zoning for the AE-20, or the Open Space Zone District. There would be no impact.

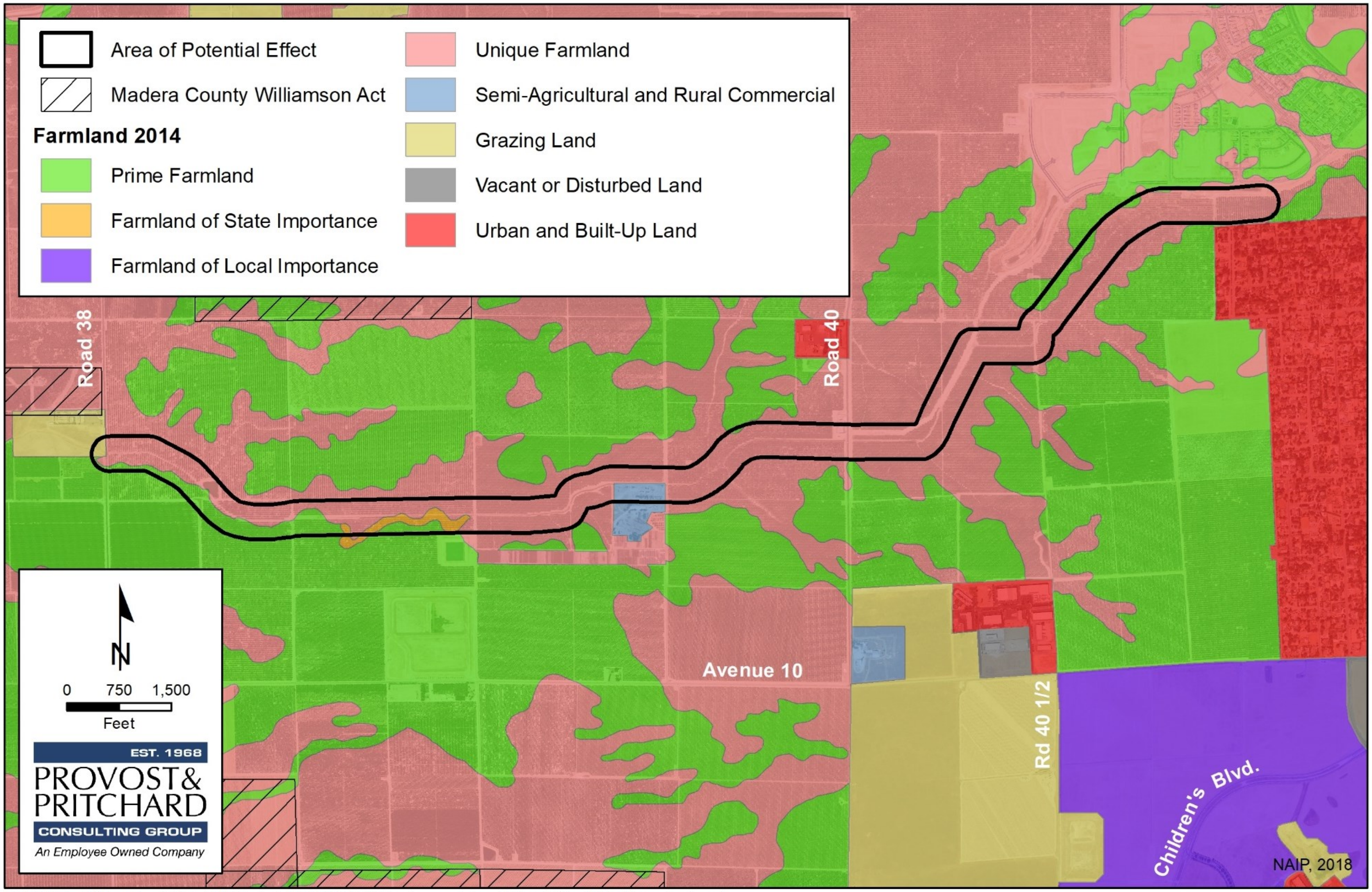
c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?

d) Result in the loss of forest land or conversion of forest land to non-forest use?

No Impact. There are no forest lands or timberlands within or near the Project APE. The Project would not cause any rezoning of forest lands, timberlands or any lands of any kind. There would be no impact.

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?

No Impact. The Project consists of improvements to Root Creek that would allow for diverting water flows from Root Creek to landowners for recharge purposes and will consist of replacement and installation of new culverts, basins and related infrastructure. Water recharge is considered to be a use that is consistent with an agricultural use. Therefore, the Project would not result in land use conversion of farmland or forest land, either directly or indirectly. There would be no impact.



6/30/2020 : G:\Root Creek WD-1249\Projects\124920019-Water Appropriations\400 GIS\Map\CEQA\Farmland.mxd

Figure 3-1. Farmland Designation Map

3.3 Air Quality

Table 3-3. Air Quality Impacts

Air Quality					
Where available, the significance criteria established by the applicable air quality management district or air pollution control district may be relied upon to make the following determinations. Would the project:		Potentially Significant Impact	Less than Significant With Mitigation Incorporated	Less than Significant Impact	No Impact
a)	Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☐	☒
b)	Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard?	☐	☐	☒	☐
c)	Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☒	☐
d)	Result in other emissions (such as those leading to odors adversely affecting a substantial number of people)?	☐	☐	☒	☐

3.3.1 Environmental Setting

The Project lies within the eight-county San Joaquin Valley Air Basin (SJVAB), which is managed by the San Joaquin Valley Air Pollution Control District (SJVAPCD). Air quality in the SJVAB is influenced by a variety of factors, including topography, local and regional meteorology. National Ambient Air Quality Standards (NAAQS) and California Ambient Air Quality Standards (CAAQS) have been established for the following criteria pollutants: carbon monoxide (CO), ozone (O_3), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), particulate matter (PM_{10} and $PM_{2.5}$), and lead (Pb). The CAAQS also set standards for sulfates (SO_4), hydrogen sulfide (H_2S), vinyl chloride (C_2H_3Cl) and visibility.

Air quality plans or attainment plans are used to bring the applicable air basin into attainment with all State and Federal ambient air quality standards designed to protect the health and safety of residents within that air basin. Areas are classified under the Federal Clean Air Act as either "attainment", "nonattainment", or "extreme nonattainment" areas for each criteria pollutant based on whether the NAAQS have been achieved or not. Attainment relative to the State standards is determined by the California Air Resources Board (CARB). The San Joaquin Valley is designated as a State and Federal nonattainment area for O_3, a State and Federal nonattainment area for $PM_{2.5}$, a State nonattainment area for PM_{10}, a Federal and State attainment area for CO, SO_2, and NO_2, and a State attainment area for sulfates, vinyl chloride and Pb[3].

3.3.2 Methodology

An Air Quality and Greenhouse Gas Emissions Evaluation Report (**Appendix A**) was prepared using CalEEmod, Version 2016.3.2 for the Project in August 2020. The sections below detail the methodology of the air quality and greenhouse gas emissions report and its conclusions.

[3] (San Joaquin Valley Air Pollution Control District, 2006-2012) Accessed August 2020.

3.3.2.1 Short-Term Construction-Generated Emissions

Short-term construction emissions associated with the Project were calculated using CalEEmod, Version 2016.3.2. The emissions modeling includes emissions generated by off-road equipment and worker commute trips. Emissions were quantified based on anticipated construction schedules provided by the Project applicant. All remaining assumptions were based on the default parameters contained in the model. Localized air quality impacts associated with the Project would be minor and were qualitatively assessed. Modeling assumptions and output files are included in **Appendix A**.

3.3.2.2 Long-Term Operational Emissions

Long-term operational emissions associated with the Project are estimated to be minimal in nature. Maintenance would be provided on an as needed basis by RCWD staff and would result in negligible emissions. The Project does not propose the use of any diesel-powered equipment. Modeling assumptions and output files are included in **Appendix A**.

3.3.2.3 Thresholds of Significance

To assist local jurisdictions in the evaluation of air quality impacts, the SJVAPCD has published the *Guide for Assessing and Mitigating Air Quality Impacts*. This guidance document includes recommended thresholds of significance to be used for the evaluation of short-term construction, long-term operational, odor, toxic air contaminant, and cumulative air quality impacts. Accordingly, the SJVAPCD-recommended thresholds of significance are used to determine whether implementation of the Project would result in a significant air quality impact. Projects that exceed these recommended thresholds would be considered to have a potentially significant impact to human health and welfare. The thresholds of significance are summarized, as follows:

Short-Term Emissions of Particulate Matter (PM_{10}): Construction impacts associated with the proposed Project would be considered significant if the feasible control measures for construction in compliance with Regulation VIII as listed in the SJVAPCD guidelines are not incorporated or implemented, or if project-generated emissions would exceed 15 tons per year (TPY).

Short-Term Emissions of Ozone Precursors (ROG and NOx): Construction impacts associated with the proposed Project would be considered significant if the project generates emissions of Reactive Organic Gases (ROG) or NO_X that exceeds 10 TPY.

Long-Term Emissions of Particulate Matter (PM10): Operational impacts associated with the proposed Project would be considered significant if the Project generates emissions of PM_{10} that exceed 15 TPY.

Long-Term Emissions of Ozone Precursors (ROG and NOx): Operational impacts associated with the proposed Project would be considered significant if the Project generates emissions of ROG or NO_X that exceeds 10 TPY.

Conflict with or Obstruct Implementation of Applicable Air Quality Plan: Due to the region's nonattainment status for ozone, $PM_{2.5}$, and PM_{10}, if the project-generated emissions of either of the ozone precursor pollutants (i.e., ROG and NO_x) or PM_{10} would exceed the SJVAPCD's significance thresholds, then the Project would be considered to conflict with the attainment plans. In addition, if the Project would result in a change in land use and corresponding increases in vehicle miles traveled, the Project may result in an increase in vehicle miles traveled that is unaccounted for in regional emissions inventories contained in regional air quality control plans.

Local Mobile-Source CO Concentrations: Local mobile source impacts associated with the Project would be considered significant if the project contributes to CO concentrations at receptor locations in excess of the CAAQS (i.e. 9.0 ppm for 8 hours or 20 ppm for 1 hour).

Exposure to toxic air contaminants (TAC) would be considered significant if the probability of contracting cancer for the Maximally Exposed Individual (i.e., maximum individual risk) would exceed 10 in 1 million or would result in a Hazard Index greater than 1.

Odor impacts associated with the Project would be considered significant if the Project has the potential to frequently expose members of the public to objectionable odors.

Table 3-4. Summary of Ambient Air Quality Standards and Attainment Designation

Pollutant	Averaging Time	California Standards*		National Standards*	
		Concentration*	Attainment Status	Primary	Attainment Status
Ozone (O_3)	1-hour	0.09 ppm	Nonattainment/ Severe	–	No Federal Standard
	8-hour	0.070 ppm	Nonattainment	0.070 ppm	Nonattainment (Extreme)**
Particulate Matter (PM_{10})	AAM	20 µg/m^3	Nonattainment	–	Attainment
	24-hour	50 µg/m^3		150 µg/m^3	
Fine Particulate Matter ($PM_{2.5}$)	AAM	12 µg/m^3	Nonattainment	12 µg/m^3	Nonattainment
	24-hour	No Standard		35 µg/m^3	
Carbon Monoxide (CO)	1-hour	20 ppm	Attainment/ Unclassified	35 ppm	Attainment/ Unclassified
	8-hour	9 ppm		9 ppm	
	8-hour (Lake Tahoe)	6 ppm		–	
Nitrogen Dioxide (NO_2)	AAM	0.030 ppm	Attainment	53 ppb	Attainment/ Unclassified
	1-hour	0.18 ppm		100 ppb	
Sulfur Dioxide (SO_2)	AAM	–	Attainment	--	Attainment/ Unclassified
	24-hour	0.04 ppm		--	
	3-hour	–		0.5 ppm	
	1-hour	0.25 ppm		75 ppb	
Lead (Pb)	30-day Average	1.5 µg/m^3	Attainment	–	No Designation/ Classification
	Calendar Quarter	–		--	
	Rolling 3-Month Average	–		0.15 µg/m^3	
Sulfates (SO_4)	24-hour	25 µg/m^3	Attainment	No Federal Standards	
Hydrogen Sulfide (H_2S)	1-hour	0.03 ppm (42 µg/m^3)	Unclassified		
Vinyl Chloride (C_2H_3Cl)	24-hour	0.01 ppm (26 µg/m^3)	Attainment		
Visibility-Reducing Particle Matter	8-hour	Extinction coefficient: 0.23/km-visibility of 10 miles or more due to particles when the relative humidity is less than 70%.	Unclassified		

** For more information on standards visit: http//www.arb.ca.gov.research/aaqs/aaqs2.pdf*
*** No Federal 1-hour standard. Reclassified extreme nonattainment for the Federal 8-hour standard May 5, 2010.*
****Secondary Standard*
Source: CARB 2016; SJVAPCD 2020

San Joaquin Valley Air Pollution Control District: The SJVAPCD is the agency primarily responsible for ensuring that NAAQS and CAAQS are not exceeded and that air quality conditions are maintained in the SJVAB, within which the proposed Project is located. Responsibilities of the SJVAPCD include, but are not limited to, preparing plans for the attainment of ambient air quality standards, adopting and enforcing rules and regulations concerning sources of air pollution, issuing permits for stationary sources of air pollution, inspecting stationary sources of air pollution and responding to citizen complaints, monitoring ambient air quality and meteorological conditions, and implementing programs and regulations required by the CAA and the CCAA.

The SJVAPCD Rules and Regulations that are relevant and applicable to the proposed Project include, but are not limited to, the following:

Regulation VIII (Fugitive Dust Prohibitions), Regulation VIII (Rules 8011-8081): This regulation is a series of rules designed to reduce particulate emissions generated by human activity, including construction and demolition activities, carryout and trackout, paved and unpaved roads, bulk material handling and storage, unpaved vehicle/traffic areas, open space areas, etc. If a non-residential area is 5.0 or more acres in area, a Dust Control Plan must be submitted as specified in Section 6.3.1 of Rule 8021. Additional requirements may apply, depending on total area of disturbance.

San Joaquin Valley Air Pollution Control District Thresholds of Significance. Projects that produce emissions that exceed the following thresholds shall be considered significant for a project level and/or cumulatively considerable impact to air quality. The following thresholds are defined for purposes of determining cumulative effects as the baseline for "considerable". Projects located within the SJVAPCD would be subject to the significance thresholds identified in section 3.3.2.3 above.

3.3.3 Impact Assessment

a) Conflict with or obstruct implementation of the applicable air quality plan?

No Impact. As noted in Impact Assessments (b) and (c) below, implementation of the Project would not result in short-term or long-term increases in emissions that would exceed applicable thresholds of significance. Projects that do not exceed the recommended thresholds would not be considered to conflict with or obstruct the implementation of applicable air quality plans.

b) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard?

Less than Significant Impact.

Short-Term Construction-Generated Emissions

Construction-generated emissions are temporary in duration, lasting approximately three months for site preparation and construction of the Project. Project development includes mobilization, site preparation, berm construction, earthwork, and other associated infrastructure. The construction of the Project would result in the temporary generation of emissions associated with site grading and excavation, motor vehicle exhaust associated with construction equipment and worker trips, as well as the movement of construction equipment on unpaved surfaces.

Estimated construction-generated emissions and operational emissions are summarized in **Table 3-5** and **Table 3-6**, respectively.

Table 3-5. Unmitigated Short-Term Construction-Generated Emissions of Criteria Air Pollutants

Source	Annual Emissions (Tons/Year) (1)				
	ROG	NO_X	CO	PM_{10}	$PM_{2.5}$
2021	0.1262	1.3245	0.8541	0.4766	0.2392
Maximum Annual Proposed Project Emissions:	0.1262	1.3245	0.8541	0.4766	0.2392
SJVAPCD Significance Thresholds:	*10*	*10*	*100*	*15*	*15*
Exceed SJVAPCD Thresholds?	*No*	*No*	*No*	*No*	*No*

1. *Emissions were quantified using CalEEmod Output Files Version 2016.3.2. Refer to Appendix A for modeling results and assumptions. Totals may not sum due to rounding.*

Table 3-6. Unmitigated Long-Term Operational Emissions

Source	Annual Emissions (Tons/Year) (1)				
	ROG	NO_X	CO	PM_{10}	$PM_{2.5}$
Maximum Annual Project Emissions:	0.3395	<1	<1	0.0000	0.0000
SJVAPCD Significance Thresholds:	*10*	*10*	*100*	*15*	*15*
Exceed SJVAPCD Thresholds?	*No*	*No*	*No*	*No*	*No*

1. *Emissions were quantified using CalEEmod Output Files Version 2016.3.2. Refer to Appendix A for modeling results and assumptions. Totals may not sum due to rounding.*

It is important to note that the Project would be required to comply with SJVAPCD Regulation VIII (Fugitive PM_{10} Prohibitions). Mandatory compliance with SJVAPCD Regulation VIII would further reduce emissions of fugitive dust from the APE, and adequately minimize the Project's potential to adversely affect nearby sensitive receptors to localized PM impacts.

Given that project-generated emissions would not exceed applicable SJVAPCD significance thresholds and the proposed Project would be required to comply with SJVAPCD Regulation VIII, construction-generated emissions of criteria pollutants would be considered less than significant.

Long-Term Operational Emissions

Long-term operational emissions associated with the Project would be minimal. Maintenance would be provided on an as needed basis and the operation of the Project would be passive in nature. Therefore, Project-related impacts to air quality would be considered less than significant.

c) Expose sensitive receptors to substantial pollutant concentrations?

Less than Significant Impact.

Toxic Air Contaminants

Implementation of the Project would not result in the long-term operation of any major onsite stationary sources of TACs, nor would Project implementation result in a substantial increase in vehicle trips along area roadways, in comparison to existing conditions. However, construction of the Project may result in temporary increases in emissions of diesel-exhaust particulate matter (DPM) associated with the use of off-road diesel equipment. More than 90% of DPM is less than one μm in diameter, and thus is a subset of $PM_{2.5}$.[4] Health-

[4] (California Air Resources Control Board, 2020). Accessed August 2020.

related risks associated with diesel-exhaust emissions are primarily associated with long-term exposure and associated risk of contracting cancer. As such, the calculation of cancer risk associated with exposure of TACs are typically calculated based on a long-term (e.g., 70-year) periods of exposure. The use of diesel-powered construction equipment, however, would be temporary and episodic. Construction activities would occur over an approximate three-month period, which would constitute less than one percent of the typical 70-year exposure period. As a result, exposure to construction generated DPM would not be anticipated to exceed applicable thresholds (i.e. incremental increase in cancer risk of 10 in one million).

The Project is located in the unincorporated area of Madera County. Nearby land uses primarily consist of agriculture with sparse residential development. Construction of the Project is not anticipated to result in a substantial increase in DPM or other TACs. As indicated in **Table 3-5**, construction of the Project would generate maximum unmitigated annual emissions of approximately 0.2392 tons/year of $PM_{2.5}$, which includes DPM. Operational impacts would be negligible due to the lack of combustible engines associated with the operation of the Project. Operation of the Project would generate maximum unmitigated annual emissions of approximately 0.0 tons/year of $PM_{2.5}$, as illustrated in **Table 3-6**. Project-related impacts to sensitive receptors would be less than significant.

Naturally Occurring Asbestos

Naturally-occurring asbestos, which was identified by CARB as a TAC in 1986, is located in many parts of California and is commonly associated with ultramafic rock. The APE is not located near any areas that are likely to contain ultramafic rock[5]. As a result, risk of exposure to asbestos during the construction process would be considered less than significant.

Fugitive Dust

Construction of the Project would include ground-disturbing activities that could result in increased emissions of airborne particulate matter. The Project would be required to comply with SJVAPCD Regulation VIII (Fugitive PM_{10} Prohibitions). Mandatory compliance with SJVAPCD Regulation VIII would reduce emissions of fugitive dust from the Project site.

The Project is located within the unincorporated Madera County. Construction of the Project is not anticipated to result in a substantial increase in particulate matter. As indicated in **Table 3-5** and **Table 3-6**, respectively, construction of the Project would generate maximum unmitigated annual emissions of approximately 0.4155 tons/year of PM_{10}, while operation of the Project would generate maximum unmitigated annual emissions of approximately 0.0 tons/year of PM_{10}, both of which are substantially less than SJVAPCD's threshold of significance of 15 tons/year. Project-related impacts to sensitive receptors would be less than significant.

d) Would the project result in other emissions (such as those leading to odors adversely affecting a substantial number of people?

Less than Significant Impact. Implementation of the Project would not result in long-term emissions of odors. However, construction would involve the use of a variety of gasoline- or diesel-powered equipment that would emit exhaust fumes. Exhaust fumes, particularly diesel exhaust, may be considered objectionable by some people. The Project is located within an area dominated by agricultural production, which includes the use of diesel-powered equipment and various odorous chemicals on a regular basis. Construction activities would be short-term in nature, lasting approximately three months. Conditions created by Project-related activities would not vary substantially from the baseline conditions routinely experienced onsite and in the vicinity. Impacts would be less than significant.

---

[5] (California Department of Conservation, 2020). Accessed August 2020.

3.4 Biological Resources

Table 3-7. Biological Resources Impacts

Biological Resources				
Would the project:	Potentially Significant Impact	Less than Significant With Mitigation Incorporated	Less than Significant Impact	No Impact
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?	☐	☒	☐	☐
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?	☐	☐	☐	☒
c) Have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	☒	☐
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☒	☐	☐
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☒
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☒

3.4.1 Environmental Setting

The Project area consists of five land cover types: ruderal/barren, developed, irrigated orchard, excavated irrigation basin, and ephemeral drainage. Elevations within the APE range from approximately 310 to 360 feet (94.5 to 109.7 meters) above mean sea level (msl). The climate in this region is generally mild with an annual minimum average temperature of 47.5 degrees Fahrenheit (F), a maximum average temperature of 76.6 degrees F, and an average annual precipitation of 10.99 inches (WRCC 2016). The topography of the Project area is generally flat. The Project area is surrounded by agricultural lands, with residential developments to the east.

3.4.2 Methodology

A Biological Resources Assessment (BRA) was prepared by Rincon Consultants, Inc. to document existing conditions and evaluate potential impacts to special-status and sensitive biological resources from the implementation of the Project. This BRA has been prepared to support California Environmental Quality Act and National Environmental Policy Act environmental review of the Project. Much of the information in this section is taken from the BRA, which can be read in its entirety in **Appendix B**.

Prior to field surveys, Rincon conducted a literature review to characterize the nature and extent of biological resources on and adjacent to the APE. The APE for the Project is also the Biological Study Area. The literature review included an evaluation of current and historical aerial photographs of the site (Google Earth Pro 2020), regional and site-specific topographic maps, climatic data, and other available background information.

Queries of the USFWS Information for Planning and Consultation system (IPaC; UFWS 2020a), CDFW California Natural Diversity Database (CNDDB; CDFW 2020a), and California Native Plant Society (CNPS) online Inventory of Rare and Endangered Plants of California (CNPS 2020) were conducted to obtain comprehensive information regarding State and federally listed species, as well as other special-status species, considered to have potential to occur within the Lanes Bridge, California USGS 7.5-minute topographic quadrangle and the surrounding eight quadrangles (Little Table Mountain, Millerton Lake West, Friant, Clovis, Fresno North, Herndon, Gregg, and Daulton). The results of database-queries and lists of special-status species were reviewed by Rincon's regional biological experts for accuracy and completeness. The final list of special-status biological resources to be evaluated is the result of documented occurrences within the 9-quad search area and species known to occur in the region based on the biologists' expert opinions. The results of the species potential-to-occur assessment were compiled into tables and be seen in **Appendix B**.

On July 14, 2020 Rincon Biologists Brooke Fletcher and Carolynn Daman conducted a reconnaissance-level filed survey. The field reconnaissance survey was conducted on foot throughout the APE. During the survey, the biologists field-verified the boundaries of vegetation communities and other land-cover types, recorded occurrences of incidental observation of special-status species (including State and federally-listed species), and developed a list of observed plants and wildlife (**Appendix B**). The approximate limits of jurisdictional waters were documented and mapped (**Appendix B**). Definitive surveys to confirm the presence or absence of special-status species were not performed and are not included with this analysis. Definitive surveys for special-status plant and wildlife species generally require specific survey protocols, extensive field survey time, and are conducted only at specific time periods of the year.

3.4.3 Impact Assessment

a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?

Less than Significant with Mitigation Incorporated. No special-status plant species have the potential to occur within the APE. Nine special-status animal species have potential to occur within the APE based upon known ranges, habitat preferences, species occurrence records in the vicinity, and presence of suitable habitat features (**Appendix B**). California horned lark, California tiger salamander, pallid bat, spotted bat, western mastiff bat, San Joaquin kit fox, tricolored blackbird, and western spadefoot were all determined to have low potential to occur. Swainson's hawk is present within the APE. Nesting birds protected by the CFGC also have the potential to occur within suitable habitat in the APE.

Nesting Raptors, Migratory Birds, and Special-status Birds (Including Swainson's Hawk, Tricolored Blackbird, and California Horned Lark)

The APE contains suitable foraging habitat for several avian species, including the special-status Swainson's hawk, and the orchard trees provide marginal nesting habitat for passerines. Ground-nesting birds, such as the killdeer could nest on the bare ground of the dirt roads on site. The Project includes the removal of numerous orchard trees in the vicinity of Root Creek. Birds nesting onsite at the time of construction activities could be injured or killed. Furthermore, construction activities could disturb birds nesting within or adjacent to work areas, resulting in nest abandonment. Project construction activities that adversely affect the nesting success of raptors and migratory birds or result in the mortality of individual birds constitutes a violation of State and federal laws and is considered a significant impact under CEQA.

Swainson's hawks are relatively common in this portion of the Central Valley. In fact, a pair of Swainson's hawks were observed soaring over the APE during the field survey. Although there are no potential raptor nest trees within Project limits, suitable nesting habitat undoubtedly does occur in the vicinity. Similarly, suitable nesting habitat for the special-status tricolored blackbird and California horned lark are absent from Project areas; however, there is at least some potential that regionally occurring special-status avian species, such as these, could pass through the Project area during foraging or dispersal movements. In the event that a Swainson's hawk or other avian species is foraging within the APE during construction activities, the individual would be expected to fly away from disturbance they encounter, subsequently eliminating the risk of injury or mortality while foraging.

Currently, the orchards on site represent sub-optimal foraging habitat where passerines take insects in flight and raptors prey on smaller birds, rodents, and lizards. While clearing orchard trees along Root Creek may result in a reduction of sub-optimal nesting habitat for passerines, large swaths of other similar suitable habitats occur in the vicinity of the APE, including expansive orchards. Additionally, the San Joaquin River and associated riparian corridor comprised of optimal nesting and foraging habitat is located approximately 1.5 miles east and 3 miles south of the APE.

Furthermore, as riparian vegetation grows within the inundated areas along Root Creek, the site will become suitable nesting and foraging habitat for several avian species, such as tricolored blackbird, various species of waterfowl, herons, flycatchers, and other riparian migratory birds. At full build-out of the Riverstone community, this segment of Root Creek is envisioned as a multipurpose aquatic feature and open space area with recreational and environmental benefits such as enhancement of the biodiversity of the Root Creek stream corridor. For these reasons, loss of nesting and foraging habitat would be considered a less than significant impact under CEQA and NEPA.

Nesting bird season is generally accepted as February 1 through August 31; however, Swainson's hawk nesting season is generally accepted as March 1 through September 15. For simplicity, these timeframes have been combined.

Implementation of the following recommended mitigation measures will reduce potential impacts to nesting raptors, migratory birds, and special-status birds, including Swainson's hawk to a less than significant level under CEQA and NEPA, and will ensure compliance with State and federal laws protecting these avian species.

Mitigation Measures:

BIO-1a (Avoidance)

The Project's construction activities shall occur, if feasible, between September 16 and January 31 (outside of nesting bird season) to avoid impacts to nesting birds.

BIO-1b (Nesting Bird Preconstruction Survey)

If construction activities must occur within nesting bird season (February 1 to September 15), a qualified biologist shall conduct preconstruction surveys for active nests within 30 days prior to initiation of ground disturbance and vegetation removal. The survey shall be conducted within the Project Area and include a 150-

foot buffer for passerines, 500-foot buffer for other raptors, and 0.5-mile buffer for active Swainson's hawk nests. The survey shall be conducted by a qualified biologist familiar with the identification of avian species known to occur in the region. If no active nests are observed, no further mitigation is required.

BIO-1c (Establish Buffers)

If any active bird nests are observed during the preconstruction survey, the biologist shall determine appropriate buffer areas in which no construction activities can occur, based on applicable CDFW and/or USFWS guidelines and/or the biology of the species in question. For Swainson's hawk nests, an avoidance buffer of up to ½ mile shall be established around the nest location based on the project activity, the line-of-sight from the nest to the project activity, and observed hawk behavior at the nest. Construction buffers shall be identified with flagging, fencing, or other easily visible means, and shall be maintained until the biologist has determined that the nestlings have fledged.

Special-status Bat Species

Although roosting habitat is absent from the Project site, there is low potential for the special-status pallid bat, spotted bat, and western mastiff bat to nocturnally pass thorough or forage over the Project area. All three of these regionally occurring bat species are designated as species of special concern in California. The Project does not propose removal of bat roosts or significant impacts to habitat features. Although impacts to individual foraging bats seems unlikely, the following recommended mitigation measure will ensure no special-status bats are injured or killed while foraging within Project areas during construction.

BIO-2 (Construction Hours)

The Project's construction activities shall be limited to the daylight hours in order to avoid and minimize potential construction-related injury or mortality of nocturnal species foraging on-site. As described in Section 4.1.2, the SJKF has an extremely low potential to occur on site due to an absence of typical denning and foraging habitat. No evidence of SJKF or burrows of sufficient size to accommodate kit foxes were detected during the field survey. At most, this species could infrequently pass through the Project site during dispersal movements or as a transient. Since there is little-to-no likelihood of a SJKF occurring on site, and suitable burrows or refugia were not observed at the time of the field survey, this species is not expected to be impacted by Project-related construction activities.

Western Spadefoot

Impacts to western spadefoot may occur if individuals are present during construction, but this is highly unlikely due to the very limited potential for the species to occur within the APE. Indirect impacts may occur due to disturbance and loss of habitat, and direct impacts may occur as a result of mortality during clearing and grubbing or active construction. Impacts to non-listed species such as western spadefoot (SSC) would be considered significant under CEQA if it would threaten the continued existence of the population. Due to the disturbance of habitat from agricultural activities in the area and the prevalence of farming, the only parcels on which the spadefoot has a low potential to occur are those with non-native grasses in the vicinity of isolated seasonal wetlands and ground squirrel burrows. It is unlikely that the continued existence of the population would be threatened due to the small area of marginally suitable habitat within the APE and the presence of similar habitat in surrounding areas outside of the Project that likely support larger populations of this species. Impacts to western spadefoot from project activities are not expected.

California Tiger Salamander

Impacts to California tiger salamander (CTS) may occur if individuals are present during construction, but this is highly unlikely due to the very limited potential for the species to occur within the APE. Indirect impacts may occur due to disturbance and loss of habitat, and direct impacts may occur as a result of mortality during clearing and grubbing or active construction. Ponded areas and an irrigation basin could be considered marginal breeding habitat for CTS, although the presence of bullfrogs and the disturbed nature of the Project area significantly reduce the quality of habitat on site. There is marginal upland habitat within the APE in small mammal burrows along Root Creek, although no vernal pools or undisturbed habitat are present. Although impacts to CTS from Project activities are not expected, implementation of the following recommended mitigation measures will aid in the avoidance and minimization of potential Project-related impacts to this State and federally listed species.

BIO-3 CTS Preconstruction Surveys

Pre-construction clearance surveys for California tiger salamander shall be conducted within 30 days prior to the start of construction (including staging and mobilization). The surveys should cover the entire disturbance footprint plus a minimum 100-foot buffer within suitable habitat, where permissible. If CTS are detected, consultation with CDFW and USFWS will be initiated.

BIO-4 Worker Environmental Awareness Program

Prior to initiation of construction activities (including staging and mobilization), all personnel associated with project construction shall attend a Worker Environmental Awareness Program (WEAP) training, conducted by a qualified biologist, to aid workers in recognizing special-status resources that may occur in the construction area. The specifics of this program should include identification of the sensitive species and habitats, a description of the regulatory status and general ecological characteristics of sensitive resources, and review of the limits of construction and mitigation measures required to reduce impacts to biological resources within the work area. A fact sheet conveying this information should also be prepared for distribution to all contractors, their employers, and other personnel involved with construction. All employees should sign a form provided by the trainer indicating they have attended the WEAP and understand the information presented to them.

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 Wildlife or U.S. Fish and Wildlife Service?

No Impact. No sensitive natural communities, including riparian habitat, are present within the Project area. Therefore, there would be no impacts to sensitive natural communities.

c) Have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?

Less than Significant Impact. Based on the ARD, two hydrologic features are present within the APE: Root Creek and an irrigation pond. Root Creek is potentially subject to CDFW and RWQCB jurisdictions, as discussed below. The irrigation pond is not considered a jurisdictional feature due to its location in upland areas and artificial nature.

Root Creek

Root Creek has no traceable hydrologic connection to the San Joaquin River or any other navigable waterway or perennial or intermittent stream. Due to the USACE determination that Root Creek is an isolated intrastate water, it is not likely to fall under CWA jurisdiction and thus not expected to be regulated by the USACE and RWQCB pursuant to Sections 404 and 401, respectively; however, areas of Root Creek where a defined bed and bank exist may be regulated by the RWQCB under the Porter-Cologne Water Quality Control Act. In addition, where streambed characteristics are present the creek meets the definition of a CDFW streambed and likely falls under CDFW jurisdiction. If Project activities would result in impacts to the bed, banks, or channel of Root Creek, or deposit any pollutants or material into it, coordination and permitting with CDFW and RWQCB may be required. A Lake and Streambed Alteration (LSA) Agreement may be required from CDFW pursuant to Section 1602 of the Fish and Game Code for diverting or obstructed the natural flow of any stream (including Root Creek) or lake, changing the bed, channel, or bank of any stream or lake or depositing material into any stream or lake. A general Waste Discharge Requirement (WDR) may be required from RWQCB pursuant to the California Water Code (CWC) Section 13260 for discharging waste or proposing to discharge waste that could affect the quality of waters of the State, including Root Creek. The aforementioned permits will have associated protective measures and conditions that the Project must comply with in order to reduce potential impacts to a less than significant level. No additional mitigation measures are required.

Irrigation Pond

The irrigation pond is not considered a jurisdictional feature due to its location in upland areas and artificial nature. No permits or mitigation measures for the irrigation pond are required.

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?

Less than Significant Impact with Mitigation Incorporated. There are no Natural Landscape Blocks or Essential Connectivity Areas mapped within the APE (**Appendix B**). Due to the highly disturbed nature of the Project area, Project-related construction activities are not likely to significantly impact any wildlife movement corridors; however, Project-related fencing could have impacts on the local migration patterns of those disturbance-tolerant wildlife species that may occasionally utilize the area. The following mitigation measure is recommended to ensure that perimeter fencing installed for the duration of the Project would not have significant impacts on wildlife movement. Impacts will be less than significant with mitigation incorporated.

BIO-5 Wildlife-friendly fencing

Any temporary or permanent fencing installed within the Project site should allow for the safe passage of wildlife. Fencing should not include any materials that would entrap wildlife. Fencing should also allow for larger wildlife species to jump over and smaller wildlife species to crawl under without injury. Fencing should be highly visible to avoid inadvertent collision by birds and other wildlife species. Common wildlife-friendly fencing incorporates smooth wires (or heavy-duty plastic) to prevent injury, caps height at a maximum of forty-two inches to facilitate leaping over, and provides at least sixteen inches of clearance between the ground and the lowest beam or wire to allow wildlife to crawl under. If Project fencing is temporary, all fencing materials should be completely removed upon completion of Project activities.

e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?

No Impact. The Project description is in compliance with the goals and policies set forth in the Madera County General Plan. There would be no conflict with the General Plan. There would be no impact.

f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?

No Impact. The Project site is not within a designated Habitat Conservation Plan, Natural Conservation Plan, or any other State or local habitat conservation plan. There would be no impact.

Figure 3-2. Picture of the Project Area

Figure 3-3. Picture of the Project Area

3.5 Cultural Resources

Table 3-8. Cultural Resources Impacts

Cultural Resources					
Would the project:		**Potentially Significant Impact**	**Less than Significant With Mitigation Incorporated**	**Less than Significant Impact**	**No Impact**
a)	Cause a substantial adverse change in the significance of a historical resource pursuant to §15064.5?	☐	☒	☐	☐
b)	Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?	☐	☒	☐	☐
c)	Disturb any human remains, including those interred outside of dedicated cemeteries?	☐	☒	☐	☐

3.5.1 Environmental Setting

The proposed Project lies on the eastern margin of the central San Joaquin Valley. This lowland is bordered on the east by the Sierra Nevada, on the west by the South Coast Ranges, and on the south by the Tehachapi Range. The Sierra Nevada greatly influences the general physiography of the region. The north-south orientation of these mountains directs the flow of rivers and streams westward providing drainage across the San Joaquin Valley. The San Joaquin River lies 1.25 miles east of the eastern edge of the Project and is 3.25 miles south of the western side of the Project. The topography consists of flat to gently sloping alluvial plains and incised drainages, with elevations ranging between 350 and 385 feet above mean sea level. Much of the natural topography within the region is leveled or recontoured because of agricultural use. Moreover, portions of Root Creek have been rechanneled (**Appendix C**Error! Reference source not found.).

3.5.2 Methodology

A Cultural Resource Inventory Report was prepared for the Project site by Applied Earthworks, Inc (Æ) in August 2020. The report documents whether historic properties, as defined by NHPA Section 106, or historical resources, as defined by the CEQA Guidelines, which mandates that government agencies consider the impacts of their actions on the environment, including cultural resources. Impacts were analyzed using the methodologies listed below. Most of the analysis in this section comes entirely from the cultural resource inventory report which can be found in its entirety in **Appendix C** at the end of this document.

3.5.2.1 Records Search

At Æ's request, the SSJVIC of the CHRIS at California State University, Bakersfield, performed a records search on June 22, 2020, to identify previously recorded resources and prior surveys within the APE and surrounding 0.5-mile radius. SSJVIC staff completed searches of the Historic Property Data File, NRHP, CRHR, listings of California Historical Landmarks, California Inventory of Historic Resources, and the California Points of Historical Interest database (Error! Reference source not found.).

3.5.2.2 Archival Research

The purpose of archival research for archaeological studies is to acquire information regarding the potential for historic-era cultural resources to exist within the APE and to build a context to support and guide evaluations of the eligibility of cultural resources for listing in the NRHP and CRHR. The investigation compiled information from several sources:

- Aerial photographs available through the Map Aerial Locator Tool (MALT) maintained by California State University, Fresno; Madera County property atlases (Online Archive of California); and USGS TopoView;
- Æ's in-house library, which includes maps and local histories; and
- RCWD website (https://rootcreekwd.com).

In addition, Æ reviewed findings presented in the Gateway Village Specific Plan Program EIR[6] and Tesoro Viejo Specific Plan Revised EIR[7].

3.5.2.3 Archaeological Survey

On July 8 and 9, 2020, Æ Staff Archaeologists conducted an intensive archaeological pedestrian survey of the APE. Staff completed the survey of all accessible areas using parallel transects spaced 15–20 meters apart. Photographs were taken using an Olympus TG-860 digital camera to document the environmental setting, ground visibility, and potential historic-era buildings, structures, or features. An Æ Senior Architectural Historian thoroughly reviewed the field records and photographs to identify any potential built environment cultural resources. Methods and observations were recorded on Daily Work Record and Survey Field Record forms. Geospatial data was collected with a Trimble Global Positioning System (GPS) unit. All photographs and field records are on file at Æ's office in Fresno, California (Error! Reference source not found.).

3.5.2.4 Buried Site Sensitivity Survey

Æ reviewed geologic, soils, and hydrologic data for the APE to assess the potential for the vertical APE to include paleosols that may contain intact prehistoric cultural deposits. Æ consulted geological maps, historical maps, aerial photographs, the U.S. Department of Agriculture Natural Resources Conservation Service Web Soil Survey online database, soils data sheets, and regional geoarchaeological studies (e.g., Asselin et al. 2016; Meyer et al. 2010; Stanley et al. 2019). These sources provided information regarding the natural watercourses in the area as well as data about local soils and sediments, parent rock formations, paleoclimate, and historical vegetation. This information was used to estimate the age of the sediments surrounding the APE, consider the hydrologic and geologic forces that created and placed these sediments, and assess the likelihood of encountering buried cultural resources within the vertical APE during proposed ground-disturbing Project activities(Error! Reference source not found.).

3.5.3 Impact Assessment

a) Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?

b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?

Less than Significant Impact with Mitigation Incorporated. Æ provided cultural resource services for the Project. The District plans to divert flows from Root Creek by constructing six embankments across a 3.5-mile segment of the creek. Each of these embankments will be approximately 5.9 feet high and will require construction of new culverts and control gates intended to control the water level and flow through the embankments. To accomplish this, the District is seeking a permit from the USACE, Sacramento District, to meet requirements of Section 404 of the Clean Water Act. Therefore, the Project is considered a "federal undertaking" subject to the requirements of Section 106 of the NHPA and its implementing regulations at 36 CFR 800. The Project is also subject to environmental review under the CEQA.

---

[6] Draft Gateway Village Specific Plan Program Environmental Impact Report. ESA, Los Angeles, California. Prepared for County of Madera Resource Management Agency, Madera, California.

[7] Tesoro Viejo Specific Plan Revised Environmental Impact Report, Vol. I. Atkins, Los Angeles, California. Prepared for Madera County Planning Department, Madera, California.

As a subconsultant to Provost & Pritchard Consulting Group, Æ conducted a cultural resource inventory of the APE to determine if historic properties or historical resources are present within the APE. Accordingly, Æ performed background research, obtained a records search from the SSJVIC of the CHRIS, requested a search of the NAHC Sacred Lands File, contacted local Native American representatives identified by the NAHC for outreach, assessed the buried site sensitivity of the APE, and conducted an intensive pedestrian archaeological and built environment survey of the APE.

The SSJVIC records search identified five previous investigations intersecting the APE and four additional studies in the surrounding 0.5-mile area. One previously recorded prehistoric ground stone isolate consisting of two fragments recorded in the APE was not located during the current survey. A search of the NAHC Sacred Lands File did not reveal the presence of sacred sites in the APE. Two Native American representatives from the Northern Valley Yokut Tribe responded to Æ's outreach, and their responses were shared with RCWD, the lead CEQA agency, further discussion of this can be found in Section 3.18 of this document.

No prehistoric or historic-era archaeological sites were discovered during pedestrian survey of the APE; however, Æ identified one isolated granitic handstone just outside the APE. Because of its location beyond the APE boundary, Æ surveyors did not formally record the resource on DPR forms.

The buried site sensitivity assessment concluded that the APE is dominated by soil types classified as having high to very high sensitivity for containing anthropogenic paleosols that may harbor intact cultural deposits. However, because some portions of the APE have been heavily disturbed in the past to channelize the creek and install water flow control equipment, there is the possibility that certain segments of the APE have low to no sensitivity for the presence of intact buried cultural deposits. In order to identify and adequately assess potentially significant adverse impacts to buried cultural resources the following mitigation measures are recommended.

Mitigation Measures:

CUL-1 (Additional Buried Site Assessment)

Prior to construction, a more detailed Buried Site Assessment shall be conducted. This study uses GIS predictive modeling to more clearly identify the boundaries of low, moderate, high, and very high sensitivity areas, followed by limited subsurface archaeological testing to confirm presence/absence of anthropogenic paleosols. Presence/absence testing for paleosols with potential to contain intact and well-preserved cultural deposits would allow for an adequate assessment of the potential for the proposed Project activities to cause adverse impacts to buried cultural resources. Methods and findings for the buried site assessment and subsurface testing along with any additional cultural resource mitigation measures would be presented to the District.

CUL-2 (Archaeological Resources)

In the event that archaeological remains are encountered at any time during development or ground-moving activities within the entire project area, all work in the vicinity of the find shall halt until a qualified archaeologist can assess the discovery. The District shall implement all recommendations of the archaeologist necessary to avoid or reduce to a less than significant level potential impacts to cultural resource. Appropriate actions could include a Data Recovery Plan or preservation in place.

c) Disturb any human remains, including those interred outside of dedicated cemeteries?

Less than Significant Impact with Mitigation Incorporated. No formal cemeteries or other places of human internment are known to exist on the Project site; however, in accordance with Health and Safety Code Section 7050.5 and Public Resource Code Section 5097.98, if human remains are uncovered, Mitigation Measure CUL-3 would be implemented.

CUL-3 (Human remains)

If human remains are uncovered, or in any other case when human remains are discovered during construction, the Madera County Coroner is to be notified to arrange their proper treatment and disposition. If the remains are identified—on the basis of archaeological context, age, cultural associations, or biological traits—as those of a Native American, California Health and Safety Code 7050.5 and Public Resource Code 5097.98 require that the coroner notify the NAHC within 24 hours of discovery. The NAHC would then identify the Most Likely Descendent who would determine the manner in which the remains are treated.

3.6 Energy

Table 3-9. Energy Impacts

Energy					
Would the project:		Potentially Significant Impact	Less than Significant With Mitigation Incorporated	Less than Significant Impact	No Impact
a)	Result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?	☐	☐	☐	☒
b)	Conflict with or obstruct a state or local plan for renewable energy or energy efficiency?	☐	☐	☐	☒

3.6.1 Environmental Setting

PG&E is the primary energy utility purveyor within Madera County. PG&E has sufficient energy supplies to support the growth that has occurred in Madera County. Much of the energy consumed in the region is for residential, commercial, and transportation purposes.

Construction equipment and construction worker vehicles operated during Project construction would use fossil fuels. This increased fuel consumption would be temporary and would cease at the end of the construction activity, and it would not have a residual requirement for additional energy input. The marginal increases in fossil fuel use resulting from Project construction are not expected to have appreciable impacts on energy resources.

3.6.2 Impact Assessment

a) Would the project result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?

No Impact. As discussed in Section 3.3, the Project would not exceed any air emission thresholds during construction or operation. The Project would comply with construction best management practices and may be required to complete a SWPPP as part of construction. Once completed, the Project would be passive in nature and would not use an excessive amount of energy. Therefore, the Project would not result in potentially significant environmental impacts due to wasteful, inefficient, or unnecessary consumption of energy resources during construction or operation.

b) Would the project conflict with or obstruct a state or local plan for renewable energy or energy efficiency?

No Impact. The Project would be passive in nature once it is completed, and the construction phase would be temporary in nature and would not exceed any thresholds set by the SJVAPCD.

3.7 Geology and Soils

Table 3-10. Geology and Soils Impacts

Geology and Soils					
Would the project:		**Potentially Significant Impact**	**Less than Significant With Mitigation Incorporated**	**Less than Significant Impact**	**No Impact**
a)	Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving: i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	☐	☐	☒	☐
	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 most recently adopted Uniform Building Code creating substantial direct or indirect 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?	☐	☐	☐	☒
f)	Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☒	☐	☐

3.7.1 Environmental Setting

Five soil mapping units, representing four soil series were identified within the Project area: Greenfield coarse sandy loam, 0 to 3 percent slopes; Ramona sandy loam, 3 to 8 percent slopes; Tujunga loamy slopes, 0 to 3 percent slopes, Whitney and Rocklin sandy loams, 3 to 8 percent slopes; and Whitney and Rocklin sandy loams, 8 to 15 percent slopes.

Greenfield coarse sandy loam, 0 to 3 percent slopes comprises 3.8 percent of the mapped Project area. The Greenfield series consists of deep, well drained soils that formed in moderately coarse and coarse textured alluvium derived from granitic and mixed rock sources. These soils have moderately rapid permeability with slow runoff and are not classified as hydric. These soils are considered prime farmland if irrigated and are typically used for a variety of irrigated field, forage, and fruit crops as well as dryland grain and pasture. Vegetation on uncultivated areas typically consists of annual grasses, forbs, and some scattered shrubs and oak trees.

Ramona sandy loam, 3 to 8 percent slopes comprises 1.5 percent of the mapped Project area. Ramona soils typically have a moderately slow permeability. This soil is well drained with a high runoff class and is not classified as hydric. This soil is considered prime farmland if irrigated and is often used for the production of grain, hay, pasture, irrigated citrus, olives, truck crops, and deciduous fruits. Uncultivated areas typically support annual grasses, forbs, chamise, or chaparral.

Tujunga loamy sandy, 0 to 3 percent slopes comprises 2.7 percent of the mapped Project area. This soil is somewhat excessively drained, typically found on alluvial fan remnants. This soil type is derived from sandy alluvium derived from granite. It is considered farmland of statewide importance if irrigated.

Whitney and Rocklin sandy loams, 3 to 8 percent slopes comprises 70.8 percent of the mapped Project area and Whitney and Rocklin sandy loams, 8 to 15 percent slopes comprises 23.9 percent of the mapped Project area. When combined, Whitney and Rocklin sandy loams cover nearly 95 percent of the Project area. Both of these soil map units are comprised of equal parts Whitney and Rocklin soils.

Whitney soils are well drained with medium surface runoff and moderate to moderately rapid permeability. This soil is not considered hydric nor is it prime farmland. Whitney soils occur along the eastern edge of the Central Valley where they are typically used for dry-farmed grains and range pasture; although, when irrigated, this soil can be used for citrus and deciduous fruits. In cultivated areas, Whitney soils mainly support annual grasses and associated herbaceous vegetation, and sometimes scattered oak trees.

The Rocklin series consist of moderately deep to hardpan soils formed in old alluvium from granitic rock sources. This soil is not considered hydric nor is it prime farmland. This soil is well drained with a high runoff class and variable permeability. Rocklin soils are typically used for livestock grazing and non-irrigated small grain crops, although they are sometimes found in irrigated pasture and vineyards. Uncultivated areas are generally associated with a vegetative cover of annual grasses and forbs such as soft chess, oats, and filaree with a few scattered oak trees.

The complete Natural Resources Conservation Service (NRCS) Web Soil Survey report is available in **Appendix D** at the end of this document.

Table 3-11. Soils of the Project site

Soils Series	Parent Material	Drainage Class	Hydric?	Shrink-swell Capacity	Acres of Project site
Atwater loamy sand, 0 to 3 percent slopes, MLRA 17	Eolian deposits derived from alluvium derived from granite	Well drained	No		3.3

Soils Series	Parent Material	Drainage Class	Hydric?	Shrink-swell Capacity	Acres of Project site
Atwater loamy sand, 3 to 8 percent slopes, MLRA 17	Eolian deposits derived from alluvium derived from granite	Well drained	No		8.0
Greenfield coarse sandy loam, 0 to 3 percent slopes	Alluvium derived from igneous, metamorphic and sedimentary rock	Well drained	No		9.1
Ramona sandy loam, 0 to 3 percent slopes	Alluvium derived from granite	Well drained	No		0.3
Ramona sandy loam, 3 to 8 percent slopes	Alluvium derived from granite	Well drained	No		6.3
Tujunga loamy sandy, 0 to 3 percent slopes	Sandy alluvium derived from granite	Somewhat excessively drained	No		6.0
Whitney and Rocklin sandy loams, 3 to 8 percent slopes	Alluvium derived from granite	Well drained	No		136.8
Whitney and Rocklin sandy loams, 8 to 15 percent slopes	Alluvium derived from granite	Well drained	No		54.0

3.7.1.1 Faults and Seismicity

The Project is not located within an Alquist-Priolo Earthquake Fault Zone and no known faults cut through the local soil at the site. The nearest fault is the San Joaquin Fault, located 50.9-miles west of the Project APE. The San Andreas Fault is the dominant active tectonic feature of the Coast Ranges and represents the boundary of the North American and Pacific plates. A smaller fault zone, the Nunez Fault is 69.6-miles southwest of the APE.

3.7.1.2 Liquefaction

The potential for liquefaction, which is the loss of soil strength due to seismic forces, is dependent on soil types and density, depth to groundwater, and the duration and intensity of ground shaking. Although no specific liquefaction hazard areas have been identified in Madera County, this potential is recognized throughout the San Joaquin Valley where unconsolidated sediments and a high water table coincide. It is reasonable to assume that due to the depth to groundwater within the southern portion of Madera County, liquefaction hazards would be negligible.

3.7.1.3 Soil Subsidence

Subsidence occurs when a large land area settles due to over-saturation or extensive withdrawal of ground water, oil, or natural gas. These areas are typically composed of open-textured soils, high in silt or clay content, that become saturated. The Project site is dominated by Whitney and Rocklin sandy loam soils, with a low to moderate risk of subsidence.

3.7.1.4 Dam and Levee Failure

Millerton Lake is located 8-miles northeast of the Project site. The Project site lies outside of inundation for Friant Dam which is 1.2-miles northwest of the APE.

3.7.2 Impact Assessment

a) Would the Project directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:

a-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.

a-ii) Strong seismic ground shaking?

Less than Significant Impact. The Project site and its vicinity are located in an area traditionally characterized by relatively low seismic activity. The site is not located in an Alquist-Priolo Earthquake Fault Zone as established by the Alquist-Priolo Fault Zoning Act (Section 2622 of Chapter 7.5, Division 2 of the California Public Resources Code). The nearest major fault is the San Joaquin Fault, located 50.9-miles west of the Project site.

The Project consists of improvements to Root Creek that would allow for diverting water flows from Root Creek to landowners for recharge purposes and does not include development of habitable residential, commercial or industrial structures. Operation of the Project would not require permanent staff onsite or an increase in the number of employees required for routine maintenance. Instead, routine maintenance and repairs would be performed infrequently, on an as-needed basis by current RCWD representatives. Therefore, implementation of the Project would not result in an increase of people or habitable structures onsite. Any impact would be less than significant.

a-iii) Seismic-related ground failure, including liquefaction?

Less than Significant Impact. Liquefaction is a process which involves the temporary transformation of soil from a solid state to a fluid form during intense and prolonged ground shaking. Water-saturated areas with shallow depth to groundwater and uniform sands, loose-to-medium in density, are prone to liquefaction. The Project site is not in a wetland area, not in an area where it is subject to 0.3 g acceleration or greater or contain soils where liquefaction can occur due to coarseness or have low clay content.

a-iv) Landslides?

No Impact. As the Project is located on the Valley floor, no major geologic landforms exist on or near the site that could result in a landslide event. According to the Madera County General Plan Background Report, the Project site is not within or near a region classified with a high landslide potential.[8] The local topography is essentially flat and level. There would be no impact.

[8] (Madera County General Plan Background Report, 1995). Accessed July 27, 2020.

b) Result in substantial soil erosion or the loss of topsoil?

Less than Significant Impact. Earthmoving activities associated with the Project would include excavation, grading, and infrastructure construction. These activities could expose soils to erosion processes and the extent of erosion would vary depending on slope steepness/stability, vegetation/cover, concentration of runoff, and weather conditions. Dischargers whose projects disturb one (1) or more acres of soil or whose projects disturb less than one acre but are part of a larger common plan of development that in total disturbs one or more acres, are required to obtain coverage under the General Permit for Discharges of Storm Water Associated with Construction Activity Construction General Permit Order 2009-0009-DWQ. Construction activity subject to this permit includes clearing, grading and disturbances to the ground such as stockpiling, or excavation, but does not include regular maintenance activities performed to restore the original line, grade, or capacity of the facility. The Construction General Permit requires the development of a Storm Water Pollution Prevention Plan (SWPPP) by a certified Qualified SWPPP Developer (QSD). Since the Project site has relatively flat terrain with a low potential for soil erosion and would comply with the SWRCB requirements, the impact would be less than significant.

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 most recently adopted Uniform Building Code creating substantial direct or indirect risks to life or property?

Less than Significant Impact. Soils onsite consist of the soils depicted on **Table 3-11**, which are classified as well drained and excessively drained, all with a very low runoff class (See **Appendix D**). The proposed project is to divert flows from Root Creek in Madera County. The Project site and surrounding areas do not contain substantial grade changes. Risk of landslides, lateral spreading, subsidence, liquefaction, and collapse are minimal due to the soil characteristics. The Project does not propose a significant change in the local topography that would cause sloping. The construction of the Project would involve excavating portions of the Project site. The Project does not include the development of habitable structures or facilities that could be affected by expansive soils or expose people to substantial risks to life or property. Furthermore, the Project would be consistent with the California Building Standards Code. Any impacts would be less than significant.

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?

No Impact. Septic installation or alternative wastewater disposal systems are not necessary for the project. There would be no impact.

f) Would the project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

Less than Significant with Mitigation Incorporated. Paleontological resources are fossilized remains of flora and fauna and associate deposits. CEQA requires that a determination be made as to whether a project would directly or indirectly destroy a unique paleontological resource or site or unique geological feature (CEQA Appendix G(v)(c)). If an impact is significant, CEQA requires feasible measures to minimize the impact (CCR Title 14(3) Section 15126.4(a)(1)). PRC Section 5097.5 (see above) also applies to paleontological resources.

The records search identified one previously recorded isolate (P-20-002236), consisting of two ground stone fragments, in the central portion of the Project site on the north side of Root Creek. Æ surveyors found the area identified on the Department of Parks and Recreation (DPR) Primary Record as the isolate location and intensively surveyed the area. Only naturally occurring granitic and basalt river cobbles were observed at the plotted location of the isolate and immediately surrounding area. No cultural resources were identified during

Æ's survey of the Project site. However, if a paleontological resource is found then the construction impacts can make a significant impact unless mitigated properly. The impact would be less than significant with mitigation measure *CUL-1* above incorporated.

3.8 Greenhouse Gas Emissions

Table 3-12. Greenhouse Gas Emissions Impacts

Greenhouse Gas Emissions					
Would the project:	**Potentially Significant Impact**	**Less than Significant With Mitigation Incorporated**	**Less than Significant Impact**	**No Impact**
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?	☐	☐	☒	☐

3.8.1 Environmental Setting

The Earth's climate has been warming for the past century. Experts believe this warming trend is related to the release of certain gases into the atmosphere. Greenhouse gases (GHG) absorb infrared energy that would otherwise escape from the Earth. As the infrared energy is absorbed, the air surrounding the Earth is heated. An overall warming trend has been recorded since the late 19th century, with the most rapid warming occurring over the past 35 years, with 16 of the 17 warmest years on record occurring since 2001. Not only was 2016 the warmest year on record, but eight of the 12 months that make up the year—from January through September, with the exception of June—were the warmest on record for those respective months. October, November, and December of 2016 were the second warmest of those months on record—in all three cases, behind records set in 2015.[9] Human activities have been attributed to an increase in the atmospheric abundance of greenhouse gases. The following is a brief description of the most commonly recognized GHGs.

3.8.1.1 Greenhouse Gases

Commonly identified GHG emissions and sources include the following:

Carbon dioxide (CO_2) is an odorless, colorless natural greenhouse gas. CO_2 is emitted from natural and anthropogenic sources. Natural sources include the following: decomposition of dead organic matter; respiration of bacteria, plants, animals, and fungus; evaporation from oceans; and volcanic out gassing. Anthropogenic sources include the burning of coal, oil, natural gas, and wood.

Methane (CH_4) is a flammable greenhouse gas. A natural source of methane is the anaerobic decay of organic matter. Geological deposits, known as natural gas fields, also contain methane, which is extracted for fuel. Other sources are from landfills, fermentation of manure, and ruminants such as cattle.

Nitrous oxide (N_2O), also known as laughing gas, is a colorless greenhouse gas. Nitrous oxide is produced by microbial processes in soil and water, including those reactions that occur in fertilizer containing nitrogen. In addition to agricultural sources, some industrial processes (fossil fuel-fired power plants, nylon production, nitric acid production, and vehicle emissions) also contribute to its atmospheric load.

[9] (NASA, 2017), Accessed June 24, 2020.

Water vapor is the most abundant, and variable greenhouse gas. It is not considered a pollutant; in the atmosphere, it maintains a climate necessary for life.

Ozone (O_3) is known as a photochemical pollutant and is a greenhouse gas; however, unlike other greenhouse gases, ozone in the troposphere is relatively short-lived and, therefore, is not global in nature. Ozone is not emitted directly into the atmosphere but is formed by a complex series of chemical reactions between volatile organic compounds, nitrogen oxides, and sunlight.

Aerosols are suspensions of particulate matter in a gas emitted into the air through burning biomass (plant material) and fossil fuels. Aerosols can warm the atmosphere by absorbing and emitting heat and can cool the atmosphere by reflecting light.

Chlorofluorocarbons (CFCs) are nontoxic, nonflammable, insoluble, and chemically unreactive in the troposphere (the level of air at the earth's surface). CFCs were first synthesized in 1928 for use as refrigerants, aerosol propellants, and cleaning solvents. CFCs destroy stratospheric ozone; therefore, their production was stopped as required by the Montreal Protocol in 1987.

Hydrofluorocarbons (HFCs) are synthetic chemicals that are used as a substitute for CFCs. Of all the greenhouse gases, HFCs are one of three groups (the other two are perfluorocarbons and sulfur hexafluoride) with the highest global warming potential. HFCs are human-made for applications such as air conditioners and refrigerants.

Perfluorocarbons (PFCs) have stable molecular structures and do not break down through the chemical processes in the lower atmosphere; therefore, PFCs have long atmospheric lifetimes, between 10,000 and 50,000 years. The two main sources of PFCs are primary aluminum production and semiconductor manufacture.

Sulfur hexafluoride (SF_6) is an inorganic, odorless, colorless, nontoxic, nonflammable gas. It has the highest global warming potential of any gas evaluated. Sulfur hexafluoride is used for insulation in electric power transmission and distribution equipment, in the magnesium industry, in semiconductor manufacturing, and as a tracer gas for leak detection.

3.8.1.2 Effects of Climate Change

The impacts of climate change have yet to fully manifest. A hotter planet is causing the sea level to rise, disease to spread to non-endemic areas, as well as more frequent and severe storms, heat events, and air pollution episodes. Also affected are agricultural production, the water supply, the sustainability of ecosystems, and therefore the economy. The magnitude of these impacts is unknown.

Emissions of GHGs contributing to global climate change are largely attributable to human activities associated with the industrial/manufacturing, utility, transportation, residential, and agricultural sectors. GHG emissions are typically expressed in carbon dioxide-equivalents (CO_2e), based on the GHG's Global Warming Potential (GWP). The GWP is dependent on the lifetime, or persistence, of the gas molecule in the atmosphere. For example, one ton of CH_4 has the same contribution to the greenhouse effect as approximately 21 tons of CO_2. Therefore, CH_4 is a much more potent GHG than CO_2.

3.8.2 Methodology

An Air Quality and Greenhouse Gas Emissions Evaluation Report (**Appendix A**) was prepared in August 2020. The sections below detail the methodology of the report and its conclusions.

3.8.2.1 Short-Term Construction-Generated Emissions

Short-term construction emissions associated with the Project were calculated using CalEEmod, Version 2016.3.2. Emissions' modeling was assumed to occur over an approximate three-month period and covering a site area of approximately 42 acres. Remaining assumptions were based on the default parameters contained in the model. Modeling assumptions and output files are included in **Appendix A**.

3.8.2.2 Long-Term Operational Emissions

Long-term operational emissions associated with the Project are estimated to be minimal in nature. Maintenance would be provided on an as needed basis by Root Creek staff. Modeling assumptions and output files are included in **Appendix A**.

3.8.2.3 Thresholds of Significance

CEQA Guidelines Amendments became effective March 18, 2010. Included in the Amendments are revisions to the Appendix G Initial Study Checklist. In accordance with these Amendments, a project would be considered to have a significant impact to climate change if it would:

a. Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment; or,
b. Conflict with any applicable plan, policy or regulation of an agency adopted for the purpose of reducing the emissions of greenhouse gases.

In accordance with SJVAPCD's *CEQA Greenhouse Gas Guidance for Valley Land-use Agencies in Addressing GHG Emission Impacts for New Projects*[10], proposed projects complying with Best Performance Standards (BPS) would be determined to have a less-than-significant impact. Projects not complying with BPS would be considered less than significant if operational GHG emissions would be reduced or mitigated by a minimum of 29 percent, in comparison to business-as-usual (year 2004) conditions. In addition, project-generated emissions complying with an approved plan or mitigation program would also be determined to have a less-than-significant impact.

3.8.2.4 Local

San Joaquin Valley Air Pollution Control District

SJVAPCD CEQA Greenhouse Gas Guidance: On December 17, 2009, the SJVAPCD Governing Board adopted "Guidance for Valley Land-use Agencies in Addressing GHG Emission Impacts for New Projects under CEQA" and the policy, "District Policy—Addressing GHG Emission Impacts for Stationary Source Projects Under CEQA When Serving as the Lead Agency." The SJVAPCD concluded that the existing science is inadequate to support quantification of the impacts that project specific greenhouse gas emissions have on global climatic change. The SJVAPCD found the effects of project-specific emissions to be cumulative, and without mitigation, that their incremental contribution to global climatic change could be considered cumulatively considerable. The SJVAPCD found that this cumulative impact is best addressed by requiring all projects to reduce their greenhouse gas emissions, whether through project design elements or mitigation.

The SJVAPCD's approach is intended to streamline the process of determining if project-specific greenhouse gas emissions would have a significant effect. Projects exempt from the requirements of CEQA, and projects complying with an approved plan or mitigation program would be determined to have a less than significant cumulative impact. Such plans or programs must be specified in law or adopted by the public agency with jurisdiction over the affected resources and have a certified final CEQA document.

[10] (San Joaquin Valley Air Pollution Control District, 2009). Accessed August 2020

Best performance standards (BPS) to address operational emissions of a project would be established according to performance-based determinations. Projects complying with BPS would not require specific quantification of GHG emissions and would be determined to have a less than significant cumulative impact for GHG emissions. Projects not complying with BPS would require quantification of GHG emissions and demonstration that operational greenhouse gas emissions have been reduced or mitigated by 29 percent, as targeted by CARB's AB 32 Scoping Plan. Furthermore, quantification of GHG emissions would be required for all projects for which the lead agency has determined that an Environmental Impact Report is required, regardless of whether the project incorporates BPS.

Bay Area Air Quality Management District's Thresholds for Significance: Bay Area Air Quality Management District's approach to developing a threshold of significance for GHG emissions is to identify the emissions level for which a project would not be expected to substantially conflict with existing California legislation adopted to reduce Statewide GHG emissions. If a project would generate GHG emissions above the threshold level, it would be considered to contribute substantially to a cumulative impact, and would be considered significant. If mitigation can be applied to lessen the emissions such that the project meets its share of emission reductions needed to address the cumulative impact, the project would normally be considered less than significant. Although the proposed Project is not located in the Bay Area, the Bay Area Air Quality Management District's thresholds for significance are based on the Statewide AB 32 objectives and would be used to quantify potential impacts related to GHG emissions. For land use development projects, the threshold is compliance with a qualified GHG Reduction Strategy or annual emissions less than 1,100 metric tons per year (MT/yr) of CO_2e. For stationary source projects, such as those requiring a permit from a local air district to operate, the threshold is 10,000 MT/yr of CO_2e.

3.8.3 Impact Assessment

a) Would the project generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment? And

Less than Significant Impact.

Short-Term Construction-Generated Emissions

Estimated construction-generated emissions are summarized in **Table 3-13**. As indicated, construction of the Project would generate maximum annual emissions of approximately 147.4065 metric tons of carbon dioxide equivalent ($MTCO_{2}e$). Construction-related production of GHGs would be temporary and last approximately three months.

Table 3-13. Short-Term Construction-Generated GHG Emissions

Short-Term Construction-Generated GHG Emissions	
Year	**Emissions (MT CO_2e)(1)**
2021	147.4065
*AB 32 Consistency Threshold for Land-Use Development Projects**	*1,100*
*AB 32 Consistency Threshold for Stationary Source Projects**	*10,000*
Exceed Threshold?	No

1. *Emissions were quantified using the CalEEmod, Version 2016.3.2. Refer to Appendix A for modeling results and assumptions. Totals may not sum due to rounding.*

* As published in the Bay Area Air Quality Management District's CEQA Air Quality Guidelines. Available online at http://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/ceqa_guidelines_may2017-pdf.pdf?la=en Accessed August 2020

Long-Term Operational Emissions

Long-term operational emissions associated with the Project would be as needed maintenance performed by RCWD consultants. There would not be a substantial increase in vehicle trips or vehicle miles travelled because maintenance would be provided on an as-needed basis. Furthermore, there is no population growth associated with the Project. Therefore, Project-related emissions of GHGs would be less than significant.

b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?

Less than Significant Impact. In accordance with SJVAPCD's recommended guidance, project-generated GHG emissions would be considered less than significant if: (1) the Project complies with applicable BPS; (2) operational GHG emissions would be reduced or mitigated by a minimum of 29 percent in comparison to business-as usual (year 2004) conditions; or (3) project-generated emissions would comply with an approved plan or mitigation program.

As discussed in Impact Assessment a) and illustrated in **Table 3-13** above, the Project complies with the Bay Area Air Quality Management District's GHG emissions thresholds for significance. Consequently, implementation of the proposed Project is not anticipated to conflict with any applicable plan, policy, or regulation for reducing the emissions of GHGs, nor will the Project have a significant impact on the environment. The impacts would be considered less than significant.

3.9 Hazards and Hazardous Materials

Table 3-14. Hazards and Hazardous Materials Impacts

Hazards and Hazardous Materials					
Would the project:		Potentially Significant Impact	Less than Significant With Mitigation Incorporated	Less than Significant Impact	No Impact
a)	Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☒	☐
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 or excessive noise for people residing or working in the project area?	☐	☐	☒	☐
f)	Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☒	☐
g)	Expose people or structures, either directly or indirectly to a significant risk of loss, injury or death involving wildland fires?	☐	☐	☐	☒

3.9.1 Environmental Setting

3.9.1.1 Hazardous Materials

The Hazardous Waste and Substances Sites (Cortese) List is a planning document used by the State, local agencies, and developers to comply with CEQA requirements in providing information about the location of hazardous materials release sites. Government Code (GC) Section 65962.5 requires the California Environmental Protection Agency (CalEPA) to develop at least annually an updated Cortese List. The Department of Toxic Substances Control (DTSC) is responsible for a portion of the information contained in the Cortese List. Other State and local government agencies are required to provide additional hazardous material release information for the Cortese List. DTSC's EnviroStor database provides DTSC's component of Cortese List data (DTSC, 2010). In addition to the EnviroStor database, the State Water Resources Control Board (SWRCB) Geotracker database provides information on regulated hazardous waste facilities in California, including underground storage tank (UST) cases and non-UST cleanup programs, including Spills-Leaks-Investigations-Cleanups (SLIC) sites, Department of Defense (DOD) sites, and Land Disposal program.

A search of the DTSC EnviroStor database and the SWRCB Geotracker performed on July 24, 2020 determined that there are no known active hazardous waste generators or hazardous material spill sites within the Project site or immediate surrounding vicinity.

3.9.1.2 Airports

The Fresno Yosemite International Airport is located 9.4-miles southeast of the APE. Sierra Sky Park Airport is located 4.3-miles southwest of the APE.

3.9.1.3 Emergency Response Plan

The Madera County Office of Emergency Services (OES) operates under the direction of the Madera county Sheriff's Department. The OES is responsible for the day to day administration of the County's disaster preparedness and response program. In addition, it is responsible for maintaining the County's Emergency Operations Center, as well as coordinating the EOSC activities during a disaster

3.9.1.4 Sensitive Receptors

The nearest sensitive receptors to Project site are the single-family residences in the Riverstone subdivision, located adjacent to the northwest end of the Project site.

3.9.2 Impact Assessment

a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials? and;

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?

Less than Significant Impact. Construction of the Project could involve the use of hazardous materials associated with construction equipment, such as diesel fuel, lubricants, and solvents. However, the contractor will implement a SWPPP and would comply with all Cal/OSHA regulations regarding regular maintenance and inspection of equipment, spill prevention, and spill remediation in order to reduce the potential for incidental release of pollutants or hazardous substances onsite. Furthermore, any potential accidental hazardous materials spills during construction are the responsibility of the contractor to remediate in accordance with industry best management practices and State and County regulations. Impacts would be less than significant.

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?

No Impact. The Project does not involve land that is listed as a hazardous materials site pursuant to Government Code Section 65962.5 and is not included on a list compiled by the Department of Toxic Substances Control. A search of the DTSC EnviroStor database and the SWRCB Geotracker performed on July 24, 2020 determined that there are no known active hazardous waste generators or hazardous material spill sites within the Project site or immediate surrounding vicinity. There would be no impact.

e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard or excessive noise for people residing or working in the project area?; and,

Less than Significant Impact. The Project is not located within an airport land use plan. Sierra Sky Park Airport is 4.3 miles southwest of the Project APE. Fresno Yosemite International Airport is located 9.4 miles southeast of the APE. Construction of the Project would not be a safety hazard for people working in the area.

Operation of the well site would not generate excessive noise, and any construction noise would be temporary. The impact would be less than significant.

f) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?

Less than Significant Impact. Construction traffic associated with the Project would be minimal and temporary, lasting approximately three months. Operational traffic would consist of as-needed maintenance trips and would have no effect on roadways or emergency access. Road closures and detours are not anticipated as part of the construction phase of the Project. Therefore, Project-related impacts to emergency evacuation routes or emergency response routes on local roadways would be considered less than significant.

g) Expose people or structures, either directly or indirectly to a significant risk of loss, injury or death involving wildland fires?

No Impact. The Project is not located in or near state responsibility areas or lands classified as very high fire hazard severity zones. The Project does not include any residential components, nor would it require any employees to be stationed permanently at the site on a daily basis. There would be no impact.

3.10 Hydrology and Water Quality

Table 3-15. Hydrology and Water Quality Impacts

Hydrology and Water Quality					
	Would the project:	Potentially Significant Impact	Less than Significant With Mitigation Incorporated	Less than Significant Impact	No Impact
a)	Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality?	☐	☐	☒	☐
b)	Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?	☐	☐	☒	☐
c)	Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:				
	i) result in substantial erosion or siltation on- or off-site;	☐	☐	☒	☐
	ii) substantially increase the rate or amount of surface runoff in a manner which would result in flooding on or offsite;	☐	☐	☒	☐
	iii) 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; or	☐	☐	☒	☐
iv)	impede or redirect flood flows?	☐	☐	☒	☐
d)	In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?	☐	☐	☐	☒
e)	Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?	☐	☐	☐	☒

3.10.1 Environmental Setting

The Project site is located in southern Madera County within the San Joaquin Valley, part of the Great Valley of California. The Valley is bordered by the Sierra Nevada Mountain Ranges to the east, the Coast Ranges to the west, the Klamath Mountains and Cascade Range to the north, and the Transverse Ranges and Mojave Desert to the south.

Like most of California, the San Joaquin Valley experiences a Mediterranean climate. Warm, dry summers are followed by cool, moist winters. Summer temperatures often reach above 90 degrees Fahrenheit, and the humidity is generally low. Winter temperatures are often below 60 degrees Fahrenheit during the day and rarely exceed 70 degrees. On average, the Central Valley receives approximately 12 inches of precipitation in the form of rainfall yearly, most of which occurs between October and March.

The Project is located within the Root Creek sub-watershed (HUC 12-180400010801), part of the Root Creek-San Joaquin River watershed (HUC 10-1804000108) (**Appendix B**), and Root Creek is the principal drainage in the vicinity. Root Creek is a highly modified ephemeral drainage with a westerly flow direction. The APE is located approximately 3 miles north and 1.5 miles west of the San Joaquin River.

The Project lies entirely within the boundaries of RCWD in the Madera Groundwater Subbasin of the San Joaquin Valley Groundwater Basin. (DWR, 2019). The Madera Subbasin has been identified by the California Department of Water Resources (DWR) as a critically over drafted subbasin due to groundwater pumping in excess of recharge by the overlying landowners. Historically, land use within the District has been comprised primarily of agriculture, but the portion of developed land is rapidly increasing through several community development projects being constructed or planned within RCWD.

The Project proposes development of control structures, and infiltration basins in order to capture storm water runoff within the Root Creek channel along a 3.5 mile stretch of Root Creek. The Project area is surrounded predominantly by orchards in agricultural production, although there is an area along the northern tributary to Root Creek that has been cleared of all vegetation, filled, graded, and leveled, likely as part of the adjacent Riverstone community development project. The Project area along Root Creek is accessible by existing compacted dirt roads.

3.10.2 Impact Assessment

a) Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality?

Less than Significant Impact. The State Water Resources Control Board (SWRCB) requires that a Storm Water Pollution Prevention Plan (SWPPP) be prepared for projects that disturb one or more acres of soil. A SWPPP involves site planning and scheduling, limiting disturbed soil areas, and determining best management practices to minimize the risk of pollution and sediments being discharged from construction sites. Implementation of the SWPPP would minimize the potential for the Project to substantially alter the existing drainage pattern in a manner that would result in substantial erosion or siltation onsite or offsite.

Based on the water quality data, values suggest pH is neutral at 7.1. Samples show electrical conductivity of 42 μS/cm and a dissolved oxygen average of 10.8 MG/L at approximately 51.6 degrees Fahrenheit. Turbidity is low and ranges from 0.15 to 0.29 NTU.

The intent of the Project is to divert water flows to help meet existing irrigation demands during the irrigation season when limited surface water is available, especially during times of a drought. Additionally, the Project would increase the amount of groundwater recharge into the local underlying aquifer in order to assist the agricultural lands in Madera County. The Project would not generate any type of process or wastewater, therefore, would be no discharge of Project water to any surface source. As such, there would be no discharge directly associated with Project implementation that could impact water quality standards of any nearby waters of the state. The impacts would be less than significant.

b) Would the project substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project would impede sustainable groundwater management of the basin?

Less than Significant. Implementation of the Project would not substantially decrease groundwater supplies or interfere with groundwater recharge, the goal is the opposite. Water would be detained behind the structures in infiltration basins and intentionally recharged into the ground for later recovery by landowner wells. There is the possibility for storage in the ponds as well as the underground, and a groundwater storage supplement is envisioned as part of the application. When not used to intentionally recharge Root Creek storm water flows these facilities could also be utilized to intentionally recharge surface water supplies imported to the district from the Central Valley Project (San Joaquin River supplies) for recharge into the ground and later recovery also requiring identification in the underground storage supplement. The impacts would be less than significant.

c) Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:

c-i) result in substantial erosion or siltation on- or off-site;

c-ii) substantially increase the rate or amount of surface runoff in a manner which would result in flooding on or offsite;

c-iii) 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; or

c-iv) impede or redirect flood flows?

Less than Significant Impact. The Project would alter the existing drainage pattern of the area by the construction of the control structures, and infiltration basins. The Project would also include some excavation within the channel in order to build up embankments for the purposes of containing flood flows for water recharge. A portion of the APE does lie in a flood zone, see **Figure 3-4**. In order to minimize erosion and run-off during construction activities, a SWPPP will be implemented, and the contractor would comply with all Cal/OSHA regulations regarding regular maintenance and inspection of equipment, spill prevention, and spill remediation in order to reduce the potential for incidental release of pollutants or hazardous substances onsite. Impacts would be less than significant.

d) Would the project in flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?

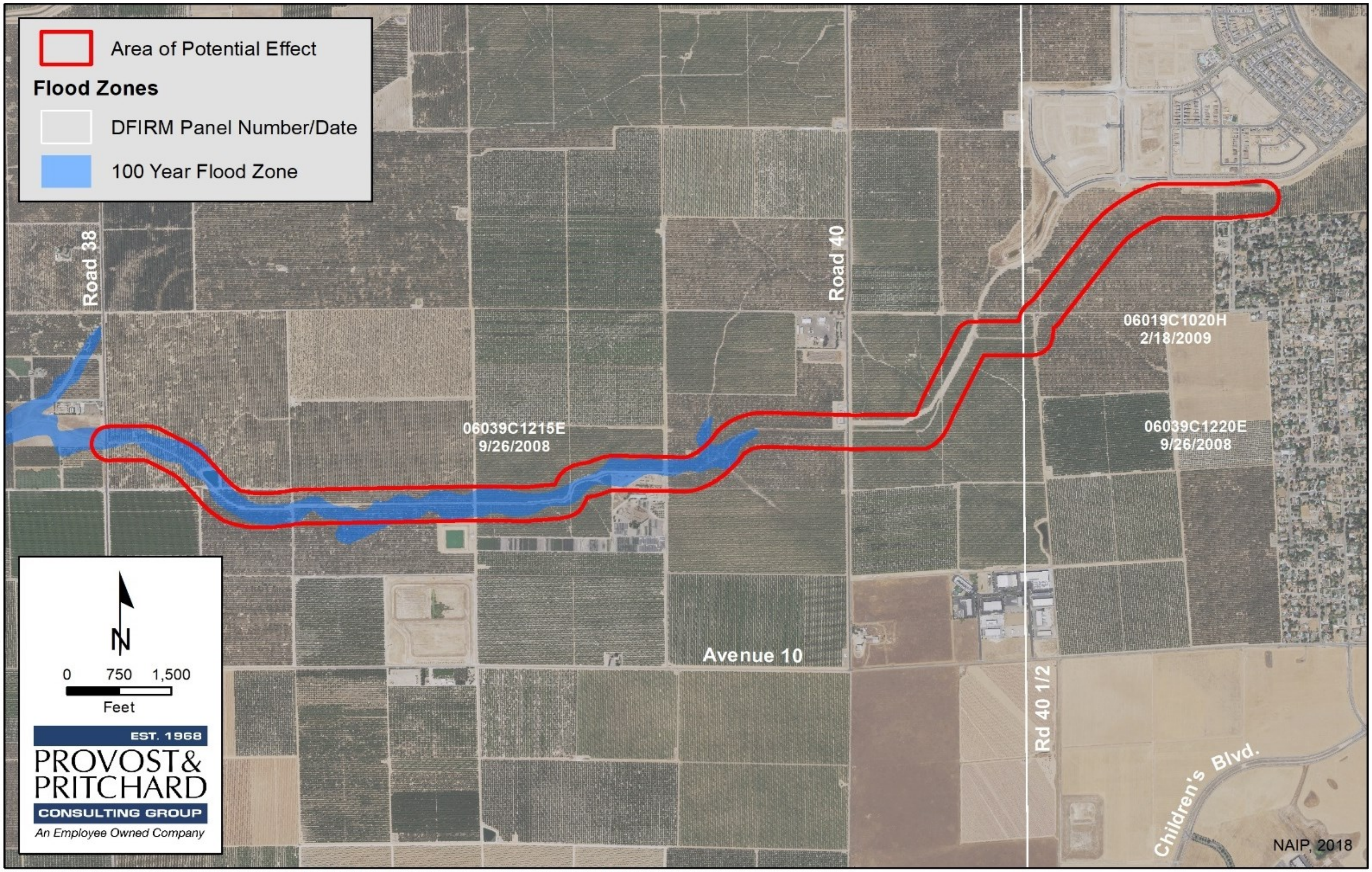
Less than Significant Impact. The Project is located in an area with no risk of tsunami and there are minimal seiche risk. A portion of the APE does lie in a flood zone, see **Figure 3-4**. In order to minimize erosion and run-off during construction activities, a SWPPP will be implemented, and the contractor would comply with all Cal/OSHA regulations. Impacts would be less than significant.

e) Otherwise substantially degrade water quality?

No Impact. As discussed above in Impact Assessments a) and c-iii) above, implementation of the Project would help alleviate water supply issues in Madera County. Furthermore, construction activities would require implementation of a SWPPP and compliance with all Cal/OSHA regulations in order to reduce the potential for incidental release of pollutants or hazardous substances into surface water or groundwater. There would be no impact.

f) Would the project conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?

No Impact. Implementation of this Project would allow the District to divert water flows to landowners within the District. Water would be detained behind the structures in infiltration basins and intentionally recharged into the ground for later recovery by landowner wells. The Project would not conflict with or obstruct implementation of any water quality control plan or sustainable groundwater management plan. There would be no impact.



6/30/2020 : G:\Root Creek WD-1249\Projects\124920019-Water Appropriations\400 GIS\Map\CEQA\FEMA.mxd

Figure 3-4. FEMA Flood Map

3.11 Land Use and Planning

Table 3-16. Land Use and Planning Impacts

Land Use and Planning					
	Would the project:	Potentially Significant Impact	Less than Significant With Mitigation Incorporated	Less than Significant Impact	No Impact
a)	Physically divide an established community?	☐	☐	☐	☒
b)	Cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☒	☐

3.11.1 Environmental Setting

Land use in the Project area is predominantly agricultural including annual crops, vineyards, orchards, and other semi-agricultural uses or agricultural related infrastructure. Almonds, grapes, and pistachios are the top crops in addition to milk from local dairies. The west side of the APE begins at Road 38 and runs east/northeasterly for 1.5 miles. The north, west, and south sides of the APE borders along agricultural farmland plots. The project APE and its surroundings are zoned AE-20 (Exclusive Agriculture, 20-Acre Minimum) Agriculture, Open Space, Residential, See **Figure 3-6.**

General Plan Land Use Designations and Zone Districts are illustrated in **Figure 3-5** and **Figure 3-6**, respectively.

3.11.2 Impact Assessment

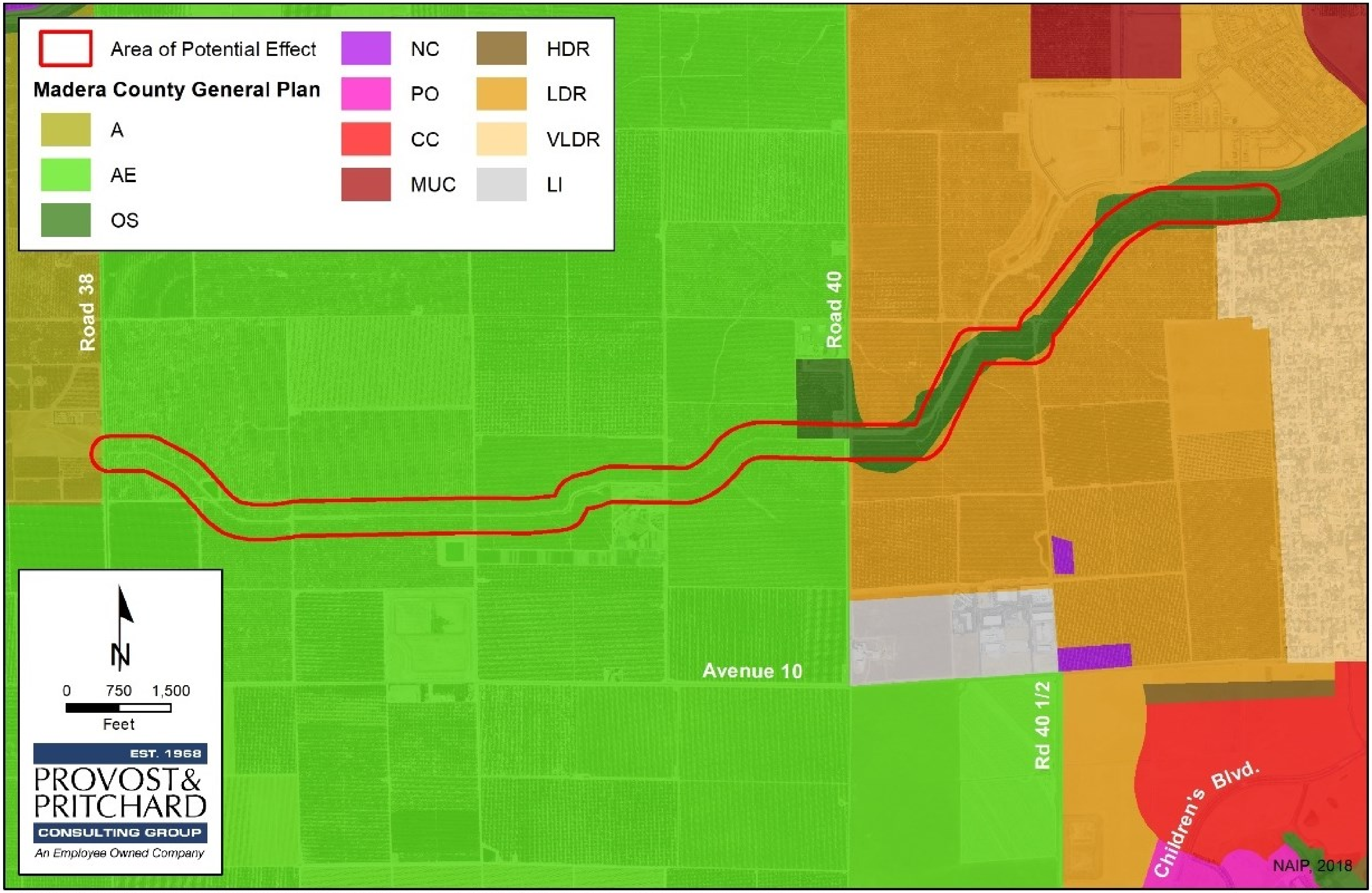
a) Would the project physically divide an established community?

No Impact. The Project APE is planned as agriculture or open space by the Madera County General Plan.[11] The Project is in the southern portion of Madera County, a region primarily consisting of agriculture. The Project does not include the alteration of roads, trails, or paths that could be considered a connectivity network. Implementation of the Project would not divide an established community. There would be no impact.

b) Would the project cause a significant environmental conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect?

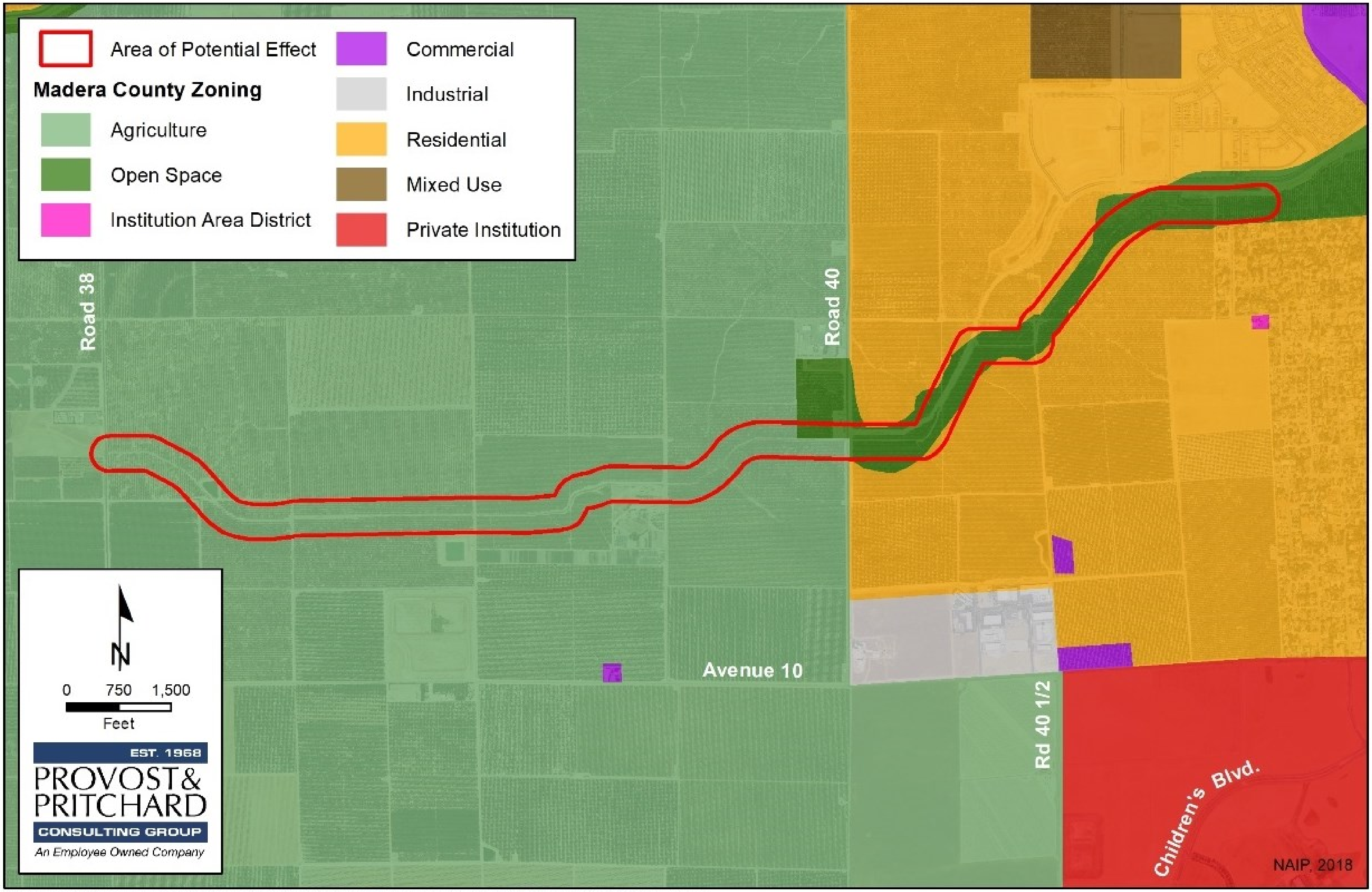
Less than Significant Impact. The Project is located on land zoned AE-20 (Exclusive Agriculture, 20-acre minimum) and OS (Open Space) and planned as Agriculture and Park space by Madera County. The Project does not propose to expand into Madera County right-of-way or other neighboring parcels. The purpose of the Project is to increase the amount of groundwater recharge for later use. The Project would be consistent with all applicable plans, policies, ordinances, and regulations. Any impact would be less than significant.

[11] (Madera County General Plan Background Report, 1995)



6/30/2020 : G:\Root Creek WD-1249\Projects\124920019-Water Appropriations\400 GIS\Map\CEQA\GeneralPlan.mxd

Figure 3-5. Madera County General Plan Map



6/30/2020 : G:\Root Creek WD-1249\Projects\124920019-Water Appropriations\400 GIS\Map\CEQA\Zoning.mxd

Figure 3-6. Madera County Zoning Map

3.12 Mineral Resources

Table 3-17. Mineral Resources Impacts

Mineral Resources					
Would the project:		Potentially Significant Impact	Less than Significant With Mitigation Incorporated	Less than Significant Impact	No Impact
a)	Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☒
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?	☐	☐	☐	☒

3.12.1 Environmental Setting

Extracted mineral resources in Madera County include aggregate (sand, gravel and crushed stone), asbestos, copper, gold, iron and silver.[12] There are no known mineral resources at the proposed Project APE. The APE is designated as Mineral Resources Zone 3 (MRZ 3) within the Madera County General Plan. The MRZ 3 designation identifies areas of the county that may contain mineral deposits, the significance of which cannot be evaluated from available material.

California Department of Conservation's Division of Oil, Gas, and Geothermal Resources maintains a database of oil wells in the Project area (DOGGR). According to the DOGGR Well Finder there are two plugged and abandoned or idle well (not in use for two years or longer) within one mile of the APE (Freeport-McMoRan Oil & Gas LLC Well No. 1 and F.A. Rife & Co. Well No. 1). There are no active wells within two miles of the APE.

There are no known current or historic mineral resource extraction or recovery operations in the Project vicinity nor are there any known significant mineral resources onsite.

3.12.2 Impact Assessment

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?

No Impact. The California Surface Mining and Reclamation Act of 1975 (SMARA) was created to address protecting the state's need for a continuing supply of mineral resources, while protecting public an environmental health. SMARA requires that all cities incorporate into their general plans mapped mineral resource designations approved by the State Mining and Geology Board. The State Geologist classifies land in California based on availability of mineral resources. Because available aggregate construction material is limited, five designations have been established for the classification of sand, gravel and crushed rock resources: Scientific Resource, Mineral Resource Zone 1, Mineral Resources Zone 2, and Mineral Resource Zone 3, and Mineral Resource Zone 4.

[12] (Madera County General Plan Background Report, 1995). Accessed July 23, 2020

According to the Department of Conservation Special Report 158, *Mineral Land Classification: Aggregate Materials in the Fresno Production-Consumption Region Sanger Plate,* the Project is within the Mineral Resource Zone 3. Mineral Resource Zone 3 is an area where the significance of mineral deposits cannot be determined from the available data. However, there are no known sources of mineral resources extraction or recovery operations in the Project vicinity nor any known significant mineral resources onsite.[13] Therefore, implementation of the Project would not result in the loss of availability of a known mineral resource since no known mineral resources occur in this area. Furthermore, the Project area has not been designated as a locally important mineral resource recovery site by a general plan, specific plan, or land use plan. There would be no impact.

[13] Ibid. Accessed July 23, 2020.

3.13 Noise

Table 3-18. Noise Impacts

Noise					
Would the project:		Potentially Significant Impact	Less than Significant With Mitigation Incorporated	Less than Significant Impact	No Impact
a)	Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☒	☐
b)	Generation of excessive ground borne vibration or ground borne noise levels?	☐	☐	☒	☐
c)	For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

3.13.1 Environmental Setting

The Project is located in southern Madera County, dominated by agricultural production. State Route 41 is the nearest highway, which is 0.39-miles east of the APE. The west side of the APE begins at Road 38 and runs east/northeasterly for 1.5-miles. The north, west, and south sides of the APE borders along agricultural farmland plots. The City of Fresno city limit is located 3.2-miles south of APE. The community of Madera Ranchos is 1.32 miles N of APE. City of Madera is located 10 miles NW from APE The Fresno Yosemite International Airport is located 9.4-miles southeast, Sierra Sky Park Airport is located 4.3-miles southwest.

3.13.2 Impact Assessment

a) Would the project result in generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

Less than Significant Impact. The construction phase of the Project would involve temporary noise sources, predominately from off-road equipment, such as excavator, gasoline generator, skid steer, compactor, loader, dump truck, haul trucks and water trucks. The construction phase of the project is estimated to last approximately three months. The Project area is surrounded agricultural lands, accustomed to noises associated with farm equipment. The Project would comply with the Madera County Noise Control Ordinance referenced in **Section 3.13.1**. Operational maintenance activities would be on an as-needed basis with routine monitoring performed by existing staff and would not generate significant new noise. Any impacts would be mild and temporary and therefore, less than significant.

b) Would the project result in generation of excessive ground borne vibration or ground borne noise levels?

Less than Significant Impact. Construction of this Project will take approximately three months to complete, and the following equipment is anticipated: crane, concrete trucks, excavator, gasoline generator, skid steer, compactor, loader, dump truck, haul truck, and water truck. All construction will be performed within a dry channel. Project-related construction activities would not vary substantially from the baseline conditions routinely experienced on neighboring agricultural properties. Impacts would be less than significant.

c) For a project located within the vicinity of a private air strip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

No Impact. The Project is not located within an airport land use plan of an airport. The Fresno Yosemite International Airport is located 9.4-miles southeast and the Sierra Sky Park Airport is located 4.3-miles southwest of the APE. The Project does not involve the development of habitable structures or require the presence of permanent staff onsite. There would be no impact.

3.14 Population and Housing

Table 3-19. Population and Housing Impacts

Population and Housing					
Would the project:		Potentially Significant Impact	Less than Significant With Mitigation Incorporated	Less than Significant Impact	No Impact
a)	Induce substantial unplanned population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☒
b)	Displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

3.14.1 Environmental Setting

The Project is located within southern Madera County. The Project is surrounded by agricultural lands, rural residential uses, and water infrastructure. The Project is located within land zoned AE-20 (Exclusive Agriculture, 20-Acre Minimum) Agriculture, Open Space, Residential and planned by as A-Ag, AE-Exclusive Ag, OS-Open Space, LDR-Low Density Residential by the Madera County General Plan.

According to United States Census Bureau, the 2019 population estimate for Madera County was 157,327. The estimated percent change from 2010 to 2019 was 4.3%. From 2014 to 2018, there was an average of 44,759 households with an average of 3.28 persons per house.[14]

The proposed Project comprises an existing canal structure and agricultural land. The closest residence is the unincorporated community of Madera Ranchos located approximately 1 mile north of the project APE. The Project will not introduce new housing or new jobs.

3.14.2 Impact Assessment

a) Would the project induce substantial unplanned population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?

b) Would the project displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere?

No Impact. The Project consists of improvements to Root Creek that would allow for diverting water flows from Root Creek to land owners for recharge purposes. The goal of the Project is not to induce population growth, but to intentionally recharge into the ground for later recovery by landowner wells. The Project would not encourage population growth directly or indirectly. No housing or habitable structures would be built, nor would any be removed. Implementation of the Project would not result in displacement of people or existing housing. Therefore, there would be no impact.

[14] (United States Census Bureau - Madera County, 2020) Accessed July 17, 2020.

3.15 Public Services

Table 3-20. Public Services Impacts

Public Services				
Would the project:	Potentially Significant Impact	Less than Significant With Mitigation Incorporated	Less than Significant Impact	No Impact
a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:				
Fire protection?	☐	☐	☐	☒
Police protection?	☐	☐	☐	☒
Schools?	☐	☐	☐	☒
Parks?	☐	☐	☐	☒
Other public facilities?	☐	☐	☐	☒

3.15.1 Environmental Setting

Fire Protection: The proposed Project would be served by the Madera County Fire Department, Station 9 – Rolling Hills. Station 9 is located 0.28-miles south by southeast of the APE. [15]

Police Protection: Police protection is provided by the Madera County Sheriff. The closest station is located approximately 10.6-miles west by northwest of the APE.

Schools: Webster Elementary School is the closest school, located approximately 2.4 miles northeast of the APE.

Parks: The park closest park is Woodward Regional Park located approximately 2.7-miles southeast of the APE.

Landfills: The closest landfill is Clovis Landfill located approximately 6.5-miles northeast of the APE.

[15] (Madera County Fire Department, 2020). Accessed July 18, 2020.

3.15.2 Impact Assessment

a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:

No Impact. The Project would not require the addition or alteration of any public services. The APE is located in Madera County and is not growth inducing. The Project would utilize existing services to the area provided by the County. There would be no impact.

3.16 Recreation

Table 3-21. Recreation Impacts

Recreation					
	Would the project:	Potentially Significant Impact	Less than Significant With Mitigation Incorporated	Less than Significant Impact	No Impact
a)	Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	☒
b)	Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☐	☒

3.16.1 Environmental Setting

Madera County has several regional parks, as well as State and national parks, national forest, wilderness areas, and other resources. Regional recreational facilities within the County include ten developed and three undeveloped park sites, five fishing access areas, and boating facility. The closest park to the Project APE is Woodward Regional Park, located 2.7-miles southeast of the APE. A trail is presently being planned by the adjacent Riverstone development for recreational use that will traverse the edge of multiple infiltration basins.

No habitable structures are proposed as part of this project and therefore would not increase the use of local parks. The closest recreational area is the and Lost Lake Recreation Area, located 4.8-miles northeast of the APE.

3.16.2 Impact Assessment

a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?

b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?

No Impact. The Project would not increase the demand for recreational facilities or put a strain on the existing recreational facilities. No population growth would be associated with the Project or be necessitated by the Project. As there is no population growth associated with the Project, construction or expansion of nearby recreational facilities would not be necessary. There would be no impact.

3.17 Transportation

Table 3-22. Transportation Impacts

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

3.17.1 Environmental Setting

Madera County's circulation system consists of a roadway network that is primarily rural in character, with exception of the urbanized area surrounding the cities of Madera, Fresno and Clovis and various smaller communities located throughout the county. There are parts of six state highways that pass through Madera County: SR 99, SR 41, SR49, SR 145, SR 152 and SR 233.

The Project is located in southern Madera County. The west side of the APE runs along Road 38 and runs east/northeasterly for approximately 1.5-miles. The Project vicinity is dominated by agricultural farmland plots and water infrastructure. State Route 41 is the nearest highway and is 0.39-miles east of the Project. There are no public improvements proposed along the APE boundary. Traffic generation after project implementation would be minimal and dedicated to only maintenance on an as-needed basis.

3.17.2 Impact Assessment

a) Would the project conflict with a plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities?

b) Would the project conflict or be inconsistent with CEQA Guidelines section 150643. Subdivision (b)?

No Impact. The Project consists of improvements to Root Creek that would allow for diverting water flows from Root Creek to land owners for recharge purposes. Construction traffic associated with the Project would be minimal and temporary, lasting approximately three months. Operational traffic consists of as-needed maintenance trips. No road improvements are proposed apart from the Project. There would not be a significant adverse effect to existing roadways in the area.

Construction associated with the Project would be restricted to the APE and it would not intersect any roadways, or pedestrian or bicycle paths. These construction-related impacts would be temporary and there would be no impacts to the surrounding transportation network.

There is no population growth associated with the Project, nor would implementation of the Project result in an increase of staff or drivers utilizing roadways in the area. Therefore, implementation of the Project would not increase the demand for any changes to congestion management programs or interfere with existing level of service standards during the operational phase. Construction-related roadway interferences would be less than significant.

c) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?

No Impact. No new roadway design features are associated with the Project. As mentioned in Impact Assessments a and b above, all potential disturbances to roadways would be temporary. Therefore, there would be no impact.

d) Result in inadequate emergency access?

Less than Significant Impact. As mentioned above in Impact Assessments a, b, and c, the Project does not propose new roadway design features or permanent alterations to roadways. Road closures and detours are not anticipated as part of the construction phase of the Project. The operational phase of the Project would have no effect on roadways or emergency access. Therefore, overall potential Project-related impacts to emergency access on local roadways would be considered less than significant.

3.18 Tribal Cultural Resources

Table 3-23. Tribal Cultural Resources Impacts

Tribal Cultural Resources				
Would the project:	Potentially Significant Impact	Less than Significant With Mitigation Incorporated	Less than Significant Impact	No Impact
a) Cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:	☐	☒	☐	☐
i. Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k), or	☐	☒	☐	☐
ii. A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.	☐	☒	☐	☐

3.18.1 Environmental Setting

The Project area is in the Southern Valley Yokuts ethnographic territory. The Yokuts are one of eight subgroups of the Penutian linguistic phylum that is present across the western coast and inland regions of North America from Canada to Mexico. The Yokuts had many language subgroups and spoke a variety of dialects across the southern and central San Joaquin Valley as well as the Sierra Nevada. Many groups could converse across dialects with relative ease. The Southern Valley Yokuts populated the shores of Tulare, Buena Vista, and Kern lakes, their connecting sloughs, and the lower portions of the Kings, Kaweah, Tule, and Kern rivers. At the beginning of the historic period, 15 tribelets of Southern Valley Yokuts lived within the Tulare Basin. Kroeber (1939) estimated that Yokuts political units averaged 350 persons each; however, a much higher population figure of 15,700 persons was made by Spanish expeditions exploring the Central Valley and California coastal regions in the early nineteenth century (**Appendix C**Error! Reference source not found.).

3.18.2 Impact Assessment

a) Cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically

defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:

a-i) Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k)

a-ii) A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.

Less than Significant Impact with Mitigation Incorporated. Æ sent a letter to the Native American Heritage Commission (NAHC) requesting a search of its Sacred Lands File and contact information for local Native American representatives who may have information about the APE.

The NAHC responded to Æ's request on June 11, 2020, with negative findings for the Sacred Lands File search of the APE; however, they caution that the absence of information in the Sacred Lands File does not indicate the absence of Native American cultural resources within the APE. The NAHC provided a list of tribal representatives for outreach to local tribal groups regarding any sites of cultural or spiritual significance in the APE. Contacts recommended by the NAHC include:

- *Chairperson Elaine Fink of the North Fork Rancheria of Mono Indians;*
- *Most Likely Descendant Contact Timothy Perez of the North Valley Yokuts Tribe;*
- *Chairperson Katherine Perez of the North Valley Yokuts Tribe; and*
- *Chairperson William Leonard of the Southern Sierra Miwuk Nation*

On July 16, 2020, Æ prepared and mailed an outreach letter to each of the contacts identified by the NAHC and kept a log of all responses. The outreach letter is standard best practices within cultural resource management and is not part of AB 52 or NHPA Section 106 government-to-government consultation. Æ's record of correspondence is included in **Appendix C**. sent a letter describing the Project site to each of the individuals and groups identified above. Follow-up contact by telephone and email was completed on July 23, 2020. Two email responses were received from the Northern Valley Yokuts/Ohlone/Bay Miwuk/Patwin Tribe on July 27, 2020. Both individuals commented that the Project site is sensitive for cultural resources..

Although the site did not have findings during the Sacred Lands File search, it is still possible that tribal cultural resources could be found during construction. Therefore, in order to reduce any impacts to less than significant, *CUL-1*, *CUL-2* and *CUL 3* will be implemented.

3.19 Utilities and Service Systems

Table 3-24. Utilities and Service Systems Impacts

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

3.19.1 Environmental Setting

3.19.1.1 Water Supply

The Project lies entirely within the Madera Groundwater Subbasin of the San Joaquin Valley Groundwater Basin.[16] Declines in groundwater basin storage and groundwater overdraft are recurring problems in the Central Valley. Measures for ensuring the continued availability of groundwater to meet demands have been identified and planned in several areas of the county. The measures include groundwater conservation and recharge, and supplementing or replacing groundwater sources for irrigation with surface water.

3.19.1.2 Wastewater Collection and Treatment

The closest wastewater treatment facility is the Root Creek Water District initial Wastewater Treatment Plant located just North of the Creek West of Road 40.. There is also a Wastewater Treatment plant located just west of Road 40 south of Avenue 9 serving Valley Children's Hospital. Another wastewater plant serving the City of Madera is located on Road 21 ½ in Madera, which is approximately 21-miles from the western end of Project

[16] (State of California Department of Water Resources). Accessed July 17, 2020.

APE. The Project does not propose to create wastewater during operation. There would be no need to connect to a wastewater treatment system.

3.19.1.3 Landfills

The Mid Valley Disposal and Transfer is the closest landfill located approximately18 miles south of the APE.

3.19.2 Impact Assessment

a) 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?

No Impact. The Project consists of improvements to Root Creek that would allow for diverting water flows from Root Creek to land owners for recharge purposes. The Project would not generate wastewater or require expansion of existing facilities. There would be no impact.

b) Have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry and multiple dry years?

No Impact. The Project is intended to help capture excess water from Root Creek and also from stormwater flows. The Project does not rely on groundwater or county water supplies. There would be no impact.

c) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?

No Impact. The Project does not propose any habitable commercial, industrial, or residential structures. It would not create a wastewater demand on any wastewater treatment provider, nor would it require any wastewater treatment facilities at the Project APE, so there would be no need for any sort of capacity determination by a wastewater treatment provider. There would be no impact.

d) Would the project generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals?

No Impact. There would be no solid waste associated with the operational phase of the Project. Waste associated with construction would be minimal and temporary, most of which would be recycled. Therefore, there would be no impact.

e) Comply with federal, state, and local management and reduction statutes and regulations related to solid waste?

No Impact. Implementation of the Project involves improvements to Root Creek that would allow for diverting water flows from Root Creek to land owners for recharge purposes. The Project is not anticipated to produce any solid waste. Furthermore, the Project would continue to comply with any federal, State, and local regulations regarding solid waste. There would be no impact.

3.20 Wildfire

Table 3-25. Wildfire Impacts

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

3.20.1 Environmental Setting

The Project is located in southern Madera County, approximately 10-miles southeast of the City of Madera. The Project APE is in a flat agricultural and urbanized area of the Central San Joaquin Valley. The proposed Project consists of water diversion by constructing embankments across the existing creek bed with gates to control the flow in the creek. Water would be detained behind the structures and intentionally recharged into the ground for later recovery by landowner wells. No habitable structures are being constructed as part of the Project, the Project is not considered to be population growth inducing and no habitable structures are being constructed as part of the Project.

3.20.2 Impact Assessment

a) Would the project substantially impair an adopted emergency response plan or emergency evacuation plan?

b) Would the project, due to slope, prevailing winds, or other factors exacerbate wildfire risks, and thereby expose project occupants to pollutant concentrations from wildfire or the uncontrolled spread of wildfire?

c) Would the project Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment?

d) Expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes?

No Impact. The Project is not located in or near state responsibility areas or lands classified as very high fire hazard severity zones and therefore would not interfere with any emergency plans or expose people or structures to any significant risk. The surrounding area is predominantly agricultural and consists of flat and even terrain. There would be no impacts.

3.21 CEQA Mandatory Findings of Significance

Table 3-26. Mandatory Findings of Significance Impacts

Mandatory Findings of Significance					
	Would the project:	Potentially Significant Impact	Less than Significant With Mitigation Incorporated	Less than Significant Impact	No Impact
a)	Does the project have the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☐	☒	☐	☐
b)	Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?	☐	☐	☒	☐
c)	Does the project have environmental effects which would cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☒	☐

3.21.1 Impact Assessment

a) Does the project have the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?

Less than Significant Impact with Mitigation Incorporated. The analysis conducted in this Initial Study/Mitigated Negative Declaration results in a determination that the Project, with incorporation of mitigation measures, would have a less than significant effect on the environment. The potential for impacts to biological resources, cultural resources, and tribal cultural resources from the implementation of the proposed Project would be less than significant with the incorporation of the mitigation measures discussed in **Chapter 4 Mitigation Monitoring and Reporting Program**. Accordingly, the Project would involve no potential for significant impacts through the degradation of the quality of the environment, the reduction in the habitat or population of fish or wildlife, including endangered plants or animals, the elimination of a plant or animal community or example of a major period of California history or prehistory.

b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?

Less than Significant Impact. CEQA Guidelines Section 15064(i) States that a Lead Agency shall consider whether the cumulative impact of a project is significant and whether the effects of the project are cumulatively considerable. The assessment of the significance of the cumulative effects of a project must, therefore, be conducted in connection with the effects of past projects, other current projects, and probable future projects. The Project would include the construction, installation and replacement of related water infrastructure to divert water flows from Root Creek into landowner properties for agricultural and recharge uses. No additional roads would be constructed as a result of the Project, nor would any additional public services be required. The Project is intended to improve water supply and would not result in direct or indirect population growth. Therefore, implementation of the Project would not result in significant cumulative impacts and all potential impacts would be reduced to less than significant through the implementation of mitigation measures and basic regulatory requirements incorporated into future Project design.

c) Does the project have environmental effects which would cause substantial adverse effects on human beings, either directly or indirectly?

Less than Significant Impact. The Project would include the construction, installation and replacement of related water infrastructure to divert water flows from Root Creek onto landowners' property for agricultural and recharge uses. The Project in and of itself would not create a significant hazard to the public or the environment. On the contrary, implementation of the Project would recharge the groundwater supply with the possibility of groundwater storage. Construction-related air quality/dust exposure impacts could occur temporarily as a result of project construction. However, implementation of basic regulatory requirements identified in this IS/MND would ensure that impacts are less than significant. Therefore, the proposed Project would not have any direct or indirect adverse impacts on humans. This impact would be less than significant.

Chapter 4 Mitigation Monitoring and Reporting Program

This Mitigation Monitoring and Reporting Program (MMRP) has been formulated based upon the findings of the Initial Study/Mitigated Negative Declaration (IS/MND) for the Root Creek Water District Water Appropriations Project (Project) in Madera County. The MMRP lists mitigation measures recommended in the IS/MND for the Project and identifies monitoring and reporting requirements.

Table 4-1 presents the mitigation measures identified for the proposed Project. Each mitigation measure is numbered with a symbol indicating the topical section to which it pertains, a hyphen, and the impact number. For example, AIR-2 would be the second mitigation measure identified in the Air Quality analysis of the IS/MND.

The first column of **Table 4-1** identifies the mitigation measure. The second column, entitled "When Monitoring is to Occur," identifies the time the mitigation measure should be initiated. The third column, "Frequency of Monitoring," identifies the frequency of the monitoring of the mitigation measure. The fourth column, "Agency Responsible for Monitoring," names the party ultimately responsible for ensuring that the mitigation measure is implemented. The last columns would be used by the District to ensure that individual mitigation measures have been complied with and monitored.

Table 4-1. Mitigation Monitoring and Reporting Program

Mitigation Measure/Condition of Approval	When Monitoring is to Occur	Frequency of Monitoring	Agency Responsible for Monitoring	Method to Verify Compliance	Verification of Compliance
Biological Resources					
BIO-1a (Avoidance) Nesting Birds					
The Project's construction activities shall occur, if feasible, between September 16 and January 31 (outside of nesting bird season) to avoid impacts to nesting birds.	Prior to the start of construction activities	Prior to ground disturbing activities and the start of construction	RCWD with assistance of a qualified biological subconsultant	By subconsultant report to RCWD	
BIO-1b (Nesting Bird Preconstruction Survey)					
If construction activities must occur within nesting bird season (February 1 to September 15), a qualified biologist shall conduct preconstruction surveys for active nests within 30 days prior to initiation of ground disturbance and vegetation removal. The survey shall be conducted within the Project Area and include a 150-foot buffer for passerines, 500-foot buffer for other raptors, and 0.5-mile buffer for active Swainson's hawk nests. The survey shall be conducted by a qualified biologist familiar with the identification of avian species known to occur in the region. If no active nests are observed, no further mitigation is required.	February 1-September 15	Once prior to initiating any ground disturbances	RCWD with assistance of a qualified biological subconsultant	By subconsultant report to RCWD	
BIO-1c (Establish Buffers)					
If any active bird nests are observed during the preconstruction survey, the biologist shall determine appropriate buffer areas in which no construction activities can occur, based on applicable CDFW and/or USFWS guidelines and/or the biology of the species in question. For Swainson's hawk nests, an avoidance buffer of up to ½ mile shall be established around the nest location based on the project activity, the line-of-sight from the nest to the project activity, and observed hawk behavior at the nest. Construction buffers shall be identified with flagging, fencing, or other easily visible means, and shall be maintained until the biologist has determined that the nestlings have fledged.			RCWD		

Mitigation Monitoring and Reporting Program					
Mitigation Measure/Condition of Approval	**When Monitoring is to Occur**	**Frequency of Monitoring**	**Agency Responsible for Monitoring**	**Method to Verify Compliance**	**Verification of Compliance**
BIO-2 (Construction Hours)					
The Project's construction activities shall be limited to the daylight hours in order to avoid and minimize potential construction-related injury or mortality of nocturnal species foraging on-site. As described in Section 4.1.2, the SJKF has an extremely low potential to occur on site due to an absence of typical denning and foraging habitat. No evidence of SJKF or burrows of sufficient size to accommodate kit foxes were detected during the field survey. At most, this species could infrequently pass through the Project site during dispersal movements or as a transient. Since there is little-to-no likelihood of a SJKF occurring on site, and suitable burrows or refugia were not observed at the time of the field survey, this species is not expected to be impacted by Project-related construction activities.			RCWD		
BIO-3 CTS Preconstruction Surveys					
Pre-construction clearance surveys for California tiger salamander shall be conducted within 30 days prior to the start of construction (including staging and mobilization). The surveys should cover the entire disturbance footprint plus a minimum 100-foot buffer within suitable habitat, where permissible. If CTS are detected, consultation with CDFW and USFWS will be initiated.	Within 30 days prior to the start ground disturbing activities	Prior to and during construction activities	RCWD with assistance of a qualified biological subconsultant	Written reporting/photos to RCWD and CDFW, if required by biologist in accordance with requirements of CDFW	
BIO-4 Worker Environmental Awareness Program					
Prior to initiation of construction activities (including staging and mobilization), all personnel associated with project construction shall attend a Worker Environmental Awareness Program (WEAP) training, conducted by a qualified biologist, to aid workers in recognizing special-status resources that may occur in the construction area. The specifics of this program should include identification of the sensitive species and habitats, a description of the regulatory status and general ecological characteristics of sensitive resources, and review of the limits of construction and mitigation measures required to reduce impacts to biological resources within the work area. A fact sheet conveying this information should also be prepared for distribution to all contractors, their employers, and other personnel involved with construction. All employees should sign a form provided by the trainer indicating they have attended the WEAP and understand the information presented to them.	Prior to the start of any construction activities	As needed for any new construction personnel during construction activities	RCWD with assistance of a qualified biological subconsultant	Written reporting/photos to RCWD and CDFW, if required, by biologist in accordance with requirements of CDFW	
BIO-5 Wildlife-friendly fencing					
Any temporary or permanent fencing installed within the Project site should allow for the safe passage of wildlife. Fencing should not include any			RCWD		

Mitigation Monitoring and Reporting Program					
Mitigation Measure/Condition of Approval	When Monitoring is to Occur	Frequency of Monitoring	Agency Responsible for Monitoring	Method to Verify Compliance	Verification of Compliance
materials that would entrap wildlife. Fencing should also allow for larger wildlife species to jump over and smaller wildlife species to crawl under without injury. Fencing should be highly visible to avoid inadvertent collision by birds and other wildlife species. Common wildlife-friendly fencing incorporates smooth wires (or heavy-duty plastic) to prevent injury, caps height at a maximum of forty-two inches to facilitate leaping over, and provides at least sixteen inches of clearance between the ground and the lowest beam or wire to allow wildlife to crawl under. If Project fencing is temporary, all fencing materials should be completely removed upon completion of Project activities.					
Cultural Resources					
Mitigation Measure CUL-1: Additional Buried Site Assessment					
Prior to construction, a more detailed Buried Site Assessment shall be conducted. This study uses GIS predictive modeling to more clearly identify the boundaries of low, moderate, high, and very high sensitivity areas, followed by limited subsurface archaeological testing to confirm presence/absence of anthropogenic paleosols. Presence/absence testing for paleosols with potential to contain intact and well-preserved cultural deposits would allow for an adequate assessment of the potential for the proposed Project activities to cause adverse impacts to buried cultural resources. Methods and findings for the buried site assessment and subsurface testing along with any additional cultural resource mitigation measures would be presented to the District.	During ground disturbing activities and in the event potential archaeological artifacts or resources are uncovered	Daily during ground disturbing activities	RCWD with assistance of a qualified cultural subconsultant	By subconsultant/ contractor reports to RCWD	
Mitigation Measure CUL-2: Archaeological Resources					
In the event that archaeological resources are encountered at any time during development or ground-moving activities within the entire project area, all work in the vicinity of the find shall halt until a qualified archaeologist can assess the discovery. The District shall implement all recommendations of the archaeologist necessary to avoid or reduce to a less than significant level potential impacts to cultural resource. Appropriate actions could include a Data Recovery Plan or preservation in place.	During ground disturbing activities and in the event human remains are uncovered	Daily during ground disturbing activities	RCWD with assistance of a qualified cultural subconsultant	By subconsultant/ contractor reports to RCWD, Fresno County Coroner notification and report, and notification to NAHC, if applicable	
Mitigation Measure CUL-3: Human Remains					
If human remains are uncovered, or in any other case when human remains are discovered during construction, the Madera County Coroner is to be notified to arrange proper treatment and disposition. If the remains are identified—on the basis of archaeological context, age, cultural associations, or biological traits—as those of a Native American, California Health and Safety Code 7050.5 and Public Resource Code 5097.98	During ground disturbing activities and in the event human remains are uncovered	Daily during ground disturbing activities	RCWD with assistance of a qualified cultural subconsultant	By subconsultant/ contractor reports to RCWD, Fresno County Coroner notification and report, and	

Mitigation Monitoring and Reporting Program					
Mitigation Measure/Condition of Approval	When Monitoring is to Occur	Frequency of Monitoring	Agency Responsible for Monitoring	Method to Verify Compliance	Verification of Compliance
require that the coroner notify the NAHC within 24 hours of discovery. The NAHC would then identify the Most Likely Descendent who would determine the manner in which the remains are treated.				notification to NAHC, if applicable	

Chapter 5 References

Calfornia Department of Conservation. (2019). *Important Farmland Categories*. Retrieved from Calfornia Department of Conservation: https://www.conservation.ca.gov/dlrp/fmmp/Pages/Important-Farmland-Categories.aspx

California Stormwater Quality Association. (2003). *California Stormwater Quality Association Stormwater Best Management Practices Handbook New and Redevelopment*. Retrieved from California Stormwater Quality Association Stormwater Best Management Practices Handbook New and Redevelopment: https://www.casqa.org/sites/default/files/BMPHandbooks/BMP_NewDevRedev_Complete.pdf

California Air Pollution Control District. (2020). *California Emissions Estimator Model (CalEEMod) Version 2016.3.1*. Fresno: California Air Pollution Control District.

California Air Resources Control Board. (2020). *California Air Resources Control Board Inhalable Particulate Matter and Health (PM2.5 and PM10)*. Retrieved from Inhalable Particulate Matter and Health (PM2.5 and PM10): https://ww2.arb.ca.gov/resources/inhalable-particulate-matter-and-health

California Department of Conservation - California Geological Survey. (2020). Retrieved from http://subduction.rocks/Storage%20for%20Handouts%20and%20Reference%20Materials/CGS%20Anniversary%20California%20Facts%20150yrs.pdf

California Department of Conservation. (1984, May 18). *Farmland Mapping and Monitoring Program*. Retrieved from Farmland Mapping and Monitoring Program: https://www.conservation.ca.gov/dlrp/fmmp

California Department of Conservation. (1999, April 1). *CGS Information Warehouse*. Retrieved from Mineral Classification: https://maps.conservation.ca.gov/cgs/informationwarehouse/mlc/

California Department of Conservation. (2020). *California Department of Conservation Naturally Occurring Asbestos*. Retrieved from California Department of Conservation Naturally Occurring Asbestos: https://ww3.arb.ca.gov/toxics/asbestos/ofr_2000-019.pdf

California Department of Conservation Fish and Wildlife. (2020). *California Department of Conservation Fish and Wildlife*. Retrieved from California Department of Conservation Fish and Wildlife: https://wildlife.ca.gov/Data/CNDDB

California Department of Conservation Well Finder. (2020, May 18). *California Department of Conservation Well Finder*. Retrieved from CalGEM Well Finder:
https://www.conservation.ca.gov/calgem/Pages/WellFinder.aspx

California Department of Food and Agriculture. (2020, April 24). *Unites States Department of Agriculture National Statistics Service*. Retrieved from
https://www.nass.usda.gov/Statistics_by_State/California/Publications/AgComm/2018/2018cropyearcactb00.pdf

California Department of Resources Recycling and Recovery. (1995). *California Department of Resources Recycling and Recovery*. Retrieved from California Department of Resources Recycling and Recovery: https://www.calrecycle.ca.gov/

California Department of Toxic Substances Control. (2020). *California Department of Toxic Substances Control EnviroStor*. Retrieved from California Department of Toxic Substances Control EnviroStor: https://www.envirostor.dtsc.ca.gov/public/

California Department of Transportation. (n.d.). *California Department of Transportation*. Retrieved from California Department of Transportation Scenic Highways:
https://www.dot.ca.gov/design/lap/livability/scenic-highways/index.html

California Department of Water Resources. (2018). *DWR Groundwater Basin Boundary Assessment Tool*. Retrieved from DWR Groundwater Basin Boundary Assessment Tool: https://gis.water.ca.gov/app/bbat/

California Emissions Estimator Model (CalEEMod) version 2013.2.2. (n.d.). *California Emissions Estimator Model (CalEEMod) version 2013.2.2*. Mendota.

California State Water Resources Control Board. (2020). *California State Water Resources Control Board Construction Stormwater Program*. Retrieved from California State Water Resources Control Board Construction

Stormwater Program: https://www.waterboards.ca.gov/water_issues/programs/stormwater/construction.html

California Stormwater Quality Association. (2003). *California Stormwater Quality Association Stormwater Best Management Practice*. Retrieved from California Stormwater Quality Association Stormwater Best Management Practice: https://www.casqa.org/sites/default/files/BMPHandbooks/BMP_NewDevRedev_Complete.pdf

California Stormwater Quality Association. (2003). *California Stormwater Quality Association Stormwater Best Management Practice* . Retrieved from California Stormwater Quality Association Stormwater Best Management Practice : https://www.casqa.org/sites/default/files/BMPHandbooks/BMP_NewDevRedev_Complete.pdf

Commission, S. o. (2020). *State of California Native American Heritage Commission*. Retrieved from State of California Native American Heritage Commission: http://nahc.ca.gov/

Congressional Research Service Central Valley Project Issues and Legislation. (2020, May 26). Retrieved from https://crsreports.congress.gov/product/pdf/R/R45342

Department of Water Resources Bay-Delta Office. (2018, August). *Mean and Extreme Climate Change Impacts on the State Water Project.* Retrieved from A Report for California's Fourth Climate Change Assessment: https://www.energy.ca.gov/sites/default/files/2019-12/Water_CCCA4-EXT-2018-004_ada.pdf

Google Earth. (2020). *Google Earth*. Retrieved from Google Earth: https://www.google.com/earth/

Madera County Fire Department. (2020). *Madera County Fire Department*. Retrieved from Madera County Fire Department Staffing/Stations: https://www.maderacounty.com/government/staffing-stations

Madera County General Plan Background Report. (1995, October 24). *Madera County General Plan Background Report*. Retrieved from Madera County General Plan Background Report Chapter 6 Agricultural and Natural Resources: https://www.maderacounty.com/Home/ShowDocument?id=2852

Madera County Municipal Code. (n.d.). *Madera County Municipal Code Noise Regulations*. Retrieved from Madera County Municipal Code Noise Regulations 9.58.020 General Noise Regulations: https://library.municode.com/ca/madera_county/codes/code_of_ordinances?nodeId=TIT9PESAMO_VOFAGPUPE_CH9.58NORE_9.58.020GENORE

National Aeronautics and Space Administration Warmest Year on Record. (2017, January 18). *NASA NOAA Data Show 2016 Warmest Year on Record Globally*. Retrieved from NASA NOAA Data Show 2016 Warmest Year on Record Globally: https://www.nasa.gov/press-release/nasa-noaa-data-show-2016-warmest-year-on-record-globally

Native American Heritage Commission Sacred Lands Files. (2020). *Native American Heritage Commission Sacred Lands Files*. Retrieved from Native American Heritage Commission Sacred Lands Files: http://nahc.ca.gov

San Joaquin Valley Air Pollution Control District. (2006-2012). *San Joaquin Valley Air Pollution Control District Ambient Air Quality Standards & Valley Attainment Status*. Retrieved from San Joaquin Valley Air Pollution Control District Ambient Air Quality Standards & Valley Attainment Status: http://www.valleyair.org/aqinfo/attainment.htm

San Joaquin Valley Air Pollution Control District. (2009, December 17). *Guidance for Valley Land-use Agencies*. Retrieved from http://www.valleyair.org/Programs/CCAP/12-17-09/3%20CCAP%20-%20FINAL%20LU%20Guidance%20-%20Dec%2017%202009.pdf

San Joaquin Valley Air Pollution Control District APR 2025. (2025). *CEQA Determinations of Significance for Projects Subject to ARB's GHG Cap-and-Trade Regulation.* Retrieved from CEQA Determinations of Significance for Projects Subject to ARB's GHG Cap-and-Trade Regulation: https://www.valleyair.org/policies_per/Policies/APR-2025.pdf

State of California . (2020). *State Water Resources Control Board Geo Tracker*. Retrieved from State Water Resources Control Board Geo Tracker: https://geotracker.waterboards.ca.gov/

State of California Air Resources Board. (2020). *State of California Air Resources Board Inhalable Particulate Matter and Health*. Retrieved from State of California Air Resources Board Inhalable Particulate Matter and Health: https://ww2.arb.ca.gov/resources/inhalable-particulate-matter-and-health

State of California Department of Water Resources. (n.d.). *DWR Bulletin 118 Groundwater Basin Boundary Assessment Tool*. Retrieved from State of California Department of Water Resources DWR Bulletin 118 Groundwater Basin Boundary Assessment Tool: https://gis.water.ca.gov/app/bbat/

State of California Legislative Information. (2013-2014). *State of California Legislative Information AB-52 Native Americans California Environmental Quality Act*. Retrieved from State of California Legislative Information AB-52 Native Americans California Environmental Quality Act: http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201320140AB52

State of California Legislative Information. (2014, September 25). *State of California Legislative Information*. Retrieved from State of California Legislative Information: http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201320140AB52

State of California Legislative Information Scenic Highways. (2020). *State of California Legislative Information Scenic Highways*. Retrieved from State of California Legislative Information Scenic Highways: https://leginfo.legislature.ca.gov/faces/codes_displayText.xhtml?lawCode=SHC&division=1.&title=&part=&chapter=2.&article=2.5.

State of California Public Resources Code. (2020). *California Code, Public Resources Code - PRC § 4526*. Retrieved from California Code, Public Resources Code - PRC § 4526: https://codes.findlaw.com/ca/public-resources-code/prc-sect-4526.html

United States Bureau of Reclamation. (2011, March 21). *News Release Archive*. Retrieved from Reclamation Announces the Availability of Section 215 Water for Friant Division Water Service Contractors: https://www.usbr.gov/newsroom/newsrelease/detail.cfm?RecordID=35605

United States Bureau of Reclamation, M.-P. R. (2012, May). *The San Joaquin River Exchange Contractors Water Authority 25-Year Water Transfer Program Water Resource Analysis*. Retrieved from https://www.usbr.gov/mp/nepa/includes/documentShow.php?Doc_ID=9627

United States Census Bureau - Madera County. (2020). *Quick Facts Madera County, CA*. Retrieved from Quick Facts Madera County, CA: https://www.census.gov/quickfacts/fact/table/fresnocountycalifornia/PST045217

United States Census Bureau - Madera County. (2020). *United States Census Bureau - Madera County Quick Facts*. Retrieved from United States Census Bureau - Madera County Quick Facts: https://www.census.gov/quickfacts/fact/table/maderacountycalifornia/PST045219

United States Census Bureau - Stanislaus County. (n.d.). *United States Census Bureau - Stanislaus County Quick Facts*. Retrieved from United States Census Bureau - Stanislaus County Quick Facts: https://www.census.gov/quickfacts/fact/table/US/PST045219

United States Department of Agriculture National Agricultural Statistics Service. (2020, May 18). *County Ag Commissioners' Data Listing*. Retrieved from USDA website: https://www.nass.usda.gov/Statistics_by_State/California/Publications/AgComm/index.php

United States Department of Energy. (n.d.). *United States Department of Energy*. Retrieved from United States Department of Energy: https://www.energy.gov/energysaver/save-electricity-and-fuel/lighting-choices-save-you-money/how-energy-efficient-light

United States Department of the Interior, Geological Survey. (2011). *Reported Historic Asbestos Mines, Historic Asbestos Prospects, and Other Natural Occurrences of Asbestos in California*. John P. Clinkenbeard, California Geological Survey, Sacramento, California: Bradley S. Van Gosen, U.S. Geological Survey, Denver, Colorado.

United States Environmental Protection Agency. (n.d.). *United States Environmental Protection Agency WATERS GeoViewer*. Retrieved from United States Environmental Protection Agency WATERS GeoViewer: https://www.epa.gov/waterdata/waters-geoviewer

United States Federal Emergency Management Agency (FEMA) . (2020). *FEMA Flood Map Service Center*. Retrieved from FEMA Flood Map Service Center: https://msc.fema.gov/portal/home

United States Fish and Wildlife Service. (2020). *United States Fish and Wildlife Service*. Retrieved from United States Fish and Wildlife Service National Wetlands Inventory: https://www.fws.gov/wetlands/

United States Geological Survey Areas of Land Subsidence in California. (2020). *USGS Areas of Land Subsidence in California*. Retrieved from USGS Areas of Land Subsidence in California: https://ca.water.usgs.gov/land_subsidence/california-subsidence-areas.html

United States Geological Survey. (2020). *United States Geological Survey*. Retrieved from United States Geological Survey: https://edits.nationalmap.gov/wbd-app/?loc=-119.5487,36.6160,13

United States Geological Survey. (2020). *USGS Areas of Land Subsidence in California*. Retrieved from USGS Areas of Land Subsidence in California: https://ca.water.usgs.gov/land_subsidence/california-subsidence-areas.html

United States Geological Survey Science Explorer. (2020). *United States Geological Survey Science Explorer*. Retrieved from United States Geological Survey Science Explorer: https://www.usgs.gov/science-explorer-results?es=Liquefaction+Susceptibility

Chapter 6 List of Preparers

The following firms, individuals, and agency staff contributed to the preparation of this document:

Provost & Pritchard Consulting Group:
Briza Sholars – Project Manager/Senior Planner/QAQC
Mark Thompson – GIS
Amy Wilson – Planner
Jackie Lancaster – Administrative Support
John Gudino – Senior Engineering Technician
Brian Ehlers – Project Engineer

Appendix A

Air Quality and Greenhouse Gas Emissions Evaluation Report

Root Creek Parkway Water Conservation Project

Madera County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Other Non-Asphalt Surfaces	107.00	Acre	107.00	4,660,920.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.9	**Precipitation Freq (Days)**	51
Climate Zone	3			**Operational Year**	2021
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 -

Construction Phase - Construction will take place over three months and will involve excavation in the channel, pipeline work, and infiltration basins.

Trips and VMT - Construction worker trips will be no more than 20 per day, and vendor trips will not be more than 20 per day during the building phase.

Construction Off-road Equipment Mitigation -

Table Name	Column Name	Default Value	New Value
tblAreaCoating	Area_Parking	279655	109771
tblConstructionPhase	NumDays	3,100.00	12.00
tblConstructionPhase	NumDays	310.00	31.00
tblConstructionPhase	NumDays	120.00	24.00
tblGrading	AcresOfGrading	77.50	187.50
tblTripsAndVMT	VendorTripNumber	764.00	20.00
tblTripsAndVMT	WorkerTripNumber	1,958.00	20.00

2.0 Emissions Summary

2.1 Overall Construction

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	tons/yr										MT/yr					
2021	0.1262	1.3245	0.8541	1.6600e-003	0.4155	0.0611	0.4766	0.1828	0.0564	0.2392	0.0000	146.3054	146.3054	0.0440	0.0000	147.4065
Maximum	**0.1262**	**1.3245**	**0.8541**	**1.6600e-003**	**0.4155**	**0.0611**	**0.4766**	**0.1828**	**0.0564**	**0.2392**	**0.0000**	**146.3054**	**146.3054**	**0.0440**	**0.0000**	**147.4065**

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	tons/yr										MT/yr					
2021	0.1262	1.3245	0.8541	1.6600e-003	0.1902	0.0611	0.2514	0.0831	0.0564	0.1395	0.0000	146.3053	146.3053	0.0440	0.0000	147.4063
Maximum	**0.1262**	**1.3245**	**0.8541**	**1.6600e-003**	**0.1902**	**0.0611**	**0.2514**	**0.0831**	**0.0564**	**0.1395**	**0.0000**	**146.3053**	**146.3053**	**0.0440**	**0.0000**	**147.4063**

	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**	**54.21**	**0.00**	**47.26**	**54.52**	**0.00**	**41.67**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
1	**3-1-2021**	**5-31-2021**	1.4196	1.4196
2	**6-1-2021**	**8-31-2021**	0.0077	0.0077
		Highest	1.4196	1.4196

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	tons/yr										MT/yr					
Area	0.3395	1.0000e-005	9.9000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.9100e-003	1.9100e-003	1.0000e-005	0.0000	2.0400e-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	0.0000
Mobile	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	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.3395**	**1.0000e-005**	**9.9000e-004**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**1.9100e-003**	**1.9100e-003**	**1.0000e-005**	**0.0000**	**2.0400e-003**

2.2 Overall Operational

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	tons/yr										MT/yr					
Area	0.3395	1.0000e-005	9.9000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.9100e-003	1.9100e-003	1.0000e-005	0.0000	2.0400e-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	0.0000
Mobile	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	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.3395**	**1.0000e-005**	**9.9000e-004**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**1.9100e-003**	**1.9100e-003**	**1.0000e-005**	**0.0000**	**2.0400e-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	Site Preparation	Site Preparation	3/1/2021	4/1/2021	5	24	
2	Grading	Grading	4/2/2021	5/14/2021	5	31	
3	Building Construction	Building Construction	5/15/2021	6/1/2021	5	12	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 187.5

Acres of Paving: 107

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

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Site Preparation	Rubber Tired Dozers	3	8.00	247	0.40
Site Preparation	Tractors/Loaders/Backhoes	4	8.00	97	0.37
Grading	Excavators	2	8.00	158	0.38
Grading	Graders	1	8.00	187	0.41
Grading	Rubber Tired Dozers	1	8.00	247	0.40
Grading	Scrapers	2	8.00	367	0.48
Grading	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Building Construction	Cranes	1	7.00	231	0.29
Building Construction	Forklifts	3	8.00	89	0.20
Building Construction	Generator Sets	1	8.00	84	0.74
Building Construction	Tractors/Loaders/Backhoes	3	7.00	97	0.37
Building Construction	Welders	1	8.00	46	0.45

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
Site Preparation	7	18.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Grading	8	20.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	9	20.00	20.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

3.2 Site Preparation - 2021

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	tons/yr										MT/yr					
Fugitive Dust					0.2168	0.0000	0.2168	0.1192	0.0000	0.1192	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0467	0.4860	0.2539	4.6000e-004		0.0245	0.0245		0.0226	0.0226	0.0000	40.1229	40.1229	0.0130	0.0000	40.4473
Total	**0.0467**	**0.4860**	**0.2539**	**4.6000e-004**	**0.2168**	**0.0245**	**0.2413**	**0.1192**	**0.0226**	**0.1417**	**0.0000**	**40.1229**	**40.1229**	**0.0130**	**0.0000**	**40.4473**

3.2 Site Preparation - 2021

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	tons/yr										MT/yr					
Hauling	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	0.0000
Vendor	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	0.0000
Worker	9.0000e-004	5.7000e-004	6.4000e-003	2.0000e-005	1.7200e-003	1.0000e-005	1.7300e-003	4.6000e-004	1.0000e-005	4.7000e-004	0.0000	1.5358	1.5358	5.0000e-005	0.0000	1.5369
Total	**9.0000e-004**	**5.7000e-004**	**6.4000e-003**	**2.0000e-005**	**1.7200e-003**	**1.0000e-005**	**1.7300e-003**	**4.6000e-004**	**1.0000e-005**	**4.7000e-004**	**0.0000**	**1.5358**	**1.5358**	**5.0000e-005**	**0.0000**	**1.5369**

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	tons/yr										MT/yr					
Fugitive Dust					0.0976	0.0000	0.0976	0.0536	0.0000	0.0536	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0467	0.4860	0.2539	4.6000e-004		0.0245	0.0245		0.0226	0.0226	0.0000	40.1228	40.1228	0.0130	0.0000	40.4472
Total	**0.0467**	**0.4860**	**0.2539**	**4.6000e-004**	**0.0976**	**0.0245**	**0.1221**	**0.0536**	**0.0226**	**0.0762**	**0.0000**	**40.1228**	**40.1228**	**0.0130**	**0.0000**	**40.4472**

3.2 Site Preparation - 2021

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	tons/yr										MT/yr					
Hauling	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	0.0000
Vendor	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	0.0000
Worker	9.0000e-004	5.7000e-004	6.4000e-003	2.0000e-005	1.7200e-003	1.0000e-005	1.7300e-003	4.6000e-004	1.0000e-005	4.7000e-004	0.0000	1.5358	1.5358	5.0000e-005	0.0000	1.5369
Total	**9.0000e-004**	**5.7000e-004**	**6.4000e-003**	**2.0000e-005**	**1.7200e-003**	**1.0000e-005**	**1.7300e-003**	**4.6000e-004**	**1.0000e-005**	**4.7000e-004**	**0.0000**	**1.5358**	**1.5358**	**5.0000e-005**	**0.0000**	**1.5369**

3.3 Grading - 2021

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	tons/yr										MT/yr					
Fugitive Dust					0.1928	0.0000	0.1928	0.0620	0.0000	0.0620	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0650	0.7192	0.4786	9.6000e-004		0.0308	0.0308		0.0283	0.0283	0.0000	84.4672	84.4672	0.0273	0.0000	85.1502
Total	**0.0650**	**0.7192**	**0.4786**	**9.6000e-004**	**0.1928**	**0.0308**	**0.2235**	**0.0620**	**0.0283**	**0.0904**	**0.0000**	**84.4672**	**84.4672**	**0.0273**	**0.0000**	**85.1502**

3.3 Grading - 2021

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	tons/yr										MT/yr					
Hauling	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	0.0000
Vendor	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	0.0000
Worker	1.3000e-003	8.2000e-004	9.1800e-003	2.0000e-005	2.4700e-003	2.0000e-005	2.4900e-003	6.6000e-004	2.0000e-005	6.7000e-004	0.0000	2.2041	2.2041	6.0000e-005	0.0000	2.2057
Total	**1.3000e-003**	**8.2000e-004**	**9.1800e-003**	**2.0000e-005**	**2.4700e-003**	**2.0000e-005**	**2.4900e-003**	**6.6000e-004**	**2.0000e-005**	**6.7000e-004**	**0.0000**	**2.2041**	**2.2041**	**6.0000e-005**	**0.0000**	**2.2057**

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	tons/yr										MT/yr					
Fugitive Dust					0.0867	0.0000	0.0867	0.0279	0.0000	0.0279	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0650	0.7192	0.4786	9.6000e-004		0.0308	0.0308		0.0283	0.0283	0.0000	84.4671	84.4671	0.0273	0.0000	85.1501
Total	**0.0650**	**0.7192**	**0.4786**	**9.6000e-004**	**0.0867**	**0.0308**	**0.1175**	**0.0279**	**0.0283**	**0.0562**	**0.0000**	**84.4671**	**84.4671**	**0.0273**	**0.0000**	**85.1501**

3.3 Grading - 2021

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	tons/yr										MT/yr					
Hauling	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	0.0000
Vendor	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	0.0000
Worker	1.3000e-003	8.2000e-004	9.1800e-003	2.0000e-005	2.4700e-003	2.0000e-005	2.4900e-003	6.6000e-004	2.0000e-005	6.7000e-004	0.0000	2.2041	2.2041	6.0000e-005	0.0000	2.2057
Total	**1.3000e-003**	**8.2000e-004**	**9.1800e-003**	**2.0000e-005**	**2.4700e-003**	**2.0000e-005**	**2.4900e-003**	**6.6000e-004**	**2.0000e-005**	**6.7000e-004**	**0.0000**	**2.2041**	**2.2041**	**6.0000e-005**	**0.0000**	**2.2057**

3.4 Building Construction - 2021

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	tons/yr										MT/yr					
Off-Road	0.0114	0.1046	0.0995	1.6000e-004		5.7500e-003	5.7500e-003		5.4100e-003	5.4100e-003	0.0000	13.8982	13.8982	3.3500e-003	0.0000	13.9821
Total	**0.0114**	**0.1046**	**0.0995**	**1.6000e-004**		**5.7500e-003**	**5.7500e-003**		**5.4100e-003**	**5.4100e-003**	**0.0000**	**13.8982**	**13.8982**	**3.3500e-003**	**0.0000**	**13.9821**

3.4 Building Construction - 2021

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	tons/yr										MT/yr					
Hauling	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	0.0000
Vendor	4.4000e-004	0.0130	3.0800e-003	3.0000e-005	7.9000e-004	4.0000e-005	8.3000e-004	2.3000e-004	4.0000e-005	2.7000e-004	0.0000	3.2240	3.2240	2.6000e-004	0.0000	3.2305
Worker	5.0000e-004	3.2000e-004	3.5500e-003	1.0000e-005	9.6000e-004	1.0000e-005	9.6000e-004	2.5000e-004	1.0000e-005	2.6000e-004	0.0000	0.8532	0.8532	3.0000e-005	0.0000	0.8538
Total	**9.4000e-004**	**0.0133**	**6.6300e-003**	**4.0000e-005**	**1.7500e-003**	**5.0000e-005**	**1.7900e-003**	**4.8000e-004**	**5.0000e-005**	**5.3000e-004**	**0.0000**	**4.0772**	**4.0772**	**2.9000e-004**	**0.0000**	**4.0843**

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	tons/yr										MT/yr					
Off-Road	0.0114	0.1046	0.0995	1.6000e-004		5.7500e-003	5.7500e-003		5.4100e-003	5.4100e-003	0.0000	13.8982	13.8982	3.3500e-003	0.0000	13.9821
Total	**0.0114**	**0.1046**	**0.0995**	**1.6000e-004**		**5.7500e-003**	**5.7500e-003**		**5.4100e-003**	**5.4100e-003**	**0.0000**	**13.8982**	**13.8982**	**3.3500e-003**	**0.0000**	**13.9821**

3.4 Building Construction - 2021

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	tons/yr										MT/yr					
Hauling	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	0.0000
Vendor	4.4000e-004	0.0130	3.0800e-003	3.0000e-005	7.9000e-004	4.0000e-005	8.3000e-004	2.3000e-004	4.0000e-005	2.7000e-004	0.0000	3.2240	3.2240	2.6000e-004	0.0000	3.2305
Worker	5.0000e-004	3.2000e-004	3.5500e-003	1.0000e-005	9.6000e-004	1.0000e-005	9.6000e-004	2.5000e-004	1.0000e-005	2.6000e-004	0.0000	0.8532	0.8532	3.0000e-005	0.0000	0.8538
Total	**9.4000e-004**	**0.0133**	**6.6300e-003**	**4.0000e-005**	**1.7500e-003**	**5.0000e-005**	**1.7900e-003**	**4.8000e-004**	**5.0000e-005**	**5.3000e-004**	**0.0000**	**4.0772**	**4.0772**	**2.9000e-004**	**0.0000**	**4.0843**

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	tons/yr										MT/yr					
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	0.0000	0.0000	0.0000
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	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
Other Non-Asphalt Surfaces	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
Other Non-Asphalt Surfaces	9.50	7.30	7.30	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Other Non-Asphalt Surfaces	0.522901	0.032557	0.165035	0.123395	0.022697	0.005779	0.014224	0.099282	0.002776	0.001743	0.007319	0.001265	0.001028

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	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
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	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	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	tons/yr										MT/yr					
Other Non-Asphalt Surfaces	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	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**

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	tons/yr										MT/yr					
Other Non-Asphalt Surfaces	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	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**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**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	tons/yr										MT/yr					
Mitigated	0.3395	1.0000e-005	9.9000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.9100e-003	1.9100e-003	1.0000e-005	0.0000	2.0400e-003
Unmitigated	0.3395	1.0000e-005	9.9000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.9100e-003	1.9100e-003	1.0000e-005	0.0000	2.0400e-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	tons/yr										MT/yr					
Architectural Coating	0.0382					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.3013					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	9.0000e-005	1.0000e-005	9.9000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.9100e-003	1.9100e-003	1.0000e-005	0.0000	2.0400e-003
Total	**0.3395**	**1.0000e-005**	**9.9000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**1.9100e-003**	**1.9100e-003**	**1.0000e-005**	**0.0000**	**2.0400e-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	tons/yr										MT/yr					
Architectural Coating	0.0382					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.3013					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	9.0000e-005	1.0000e-005	9.9000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.9100e-003	1.9100e-003	1.0000e-005	0.0000	2.0400e-003
Total	**0.3395**	**1.0000e-005**	**9.9000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**1.9100e-003**	**1.9100e-003**	**1.0000e-005**	**0.0000**	**2.0400e-003**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Other Non-Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Other Non-Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

9.0 Operational Offroad

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

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

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

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Appendix B

Biological Resources Assessment

Root Creek Water District Water Conservation Project

Biological Resources Assessment

prepared by

Provost and Pritchard
Brian Ehlers, PE
286 West Cromwell Avenue
Fresno, California 93711
Via email: behlers@ppeng.com

prepared with the assistance of

Rincon Consultants, Inc.
7080 North Whitney Avenue, #101
Fresno, California 93720

October 2020

RINCON CONSULTANTS, INC.
Environmental Scientists | Planners | Engineers
rinconconsultants.com

Root Creek Water District Water Conservation Project

Biological Resources Assessment

prepared by

Provost and Pritchard
Brian Ehlers, PE
286 West Cromwell Avenue
Fresno, California 93711
Via email: behlers@ppeng.com

prepared with the assistance of

Rincon Consultants, Inc.

7080 North Whitney Ave #101
Fresno, California 93720

October 2020

RINCON CONSULTANTS, INC.
Environmental Scientists | Planners | Engineers
rinconconsultants.com

This report prepared on 50% recycled paper with 50% post-consumer content.

Table of Contents

Tables

Figures

Appendices

Executive Summary

This Biological Resources Assessment was prepared to document existing conditions and evaluate potential impacts to special-status and sensitive biological resources from the implementation of the Root Creek Water District Water Conservation Project located in Madera County, California. This BRA has been prepared to support California Environmental Quality Act and National Environmental Policy Act environmental review of the Project.

Five land cover types were identified within the Area of Potential Effect: ruderal/barren, developed, irrigated orchard, excavated irrigation basin, and ephemeral drainage.

Eighteen special-status plant species were evaluated for their potential to occur within the project area. All eighteen were determined to have no potential to occur based on the absence of habitat, lack of suitable soils or elevation, and historical disturbance due to intensive agriculture.

Nine special-status wildlife species have potential to occur within the Project area. Eight of these species have low potential to occur: California horned lark (*Eremophila alpestris actia*), California tiger salamander (*Abystoma californiense*), pallid bat (*Antrozous pallidus*), San Joaquin kit fox (*Vulpes macrotis mutica*), spotted bat (*Euderma maculatum*), tricolored blackbird (*Agelaius tricolor*), western mastiff bat (*Eumops perotis californicus*), and western spadefoot (*Spea hammondii*). One special-status species, Swainson's hawk (*Buteo swainsonii*), was observed flying over the Project area during the field reconnaissance survey.

Potentially jurisdictional waters within the Project area include Root Creek. Root Creek is not under U.S. Army Corp of Engineers jurisdiction but may fall under the jurisdiction of the California Department of Fish and Wildlife and the Regional Water Quality Control Board.

1 Introduction

Rincon Consultants, Inc. (Rincon) has prepared this Biological Resources Assessment (BRA) to document existing conditions and evaluate potential impacts to special-status and sensitive biological resources from the implementation of the Root Creek Water District Water Conservation Project (Project) located in Madera County, California. This BRA has been prepared to support California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA) environmental review of the Project.

1.1 Project Location

The Project is located in southern Madera County within the San Joaquin Valley, part of the Great Valley of California (Figure 1). The valley is bordered by the Sierra Nevada Mountain Ranges to the east, the Coast Ranges to the west, the Klamath Mountains and Cascade Range to the north, and the Transverse Ranges and Mojave Desert to the south. The Project lies within the *Lanes Bridge, California* United States Geological Survey (USGS) 7.5-minute topographic quadrangle, and the Public Lands Survey System plots the area as Township 12 south, Range 19 east, Section 12 and Range 20 east, Sections 4, 5, 7, and 8.

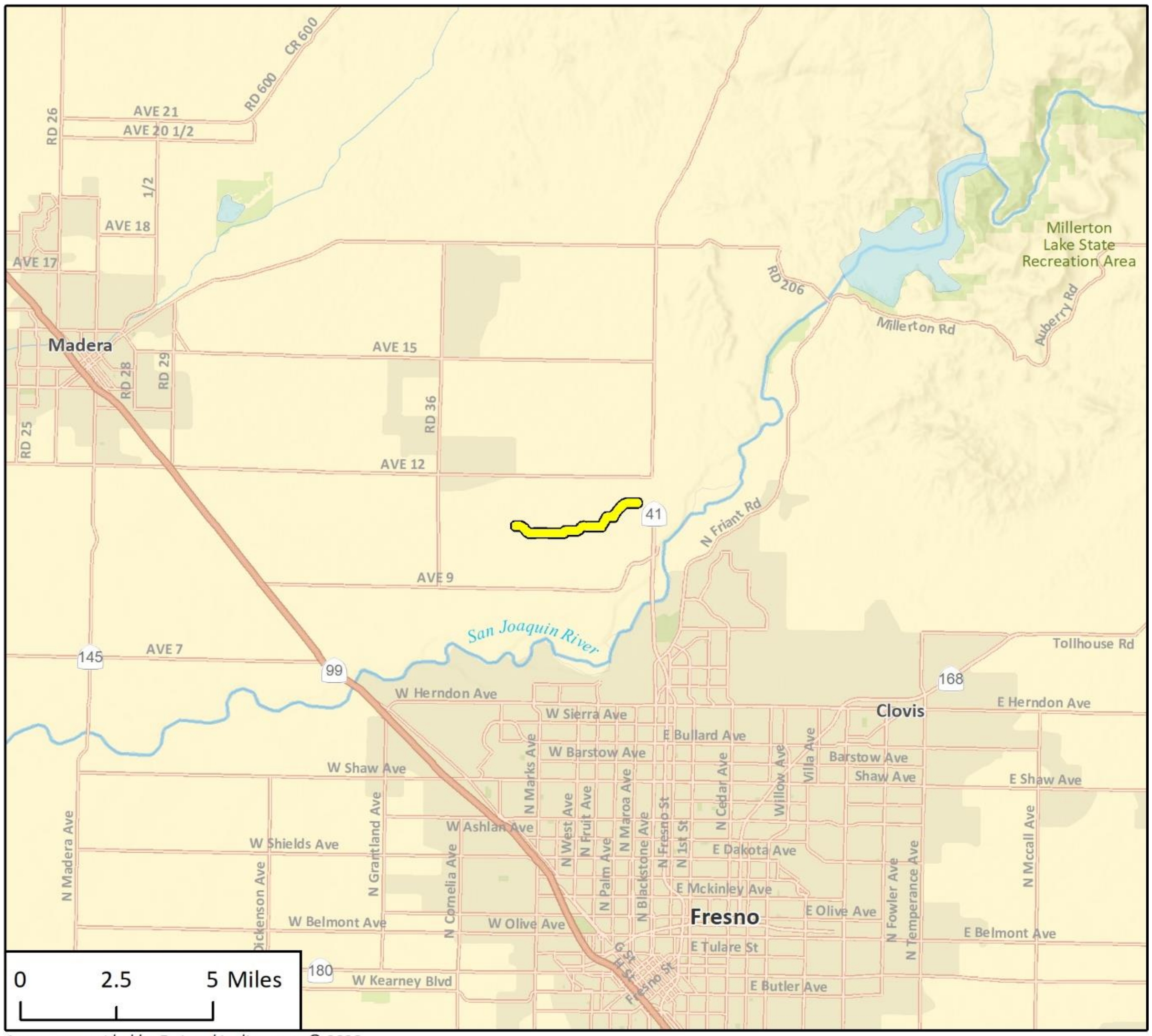
The Area of Potential Effect (APE) for the Project is defined as the 3.5-mile segment of Root Creek that will be altered by installation of control structures, in addition to an approximately 100-foot buffer extending outward from each bank to accommodate access, staging, and percolation areas (Figure 2). Root Creek flows in a westerly direction, and the targeted segment begins approximately at coordinates 36.913540, -119.799919 and ends near 36.903876, -119.858349 (WGS 84). This segment of Root Creek is predominantly surrounded by lands in agricultural production, consisting primarily of irrigated orchards, although residential housing developments are present towards the eastern terminus of the Project area.

1.2 Project Description

Root Creek Water District (RCWD) proposes to divert flows from Root Creek in southeastern Madera County by constructing the Root Creek Parkway Water Conservation Project. The Project includes construction of approximately six control structures across a 3.5-mile segment of Root Creek. Each proposed control structure will consist of a flashboard riser and embankments approximately 5.9 feet in height which will include culverts and control gates intended to control the water level and flow through the embankments at a capacity of up to 550 cubic feet per second (cfs).

The Project proposes six infiltration basins that will capture storm water runoff within the Root Creek channel. The Project includes excavation within the channel to build the proposed embankments and will use Root Creek's natural surface elevations as the north and south embankments. Grading is anticipated to be approximately 8,200 cubic yards and will be balanced on site. A lift station and pump will be constructed at infiltration basin 5 to take additional demand from Root Creek into an existing basin. The Project will establish pipe connections to existing irrigation facilities which include gate valves, meters, strainers, vaults, and approximately 1,585 linear feet of pipe, along with four outlet structures into the infiltration basins that will deliver water for recharge purposes when not being used to capture storm water. Fencing, equipped with gates,

Figure 1 Regional Location Map



Imagery provided by Esri and its licensors © 2020.

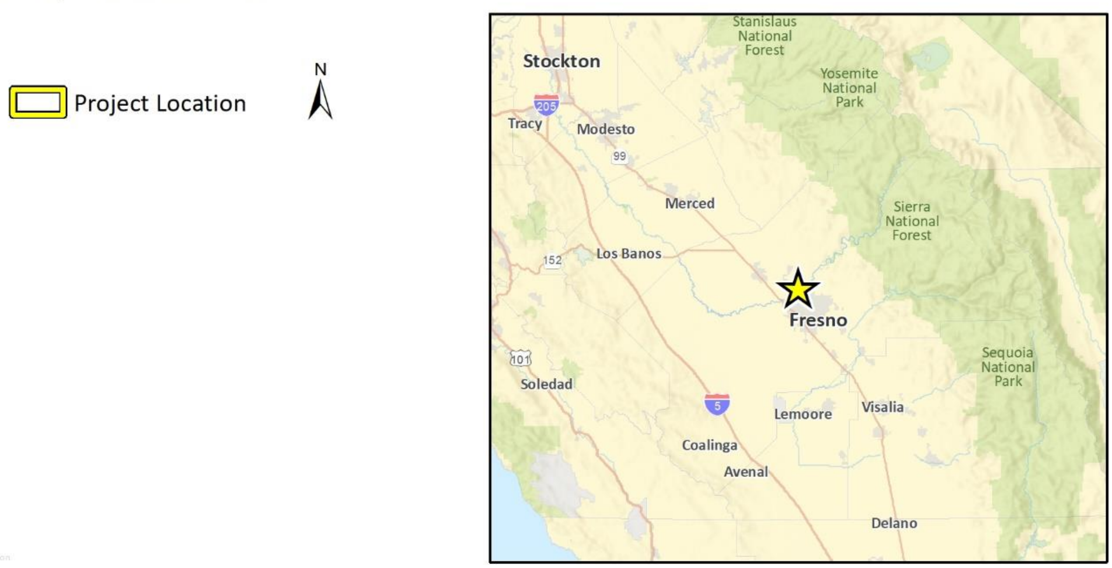
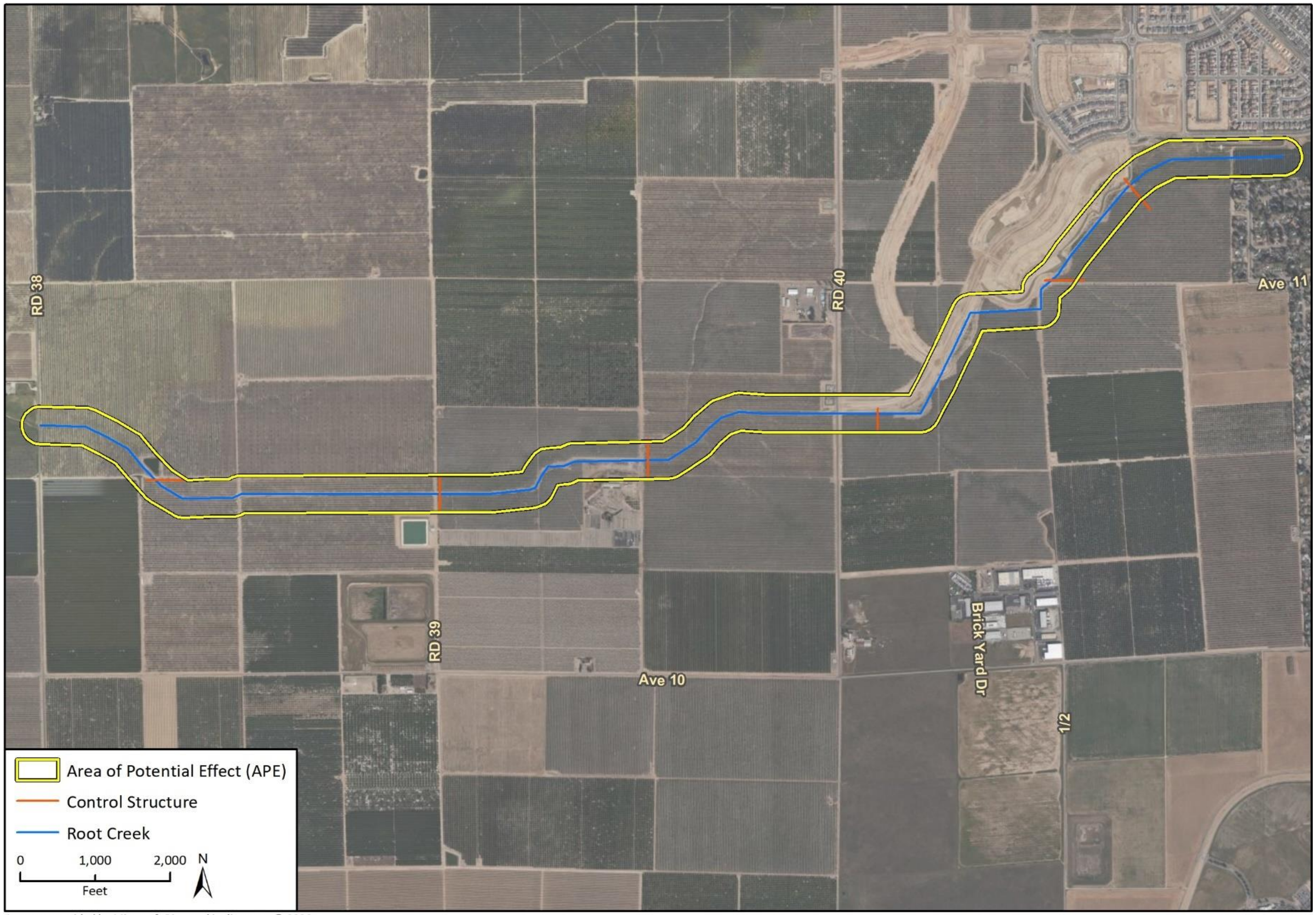


Figure 2 Area of Potential Effect (APE)



Imagery provided by Microsoft Bing and its licensors © 2020.

will surround infiltration basins 1, 2 and 3 to prevent harm to residents from Riverstone and Rolling Hills subdivisions when these areas are converted to a recreational parkway in the future.

The proposed infiltration basins will have the ability to store and regulate storm waters, percolate storm water underground for increasing local water supplies, minimize flooding downstream, and provide for catchment of silt loading that moves through the system before it deposits and accumulates downstream. Implementation of the Project would intercept a significant portion of the flows from the watershed and utilize this resource by recharging the supply to the aquifer.

The Project will take approximately 3 months to be constructed and is expected to be completed by the end of December 2021. Non-native orchard trees adjacent to Root Creek will be removed as part of the Project. Operation activities will include patrolling and operating water and flow control facilities manually and by use of Supervisory Control and Data Acquisition (SCADA) equipment. Maintenance activities are proposed to include weed and rodent control, minor earthwork, and grading to restore grades, as well as lubrication and exercising of water control gates, painting and graffiti removal, and electrical and SCADA repairs.

2 Methodology

2.1 Regulatory Overview

Regulated or sensitive resources studied and analyzed herein include special-status plant and animal species, nesting birds and raptors, sensitive plant communities, jurisdictional waters and wetlands, wildlife movement, and locally protected resources, such as protected trees. Regulatory authority over biological resources is shared by federal, State, and local authorities. Primary authority for regulation of general biological resources lies within the land use control and planning authority of local jurisdictions (in this instance, the County of Madera).

Under provisions of Section 7(a)(2) of the Federal Endangered Species Act (FESA), a federal agency reviewing a proposed project/action within its jurisdiction must ensure that actions "authorized, funded, or carried out by" a federal agency are not likely to jeopardize the continued existence of a listed species or species proposed for listing, or result in the destruction or adverse modification of designated or proposed critical habitat for such species, unless the agency has been granted an exception allowing specified levels of incidental take otherwise prohibited by the FESA. "Take" under federal definition means to harass, harm (which includes habitat modification), pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. This determination is done in consultation with the United States Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS), who share responsibility for implementing the FESA (16 USC § 153 et seq.). The USFWS generally implements the FESA for terrestrial and freshwater species, while NMFS implements the FESA for marine and anadromous species. The proposed Project evaluated in this report would not affect marine or anadromous species, thus only USFWS is discussed for the remainder of the report.

2.1.1 Definition of Special-status Species

For the purposes of this report, special-status species include:

- Species listed as threatened or endangered under the FESA; species that are under review may be included if there is a reasonable expectation of listing within the life of the project
- Species listed as candidate, threatened, or endangered under the California Endangered Species Act (CESA)
- Species designated as Fully Protected, Species of Special Concern, or Watch List by the California Department of Fish and Wildlife (CDFW)
- Species designated as sensitive by the U.S. Forest Service or Bureau of Land Management, if the project would affect lands administered by these agencies
- Species designated as locally important by the Local Agency and/or otherwise protected through ordinance or local policy.

2.1.2 Environmental Statutes

For the purpose of this report, potential impacts to biological resources were analyzed based on the following statutes (Appendix A):

- California Environmental Quality Act (CEQA)

- National Environmental Policy Act (NEPA)
- Federal Endangered Species Act (FESA)
- California Endangered Species Act (CESA)
- Federal Clean Water Act (CWA)
- California Fish and Game Code (CFGC)
- Migratory Bird Treaty Act (MBTA)
- The Bald and Golden Eagle Protection Act
- Porter-Cologne Water Quality Control Act
- Madera County General Plan
- Madera County Municipal Code

2.1.3 Guidelines for Determining CEQA Significance

The following threshold criteria, as defined by the CEQA Guidelines Appendix G Initial Study Checklist, were used to evaluate potential environmental effects. Based on these criteria, the proposed project would have a significant effect on biological resources if it would:

a) *Have substantial adverse effects, either directly or through habitat modifications, on any species identified as a candidate, sensitive or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service.*

b) *Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, and regulations or by the California Department of Fish and Wildlife or US Fish and Wildlife Service.*

c) *Have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means.*

d) *Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.*

e) *Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.*

f) *Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional or state habitat conservation plan.*

2.2 Literature Review

Prior to field surveys, Rincon conducted a literature review to characterize the nature and extent of biological resources on and adjacent to the Project site. The APE for the Project is also the Biological Study Area. The literature review included an evaluation of current and historical aerial photographs of the site (Google Earth Pro 2020), regional and site-specific topographic maps, climatic data, and other available background information.

Queries of the USFWS Information for Planning and Consultation system (IPaC; UFWS 2020a), CDFW California Natural Diversity Database (CNDDB; CDFW 2020a), and California Native Plant Society (CNPS) online Inventory of Rare and Endangered Plants of California (CNPS 2020) were conducted to obtain comprehensive information regarding State and federally listed species, as well as other special-status species, considered to have potential to occur within the *Lanes Bridge, California* USGS 7.5-minute topographic quadrangle and the surrounding eight quadrangles (*Little Table Mountain, Millerton Lake West, Friant, Clovis, Fresno North, Herndon, Gregg,* and *Daulton*). The results of database-queries and lists of special-status species were reviewed by Rincon's regional biological experts for accuracy and completeness. The final list of special-status biological resources to be evaluated is the result of documented occurrences within the 9-quad search area and species known to occur in the region based on the biologists' expert opinions. The results of the species potential-to-occur assessment were compiled into tables presented as Appendix B.

The following resources were reviewed for additional information on existing conditions relating to biological resources within the APE:

- United States Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) Web Soil Survey (USDA 2020a)
- USFWS Critical Habitat portal (USFWS 2020b)
- CDFW CNDDB map of State and federally listed species that have been previously documented within a 5-mile (8-kilometer) radius of the project site (CDFW 2020a)
- CDFW Biogeographic Information and Observation System (BIOS 2020b)
- CDFW Special Animals List (CDFW 2020c)
- CDFW Special Vascular Plants, Bryophytes, and Lichens List (2020d)
- CalFlora's online database of California native plants (2020)
- Jepson Herbarium online database (Jepson eFlora 2020)
- NatureServe Explorer online database (2020)
- USDA, NRCS National Wetland Plant List (2020b)
- CDFW California Wildlife Habitat Relationships (CWHR) database (Zeiner et al., 1988-1990)
- eBird: a citizen-based bird observation network (2020)
- California Herps online database (Nafis 2020)
- iNaturalist online database (2020)
- Gateway Village Specific Plan, Program Environmental Impact Report (Madera County 2006)

2.3 Field Reconnaissance Survey

The reconnaissance-level field survey was conducted by Rincon Biologists Brooke Fletcher and Carolynn Daman on July 14, 2020 concurrently with the field work for an aquatic resources delineation. Site photos from the survey are included as Appendix C. The field reconnaissance survey was conducted on foot throughout the APE. During the survey, the biologists field-verified the boundaries of vegetation communities and other land-cover types, recorded occurrences of incidental observation of special-status species (including State and federally-listed species), and developed a list of observed plants and wildlife (Appendix D). The approximate limits of jurisdictional waters were documented and mapped (Rincon 2020). Definitive surveys to confirm the presence or absence of special-status species were not performed and are not included with this analysis. Definitive surveys for special-status plant and wildlife species generally require specific survey protocols, extensive field survey time, and are conducted only at specific time periods of the year.

3 Existing Conditions

3.1 Physical Characteristics

Elevations within the APE range from approximately 310 to 360 feet (94.5 to 109.7 meters) above mean sea level (msl). The climate in this region is generally mild with an annual minimum average temperature of 47.5 degrees Fahrenheit (F), a maximum average temperature of 76.6 degrees F, and an average annual precipitation of 10.99 inches (WRCC 2016). The topography of the APE is generally flat. The APE is surrounded by agricultural lands, with residential developments to the east.

3.1.1 Watershed and Drainages

The APE is located within the Root Creek sub-watershed (HUC 12-180400010801), part of the Root Creek-San Joaquin River watershed (HUC 10-1804000108) (USGS 2020; CDWR 2020), and Root Creek is the principal drainage in the vicinity. Root Creek is a highly modified ephemeral drainage with a westerly flow direction. The APE is located approximately 3 miles north and 1.5 miles west of the San Joaquin River. For additional details regarding aquatic features of the APE, refer to the separate aquatic resources delineation report prepared by Rincon (2020).

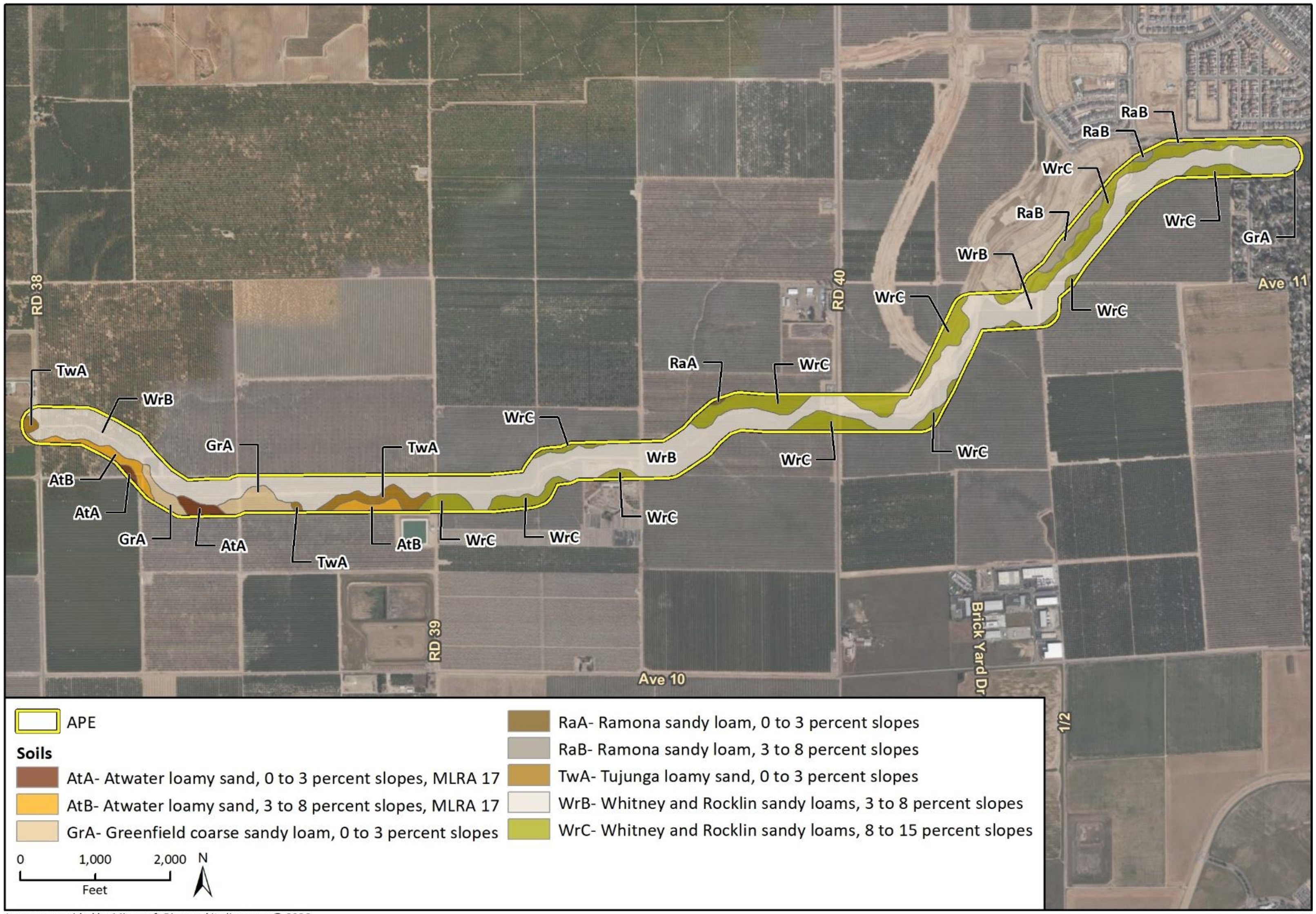
3.1.2 Soils

The USDA-NRCS has mapped eight soil units within the APE: Atwater loamy sandy, 0 to 3 percent slopes, Major Land Resource Group (MLRA) 17; Atwater loamy sand, 3 to 8 percent slopes, MLRA 17; Greenfield coarse sandy loam, 0 to 3 percent slopes; Ramona sandy loam, 0 to 3 percent slopes; Ramona sandy loam, 3 to 8 percent slopes; Tujunga loamy sand, 0 to 3 percent slopes; Whitney and Rocklin sandy loams, 3 to 8 percent slopes; Whitney and Rocklin sandy loams, 8 to 15 percent slopes (USDA-NRCS, 2020a). Four of the eight soil types are listed as a hydric soil (USDA-NRCS, 2020c). Of these eight soil types, Whitney and Rocklin sandy loams, 3 to 8 percent slopes, and Whitney and Rocklin sandy loams, 8 to 15 percent slopes, represent the predominant soils of the APE (Figure 3). Descriptions of each soil type are listed below:

Atwater loamy sand, 0 to 3 percent slopes, MLRA 17 is a well-drained soil, typically found on dunes. This soil type is derived from eolian deposits derived from alluvium derived from granite. A typical soil profile consists of loamy sand to 24 inches, sandy loam 24 to 55 inches, loamy sand 55 to 73 inches, and cemented loamy sand 73 to 79 inches.

Atwater loamy sand, 3 to 8 percent slopes, MLRA 17 is a well-drained soil, typically found on dunes. This soil type is derived from eolian deposits derived from alluvium derived from granite. A typical soil profile consists of loamy sand to 24 inches, sandy loam 24 to 73 inches, and loamy sand 73 to 79 inches.

Figure 3 Soils Mapped within the APE



Imagery provided by Microsoft Bing and its licensors © 2020.
Additional data provided by SSURGO NRCS USDA, 2020.

Greenfield coarse sandy loam, 0 to 3 percent slopes is a well-drained soil, typically found on alluvial fans. This soil type is derived from alluvium derived from igneous, metamorphic and sedimentary rock. A typical soil profile consists of coarse sandy loam to 23 inches, sandy loam 23 to 51 inches, and stratified loamy sand to sandy loam 51 to 72 inches.

Ramona sandy loam, 0 to 3 percent slopes and **Ramona sandy loam, 3 to 8 percent slopes** are well drained soils, typically found on fan remnants. These soil types are derived from alluvium derived from granite. A typical soil profile for these soils consist of sandy loam to 60 inches. Both soil types are classified as a hydric soil (USDA-NRCS, 2020c).

Tujunga loamy sand, 0 to 3 percent slopes is a somewhat excessively drained soil, typically found on alluvial fans. This soil type is derived from sandy alluvium derived from granite. A typical soil profile consists of loamy sand to 11 inches, stratified sand to loamy sand 11 to 24 inches, stratified gravelly sand to gravelly loamy sand 24 to 60 inches.

Whitney and Rocklin sandy loams, 3 to 8 percent slopes and **Whitney and Rocklin sandy loams, 8 to 15 percent slopes** are well drained soils, typically found on fan remnants. These soil types are derived from alluvium derived from granite. A typical soil profile for these soils consist of sandy loam to 19 inches, fine sandy loam 19 to 28 inches, and weathered bedrock 28 to 60 inches. Both soil types are classified as a hydric soil (USDA-NRCS, 2020c).

3.2 Vegetation and Other Land Cover

There are no natural vegetation communities present within the APE. During the field reconnaissance survey, five land cover types were observed within the APE: ruderal/barren, developed, irrigated orchard, excavated irrigation basin, and ephemeral drainage.

The Root Creek alignment is the centerline of the APE. Root Creek is an ephemeral drainage, although some scattered ponding and hydrophytic vegetation was observed due to introduced runoff from adjacent agricultural irrigation practices and from the residential development in the vicinity. Several outfall structures were observed depositing water into the Root Creek channel at the time of the field survey. Conditions within the surveyed segment of Root Creek were highly variable. Parts of the creek were channelized and trapezoidal, other sections were no more than a gradual swale through orchard rows, and other portions lacked any features of a bed, bank, or channel due to grading and development. One excavated irrigation basin was observed within an orchard north of the Root Creek alignment, approximately 0.25 miles east of Road 38. For additional details regarding aquatic features within the APE, refer to the separate aquatic resources delineation report prepared by Rincon (2020).

The majority of the APE consists of pistachio, almond, and olive orchards, which are composed of single-species trees planted in rows. At the time of the field survey, the orchard understory supported a variety of weedy grasses and forbs, including soft chess (*Bromus hordeaceus*), wild oat (*Avena fatua*), big heron bill (*Erodium botrys*), prickly lettuce (*Lactuca serriola*), sowthistle (*Sonchus asper*), telegraph weed (*Heterotheca grandiflora*), pigweed (*Amaranthus retroflexus*), and Jimsonweed (*Datura wrightii*).

Ruderal (barren) habitat is present within the APE in the form of compacted dirt roads which are likely used for construction site access, ingress and egress of equipment, and ongoing activities related to agricultural production of orchards. Developed habitat is present in the form of paved roads, the Riverstone residential development, and agricultural facilities such as equipment yards and processing plants. Although not visible in the most current aerial photograph, nearly the entire area north of Root Creek, east of Road 40, is developed into housing or is under construction as part of the Riverstone Community (formerly Gateway Village) development project.

3.3 General Wildlife

Wildlife observed in the APE was generally consistent with species expected within agricultural and urban environments. The following disturbance-tolerant avian species were detected: American crow (*Corvus brachyrhynchos*), Brewer's blackbird (*Euphagus cyanocephalus*), California scrub jay (*Aphelcoma californica*), northern mockingbird (*Mimus polyglottos*), killdeer (*Charadrius vociferous*), black phoebe *(Sayornis nigricans*), mourning dove (*Zenaida macroura*), western kingbird (*Tyrannus verticalis*), American robin (*Turdus migratorius*), and red-tailed hawk (*Buteo jamaicensis*). In addition, a pair of State-listed threatened Swainson's hawks (*Buteo swainsonii*) were observed soaring overhead and appeared to be foraging within orchard habitat in the vicinity. Although not observed, avian species consistent with aquatic habitat and standing pools, such as great blue herons (*Ardea herodias*), great egrets (*Ardea alba*), and mallards (*Anas platyrhynchos*) may utilize the irrigation basins and forage within ponded areas along the Root Creek alignment within the APE.

At the time of the field survey, amphibian and reptile species observations were limited to American bullfrog (*Lithobates catesbeianus*), San Joaquin fence lizard (*Sceloporus occidentalis biseriatus*), and western side-blotched lizard (*Uta stansburiana elegans*). California toad (*Anaxyrus boreas halophilus*) and Sierran treefrog (*Pseudacris sierra*) were not observed during the field survey, but may breed within ponded areas of Root Creek, irrigation basins, and in the understory of orchards in the vicinity and disperse into neighboring habitats. Pacific gophersnake (*Pituophis catenifer*) and California kingsnake (*Lampropeltis californiae*) are often found in the understory of orchards and vineyards in the Central Valley and would be expected to occur within the APE, though they were also not observed during the field survey.

Mammalian species observed included California ground squirrel (*Otospermophilus beecheyi*), domestic dog, and domestic cat. Additional species expected to occur within the habitats of the APE include coyote (*Canis latrans*), Virginia opossum (*Didelphis virginiana*), striped skunk (*Mephitis mephitis*), black-tailed jackrabbit (*Lepus californicus*), and desert cottontail (*Sylvilagus audubonii*). Botta's pocket gopher (*Thomomys bottae*) and murid rodents such as deer mice (*Peromyscus maniculatus*), house mice (*Mus musculus*), and Norway rats (*Rattus norvegicus*) would also be expected to occur, although these species are often considered agricultural pests and populations on site may be impacted by the use of rodenticides in neighboring orchards and residential developments. Although typical roosting habitat was not observed within the APE, various species of bat could potentially forage for flying arthropods over the habitats on site.

4 Sensitive Biological Resources

Local, State, and federal agencies regulate special-status species and other sensitive biological resources and require an assessment of their presence or potential presence to be conducted on site prior to the approval of proposed development on a property. This section discusses sensitive biological resources observed on the project site, and evaluates the potential for the project site to support additional sensitive biological resources. Assessments for the potential occurrence of special-status species are based upon known ranges, habitat preferences for the species, species occurrence records from the CNDDB, species occurrence records from other sites in the vicinity of the survey area, previous reports for the project site, and the results of surveys of the project site. The potential for each special-status species to occur in the APE was evaluated according to the following criteria:

- **No Potential.** Habitat on and adjacent to the site is clearly unsuitable for the species requirements (foraging, breeding, cover, substrate, elevation, hydrology, plant community, site history, disturbance regime), and species would have been identifiable on-site if present (e.g., oak trees). Protocol surveys (if conducted) did not detect species.
- **Low Potential.** Few of the habitat components meeting the species requirements are present, and/or the majority of habitat on and adjacent to the site is unsuitable or of very poor quality. The species is not likely to be found on the site. Protocol surveys (if conducted) did not detect species.
- **Moderate Potential**. Some of the habitat components meeting the species requirements are present, and/or only some of the habitat on or adjacent to the site is unsuitable. The species has a moderate probability of being found on the site.
- **High Potential.** All of the habitat components meeting the species requirements are present and/or most of the habitat on or adjacent to the site is highly suitable. The species has a high probability of being found on the site.
- **Present.** Species is observed on the site or has been recorded (e.g., CNDDB, other reports) on the site recently (within the last 5 years).

4.1 Special-status Species

Based on the results of the database queries, literature review and reconnaissance survey, 18 special-status plant species and 30 special-status wildlife species required evaluation for potential to occur within the APE. Special-status plant and wildlife species recorded in the CNDDB, by the CNPS Online Inventory of Rare and Endangered Plants of California (within the *Lanes Bridge, California* USGS 7.5-minute quadrangles and the eight surrounding quadrangles), and in USFWS IPaC are listed in Appendix B. A list of animals and plants observed during surveys can be found in Appendix D.

4.1.1 Special-status Plant Species

Eighteen special-status plant species were evaluated for their potential to occur within the APE, including 12 species known to occur within five miles. All 18 species were excluded based on the absence of habitat, lack of suitable soils or elevation, and historical disturbance experienced in the APE (see Appendix B for a species-by-species evaluation).

4.1.2 Special-status Animal Species

Rincon evaluated 30 special-status wildlife species for their potential to occur within the APE or adjacent habitats (Appendix B). Twenty-one of these species are not expected to occur in the APE or immediate vicinity based on the absence of suitable habitat and/or because the species' range does not overlap the APE. Of the remaining nine species, four are listed as threatened or endangered by State or federal regulations, four are CDFW Species of Special Concern (SSC), and one is a CDFW Watch List (WL) species. Table 1 provides a summary of all special-status wildlife species with potential to occur within the APE. More information on each of these species is provided below.

Table 1 Wildlife Species with Potential to Occur within the APE

Common Name	Scientific Name	Status	Potential to Occur
California horned lark	*Eremophila alpestris actia*	WL	Low Potential
California tiger salamander	*Abystoma californiense*	FT, ST	Low Potential
Pallid bat	*Antrozous pallidus*	SSC	Low Potential
San Joaquin kit fox	*Vulpes macrotis mutica*	FE, ST	Low Potential
Spotted bat	*Euderma maculatum*	SSC	Low Potential
Swainson's hawk	*Buteo swainsonii*	ST, SSC	Present
Tricolored blackbird	*Agelaius tricolor*	ST	Low Potential
Western mastiff bat	*Eumops perotis californicus*	SSC	Low Potential
Western spadefoot	*Spea hammondii*	SSC	Low Potential
FE = Federally Endangered	FT = Federally Threatened	SE = State Endangered	ST = State Threatened
SSC = CDFW Species of Special Concern	FP = State Fully Protected	WL = State Watch List	

California Horned Lark

California horned lark is a CDFW WL species. Found in a variety of open habitats, this species builds nests on the ground in areas with low, sparse vegetation such as grasslands, scrub, or fallow fields. One occurrence has been recorded within five miles of the APE (CDFW 2020a) and recent sightings of this species occur in the vicinity of the APE (eBird 2020). The APE has orchards, residential developments, and other disturbed habitats, but contains no fallow fields or undisturbed open areas that would provide nesting habitat for this species. California horned lark has a low potential to pass through or forage in the APE, but suitable nesting habitat is not present.

California Tiger Salamander

California tiger salamander (CTS) is a federally and State threatened amphibian species found primarily in grasslands and oak savannah of California's Central Valley, the Sierra Nevada and Coast ranges, and San Francisco Bay, at elevations below 1,500 feet (CDFW 2010). This species is not known to breed in streams or rivers; instead it relies on vernal pools or seasonal wetlands for reproduction, and terrestrial habitat consists of ground squirrel or gopher burrows (USFWS 2017). Although CTS typically disperse within 492 to 2,034 feet of breeding ponds (Trenham and Shaffer 2005), the species has been detected up to 1.2 miles from the nearest breeding pond (Orloff 2011).

Studies have shown that CTS prefer upland habitats within short annual grassland, gentle slopes (less than 5 degrees) and an abundance of pocket gopher or ground squirrel burrows (Pittman 2005

(Trenham 2001). Since burrows collapse within 18 months, an active ground squirrel or pocket gopher population is required for a site to be considered suitable upland habitat (Trenham 2001). In his 2001 publication, Trenham also noted, "although rocks, logs, culverts, and other potential refugia were available, these were never used by tracked salamanders."

There are 16 known occurrences of this species within five miles of the APE, all of which occurred in grasslands with vernal pools or other wetland areas (CDFW 2020a). The nearest CNDDB record for this species occurs approximately one mile to the east of the APE in undisturbed grassland and vernal pool habitat. Extensive commercial and residential development and State Route 41 separate remaining suitable patches of fragmented habitat from the APE. Furthermore, American bullfrog, an apex predator, was observed within the APE at the time of the survey. Ponded areas and an irrigation basin could be considered marginal breeding habitat for CTS, although the presence of bullfrogs and the disturbed nature of the APE significantly reduce the quality of habitat on site. There is marginal upland habitat within the APE in small mammal burrows along Root Creek, although no vernal pools or undisturbed habitat are present. Therefore, there is a low potential for CTS to occur in upland refuge within the APE.

Special-status Bat Species

Pallid bat, spotted bat, and western mastiff bat are all CDFW SSC. Each of these species is known to inhabit open, dry habitats including deserts, grasslands, shrublands, woodlands and forests. Rocky areas, such as caves, cliffs, and rock crevices are typically necessary for roosting, though buildings may also be used. Pallid bat and western mastiff bat will also use trees for roosting. Pallid bats form maternity colonies from April through July that can vary in size from one dozen to over 100 individuals (Zeiner *et al.* 1990). Western mastiff bats establish maternity roosts April through September with 30 to 100 bats. Parturition for the spotted bat occurs from June through August. This species is solitary and does not form colonies.

All three species hunt insects, with spotted bats specializing on moths. All three species hunt in the air, but pallid bats mostly take prey on the ground and will eat arthropods that don't fly. While open water is an important drinking source for all three bat species, the spotted bat hunts over open water, and thus requires nearby open water for feeding.

There are no CNDDB records for any of these three bat species within five miles of the APE. Suitable roosting habitat for these species is absent from the APE; however, there is a low potential for these bats to pass through or forage above the APE.

San Joaquin Kit Fox

The San Joaquin kit fox (SJKF) is a federally endangered and State threatened species that is endemic to California west of the Sierra Nevada Mountains. It occurs in the Central Valley generally from the Sacramento area south to the southern end of the San Joaquin Valley, in the Carrizo Plain, the Panoche Valley, and from northern San Luis Obispo County north through the Salinas Valley. This species is about the size of a house cat, weighing 4-7 pounds and is approximately 30 inches in length. Its diet consists of desert cottontails, rodents (especially kangaroo rats [*Dipodomys* sp.] and ground squirrels [*Spermophilus* sp.]), insects, reptiles, and some birds. SJKF are most commonly found in gently sloping to relatively flat terrain vegetated with grasslands, open scrub, or oak savannah, though their range has been significantly limited by agricultural development (Clark *et al.* 2007).

No San Joaquin kit fox individuals, sign (tracks, scat, or prey remains), or burrows of suitable dimensions (greater than 3 inches in diameter) were observed during the field survey, and habitats of the APE surrounding lands are typically unsuitable for this species. While the APE may lie within the historic distribution range of this species, regional intensive agricultural development has likely reduced kit fox activity in the area. Although some populations of SJKF have adapted to urbanized environments, kit fox occurrences are locally scarce, with no observations recorded within 5 miles of the APE (CDFW 2020a). There are only two CNDDB records of SJKF occurrences within the 9-quad search area, and both observations were made more than 25 years ago. The nearest CNDDB record was reported in the 1990s in Fresno County just below Friant Dam, approximately 8 miles northeast of the APE. After an abundance of protocol-level focused surveys, including camera trapping, scent stations, and spotlighting, this occurrence and all other recorded occurrences within eastern Fresno County and eastern Madera County were determined to be transient individuals (LOA 2003).

Although the eastern terminus of the APE is located within a mapped linkage recovery area (USFWS 2010), kit foxes have never been recorded in this portion of Madera County. Multiple studies indicate that the APE is outside of the accepted historic and current range of this species (Zeiner et al. 1990, Brown et al. 2014). In 2019, Phillips and Cypher evaluated the San Joaquin Valley for SJKF habitat suitability and found the portion of Madera County that contains the Project to have low to moderate habitat value for SJKF. In 2013, a separate habitat suitability analysis determined this portion of Madera County to contain patches of medium suitability habitat, although the study explains that the value of the habitat for kit foxes in [the eastern edge of the San Joaquin Valley from Fresno County north to San Joaquin County] was “potentially inflated” (Cypher, Phillips, and Kelly 2013). The authors further state that “no persistent populations of kit foxes currently are known to occur in areas with only medium suitability habitat” (Cypher, Phillips, and Kelly 2013).

There are records from the early 1990s indicating the presence of a satellite SJKF population in western Madera County, approximately 30 miles west of the APE, but this species has never been detected east of State Route 99. The Project is located approximately 50 miles east of the nearest known core population in Ciervo-Panoche Natural Area. Although California ground squirrels were observed in the APE during the field survey, their burrows were few, and small mammal diversity and abundance within the APE is low based on observations during the reconnaissance survey, including the presence of rodent bait stations. The Project site is unlikely to support resident SJKF, however there is a low potential the species could pass through the site during dispersal movements.

Swainson’s Hawk

The historical breeding range of Swainson’s hawk in California included the Great Basin, Sacramento and San Joaquin Basins, the coast from Marin County to San Diego County, and scattered sites in the Mojave and Colorado Deserts (England et al. 1997). The species continues to breed across its entire historical range, but in significantly lower numbers than historically. In the Central Valley, much of the native habitat has been converted to agricultural and urban uses, thereby limiting nesting and foraging opportunities for Swainson’s hawk. This species is often found nesting in trees associated with scattered rural residences, particularly in relation to grasslands or dry-land grain fields. Throughout its range the species nest almost exclusively in trees, typically on the edges of woodland adjacent to grass or shrubland habitat (England et al. 1997).

An active nest site was recorded approximately 4 miles north of the APE in 2013 (CDFW 2020a). Large ornamental trees in the vicinity have potential to provide nesting habitat for this species and the site provides suitable foraging habitat. During the field survey, a pair of Swainson’s hawks was observed soaring overhead and appeared to be foraging within orchard habitat in the vicinity. The species is therefore present within the APE, though nesting habitat in the area is limited.

Tricolored Blackbird

Tricolored blackbird is a State threatened species. This colonial species is largely endemic to and a year-round resident of California. The species requires open water, protected nesting substrate, and foraging areas with insect prey within a few kilometers of the colony. The species preferentially selects breeding sites that include open accessible water with protected areas for nesting. Sites generally need to support flooded nesting vegetation and suitable foraging sites within a few kilometers (Shuford and Gardali 2008).

Man-made ponds for agricultural use are present within the APE, but suitable vegetation for nesting is absent. One occurrence from 1974 was recorded five miles south of the Project (CDFW 2020a). Recent sightings within two miles of the Project have been recorded near larger areas of open water, such as the Friant canal to the north and ponds to the east of Highway 41 (eBird 2020); however, no nesting colonies have been identified in Madera County in recent years (CDFW 2018). Tricolored blackbird has low potential to pass through or forage in the APE, but suitable nesting habitat is not present.

Western Spadefoot

Western spadefoot is a CDFW SSC found in sandy washes and flood plains of the Central Valley and the central and southern Coast ranges of California (Stebbins 2003). This species gets its name from a hardened patch on its rear feet used for digging. Western spadefoot toads are nocturnal and have vertical pupils for night vison. They are terrestrial, taking refuge underground during the day, and only entering the water to breed. Breeding occurs in vernal pools or ponds with slow or stagnant water. One CNDDB occurrence has been recorded one mile east of the APE in vernal pool and undisturbed grassland habitat (CDFW 2020a). Small mammal burrows that could be considered suitable upland refugia for this species were observed along the banks of Root Creek; however vernal pools are absent, habitat is disturbed from agricultural activities, and American bullfrog, an apex predator, was observed within the APE at the time of the survey. Although unlikely, this species has a low potential to occur in burrows near water sources within the APE.

4.1.3 Other Protected Species

Non-game migratory birds protected under the California Fish and Game Code (CFGC) Section 3503, such as native avian species common to agricultural, developed and ruderal areas, have the potential to breed and forage throughout the APE. Species of birds common to the area that typically occur in the region, such as red-tailed hawk, mourning dove, American crow, and Brewer’s blackbird, may nest in habitats found within the APE. Nesting by a variety of common birds protected by CFGC Section 3503 could occur in virtually any location throughout the APE containing native or non-native vegetation. The disturbance-tolerant black phoebe could nest on structures such as irrigation standpipes, and killdeer could nest on bare ground or gravel substrate within the APE.

4.2 Sensitive Plant Communities and Critical Habitats

No critical habitats occur within the APE, however critical habitat for California tiger salamander, vernal pool fairy shrimp, hairy Orcutt grass, fleshy owl’s clover, and San Joaquin Orcutt grass does occur within five miles of the APE (USFWS 2020b). Four sensitive natural communities were found in the CNDDB search of the nine USGS quadrangles surrounding the APE: Great Valley Mixed Riparian Forest, Northern Claypan Vernal Pool, Northern Hardpan Vernal Pool, and Sycamore Alluvial Woodland (CDFW 2020a); however, none of these communities nor other sensitive plant communities are found within the APE.

4.3 Jurisdictional Waters and Wetlands

Based on the Aquatic Resources Delineation (ARD) conducted by Rincon biologists in July 2020, two hydrologic features are present within the APE: Root Creek and an irrigation pond. Root Creek is potentially subject to CDFW and RWQCB jurisdictions, as discussed below. The irrigation pond is not considered a jurisdictional feature due to its artificial nature and location in an upland area.

Root Creek

Root Creek is an ephemeral agricultural ditch with inputs from irrigation that convey water outside of precipitation events. Root Creek enters the APE 0.56 miles west of Highway 41 and 0.3 miles north of Avenue 11 and passes through active pistachio and almond orchards before exiting the APE through a large culvert under Road 38. Root Creek passes through eight pipe culverts ranging from two feet to 10 feet in diameter with the APE. At each culvert, broken concrete or imported rock slope protection exists upstream and downstream within the channel and along the banks. Root Creek is a heavily modified channel throughout the APE. Some areas contained constructed, well-defined bed and banks, while other areas lacked any defined bed or banks due to recent grading or routine grading and ground modification for agricultural activities. The top of the bank varied between two feet to 20 feet across and ranged from six inches to eight feet in height from the channel bed. New development east of Road 40, west of Highway 41 and north of Root Creek has reconstructed a section of Root Creek and included the installation of two new residential stormwater drainage outfalls that contain excavated channels with direct connectivity to Root Creek. This section of Root Creek has been relocated, modified and excavated with a well-defined incised channel with vertical banks of approximately two feet in height. Topography within the APE indicates that water flows generally from east to west. Root Creek has no traceable hydrologic connection to the San Joaquin River or any other navigable waterway or perennial or intermittent stream.

The United States Army Corp of Engineers (USACE) declined to assert jurisdiction over Root Creek under Section 404 of the CWA in an Approved Jurisdictional Determination dated August 7, 2013 (USACE File No. SPK-2001-00160). In this determination, the USACE found that stock ponds, ephemeral drainages, and agricultural ditches (including Root Creek) are intrastate isolated waters with no apparent interstate or foreign commerce connects and are therefore not subject to CWA jurisdiction. Because Root Creek is not subject to the CWA, the Regional Water Quality Control Board (RWQCB) will not assert jurisdiction under Section 401 of the CWA; however, where a defined bed and bank exist, Root Creek may be regulated by the RWQCB under the Porter-Cologne Water Quality Control Act. In addition, areas of this creek where streambed characteristics are present meet the definition of a CDFW streambed and it likely falls under CDFW jurisdiction pursuant to CFGC Section 1600 et seq. Areas lacking a defined bed and bank are considered non-jurisdictional sections of Root Creek as they are likely not regulated by RWQCB or CDFW (Rincon 2020).

Irrigation Pond

One irrigation pond was observed near the western side of the APE. During the time of the survey, this irrigation pond was observed with water and ruderal vegetation lining the natural soil banks. The pond was excavated in uplands and contains banks approximately four feet above the surrounding ground level. It is unlikely for the irrigation pond to have direct connection with Root Creek, even during above average precipitation events. Numerous pipe inlets and outlets occur within the pond for irrigation purposes.

This irrigation pond has no traceable hydrologic connection to navigable waters; therefore, it does not meet the definition of a water of the U.S. The Central Valley RWQCB does not take jurisdiction over excavated irrigation basins in upland areas under the Porter-Cologne Water Quality Control Act. This pond also does not meet the definition of a CDFW jurisdictional lake feature due to constant disturbance of the feature and the lack of fish or wildlife habitat establishment; therefore, it is not likely to fall under CDFW jurisdiction (Rincon 2020).

4.4 Wildlife Movement

Wildlife movement corridors, or habitat linkages, are generally defined as connections between habitat patches that allow for physical and genetic exchange between otherwise isolated animal populations. Such linkages may serve a local purpose, such as providing a linkage between foraging and denning areas, or they may be regional in nature. Some habitat linkages may serve as migration corridors, wherein animals periodically move away from an area and then subsequently return. Others may be important as dispersal corridors for young animals. A group of habitat linkages in an area can form a wildlife corridor network. The California Essential Habitat Connectivity Project commissioned by the California Department of Transportation (Caltrans) and CDFW; identifies “Natural Landscape Blocks” which support native biodiversity and the “Essential Connectivity Areas” which link them (Spencer et al. 2010).

Wildlife movement corridors are routes that animals regularly and predictably follow during seasonal migration, dispersal from native ranges, daily travel within home ranges, and inter-population movements. On a local scale, movement corridors in this region are typically associated with rivers and creeks supporting riparian vegetation. Root Creek is highly disturbed in the APE and surrounded by urban and agricultural development. Through most of the drainage, riparian vegetation is essentially absent, and the banks are flanked by residential development, access roads, and orchards in agricultural production. Furthermore, the Project is located in a region often disturbed by intensive agricultural cultivation practices and human disturbance which would discourage dispersal and migration. At most, some disturbance tolerant species adapted to urban environments, such as the opossum, striped skunk, or coyote could occasionally use the canal banks or compacted dirt access roads of the Project area.

On a larger scale, no Natural Landscape Blocks or Essential Connectivity Areas are mapped within the APE in BIOS (CDFW 2020b). The nearest Natural Landscape Block occurs approximately 2.7 miles northeast of the APE, near Millerton Lake State Recreation Area.

4.5 Habitat Conservation Plans

The APE is not located within any Habitat Conservation Plan (HCP) or other conservation plan areas.

5 Impact Analysis and Mitigation Measures

5.1 Special-Status Species

The proposed project would have a significant effect on biological resources if it would:

a) *Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service.*

No special-status plant species have the potential to occur within the APE. Nine special-status animal species have potential to occur within the APE based upon known ranges, habitat preferences, species occurrence records in the vicinity, and presence of suitable habitat features (Appendix B). California horned lark, California tiger salamander, pallid bat, spotted bat, western mastiff bat, San Joaquin kit fox, tricolored blackbird, and western spadefoot were all determined to have low potential to occur. Swainson's hawk is present within the APE. Nesting birds protected by the CFGC also have the potential to occur within suitable habitat in the APE.

Nesting Raptors, Migratory Birds, and Special-status Birds (Including Swainson's Hawk, Tricolored Blackbird, and California Horned Lark)

The APE contains suitable foraging habitat for several avian species, including the special-status Swainson's hawk, and the orchard trees provide marginal nesting habitat for passerines. Ground-nesting birds, such as the killdeer could nest on the bare ground of the dirt roads on site. The Project includes the removal of numerous orchard trees in the vicinity of Root Creek. Birds nesting onsite at the time of construction activities could be injured or killed. Furthermore, construction activities could disturb birds nesting within or adjacent to work areas, resulting in nest abandonment. Project construction activities that adversely affect the nesting success of raptors and migratory birds or result in the mortality of individual birds constitutes a violation of State and federal laws and is considered a significant impact under CEQA.

Swainson's hawks are relatively common in this portion of the Central Valley. In fact, a pair of Swainsons' hawks were observed soaring over the APE during the field survey. Although there are no potential raptor nest trees within Project limits, suitable nesting habitat undoubtedly does occur in the vicinity. Similarly, suitable nesting habitat for the special-status tricolored blackbird and California horned lark are absent from Project areas; however, there is at least some potential that regionally occurring special-status avian species, such as these could pass through the Project area during foraging or dispersal movements. In the event that a Swainson's hawk or other avian species is foraging within the APE during construction activities, the individual would be expected to fly away from disturbance they encounter, subsequently eliminating the risk of injury or mortality while foraging.

Currently, the orchards on site represent sub-optimal foraging habitat where passerines take insects in flight and raptors prey on smaller birds, rodents, and lizards. While clearing orchard trees along Root Creek may result in a reduction of sub-optimal nesting habitat for passerines, large swaths of other similar suitable habitats occur in the vicinity of the APE, including expansive orchards. Additionally, the San Joaquin River and associated riparian corridor comprised of optimal nesting and foraging habitat is located approximately 1.5 miles east and 3 miles south of the APE. Furthermore, as riparian vegetation grows within the inundated areas along Root Creek, the site will become suitable nesting and foraging habitat for several avian species, such as tricolored blackbird, various species of waterfowl, herons, flycatchers, and other riparian migratory birds. At full build-out of the Riverstone community, this segment of Root Creek is envisioned as a multipurpose aquatic feature and open space area with recreational and environmental benefits such as enhancement of the biodiversity of the Root Creek stream corridor. For these reasons, loss of nesting and foraging habitat would be considered a less than significant impact under CEQA and NEPA.

Nesting bird season is generally accepted as February 1 through August 31; however, Swainson's hawk nesting season is generally accepted as March 1 through September 15. For simplicity, these timeframes have been combined.

Implementation of the following recommended mitigation measures will reduce potential impacts to nesting raptors, migratory birds, and special-status birds, including Swainson's hawk to a less than significant level under CEQA and NEPA, and will ensure compliance with State and federal laws protecting these avian species.

BIO-1a Avoidance

The Project's construction activities shall occur, if feasible, between September 16 and January 31 (outside of nesting bird season) to avoid impacts to nesting birds.

BIO-1b Nesting Bird Preconstruction Survey

If construction activities must occur within nesting bird season (February 1 to September 15), a qualified biologist shall conduct preconstruction surveys for active nests within 30 days prior to initiation of ground disturbance and vegetation removal. The survey shall be conducted within the Project Area and include a 150-foot buffer for passerines, 500-foot buffer for other raptors, and 0.5-mile buffer for active Swainson's hawk nests. The survey shall be conducted by a qualified biologist familiar with the identification of avian species known to occur in the region. If no active nests are observed, no further mitigation is required.

BIO-1c Establish Buffers

If any active bird nests are observed during the preconstruction survey, the biologist shall determine appropriate buffer areas in which no construction activities can occur, based on applicable CDFW and/or USFWS guidelines and/or the biology of the species in question. For Swainson's hawk nests, an avoidance buffer of up to ½ mile shall be established around the nest location based on the project activity, the line-of-sight from the nest to the project activity, and observed hawk behavior at the nest. Construction buffers shall be identified with flagging, fencing, or other easily visible means, and shall be maintained until the biologist has determined that the nestlings have fledged.

Special-status Bat Species

Although roosting habitat is absent from the Project site, there is low potential for the special-status pallid bat, spotted bat, and western mastiff bat to nocturnally pass thorough or forage over the Project area. All three of these regionally occurring bat species are designated as species of special concern in California. The Project does not propose removal of bat roosts or significant impacts to habitat features. Although impacts to individual foraging bats seems unlikely, the following recommended mitigation measure will ensure no special-status bats are injured or killed while foraging within Project areas during construction.

BIO-2 Construction Hours

The Project's construction activities shall be limited to the daylight hours in order to avoid and minimize potential construction-related injury or mortality of nocturnal species foraging on-site.

San Joaquin Kit Fox

As described in Section 4.1.2, the SJKF has an extremely low potential to occur on site due to an absence of typical denning and foraging habitat. No evidence of SJKF or burrows of sufficient size to accommodate kit foxes were detected during the field survey. At most, this species could infrequently pass through the Project site during dispersal movements or as a transient. Since there is little-to-no likelihood of a SJKF occurring on site, and suitable burrows or refugia were not observed at the time of the field survey, this species is not expected to be impacted by Project-related construction activities.

Western Spadefoot

Impacts to western spadefoot may occur if individuals are present during construction, but this is highly unlikely due to the very limited potential for the species to occur within the APE. Indirect impacts may occur due to disturbance and loss of habitat, and direct impacts may occur as a result of mortality during clearing and grubbing or active construction. Impacts to non-listed species such as western spadefoot (SSC) would be considered significant under CEQA if it would threaten the continued existence of the population. Due to the disturbance of habitat from agricultural activities in the area and the prevalence of farming, the only parcels on which the spadefoot has a low potential to occur are those with non-native grasses in the vicinity of isolated seasonal wetlands and ground squirrel burrows. It is unlikely that the continued existence of the population would be threatened due to the small area of marginally suitable habitat within the APE and the presence of similar habitat in surrounding areas outside of the Project that likely support larger populations of this species. Impacts to western spadefoot from project activities are not expected.

California Tiger Salamander

Impacts to California tiger salamander (CTS) may occur if individuals are present during construction, but this is highly unlikely due to the very limited potential for the species to occur within the APE. Indirect impacts may occur due to disturbance and loss of habitat, and direct impacts may occur as a result of mortality during clearing and grubbing or active construction. Ponded areas and an irrigation basin could be considered marginal breeding habitat for CTS, although the presence of bullfrogs and the disturbed nature of the Project area significantly reduce the quality of habitat on site. There is marginal upland habitat within the APE in small mammal burrows along Root Creek, although no vernal pools or undisturbed habitat are present. Although impacts to CTS from Project activities are not expected, implementation of the following recommended mitigation measures will aid in the avoidance and minimization of potential Project-related impacts to this State and federally listed species.

BIO-3 CTS Preconstruction Surveys

Pre-construction clearance surveys for California tiger salamander shall be conducted within 30 days prior to the start of construction (including staging and mobilization). The surveys should cover the entire disturbance footprint plus a minimum 100-foot buffer within suitable habitat, where permissible. If CTS are detected, consultation with CDFW and USFWS will be initiated.

BIO-4 Worker Environmental Awareness Program

Prior to initiation of construction activities (including staging and mobilization), all personnel associated with project construction shall attend a Worker Environmental Awareness Program (WEAP) training, conducted by a qualified biologist, to aid workers in recognizing special-status resources that may occur in the construction area. The specifics of this program should include identification of the sensitive species and habitats, a description of the regulatory status and general ecological characteristics of sensitive resources, and review of the limits of construction and mitigation measures required to reduce impacts to biological resources within the work area. A fact sheet conveying this information should also be prepared for distribution to all contractors, their employers, and other personnel involved with construction. All employees should sign a form provided by the trainer indicating they have attended the WEAP and understand the information presented to them.

5.2 Sensitive Plant Communities

The proposed project would have a significant effect on biological resources if it would:

b) *Have a substantial adverse impact on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Wildlife or US Fish and Wildlife Service.*

No sensitive natural communities, including riparian habitat, are present within the APE. Therefore, no impacts to sensitive natural communities are expected.

5.3 Jurisdictional Waters and Wetlands

The proposed project would have a significant effect on biological resources if it would:

c) *Have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means.*

Based on the ARD, two hydrologic features are present within the APE: Root Creek and an irrigation pond. Root Creek is potentially subject to CDFW and RWQCB jurisdictions, as discussed below. The irrigation pond is not considered a jurisdictional feature due to its location in upland areas and artificial nature.

Root Creek

Root Creek has no traceable hydrologic connection to the San Joaquin River or any other navigable waterway or perennial or intermittent stream. Due to the USACE determination that Root Creek is an isolated intrastate water, it is not likely to fall under CWA jurisdiction and thus not expected to be regulated by the USACE and RWQCB pursuant to Sections 404 and 401, respectively; however, areas of Root Creek where a defined bed and bank exist may be regulated by the RWQCB under the Porter-Cologne Water Quality Control Act. In addition, where streambed characteristics are present the creek meets the definition of a CDFW streambed and likely falls under CDFW jurisdiction.

If Project activities would result in impacts to the bed, banks, or channel of Root Creek, or deposit any pollutants or material into it, coordination and permitting with CDFW and RWQCB may be required. A Lake and Streambed Alteration (LSA) Agreement may be required from CDFW pursuant to Section 1602 of the Fish and Game Code for diverting or obstructed the natural flow of any stream (including Root Creek) or lake, changing the bed, channel, or bank of any stream or lake or depositing material into any stream or lake. A general Waste Discharge Requirement (WDR) may be required from RWQCB pursuant to the California Water Code (CWC) Section 13260 for discharging waste or proposing to discharge waste that could affect the quality of waters of the State, including Root Creek. The aforementioned permits will have associated protective measures and conditions that the Project must comply with in order to reduce potential impacts to a less than significant level. No additional mitigation measures are required.

Irrigation Pond

The irrigation pond is not considered a jurisdictional feature due to its location in upland areas and artificial nature. No permits or mitigation measures for the irrigation pond are required.

5.4 Wildlife Movement

The proposed project would have a significant effect on biological resources if it would:

d) Interfere substantially with the movement of any resident or migratory fish or wildlife species or with established resident or migratory wildlife corridors, or impede the use of wildlife nursery sites.

There are no Natural Landscape Blocks or Essential Connectivity Areas mapped within the APE (CDFW 2020b). Due to the highly disturbed nature of the Project area, Project-related construction activities are not likely to significantly impact any wildlife movement corridors; however, Project-related fencing could have impacts on the local migration patterns of those disturbance-tolerant wildlife species that may occasionally utilize the area. The following mitigation measure is recommended to ensure that perimeter fencing installed for the duration of the Project would not have significant impacts on wildlife movement.

BIO-5 Wildlife-friendly fencing

Any temporary or permanent fencing installed within the Project site should allow for the safe passage of wildlife. Fencing should not include any materials that would entrap wildlife. Fencing should also allow for larger wildlife species to jump over and smaller wildlife species to crawl under without injury. Fencing should be highly visible to avoid inadvertent collision by birds and other wildlife species. Common wildlife-friendly fencing incorporates smooth wires (or heavy-duty plastic) to prevent injury, caps height at a maximum of forty-two inches to facilitate leaping over, and provides at least sixteen inches of clearance between the ground and the lowest beam or wire to allow wildlife to crawl under. If Project fencing is temporary, all fencing materials should be completely removed upon completion of Project activities.

5.5 Local Policies and Ordinances

The proposed project would have a significant effect on biological resources if it would:

e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance

The County of Madera’s General Plan includes goals and policies to protect biological resources, (Policies 5E.1-5E.10). With the implementation of mitigation measures described above, there would be no conflict with the General Plan. No additional measures are recommended.

5.6 Adopted or Approved Plans

The proposed project would have a significant effect on biological resources if it would:

f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Conservation Community Plan, or other approved local, regional, or state habitat conservation plan.

The APE is not included in any adopted Habitat Conservation Plan, Natural Conservation Community Plan, or other approved local, regional, or state habitat conservation plans. There would be no conflicts with any adopted or approved plans, and no additional measures are recommended.

6 Limitations, Assumptions, and Use Reliance

This Biological Resources Assessment has been performed in accordance with professionally accepted biological investigation practices conducted at this time and in this geographic area. The biological investigation is limited by the scope of work performed. Reconnaissance biological surveys for certain taxa may have been conducted as part of this assessment but were not performed during a particular blooming period, nesting period, or particular portion of the season when positive identification would be expected if present, and therefore, cannot be considered definitive. The biological surveys are limited also by the environmental conditions present at the time of the surveys. In addition, general biological (or protocol) surveys do not guarantee that the organisms are not present and will not be discovered in the future within the site. In particular, mobile wildlife species could occupy the site on a transient basis, or re-establish populations in the future. Our field studies were based on current industry practices, which change over time and may not be applicable in the future. No other guarantees or warranties, expressed or implied, are provided. The findings and opinions conveyed in this report are based on findings derived from site reconnaissance, jurisdictional areas, review of CNDDB RareFind5, and specified historical and literature sources. Standard data sources relied upon during the completion of this report, such as the CNDDB, may vary with regard to accuracy and completeness. In particular, the CNDDB is compiled from research and observations reported to CDFW that may or may not have been the result of comprehensive or site-specific field surveys. Although Rincon believes the data sources are reasonably reliable, Rincon cannot and does not guarantee the authenticity or reliability of the data sources it has used. Additionally, pursuant to our contract, the data sources reviewed included only those that are practically reviewable without the need for extraordinary research and analysis.

7 References

Brown, N.L., C.D. Johnson, P.A. Kelly, and D.F. Williams. 2014. San Joaquin Kit Fox. Species Profile. Endangered Species Recovery Program. Dept. of Biological Sciences. California State University Stanislaus (CSUS). https://esrp.csustan.edu/speciesprofiles/profile.php?sp=vuma (Accessed January 2020).

Calflora. 2020. Information on wild California plants for conservation, education, and appreciation. Berkeley, CA. www.calflora.org. (Accessed July, 2020).

California Department of Fish and Wildlife (CDFW). 2010. A Status Review of the California Tiger Salamander. (*Ambystoma californiense*).

CDFW. 2018. 2018 Tricolored Blackbird Monitoring Report, Tricolored Blackbird Survey and Colony Protection San Joaquin Valley, California. Prepared by Colibri Ecological Consulting, LLC 9493 N Fort Washington, Suite 108 Fresno, CA 93730.

CDFW. 2020a. California Natural Diversity Database, Rarefind V. (Accessed July, 2020).

CDFW. 2020b. Biogeographic Information and Observation System (BIOS). www.wildlife.ca.gov/data/BIOS. (Accessed December 21, 2010).

CDFW. 2020c. Special Animals List. Biogeographic Data Branch, California Natural Diversity Database. July 2020.

CDFW. 2020d. Special Vascular Plants, Bryophytes, and Lichens List. Biogeographic Data Branch, California Natural Diversity Database. January 2020.

California Department of Water Resources (CDWR). 2020. California Department of Water Resources Water Management Planning Tool. https://gis.water.ca.gov/app/boundaries/. (Accessed on July, 2020).

California Native Plant Society (CNPS). 2020. Inventory of Rare and Endangered Plants. Online Edition, v8-03 0.39. www.rareplants.cnps.org . (Accessed July 2020).

Clark, H.O., R.R. Duke, M.C. Orland and S.I. Hagen. 2007. The San Joaquin Kit Fox in North-Central California: A Review. Transactions of the Western Section of the Wildlife Society 43:27-36.

Cypher, B.L., Phillips, S.E., and Kelly, P.A. 2013. Quantity and Distribution of Suitable Habitat for Endangered San Joaquin Kit Foxes: Conservation Implications. Canid Biology & Conservation. 16(7):25-31.

eBird. 2020. eBird: An online database of bird distribution and abundance [web application]. eBird, Ithaca, New York. http://www.ebird.org (Accessed July 2020).

England, A.S., M.J. Bechard, and C.S. Houston. 1997. Swainson's Hawk (*Buteo swainsoni*). *In*: A. Poole and F. Gill (eds.), The Birds of North America, No. 265. The Academy of Natural Sci., Philadelphia, PA, and The American Ornithologists' Union, Washington, D.C.

iNaturalist. 2020. https://www.inaturalist.org. (Accessed July, 2020)

Jepson Flora Project (eds.) 2020. Jepson eFlora, http://ucjeps.berkeley.edu/eflora/ (Accessed September 2020)

Lichvar, R.W., D.L. Banks, W.N. Kirchner, and N.C. Melvin. 2018. *The National Wetland Plant List: 2018 wetland ratings*. Phytoneuron 2016-30: 1–17.

Live Oak Associates, Inc. (LOA). 2003. San Joaquin Kit Fox Survey: Friant Road and Associated Properties. Fresno County.

Madera County. 2006. Draft, Gateway Village Specific Plan. Program Environmental Impact Report. prepared by Environmental Science Associates (ESA).

NatureServe. 2020. NatureServe Explorer [web application]. NatureServe, Arlington, Virginia. Available https://explorer.natureserve.org/. (Accessed September 2020).

Nafis, G. (2000-2020) California Herps - A Guide to the Amphibians and Reptiles of California. http://www.californiaherps.com/ (accessed September, 2020).

Orloff, S.G. 2011. Movement Patterns and Migration Distances in an Upland Population of California Tiger Salamander. Herpetological Conservation and Biology. 6(2):266-276.

Phillips, S.E. and Cypher, B.L. 2019. Solar Energy Development and Endangered Species in the San Joaquin Valley, California: Identification of Conflict Zones. Western Wildlife 6:29-44.

Pittman, B.T. 2005. Observations of Upland Habitat Use by California Tiger Salamanders Based on Burrow Excavations. Transactions of the Western Section of the Wildlife Society. 41:26-30.

Rincon Consultants, Inc. 2020. Aquatic Resources Delineation for the Root Creek Water District: Water Conservation Project.

Shuford, W. D., and Gardali, T., editors. 2008. California Bird Species of Special Concern: A ranked assessment of species, subspecies, and distinct populations of birds of immediate conservation concern in California. Studies of Western Birds 1. Western Field Ornithologists, Camarillo, California, and California Department of Fish and Game, Sacramento.

Spencer, W.D., P. Beier, K. Penrod, K. Winters, C. Paulman, H. Rustigian- Romsos, J. Strittholt, M. Parisi, and A. Pettler. 2010. California Essential Habitat Connectivity Project: A Strategy for Conserving a Connected California. Prepared for California Department of Transportation, California Department of Fish and Game, and Federal Highways Administration. https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=18366 (Accessed July 2020)

Stebbins, R. C. 2003. A Field Guide to Western Reptiles and Amphibians. 2nd ed. Houghton-Mifflin Company. Boston, Massachusetts.

Trenham, P.C. 2001. Terrestrial Habitat Use by Adult California Tiger Salamanders. Journal of Herpetology. 35(2):343-346.

Trenham, P.C., and H.B. Shaffer. 2005. Amphibian upland habitat use and its consequences for population viability. Ecological Applications 15:1158–1168.

United States Department of Agricultural, Natural Resources Conservation Service (USDA-NRCS). 2020a. Web Soil Survey. Accessed December 21, 2010. Soil Survey Area: Kings County, California. Soil Survey Data: Version 8, August 27, 2009. Available at: https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm.

USDA. 2020b. National Wetland Plant List. Last updated on April 3, 2014. https://plants.usda.gov/core/wetlandSearch (Accessed September 2020).

USDA-NRCS. 2020c. Lists of Hydric Soils. National Cooperative Soil Survey, U.S. Department of Agriculture. https://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/use/hydric/ (Accessed September, 2020).

United States Fish and Wildlife Service (USFWS). 2010. San Joaquin Kit Fox (*Vulpes macrotis mutica*). 5-Year Review: Summary and Evaluation. Sacramento, CA.

USFWS. 2017. Recovery Plan for the Central California Distinct Population Segment of the California Tiger Salamander (*Ambystoma californiense*).

USFWS. 2020a. Information for Planning and Consultation online project planning tool. https://ecos.fws.gov/ipac/ (Accessed July, 2020).

USFWS. 2020b. Critical Habitat Portal. https://ecos.fws.gov/ecp/report/table/critical-habitat.html (Accessed July, 2020).

United States Geologic Survey (USGS). 2020. National Hydrography Dataset (NHD). https://www.usgs.gov/core-science-systems/ngp/national-hydrography. (Accessed July 2020).

Western Regional Climate Center (WRCC). 2016. Climate of California. Madera, California (045233). www.wrcc.dri.edu/Climate/narrative_ca.php.

Xerces Society, Wildlife Preservation Canada, York University, The Montreal Insectarium, The London Natural History Museum, and Bee Spotter. 2020. Data accessed from Bumble Bee Watch, a collaborative website to track and conserve North America's bumble bees. http://www.bumblebeewatch.org/app/#/bees/lists (Accessed July 2020).

Zeiner, D., W.F. Laudenslayer, Jr., and K.E. Mayer (1988-1990). California's Wildlife. California Statewide Wildlife Habitat Relationship System, Volumes I, II, & III. California Department of Fish and Wildlife. https://www.wildlife.ca.gov/data/cwhr/life-history-and-range (Accessed September 2020).

8 List of Preparers

Rincon Consultants, Inc.

Primary Author

- Brooke Fletcher, Project Manager/Biologist

Secondary Authors

- Anastasia Ennis, Biologist
- Kendra Bonsall, Biologist
- Heather Price Curran, Biologist

Technical Review

- Sherri Miller, Principal
- Craig Lawrence, Senior Biologist/Regulatory Specialist

Graphics

- Annette Tran, GIS analyst

Production

- Dario Campos, Production Specialist

Field Reconnaissance Survey and Jurisdictional Evaluation

- Brooke Fletcher, Project Manager/Biologist
- Carolynn Daman, Biologist

Appendix A

Regulatory Setting

Regulatory Setting

Special-status habitats are vegetation types, associations, or sub-associations that support concentrations of special-status plant or animal species, are of relatively limited distribution, or are of particular value to wildlife.

Listed species are those taxa that are formally listed as endangered or threatened by the federal government (e.g. U.S. Fish and Wildlife Service [USFWS]), pursuant to the Federal Endangered Species Act (FESA) or as endangered, threatened, or rare (for plants only) by the State of California (i.e. California Fish and Game Commission), pursuant to the California Endangered Species Act or the California Native Plant Protection Act. Some species are considered rare (but not formally listed) by resource agencies, organizations with biological interests/expertise (e.g. Audubon Society, CNPS, The Wildlife Society), and the scientific community.

The following is a brief summary of the regulatory context under which biological resources are managed at the federal, state, and local levels. A number of federal and state statutes provide a regulatory structure that guides the protection of biological resources. Agencies with the responsibility for protection of biological resources within the project site include:

- U.S. Army Corps of Engineers (wetlands and other waters of the United States);
- Central Valley Regional Water Quality Control Board (waters of the State);
- U.S. Fish and Wildlife Service (federally listed species and migratory birds);
- California Department Fish and Wildlife (riparian areas, streambeds, and lakes; state-listed species; Species of Special Concern; nesting birds);
- The Madera County General Plan
- Madera County Municipal Code

U.S. Army Corps of Engineers

Under Section 404 of the Clean Water Act (CWA), the U.S. Army Corps of Engineers (USACE) has authority to regulate activities that could discharge fill of material into wetlands or other “waters of the United States.” In achieving the goals of the CWA, the USACE seeks to avoid adverse impacts and offset unavoidable adverse impacts on existing aquatic resources. Any fill of wetlands that are hydrologically connected to jurisdictional waters would require a permit from the USACE prior to the start of work. Typically, when a project involves impacts to waters of the United States, the goal of no net loss of wetland acres or values is met through avoidance and minimization to the extent practicable, followed by compensatory mitigation involving creation or enhancement of similar habitats.

Congress enacted the CWA “to restore and maintain the chemical, physical, and biological integrity of the Nation's waters.” In practice, the boundaries of certain waters subject to USACE jurisdiction under Section 404 have not been fully defined. Previous regulations codified in 1986 defined “waters of the United States” as traditional navigable waters, interstate waters, all other waters that could affect interstate or foreign commerce, impoundments of waters of the United States, tributaries, the territorial seas, and adjacent wetlands.

On April 21, 2020, the USACE and U.S. Environmental Protection Agency published the *Navigable Waters Protection Rule to define “Waters of the United States.”* This rule, effective on June 22, 2020, defines four categories of jurisdictional waters, documents certain types of waters that are excluded from jurisdiction, and clarifies some regulatory terms. Under the *Navigable Waters Protection Rule*, "waters of the United States" include:

(1) Territorial seas and traditional navigable waters;
(2) Perennial and intermittent tributaries that contribute surface flow to those waters;
(3) Certain Lakes and ponds, and impoundments of jurisdictional waters, and;
(4) Wetlands adjacent to jurisdictional waters.

Tributaries are defined as "a river, stream, or similar naturally occurring surface water channel that contributes surface water flow to the territorial seas or traditional navigable waters in a typical year either directly or through one or more tributaries, jurisdictional lakes, ponds, and impoundments of jurisdictional waters, or adjacent wetlands." The tributary category also includes a ditch that "either relocates a tributary, is constructed in a tributary, or is constructed in an adjacent wetland as long as the ditch is perennial or intermittent and contributes surface water flow to a traditional navigable water or territorial sea in a typical year."

Adjacent wetlands are defined as wetlands that:

(i) Abut, meaning to touch at least at one point or side of, a defined Water of the U.S.;
(ii) Are inundated by flooding from a defined Water of the U.S in a typical year;
(iii) Are physically separated from a defined Water of the U.S. by a natural berm, bank, dune, or similar natural features or by artificial dike, barrier or similar artificial structures as long as direct hydrological surface connection to defined Waters of the U.S. are allowed; or,
(iv) Are impounded of Waters of the U.S. in a typical year through a culvert, flood or tide gate, pump or similar artificial structure.

The Navigable Waters Protection Rule states that the following areas not considered to be jurisdictional waters even where they otherwise meet the definitions described above:

(1) Groundwater, including groundwater drained through subsurface drainage systems;
(2) Ephemeral features that flow only in direct response to precipitation including ephemeral streams, swales, gullies, rills and pools;
(3) Diffuse stormwater runoff and directional sheet flow over uplands;
(4) Ditches that are not defined Waters of the U.S. and not constructed in adjacent wetlands subject to certain limitations;
(5) Prior converted cropland;
(6) Artificially irrigated areas that would revert to upland if artificial irrigation ceases;
(7) Artificial lakes and ponds that are not jurisdictional impoundments and that are constructed or excavated in upland or non-jurisdictional waters;
(8) Water-filled depressions constructed or excavated in upland or in non-jurisdictional waters for the purpose of obtaining fill, sand, or gravel;
(9) Stormwater control features constructed or excavated in uplands or in non-jurisdictional water to convey, treat, infiltrate, or stormwater run-off;
(10) Groundwater recharge, water reuse, and wastewater recycling structures constructed or excavated in upland or in non-jurisdictional waters; and,

(11) Waste treatment systems.

USACE jurisdictional limits are typically identified by the OHWM or the landward edge of adjacent wetlands (where present). The OHWM is the "line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding area" (33 CFR 328.3).

Wetland Waters of the U.S.

The USACE defines wetlands as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (33 CFR 328.3). The USACE's delineation procedures identify wetlands in the field based on indicators of three wetland parameters: hydrophytic vegetation, hydric soils, and wetland hydrology. The following is a discussion of each of these parameters.

HYDROPHYTIC VEGETATION

Hydrophytic vegetation dominates areas where frequency and duration of inundation or soil saturation exerts a controlling influence on the plant species present. Plant species are assigned wetland indicator status according to the probability of their occurring in wetlands. More than fifty percent of the dominant plant species must have a wetland indicator status to meet the hydrophytic vegetation criterion. The USACE published the National Wetland Plant List (Lichvar, 2018), which separates vascular plants into the following four basic categories based on plant species frequency of occurrence in wetlands:

- **Obligate Wetland (OBL).** Almost always occur in wetlands
- **Facultative Wetland (FACW).** Usually occur in wetlands, but occasionally found in non-wetlands
- **Facultative (FAC).** Occur in wetlands or non-wetlands
- **Facultative Upland (FACU).** Usually occur in non-wetlands, but may occur in wetlands
- **Obligate Upland (UPL).** Almost never occur in wetlands

The USACE considers OBL, FACW and FAC species to be indicators of wetlands. An area is considered to have hydrophytic vegetation when greater than 50 percent of the dominant species in each vegetative stratum (tree, shrub, and herb) fall within these categories. Any species not appearing on the United States Fish and Wildlife Service's list is assumed to be an upland species, almost never occurring in wetlands. In addition, an area needs to contain at least 5% vegetative cover to be considered as a vegetated wetland.

HYDRIC SOILS

Hydric soils are saturated or inundated for a sufficient duration during the growing season to develop anaerobic or reducing conditions that favor the growth and regeneration of hydrophytic vegetation. Field indicators of wetland soils include observations of ponding, inundation, saturation, dark (low chroma) soil colors, bright mottles (concentrations of oxidized minerals such as iron), gleying (indicates reducing conditions by a blue-grey color), or accumulation of organic material. Additional supporting information includes documentation of soil as hydric or reference to wet conditions in the local soils survey, both of which must be verified in the field.

WETLAND HYDROLOGY

Wetland hydrology is inundation or soil saturation with a frequency and duration long enough to cause the development of hydric soils and plant communities dominated by hydrophytic vegetation. If direct observation of wetland hydrology is not possible (as in seasonal wetlands), or records of wetland hydrology are not available (such as stream gauges), assessment of wetland hydrology is frequently supported by field indicators, such as water marks, drift lines, sediment deposits, or drainage patterns in wetlands.

Regional Water Quality Control Board

The State Water Resources Control Board (SWRCB) and the local Regional Water Quality Control Board (RWQCB) have jurisdiction over "waters of the State," pursuant to the Porter-Cologne Water Quality Control Act, which are defined as any surface water or groundwater, including saline waters, within the boundaries of the State. The SWRCB has issued general Waste Discharge Requirements (WDRs) regarding discharges to "isolated" waters of the State (Water Quality Order No. 2004-0004-DWQ, Statewide General Waste Discharge Requirements for Dredged or Fill Discharges to Waters Deemed by the U.S. Army Corps of Engineers to be Outside of Federal Jurisdiction). The RWQCB administers actions under this general order for isolated waters not subject to federal jurisdiction and is also responsible for the issuance of water quality certifications pursuant to Section 401 of the Clean Water Act for waters subject to federal jurisdiction.

The SWRCB or local RWQCB have not established regulations for field determinations of waters of the state except for wetlands currently. The RWQCB is affected by or shares USACE jurisdiction unless isolated conditions or ephemeral waters are present. Each local RWQCB may delineate their jurisdictions of waters of the state differently based on current interpretations of jurisdiction.

Procedures for defining RWQCB jurisdiction is pursuant to the SWRCB's *State Wetland Definition and Procedures for Discharges of Dredged or Fill Material to Waters of the State* effective May 28, 2020.The SWRCB define an area as wetland if, under normal circumstances:

(i) the area has continuous or recurrent saturation of the upper substrate caused by groundwater, or shallow surface water, or both;
(ii) the duration of such saturation is sufficient to cause anaerobic conditions in the upper substrate; and
(iii) the area's vegetation is dominated by hydrophytes or the area lacks vegetation.

The USACE wetland delineation method differs than the federal definition in that a lack of vegetation does not preclude the determination of an area that meets the definition of a wetland and the upper substrate instead of soils that can cause hydric conditions.

United States Fish and Wildlife Service

The USFWS implements the Migratory Bird Treaty Act (16 United States Code [USC] Section 703-711) and the Bald and Golden Eagle Protection Act (16 USC Section 668). The USFWS and National Marine Fisheries Service (NMFS) share responsibility for implementing the Federal Endangered Species Act (FESA) (16 USC § 153 et seq.). Generally, the USFWS implements the FESA for terrestrial and freshwater species, while the NMFS implements the FESA for marine and anadromous species. Projects that would result in "take" of any federally threatened or endangered species are required to obtain permits from the USFWS or NMFS through either Section 7 (interagency consultation with a federal nexus) or Section 10 (Habitat Conservation Plan) of the FESA, depending on the involvement by the federal government in permitting and/or funding of the project. The permitting process is used to determine if a project would jeopardize the continued existence of a listed species and what measures would be required to avoid jeopardizing the species. “Take” under federal definition means to harass, harm (which includes habitat modification), pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. Proposed or candidate species do not have the full protection of the FESA; however, the USFWS and NMFS advise project applicants that they could be elevated to listed status at any time.

California Department of Fish and Wildlife

The California Department of Fish and Wildlife (CDFW) derives its authority from the Fish and Game Code of California. The California Endangered Species Act (CESA) (Fish and Game Code Section 2050 et. seq.) prohibits take of state listed threatened or endangered. Take under CESA is restricted to direct mortality of a listed species and the law does not prohibit indirect harm by way of habitat modification. Where incidental take would occur during construction or other lawful activities, CESA allows the CDFW to issue an Incidental Take Permit upon finding, among other requirements, that impacts to the species have been minimized and fully mitigated.

The CDFW also enforces Sections 3511, 4700, 5050, and 5515 of the Fish and Game Code, which prohibits take of species designated as Fully Protected. The CDFW is not allowed to issue an Incidental Take Permit for Fully Protected species; therefore, impacts to these species must be avoided.

California Fish and Game Code sections 3503, 3503.5, and 3513 describe unlawful take, possession, or destruction of native birds, nests, and eggs. Section 3503.5 of the Code protects all birds-of-prey and their eggs and nests against take, possession, or destruction of nests or eggs. Section 3513 makes it a state-level office to take any bird in violation of the federal Migratory Bird Treaty Act. CDFW administers these requirements.

Species of Special Concern (SSC) is a category used by the CDFW for those species which are considered to be indicators of regional habitat changes or are considered to be potential future protected species. Species of Special Concern do not have any special legal status except that which may be afforded by the Fish and Game Code as noted above. The SSC category is intended by the CDFW for use as a management tool to include these species in special consideration when decisions are made concerning the development of natural lands. The CDFW also has authority to administer the Native Plant Protection Act (NPPA) (Fish and Game Code Section 1900 et seq.). The NPPA requires the CDFW to establish criteria for determining if a species, subspecies, or variety of native plant is endangered or rare. Effective in 2015, CDFW promulgated regulations (14 CCR 786.9) under the authority of the NPPA, establishing that the CESA’s permitting procedures would be applied to plants listed under the NPPA as "Rare." With this change, there is little practical difference for the regulated public between plants listed under CESA and those listed under the NPPA.

Perennial, intermittent, and ephemeral streams and associated riparian vegetation, when present, also fall under the jurisdiction of the CDFW. Section 1600 *et seq*. of the Fish and Game Code (Lake and Streambed Alteration Agreements) gives the CDFW regulatory authority over activities that divert, obstruct, or alter the channel, bed, or bank of any river, stream or lake.

Local Jurisdiction

Madera County General Plan

The County of Madera General Plan (GP) includes policies to protect, restore, and enhance habitats that support fish and wildlife species so as to maintain populations at viable levels." This is supported by policies such as 5.E.1 which identifies and protects critical nesting and foraging areas, spawning grounds, migratory routes, waterfowl resting areas, oak woodlands wildlife movement corridors, and other unique wildlife habitats. The GP also includes the following policies:

Policy 5.E.2 requires "development in areas known to have particular value for wildlife to be carefully planned and, where possible, located so that the reasonable value of the habitat for wildlife is maintained."

Policy 5.E.3 encourages private landowners "to adopt sound wildlife habitat management practices, as recommended by the California Department of Fish and Game officials and the U.S. Fish and Wildlife Service."

Policy 5.E.4 supports "preservation of the habitats of rare, threatened, endangered, and/or other special-status species."

Policy 5.E.5 supports "the maintenance of suitable habitats for all indigenous species of wildlife through maintenance of habitat diversity."

Policy 5.E.6 ensures "the conservation of sufficiently large, continuous expanses of native vegetation to provide suitable habitat for maintaining abundant and diverse wildlife, if this preservation does not threaten the economic well-being of the county."

Policy 5.E.7 supports "the preservation or reestablishment of fisheries in the rivers and streams within the county, whenever possible."

Policy 5.E.8 ensures "close monitoring of pesticide use in areas adjacent to habitats of special-status plants and animals."

Policy 5.E.9 promotes "effective methods of ground squirrel control on croplands bordering sensitive habitat that do not place kit foxes and other special-status species at risk."

Policy 5.E.10 requires a biological resources evaluation of the site by a qualified biologist, prior to approval of discretionary development permits involving parcels within a significant ecological resource area. The evaluation is based upon "field reconnaissance performed at the appropriate time of year to determine the presence or absence of rare, threatened, or endangered species of plants or animals. Such evaluation will consider the potential for significant impact on these resources and will either identify feasible measures to mitigate such impacts or indicate why mitigation is not feasible."

Madera County Municipal Code

The Madera County Municipal Code does not contain any ordinances regarding protection of biological resources with relevance to the proposed Project.

Appendix B

Special-status Species Evaluation Tables

Special-Status Plant Species in the Regional Vicinity of the Project Area

Scientific Name Common Name	Status Fed/State ESA CRPR	Habitat Requirements	Potential to Occur	Rationale
Calycadenia hooveri Hoover's calycadenia	None/None 1B.3	Cismontane woodland, Valley and foothill grassland. rocky. 65 - 300 m. annual herb. Blooms Jul-Sep	Not Expected	The disturbed agricultural lands present in the Project area do not provide suitable habitat for this species. One occurrence is recorded over 4 miles northeast of the Project area (CDFW 2020a).
Castilleja campestris var. succulenta succulent owl's-clover	FT/CE 1B.2	Vernal pools (often acidic). 50 - 750 m. annual herb (hemiparasitic). Blooms (Mar)Apr-May	Not Expected	No vernal pools are found within the Project area, thus it provides no suitable habitat for this species. Eight occurrences are recorded with the most recent found over 2 miles northeast of the Project area (CDFW 2020a).
Caulanthus californicus California jewelflower	FE/CE 1B.1	Chenopod scrub, Pinyon and juniper woodland, Valley and foothill grassland. sandy. 61 - 1000 m. annual herb. Blooms Feb-May	Not Expected	The disturbed agricultural lands present in the Project area do not provide suitable habitat for this species. One historical occurrence from the 1890s is recorded over 4.5 miles south of the Project area (CDFW 2020a). The status of this observation has since been updated to "extirpated."
Cryptantha hooveri Hoover's cryptantha	None/None 1A	Inland dunes, Valley and foothill grassland (sandy). 9 - 150 m. annual herb. Blooms Apr-May	Not Expected	The disturbed agricultural lands present in the Project area do not provide suitable habitat for this species.
Downingia pusilla dwarf downingia	None/None 2B.2	Valley and foothill grassland (mesic), Vernal pools. 1 - 445 m. annual herb. Blooms Mar-May	Not Expected	The disturbed agricultural lands present in the Project area do not provide suitable habitat for this species. One historical occurrence is recorded 4.8 miles west of the Project area (CDFW 2020a).
Eryngium spinosepalum spiny-sepaled button-celery	None/None 1B.2	Valley and foothill grassland, Vernal pools. 80 - 975 m. annual / perennial herb. Blooms Apr-Jun	Not Expected	Grassland and vernal pools are not present within the Project area, thus it provides no suitable habitat for this species. Two occurrences from 2010 are recorded in the CNDDB 2.5 miles northeast of the Project area (CDFW 2020a).

Scientific Name Common Name	Status Fed/State ESA CRPR	Habitat Requirements	Potential to Occur	Rationale
Imperata brevifolia California satintail	None/None 2B.1	Chaparral, Coastal scrub, Mojavean desert scrub, Meadows and seeps (often alkali), Riparian scrub. mesic. 0 - 1215 m. perennial rhizomatous herb. Blooms Sep-May	Not Expected	Suitable habitat is not present in the disturbed agricultural lands within the Project area. Only one historical occurrence from 1893 is recorded within 5 miles of the Project area (CDFW 2020a).
Layia munzii Munz's tidy-tips	None/None 1B.2	Chenopod scrub, Valley and foothill grassland (alkaline clay). 150 - 700 m. annual herb. Blooms Mar-Apr	Not Expected	Suitable elevations, habitats, and soils for this species are not present within the Project area.
Leptosiphon serrulatus Madera leptosiphon	None/None 1B.2	Cismontane woodland, Lower montane coniferous forest. 300 - 1300 m. annual herb. Blooms Apr-May	Not Expected	Suitable habitat and elevations are not present within the Project area.
Lupinus citrinus var. citrinus orange lupine	None/None 1B.2	Chaparral, Cismontane woodland, Lower montane coniferous forest. granitic. 380 - 1700 m. annual herb. Blooms Apr-Jul	Not Expected	Suitable habitat and elevations are absent from the Project area.
Navarretia myersii ssp. myersii pincushion navarretia	None/None 1B.1	Vernal pools. often acidic. 20 - 330 m. annual herb. Blooms Apr-May	Not expected	Vernal pools are not present within the Project area, thus suitable habitat is absent for this species. One occurrence (2016) is recorded within 5 miles, north of the site (CDFW 2020a)
Navarretia nigelliformis ssp. radians shining navarretia	None/None 1B.2	Cismontane woodland, Valley and foothill grassland, Vernal pools. Sometimes clay. 65 - 1000 m. annual herb. Blooms (Mar)Apr-Jul	Not expected	The disturbed agricultural lands of the Project area do not provide suitable habitat for this species. No occurrences have been recorded within 5 miles (CDFW 2020a).

Scientific Name Common Name	Status Fed/State ESA CRPR	Habitat Requirements	Potential to Occur	Rationale
Orcuttia inaequalis San Joaquin Valley Orcutt grass	FT/CE 1B.1	Vernal pools. 10 - 755 m. annual herb. Blooms Apr-Sep	Not Expected	Suitable habitat is not present within the Project area due to disturbed agricultural lands and the absence of vernal pools. Eight occurrences have been recorded within 5 miles of the Project area (CDFW 2020a).
Orcuttia pilosa hairy Orcutt grass	FE/CE 1B.1	Vernal pools. 46 - 200 m. annual herb. Blooms May-Sep	Not Expected	Suitable habitat is not present within the Project area due to disturbed agricultural lands and the absence of vernal pools. Five occurrences have been recorded within 5 miles of the Project area (CDFW 2020a).
Pseudobahia bahiifolia Hartweg's golden sunburst	FE/CE 1B.1	Cismontane woodland, Valley and foothill grassland. clay, often acidic. 15 - 150 m. annual herb. Blooms Mar-Apr	Not Expected	The disturbed agricultural lands and sandy loam soils of the Project area do not provide suitable habitat for this species. No occurrences have been recorded within 5 miles (CDFW 2020a).
Sagittaria sanfordii Sanford's arrowhead	None/None 1B.2	Marshes and swamps (assorted shallow freshwater). 0 - 650 m. perennial rhizomatous herb (emergent). Blooms May-Oct (Nov)	Not Expected	The disturbed agricultural lands of the Project area do not provide suitable habitat for this species. Two historical (1950s) occurrences have been recorded within 5 miles (CDFW 2020a).
Tropidocarpum capparideum caper-fruited tropidocarpum	None/None 1B.1	Valley and foothill grassland (alkaline hills). 1 - 455 m. annual herb. Blooms Mar-Apr	Not Expected	The disturbed agricultural lands of the Project area do not provide suitable habitat for this species. One historical (1930) occurrence has been recorded within 5 miles (CDFW 2020a).
Tuctoria greenei Greene's tuctoria	FE/CR 1B.1	Vernal pools. 30 - 1070 m. annual herb. Blooms May-Jul(Sep)	Not Expected	The disturbed agricultural lands of the Project area do not provide suitable habitat for this species. No occurrences have been recorded within 5 miles (CDFW 2020a).

Scientific Name Common Name	Status Fed/State ESA CRPR	Habitat Requirements	Potential to Occur	Rationale

Regional Vicinity refers to within a 9-quad search radius of site.

FE = Federally Endangered FT = Federally Threatened FC = Federal Candidate Species

SE = State Endangered ST = State Threatened SC = State Candidate SR = State Rare

CRPR (CNPS California Rare Plant Rank):

1A=Presumed Extinct in California

1B=Rare, Threatened, or Endangered in California and elsewhere

2A=Plants presumed extirpated in California, but more common elsewhere

2B=Plants Rare, Threatened, or Endangered in California, but more common elsewhere

CRPR Threat Code Extension:

.1=Seriously endangered in California (over 80% of occurrences threatened / high degree and immediacy of threat)

.2=Fairly endangered in California (20-80% occurrences threatened)

.3=Not very endangered in California (<20% of occurrences threatened)

Special-Status Animal Species in the Regional Vicinity of the Project Area

Scientific Name Common Name	Status Fed/State ESA CDFW	Habitat Requirements	Potential to Occur	Rationale
Invertebrates				
Bombus crotchii Crotch bumble bee	None/SC	Coastal California east to the Sierra-Cascade crest and south into Mexico. Food plant genera include *Antirrhinum, Phacelia, Clarkia, Dendromecon, Eschscholzia*, and *Eriogonum*.	Not Expected	The disturbed agricultural lands do not provide adequate floral resources or sufficient nesting habitat for this ground-nesting species. There is one historical CNDDB occurrence (1899) within 5 miles of the Project area (CDFW 2020a), and no occurrences are recorded in the Bumble Bee Watch online database (Xerces Society et al. 2020).
Branchinecta conservatio conservancy fairy shrimp	FE/None	Endemic to the grasslands of the northern two-thirds of the Central Valley; found in large, turbid pools. Inhabit astatic pools located in swales formed by old, braided alluvium; filled by winter/spring rains, last until June.	Not Expected	Suitable grasslands and vernal pools are absent from the Project area. No occurrences are recorded within 5 miles of the APE (CDFW 2020a).
Branchinecta lynchi vernal pool fairy shrimp	FT/None	Endemic to the grasslands of the Central Valley, Central Coast mountains, and South Coast mountains, in astatic rain-filled pools. Inhabit small, clear-water sandstone-depression pools and grassed swale, earth slump, or basalt-flow depression pools.	Not Expected	Grassland habitat and vernal pools are absent from the Project area, and the disturbed agricultural land use on-site does not provide suitable habitat. Although 26 historic and contemporary occurrences have been recorded within 5 miles (CDFW 2020a), none overlap with the Project area.
Branchinecta mesovallensis midvalley fairy shrimp	None/None	Vernal pools in the Central Valley.	Not Expected	Suitable vernal pool habitat is absent from the Project area. Two occurrences have been recorded within 5 miles of the APE (CDFW 2020a).
Desmocerus californicus dimorphus valley elderberry longhorn beetle	FT/None	Occurs only in the Central Valley of California, in association with blue elderberry (*Sambucus mexicana*). Prefers to lay eggs in elderberries 2-8 inches in diameter; some preference shown for stressed elderberries.	Not Expected	The APE is outside the distribution range of this species, and suitable elderberry habitat is absent.

Scientific Name Common Name	Status Fed/State ESA CDFW	Habitat Requirements	Potential to Occur	Rationale
Fish				
Hypomesus transpacificus Delta smelt	FT/SE	Sacramento-San Joaquin Delta. Seasonally in Suisun Bay, Carquinez Strait & San Pablo Bay. Seldom found at salinities > 10 ppt. Most often at salinities < 2ppt.	Not Expected	The Project area is outside the current distribution range of this species.
Mylopharodon conocephalus hardhead	None/None SSC	Low to mid-elevation streams in the Sacramento-San Joaquin drainage. Also present in the Russian River. Clear, deep pools with sand-gravel-boulder bottoms and slow water velocity. Not found where exotic centrarchids predominate.	Not Expected	Suitable perennial aquatic habitat is absent from the Project area. The only recorded historical occurrence (1981) was over two miles southeast of the APE. (CDFW 2020a).
Reptiles				
Anniella pulchra northern California legless lizard	None/None SSC	Sandy or loose loamy soils under sparse vegetation. Soil moisture is essential. They prefer soils with a high moisture content.	Not Expected	Disturbed agricultural habitat and vegetation cover present in the APE do not provide suitable habitat for this species. One historic occurrence from the 1880s is recorded 5 miles south of the project.
Arizona elegans occidentalis California glossy snake	None/None SSC	Patchily distributed from the eastern portion of San Francisco Bay, southern San Joaquin Valley, and the Coast, Transverse, and Peninsular ranges, south to Baja California. Generalist reported from a range of scrub and grassland habitats, often with loose or sandy soils.	Not Expected	The Project area is outside of the known distribution range of this species.
Gambelia sila blunt-nosed leopard lizard	FE/SE FP	Resident of sparsely vegetated alkali and desert scrub habitats, in areas of low topographic relief. Seeks cover in mammal burrows, under shrubs or structures such as fence posts; they do not excavate their own burrows.	Not Expected	The Project area is outside of the known distribution range of this species. Disturbed agricultural lands such as those found on-site do not provide suitable habitat for this species. No occurrences have been recorded within 5 miles (CDFW 2020a).

Scientific Name Common Name	Status Fed/State ESA CDFW	Habitat Requirements	Potential to Occur	Rationale
Emys marmorata western pond turtl*e*	None/None SSC	A thoroughly aquatic turtle of ponds, marshes, rivers, streams and irrigation ditches, usually with aquatic vegetation, below 6000 ft elevation. Needs basking sites and suitable (sandy banks or grassy open fields) upland habitat up to 0.5 km from water for egg-laying.	Not Expected	The highly disturbed habitats of the Project area and fragmentation of the surrounding lands are unsuitable for this species. Typical preferred aquatic habitat is absent from the APE, and terrestrial habitat is unsuitable due to frequent ground disturbance associated with agricultural production. No occurrences have been recorded within 5 miles (CDFW 2020a).
Phrynosoma blainvillii coast horned lizard	None/None SSC	Frequents a wide variety of habitats, most common in lowlands along sandy washes with scattered low bushes. Open areas for sunning, bushes for cover, patches of loose soil for burial, and abundant supply of ants and other insects.	Not Expected	Highly disturbed agricultural lands within the Project area do not provide suitable habitat for this species. One historical occurrence (1893) was recorded 5 miles south of the project (CDFW 2020a).
Thamnophis gigas giant garter snake	FT/ST	Prefers freshwater marsh and low gradient streams. Has adapted to drainage canals and irrigation ditches. This is the most aquatic of the garter snakes in California.	Not Expected	The ephemeral nature of Root Creek and absence of marsh or slough habitat in the vicinity makes the Project area unsuitable for this species. No occurrences have been recorded within 5 miles (CDFW 2020a).
Amphibians				
Ambystoma californiense California tiger salamander	FT/ST WL	Central Valley DPS federally listed as threatened. Santa Barbara and Sonoma counties DPS federally listed as endangered. Need underground refuges, especially ground squirrel burrows, and vernal pools or other seasonal water sources for breeding.	Low	The highly disturbed habitats of the Project area and surrounding lands are generally unsuitable for this species, and typical vernal pool habitat is absent from the Project area. The nearest occurrence of this species was recorded in undisturbed grassland and vernal pool habitat approximately 1 mile east of the Project. State Route 41 and extensive residential and commercial development separates any fragmented patches of remaining natural habitat from the APE. Furthermore, apex predator, the American bullfrog was observed within the Project area at the time of the field survey.

Scientific Name Common Name	Status Fed/State ESA CDFW	Habitat Requirements	Potential to Occur	Rationale
Rana boylii foothill yellow-legged frog	None/SE SSC	Partly-shaded, shallow streams and riffles with a rocky substrate in a variety of habitats. Needs at least some cobble-sized substrate for egg-laying. Needs at least 15 weeks to attain metamorphosis.	Not Expected	The Project area is outside of the known distribution range of this species, and suitable habitat is absent. No occurrences have been recorded within 5 miles (CDFW 2020a).
Rana draytonii California red-legged frog	FT/None SSC	Lowlands and foothills in or near permanent sources of deep water with dense, shrubby or emergent riparian vegetation. Requires 11-20 weeks of permanent water for larval development. Must have access to estivation habitat.	Not Expected	The Project area is outside of the known distribution range of this species, and suitable riparian habitat is absent. No occurrences have been recorded within 5 miles (CDFW 2020a).
Spea hammondii western spadefoot	None/None SSC	Occurs primarily in grassland habitats but can be found in valley-foothill hardwood woodlands. Vernal pools are essential for breeding and egg-laying.	Low	The highly disturbed habitats of the Project area and surrounding lands are generally unsuitable for this species, and typical vernal pool habitat is absent from the Project area. The nearest occurrence of this species was recorded in undisturbed grassland and vernal pool habitat approximately 1 mile east of the Project. State Route 41 and extensive residential and commercial development separates any fragmented patches of remaining natural habitat from the APE. Furthermore, apex predator, the American bullfrog was observed within the Project area at the time of the field survey.
Birds				
Agelaius tricolor tricolored blackbird	None/ST SSC USFWS BCC-Birds of Conservation Concern	Highly colonial species, most numerous in Central Valley & vicinity. Largely endemic to California. Requires open water, protected nesting substrate, and foraging area with insect prey within a few km of the colony.	Low	Man-made ponds for agricultural use are present within the Project area; however, suitable vegetation for nesting is absent. One historical occurrence (1974) is recorded 5 miles south of the project (CDFW 2020a). Recent sightings in eBird (2020) have been recorded within two miles of the APE, although these are near larger areas of open water, such as the Friant canal to the north and ponds to the east of Highway 41.

Scientific Name Common Name	Status Fed/State ESA CDFW	Habitat Requirements	Potential to Occur	Rationale
Athene cunicularia burrowing owl	None/None SSC USFWS BCC-Birds of Conservation Concern	Open, dry annual or perennial grasslands, deserts, and scrublands characterized by low-growing vegetation. Subterranean nester, dependent upon burrowing mammals, most notably, the California ground squirrel.	Not Expected	Suitable habitat for this species is absent from the Project area. CNDDB records (CDFW 2020a) and eBird (2020) sightings in the vicinity do not show recent records closer than 2.5 miles to the APE.
Buteo swainsoni Swainson's hawk	None/ST USFWS BCC-Birds of Conservation Concern	Breeds in grasslands with scattered trees, juniper-sage flats, riparian areas, savannahs, & agricultural or ranch lands with groves or lines of trees. Requires adjacent suitable foraging areas such as grasslands, or alfalfa or grain fields supporting rodent populations.	Present	This species was observed soaring over the Project area during the field survey. Suitable nest trees are absent from the APE; however, this species could potentially nest in large ornamental trees in the vicinity and forage on-site.
Coccyzus americanus occidentalis western yellow-billed cuckoo	FT/SE USFWS BCC-Birds of Conservation Concern	Riparian forest nester, along the broad, lower flood-bottoms of larger river systems. Nests in riparian jungles of willow, often mixed with cottonwoods, with lower story of blackberry, nettles, or wild grape.	Not Expected	Suitable habitat is absent from the APE and the project location is outside the accepted distribution range of this species. One historical occurrence (1883) is recorded for this species within 5 miles of the APE (CDFW 2020a), and the status of the occurrence has been updated to extirpated.
Eremophila alpestris actia California horned lark	None/None WL	Coastal regions, chiefly from Sonoma County to San Diego County. Also found in main part of San Joaquin Valley and east to foothills. Short-grass prairie, bald hills, mountain meadows, open coastal plains, fallow grain fields, alkali flats.	Low	Suitable habitat for this species is absent from the Project area. Only one occurrence is recorded in the CNDDB, 1.5 miles southeast in 1992 (CDFW 2020a). The nearest eBird sighting was 2 miles to the east (2020).
Phalacrocorax auritus double-crested cormorant	None/None WL	Colonial nester on coastal cliffs, offshore islands, and along lake margins in the interior of the state. Nests along coast on sequestered islets, usually on ground with sloping surface, or in tall trees along lake margins.	Not Expected	No lakes are present in the Project area; thus, suitable habitat is absent for this species. No occurrences are recorded within 5 miles (CDFW 2020a). Sightings in eBird (2020) are numerous but are not found west of the San Joaquin River.

Scientific Name Common Name	Status Fed/State ESA CDFW	Habitat Requirements	Potential to Occur	Rationale
Vireo bellii pusillus least Bell's vireo	FE/SE	Summer resident of Southern California in low riparian in vicinity of water or in dry river bottoms; below 2000 ft. Nests placed along margins of bushes or on twigs projecting into pathways, usually willow, *Baccharis*, mesquite.	Not Expected	Suitable habitat is absent, and the Project area is outside of the current distribution range for this species.
Mammals				
Antrozous pallidus pallid bat	None/None SSC	Deserts, grasslands, shrublands, woodlands and forests. Most common in open, dry habitats with rocky areas for roosting. Roosts must protect bats from high temperatures. Very sensitive to disturbance of roosting sites.	Low	Suitable roosting habitat is absent from the APE, and foraging habitat is marginal, at best. There are no recorded occurrences within 5 miles of the Project area (CDFW 2020a).
Dipodomys nitratoides exilis Fresno kangaroo rat	FE/SE	Alkali sink-open grassland habitats in western Fresno County. Bare alkaline clay-based soils subject to seasonal inundation, with more friable soil mounds around shrubs and grasses.	Not Expected	Disturbed agricultural lands within the APE and development in the vicinity do not provide suitable habitat for this species. No occurrences have been recorded within 5 miles of the Project area (CDFW 2020a).
Euderma maculatum spotted bat	None/None SSC	Occupies a wide variety of habitats from arid deserts and grasslands through mixed conifer forests. Feeds over water and along washes. Feeds almost entirely on moths. Needs rock crevices in cliffs or caves for roosting.	Low	Suitable roosting habitat is absent, and foraging habitat is marginal. There are no recorded occurrences within 5 miles of the Project area (CDFW 2020a).
Eumops perotis californicus western mastiff bat	None/None SSC	Many open, semi-arid to arid habitats, including conifer & deciduous woodlands, coastal scrub, grasslands, chaparral, etc. Roosts in crevices in cliff faces, high buildings, trees and tunnels.	Low	Suitable roosting habitat is absent, and foraging habitat is marginal. There are no recorded occurrences within 5 miles of the Project area (CDFW 2020a).
Taxidea taxus American badger	None/None SSC	Most abundant in drier open stages of most shrub, forest, and herbaceous habitats, with friable soils. Needs sufficient food, friable soils and open, uncultivated ground. Preys on burrowing rodents. Digs burrows.	Not Expected	The disturbed habitats of the Project area, which is composed almost entirely of orchards in agricultural production and residential development, are unsuitable for this species. There is one recorded historical occurrence (1988) 5 miles southeast of the APE (CDFW 2020a).
Vulpes macrotis mutica	FE/ST	Annual grasslands or grassy open stages with scattered	Low	The highly disturbed habitats of the and fragmentation of the

Scientific Name Common Name	Status Fed/State ESA CDFW	Habitat Requirements	Potential to Occur	Rationale
San Joaquin kit fox		shrubby vegetation. Need loose-textured sandy soils for burrowing, and suitable prey base.		surrounding lands makes the APE unsuitable for this species. The Project is located approximately 50 miles east of the nearest known core population in Ciervo-Panoche Natural Area. Although some populations of San Joaquin Kit Fox in other parts of California have adapted to an urbanized environment, modern kit fox occurrences are locally scarce. At most, this species could conceivably pass through the Project area during dispersal movements. There are no recorded occurrences within 5 miles of the Project site (CDFW 2020a).

Regional Vicinity refers to within a 9-quad search radius of site.

FE = Federally Endangered   FT = Federally Threatened   FC = Federal Candidate Species

SE = State Endangered   ST = State Threatened   SC = State Candidate

SSC = CDFW Species of Special Concern   WL = State Watch List

Scientific Name Common Name	Federal Status	Determination	Rationale
Castilleja campestris var. succulenta succulent owl's-clover	Threatened	No effect	Habitat is absent
Caulanthus californicus California jewelflower	Endangered	No effect	Habitat is absent
Orcuttia inaequalis San Joaquin Valley Orcutt grass	Threatened	No effect	Habitat is absent
Orcuttia pilosa hairy Orcutt grass	Endangered	No effect	Habitat is absent
Pseudobahia bahiifolia Hartweg's golden sunburst	Endangered	No effect	Habitat is absent
Tuctoria greenei Greene's tuctoria	Endangered	No effect	Habitat is absent
Branchinecta conservatio conservancy fairy shrimp	Endangered	No effect	Habitat is absent
Branchinecta lynchi vernal pool fairy shrimp	Threatened	No effect	Habitat is absent
Desmocerus californicus dimorphus valley elderberry longhorn beetle	Threatened	No effect	Habitat is absent
Hypomesus transpacificus Delta smelt	Threatened	No effect	Habitat is absent and the Project is outside of the range of this species
Gambelia sila blunt-nosed leopard lizard	Endangered	No effect	Habitat is absent and the Project is outside of the range of this species
Thamnophis gigas giant garter snake	Threatened	No effect	Habitat is absent and there are no recent observations in the vicinity
Ambystoma californiense California tiger salamander	Threatened	No effect	Habitat is absent
Rana draytonii California red-legged frog	Threatened	No effect	Habitat is absent and the Project is outside of the range of this species
Coccyzus americanus occidentalis western yellow-billed cuckoo	Threatened	No effect	Habitat is absent and there are no recent observations in the vicinity
Vireo bellii pusillus least Bell's vireo	Endangered	No effect	Habitat is absent and the Project is outside of the range of this species

Scientific Name Common Name	Federal Status	Determination	Rationale
Dipodomys nitratoides exilis Fresno kangaroo rat	Endangered	No effect	Habitat is absent and there are no recent observations in the vicinity
Vulpes macrotis mutica San Joaquin kit fox	Endangered	No effect	Habitat is absent and there are no recent observations in the vicinity

This page intentionally left blank.

Appendix C

Site Photographs

Photo 1. Root Creek is heavily impacted throughout the APE and serves as an irrigation canal for surrounding orchards. Water was present in low-lying portions of the canal during the July 2020 site visit. (Aspect: west)

Photo 2. The Root Creek channel was dry, and lacked features of a bed or bank throughout much of the APE during the July 2020 site visit. The channel supports some hydrophytic vegetation but does not constitute riparian habitat. (Aspect: east)

Photo 3. The Root Creek channel runs between a dirt access road and an agricultural equipment storage area in this portion of the APE. (Aspect: west)

Photo 4. The Project alignment runs between orchard rows throughout the majority of the APE. Orchard trees could provide nesting habitat during the nesting bird season. (Aspect: southwest)

Photo 5. A culvert carries water from Root Creek beneath paved road. (Aspect: northeast)

Photo 6. The Project alignment runs between an open field and an orchard access road in this portion of the APE. (Aspect: east)

Photo 7. Overview of Root Creek Project area south of new residential development (Aspect: east)

Photo 8. Root Creek Project area is heavily disturbed adjacent to new residential development (Aspect: east)

Photo 9. Overview of Root Creek Project area through orchard in the eastern portion of the alignment. Note the absence of bed and bank. (Aspect: west)

Photo 10. Overview of the eastern terminus of the Root Creek Project area alignment through an olive orchard**.** (Aspect: east)

This page intentionally left blank.

Appendix D

Floral and Faunal Compendium

Plant Species Observed Within the APE on July 14, 2020

Scientific Name	Common Name	Status	Native or Introduced
Trees			
Olea europaea	Olive	N/A	Introduced, Orchard Trees
Pistacia vera	Pistachio	N/A	Introduced, Orchard Trees
Prunus dulcis	Almond	N/A	Introduced, Orchard Trees
Washingtonia robusta	Mexican fan palm	N/A	Introduced, Cal-IPC Moderate
Shrubs			
Opuntia spp.	Prickly pear cactus	N/A	Introduced
Herbs			
Amarantus albus	Tumbleweed	N/A	Introduced
Amaranthus blitoides	Prostrate pigweed	N/A	Native
Amaranthus retroflexus	Pigweed	N/A	Introduced
Amsinckia intermedia	Common fiddleneck	N/A	Native
Brassica nigra	Black mustard	N/A	Introduced, Cal-IPC Moderate
Croton setiger	Doveweed	N/A	Native
Cucurbita palmata	Coyote melon	N/A	Native
Cyperus difformis	Variable flatsedge	N/A	Introduced
Cyperus odoratus	Fragrant flatsedge	N/A	Native
Datura wrightii	Jimsonweed	N/A	Native
Eleocharis pulstris	Common spikerush	N/A	Native
Erigeron canadensis	Canada horseweed	N/A	Native
Erodium botrys	Big heron bill	N/A	Introduced
Heterotheca grandiflora	Telegraph weed	N/A	Native
Hirschfeldia incana	Field mustard	N/A	Introduced, Cal-IPC Moderate
Lactuca serriola	Prickly lettuce	N/A	Introduced
Portulaca oleraea	Common purslane	N/A	Introduced
Rumex crispus	Curly dock	N/A	Introduced, Cal-IPC Limited
Sonchus asper	Spiny sowthistle	N/A	Introduced
Tribulus terrestris	Puncture vine	N/A	Introduced, Cal-IPC Limited
Typha latifolia	Broadleaf cattail	N/A	Native
Xanthium strumarium	Rough cocklebur	N/A	Native
Grasses			
Avena fatua	Wild oat	N/A	Introduced, Cal-IPC Moderate
Avena barbata	Slim oat	N/A	Introduced, Cal-IPC Moderate
Bromus diandrus	Ripgut brome	N/A	Introduced, Cal-IPC Moderate
Bromus hordeaceus	Soft chess	N/A	Introduced, Cal-IPC Limited
Bromus madritensis	Foxtail brome	N/A	Introduced
Cynodon dactylon	Bermuda grass	N/A	Introduced, Cal-IPC Moderate
Dactylis glomerate	Orchard grass	N/A	Introduced, Cal-IPC Limited
Echinochloa crus-galli	Barnyard grass	N/A	Introduced

Scientific Name	Common Name	Status	Native or Introduced
Hordeum murinum var. *leporinum*	Foxtail barley	N/A	Introduced
Polypogon monspeliensis	Rabbitsfoot grass	N/A	Introduced, Cal-IPC Limited
Source: CalFlora 2020 and Cal-IPC 2020 for Great Valley Jepson Region			

Animal Species Observed Within the APE on July 14, 2020

Scientific Name	Common Name	Status	Native or Introduced
Reptiles			
Sceloporus occidentalis biseriatus	San Joaquin fence lizard	None	Native
Uta stansburiana elegans	western side-blotched lizard	None	Native
Amphibians			
Lithobates catesbeianus	American bullfrog	None	Introduced
Birds			
Aphelcoma californica	California scrub jay	None	Native
Buteo jamaicensis	red-tailed hawk	None	Native
Buteo swainsoni	Swainson's hawk	ST	Native
Charadrius vociferus	killdeer	None	Native
Corvus brachyrhynchos	American crow	None	Native
Euphagus cyanocephalus	Brewer's blackbird	None	Native
Mimus polyglottos	northern mockingbird	None	Native
Sayornis nigricans	black phoebe	None	Native
Turdus migratorius	American robin	None	Native
Tyrannus verticalis	western kingbird	None	Native
Zenaida macroura	mourning dove	None	Native
Mammals			
Canis lupus familiaris	domestic dog	None	Introduced
Felis catus	domestic cat	None	Introduced
Otospermophilus beecheyi	California ground squirrel	None	Native
ST – State Threatened			

Appendix C

Cultural Resources Inventory Report

Cultural Resource Inventory Report for the Root Creek Water District Project, Madera County, California

Diana T. Dyste, Anna Hoover, Amber Long, and Jessica Jones

Prepared By

Applied EarthWorks, Inc.
1391 W. Shaw Avenue, Suite C
Fresno, CA 93711

Prepared For
Provost & Pritchard Consulting Group
286 W. Cromwell Avenue
Fresno, CA 93711

August 2020
draft

USGS Lanes Bridge 7.5-minute topographic quadrangle; T12S, R19–20E
252.17-acre APE; 242.46 acres intensive survey; 9.71 acres not surveyed
Keywords: Root Creek Canal; negative findings

MANAGEMENT SUMMARY

Applied EarthWorks, Inc. (Æ), at the request of the Root Creek Water District and under subcontract to Provost & Pritchard Consulting Group, completed a cultural resource inventory and evaluation for the Root Creek Water District Project (Project) in Madera County, California. The Project proposes to divert water from Root Creek to recharge groundwater for later recovery by landowner wells. The Project includes construction of nine new embankments across a 3.5-mile segment of Root Creek. Each of these embankments will be approximately 5.9 feet high and include new culverts and control gates intended to control the water level and flow through the embankments. The Project must comply with both Section 106 of the National Historic Preservation Act (NHPA) and the California Environmental Quality Act (CEQA), which mandate that government agencies consider the impacts of their actions on the environment, including cultural resources. This report documents whether historic properties, as defined by NHPA Section 106, or historical resources, as defined by the CEQA Guidelines, would be adversely impacted by the proposed Project.

To fulfill requirements of NHPA Section 106 and CEQA, Æ's cultural resource inventory included a records search at the California Historical Resources Information System Southern San Joaquin Valley Information Center at California State University, Bakersfield; a review of historic maps, aerial photographs, and atlases; a search of the Native American Heritage Commission's (NAHC) Sacred Lands File; nongovernmental outreach to local Native American representatives identified by the NAHC; a buried site sensitivity assessment; and an intensive pedestrian survey of the Area of Potential Effects (APE) to identify cultural resources observable on the ground surface.

The Southern San Joaquin Valley Information Center records search for the APE and surrounding 0.5-mile area identified five previous investigations intersecting the APE and four additional studies in the surrounding 0.5-mile area. An isolate consisting of two fragments of prehistoric ground stone was previously recorded in the APE, and another isolate, a prehistoric milling slab, was previously recorded in the surrounding 0.5-mile radius. A search of the NAHC Sacred Lands File did not identify sacred sites in the APE; however, two representatives of the Northern Valley Yokut Tribe submitted responses to the Project. This information was provided to the Root Creek Water District (the lead CEQA agency).

Æ archaeologists conducted an intensive pedestrian survey of the APE to identify cultural and built environmental resources visible at the ground surface. No prehistoric or historic-era archaeological sites were discovered during pedestrian survey of the APE; however, Æ identified one isolated granitic handstone outside the APE. Because of its location, Æ surveyors did not formally record the resource on California Department of Parks and Recreation culture resource record forms.

The buried site sensitivity assessment concluded there is moderate to very high potential for the soils in the APE to contain anthropogenic paleosols that may harbor intact cultural deposits. Because portions of the APE have been previously disturbed during channelization and canal construction, Æ recommends the use of a Geographic Information Systems predictive model to identify areas of low, moderate, high, and very high sensitivity, followed by focused subsurface testing of areas classified as having moderate to very high sensitivity. Presence/absence testing for paleosols with potential to contain intact and well-preserved cultural deposits would allow for an adequate assessment of the potential for the proposed Project activities to cause adverse impacts to buried cultural resources. The methods and findings of the study would be presented as an addendum to this report and would include cultural resource management recommendations.

Field notes and photographs are on file at Æ's office in Fresno, California. A copy of the final version of this report and associated cultural resource records will be transmitted to the Southern San Joaquin Valley Information Center for inclusion in the California Historical Resources Information System.

CONTENTS

APPENDICES

FIGURES

ACRONYMS AND ABBREVIATIONS

ACHP	Advisory Council on Historic Preservation
APE	Area of Potential Effects
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CHRIS	California Historical Resources Information System
CRHR	California Register of Historical Resources
DPR	Department of Parks and Recreation
EIR	Environmental Impact Report
MID	Madera Irrigation District
NAHC	Native American Heritage Commission
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NRHP	National Register of Historic Places
PRC	Public Resources Code (California)
RCWD	Root Creek Water District
SSJVIC	Southern San Joaquin Valley Information Center
TCR	Tribal Cultural Resource
USACE	U.S. Army Corps of Engineers
USBR	U.S. Bureau of Reclamation
USC	United States Code
USGS	U.S. Geological Survey

1
INTRODUCTION

Applied EarthWorks, Inc. (Æ), on behalf of the Root Creek Water District (RCWD, District), and under subcontract to Provost & Pritchard Consulting Group, conducted a cultural resource inventory for the Root Creek Water District Project (Project). The Project is approximately 12 miles southeast of the city of Madera in Madera County, California (Figure 1-1). Specifically, the Project is in Sections 11 and 12 of Township 12 South, Range 19 East, and Sections 4, 5, 7 and 8 of Township 12 South, Range 20 East, Mount Diablo Base and Meridian, as shown on the U.S. Geological Survey (USGS) Lanes Bridge, California, 7.5-minute topographic quadrangle (Figure 1-2). The Project includes Root Creek, its embankments, and any access areas owned by the RCWD (Figure 1-3).

1.1 GOALS OF THE STUDY

The proposed Project would require permits from federal agencies (i.e., the U.S. Army Corps of Engineers [USACE] and U.S. Bureau of Reclamation [USBR]) and is therefore considered a "federal undertaking" subject to the requirements of Section 106 of the National Historic Preservation Act (NHPA; 54 U.S. Code [USC] Section 306108) and its implementing regulations at Title 36, Code of Federal Regulations (CFR), Section 800.1(a). This report also meets the requirements of the California Environmental Quality Act (CEQA) Guidelines. The RCWD is the agency responsible for environmental review pursuant to the CEQA.

The NHPA and CEQA mandate that government agencies consider the impacts of proposed Project activities on the environment, including cultural resources (California Public Resources Code [PRC] 21084.1). For purposes of this report, a historic property or historical resource is defined as a prehistoric or historic-era archaeological site, or a building, structure, or object that is at least 50 years old, and that meets the criteria for listing in the National Register of Historic Places (NRHP) or the California Register of Historical Resources (CRHR). Cultural resources determined eligible for the NRHP are termed "historic properties" (36 CFR 800.16[l]); those eligible for the CRHR are called "historical resources" (Title 14, Chapter 3, Article 5, Section 15064.5 of the California Code of Regulations [14 CCR 15064.5]). Under both statutes, the determination of eligibility is based on a set of significance criteria (36 CFR 60.4; 14 CCR 15064.5).

This report seeks to determine whether historic properties or historical resources would be adversely impacted by the proposed Project in a manner that would diminish a resource's significance or eligibility for inclusion in the NRHP or CRHR. Æ's cultural resource inventory included: (1) a records search of the California Historical Resources Information System (CHRIS) at the Southern San Joaquin Valley Information Center (SSJVIC) at California State University, Bakersfield, (2) desktop historical/archival research, (3) a search of the Native American Heritage Commission's (NAHC) Sacred Lands File and outreach to local Native American tribes, (4) a desktop buried site sensitivity assessment, (5) and an intensive pedestrian survey of the APE to identify and record cultural resources.

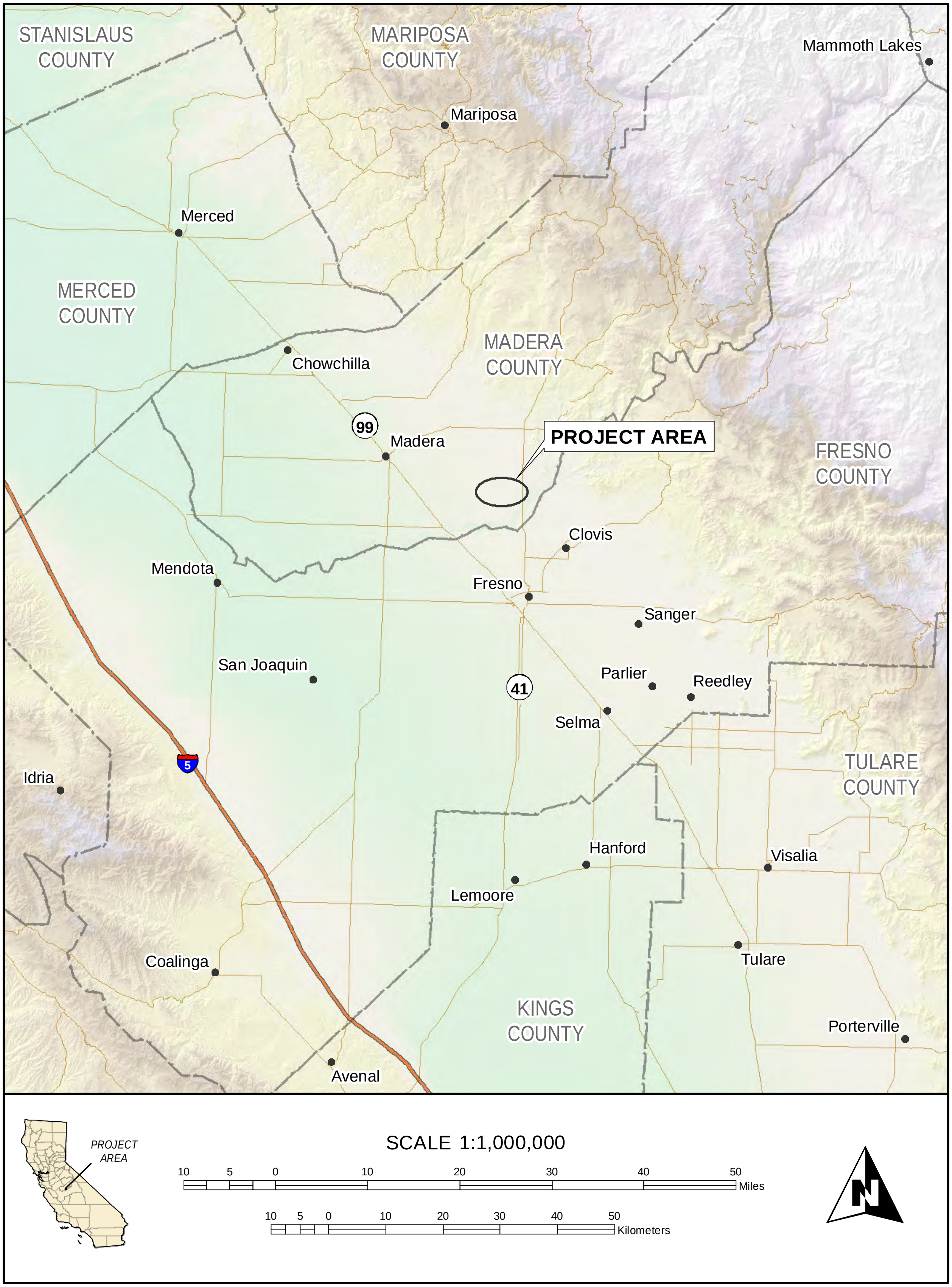


Figure 1-1 Project vicinity in Madera County, California.

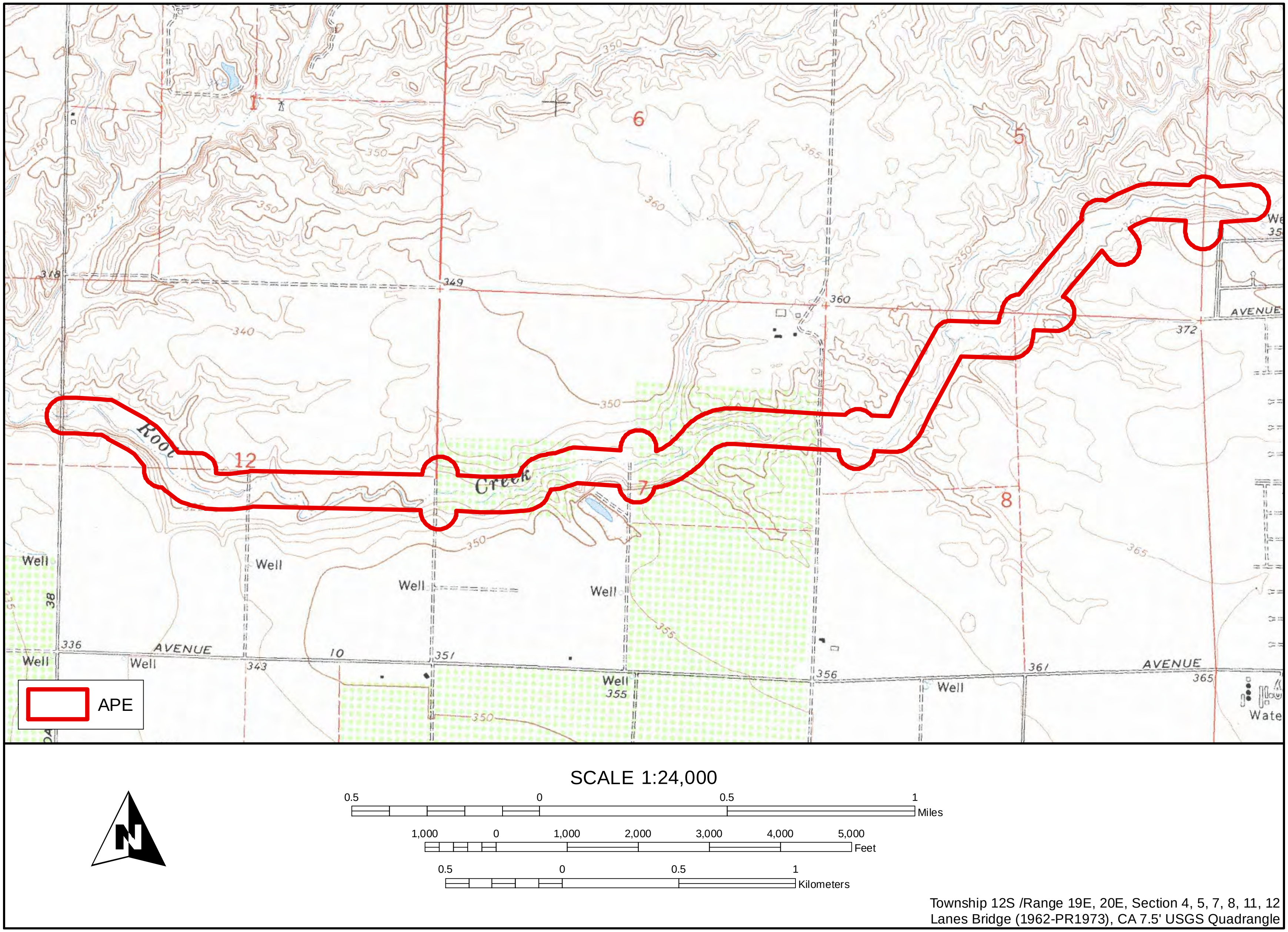


Figure 1-2 APE on the USGS Lanes Bridge, CA 7.5-minute topographic quadrangle.

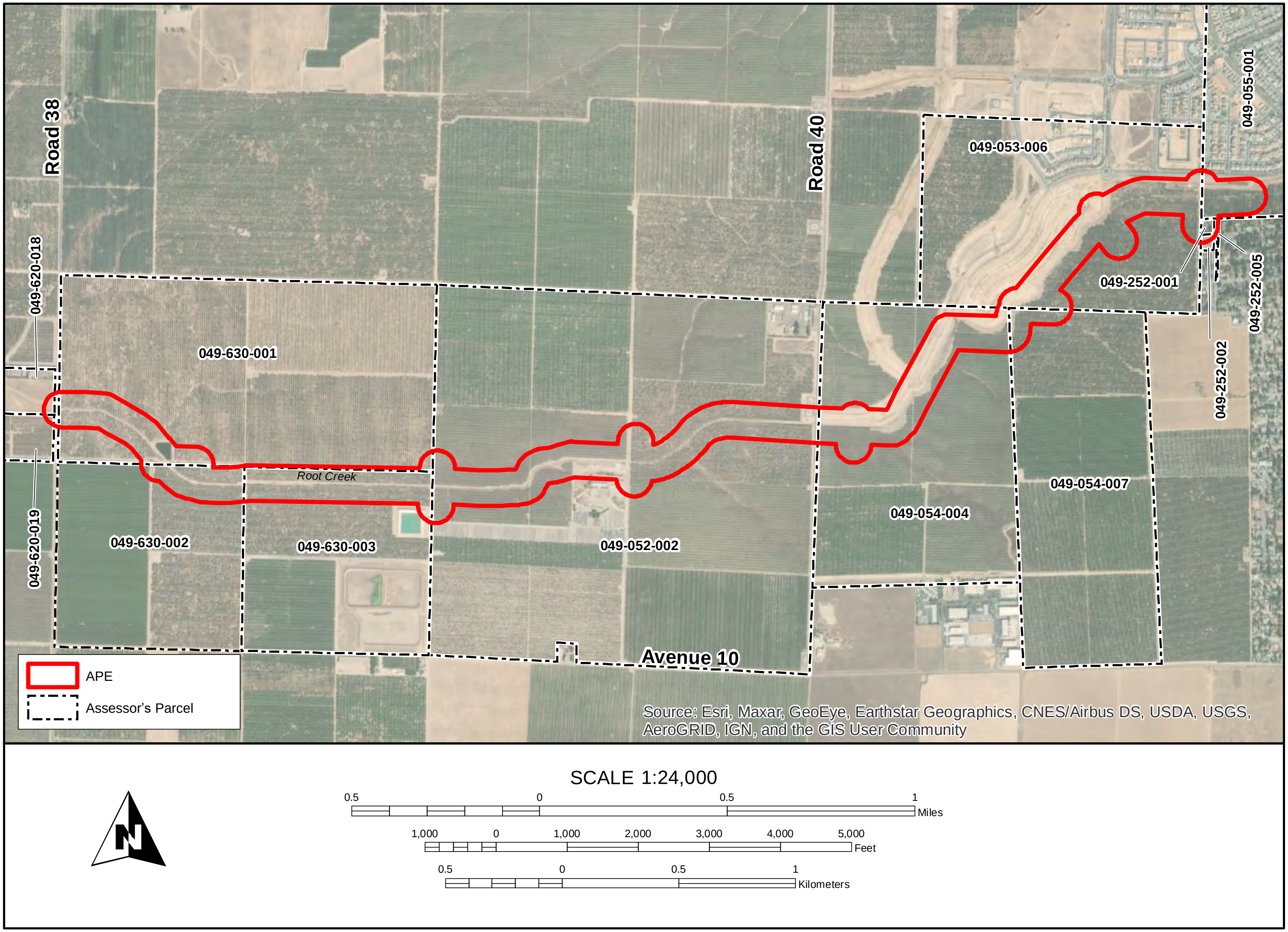


Figure 1-3 Aerial view of APE showing assessor's parcel boundaries.

1.2 PROJECT DESCRIPTION

The RCWD proposes to divert water flow from Root Creek for groundwater recharge. To accomplish this, the District proposes construction of embankments across the creek and installation of new gates to control water flow. Water would be detained behind the gate structures and intentionally recharged into the ground for later recovery by landowner wells. The Project may include pond and underground storage, and a groundwater storage supplement is envisioned. When not used to intentionally recharge Root Creek storm water flows, these facilities also could be utilized to intentionally recharge surface water supplies imported to the District from the Central Valley Project (i.e., San Joaquin River). These flows could recharge into the ground for later recovery, also requiring identification in the underground storage supplement. The proposed Project would include construction of nine new embankments across a 3.5-mile-long segment of Root Creek. Each of these embankments would be approximately 5.9 feet tall and include new culverts and control gates intended to control the water level and flow through the embankments.

1.3 FEDERAL LAWS AND REGULATIONS

1.3.1 National Environmental Policy Act

The National Environmental Policy Act (NEPA; 42 USC 4321–4370h) requires that federal agencies consider whether an undertaking would result in significant impacts to the environment. NEPA regulations (40 CFR 1500–1508) declare that one objective of NEPA is “to preserve important historic, cultural, and natural aspects of our national heritage.” In order to document potential impacts to these types of resources, federal agencies require the identification and evaluation of historic properties as well as an assessment of the potential effects an undertaking may have on historic properties as required by Section 106 of the NHPA (see below).

1.3.2 National Historic Preservation Act

The NHPA authorizes the U.S. Secretary of the Interior to expand and maintain the NRHP; it establishes the Advisory Council on Historic Preservation (ACHP) as an independent federal entity; it requires federal agencies to take into account the effects of their undertakings on historic properties and to afford the ACHP a reasonable opportunity to comment on such undertakings; and it identifies the federal agencies as responsible for the preservation of historic properties located within lands owned or managed by their agencies. In addition to establishing the NRHP, the NHPA provides that states may establish State Historic Preservation Officers to administer State Historic Preservation Programs. Finally, before approving any undertaking, NHPA Section 106 and its implementing regulations (36 CFR Part 800) require federal agencies to consider the effects of the undertaking on any district, site, building, structure, or object that is included in or eligible for inclusion in the NRHP.

1.3.3 Antiquities Act of 1906

The Antiquities Act of 1906 (16 USC 431–433) establishes criminal penalties for unauthorized destruction or appropriation of “any historic or prehistoric ruin or monument, or any object of antiquity” on federal land; provides for issuance of permits for excavation of archaeological sites or collection of "antiquities" on federal land to qualified institutions or individuals; and empowers the President to establish historical monuments and landmarks.

1.3.4 American Indian Religious Freedom Act

American Indian Religious Freedom Act (42 USC 1996) establishes a policy of respect and federal protection of Indian religious practices. It seeks to correct federal policies and practices that could (a) deny access to sacred sites required in traditional religious ceremony, (b) prohibit use and possession of sacred objects necessary for religious ceremonies, and (c) intrude upon or interfere with religious ceremonies.

1.3.5 Executive Order 13007

Executive Order 13007 directs federal agencies to accommodate access to, and ceremonial use of, Indian sacred sites by Indian religious practitioners. It requires federal agencies to avoid adversely affecting the physical integrity of sacred sites to the extent practicable, permitted by law, and not clearly inconsistent with essential agency functions. Executive Order 13007 reinforces the American Indian Religious Freedom Act.

1.4 STATE LAWS AND REGULATIONS

1.4.1 CEQA and Assembly Bill 52

The CEQA Statute (PRC 21000 et seq.) and Guidelines (14 CCR 15000 et seq.) direct lead agencies to determine whether cultural resources are "historically significant." Generally, a cultural resource shall be considered "historically significant" if it is 50 years old or older; possesses integrity of location, design, setting, materials, workmanship, feeling, and association; and meets the requirements for listing on the CRHR under any one of the following criteria (14 CCR 15064.5):

1. Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage;

2. Is associated with the lives of persons important in our past;

3. Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values; or

4. Has yielded, or may be likely to yield, information important in prehistory or history.

Unique archaeological resources are also protected under CEQA. Unique archaeological resources are those resources that may not meet the above criteria but can clearly demonstrate that, without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria (PRC 21082.2[g]):

1. Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information;

2. Has a special and particular quality such as being the oldest of its type or the best available example of its type; and

3. Is directly associated with a scientifically recognized important prehistoric or historic event or person.

In addition, PRC 21074 defines a tribal cultural resource (TCR) as “a site, feature, place, or cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe.” TCRs may also include “non-unique archaeological resources” that may not be scientifically significant but still hold sacred or cultural value to a consulting tribe. A TCR is considered significant if it is: (1) listed or eligible for listing in the CRHR or in a local register of historical resources as defined in PRC 5020.1(k) or (2) a TCR determined by the lead agency, at its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in PRC 5024.1(c). In applying these criteria applicable to TCRs, the lead agency must consider the significance of the resource to a California Native American tribe.

Under CEQA, a project with an effect that may cause a substantial adverse change in the significance of a historical resource or a TCR is a project that may have a significant effect on the environment (14 CCR 15064.5[b]). Substantial adverse change in the significance of a historical resource or TCR is defined as physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings in a manner that materially impairs the significance of the resource that justifies its inclusion or eligibility to be included in the CRHR. Additionally, a project may cause a substantial adverse change in the significance of a TCR if the adverse change is identified through consultation with any California Native American tribe that requests consultation and is traditionally and culturally affiliated with the geographic area of a proposed project (PRC 21084.2).

The cited statute and guidelines specify how cultural resources and TCRs are to be managed in the context of projects, such as the present Project. Briefly, archival and field surveys must be conducted, government-to-government consultation with California Native American tribes must occur, and identified resources must be inventoried and evaluated in prescribed ways. Impacts on TCRs, prehistoric and historical archaeological resources, and built environment resources such as standing structures, buildings, and objects deemed “historically significant” must be avoided or mitigated to the extent feasible (PRC 21081).

1.4.2 California Health and Safety Codes

California Health and Safety Code (CHSC) 7050.5 and PRC 5097.98 both concern the treatment of human remains. Per CHSC 7050.5, if human remains are exposed during Project-related construction work, the Madera County Coroner is to be notified immediately to arrange for proper treatment and disposition. If the coroner determines the remains to be Native American, per CHSC 7050.5 and PRC 5097.98, the coroner must notify the Native American Heritage Commission (NAHC) within 24 hours of discovery.

1.4.3 Madera County General Plan

Chapter 4 of the Madera County General Plan addresses goals and policies or the preservation, protection, and enhancement of cultural resources. Policies 4.D.1–4.D.8 include solicitation of information from local Native American tribes, cities, and agencies, and establish various standards for ensuring the preservation and confidentiality of cultural resource locations within the county (Madera County 1995:59–60).

1.5 DEFINITION OF THE AREA OF POTENTIAL EFFECTS

The APE is defined as "the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if any such properties exist" (36 CFR Section 800.16[d]). Moreover, the APE consists of both horizontal and vertical limits of proposed Project activities and encompasses all portions of the proposed Project area, whether owned by the District, privately, or otherwise.

The APE encompasses 3.5 miles of Root Creek within a corridor extending 50 feet on either side of the creek's centerline, including creek embankments and water flow gates, as well as Project staging areas. The 252.17-acre horizontal APE includes portions of the 13 assessor's parcels listed below (also see Figure 1-3):

049-052-002	049-055-001	049-620-018	049-630-003
049-053-006	049-252-001	049-620-019	
049-054-004	049-252-002	049-630-001	
049-054-007	049-252-005	049-630-002	

The vertical limits of the APE are defined as the maximum average depth of the creek bed (estimated to be about 5 feet below the surrounding ground surface) and the maximum height of water control structures, which would be 5.9 feet tall.

1.6 PROFESSIONAL QUALIFICATIONS

Æ Senior Archaeologist Diana T. Dyste (M.A., RPA 39362477) served as project manager, provided technical and administrative oversight for all aspects of the Project, and completed the desktop buried site sensitivity analysis. Dyste meets the Secretary of the Interior's Standards for Professional Qualifications in Archaeology. Æ Senior Architectural Historian Amber Long (M.A.) conducted site-specific archival research and prepared the historic context. She meets the Secretary of the Interior's Standards for the Professional Qualifications in Historic Architecture, Architectural History, and History. Senior Archaeologist Anna Hoover (M.S., RPA 28576661) served as a co-author on the report. Hoover meets the Secretary of the Interior's Standards for Professional Qualifications in Archaeology. Staff Archaeologist Jessica Jones (B.A.) conducted Native American outreach and contributed to the report. GIS Technician and Staff Archaeologist Flavio Silva (Ph.D., RPA 17131) prepared report graphics, compiled the Project's GIS data, and assisted with the buried site sensitivity spatial data. The field survey was completed by Æ Staff Archaeologist Ward Stanley assisted by Field Technician Gabriel Granado. Résumés for key personnel are provided in Appendix A.

1.7 REPORT ORGANIZATION

This technical report was prepared according to California Office of Historic Preservation (1990) standards outlined in *Archaeological Resource Management Reports (ARMR): Recommended Contents and Format* and thus fulfills the requirements for NHPA Section 106.

Following this introduction, Chapter 2 describes the natural environment, prehistoric setting, ethnography of the region, and historic setting encompassing the APE. Chapter 3 discusses the methods used during archival research, buried site sensitivity assessment, and archaeological and built environment surveys. Research findings and results of the survey are provided in Chapter 4. A summary of findings and cultural resource management recommendations are included in Chapter 5. References are provided in Chapter 6, followed by Appendices A–C.

2
NATURAL AND CULTURAL SETTING

2.1 NATURAL SETTING

The APE lies on the eastern margin of the central San Joaquin Valley. This lowland is bordered on the east by the Sierra Nevada, on the west by the South Coast Ranges, and on the south by the Tehachapi Range. The Sierra Nevada greatly influences the general physiography of the region. The north-south orientation of these mountains directs the flow of rivers and streams westward providing drainage across the San Joaquin Valley. The San Joaquin River lies 1.25 miles east of the eastern edge of the APE and is 3.25 miles south of the western side of the APE. The topography consists of flat to gently sloping alluvial plains and incised drainages, with elevations ranging between 350 and 385 feet above mean sea level. Much of the natural topography within the region is leveled or recontoured because of agricultural use. Moreover, portions of Root Creek have been rechanneled.

The geology of the adjacent Sierra Nevada is reflected in primary and secondary soils in the San Joaquin Valley. Primary soils have been developed by weathering, seasonal erosion, and mass flood events that cause downward movement of granitic parent material. Secondary soils are formed by a combination of eolian and alluvial forces that have transported granitic and assorted metamorphic and metavolcanic materials along mountain streams (Weir 1956). Quaternary and recent alluvium covers most of the valley basin (Meyer et al. 2010).

The APE is within the Madera Subbasin hydrologic unit, which includes a portion of the San Joaquin Valley's dominant hydrological feature, the San Joaquin River. The river descends from the foothills northeast of Madera and flows southwest across the valley floor toward the community of Mendota, where it turns and follows a northeastern course towards the Sacramento–San Joaquin Delta. Before historic drainage and modern reclamation projects, seasonal flooding from the San Joaquin and Kings rivers produced extensive wetlands in the San Joaquin Valley. As a result, lakes, marshes, and sloughs once covered more than 3,000 square miles of the valley (Moratto 1984:168). The largest of these lakes was ancient Tulare Lake, approximately 50 miles south of the APE, which once spanned as much as 30 miles from shore to shore (Preston 1981). As more water was historically diverted from major streams for agricultural purposes, the shores of the lake progressively retreated. By the early twentieth century, Tulare Lake had all but disappeared except in unusually wet years when high levels of runoff were released into these rivers.

The abundance of water corridors within the APE and surrounding region provided rich habitat for plants and animals during prehistory and into the historic period. Common native plants likely present in the APE during prehistory include white, blue, and live oaks (*Quercus* spp.) as well as walnut (*Juglans* sp.), cottonwood (*Populus fremontii*), willow (*Salix* sp.), and tule (*Schoenoplectus* sp.) species, especially hardstem bulrush (*Scirpus acutus*). Also prominent would have been cattail (*Typha* sp.) and various grasses, forbs, and sedges. A variety of animals lived in and around the APE prior to the modern era, including mule deer (*Odocoileus hemionus*), white-tailed deer (*O. virginianus*), tule elk (*Cervus* sp.), pronghorn (*Antilocapra* *americana*), grizzly bears (*Ursus arctos californicus*), black bears (*U. americanus*), and mountain lions (*Puma concolor*) (Preston 1981:245–247).

Mammals commonly noted during the historic era include the valley coyote (*Canis latrans*), bobcat (*Lynx rufus*), gray fox (*Urocyon cinereoargenteus*), kit fox (*Vulpes macrotis*), and rabbit (Leporidae). Avian species include American osprey (*Panidon* sp.), redwing blackbird (*Agelaius phoeniceus*), marsh hawk (*Circus cyaneus*), Nuttall's woodpecker (*Dryobates nuttallii*), western meadowlark (*Sturnella neglecta*), and quail (Odontophoridae). Fish were not observed in Root Creek.

The effects of historic-era and modern agriculture, ranching, and damming of natural watercourses has spurred the replacement of native plants and animals with domesticated species in most parts of the valley. Urban development of the valley floor and adjacent foothill areas has further reduced available habitat for native flora and fauna. The APE contains relatively few native plant and animal species as it has undergone extensive cultivation and channel modifications since the nineteenth century. For example, the thick-tailed chub was once a major dietary component for Native Americans in the valley but is now extinct. Other native flora and fauna are extant in the APE, albeit in exponentially smaller populations.

2.2 CULTURAL SETTING

2.2.1 Prehistory

The most recent archaeological studies near the APE include investigations near Ledger Island along the San Joaquin River, approximately 4 miles northeast of the APE (Baloian et al. 2006); at Hidden Reservoir (Fenenga 1973, 1975) and Buchanan Reservoir (King 1976; Moratto 1972) to the northwest; and along Highway 168 at CA-FRE-1671 to the southeast (Moratto 1988). Prehistoric sequences developed from these excavations provide a fairly clear understanding of culture change during the last 3,000 years. However, archaeological investigations in the Tulare Lake and Buena Vista Lake localities suggest that people occupied the San Joaquin Valley as early as 11,000–12,000 years ago (Fredrickson and Grossman 1977; Riddell and Olsen 1969). Because there has been very little systematic and thorough archaeological excavation in the immediate vicinity of the APE, it is unclear whether the cultural phases identified in the adjacent foothills or southern valley extend to this area. Although some limited data suggest that phases developed for Yosemite National Park and Buchanan Reservoir for the most recent period of prehistory can be extended to sites in the San Joaquin Valley (Baloian et al. 2006), there is no evidence that this holds true for earlier phases.

Archaeological evidence suggests that the valley's initial occupants settled mostly in lakeshore and streamside environments and used the foothills seasonally. Early Holocene sites (i.e., Paleoindian) are typified by fluted points, stemmed dart points, scrapers, and flaked stone crescents. The middle and latter portions of the Holocene are characterized by mobile gatherer and hunter cultural patterns. As compared with their predecessors, Archaic groups utilized a broad resource base, including both large and small game and hard seeds. Manos, milling slabs, mortars, and pestles are common in Archaic assemblages, as are atlatl dart points. Favorable climatic conditions between 3,000 and 3,500 years ago instigated widespread settlement along the Sierran west slope. The Late Holocene witnessed various technological and social changes, including the adoption of the bow and arrow, expansion of trade, increasing use of acorns, and improved food storage techniques. As populations grew, social relations became more complex. Violence among many Sierran and Foothill groups may have become more common as economic stress and social instability became more pronounced during a period of xeric climates between circa A.D. 450 and 1250. Thereafter, new levels of population growth were achieved, resulting in part from movement of new Sierran groups. By circa A.D. 1600–1700 most groups settled into the territories that would later be identified ethnographically.

These Late Holocene (circa 1000 B.C.–A.D. 1850) adaptations occurred at various times throughout the south-central Sierra and foothill regions. The prehistoric sequence developed from excavations at Eastman Lake/Buchanan Reservoir divides these events into three phases: the Chowchilla Phase (circa 800 B.C.–A.D. 550), the Raymond Phase (A.D. 550–1500), and the Madera Phase (A.D. 1500–1850) (Moratto 1972). To summarize:

> Chowchilla Phase occupation (now dated circa 800 B.C.–A.D. 550) of the Buchanan Reservoir locality was centered at a few main villages along the Chowchilla River. Large, socially complex populations exploited local resources and actively traded with their neighbors. After circa A.D. 550, however, both population size and social complexity diminished; local Raymond Phase settlement was sporadic, violence was common, and trade was disrupted. Then, after circa A.D. 1500, scores of small settlements were established, and these maintained social ties with the revitalized older centers. The Madera Phase, with its village community organization and distinctive economic patterns, represents the late prehistory of the Southern Sierra Miwok (King 1976) [Moratto 1984:323].

Artifacts recovered during limited testing at CA-MAD-295/827 and CA-MAD-826 (Baloian et al. 2006) along the San Joaquin River were consistent with those associated with the Madera Phase. Information collected from published literature and interviews with the Dumna Tribal Government suggests that CA-MAD-295/827 may be associated with the Dumna Yokuts ethnographic village *I-ah'-pin* (see Section 2.2.2 below).

Six prehistoric sites were discovered during the survey of a proposed quarry along Highway 41 (Lloyd and Baloian 2007), approximately 8 miles northeast of the Project. All six contain bedrock milling stations and range from one milling slick to multiple features and loci with milling slicks, milling cups, and associated artifacts. A portion of CA-MAD-1503, a locus with milling tools and flakes (Kus 1991), lies along the southern edge of the proposed quarry area; four other prehistoric archaeological sites have been recorded within a 1-mile radius (Lloyd et al. 2005). In addition to sites along the San Joaquin River, many small processing stations and temporary camps have been found along seasonal channels near the lower foothills (Meighan and Dillon 1987), suggesting a pattern of widespread use of the area during the Late Holocene (McGuire 1992). The San Joaquin River supplied an abundance of salmon during the fall and spring (Baumhoff 1963:169, 174, Table 5), and the numerous granite outcroppings along the river and smaller tributaries provided grinding surfaces to process acorns, a staple of the California Indian diet.

2.2.2 Ethnohistory

The Yokuts are one of eight subgroups of the Penutian linguistic phylum that is present across the western coast and inland regions of North America from Canada to Mexico (Golla 2011:168). The Yokuts had many language subgroups and spoke a variety of dialects across the southern and central San Joaquin Valley as well as the Sierra Nevada. Many groups could converse across dialects with relative ease (Golla 2011). Kroeber (1939) estimated that Yokuts political units averaged 350 persons each; however, a much higher population figure of 15,700 persons was made by Spanish expeditions exploring the Central Valley and California coastal regions in the early nineteenth century (Cook 1955). These small, politically autonomous groups followed a seasonal resource gathering cycle that involved living in permanent villages in the winter months, usually adjacent to a primary drainage or marshy floodplain, and occupying smaller temporary foothill camps in the summer months (Moratto 1984).

The Yokuts tribes traditionally have been grouped into Southern Valley, Northern Valley, Delta, and Foothill groups. The APE lies along the margin between the Northern and Foothill territories, but determining which particular tribe occupied the APE is challenging for several reasons. Although there have been attempts to map the territories of California Indians—most notably by Kroeber (1925) and Heizer (1978:ix), the accuracy of these boundaries is by no means certain and loses accuracy with greater time depth. Very often the ethnographic accounts differ with respect to the names and geographical distribution of tribes. Such accounts were recorded after the indigenous lifeways and demographics had been disrupted by the incursion of Euro-American settlers and thus may not reflect the territories of peoples before European contact. Moreover, it is unlikely that prehistoric Native Americans maintained distinct, static borders. Rather, the foraging ranges of tribes typically overlapped each other and were subject to long-term changes due to geopolitical struggles, environmental change, or large-scale prehistoric migrations.

These limitations notwithstanding, the available ethnographic data suggests that the APE lies within the sphere of influence of both Dumna and Hoyima tribes. The Dumna, a subgroup of the Foothill Yokuts, were centered at the present-day location of Millerton Lake, where their largest village (*A'tbu*) was located (Gayton 1948:153). They occupied the banks of the San Joaquin River both above and below the village (Kroeber 1925:481; Spier 1978:471). Located farther downstream from the Dumna were the Hoyima, a subgroup of the Northern Valley Yokuts that inhabited an area north of the San Joaquin River, as far north as the Fresno River (Kroeber 1925:484, Plate 447).

Villages of both tribes have been identified in the APE's vicinity. Kroeber (1925:Plate 47) places the Hoyima village of *Moyolui* above the mouth of Little Dry Creek on the north side of the San Joaquin River. Latta (1977:161) states that the Hoyumne (Hoyima) village of *Moloyu* was located "on the north side of the San Joaquin and about three miles above the mouth of Big Dry Creek." It is possible that Latta's recording of the village *Moloyu* is the same as Kroeber's recorded village called *Moyoliu*, although there is a discrepancy in the location (Big Dry Creek versus Little Dry Creek). Latta (1977:161, 163) further identifies three other villages: the Hoyumne village of *Yimshau*, situated "on both sides of the San Joaquin River, about two miles above Lanes Bridge"; the village of *Atabau* about three miles upstream from the Herndon Bridge across the San Joaquin River, and the Dumna village of *I-ah'-pin*, located "north of the river and below Friant Dam about five miles," which is potentially the location of CA-MAD-295/827.

Intensive European exploration of Yokuts territory did not take place until the early nineteenth century (Wallace 1978). The Native American population in the San Joaquin Valley was significantly reduced by disease, and settlement patterns were disrupted as a result of recruitment to Mission Soledad, Mission San Luis Obispo, Mission San Antonio de Padua, and Mission San

Juan Bautista. However, even more traumatic impacts to the valley's Native American population were caused by a series of parasitic (i.e., malaria) and viral (e.g., influenza) epidemics that began in 1833. The diseases struck with such virulence that by 1846 an estimated 40–75 percent of Native Americans had died during outbreaks in California. The Northern Valley and Foothill Yokuts, residing primarily in riparian environments, would have been particularly vulnerable to malaria. Interruption of the valley's traditional cultures and societies accelerated in 1848 with the signing of the Treaty of Guadalupe Hidalgo and start of the gold rush, which spurred mass migration of American settlers into California (Moratto 1984). By 1850, of the estimated 15,700 people constituting the 15 tribelets of the Southern Valley Yokuts, only approximately 3,680 are estimated to have survived into the mid-twentieth century (Cook 1955).

Currently there are four Native American tribal groups with ancestral ties to the APE, including the North Valley Yokuts Tribe, Wuksache Indian Tribe/Eshom Valley Band, Southern Sierra Miwuk Nation, and the North Fork Mono Tribe. Several Northern and Southern Valley Yokuts tribes have survived the effects of colonization. Yokuts today have developed language apprenticeship programs and early childhood education centers to serve tribal members, including the Wukchumne of the Tule-Kaweah near Porterville, Choynimni speakers of the Kings River tribes, Chukchansi at the Picayune and Table Mountain Rancherias east and southeast of the APE, and Yawelmani speakers of the Tule River Reservation (Golla 2011:154). Several Yokuts tribal groups are governed by a Tribal Council and operate auxiliary departments that serve local tribal populations in areas of governance, healthcare, education, and cultural resource management.

2.2.3 History and Establishment of Madera County

Ranching and farming have occurred in southern Madera County since the first settlers occupied the area under the Mexican administration of California in the mid-nineteenth century. General José Castro received the first land grant in 1846 in the area that is now Madera County. Named *el Rancho del Río San Joaquin*, this 47,470-acre grant extended along both sides of the San Joaquin River from north of Friant to just below Herndon and was used predominately for cattle ranching. Conflicts between Mexico and the United States in 1846, culminating in the war with Mexico and the 1848 Treaty of Guadalupe Hidalgo, forced Castro to abandon his ranching activities (Clough and Secrest 1984:35). In 1850, California gained statehood, and the area that was to become Madera County, along with Fresno and several other counties, was part of Mariposa County. Mariposa, truly the "mother of counties," was the largest county in the state, encompassing more than one fifth of California. In 1856, the area which today includes Madera and Fresno counties was separated from Mariposa County and established as Fresno County. Madera County, as it exists today, was formed in 1893.

Early Exploration of the Central Valley and Southern Madera County

Euro-American settlers occupied the region after 1848 and were quickly drawn to the excitement of the gold mining camps. The earliest settlements occurred along the transportation routes and in mining centers like Coarsegold. Only a few individuals were registered as farmers in Mariposa County in the 1850 census (Clough 1968). However, as production in the gold mines declined, many of the miners turned to ranching, farming, or other pursuits. The earliest farms were located along the transportation routes near the Sierra foothills and in the densely populated mining centers. Wheat farming was the most significant development during the early settlement of the San Joaquin Valley.

Although ranching had been a part of the state's economy since the Mexican period, the industry's growth accelerated as many successful prospectors and businessmen reinvested their profits from the gold rush into cattle and sheep herds. In the early days of ranching, sheep were a valued commodity because they not only could be sold for consumption but could be sheared for their wool. From 1857 to 1871, the amount of wool produced in California increased more than twenty-fold, while revenue grew at an average annual rate of 30 percent (Vandor 1919:164). Similarly, cattle provided beef and dairy products as well as hides. Tallow, another valuable commodity, was rendered from the fat of both cattle and sheep.

Agriculture had been gathering its own momentum since the gold rush. Early efforts to grow wheat without a sufficient water supply met with failure. Before the 1870s and the advent of large-scale water conveyance systems, farms were generally located near a perennial water source. This constraint on early agriculture kept the valley's two major industries—farming and ranching—in balance within the economy. Competition for real estate was minimized because agricultural interests had little reason to expand into pasturelands that were unsuitable for farming.

By the early 1870s, however, the scales began to tip in favor of agriculture. The construction of extensive irrigation systems, typically financed by developers like A. Y. Easterby, converted the valley's dry soils into fertile farmlands. The 1874 "no fence" law underscored the growing dominance of agricultural interests and resulted in both operational and monetary repercussions for the sheep and cattle industry:

> The "no fence" law obligated the stock owner to herd his cattle and sheep, whereas before the stock roamed at will and was not assembled except for the annual rodeo. He was also made responsible for damage done by his beasts. The farmer was not required to fence his holdings, though . . . he occasionally did so [Vandor 1919:163].

The "no fence" law was a major setback to ranching; the stockman no longer had the entire extent of the San Joaquin Valley at his disposal and was now burdened with the cost of fencing in his herds and flocks. Nevertheless, the industry continued to grow within Madera County, albeit not at the same pace as agriculture. The cattle empire of the Miller & Lux Company, which operated well into the twentieth century, owned as much as 145,000 acres of pastureland in Madera County (Barcroft 1933).

While much of the valley was covered in wheat fields in the mid-1870s (Clough 1968), farmers had been experimenting with grape vines and citrus trees since the 1850s. By the 1880s, a nationwide glut in the grain market and attendant drop in the price of wheat caused valley farmers to shift their attention to these newer crops. In a relatively short time, large-scale vineyards and orchards had replaced wheat fields in most regions of the valley.

Cattle, hog, and sheep ranching was of great importance to Madera's early economy. By the 1880s, sheep raising was considered the prevailing livestock industry with sheep outnumbering cattle 10 to 1 (Clough 1968). Joseph Lane was one of several prominent sheepmen of the era. His family settled in southern Madera County in 1870 and acquired over 7,000 acres of San Joaquin

River terrace near what is now known as Lane's Bridge (Guinn 1905; Vandor 1919). Other prominent sheep ranchers of southern Madera County include W. C. Miller and Alexander Gordon. Both men settled in Madera County in 1874 and continued in business together managing 10,000–12,000 sheep. Their partnership lasted 17 years, when Gordon eventually sold out to Miller and became one of the earliest prominent and successful grape growers. An 1891 atlas of Fresno County shows that A. Gordon and W. C. Miller both owned property in the vicinity of the APE (Thompson 1891:47). Since the 1900s, southern Madera County has continued to be a center for ranching and farming activities.

The growth of agriculture in the valley necessitated the development of an elaborate system of canals to distribute water for irrigation beginning in the 1870s. Water typically has been distributed to farmers primarily at the county level through the water companies of the nineteenth century and more recently by such entities as the Madera Irrigation District (MID). By the late 1920s and early 1930s, however, it became apparent to the state government that a valley-wide system was necessary to alleviate local shortages (JRP Historical Consulting Services and California Department of Transportation 2000:73–74). The solution was the Central Valley Project, a multicomponent water conveyance system that included, among other elements, the Delta-Mendota Canal and the Friant-Kern Canal. Funding for such a massive project was beyond the means of the local water agencies, and the State of California was unable to sell the necessary bond issues due to the monetary constraints of the depression. Although construction of the Central Valley Project began in the late 1930s, labor and material shortages caused by World War II delayed completion of many of the project's components until the mid-1940s.

Madera Irrigation District

The MID was formed in 1920 out of a need to provide a more comprehensive irrigation system for Madera County agriculturists (Madera Irrigiation District 1976:4–5). For the first part of the twentieth century, Madera County farmers relied on well water and the uncertain flow of the Fresno River for irrigation. The centerpiece of the MID's plan involved construction of a canal network from the San Joaquin River, and its first assessments accordingly went toward the purchase of a dam site along the river near the town of Friant. Although the acquisition eventually proved to be a prudent one, the district's initial efforts to establish an appropriation on the river were legally blocked by the powerful Miller & Lux Company, whose long-standing water rights gave the company a virtual monopoly on the river from the 1870s to 1939. During the 1920s, the two parties attempted but failed to reach an out-of-court compromise.

When the federal government assumed jurisdiction and financing of an ambitious water project from the State of California in 1935, it presented the Madera Irrigation District (MID) with the opportunity to finally realize its aspirations. The Central Valley Project was placed into service in the late 1940s and included the Madera (or Friant-Madera) Canal and Friant Dam, which was completed in 1944, and the Friant-Kern Canal, completed in 1951 (JRP Historical Consulting Services and California Department of Transportation 2000:80). Unlike the Friant-Kern and Delta-Mendota canals, which cross several counties along the state's north–south axis, the Madera Canal lies wholly within one county and runs a relatively short 36 miles from Friant Dam to a slough on the Chowchilla River. Yet before actual construction could proceed, the USBR, as the lead federal agency, had to create the legal/contractual foundation to avoid claims against federal use of the San Joaquin River. In 1939, the Miller & Lux Company, as well as other riparianists, sold part of their long-standing water rights to the federal government (*Fresno*

Bee 1939:173; Miller 1993). As part of the deal, the Miller & Lux Company and its irrigation subsidiaries agreed to receive replacement waters from the Delta-Mendota Canal, and the government guaranteed a sufficient release from Millerton Lake to irrigate its crops and grasslands. In the same year, the USBR worked out a similar transaction with the MID: in selling a portion of the Friant Dam site for $300,000, the district received first priority to federal water delivered by the Madera Canal (*Bakersfield Californian* 1939; Madera Irrigiation District 1976:4–5). The War Production Board initially suspended construction on the dam and canal during the first year and a half of World War II but afterward ordered their completion in 1943 to facilitate war-time food production. Water was first impounded by Friant Dam and delivered through the 36-mile-long Madera Canal in 1944 (Autobee 1994:14–15).

Even after the canal's completion and the end of the war, much of the district's 174,000 acres remained unirrigated by the canal for several years due to the lack of a distribution system. In 1949, the USBR and MID reached an agreement in principle whereby the federal agency would administer construction of an open-ditch network and sell water to the district in return for irrigation charges and installed/termed repayment of construction costs (Bureau of Reclamation 1950; Madera Irrigiation District 1976:5). Similar to contracts with other valley irrigation districts, the MID received a guarantee of 85,000 acre feet of water (Class I) plus a contingent supply projected to average 89,000 acre feet from year to year (Class II). The total cost of the distribution system was $8.3 million.

Root Creek Water District, Root Creek Improvements, and Prior Land Use

The RCWD was formed in 1994 to address a declining groundwater table resulting from a lack of permanent surface water supply to the area encompassing the APE. As a result of the proposed master-planned developments in the area, the District developed agreements with the adjacent MID to purchase San Joaquin River floodwaters and Class 2 CVP water to service master-planned communities and surrounding agricultural land (ESA 2006). The RCWD has also entered into agreements with the Westside Mutual Water Company to provide a consistent water supply (ESA 2006; Root Creek Water District 2016).

The primary water demand is for irrigation purposes, and the RCWD relies almost exclusively on groundwater to meet local area water needs. The District was able to ensure a reliable long-term water supply by harnessing resources from upstream at Millerton Lake via MID Lateral 6.2, then through a 48-inch gravity pipeline at the Root Creek turnout. The pipeline was built and began service to the local area in 2014 (Root Creek Water District 2016). Prior to Root Creek channelization and embankments, the APE was surrounded by agricultural and homestead land (Figure 2-1). The creek is depicted in what appears to be a natural unmodified state in a 1961 aerial image series of the APE and surrounding vicinity (Figure 2-2). Similarly, the 1973 USGS Lanes Bridge 7.5-minute topographic map depicts the creek in a natural meandering form (Figure 2-3).

Root Creek is an intermittent stream originating in the foothills east of the District. The Root Creek watershed encompasses 39 square miles and drains east to west (ESA 2006). The Root Creek channel has been modified by agricultural operations over many decades and is typically considered channelized and is denuded of natural vegetation. However, in nonchannelized portions, Root Creek is a naturally occurring swale that is bordered by crops and orchards. Segments of Root Creek vary from 1 to 15 feet wide with a depth that ranges from less than

1 foot to a visually estimated depth of 10 feet. Flows from Root Creek vary considerably between wet and dry years and is characterized by seasonal fluctuations in water flow. In its natural state, the creek is generally dry between May and October, preventing year-round local agricultural use. Use of water for agricultural purposes or for recharge tends to occur over short time periods, generally in the winter when water demand is low (ESA 2006).

Nearby Master-Planned Communities

A portion of the APE intersects with the Gateway Village project. In 2007, the County of Madera approved an Environmental Impact Report (EIR), which outlined the master-planned community consisting of residential, commercial, light industrial, transportation improvements, and open space. It was proposed that the segment of Root Creek encompassed in the EIR study area would be designated open space and improved upon to provide the public with passive and active park elements. The EIR also calls for a pipeline to be installed along Root Creek to recharge groundwater and construction of two water retention basins. The RCWD is designed to supply water to Gateway Village through water contracts developed with the adjacent MID. For the first phases of development north of Root Creek, groundwater wells will be required to supply water needs. A combination of wells and surface water treatment would be required south of Root Creek (ESA 2006). The EIR did not identify cultural resources within the study area but concluded there was potential for buried cultural resources given the deep alluvium in the study area.

The River West-Madera Master Plan area is approximately 4 miles southeast of the APE and contains 3,791 acres of river floodplain land. The draft master plan was prepared by the Madera County Planning Department (Madera County 2012) in partnership with the San Joaquin River Conservancy. While the master plan does not specifically describe cultural resources within its project area, the master plan does include an Education Objective to “provide educational and interpretive opportunities to inform the public about the site’s environmental, historical and other appropriate elements” (Madera County 2012:26). The master plan also describes a signage program that would educate the public about local Native American histories within the project and surrounding area, particularly as it relates to the importance of the San Joaquin River as a key resource that supported Native American lifeways. The master plan also describes the San Joaquin River as a crucial element of later American settlement due to its role in providing a waterborne transportation route for the shipping of resources up until the 1940s, when Friant Dam was constructed and significantly altered the pattern of water flow in the river.

Although not the closest master-planned community to the APE, Tesoro Viejo is certainly an important nearby project. Located approximately 13 miles north of the APE, the Tesoro Viejo Specific Plan Revised EIR was approved by the County of Madera in 2012. The proposed project will develop 1,584-acre planned mixed-use community including residential, commercial, retail, education, and industrial components, with additional infrastructure involving roads, water control, and electrical supply. The Tesoro Viejo project shares a common watershed —the San Joaquin River—as well as similar prehistoric and historic-era settlement patterns. The Tesoro Viejo EIR identified two prehistoric archaeological sites within the Tesoro Viejo study area near the San Joaquin River, one of which required mitigation measures involving project redesign for avoidance and required additional protection for the resource post-construction (Atkins 2012).

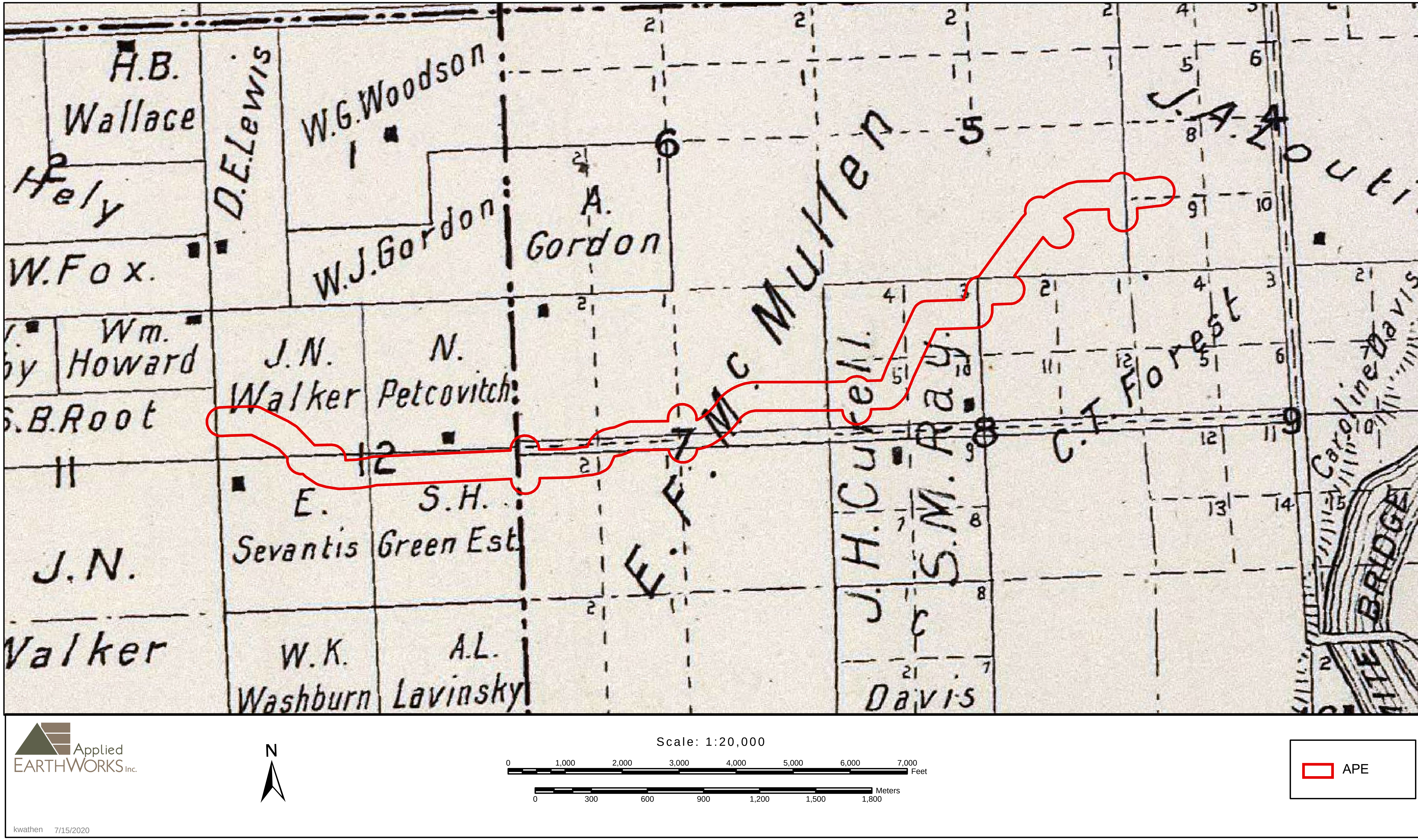


Figure 2-1 1891 Fresno County atlas map showing historic-era land ownership (Thompson 1891:47).

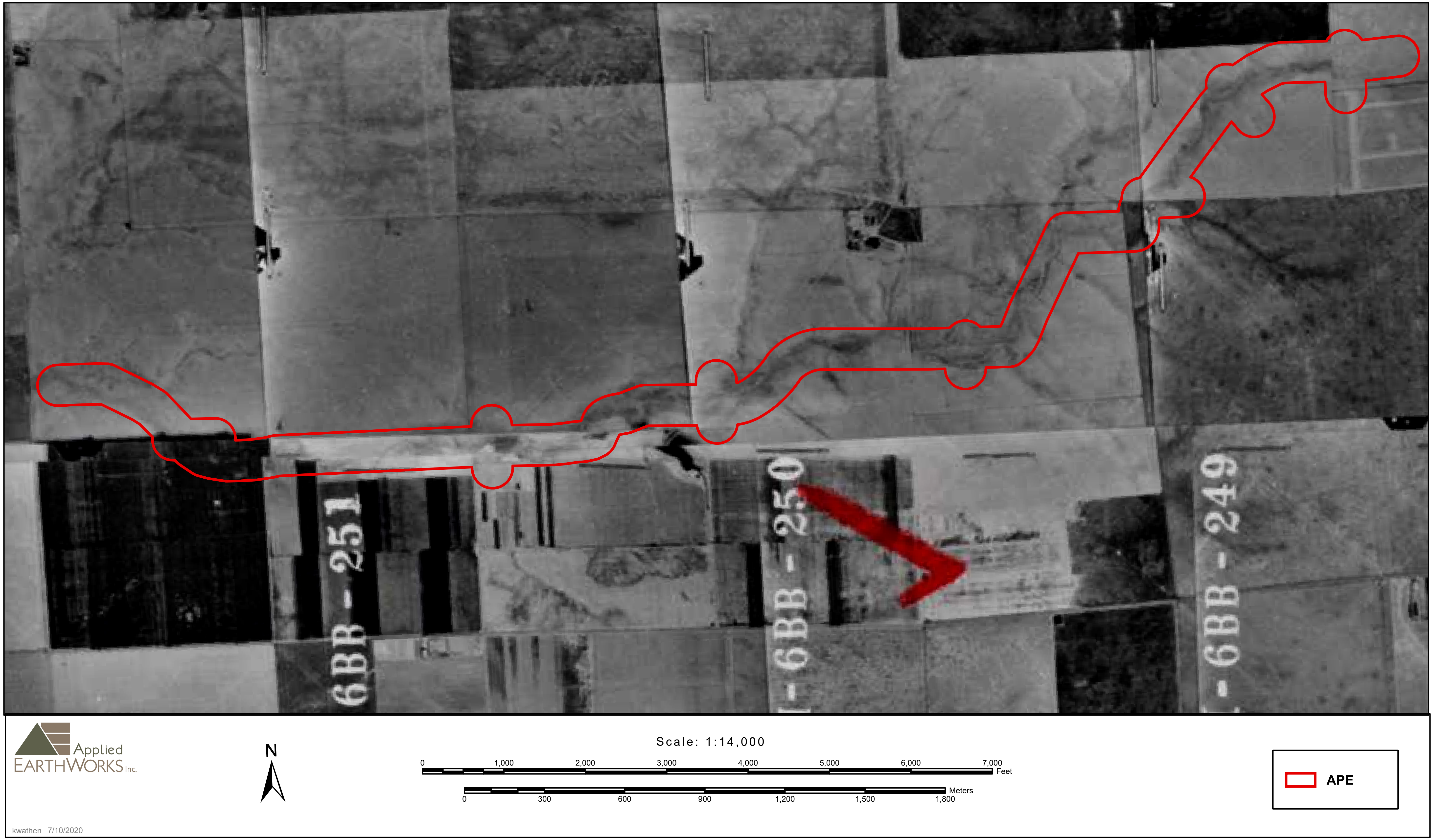


Figure 2-2 1961 aerial photograph showing Root Creek within the APE in a natural, undeveloped state.

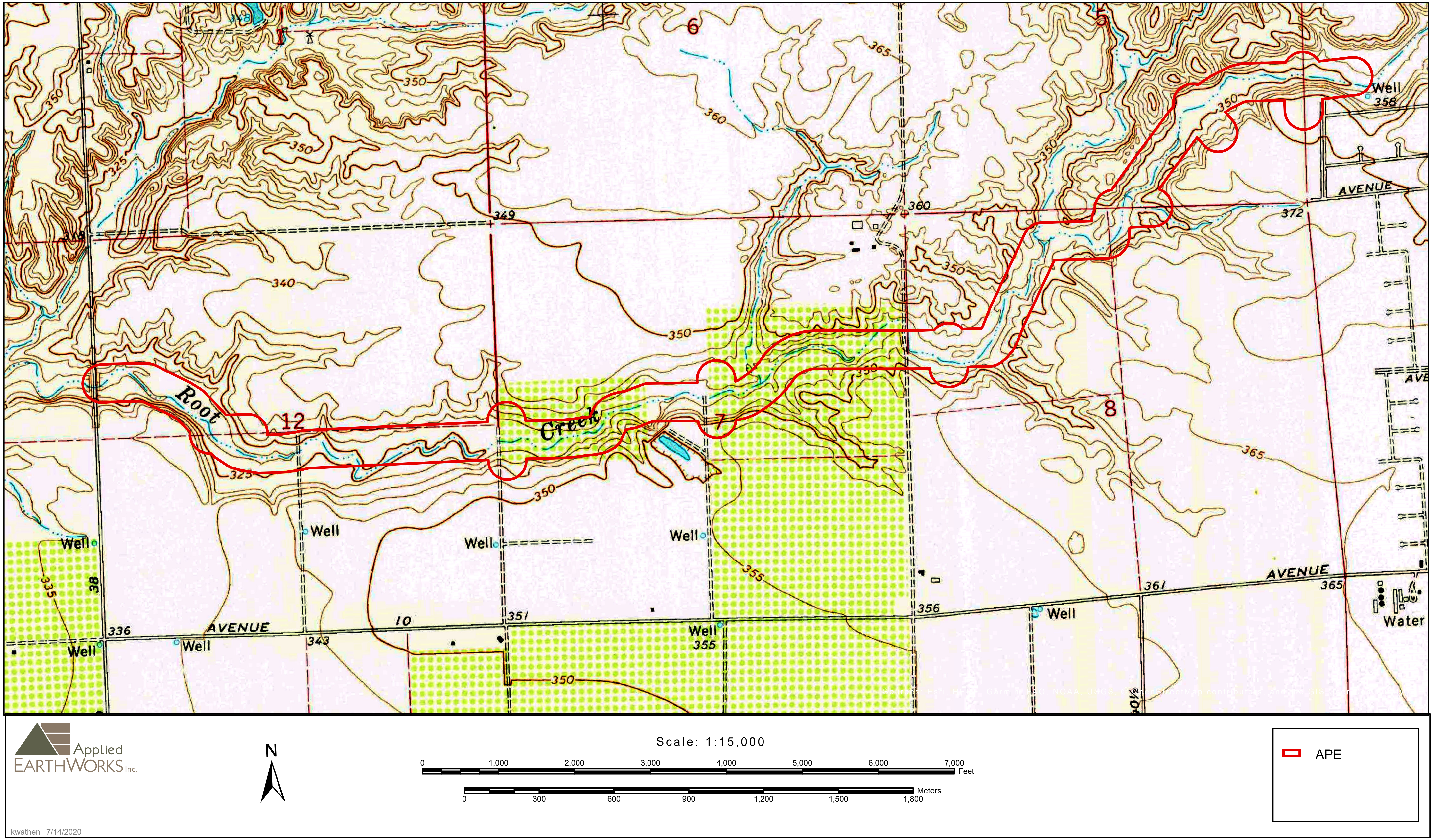


Figure 2-3 USGS 1973 Lanes Bridge 7.5-minute topographic quadrangle showing Root Creek in its natural form prior to MID and RCWD improvements.

3
METHODS

3.1 RECORDS SEARCH

At Æ's request, the SSJVIC of the CHRIS at California State University, Bakersfield, performed a records search on June 22, 2020, to identify previously recorded resources and prior surveys within the APE and surrounding 0.5-mile radius. SSJVIC staff completed searches of the Historic Property Data File, NRHP, CRHR, listings of California Historical Landmarks, California Inventory of Historic Resources, and the California Points of Historical Interest database.

3.2 ARCHIVAL RESEARCH

The purpose of archival research for archaeological studies is to acquire information regarding the potential for historic-era cultural resources to exist within the APE and to build a context to support and guide evaluations of the eligibility of cultural resources for listing in the NRHP and CRHR. The investigation compiled information from several sources:

- Aerial photographs available through the Map Aerial Locator Tool (MALT) maintained by California State University, Fresno; Madera County property atlases (Online Archive of California); and USGS TopoView;
- Æ's in-house library, which includes maps and local histories; and
- RCWD website (https://rootcreekwd.com).

In addition, Æ reviewed findings presented in the Gateway Village Specific Plan Program EIR (ESA 2006) and Tesoro Viejo Specific Plan Revised EIR (Atkins 2012).

3.3 NATIVE AMERICAN OUTREACH

Pursuant to California PRC Section 5097.9, state and local agencies cooperate with and assist the NAHC in its efforts to preserve and protect locations of sacred or special cultural and spiritual significance to Native Americans. Æ contacted the NAHC to request a search of its Sacred Lands File to identify Native American resources in the APE and to obtain the names and contact information for individuals knowledgeable of such resources. The NAHC responded on June 11, 2020, with its findings and attached a list of Native American tribes and individuals culturally affiliated with the APE. Æ sent a letter summarizing the cultural resource investigation to each of the contacts identified by the NAHC. In the letter, Æ sought input on known sacred areas within the APE. Æ followed up with a telephone call or email to each Native American contact to confirm that the correspondence was received and to provide an opportunity for comment. A log detailing the outreach efforts and responses is provided in Appendix C

3.4 ARCHAEOLOGICAL SURVEY

On July 8 and 9, 2020, Æ Staff Archaeologists conducted an intensive archaeological pedestrian survey of the APE. Staff completed the survey of all accessible areas using parallel transects spaced 15–20 meters apart. Photographs were taken using an Olympus TG-860 digital camera to document the environmental setting, ground visibility, and potential historic-era buildings, structures, or features. An Æ Senior Architectural Historian thoroughly reviewed the field records and photographs to identify any potential built environment cultural resources. Methods and observations were recorded on Daily Work Record and Survey Field Record forms. Geospatial data was collected with a Trimble Global Positioning System (GPS) unit. All photographs and field records are on file at Æ's office in Fresno, California.

3.5 BURIED SITE SENSITIVITY ASSESSMENT

Æ reviewed geologic, soils, and hydrologic data for the APE to assess the potential for the vertical APE to include paleosols that may contain intact prehistoric cultural deposits. Æ consulted geological maps, historical maps, aerial photographs, the U.S. Department of Agriculture Natural Resources Conservation Service Web Soil Survey online database, soils data sheets, and regional geoarchaeological studies (e.g., Asselin et al. 2016; Meyer et al. 2010; Stanley et al. 2019). These sources provided information regarding the natural watercourses in the area as well as data about local soils and sediments, parent rock formations, paleoclimate, and historical vegetation. This information was used to estimate the age of the sediments surrounding the APE, consider the hydrologic and geologic forces that created and placed these sediments, and assess the likelihood of encountering buried cultural resources within the vertical APE during proposed ground-disturbing Project activities.

4
FINDINGS

4.1 RECORDS SEARCH RESULTS

The SSJVIC records search (No. 20-231) identified five prior cultural resource studies intersecting the APE (MA-00204, -00205, -001051, -01099, and -01201) and four additional studies completed within a 0.5-mile radius of the APE (MA-00120, -00135, -00290, -01094). One isolated prehistoric obsidian biface fragment has been recorded within the APE (P-20-002236) and two ground stone fragments have been recorded within a 0.5 mile of the APE (P-20-002235). The records search results with further details of these studies and resources are provided in Appendix B.

4.2 ARCHIVAL RESEARCH

Results of desktop research provided key information for this report, including historical data presented in Section 2.2.3. Specific sources and records consulted during archival research are identified in Appendix B.

4.3 NATIVE AMERICAN OUTREACH

The NAHC's response letter stated that a search of the Sacred Lands File did not identify any sacred sites in the APE. However, the NAHC cautioned that the absence of information in the Sacred Lands File does not indicate the absence of Native American cultural resources in or around the APE (Appendix C).

The NAHC supplied a contact list including Native American representatives that may have an interested in providing information about sacred or special sites of cultural and spiritual significance in the APE and surrounding 0.50-mile area. These individuals included:

- Chairperson Elaine Fink of the North Fork Rancheria of Mono Indians;
- Most Likely Descendant Contact Timothy Perez of the North Valley Yokuts Tribe;
- Chairperson Katherine Perez of the North Valley Yokuts Tribe; and
- Chairperson William Leonard of the Southern Sierra Miwuk Nation

On July 16, 2020, Æ sent a letter describing the APE to each of the individuals and groups identified above. Follow-up contact by telephone and email was completed on July 23, 2020. Two email responses were received from the Northern Valley Yokuts/Ohlone/Bay Miwuk/Patwin Tribe on July 27, 2020. Both individuals commented that the APE is sensitive for cultural resources. The information was forwarded to the RCWD, who is the CEQA lead agency for the proposed Project.

4.4 BURIED SITE SENSITIVITY ASSESSMENT

4.4.1 Paleoclimate and Regional Soils Deposition Patterns

The San Joaquin Valley is largely composed of older Pleistocene (prior to 25,000 cal B.P.) alluvial fan deposits originating from the Sierra Nevada. These deposits form a large piedmont to the east where the valley margins join the Sierra Nevada. These margins have undergone episodes of stability as well as erosion by channel incision. Eroded material is later redeposited, which results in an accumulation of buried soil deposits within the center of the valley and shallow sedimentary deposits closer to the Sierra Nevada, which includes the APE. These deposits can form only a thin veneer over granitic basement rocks of the Sierra Nevada (Bartow 1991; Galloway et al. 1999). Buried landforms of the late Pleistocene, a time encompassing when early humans first expanded into North America, are small, often isolated, and far less prevalent than older Pleistocene landforms. Thus, late Pleistocene paleosols would be rare in the APE given its proximity to the Sierra Nevada range (Meyer et al. 2010).

The transition to nonglacial conditions during the latest Pleistocene (15,000–11,500 cal B.P.) brought on pronounced changes in hydrologic, geomorphic, and biotic systems. During this time, the environment experienced rapid climatic fluctuations, most notably during the onset of the Younger Dryas (12,900–11,500 cal B.P.) when the climate abruptly, yet briefly, returned to glacial conditions. The latest Pleistocene was a period of greater climatic variability compared to prior time periods, and the subsequent disequilibrium is evident in the deep stratigraphic deposits. Landforms generated during this period of environmental instability are more prevalent today than late Pleistocene-age landforms but would also be rare within the APE due to its position within the meander belt corridor.

The Early Holocene (11,500–7000 cal B.P.) had more stable conditions than the latest Pleistocene and experienced a warmer and drier climate. However, this was followed by pronounced climatic variability in the Middle Holocene (7000–4000 cal B.P.). Middle Holocene landforms within California are typically rare. The cooler and wetter conditions of the Late Holocene (4000–0 cal B.P.) are characterized by episodes of increased precipitation and runoff, which allowed vegetation to flourish and stabilized new and existing deposits, slowing the rate of landscape change prior to 2000 cal B.P. The onset of the latest Holocene (2000–150 cal B.P.) brought increased shifts in rainfall, episodic droughts, and the Little Ice Age. This increase in climatic variability contributed to rapid and extensive landscape modification. Large-scale flooding led to large-scale deposition, resulting in extensive capping of older strata by these vast latest Holocene alluvial deposits (Meyer et al. 2010).

The historic and modern (150–0 cal B.P.) period is characterized by extensive landscape development and erosion caused by grazing and agricultural development throughout the region encompassing the APE. Historic-era land use of the APE documented during archival research include agricultural activities involving food crops, livestock grazing, and homesteading. Modern creek channelization and water control measures have contributed to a slowing of historic-era alluvial deposition within the APE along Root Creek.

4.4.2 Soils Descriptions

Geologic and soil data derived from the National Resources Conservation Service Web Soil Survey identify the dominant soil in the APE as Whitney and Rocklin sandy loam (84 percent of the APE). Smaller portions of the APE consist of Atwater loamy sand (5 percent), Greenfield sandy loam (5 percent), Ramona sandy loam (3 percent), and Tujunga loamy sand (2 percent). In general, the APE consists of soils with moderate to very high sensitivity that have potential to contain paleosols with intact cultural deposits. Maps depicting soil types in the APE and their respective cultural resource sensitivity classification is provided in Appendix D.

Whitney and Rocklin sandy loam soils consist of alluvium formed from decomposed granite. These soils are found on alluvial fan remnants and are derived from Atwater parent soil, and thus likely date to the Late Holocene. They are well drained and neutral to slightly alkaline (6.9–7.8 pH), have a minor subsurface clay component, and often support native grasses and herbs. The sensitivity classification for Whitney/Rocklin soil is estimated to be high based on its parent soil association. Atwater soils have been dated to the Late Holocene and have high sensitivity for the presence of paleosols that may contain well-preserved cultural deposits (Meyer et al. 2010:48). This soil type is an eolian deposit derived from alluvium originating from granite. It is a well-drained and weakly cemented soil that is slight acidic to neutral (6–7 pH). These are typically deep soils that occur on low terraces on the leeward side of existing or abandoned stream courses. If not modified through agricultural use, Atwater soils are free of excess salt and alkali (Ulrich and Stromberg 1962).

Greenfield sandy loam is typically very deep, well-drained or excessively drained soil that forms in moderately coarse-textured alluvium derived from granitic sources. While Whitney/Rocklin and Tujunga soils are associated with grasses and forbs during the early historic period, Greenfield soil supports a wider variety of vegetation, including annual grasses, forbs, shrubs, and scattered oak trees. Greenfield soil has very high sensitivity for paleosols and has been radiocarbon dated to the Early and Middle Holocene (Asselin et al. 2016:87; Meyer et al. 2010:48). Tujunga soils are relatively young Holocene soils that are formed from sandy alluvium derived from granite. They are present in alluvial fan landforms, are somewhat excessively drained, and are slightly acidic to slightly alkaline (6.6–7.7 pH). Tujunga soils has very high sensitivity for paleosols (Asselin et al. 2016:87).

Ramona soils are classified as having moderate to high sensitivity. Much like Atwater and Whitney/Rocklin soils, Ramona soil is found in fan remnants in old, low terraces and is an alluvium derived from granite (Ulrich and Stromberg 1962). Much like Greenfield soil, annual grasses, forbs, herbs, and scattered oak trees are naturally supported by this soil type. Ramona soil is moderately acidic to neutral (6–7 pH) and is well drained (Soil Survey Staff 2003; Ulrich and Stromberg 1962).

Most of the soils identified in the APE share formation on slopes that range from 0 to 3 and 3 to 8 percent with a few subsections of Whitney/Rocklin types having 8–15 percent slopes. Overall, the soils in the APE represent relatively stable soil environments that may have experienced sporadic paleo episodes of mass alluvial deposition. Except for Ramona, all soils in the APE have been documented elsewhere in the San Joaquin Valley to have high to very high potential for containing intact anthropogenic paleosols that may contain significant resources at depths up to 30 feet below the ground surface (Asselin et al. 2016; Meyer et al. 2010; Onken 2020).

In general the soil within the APE ranges from slightly acidic to neutral pH and is identified as being free of excess salt and alkali. Most of the soil types are also well drained, with ponding or water inundation occurring seasonally. The depth to hardpan for Whitney/Rocklin soils is between 2 and 3 feet below ground surface (bgs), while all other soil types have recorded hardpan at depths below 5 feet bgs.

4.4.3 Sensitivity Assessment

Alluvial fan and remnant fan landforms are environments with potential to contain anthropogenic paleosols, particularly in streams where the effects of continuous high velocity helical water flow are comparatively less than is observed commonly in larger rivers. In addition, subsurface conditions composed of well-drained nonsaline soils with slightly acidic to neutral pH levels tend to moderately preserve bone, teeth, and other organic materials (Schiffer 1987). Saline introduced into cultural deposits via groundwater percolation, which is common in agricultural areas, may contribute to an accelerated rate of decay of certain artifact classes. Metals and other porous materials would be most susceptible to corrosion resulting from saline rich groundwater percolation, particularly with increasing acidic conditions (Kibblewhite et al. 2015; Rapp and Hill 2006). Yet, improved preservation of cultural deposits is expected below the hardpan, as the decomposing effects of excessive water percolation are slowed (Kibblewhite et al. 2015). Thus, the possibility of encountering moderately or well-preserved cultural deposits within the vertical APE increases with depth. Therefore, the potential for encountering a well-preserved anthropogenic paleosol would be greatest within the Whitney/Rocklin soil type where the hardpan would be encompassed by the vertical APE. However, moderately preserved and intact cultural deposits could be encountered in any paleosol above the hardpan.

Nearly all the APE is encompassed by soil types that have high or very high potential for containing anthropogenic paleosols with intact cultural deposits. Moreover, two nearby prehistoric archaeological sites that qualify as historical resources were identified in the EIR for the Tesoro Viejo Master Planned Community (Atkins 2012), which is within a few miles of the APE. However, as can be seen in the juxtaposition of the APE (which follows the approximate modern creek formation) against the 1946 USGS Lanes Bridge 7.5-minute topographic map of Root Creek (Figure 4-1), it is likely that some portions of the APE have been disturbed by past channelization that has greatly reduced the sensitivity for buried sites to low or none. Additional evidence of modern canal earthwork in portions of the APE is presented in Figure 4-2. This evidence of modern disturbance notwithstanding, due to the sensitivity of the soil types in the APE, coupled with cultural resource findings from neighboring projects, preparation of a GIS predictive model is recommended to clearly identify areas within the APE that are low, moderate, high, and very high in sensitivity, followed by limited subsurface archaeological testing to confirm the presence/absence of anthropogenic paleosols.

4.5 PEDESTRIAN SURVEY

An intensive archaeological and built environment survey of the APE was completed for all accessible areas, totaling approximately 242.46 acres, or 96.5 percent of the APE (Figure 4-3). The remaining 3.5 percent (9.71-acres) was not surveyed due to fenced water treatment areas, private residences, and basins that were filled with water (Figure 4-4). The results of this survey are described below.

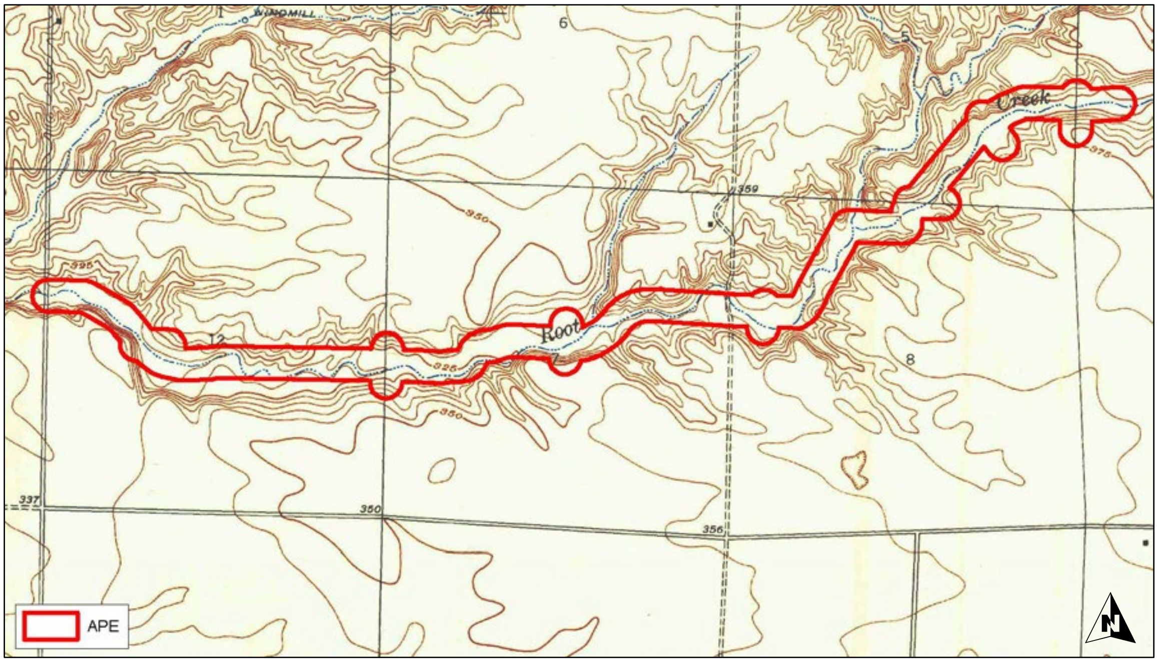


Figure 4-1 **APE juxtaposed against the 1946 USGS Lanes Bridge 7.5-minute topographic quadrangle.**

Figure 4-2 **Modern culvert constructed in the Root Creek Canal as it passes below Road 38, facing west.**

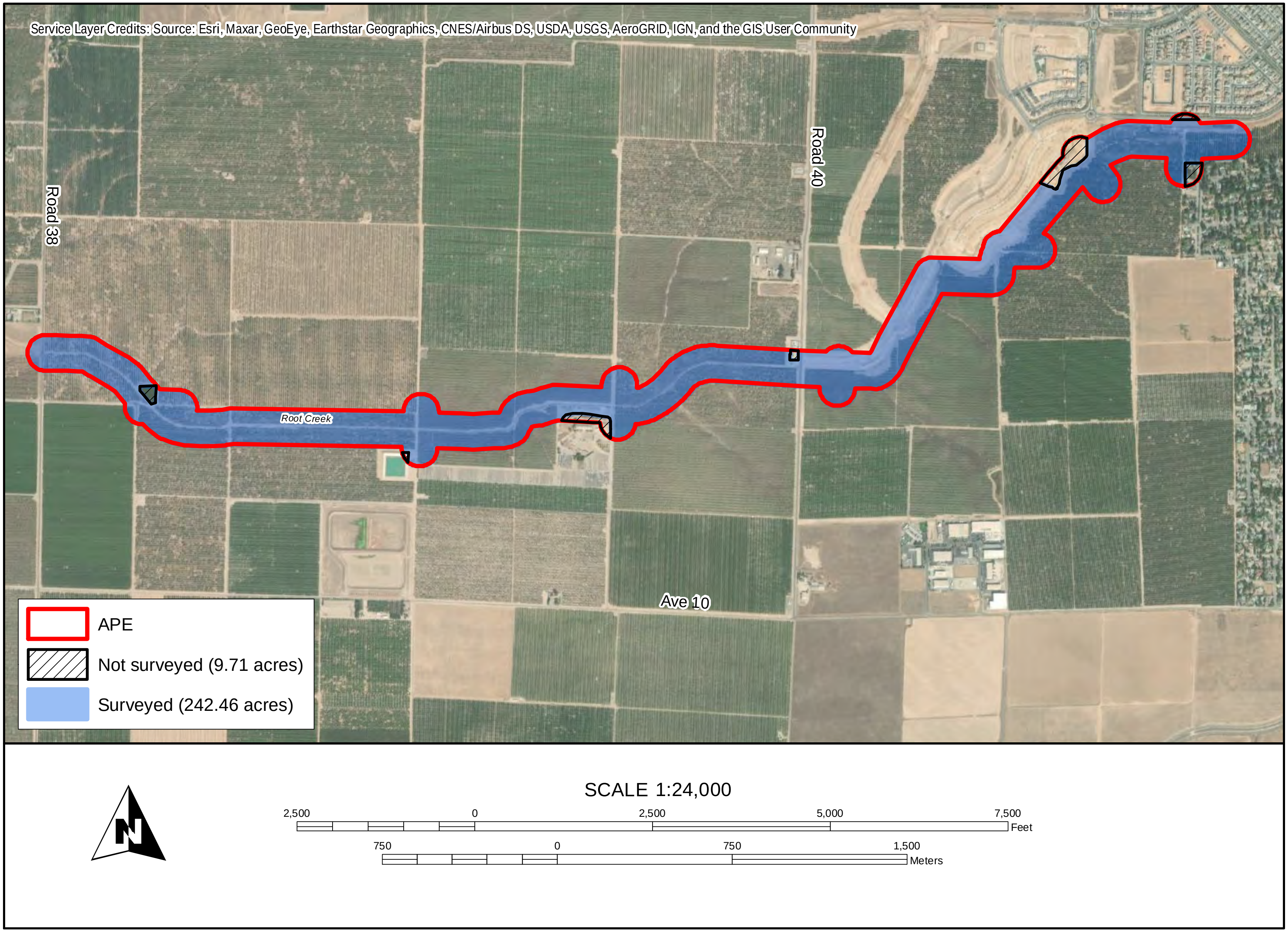


Figure 4-3 Survey coverage within the Root Creek Project APE.

4.5.1 Visibility

Lands surrounding the APE consist of gently rolling and terraced hills that are currently in use as almond and olive orchards. Flat, cultivated ground with orchards and scattered single-family residences are in and adjacent to the APE. The eastern end of the APE is immediately south of the newly constructed first phase of the residential Gateway Village housing development. Ground visibility varied greatly from 0 to 100 percent in areas of recent canal maintenance and agricultural activity. Ground visibility was approximately 90–100 percent in areas where the almond and olive canopies fully covered the tree rows (Figure 4-4). In areas where rows were exposed to sunlight, grass and vegetation growth obscured the ground providing 0–50 percent ground visibility (Figure 4-5). The east end of the APE has been impacted by heavy machinery, which has denuded ground vegetation, allowing for an unobstructed 100 percent visibility (Figure 4-6). In contrast, the west end of the APE was completely obscured by dense grasses, and Æ surveyors were unable to view the ground surface (Figure 4-7). Within Root Creek, patches of dense vegetation reduced visibility to less than 50 percent, while the remaining ground surface was clear and provided 100 percent visibility (Figure 4-8). Two basins filled with water in the western portion of the APE (Figure 4-9), covering less than 1 acre combined, could not be surveyed.

Figure 4-4 View of APE beneath an almond grove canopy with 100 percent visibility, facing west.

Figure 4-5 **View of APE in an almond grove with exposed rows and approximately 50 percent visibility, facing west.**

Figure 4-6 **Unobstructed ground visibility in the APE on the eastern end of Root Creek Canal, facing east.**

Figure 4-7 Western extent of APE with zero ground surface visibility, facing northwest.

Figure 4-8 Variable ground visibility adjacent to Root Creek in APE, facing east.

Figure 4-9 Westernmost filled basin in APE (area not surveyed), facing south.

4.5.2 Cultural Resources

The records search identified one previously recorded isolate (P-20-002236), consisting of two ground stone fragments, in the central portion of the APE on the north side of Root Creek. Æ surveyors found the area identified on the Department of Parks and Recreation (DPR) Primary Record as the isolate location and intensively surveyed the area. Only naturally occurring granitic and basalt river cobbles were observed at the plotted location of the isolate and immediately surrounding area. No cultural resources were identified during Æ's survey of the APE.

4.5.3 Built Environment Resources

The east side of the APE includes portions of three residential lots. Review of 1970 aerial photographs shows no houses existed at that time; therefore, the existing houses are not over 50 years old and, therefore, do not meet the age threshold to qualify as historic properties under Section 106 of the NHPA (National Park Service 1997:2) or historical resources under CEQA. The buildings do not have any special qualities or exceptional circumstances for buildings younger than 50 years old that would satisfy any of the significance criteria for eligibility to be listed in the NRHP (National Park Service 1997:11–43) or CRHR. RCWD began service in 1994, although it is possible that some improvements to the creek were completed by the MID between 1970 and 1993. Any improvements to the creek constructed after 1970 would not qualify as historic (i.e., more than 50 years of age), nor do the improvements made to the creek represent unique design or special circumstances that would qualify a resource younger than 50 years as a potential historic property under Criterion G per the National Park Service (1997:41) guidelines for evaluating cultural resources per Section 106 of the NHPA.

4.5.4 Cultural Resources Noted but Not Recorded

Æ archaeologists observed a single prehistoric handstone on the ground surface just outside the APE boundary (NAD 83, Zone 11, 247079.52mE/4087833.92mN). The handstone is fine-grained granite with a smooth ground surface and one battered edge (Figure 4-10). Æ surveyors closely inspected a 50-meter radius surrounding the handstone within the APE to determine if additional resources may be present. The immediate area contained a light to moderate scatter of natural granitic and basalt cobbles, which was not observed elsewhere in the APE. No other cultural material was observed. Because the handstone is outside the APE, Æ did not complete a DPR form for the handstone. The handstone was not collected. Survey documentation that includes information about the isolate is on file at Æ's office in Fresno, California.

Figure 4-10 Isolated handstone identified outside the APE.

5
SUMMARY AND CONCLUSION

Æ provided cultural resource services for the Root Creek Water District Project in Madera County, California. The District plans to divert flows from Root Creek by constructing nine embankments across a 3.5-mile segment of the creek. Each of these embankments will be approximately 5.9 feet high and will require construction of new culverts and control gates intended to control the water level and flow through the embankments. To accomplish this, the District is seeking a permit from the USACE, Sacramento District, to meet requirements of Section 404 of the Clean Water Act. Therefore, the Project is considered a "federal undertaking" subject to the requirements of Section 106 of the NHPA and its implementing regulations at 36 CFR 800. The Project is also subject to environmental review under the CEQA.

As a subconsultant to Provost & Pritchard Consulting Group, Æ conducted a cultural resource inventory of the APE to determine if historic properties or historical resources are present within the APE. Accordingly, Æ performed background research, obtained a records search from the SSJVIC of the CHRIS, requested a search of the NAHC Sacred Lands File, contacted local Native American representatives identified by the NAHC for outreach, assessed the buried site sensitivity of the APE, and conducted an intensive pedestrian archaeological and built environment survey of the APE.

The SSJVIC records search identified five previous investigations intersecting the APE and four additional studies in the surrounding 0.5-mile area. One previously recorded prehistoric ground stone isolate consisting of two fragments recorded in the APE was not located during the current survey. A search of the NAHC Sacred Lands File did not reveal the presence of sacred sites in the APE. Two Native American representatives from the Northern Valley Yokut Tribe responded to Æ's outreach, and their responses were shared with RCWD, the lead CEQA agency.

No prehistoric or historic-era archaeological sites were discovered during pedestrian survey of the APE; however, Æ identified one isolated granitic handstone just outside the APE. Because of its location beyond the APE boundary, Æ surveyors did not formally record the resource on DPR forms.

The buried site sensitivity assessment concluded that the APE is dominated by soil types classified as having high to very high sensitivity for containing anthropogenic paleosols that may harbor intact cultural deposits. However, because some portions of the APE have been heavily disturbed in the past to channelize the creek and install water flow control equipment, there is the possibility that certain segments of the APE have low to no sensitivity for the presence of intact buried cultural deposits. In order to identify and adequately assess potentially significant adverse impacts to buried cultural resources, Æ recommends a more detailed study that uses GIS predictive modeling to more clearly identify the boundaries of low, moderate, high, and very high sensitivity areas, followed by limited subsurface archaeological testing to confirm presence/absence of anthropogenic paleosols. Presence/absence testing for paleosols with potential to contain intact and well-preserved cultural deposits would allow for an adequate assessment of the potential for the proposed Project activities to cause adverse impacts to buried cultural resources. Methods and findings for the buried site assessment and subsurface testing along with cultural resource mitigation measures would be presented in an addendum to this report.

6
REFERENCES

Asselin, Katie, Randy Baloian, Aubrie Morlet, Michael J. Mirro, Jennifer Whiteman, Josh Tibbet, and Mary Baloian

2016 *Cultural Resources Inventory and Evaluation for the Central Valley Power Connect Project, Fresno, Kings, and Madera Counties, California*. Applied EarthWorks, Inc., Fresno, California. Prepared for Pacific Gas and Electric Company, San Francisco, California.

Atkins

2012 *Tesoro Viejo Specific Plan Revised Environmental Impact Report*, Vol. I. Atkins, Los Angeles, California. Prepared for Madera County Planning Department, Madera, California.

Autobee, Robert

1994 *Friant Division, Central Valley Project*. Electronic document, https://www.usbr.gov/projects/pdf.php?id=103, accessed August 14, 2019. Bureau of Reclamation, Mid-Pacific Region, California.

Bakersfield Californian

1939 The Great Central Valley Project Means Millions to Kern. 6 June:4. Bakersfield, California.

Baloian, Mary Clark, Randy Baloian, Michael J. Moratto, and Barry A. Price

2006 *Cultural Resources Survey and Evaluation on the Sumner Peck Ranch for the Tesoro Viejo Project, Madera County, California*. Applied EarthWorks, Inc., Fresno, California. Prepared for Tesoro Viejo, Inc., Fresno, California.

Barcroft, Joseph (editor)

1933 *Madera County History*. GenWeb, Madera County, California. Originally published in *History of Fresno and Madera Counties, California: Narrative and Biographical*, by Lilbourne Alsip Winchell. A. H. Cawston, Fresno, California.

Bartow, J. Alan

1991 *The Cenozoic Evolution of the San Joaquin Valley, California*. U.S. Geological Survey Professional Paper 1501. U.S. Government Printing Office, Washington, D.C.

Baumhoff, Martin A.

1963 *Ecological Determinants of Aboriginal California Populations*. University of California Publications in American Archaeology and Ethnology Vol. 49(2). University of California Press, Berkeley.

Bureau of Reclamation

1950 *Factual Report: Madera Irrigation District, Central Valley Project, California*. U.S. Department of the Interior, Bureau of Reclamation, Region II, San Joaquin Valley District.

Clough, Charles W.

1968 *The, Rich, Colorful and Exciting Historical Heritage of That Area Now Known as Madera County, California*. Madera County Jubilee Committee, Madera County Historical Society, Madera, California.

Clough, Charles W., and William B. Secrest, Jr.

1984 *Fresno County—the Pioneer Years: From the Beginnings to 1900*, edited by Bobbye Sisk Temple. Panorama West Books, Fresno, California.

Cook, Sherburne F.

1955 *The Aboriginal Population of the San Joaquin Valley, California*. University of California Anthropological Records 16(2). University of California Press, Berkeley and Los Angeles, California.

ESA

2006 *Draft Gateway Village Specific Plan Program Environmental Impact Report*. ESA, Los Angeles, California. Prepared for County of Madera Resource Management Agency, Madera, California.

Fenenga, Franklin F.

1973 *Archaeological Work in the Hidden Valley Reservoir Area, Madera County, California*. California State University Long Beach. Submitted to U.S. Department of the Interior, National Park Service, Western Archaeological Center, Tucson, Arizona.

1975 The Post-Contact Archaeological Sites on the Fresno and Chowchilla Rivers. Paper presented at the 9th Annual Meeting of the Society for California Archaeology, Santa Cruz.

Fredrickson, David A., and Joel W. Grossman

1977 A San Dieguito Component at Buena Vista Lake, California. *Journal of California Anthropology* 4(2):173–190.

Fresno Bee

1939 Government Gets San Joaquin Water Rights. 26 October. Fresno, California.

Galloway, Devin, David R. Jones, and S.E. Ingebritsen

1999 *Land Subsidence in the United States*. Circular 1182. U.S. Department of the Interior, U.S. Geological Survey, Reston, Virginia.

Gayton, Anna

1948 Yokuts and Western Mono Ethnography II: Northern Foothill Yokuts and Western Mono. *University of California Anthropological Records* 10(2):143–301.

Golla, Victor
2011 *California Indian Languages*. University of California Press, Berkeley and Los Angeles.

Guinn, James Miller
1905 *History of the State of California and Biographical Record of the San Joaquin Valley, California: An Historical Story of the State's Marvelous Growth from Its Earliest Settlement to the Present Time*. Chapman, Chicago, Illinois.

Heizer, Robert F. (editor)
1978 *California*. Handbook of North American Indians, Vol. 8, William C. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.

JRP Historical Consulting Services, and California Department of Transportation
2000 *Water Conveyance Systems in California: Historic Context Development and Evaluation Procedures*. JRP Historical Consulting Services, Davis, California, and California Department of Transportation, Environmental Program/Cultural Studies Office, Sacramento.

Kibblewhite, Mark, Gergely Tóth, and Tamás Hermann
2015 Predicting the Preservation of Cultural Artefacts and Buried Materials in the Soil. *Science of the Total Environment* 529:249–263.

King, Thomas F.
1976 *Political Differentiation among Hunter-Gatherers: An Archaeological Test*. Ph.D. dissertation, Department of Anthropology, University of California, Riverside.

Kroeber, Alfred L.
1925 *Handbook of the Indians of California*. Bureau of American Ethnology Bulletin 78. Smithsonian Institution, Washington, D.C.

1939 *Cultural and Natural Areas of Native North America*. University of California Publications in American Archaeology and Ethnology Vol. 38. University of California Press, Berkeley.

Kus, James S.
1991 *Second Addendum Archaeological Survey Report for a Route Adoption Study on Highway 41 in Fresno and Madera Counties, CA, 6-Fre, Mad-41 R32.2/R33.4, R0.0/R10.3*. Department of Geography, California State University, Fresno. Submitted to Environmental Branch Chief, California Department of Transportation, District 6, Fresno.

Latta, Frank F.
1977 *Handbook of Yokuts Indians*. 2nd ed. Bear State Books, Santa Cruz, California.

Lloyd, Jay B., and Randy Baloian

2007 *Cultural Resources Survey for the Highway 41 Quarry Project, Madera County, California*. Applied EarthWorks, Inc., Fresno, California. Submitted to Vulcan Materials Company, Fresno, California.

Lloyd, Jay B., Randy Baloian, and Mark Clark Baloian

2005 *Archaeological Sensitivity Analysis for the Highway 41 Quarry Project, Madera County, California*. Applied EarthWorks, Inc., Fresno, California. Submitted to Vulcan Materials Company, Fresno, California.

Madera County

1995 *Madera County General Plan Policy Document*. Madera County Planning Division, Madera, California.

2012 *River West-Madera Master Plan, San Joaquin River Parkway, Madera County (Draft)*. Madera County Planning Department, KLA Landscape Architecture & Planning, Jones and Snyder Surveying, J&R Environmental Services, and Environmental Site Restoration, Inc., Madera, California.

Madera Irrigiation District

1976 *Annual Report*. On file, Madera Irrigation District, Madera, California.

McGuire, Kelly R.

1992 *Rural Route 180, Fowler to Cove Avenues (06-FRE-180-R64.6/84.0 06-250-342500); Test Excavations at CA-FRE-61 and Extended Survey at CA-FRE-2851: A Preliminary Report*, with contributions by R. Bethard, H. McCarthy, K. Tate, and E. Wohlgemuth. Far Western Anthropological Research Group, Inc., Davis, California. Submitted to Woodward-Clyde Consultants, Oakland, California, and California Department of Transportation, District 6, Fresno.

Meighan, Clement W., and Brian D. Dillon

1987 *Redbank and Fancher Creeks Intensive Cultural Resources Survey*. Mitech, Inc., Santa Ana, California. Submitted to U.S. Army Corps of Engineers, Sacramento District.

Meyer, Jack, D. Craig Young, and Jeffery S. Rosenthal

2010 *A Geoarchaeological Overview and Assessment of Caltrans Districts 6 and 9: Cultural Resources Inventory of Caltrans District 6/9 Rural Conventional Highways*. Far Western Anthropological Research Group, Inc., Davis, California. Submitted to California Department of Transportation, District 6, Fresno.

Miller, M. Catherine

1993 *Flooring the Courtrooms: Law and Water in the Far West*. University of Nebraska Press, Lincoln, Nebraska.

Moratto, Michael J.

1972 *A Study of Prehistory in the Southern Sierra Nevada Foothills, California*. Ph.D. dissertation, Department of Anthropology, University of Oregon, Eugene.

1984 *California Archaeology*. Academic Press, Orlando, Florida.

1988 *Archaeological Excavations at Site CA-FRE-1671, Fresno County, California*. 2 vols. INFOTEC Research, Inc., Sonora, California. Submitted to the California Department of Transportation, District 6, Fresno, California. California Department of Transportation, Publications Unit, Sacramento, California.

National Park Service
1997 *How to Apply the National Register Criteria for Evaluation*. Rev. ed. National Register Bulletin. U.S. Department of the Interior, National Park Service, Cultural Resources Division, Washington, D.C.

Office of Historic Preservation
1990 *Archaeological Resource Management Reports (ARMR): Recommended Contents and Format*. California Department of Parks and Recreation, Sacramento.

Onken, Jill A.
2020 *Geoarchaeological Assessment for the Mowry Bridge Replacement Project, City of Mendota, Fresno County, California*. Prepared for Applied EarthWorks, Inc. and Provost & Pritchard Consulting Group. Submitted to City of Mendota.

Preston, William L.
1981 *Vanishing Landscapes: Land and Life in the Tulare Lake Basin*. University of California Press, Berkeley.

Rapp, George (Rip) Jr., and Christopher L. Hill
2006 *Geoarchaeology: The Earth-Science Approach to Archaeological Interpretation*. 2nd ed. Yale University Press, New Haven, Connecticut.

Riddell, Francis A., and William H. Olsen
1969 An Early Man Site in the San Joaquin Valley, California. *American Antiquity* 34(2):121–130.

Root Creek Water District
2016 About Us, https://rootcreekwd.com/about-us/, accessed August 7, 2020.

Schiffer, Michael B.
1987 *Formation Processes of the Archaeological Record*. University of New Mexico Press, Albuquerque.

Soil Survey Staff
2003 *Map Unit Description: Ramona Sandy Soils, 3 to 8 Percent Slopes*. Web Soil Survey. Electronic document, https://websoilsurvey.sc.egov.usda.gov/, accessed August 5, 2020. U.S. Department of Agriculture, Natural Resources Conservation Service.

Spier, Robert F. G.
1978 Foothill Yokuts. In *California*, edited by Robert F. Heizer, pp. 471–484. Handbook of North American Indians, Vol. 8, William C. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.

Stanley, Ward, Annie McCausland, and Mary Baloian
2019 *Cultural Resource Inventory and Assessment of Effects for the Madera Irrigation District Greenleaf Orchards Turnout and Pipeline Project, Madera County, California*. Applied EarthWorks, Inc., Fresno, California. Prepared for Provost & Pritchard Consulting Group, Fresno, California.

Thompson, Thomas H.
1891 *Official Historical Atlas Map of Fresno County*. Thos. H. Thompson, Tulare, California.

Ulrich, Rudolph, and Leslie K. Stromberg
1962 *Soil Survey, Madera Area, California*. U.S. Department of Agriculture and the California Agricultural Experiment Station Soil Conservation Service Soil Survey.

Vandor, Paul E.
1919 *History of Fresno County, California, with Biographical Sketches*. 2 vols. Historic Record Company, Los Angeles, California.

Wallace, William J.
1978 Northern Valley Yokuts. In *California*, edited by Robert F. Heizer, pp. 462–470. Handbook of North American Indians, Vol. 8, William C. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.

Weir, Walter W.
1956 *Soils of Madera County, California*. Soil Survey No. 12. Department of Soils and Plant Nutrition, University of California, Berkeley.

APPENDIX A

Personnel Qualifications

Applied EARTHWORKS Inc.

DIANA TERESA DYSTE

Senior Archaeologist

Areas of Expertise

- Cultural resource management
- Ethnography
- Tribal consultation
- Zooarchaeological, paleoethnobotanical, and lithics analysis

Years of Experience

- 20

Education

Ph.D. candidate, Anthropology/ Feminist Studies, University of California, Santa Barbara

M.A., Anthropology (Archaeology/ Cultural Resource Management emphasis), University of California, Santa Barbara, 2010

B.A., Anthropology, University of California, Santa Barbara, 2002

A.A., Liberal Arts and Sciences, Ventura College, 1999

Registrations/Certifications

- Registered Professional Archaeologist 39362477

Permits/Licensure

- Principal Investigator, California BLM Statewide Cultural Resources Use Permit CA-18-22

Professional Affiliations

- American Anthropological Association
- American Cultural Resources Association
- Santa Barbara Museum of Natural History
- Society for American Archaeology
- Society for California Archaeology
- World Archaeological Congress

Professional Experience

2018–	Senior Archaeologist, Applied EarthWorks, Inc., Fresno, California
2015–2018	Interim Cultural Resources Supervisor and Senior Archaeologist/Ethnographer, Aspen Environmental Group
2007–2009	Archaeologist (GS-9), U.S. Department of Agriculture, Los Padres National Forest
2005–2007	Archaeologist (GS-7), U.S. Department of Agriculture, Los Padres National Forest
2004–2005	Archaeological Contractor, Padre, Inc., Ventura, California
2000–2005	Archaeologist (GS-4/5), U.S. Department of Agriculture, Los Padres National Forest

Technical Qualifications

Ms. Dyste has 20 years of experience in cultural resources management and meets the Secretary of the Interior's qualification criteria as an archaeologist. She has extensive experience preparing environmental documents and managing complex projects pursuant to applicable federal, state, and local regulations. Her work includes senior review or prime authorship of cultural resources documents for National Historical Preservation Act Section 106, National Environmental Policy Act, and California Environmental Quality Act compliance, including public and tribal comment and response; development of research designs; design and implementation of cultural resources plans. Ms. Dyste is qualified to conduct archaeological survey, including the supervision of small to large sized field crews, as well as zooarchaeological, paleoethnobotanical, lithics, and ethnographic analyses. She is able to analyze cultural spatial patterns via use of Total Station and Geographic Information Systems software. Ms. Dyste's Assembly Bill 52 and NHPA Section 106 tribal consultation services are informed by her knowledge and training in Native American jurisprudence, cultural sensitivity training, and graduate seminars in Native American environmental law, indigenous research methodologies, and community-based Participatory Action Research with tribal and special interest groups. She has project experience in coastal, highlands, grasslands, desert, and remote mountain settings across the state of California, although her academic region of specialty is in central and southern California with a focus on Salinan, Esselan, northern/interior/coastal Chumash prehistoric and modern political tribal groups. Ms. Dyste is a native Spanish speaker and assists clients with the translation of English to Spanish signage and public notices.

ANNA HOOVER

Senior Archaeologist

Areas of Expertise

- Cultural resources management
- Prehistoric archaeology of southern California
- Indigenous archaeology and Native American/descendant community coordination
- Federal, State, local environmental laws and regulations
- Training, capacity building
- Traditional Cultural Property and Landscape analysis

Years of Experience

- 23

Education

M.S., Anthropology, focus Archaeology, 2003, University of California, Riverside

B.S., Anthropology, 2000, University of California, Riverside

B.A., Linguistics, 2000, University of California, Riverside

A.A., English, 1996, Long Beach City College

Registrations/Certifications

- Registered Professional Archaeologist 28576661 (current)
- Cultural Consultant, Riverside County #171 (current)

Professional Associations

- Archaeological Institute of America
- Temecula Valley Historical Museum

Professional Experience

2020–	Senior Archaeologist, Applied EarthWorks, Inc.
2017–2020	Senior Ethnoarchaeologist, Cultural Geographics Consulting
2007–2017	Deputy Tribal Historic Preservation Officer, Pechanga Band of Luiseño Mission Indians
2001–2015	Archaeological Assistant, San Bernardino County Coroner
2002–2007	Senior Archaeologist, L&L Environmental, Inc.

Technical Qualifications

Anna Hoover has more than 23 years of experience in archaeological, cultural, and tribal resource management in Alta and Baja California, and Yucatan, Mexico. Mrs. Hoover has collaborated with governmental agencies, environmental consultants, and indigenous communities to develop sustainable and practical applications for the identification and preservation of archaeological and tribal cultural resources, including landscapes and large, geographical features.

Mrs. Hoover has written many hundreds of compliance reports and several National Register of Historic Places (NRHP) nominations in Southern California, prepared comments and revisions on a variety of Programmatic and Master environmental documents, and contributed to a published book on Tribal GIS applications. She has presented collaborative projects, personal research, cultural resources education, and environmental regulation guidance trainings to a wide variety of audiences.

Amber Long

Senior Architectural Historian

Areas of Expertise

- Cultural resource management
- Project management
- Architectural history
- California history
- Environmental history
- CEQA/NEPA analysis
- Environmental and land-use planning

Years of Experience

- 6

Education

M.A., History, California Polytechnic State University, San Luis Obispo, 2015 (with distinction)

B.A., Political Science/ Communications, California Polytechnic State University, San Luis Obispo, 2003

Professional Affiliations

- California Preservation Foundation
- American Planning Association

Professional Experience

2019–	Associate Architectural Historian, Applied EarthWorks, Inc., San Luis Obispo, California
2018–2019	Planner, Santa Barbara County Planning and Development Department, Development Review Division, Santa Maria, California
2017–2018	Cultural Resources Manager, LSA Associates Inc., San Luis Obispo, California
2015–2017	Cultural Resources Analyst, LSA Associates Inc., San Luis Obispo, California
2013–2015	Cultural Resources Assistant, LSA Associates Inc., San Luis Obispo, California

Technical Qualifications

Ms. Long meets the Secretary of the Interior's Professional Qualification Standards for Architectural History and History. She has managed cultural resource projects throughout the Central Coast region and has contributed to large-scale projects state wide. Ms. Long's expertise includes effects analysis, policy consistency analysis, historical resource evaluation, significance evaluation, archival and historical research, and architectural field surveys. She has completed projects in consultation with California Department of Transportation (Caltrans) Districts 5 and 12 as well as various local governments and private-sector clients to satisfy compliance requirements under NHPA Section 106, CEQA, and local regulations. Her strong CEQA background stems from her experience as an environmental and land-use planner. Ms. Long has authored Initial Studies, contributed to Environmental Impact Reports and Environmental Assessments, and prepared regulatory permits in Santa Barbara County.

CONFIDENTIAL APPENDIX*
Not for Public Distribution

APPENDIX B

Records Search Results

*Archaeological site location information is exempt from the Freedom of Information Act (FOIA) and California Public Records Act (CPRA).

California Historical Resources Information System

Fresno
Kern
Kings
Madera
Tulare

Southern San Joaquin Valley Information Center
California State University, Bakersfield
Mail Stop: 72 DOB
9001 Stockdale Highway
Bakersfield, California 93311-1022
(661) 654-2289
E-mail: ssjvic@csub.edu
Website: www.csub.edu/ssjvic

6/22/2020

Diana Dyste
Applied EarthWorks, Inc.
1391 W. Shaw Ave., Suite C
Fresno, CA 93711

Re: Root Creek Water District Project, Madera County, California
Records Search File No.: 20-231

The Southern San Joaquin Valley Information Center received your record search request for the project area referenced above, located on the Lanes Bridge USGS 7.5' quad. The following reflects the results of the records search for the project area and the 0.5 mile radius:

As indicated on the data request form, the locations of resources and reports are provided in the following format: ☐ custom GIS maps ☒ shapefiles

Resources within project area:	P-20-002236
Resources within 0.5 mile radius:	P-20-002235
Reports within project area:	MA-00204, 00205, 01051, 01099, 01201
Reports within 0.5 mile radius:	MA-00120, 00135, 00290, 01094

Resource Database Printout (list): ☒ enclosed ☐ not requested ☐ nothing listed

Resource Database Printout (details): ☒ enclosed ☐ not requested ☐ nothing listed

Resource Digital Database Records: ☒ enclosed ☐ not requested ☐ nothing listed

Report Database Printout (list): ☒ enclosed ☐ not requested ☐ nothing listed

Report Database Printout (details): ☒ enclosed ☐ not requested ☐ nothing listed

Report Digital Database Records: ☒ enclosed ☐ not requested ☐ nothing listed

Resource Record Copies: ☒ enclosed ☐ not requested ☐ nothing listed

Report Copies: ☐ enclosed ☒ not requested ☐ nothing listed

OHP Built Environment Resources Directory: ☐ enclosed ☐ not requested ☒ nothing listed

Archaeological Determinations of Eligibility: ☐ enclosed ☐ not requested ☒ nothing listed

CA Inventory of Historic Resources (1976): ☐ enclosed ☐ not requested ☒ nothing listed

Caltrans Bridge Survey: Not available at SSJVIC; please see

http://www.dot.ca.gov/hq/structur/strmaint/historic.htm

Ethnographic Information: Not available at SSJVIC

Historical Literature: Not available at SSJVIC

Historical Maps: Not available at SSJVIC; please see
http://historicalmaps.arcgis.com/usgs/

Local Inventories: Not available at SSJVIC

GLO and/or Rancho Plat Maps: Not available at SSJVIC; please see
http://www.glorecords.blm.gov/search/default.aspx#searchTabIndex=0&searchByTypeIndex=1 and/or
http://www.oac.cdlib.org/view?docId=hb8489p15p;developer=local;style=oac4;doc.view=items

Shipwreck Inventory: Not available at SSJVIC; please see
http://www.slc.ca.gov/Info/Shipwrecks.html

Soil Survey Maps: Not available at SSJVIC; please see
http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx

Please forward a copy of any resulting reports from this project to the office as soon as possible. Due to the sensitive nature of archaeological site location data, we ask that you do not include resource location maps and resource location descriptions in your report if the report is for public distribution. If you have any questions regarding the results presented herein, please contact the office at the phone number listed above.

The provision of CHRIS Data via this records search response does not in any way constitute public disclosure of records otherwise exempt from disclosure under the California Public Records Act or any other law, including, but not limited to, records related to archeological site information maintained by or on behalf of, or in the possession of, the State of California, Department of Parks and Recreation, State Historic Preservation Officer, Office of Historic Preservation, or the State Historical Resources Commission.

Due to processing delays and other factors, not all of the historical resource reports and resource records that have been submitted to the Office of Historic Preservation are available via this records search. Additional information may be available through the federal, state, and local agencies that produced or paid for historical resource management work in the search area. Additionally, Native American tribes have historical resource information not in the CHRIS Inventory, and you should contact the California Native American Heritage Commission for information on local/regional tribal contacts.

Should you require any additional information for the above referenced project, reference the record search number listed above when making inquiries. Invoices for Information Center services will be sent under separate cover from the California State University, Bakersfield Accounting Office.

Thank you for using the California Historical Resources Information System (CHRIS).

Sincerely,

Digitally signed by Celeste M. Thomson
Date: 2020.06.22 10:58:02 -07'00'

Celeste M. Thomson
Coordinator

Resource List

SSJVIC Record Search 20-231

Primary No.	Trinomial	Other IDs	Type	Age	Attribute codes	Recorded by	Reports
P-20-002235		Resource Name - IF-MAD-33; Other - VOM-ISO-1	Object	Prehistoric	AP02	1996 (M. Strobl and C. Pansarosa, Applied EarthWorks, Inc.)	
P-20-002236		Resource Name - IF-MAD-34; Other - VOM-ISO-2	Object	Prehistoric	AP16	1993 (C. Pansarosa and J. Eckley, Applied EarthWorks, Inc.)	

Report List

SSJVIC Record Search 20-231

Report No.	Other IDs	Year	Author(s)	Title	Affiliation	Resources
MA-00120	Caltrans - 6-Fre-41 32.3/33.4; 6-Mad-41 0.0/9.8; 06820-263200	1987	Weigel, Lawrence E.	Archaeological Survey Report for a Proposed Route Adoption Study Audubon Drive to Route 45	California Department of Transportation	20-001503, 20-001504, 20-001505
MA-00120A		1987	Unknown	Historic Property Survey Report: Proposed Route Adoption and Highway Improvement on State Route 41 from Audubon Drive in Fresno County to One Mile North of State Route 145 in Madera County, California	Caltrans	
MA-00135	Caltrans - 06-Fre-41, P.M. 31.3/33.4; 06-MAD-41 P.M. 0.0/10.4; EA 06-263200	1994	Unknown	Supplemental Historic Proerpty Survey Report Corridor Study and Route Adoption in Norhtern Fresno County and Southern Madera County	California Department of Transportation	20-001503, 20-001504, 20-001505, 20-001912
MA-00204		1996	Clark, Mary E.	Archaeological Survey Report for Gateway Villages Element, Villages of Madera Project, Madera County, California	Applied EarthWorks, Inc.	
MA-00205		1995	Moratto, Michael J. and Wickstrom, Brian P.	Archaeological Survey of N 3/4 of W 1/2 of Sec. 4, T12S, R20E, State Route 41 at Avenue 12, Madera County, California	Applied EarthWorks, Inc.	
MA-00290	Caltrans - 06-MAD-41 PM 0.0/6.9 EA 06100-224900	1982	Levulett, Valerie A.	Archaeological survey Report for Various Improvements to 06-MAD-41 PM 0.0/6.9 06100-224900	California Department of Transportation	
MA-01051		2009	Byrd, Brian F., Wee, Stephen, and Costello, Julia	Cultural Resources Sensitivity Study and Research Design for the San Joaquin River Restoration Program, Fresno, Madera, Merced, and Stanislaus Counties, California	Far Western Anthropological Research Group, Inc; JRP Historical Consulting; Foothill Resources Ltd.	
MA-01094	Submitter - Contract No. 06A1106; Submitter - Expenditure Authorization No. 06-0A7408	2010	Leach-Palm, Laura, Brandy, Pual, King, Jay, Mikkelson, Pat, Seil, Libby, Hartman, Lindsay, and Bradeen, Jill	Cultural Resources Inventory of Caltrans District 6 Rural Conventional Highways in Fresno, Western Kern, Kings, Madera, and Tulare Counties	Far Western Anthropological Research Group, Inc.	20-001279, 20-001531, 20-001737, 20-001744, 20-001746, 20-002519
MA-01099		2007	Roper, C. Kristina	A Cultural Resources Survey for the Root Creek Water District In-Lieu Groundwater Recharge Facilities Project Avenue 12 at Road 40, Madera County, California	Sierra Valley Cultural Planning	

Report List

SSJVIC Record Search 20-231

Report No.	Other IDs	Year	Author(s)	Title	Affiliation	Resources
MA-01201		2010	Meyer, Jack, Young, D. Craig, and Rosenthal, Jeffrey	Volume I: A Geoarchaeological Overview and Assessment of Caltrans Districts 6 and 9 - Cultural Resources Inventory of Caltrans District 6/9 Rural Conventional Highways - EA 06-0A7408 TEA Grant	Far Western	
MA-01201A		2010	Meyer, Jack, Young, D. Craig, and Rosenthal, Jeffrey S.	Volume II: Appendices A Geoarchaeological Overview and Assessment of Caltrans District 6 and 9 - Cultural Resources Inventory of Caltrans District 6/9 Rural Conventional Highways - EA 06-0A7408 TEA Grant	Far Western Anthropological Research Group, Inc.	

Maps and Aerial Images Consulted

Date	Name	Author	Reference	Notes
1856	Township 12 South, Range 19 East	General Land Office	1856 General Land Office Survey Plat, Township 12 South, Range 19 East, Mount Diablo Meridian, DM ID 379755. U.S. Department of the Interior, Bureau of Land Management General Land Office Records, https://glorecords.blm.gov, accessed May 19, 2020.	No anthropogenic modification of the landscape is visible in the APE.
1874	Township 12 South, Range 19 East	General Land Office	1874 General Land Office Survey Plat, Township 12 South, Range 19 East, Mount Diablo Meridian, DM ID 379757. U.S. Department of the Interior, Bureau of Land Management General Land Office Records, https://glorecords.blm.gov, accessed May 19, 2020.	No anthropogenic modification of the landscape is visible in the APE.
1856	Township 12 South, Range 20 East	General Land Office	1856 General Land Office Survey Plat, Township 12 South, Range 20 East, Mount Diablo Meridian, DM ID 379947. U.S. Department of the Interior, Bureau of Land Management General Land Office Records, https://glorecords.blm.gov, accessed May 19, 2020.	No anthropogenic modification of the landscape is visible in the APE.
1874	Township 12 South, Range 20 East	General Land Office	1874 General Land Office Survey Plat, Township 12 South, Range 20 East, Mount Diablo Meridian, DM ID 379949. U.S. Department of the Interior, Bureau of Land Management General Land Office Records, https://glorecords.blm.gov, accessed May 19, 2020.	No anthropogenic modification of the landscape is visible in the APE.
1922	Lanes End, CA 1:31,680	U.S. Geological Survey	1922 Lanes End, CA 1:31680 scale. U.S. National Geologic Map Database, Historical Topographic Map Collection (topoView), https://ngmdb.usgs.gov/topoview/, accessed May 19, 2020	Root Creek is shown. No anthropogenic modification of the landscape is visible in the APE.
1947	Lanes End, CA 1:24,000	U.S. Geological Survey	1947 Lanes End, CA 1:24,000 scale. U.S. National Geologic Map Database, Historical Topographic Map Collection (topoView), https://ngmdb.usgs.gov/topoview/, accessed May 19, 2020	Root Creek is shown. No anthropogenic modification of the landscape is visible in the APE.
1948	Fresno, CA 1:250,000	U.S. Geological Survey	1948 Fresno, CA 1:250,000 scale. U.S. National Geologic Map Database, Historical Topographic Map Collection (topoView), https://ngmdb.usgs.gov/topoview/, accessed May 19, 2020	Root Creek is shown. No anthropogenic modification of the landscape is visible in the APE.
1946 (1957 Ed.)	Lanes End, CA 1:24,000	U.S. Geological Survey	1946 (1957 Ed.) Lanes End, CA 1:24,000 scale. U.S. National Geologic Map Database, Historical Topographic Map Collection (topoView), https://ngmdb.usgs.gov/topoview/, accessed May 19, 2020	Root Creek is Shown. Road 40 is shown for the first time between Sections 7 and 8 in Township 12 Range 20.
1964 (1965 Ed.)	Fresno, CA 1:24,000	U.S. Geological Survey	1964 (1965 Ed.) Lanes Bridge, CA 1:24,000 scale. U.S. National Geologic Map Database, Historical Topographic Map Collection (topoView), https://ngmdb.usgs.gov/topoview/, accessed May 19, 2020	Road 38 is shown for first time on the west border of Section 12, T12 Range 19.

Maps and Aerial Images Consulted

Date	Name	Author	Reference	Notes
1965 (1967 Ed.)	Herndon, CA 1:62,500	U.S. Geological Survey	1965 (1967 Ed.) Herndon, CA 1:62,500 scale. U.S. National Geologic Map Database, Historical Topographic Map Collection (topoView), https://ngmdb.usgs.gov/topoview/, accessed May 19, 2020	Root Creek is shown. No anthropogenic modification of the landscape is visible in the APE.
1937	13-ABI-49-13	Agricultual Adjustment Administration	1937 Flight 13-ABI-49-13, Fairchild Aerial Surveys, Inc. Los Angeles, California. http://malt.lib.csufresno.edu/MALT/, accessed May 20, 2020.	
1942	ABH-7B-195	Agricultual Adjustment Administration	1937 Flight ABH-7B-195, Fresno County, California, aerial survey. http://malt.lib.csufresno.edu/MALT/, accessed May 20, 2020.	
1946	GS-CO 3-120	Agricultual Adjustment Administration	1946 Flight GS-CO 3-120, Fresno County, California, aerial survey. http://malt.lib.csufresno.edu/MALT/, accessed May 20, 2020.	
1950	ABH-3G-129	Department of Agriculture. Production and Marketing	1950 Flight ABH-3G-129, Aero Exploration Co., Tulsa, Oklahoma. http://malt.lib.csufresno.edu/MALT/, accessed May 20, 2020.	
1957	ABI-51T-77	Agricultural Adjustment Administration	1957 Flight ABI-51T-77, Cartwright Aerial Surveys, , Sacramento, California. http://malt.lib.csufresno.edu/MALT/, accessed May 20, 2020.	
1965	FRE-6-3	Agricultural Adjustment Administration	1965 Flight FRE-6-3, Cartwright Aerial Surveys, , Sacramento, California. http://malt.lib.csufresno.edu/MALT/, accessed May 20, 2020.	
1970	2866-1-74	Agricultural Adjustment Administration	1970 Flight 2866-1-74, Cartwright Aerial Surveys, , Sacramento, California. http://malt.lib.csufresno.edu/MALT/, accessed May 20, 2020.	
1950	ABH-1950	USDA Production and Marketing Administration	1950 USDA Production and Marketing Administration. Aero Exploration Co. Aerial Survey. No. ABH-1950, http://mil.library.ucsb.edu/ap_indexes/FrameFinder/, accessed May 20, 2020.	

APPENDIX C

Native American Outreach

Applied EARTHWORKS Inc.

Native American Outreach Log

Root Creek Water District

Organization	Name	Position	Letter	E-mail	Phone	Summary of Contact
Native American Heritage Commission						
North Valley Yokuts Tribe	Katherine Erolinda Perez	Chairperson	07/15/20	07/23/20		Outreach letter mailed - JJ; Follow up by email - JJ
North Valley Yokuts Tribe	Timothy Perez	MLD Contact	07/15/20	07/23/20		Outreach letter mailed - JJ; Follow up by email - JJ
Wuksache Indian Tribe/Eshom Valley Band	Kenneth Woodrow	Chairperson	07/15/20	07/23/20		Outreach letter mailed - JJ; Follow up by email - JJ
Southern Sierra Miwuk Nation	William Leonard	Chairperson	07/15/20		07/23/20	Outreach letter mailed - JJ; Follow up by phone - no answer left message - JJ
North Fork Rancheria of Mono Indians	Elaine Fink	Chairperson	07/15/20	07/23/20		Outreach letter mailed - JJ; Follow up by email - JJ

NATIVE AMERICAN HERITAGE COMMISSION

NAHC HEADQUARTERS
1550 Harbor Boulevard
Suite 100
West Sacramento,
California 95691
(916) 373-3710
nahc@nahc.ca.gov
NAHC.ca.gov

June 11, 2020

Diane Dyste

Applied EarthWorks, Inc.

Via Email to: DDyste@appliedearthworks.com

Re: Root Creek Water District Project, Madera County

Dear Ms. Dyste:

A record search of the Native American Heritage Commission (NAHC) Sacred Lands File (SLF) was completed for the information you have submitted for the above referenced project. The results were negative. However, the absence of specific site information in the SLF does not indicate the absence of cultural resources in any project area. Other sources of cultural resources should also be contacted for information regarding known and recorded sites.

Attached is a list of Native American tribes who may also have knowledge of cultural resources in the project area. This list should provide a starting place in locating areas of potential adverse impact within the proposed project area. I suggest you contact all of those indicated; if they cannot supply information, they might recommend others with specific knowledge. By contacting all those listed, your organization will be better able to respond to claims of failure to consult with the appropriate tribe. If a response has not been received within two weeks of notification, the Commission requests that you follow-up with a telephone call or email to ensure that the project information has been received.

If you receive notification of change of addresses and phone numbers from tribes, please notify me. With your assistance, we can assure that our lists contain current information.

If you have any questions or need additional information, please contact me at my email address: Nancy.Gonzalez-Lopez@nahc.ca.gov.

Sincerely,

Nancy Gonzalez-Lopez

Nancy Gonzalez-Lopez
Staff Services Analyst

Attachment

Native American Heritage Commission
Native American Contact List
Madera County
6/11/2020

North Fork Rancheria of Mono Indians Elaine Fink, Chairperson P.O .Box 929 North Fork, CA, 93643 Phone: (559) 877 - 2461 Fax: (559) 877-2467 efink@nfr-nsn.gov	Mono
North Valley Yokuts Tribe Katherine Perez, Chairperson P.O. Box 717 Linden, CA, 95236 Phone: (209) 887 - 3415 canutes@verizon.net	Costanoan Northern Valley Yokut
North Valley Yokuts Tribe Timothy Perez, MLD Contact P.O. Box 717 Linden, CA, 95236 Phone: (209) 662 - 2788 huskanam@gmail.com	Costanoan Northern Valley Yokut
Southern Sierra Miwuk Nation William Leonard, Chairperson P.O. Box 186 Mariposa, CA, 95338 Phone: (209) 628 - 8603	Miwok Northern Valley Yokut Paiute

This list is current only as of the date of this document. Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resource Section 5097.98 of the Public Resources Code.

This list is only applicable for contacting local Native Americans with regard to cultural resources assessment for the proposed Root Creek Water District Project, Madera County.

EXAMPLE

Applied EarthWorks Inc.

1391 W. Shaw Ave., Suite C
Fresno, CA 93711-3600
O: (559) 229-1856 | F: (559) 229-2019

July 14, 2020

Katherine Erolinda Perez
Chairperson
North Valley Yokuts Tribe
P.O. Box 717
Linden, CA 95236

RE: Root Creek Water District Project, Madera County, California.

Dear Katherine Erolinda Perez,

Applied EarthWorks, Inc. (Æ) is providing cultural resource services to Provost & Pritchard Consulting for the Root Creek Water District Project (Project) in Madera County, California. The Project will improve the control of creek flow through altering existing embankments along Root Creek and the construction of new culverts and water control gates. The proposed project footprint is approximately 180 acres in size. Because the Project requires federal permits issued by the Army Corps of Engineers, the Project constitutes an undertaking under Section 106 of the National Historic Preservation Act of 1966, as amended.

The Area of Potential Effects (APE) lies within Township 12 South, Range 19 East and 20 East, Sections 4, 5, 7, 8, 11, and 12 of the Lanes Bridge, CA USGS quadrangle (see attached maps). A search of the Native American Heritage Commission's (NAHC) Sacred Lands File was completed on June 11, 2020. The NAHC reported negative results in the APE; however, the NAHC provided your contact information as someone who may have specific details on the APE and vicinity.

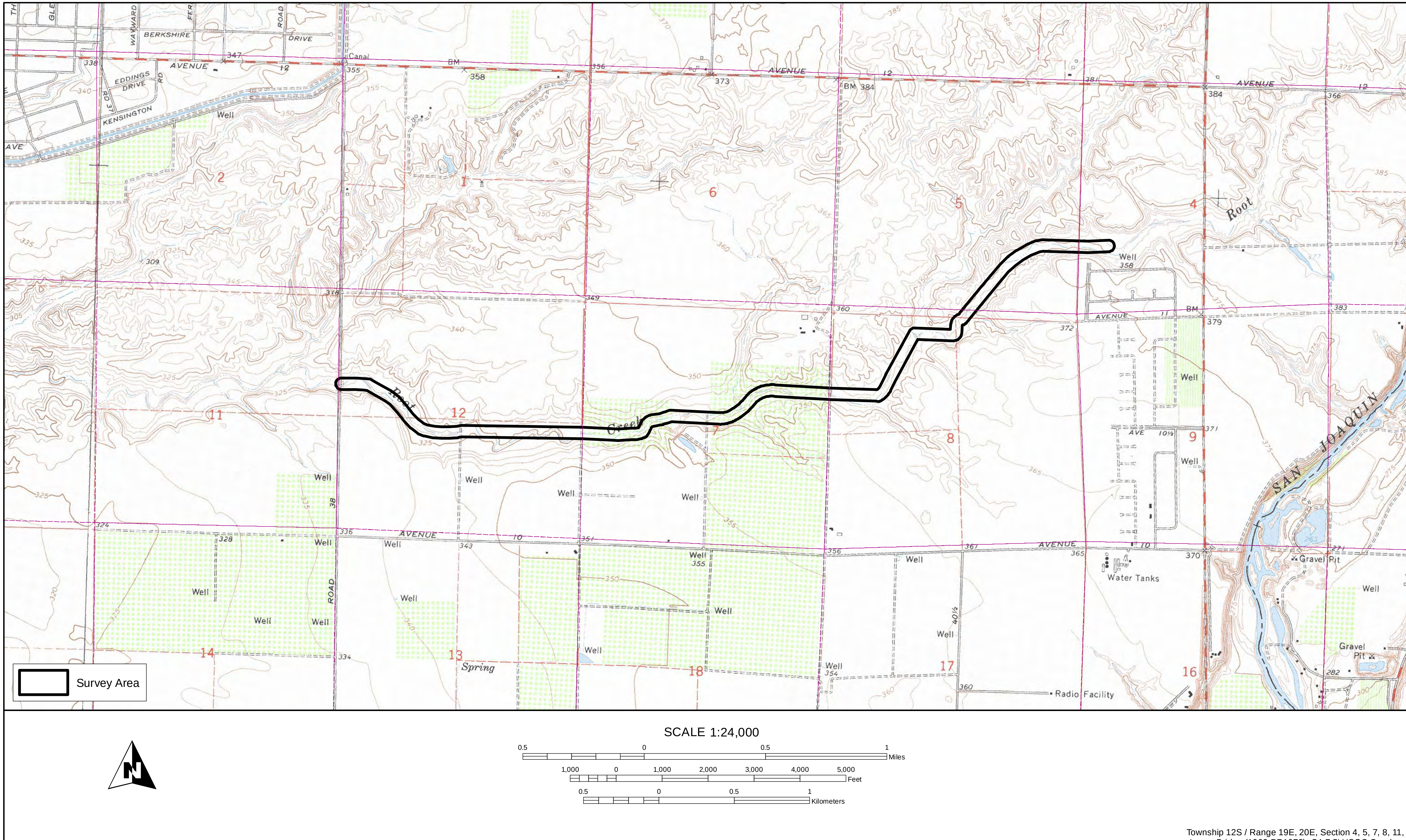
A records search from the Southern San Joaquin Valley Information Center (SSJVIC) has been performed for the Project. One previously recorded isolate, two granite metate fragments (P-20-002236), was identified in the APE in 1996. The isolate was not observed during Æ's recent pedestrian survey of the APE. Æ's field inspection of the APE did not identify any cultural material on the ground surface, however; an isolated handstone was observed adjacent to but outside of the APE.

Your name and address were provided to us by the NAHC as someone who may have knowledge about cultural resources in or near the APE. If you would like to share information about any sacred or special sites in the immediate area or that might otherwise be impacted by the proposed Project, please call or send a letter to my attention using the address in the header. I can also be reached at (559) 229-1856 X 123 or by email at ddyste@appliedearthworks.com. Information shared with Æ about this Project will only be included in the technical report documenting this investigation with your written permission. Pursuant to state and federal laws protecting the confidentiality of archaeological sites and tribal cultural resources, confidential informaiton will be protected from release to the general public (Pub. Resources Code § 21082.3[c][1]; NHPA Section 304).

Sincerely,

Diana T. Dyste,
Senior Archaeologist

encl.: Project Map



NAHC Sacred Lands File Search map for the *Root Creek Water District Project - AE4182.*

APPENDIX D

Buried Site Sensitivity Map Series

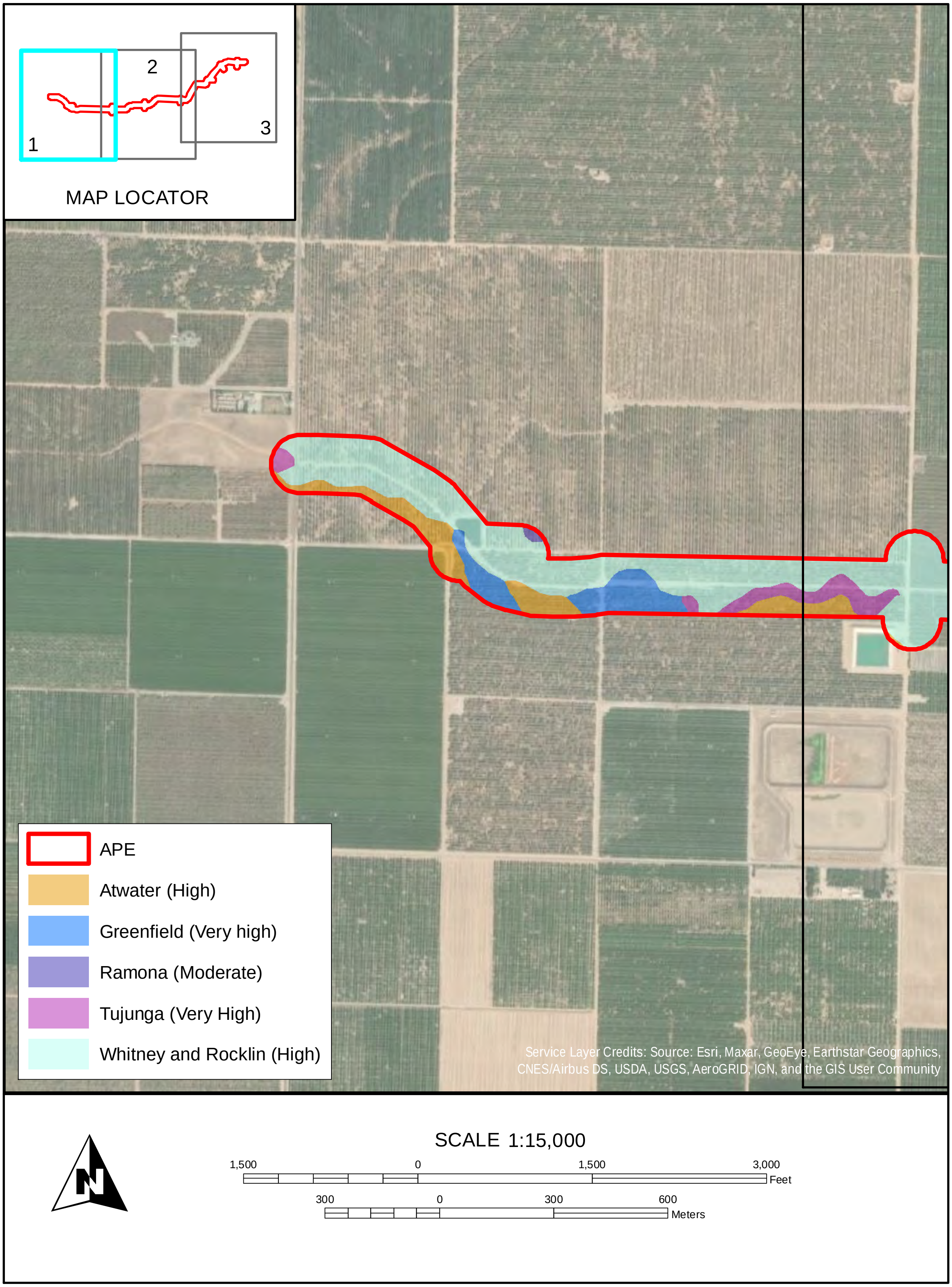


Figure D-1 **Distribution of soil types across APE with buried site sensitivity classification.**

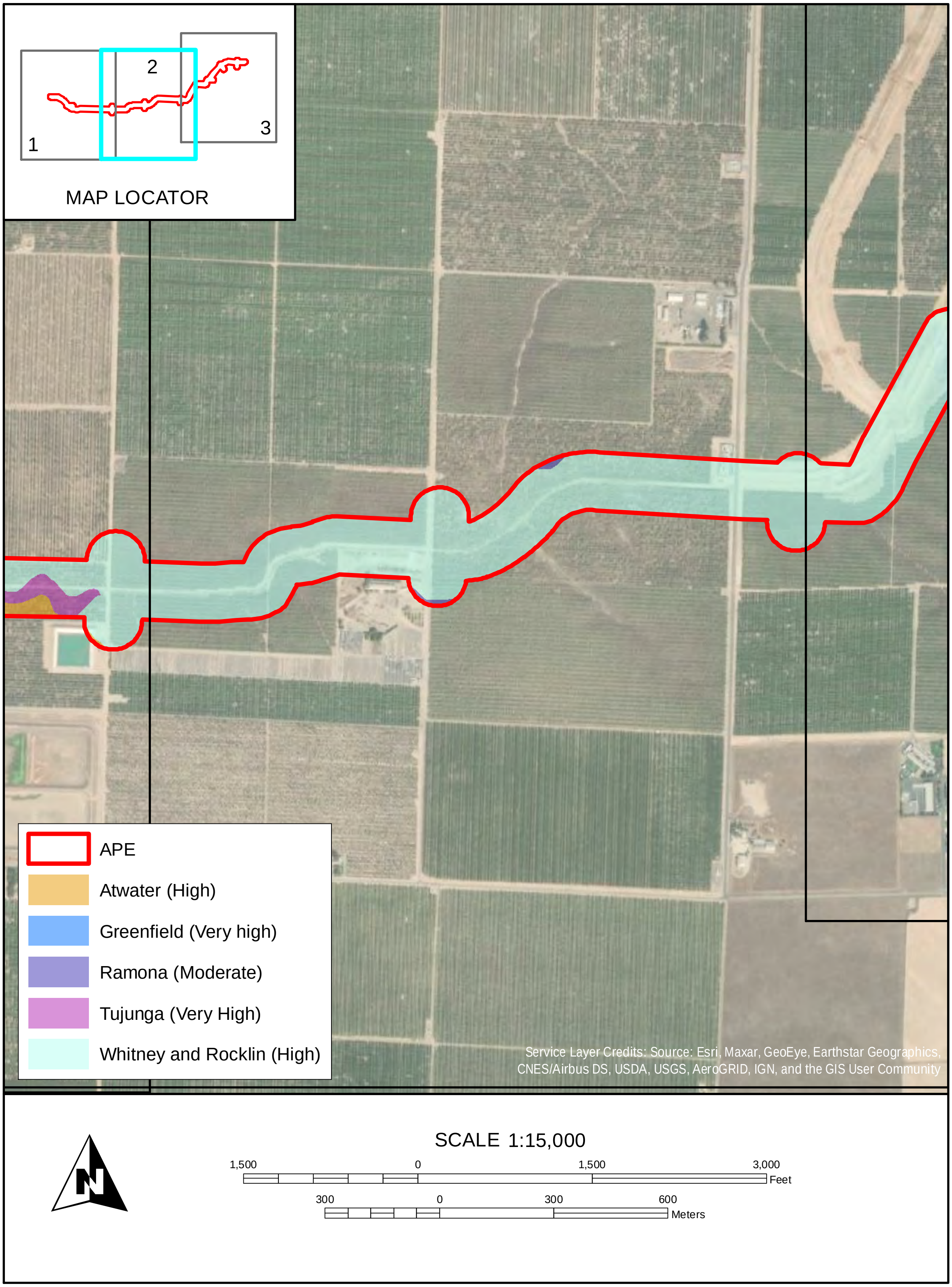


Figure D-2 Distribution of soil types across APE with buried site sensitivity classification.

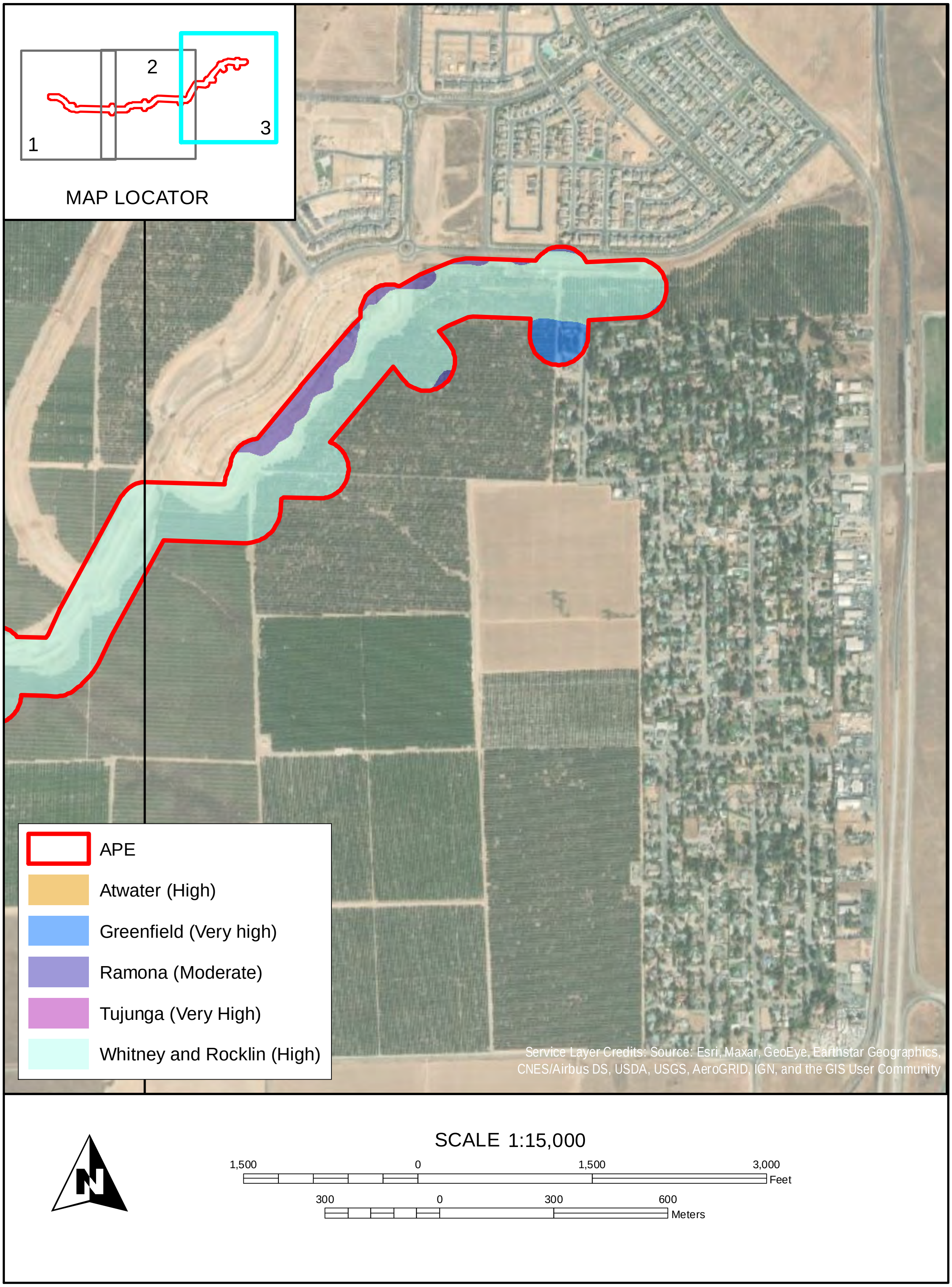


Figure D-3 Distribution of soil types across APE with buried site sensitivity classification.

Appendix D

NRCS Soil Resource Report

United States Department of Agriculture

NRCS

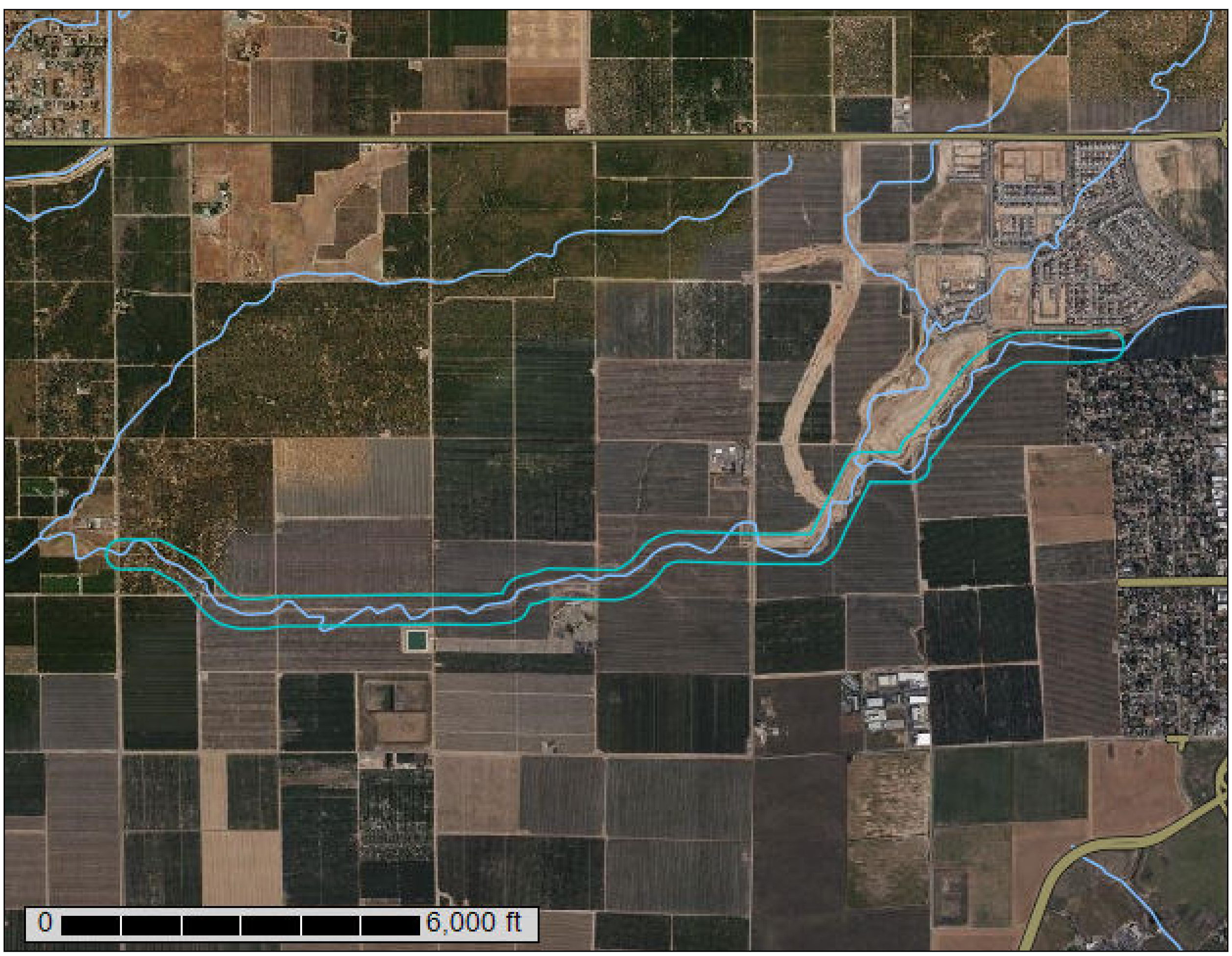
Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Madera Area, California

Root Creek



July 8, 2020

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

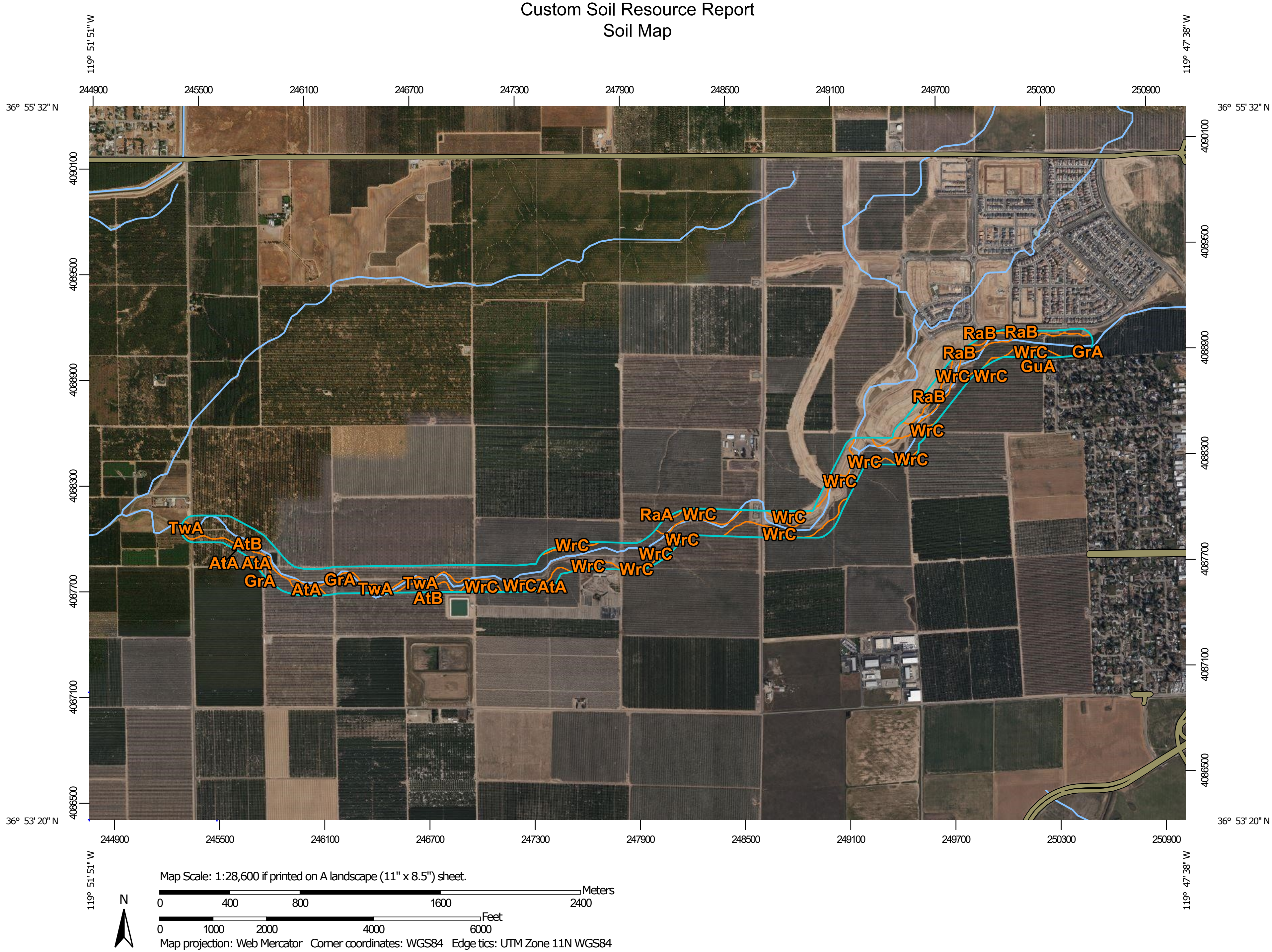
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map



Map Scale: 1:28,600 if printed on A landscape (11" x 8.5") sheet.

Meters: 0, 400, 800, 1600, 2400

Feet: 0, 1000, 2000, 4000, 6000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Madera Area, California
Survey Area Data: Version 14, Jun 1, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 5, 2015—Mar 5, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
AtA	Atwater loamy sand, 0 to 3 percent slopes, MLRA 17	3.3	1.5%
AtB	Atwater loamy sand, 3 to 8 percent slopes, MLRA 17	8.0	3.6%
GrA	Greenfield coarse sandy loam, 0 to 3 percent slopes	9.1	4.0%
GuA	Greenfield sandy loam, 0 to 3 percent slopes	0.0	0.0%
RaA	Ramona sandy loam, 0 to 3 percent slopes	0.3	0.1%
RaB	Ramona sandy loam, 3 to 8 percent slopes	6.3	2.8%
TwA	Tujunga loamy sand, 0 to 3 percent slopes	6.0	2.7%
WrB	Whitney and Rocklin sandy loams, 3 to 8 percent slopes	136.8	61.2%
WrC	Whitney and Rocklin sandy loams, 8 to 15 percent slopes	54.0	24.2%
Totals for Area of Interest		**223.7**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Madera Area, California

AtA—Atwater loamy sand, 0 to 3 percent slopes, MLRA 17

Map Unit Setting

National map unit symbol: 2vnd0
Elevation: 110 to 430 feet
Mean annual precipitation: 11 to 14 inches
Mean annual air temperature: 62 to 64 degrees F
Frost-free period: 240 to 300 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Atwater and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Atwater

Setting

Landform: Dunes
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian deposits derived from alluvium derived from granite

Typical profile

Ap - 0 to 24 inches: loamy sand
Bt - 24 to 55 inches: sandy loam
C - 55 to 73 inches: loamy sand
2Bq - 73 to 79 inches: cemented loamy sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 60 to 79 inches to cemented horizon
Natural drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low (0.02 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Sodium adsorption ratio, maximum in profile: 3.0
Available water storage in profile: Moderate (about 6.1 inches)

Interpretive groups

Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Delhi

Percent of map unit: 5 percent
Landform: Dunes

Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Rocklin

Percent of map unit: 4 percent
Landform: Fan remnants, terraces
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

San joaquin

Percent of map unit: 4 percent
Landform: Fan remnants, terraces
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Whitney

Percent of map unit: 2 percent
Landform: Terraces, fan remnants
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

AtB—Atwater loamy sand, 3 to 8 percent slopes, MLRA 17

Map Unit Setting

National map unit symbol: 2vnd4
Elevation: 120 to 460 feet
Mean annual precipitation: 11 to 14 inches
Mean annual air temperature: 62 to 64 degrees F
Frost-free period: 240 to 280 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Atwater and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Atwater

Setting

Landform: Dunes
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear

Parent material: Eolian deposits derived from alluvium derived from granite

Typical profile

Ap - 0 to 24 inches: loamy sand
Bt - 24 to 39 inches: sandy loam
C - 39 to 73 inches: sandy loam
2Bq - 73 to 79 inches: loamy sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 60 to 79 inches to cemented horizon
Natural drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low (0.02 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Sodium adsorption ratio, maximum in profile: 3.0
Available water storage in profile: Low (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Delhi

Percent of map unit: 5 percent
Landform: Dunes
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Rocklin

Percent of map unit: 4 percent
Landform: Fan remnants, terraces
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

San joaquin

Percent of map unit: 4 percent
Landform: Fan remnants, terraces
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Whitney

Percent of map unit: 2 percent
Landform: Fan remnants, terraces
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear

Across-slope shape: Linear
Hydric soil rating: No

GrA—Greenfield coarse sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: hk7d
Elevation: 100 to 3,500 feet
Mean annual precipitation: 9 to 20 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 200 to 300 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Greenfield and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Greenfield

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from igneous, metamorphic and sedimentary rock

Typical profile

H1 - 0 to 23 inches: coarse sandy loam
H2 - 23 to 51 inches: sandy loam
H3 - 51 to 72 inches: stratified loamy sand to sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.8 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 4c
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

San joaquin

Percent of map unit: 5 percent
Hydric soil rating: No

Ramona

Percent of map unit: 5 percent
Hydric soil rating: No

Hanford

Percent of map unit: 5 percent
Hydric soil rating: No

GuA—Greenfield sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: hk7j
Elevation: 100 to 3,500 feet
Mean annual precipitation: 9 to 20 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 200 to 300 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Greenfield and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Greenfield

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from igneous, metamorphic and sedimentary rock

Typical profile

H1 - 0 to 23 inches: sandy loam
H2 - 23 to 51 inches: sandy loam
H3 - 51 to 72 inches: stratified loamy sand to sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Very low

Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.8 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 4c
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Hanford

Percent of map unit: 5 percent
Hydric soil rating: No

San joaquin

Percent of map unit: 5 percent
Hydric soil rating: No

Ramona

Percent of map unit: 5 percent
Hydric soil rating: No

RaA—Ramona sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: hk99
Elevation: 250 to 3,500 feet
Mean annual precipitation: 10 to 20 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 230 to 320 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Ramona and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ramona

Setting

Landform: Fan remnants
Landform position (two-dimensional): Backslope
Down-slope shape: Convex
Across-slope shape: Concave
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 8 inches: sandy loam
H2 - 8 to 42 inches: sandy loam
H3 - 42 to 60 inches: sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.9 inches)

Interpretive groups

Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Madera

Percent of map unit: 10 percent
Hydric soil rating: No

San joaquin

Percent of map unit: 4 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

RaB—Ramona sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: hk9b
Elevation: 250 to 3,500 feet
Mean annual precipitation: 10 to 20 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 230 to 320 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Ramona and similar soils: 85 percent
Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ramona

Setting

Landform: Fan remnants
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Riser
Down-slope shape: Convex
Across-slope shape: Concave
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 8 inches: sandy loam
H2 - 8 to 42 inches: sandy loam
H3 - 42 to 60 inches: sandy loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.9 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Madera

Percent of map unit: 10 percent
Hydric soil rating: No

San joaquin

Percent of map unit: 4 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

TwA—Tujunga loamy sand, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: hkbs
Elevation: 10 to 1,500 feet
Mean annual precipitation: 10 to 25 inches
Mean annual air temperature: 59 to 64 degrees F
Frost-free period: 250 to 350 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Tujunga and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tujunga

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium derived from granite

Typical profile

H1 - 0 to 11 inches: loamy sand
H2 - 11 to 24 inches: stratified sand to loamy sand
H3 - 24 to 60 inches: stratified gravelly sand to gravelly loamy sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water storage in profile: Low (about 3.9 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Delhi

Percent of map unit: 5 percent
Hydric soil rating: No

Dinuba

Percent of map unit: 5 percent
Hydric soil rating: No

Hanford

Percent of map unit: 5 percent
Hydric soil rating: No

WrB—Whitney and Rocklin sandy loams, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: hkcg
Elevation: 200 to 1,500 feet
Mean annual precipitation: 15 inches
Mean annual air temperature: 61 degrees F
Frost-free period: 250 to 300 days
Farmland classification: Not prime farmland

Map Unit Composition

Whitney and similar soils: 41 percent
Rocklin and similar soils: 39 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Whitney

Setting

Landform: Fan remnants
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Riser
Down-slope shape: Convex
Across-slope shape: Concave
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 19 inches: sandy loam
H2 - 19 to 28 inches: fine sandy loam
Cr - 28 to 60 inches: weathered bedrock

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 28 to 32 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Medium

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.5 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Hydric soil rating: No

Description of Rocklin

Setting

Landform: Fan remnants
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Riser
Down-slope shape: Convex
Across-slope shape: Concave
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 18 inches: sandy loam
H2 - 18 to 31 inches: loam
H3 - 31 to 32 inches: indurated
H4 - 32 to 60 inches: stratified coarse sandy loam to fine sandy loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 31 to 32 inches to duripan
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Cometa

Percent of map unit: 10 percent
Hydric soil rating: No

San joaquin

Percent of map unit: 9 percent
Hydric soil rating: No

Unnamed, ponded

Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

WrC—Whitney and Rocklin sandy loams, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: hkch
Elevation: 200 to 1,500 feet
Mean annual precipitation: 15 inches
Mean annual air temperature: 61 degrees F
Frost-free period: 250 to 300 days
Farmland classification: Not prime farmland

Map Unit Composition

Whitney and similar soils: 41 percent
Rocklin and similar soils: 39 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Whitney

Setting

Landform: Fan remnants
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Riser
Down-slope shape: Convex
Across-slope shape: Concave
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 19 inches: sandy loam
H2 - 19 to 28 inches: fine sandy loam
Cr - 28 to 60 inches: weathered bedrock

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 28 to 32 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.5 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Hydric soil rating: No

Description of Rocklin

Setting

Landform: Fan remnants
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Riser
Down-slope shape: Convex
Across-slope shape: Concave
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 18 inches: sandy loam
H2 - 18 to 31 inches: loam
H3 - 31 to 32 inches: indurated
H4 - 32 to 60 inches: stratified coarse sandy loam to fine sandy loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 31 to 32 inches to duripan
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Cometa

Percent of map unit: 10 percent
Hydric soil rating: No

San joaquin

Percent of map unit: 9 percent
Hydric soil rating: No

Unnamed, ponded

Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

Soil Information for All Uses

Suitabilities and Limitations for Use

The Suitabilities and Limitations for Use section includes various soil interpretations displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each interpretation.

Land Classifications

Land Classifications are specified land use and management groupings that are assigned to soil areas because combinations of soil have similar behavior for specified practices. Most are based on soil properties and other factors that directly influence the specific use of the soil. Example classifications include ecological site classification, farmland classification, irrigated and nonirrigated land capability classification, and hydric rating.

Irrigated Capability Class

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations that show suitability and limitations of groups of soils for rangeland, for woodland, or for engineering purposes.

In the capability system, soils are generally grouped at three levels-capability class, subclass, and unit. Only class and subclass are included in this data set.

Capability classes, the broadest groups, are designated by the numbers 1 through 8. The numbers indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class 1 soils have few limitations that restrict their use.

Class 2 soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class 3 soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class 4 soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

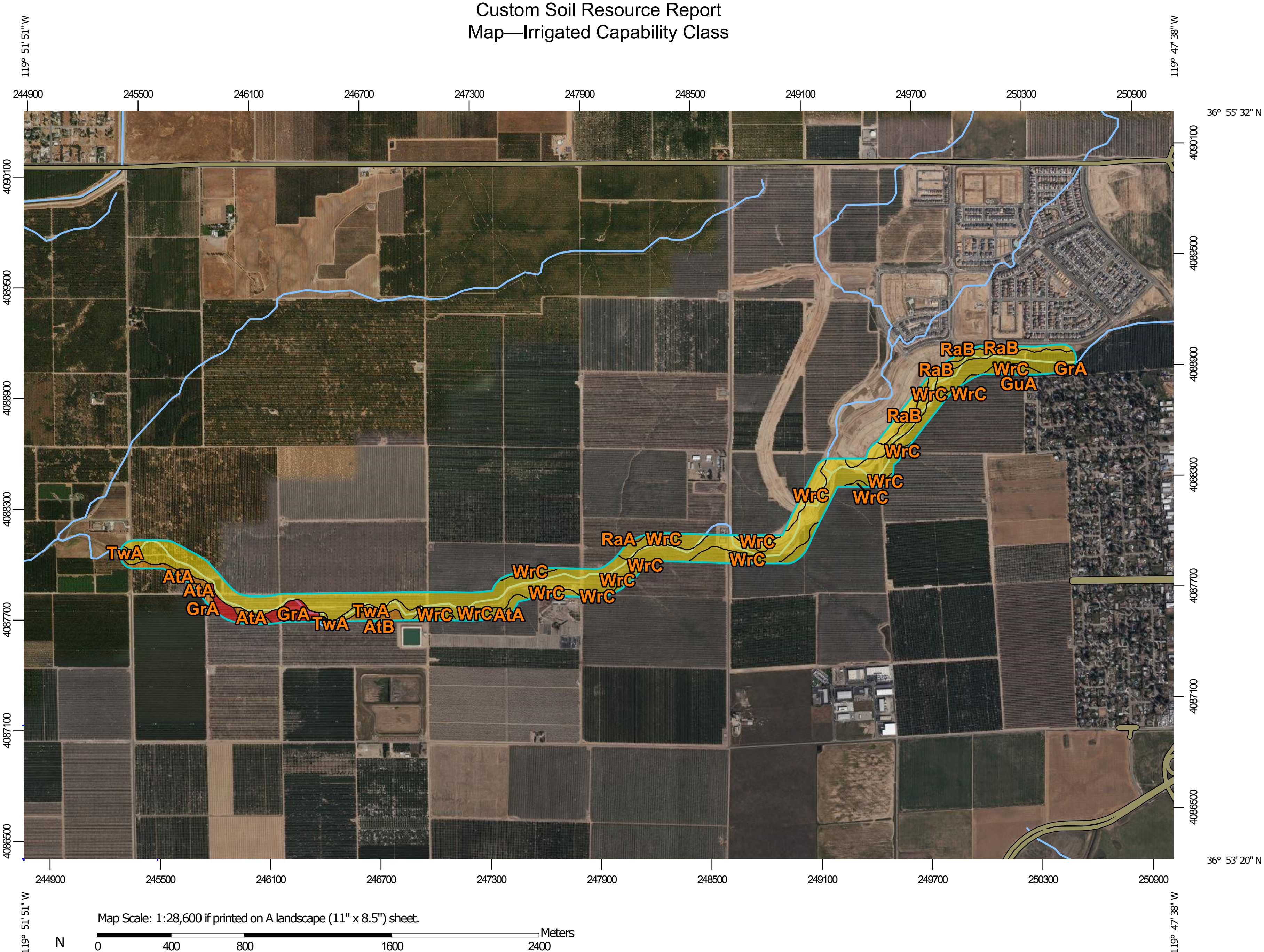
Class 5 soils are subject to little or no erosion but have other limitations, impractical to remove, that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Class 6 soils have severe limitations that make them generally unsuitable for cultivation and that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Class 7 soils have very severe limitations that make them unsuitable for cultivation and that restrict their use mainly to grazing, forestland, or wildlife habitat.

Class 8 soils and miscellaneous areas have limitations that preclude commercial plant production and that restrict their use to recreational purposes, wildlife habitat, watershed, or esthetic purposes.

Custom Soil Resource Report
Map—Irrigated Capability Class



Map Scale: 1:28,600 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0, 400, 800, 1600, 2400

Feet: 0, 1000, 2000, 4000, 6000

Map projection: Web Mercator   Corner coordinates: WGS84   Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

Capability Class - I

Capability Class - II

Capability Class - III

Capability Class - IV

Capability Class - V

Capability Class - VI

Capability Class - VII

Capability Class - VIII

Not rated or not available

Soil Rating Lines

Capability Class - I

Capability Class - II

Capability Class - III

Capability Class - IV

Capability Class - V

Capability Class - VI

Capability Class - VII

Capability Class - VIII

Not rated or not available

Soil Rating Points

Capability Class - I

Capability Class - II

Capability Class - III

Capability Class - IV

Capability Class - V

Capability Class - VI

Capability Class - VII

Capability Class - VIII

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Madera Area, California
Survey Area Data: Version 14, Jun 1, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 5, 2015—Mar 5, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Irrigated Capability Class

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AtA	Atwater loamy sand, 0 to 3 percent slopes, MLRA 17	2	3.3	1.5%
AtB	Atwater loamy sand, 3 to 8 percent slopes, MLRA 17	2	8.0	3.6%
GrA	Greenfield coarse sandy loam, 0 to 3 percent slopes	1	9.1	4.0%
GuA	Greenfield sandy loam, 0 to 3 percent slopes	1	0.0	0.0%
RaA	Ramona sandy loam, 0 to 3 percent slopes	2	0.3	0.1%
RaB	Ramona sandy loam, 3 to 8 percent slopes	3	6.3	2.8%
TwA	Tujunga loamy sand, 0 to 3 percent slopes	3	6.0	2.7%
WrB	Whitney and Rocklin sandy loams, 3 to 8 percent slopes	3	136.8	61.2%
WrC	Whitney and Rocklin sandy loams, 8 to 15 percent slopes	3	54.0	24.2%
Totals for Area of Interest			**223.7**	**100.0%**

Rating Options—Irrigated Capability Class

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie. The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Higher

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

Irrigated Capability Class

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations that show suitability and limitations of groups of soils for rangeland, for woodland, or for engineering purposes.

In the capability system, soils are generally grouped at three levels-capability class, subclass, and unit. Only class and subclass are included in this data set.

Capability classes, the broadest groups, are designated by the numbers 1 through 8. The numbers indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class 1 soils have few limitations that restrict their use.

Class 2 soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class 3 soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class 4 soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

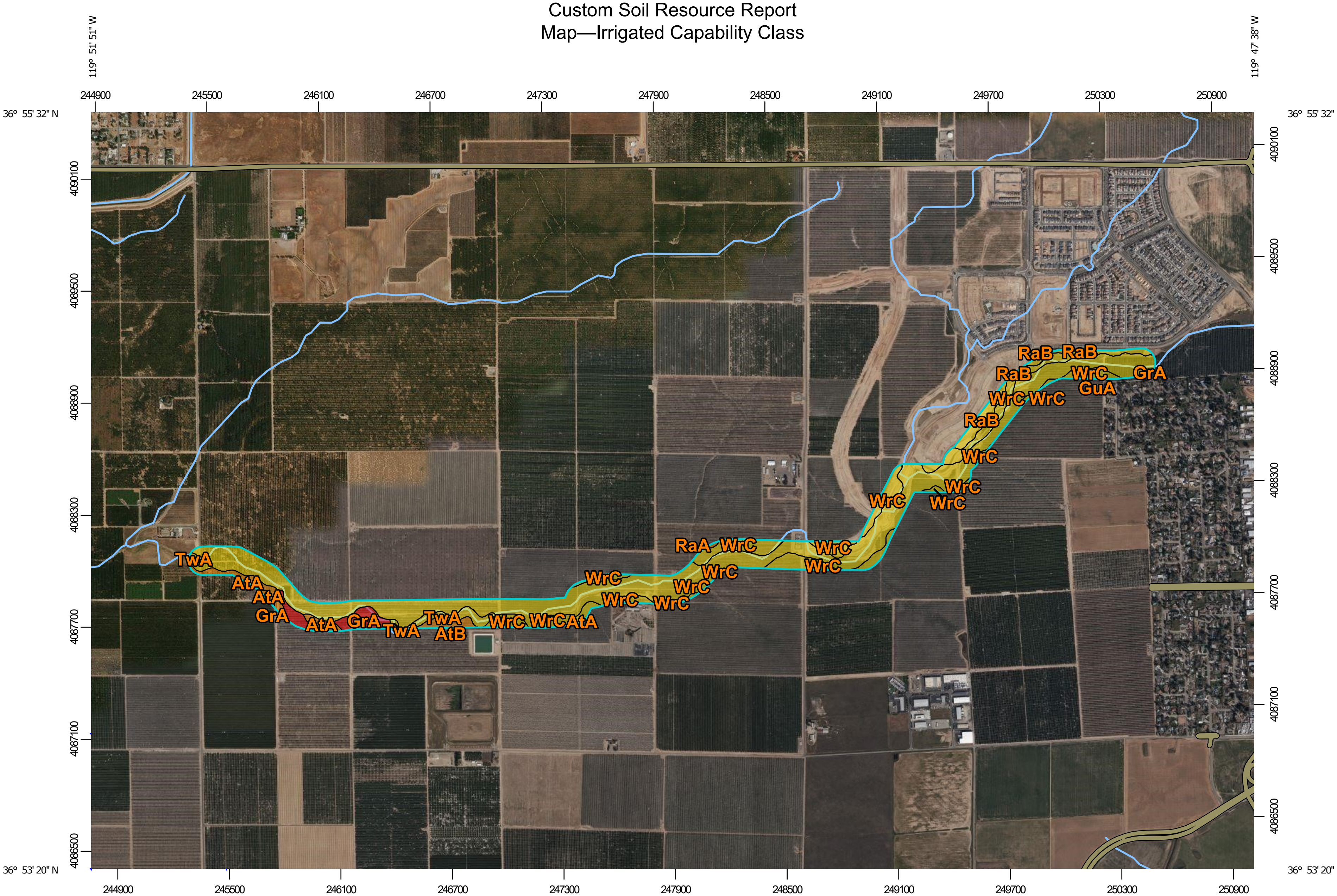
Class 5 soils are subject to little or no erosion but have other limitations, impractical to remove, that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Class 6 soils have severe limitations that make them generally unsuitable for cultivation and that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Class 7 soils have very severe limitations that make them unsuitable for cultivation and that restrict their use mainly to grazing, forestland, or wildlife habitat.

Class 8 soils and miscellaneous areas have limitations that preclude commercial plant production and that restrict their use to recreational purposes, wildlife habitat, watershed, or esthetic purposes.

Custom Soil Resource Report
Map—Irrigated Capability Class



Map Scale: 1:28,600 if printed on A landscape (11" x 8.5") sheet.

Meters: 0 400 800 1600 2400

Feet: 0 1000 2000 4000 6000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

Capability Class - I

Capability Class - II

Capability Class - III

Capability Class - IV

Capability Class - V

Capability Class - VI

Capability Class - VII

Capability Class - VIII

Not rated or not available

Soil Rating Lines

Capability Class - I

Capability Class - II

Capability Class - III

Capability Class - IV

Capability Class - V

Capability Class - VI

Capability Class - VII

Capability Class - VIII

Not rated or not available

Soil Rating Points

Capability Class - I

Capability Class - II

Capability Class - III

Capability Class - IV

Capability Class - V

Capability Class - VI

Capability Class - VII

Capability Class - VIII

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Madera Area, California
Survey Area Data: Version 14, Jun 1, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 5, 2015—Mar 5, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Irrigated Capability Class

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AtA	Atwater loamy sand, 0 to 3 percent slopes, MLRA 17	2	3.3	1.5%
AtB	Atwater loamy sand, 3 to 8 percent slopes, MLRA 17	2	8.0	3.6%
GrA	Greenfield coarse sandy loam, 0 to 3 percent slopes	1	9.1	4.0%
GuA	Greenfield sandy loam, 0 to 3 percent slopes	1	0.0	0.0%
RaA	Ramona sandy loam, 0 to 3 percent slopes	2	0.3	0.1%
RaB	Ramona sandy loam, 3 to 8 percent slopes	3	6.3	2.8%
TwA	Tujunga loamy sand, 0 to 3 percent slopes	3	6.0	2.7%
WrB	Whitney and Rocklin sandy loams, 3 to 8 percent slopes	3	136.8	61.2%
WrC	Whitney and Rocklin sandy loams, 8 to 15 percent slopes	3	54.0	24.2%
Totals for Area of Interest			**223.7**	**100.0%**

Rating Options—Irrigated Capability Class

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie. The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Higher

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

Glossary

Many of the terms relating to landforms, geology, and geomorphology are defined in more detail in the following National Soil Survey Handbook link: "National Soil Survey Handbook."

ABC soil

A soil having an A, a B, and a C horizon.

Ablation till

Loose, relatively permeable earthy material deposited during the downwasting of nearly static glacial ice, either contained within or accumulated on the surface of the glacier.

AC soil

A soil having only an A and a C horizon. Commonly, such soil formed in recent alluvium or on steep, rocky slopes.

Aeration, soil

The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil

Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil

A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvial cone

A semiconical type of alluvial fan having very steep slopes. It is higher, narrower, and steeper than a fan and is composed of coarser and thicker layers of material deposited by a combination of alluvial episodes and (to a much lesser degree) landslides (debris flow). The coarsest materials tend to be concentrated at the apex of the cone.

Alluvial fan

A low, outspread mass of loose materials and/or rock material, commonly with gentle slopes. It is shaped like an open fan or a segment of a cone. The material was deposited by a stream at the place where it issues from a narrow mountain valley or upland valley or where a tributary stream is near or at its junction with the main stream. The fan is steepest near its apex, which points upstream, and slopes gently and convexly outward (downstream) with a gradual decrease in gradient.

Alluvium

Unconsolidated material, such as gravel, sand, silt, clay, and various mixtures of these, deposited on land by running water.

Alpha,alpha-dipyridyl

A compound that when dissolved in ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction implies reducing conditions and the likely presence of redoximorphic features.

Animal unit month (AUM)

The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Aquic conditions

Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Argillic horizon

A subsoil horizon characterized by an accumulation of illuvial clay.

Arroyo

The flat-floored channel of an ephemeral stream, commonly with very steep to vertical banks cut in unconsolidated material. It is usually dry but can be transformed into a temporary watercourse or short-lived torrent after heavy rain within the watershed.

Aspect

The direction toward which a slope faces. Also called slope aspect.

Association, soil

A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity)

The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low: 0 to 3
Low: 3 to 6
Moderate: 6 to 9
High: 9 to 12
Very high: More than 12

Backslope

The position that forms the steepest and generally linear, middle portion of a hillslope. In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below.

Backswamp

A flood-plain landform. Extensive, marshy or swampy, depressed areas of flood plains between natural levees and valley sides or terraces.

Badland

A landscape that is intricately dissected and characterized by a very fine drainage network with high drainage densities and short, steep slopes and narrow interfluves. Badlands develop on surfaces that have little or no vegetative cover overlying unconsolidated or poorly cemented materials (clays, silts, or sandstones) with, in some cases, soluble minerals, such as gypsum or halite.

Bajada

A broad, gently inclined alluvial piedmont slope extending from the base of a mountain range out into a basin and formed by the lateral coalescence of a series of alluvial fans. Typically, it has a broadly undulating transverse profile, parallel to the mountain front, resulting from the convexities of component fans. The term is generally restricted to constructional slopes of intermontane basins.

Basal area

The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

Base saturation

The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Base slope (geomorphology)

A geomorphic component of hills consisting of the concave to linear (perpendicular to the contour) slope that, regardless of the lateral shape, forms an apron or wedge at the bottom of a hillside dominated by colluvium and slope-wash sediments (for example, slope alluvium).

Bedding plane

A planar or nearly planar bedding surface that visibly separates each successive layer of stratified sediment or rock (of the same or different lithology) from the preceding or following layer; a plane of deposition. It commonly marks a change in the circumstances of deposition and may show a parting, a color difference, a change in particle size, or various combinations of these. The term is commonly applied to any bedding surface, even one that is conspicuously bent or deformed by folding.

Bedding system

A drainage system made by plowing, grading, or otherwise shaping the surface of a flat field. It consists of a series of low ridges separated by shallow, parallel dead furrows.

Bedrock

The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-controlled topography

A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

Bench terrace

A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bisequum

Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Blowout (map symbol)

A saucer-, cup-, or trough-shaped depression formed by wind erosion on a preexisting dune or other sand deposit, especially in an area of shifting sand or loose soil or where protective vegetation is disturbed or destroyed. The adjoining accumulation of sand derived from the depression, where recognizable, is commonly included. Blowouts are commonly small.

Borrow pit (map symbol)

An open excavation from which soil and underlying material have been removed, usually for construction purposes.

Bottom land

An informal term loosely applied to various portions of a flood plain.

Boulders

Rock fragments larger than 2 feet (60 centimeters) in diameter.

Breaks

A landscape or tract of steep, rough or broken land dissected by ravines and gullies and marking a sudden change in topography.

Breast height

An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

Brush management

Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Butte

An isolated, generally flat-topped hill or mountain with relatively steep slopes and talus or precipitous cliffs and characterized by summit width that is less than the height of bounding escarpments; commonly topped by a caprock of resistant material and representing an erosion remnant carved from flat-lying rocks.

Cable yarding

A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To reduce friction and soil disturbance, felled trees generally are reeled in while one end is lifted or the entire log is suspended.

Calcareous soil

A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Caliche

A general term for a prominent zone of secondary carbonate accumulation in surficial materials in warm, subhumid to arid areas. Caliche is formed by both geologic and pedologic processes. Finely crystalline calcium carbonate forms a nearly continuous surface-coating and void-filling medium in geologic (parent) materials. Cementation ranges from weak in nonindurated forms to very strong in indurated forms. Other minerals (e.g., carbonates, silicate, and sulfate) may occur as accessory cements. Most petrocalcic horizons and some calcic horizons are caliche.

California bearing ratio (CBR)

The load-supporting capacity of a soil as compared to that of standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Canopy

The leafy crown of trees or shrubs. (See Crown.)

Canyon

A long, deep, narrow valley with high, precipitous walls in an area of high local relief.

Capillary water

Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena

A sequence, or “chain,” of soils on a landscape that formed in similar kinds of parent material and under similar climatic conditions but that have different characteristics as a result of differences in relief and drainage.

Cation

An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity

The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Catsteps

See Terracettes.

Cement rock

Shaly limestone used in the manufacture of cement.

Channery soil material

Soil material that has, by volume, 15 to 35 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches (15 centimeters) along the longest axis. A single piece is called a channer.

Chemical treatment

Control of unwanted vegetation through the use of chemicals.

Chiseling

Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Cirque

A steep-walled, semicircular or crescent-shaped, half-bowl-like recess or hollow, commonly situated at the head of a glaciated mountain valley or high on the side of a mountain. It was produced by the erosive activity of a mountain glacier. It commonly contains a small round lake (tarn).

Clay

As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay depletions

See Redoximorphic features.

Clay film

A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Clay spot (map symbol)

A spot where the surface texture is silty clay or clay in areas where the surface layer of the soils in the surrounding map unit is sandy loam, loam, silt loam, or coarser.

Claypan

A dense, compact subsoil layer that contains much more clay than the overlying materials, from which it is separated by a sharply defined boundary. The layer restricts the downward movement of water through the soil. A claypan is commonly hard when dry and plastic and sticky when wet.

Climax plant community

The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse textured soil

Sand or loamy sand.

Cobble (or cobblestone)

A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material

Material that has 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

COLE (coefficient of linear extensibility)

See Linear extensibility.

Colluvium

Unconsolidated, unsorted earth material being transported or deposited on side slopes and/or at the base of slopes by mass movement (e.g., direct gravitational action) and by local, unconcentrated runoff.

Complex slope

Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil

A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions

See Redoximorphic features.

Conglomerate

A coarse grained, clastic sedimentary rock composed of rounded or subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer textured material. Conglomerate is the consolidated equivalent of gravel.

Conservation cropping system

Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage

A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil

Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the “Soil Survey Manual.”

Contour stripcropping

Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section

The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coprogenous earth (sedimentary peat)

A type of limnic layer composed predominantly of fecal material derived from aquatic animals.

Corrosion (geomorphology)

A process of erosion whereby rocks and soil are removed or worn away by natural chemical processes, especially by the solvent action of running water, but also by other reactions, such as hydrolysis, hydration, carbonation, and oxidation.

Corrosion (soil survey interpretations)

Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop

A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Crop residue management

Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cropping system

Growing crops according to a planned system of rotation and management practices.

Cross-slope farming

Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Crown

The upper part of a tree or shrub, including the living branches and their foliage.

Cryoturbate

A mass of soil or other unconsolidated earthy material moved or disturbed by frost action. It is typically coarser than the underlying material.

Cuesta

An asymmetric ridge capped by resistant rock layers of slight or moderate dip (commonly less than 15 percent slopes); a type of homocline produced by differential erosion of interbedded resistant and weak rocks. A cuesta has a long, gentle slope on one side (dip slope) that roughly parallels the inclined beds; on the other side, it has a relatively short and steep or clifflike slope (scarp) that cuts through the tilted rocks.

Culmination of the mean annual increment (CMAI)

The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.

Cutbanks cave

The walls of excavations tend to cave in or slough.

Decreasers

The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing

Postponing grazing or resting grazing land for a prescribed period.

Delta

A body of alluvium having a surface that is fan shaped and nearly flat; deposited at or near the mouth of a river or stream where it enters a body of relatively quiet water, generally a sea or lake.

Dense layer

A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depression, closed (map symbol)

A shallow, saucer-shaped area that is slightly lower on the landscape than the surrounding area and that does not have a natural outlet for surface drainage.

Depth, soil

Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Desert pavement

A natural, residual concentration or layer of wind-polished, closely packed gravel, boulders, and other rock fragments mantling a desert surface. It forms where wind action and sheetwash have removed all smaller particles or where rock fragments have migrated upward through sediments to the surface. It typically protects the finer grained underlying material from further erosion.

Diatomaceous earth

A geologic deposit of fine, grayish siliceous material composed chiefly or entirely of the remains of diatoms.

Dip slope

A slope of the land surface, roughly determined by and approximately conforming to the dip of the underlying bedrock.

Diversion (or diversion terrace)

A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Divided-slope farming

A form of field stripcropping in which crops are grown in a systematic arrangement of two strips, or bands, across the slope to reduce the hazard of water erosion. One strip is in a close-growing crop that provides protection from erosion, and the other strip is in a crop that provides less protection from erosion. This practice is used where slopes are not long enough to permit a full stripcropping pattern to be used.

Drainage class (natural)

Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,* and *very poorly drained*. These classes are defined in the "Soil Survey Manual."

Drainage, surface

Runoff, or surface flow of water, from an area.

Drainageway

A general term for a course or channel along which water moves in draining an area. A term restricted to relatively small, linear depressions that at some time move concentrated water and either do not have a defined channel or have only a small defined channel.

Draw

A small stream valley that generally is shallower and more open than a ravine or gulch and that has a broader bottom. The present stream channel may appear inadequate to have cut the drainageway that it occupies.

Drift

A general term applied to all mineral material (clay, silt, sand, gravel, and boulders) transported by a glacier and deposited directly by or from the ice or transported by running water emanating from a glacier. Drift includes unstratified material (till) that forms moraines and stratified deposits that form outwash plains, eskers, kames, varves, and glaciofluvial sediments. The term is generally applied to Pleistocene glacial deposits in areas that no longer contain glaciers.

Drumlin

A low, smooth, elongated oval hill, mound, or ridge of compact till that has a core of bedrock or drift. It commonly has a blunt nose facing the direction from which the ice approached and a gentler slope tapering in the other direction. The longer axis is parallel to the general direction of glacier flow. Drumlins are products of streamline (laminar) flow of glaciers, which molded the subglacial floor through a combination of erosion and deposition.

Duff

A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Dune

A low mound, ridge, bank, or hill of loose, windblown granular material (generally sand), either barren and capable of movement from place to place or covered and stabilized with vegetation but retaining its characteristic shape.

Earthy fill

See Mine spoil.

Ecological site

An area where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. An ecological site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other ecological sites in kind and/or proportion of species or in total production.

Eluviation

The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation

A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Eolian deposit

Sand-, silt-, or clay-sized clastic material transported and deposited primarily by wind, commonly in the form of a dune or a sheet of sand or loess.

Ephemeral stream

A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Episaturation

A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion

The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (accelerated)

Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Erosion (geologic)

Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion pavement

A surficial lag concentration or layer of gravel and other rock fragments that remains on the soil surface after sheet or rill erosion or wind has removed the finer soil particles and that tends to protect the underlying soil from further erosion.

Erosion surface

A land surface shaped by the action of erosion, especially by running water.

Escarpment

A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Most commonly applied to cliffs produced by differential erosion. Synonym: scarp.

Escarpment, bedrock (map symbol)

A relatively continuous and steep slope or cliff, produced by erosion or faulting, that breaks the general continuity of more gently sloping land surfaces. Exposed material is hard or soft bedrock.

Escarpment, nonbedrock (map symbol)

A relatively continuous and steep slope or cliff, generally produced by erosion but in some places produced by faulting, that breaks the continuity of more gently sloping land surfaces. Exposed earthy material is nonsoil or very shallow soil.

Esker

A long, narrow, sinuous, steep-sided ridge of stratified sand and gravel deposited as the bed of a stream flowing in an ice tunnel within or below the ice (subglacial) or between ice walls on top of the ice of a wasting glacier and left behind as high ground when the ice melted. Eskers range in length from less than a kilometer to more than 160 kilometers and in height from 3 to 30 meters.

Extrusive rock

Igneous rock derived from deep-seated molten matter (magma) deposited and cooled on the earth's surface.

Fallow

Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fan remnant

A general term for landforms that are the remaining parts of older fan landforms, such as alluvial fans, that have been either dissected or partially buried.

Fertility, soil

The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat)

The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity

The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity*.

Fill slope

A sloping surface consisting of excavated soil material from a road cut. It commonly is on the downhill side of the road.

Fine textured soil

Sandy clay, silty clay, or clay.

Firebreak

An area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of firefighters and equipment. Designated roads also serve as firebreaks.

First bottom

An obsolete, informal term loosely applied to the lowest flood-plain steps that are subject to regular flooding.

Flaggy soil material

Material that has, by volume, 15 to 35 percent flagstones. Very flaggy soil material has 35 to 60 percent flagstones, and extremely flaggy soil material has more than 60 percent flagstones.

Flagstone

A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain

The nearly level plain that borders a stream and is subject to flooding unless protected artificially.

Flood-plain landforms

A variety of constructional and erosional features produced by stream channel migration and flooding. Examples include backswamps, flood-plain splays, meanders, meander belts, meander scrolls, oxbow lakes, and natural levees.

Flood-plain splay

A fan-shaped deposit or other outspread deposit formed where an overloaded stream breaks through a levee (natural or artificial) and deposits its material (commonly coarse grained) on the flood plain.

Flood-plain step

An essentially flat, terrace-like alluvial surface within a valley that is frequently covered by floodwater from the present stream; any approximately horizontal surface still actively modified by fluvial scour and/or deposition. May occur individually or as a series of steps.

Fluvial

Of or pertaining to rivers or streams; produced by stream or river action.

Foothills

A region of steeply sloping hills that fringes a mountain range or high-plateau escarpment. The hills have relief of as much as 1,000 feet (300 meters).

Footslope

The concave surface at the base of a hillslope. A footslope is a transition zone between upslope sites of erosion and transport (shoulders and backslopes) and downslope sites of deposition (toeslopes).

Forb

Any herbaceous plant not a grass or a sedge.

Forest cover

All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type

A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Fragipan

A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Genesis, soil

The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gilgai

Commonly, a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of clayey soils that shrink and swell considerably with changes in moisture content.

Glaciofluvial deposits

Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur in the form of outwash plains, valley trains, deltas, kames, eskers, and kame terraces.

Glaciolacustrine deposits

Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are bedded or laminated.

Gleyed soil

Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Graded stripcropping

Growing crops in strips that grade toward a protected waterway.

Grassed waterway

A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel

Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravel pit (map symbol)

An open excavation from which soil and underlying material have been removed and used, without crushing, as a source of sand or gravel.

Gravelly soil material

Material that has 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Gravelly spot (map symbol)

A spot where the surface layer has more than 35 percent, by volume, rock fragments that are mostly less than 3 inches in diameter in an area that has less than 15 percent rock fragments.

Green manure crop (agronomy)

A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water

Water filling all the unblocked pores of the material below the water table.

Gully (map symbol)

A small, steep-sided channel caused by erosion and cut in unconsolidated materials by concentrated but intermittent flow of water. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage whereas a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hard bedrock

Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hard to reclaim

Reclamation is difficult after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Hardpan

A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Head slope (geomorphology)

A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway. The overland waterflow is converging.

Hemic soil material (mucky peat)

Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-residue crops

Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill

A generic term for an elevated area of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline. Slopes are generally more than 15 percent. The distinction between a hill and a mountain is arbitrary and may depend on local usage.

Hillslope

A generic term for the steeper part of a hill between its summit and the drainage line, valley flat, or depression floor at the base of a hill.

Horizon, soil

A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the “Soil Survey Manual.” The major horizons of mineral soil are as follows:

O horizon: An organic layer of fresh and decaying plant residue.

L horizon: A layer of organic and mineral limnic materials, including coprogenous earth (sedimentary peat), diatomaceous earth, and marl.

A horizon: The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon: The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon: The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon: The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon: Soft, consolidated bedrock beneath the soil.

R layer: Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

M layer: A root-limiting subsoil layer consisting of nearly continuous, horizontally oriented, human-manufactured materials.

W layer: A layer of water within or beneath the soil.

Humus

The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups

Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties include depth to a seasonal high water table, the infiltration rate, and depth to a layer that significantly restricts the downward movement of water. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Igneous rock

Rock that was formed by cooling and solidification of magma and that has not been changed appreciably by weathering since its formation. Major varieties include plutonic and volcanic rock (e.g., andesite, basalt, and granite).

Illuviation

The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil

A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers

Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration

The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity

The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate

The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate

The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Very low: Less than 0.2
Low: 0.2 to 0.4
Moderately low: 0.4 to 0.75
Moderate: 0.75 to 1.25
Moderately high: 1.25 to 1.75
High: 1.75 to 2.5
Very high: More than 2.5

Interfluve

A landform composed of the relatively undissected upland or ridge between two adjacent valleys containing streams flowing in the same general direction. An elevated area between two drainageways that sheds water to those drainageways.

Interfluve (geomorphology)

A geomorphic component of hills consisting of the uppermost, comparatively level or gently sloping area of a hill; shoulders of backwearing hillslopes can narrow the upland or can merge, resulting in a strongly convex shape.

Intermittent stream

A stream, or reach of a stream, that does not flow year-round but that is commonly dry for 3 or more months out of 12 and whose channel is generally below the local water table. It flows only during wet periods or when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Invaders

On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

Iron depletions

See Redoximorphic features.

Irrigation

Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin: Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border: Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding: Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation: Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle): Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow: Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler: Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation: Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding: Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame

A low mound, knob, hummock, or short irregular ridge composed of stratified sand and gravel deposited by a subglacial stream as a fan or delta at the margin of a melting glacier; by a supraglacial stream in a low place or hole on the surface of the glacier; or as a ponded deposit on the surface or at the margin of stagnant ice.

Karst (topography)

A kind of topography that formed in limestone, gypsum, or other soluble rocks by dissolution and that is characterized by closed depressions, sinkholes, caves, and underground drainage.

Knoll

A small, low, rounded hill rising above adjacent landforms.

Ksat

See Saturated hydraulic conductivity.

Lacustrine deposit

Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Lake plain

A nearly level surface marking the floor of an extinct lake filled by well sorted, generally fine textured, stratified deposits, commonly containing varves.

Lake terrace

A narrow shelf, partly cut and partly built, produced along a lakeshore in front of a scarp line of low cliffs and later exposed when the water level falls.

Landfill (map symbol)

An area of accumulated waste products of human habitation, either above or below natural ground level.

Landslide

A general, encompassing term for most types of mass movement landforms and processes involving the downslope transport and outward deposition of soil and rock materials caused by gravitational forces; the movement may or may not involve saturated materials. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones

Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Lava flow (map symbol)

A solidified, commonly lobate body of rock formed through lateral, surface outpouring of molten lava from a vent or fissure.

Leaching

The removal of soluble material from soil or other material by percolating water.

Levee (map symbol)

An embankment that confines or controls water, especially one built along the banks of a river to prevent overflow onto lowlands.

Linear extensibility

Refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. Linear extensibility is used to determine the shrink-swell potential of soils. It is an expression of the volume change between the water content of the clod at $^{1}/_{3}$- or $^{1}/_{10}$-bar tension (33kPa or 10kPa tension) and oven dryness. Volume change is influenced by the amount and type of clay minerals in the soil. The volume change is the percent change for the whole soil. If it is expressed as a fraction, the resulting value is COLE, coefficient of linear extensibility.

Liquid limit

The moisture content at which the soil passes from a plastic to a liquid state.

Loam

Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess

Material transported and deposited by wind and consisting dominantly of silt-sized particles.

Low strength

The soil is not strong enough to support loads.

Low-residue crops

Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Marl

An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal proportions; formed primarily under freshwater lacustrine conditions but also formed in more saline environments.

Marsh or swamp (map symbol)

A water-saturated, very poorly drained area that is intermittently or permanently covered by water. Sedges, cattails, and rushes are the dominant vegetation in marshes, and trees or shrubs are the dominant vegetation in swamps. Not used in map units where the named soils are poorly drained or very poorly drained.

Mass movement

A generic term for the dislodgment and downslope transport of soil and rock material as a unit under direct gravitational stress.

Masses

See Redoximorphic features.

Meander belt

The zone within which migration of a meandering channel occurs; the flood-plain area included between two imaginary lines drawn tangential to the outer bends of active channel loops.

Meander scar

A crescent-shaped, concave or linear mark on the face of a bluff or valley wall, produced by the lateral erosion of a meandering stream that impinged upon and undercut the bluff.

Meander scroll

One of a series of long, parallel, close-fitting, crescent-shaped ridges and troughs formed along the inner bank of a stream meander as the channel migrated laterally down-valley and toward the outer bank.

Mechanical treatment

Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil

Very fine sandy loam, loam, silt loam, or silt.

Mesa

A broad, nearly flat topped and commonly isolated landmass bounded by steep slopes or precipitous cliffs and capped by layers of resistant, nearly horizontal rocky material. The summit width is characteristically greater than the height of the bounding escarpments.

Metamorphic rock

Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement at depth in the earth’s crust. Nearly all such rocks are crystalline.

Mine or quarry (map symbol)

An open excavation from which soil and underlying material have been removed and in which bedrock is exposed. Also denotes surface openings to underground mines.

Mine spoil

An accumulation of displaced earthy material, rock, or other waste material removed during mining or excavation. Also called earthy fill.

Mineral soil

Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage

Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area

A kind of map unit that has little or no natural soil and supports little or no vegetation.

Miscellaneous water (map symbol)

Small, constructed bodies of water that are used for industrial, sanitary, or mining applications and that contain water most of the year.

Moderately coarse textured soil

Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil

Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon

A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Moraine

In terms of glacial geology, a mound, ridge, or other topographically distinct accumulation of unsorted, unstratified drift, predominantly till, deposited primarily by the direct action of glacial ice in a variety of landforms. Also, a general term for a landform composed mainly of till (except for kame moraines, which are composed mainly of stratified outwash) that has been deposited by a glacier. Some types of moraines are disintegration, end, ground, kame, lateral, recessional, and terminal.

Morphology, soil

The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil

Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Mountain

A generic term for an elevated area of the land surface, rising more than 1,000 feet (300 meters) above surrounding lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep sides. A mountain can occur as a single, isolated mass or in a group forming a chain or range. Mountains are formed primarily by tectonic activity and/or volcanic action but can also be formed by differential erosion.

Muck

Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Mucky peat

See Hemic soil material.

Mudstone

A blocky or massive, fine grained sedimentary rock in which the proportions of clay and silt are approximately equal. Also, a general term for such material as clay, silt, claystone, siltstone, shale, and argillite and that should be used only when the amounts of clay and silt are not known or cannot be precisely identified.

Munsell notation

A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Natric horizon

A special kind of argillic horizon that contains enough exchangeable sodium to have an adverse effect on the physical condition of the subsoil.

Neutral soil

A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nodules

See Redoximorphic features.

Nose slope (geomorphology)

A geomorphic component of hills consisting of the projecting end (laterally convex area) of a hillside. The overland waterflow is predominantly divergent. Nose slopes consist dominantly of colluvium and slope-wash sediments (for example, slope alluvium).

Nutrient, plant

Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter

Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low: Less than 0.5 percent
Low: 0.5 to 1.0 percent
Moderately low: 1.0 to 2.0 percent
Moderate: 2.0 to 4.0 percent
High: 4.0 to 8.0 percent
Very high: More than 8.0 percent

Outwash

Stratified and sorted sediments (chiefly sand and gravel) removed or “washed out” from a glacier by meltwater streams and deposited in front of or beyond the end moraine or the margin of a glacier. The coarser material is deposited nearer to the ice.

Outwash plain

An extensive lowland area of coarse textured glaciofluvial material. An outwash plain is commonly smooth; where pitted, it generally is low in relief.

Paleoterrace

An erosional remnant of a terrace that retains the surface form and alluvial deposits of its origin but was not emplaced by, and commonly does not grade to, a present-day stream or drainage network.

Pan

A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

Parent material

The unconsolidated organic and mineral material in which soil forms.

Peat

Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped

An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedisediment

A layer of sediment, eroded from the shoulder and backslope of an erosional slope, that lies on and is being (or was) transported across a gently sloping erosional surface at the foot of a receding hill or mountain slope.

Pedon

The smallest volume that can be called “a soil.” A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation

The movement of water through the soil.

Perennial water (map symbol)

Small, natural or constructed lakes, ponds, or pits that contain water most of the year.

Permafrost

Ground, soil, or rock that remains at or below 0 degrees C for at least 2 years. It is defined on the basis of temperature and is not necessarily frozen.

pH value

A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Phase, soil

A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

Piping

Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Pitting

Pits caused by melting around ice. They form on the soil after plant cover is removed.

Plastic limit

The moisture content at which a soil changes from semisolid to plastic.

Plasticity index

The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plateau (geomorphology)

A comparatively flat area of great extent and elevation; specifically, an extensive land region that is considerably elevated (more than 100 meters) above the adjacent lower lying terrain, is commonly limited on at least one side by an abrupt descent, and has a flat or nearly level surface. A comparatively large part of a plateau surface is near summit level.

Playa

The generally dry and nearly level lake plain that occupies the lowest parts of closed depressions, such as those on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation and runoff. Playa deposits are fine grained and may or may not have a high water table and saline conditions.

Plinthite

The sesquioxide-rich, humus-poor, highly weathered mixture of clay with quartz and other diluents. It commonly appears as red mottles, usually in platy, polygonal, or reticulate patterns. Plinthite changes irreversibly to an ironstone hardpan or to irregular aggregates on repeated wetting and drying, especially if it is exposed also to heat from the sun. In a moist soil, plinthite can be cut with a spade. It is a form of laterite.

Plowpan

A compacted layer formed in the soil directly below the plowed layer.

Ponding

Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded

Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Pore linings

See Redoximorphic features.

Potential native plant community

See Climax plant community.

Potential rooting depth (effective rooting depth)

Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning

Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.

Productivity, soil

The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil

A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use

Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Rangeland

Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Reaction, soil

A measure of acidity or alkalinity of a soil, expressed as pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid: Less than 3.5
Extremely acid: 3.5 to 4.4
Very strongly acid: 4.5 to 5.0
Strongly acid: 5.1 to 5.5
Moderately acid: 5.6 to 6.0
Slightly acid: 6.1 to 6.5
Neutral: 6.6 to 7.3
Slightly alkaline: 7.4 to 7.8
Moderately alkaline: 7.9 to 8.4
Strongly alkaline: 8.5 to 9.0
Very strongly alkaline: 9.1 and higher

Red beds

Sedimentary strata that are mainly red and are made up largely of sandstone and shale.

Redoximorphic concentrations

See Redoximorphic features.

Redoximorphic depletions

See Redoximorphic features.

Redoximorphic features

Redoximorphic features are associated with wetness and result from alternating periods of reduction and oxidation of iron and manganese compounds in the soil. Reduction occurs during saturation with water, and oxidation occurs when the soil is not saturated. Characteristic color patterns are created by these processes. The reduced iron and manganese ions may be removed from a soil if vertical or lateral fluxes of water occur, in which case there is no iron or manganese precipitation in that soil. Wherever the iron and manganese are oxidized and precipitated, they form either soft masses or hard concretions or nodules. Movement of iron and manganese as a result of redoximorphic processes in a soil may result in redoximorphic features that are defined as follows:

1. Redoximorphic concentrations.—These are zones of apparent accumulation of iron-manganese oxides, including:
   A. Nodules and concretions, which are cemented bodies that can be removed from the soil intact. Concretions are distinguished from nodules on the basis of internal organization. A concretion typically has concentric layers that are visible to the naked eye. Nodules do not have visible organized internal structure; *and*
   B. Masses, which are noncemented concentrations of substances within the soil matrix; *and*
   C. Pore linings, i.e., zones of accumulation along pores that may be either coatings on pore surfaces or impregnations from the matrix adjacent to the pores.
2. Redoximorphic depletions.—These are zones of low chroma (chromas less than those in the matrix) where either iron-manganese oxides alone or both iron-manganese oxides and clay have been stripped out, including:
   A. Iron depletions, i.e., zones that contain low amounts of iron and manganese oxides but have a clay content similar to that of the adjacent matrix; *and*
   B. Clay depletions, i.e., zones that contain low amounts of iron, manganese, and clay (often referred to as silt coatings or skeletans).
3. Reduced matrix.—This is a soil matrix that has low chroma *in situ* but undergoes a change in hue or chroma within 30 minutes after the soil material has been exposed to air.

Reduced matrix

See Redoximorphic features.

Regolith

All unconsolidated earth materials above the solid bedrock. It includes material weathered in place from all kinds of bedrock and alluvial, glacial, eolian, lacustrine, and pyroclastic deposits.

Relief

The relative difference in elevation between the upland summits and the lowlands or valleys of a given region.

Residuum (residual soil material)

Unconsolidated, weathered or partly weathered mineral material that accumulated as bedrock disintegrated in place.

Rill

A very small, steep-sided channel resulting from erosion and cut in unconsolidated materials by concentrated but intermittent flow of water. A rill generally is not an obstacle to wheeled vehicles and is shallow enough to be smoothed over by ordinary tillage.

Riser

The vertical or steep side slope (e.g., escarpment) of terraces, flood-plain steps, or other stepped landforms; commonly a recurring part of a series of natural, steplike landforms, such as successive stream terraces.

Road cut

A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments

Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rock outcrop (map symbol)

An exposure of bedrock at the surface of the earth. Not used where the named soils of the surrounding map unit are shallow over bedrock or where “Rock outcrop” is a named component of the map unit.

Root zone

The part of the soil that can be penetrated by plant roots.

Runoff

The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil

A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Saline spot (map symbol)

An area where the surface layer has an electrical conductivity of 8 mmhos/cm more than the surface layer of the named soils in the surrounding map unit. The surface layer of the surrounding soils has an electrical conductivity of 2 mmhos/cm or less.

Sand

As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone

Sedimentary rock containing dominantly sand-sized particles.

Sandy spot (map symbol)

A spot where the surface layer is loamy fine sand or coarser in areas where the surface layer of the named soils in the surrounding map unit is very fine sandy loam or finer.

Sapric soil material (muck)

The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saturated hydraulic conductivity (Ksat)

The ease with which pores of a saturated soil transmit water. Formally, the proportionality coefficient that expresses the relationship of the rate of water movement to hydraulic gradient in Darcy's Law, a law that describes the rate of water movement through porous media. Commonly abbreviated as "Ksat." Terms describing saturated hydraulic conductivity are:

Very high: 100 or more micrometers per second (14.17 or more inches per hour)
High: 10 to 100 micrometers per second (1.417 to 14.17 inches per hour)
Moderately high: 1 to 10 micrometers per second (0.1417 inch to 1.417 inches per hour)
Moderately low: 0.1 to 1 micrometer per second (0.01417 to 0.1417 inch per hour)
Low: 0.01 to 0.1 micrometer per second (0.001417 to 0.01417 inch per hour)
Very low: Less than 0.01 micrometer per second (less than 0.001417 inch per hour).

To convert inches per hour to micrometers per second, multiply inches per hour by 7.0572. To convert micrometers per second to inches per hour, multiply micrometers per second by 0.1417.

Saturation

Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Scarification

The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Sedimentary rock

A consolidated deposit of clastic particles, chemical precipitates, or organic remains accumulated at or near the surface of the earth under normal low temperature and pressure conditions. Sedimentary rocks include consolidated equivalents of alluvium, colluvium, drift, and eolian, lacustrine, and marine deposits. Examples are sandstone, siltstone, mudstone, claystone, shale, conglomerate, limestone, dolomite, and coal.

Sequum

A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil

A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Severely eroded spot (map symbol)

An area where, on the average, 75 percent or more of the original surface layer has been lost because of accelerated erosion. Not used in map units in which “severely eroded,” “very severely eroded,” or “gullied” is part of the map unit name.

Shale

Sedimentary rock that formed by the hardening of a deposit of clay, silty clay, or silty clay loam and that has a tendency to split into thin layers.

Sheet erosion

The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Short, steep slope (map symbol)

A narrow area of soil having slopes that are at least two slope classes steeper than the slope class of the surrounding map unit.

Shoulder

The convex, erosional surface near the top of a hillslope. A shoulder is a transition from summit to backslope.

Shrink-swell

The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Shrub-coppice dune

A small, streamlined dune that forms around brush and clump vegetation.

Side slope (geomorphology)

A geomorphic component of hills consisting of a laterally planar area of a hillside. The overland waterflow is predominantly parallel. Side slopes are dominantly colluvium and slope-wash sediments.

Silica

A combination of silicon and oxygen. The mineral form is called quartz.

Silica-sesquioxide ratio

The ratio of the number of molecules of silica to the number of molecules of alumina and iron oxide. The more highly weathered soils or their clay fractions in warm-temperate, humid regions, and especially those in the tropics, generally have a low ratio.

Silt

As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone

An indurated silt having the texture and composition of shale but lacking its fine lamination or fissility; a massive mudstone in which silt predominates over clay.

Similar soils

Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Sinkhole (map symbol)

A closed, circular or elliptical depression, commonly funnel shaped, characterized by subsurface drainage and formed either by dissolution of the surface of underlying bedrock (e.g., limestone, gypsum, or salt) or by collapse of underlying caves within bedrock. Complexes of sinkholes in carbonate-rock terrain are the main components of karst topography.

Site index

A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Slickensides (pedogenic)

Grooved, striated, and/or glossy (shiny) slip faces on structural peds, such as wedges; produced by shrink-swell processes, most commonly in soils that have a high content of expansive clays.

Slide or slip (map symbol)

A prominent landform scar or ridge caused by fairly recent mass movement or descent of earthy material resulting from failure of earth or rock under shear stress along one or several surfaces.

Slope

The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope alluvium

Sediment gradually transported down the slopes of mountains or hills primarily by nonchannel alluvial processes (i.e., slope-wash processes) and characterized by particle sorting. Lateral particle sorting is evident on long slopes. In a profile sequence, sediments may be distinguished by differences in size and/or specific gravity of rock fragments and may be separated by stone lines. Burnished peds and sorting of rounded or subrounded pebbles or cobbles distinguish these materials from unsorted colluvial deposits.

Slow refill

The slow filling of ponds, resulting from restricted water transmission in the soil.

Slow water movement

Restricted downward movement of water through the soil. See Saturated hydraulic conductivity.

Sodic (alkali) soil

A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Sodic spot (map symbol)

An area where the surface layer has a sodium adsorption ratio that is at least 10 more than that of the surface layer of the named soils in the surrounding map unit. The surface layer of the surrounding soils has a sodium adsorption ratio of 5 or less.

Sodicity

The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na^{+} to Ca^{++} + Mg^{++}. The degrees of sodicity and their respective ratios are:

Slight: Less than 13:1

Moderate: 13-30:1

Strong: More than 30:1

Sodium adsorption ratio (SAR)

A measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration.

Soft bedrock

Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil

A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief and by the passage of time.

Soil separates

Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand: 2.0 to 1.0
Coarse sand: 1.0 to 0.5
Medium sand: 0.5 to 0.25
Fine sand: 0.25 to 0.10
Very fine sand: 0.10 to 0.05
Silt: 0.05 to 0.002
Clay: Less than 0.002

Solum

The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Spoil area (map symbol)

A pile of earthy materials, either smoothed or uneven, resulting from human activity.

Stone line

In a vertical cross section, a line formed by scattered fragments or a discrete layer of angular and subangular rock fragments (commonly a gravel- or cobble-sized lag concentration) that formerly was draped across a topographic surface and was later buried by additional sediments. A stone line generally caps material that was subject to weathering, soil formation, and erosion before burial. Many stone lines seem to be buried erosion pavements, originally formed by sheet and rill erosion across the land surface.

Stones

Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony

Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stony spot (map symbol)

A spot where 0.01 to 0.1 percent of the soil surface is covered by rock fragments that are more than 10 inches in diameter in areas where the surrounding soil has no surface stones.

Strath terrace

A type of stream terrace; formed as an erosional surface cut on bedrock and thinly mantled with stream deposits (alluvium).

Stream terrace

One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel, originally formed near the level of the stream; represents the remnants of an abandoned flood plain, stream bed, or valley floor produced during a former state of fluvial erosion or deposition.

Stripcropping

Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion and water erosion.

Structure, soil

The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are:

Platy: Flat and laminated
Prismatic: Vertically elongated and having flat tops
Columnar: Vertically elongated and having rounded tops
Angular blocky: Having faces that intersect at sharp angles (planes)
Subangular blocky: Having subrounded and planar faces (no sharp angles)
Granular: Small structural units with curved or very irregular faces

Structureless soil horizons are defined as follows:

Single grained: Entirely noncoherent (each grain by itself), as in loose sand
Massive: Occurring as a coherent mass

Stubble mulch

Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil

Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling

Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum

The part of the soil below the solum.

Subsurface layer

Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summer fallow

The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Summit

The topographically highest position of a hillslope. It has a nearly level (planar or only slightly convex) surface.

Surface layer

The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the “plow layer,” or the “Ap horizon.”

Surface soil

The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Talus

Rock fragments of any size or shape (commonly coarse and angular) derived from and lying at the base of a cliff or very steep rock slope. The accumulated mass of such loose broken rock formed chiefly by falling, rolling, or sliding.

Taxadjuncts

Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior. Soils are recognized as taxadjuncts only when one or more of their characteristics are slightly outside the range defined for the family of the series for which the soils are named.

Terminal moraine

An end moraine that marks the farthest advance of a glacier. It typically has the form of a massive arcuate or concentric ridge, or complex of ridges, and is underlain by till and other types of drift.

Terrace (conservation)

An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geomorphology)

A steplike surface, bordering a valley floor or shoreline, that represents the former position of a flood plain, lake, or seashore. The term is usually applied both to the relatively flat summit surface (tread) that was cut or built by stream or wave action and to the steeper descending slope (scarp or riser) that has graded to a lower base level of erosion.

Terracettes

Small, irregular steplike forms on steep hillslopes, especially in pasture, formed by creep or erosion of surficial materials that may be induced or enhanced by trampling of livestock, such as sheep or cattle.

Texture, soil

The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying “coarse,” “fine,” or “very fine.”

Thin layer

Otherwise suitable soil material that is too thin for the specified use.

Till

Dominantly unsorted and nonstratified drift, generally unconsolidated and deposited directly by a glacier without subsequent reworking by meltwater, and consisting of a heterogeneous mixture of clay, silt, sand, gravel, stones, and boulders; rock fragments of various lithologies are embedded within a finer matrix that can range from clay to sandy loam.

Till plain

An extensive area of level to gently undulating soils underlain predominantly by till and bounded at the distal end by subordinate recessional or end moraines.

Tilth, soil

The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toeslope

The gently inclined surface at the base of a hillslope. Toeslopes in profile are commonly gentle and linear and are constructional surfaces forming the lower part of a hillslope continuum that grades to valley or closed-depression floors.

Topsoil

The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements

Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Tread

The flat to gently sloping, topmost, laterally extensive slope of terraces, flood-plain steps, or other stepped landforms; commonly a recurring part of a series of natural steplike landforms, such as successive stream terraces.

Tuff

A generic term for any consolidated or cemented deposit that is 50 percent or more volcanic ash.

Upland

An informal, general term for the higher ground of a region, in contrast with a low-lying adjacent area, such as a valley or plain, or for land at a higher elevation than the flood plain or low stream terrace; land above the footslope zone of the hillslope continuum.

Valley fill

The unconsolidated sediment deposited by any agent (water, wind, ice, or mass wasting) so as to fill or partly fill a valley.

Variegation

Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve

A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Very stony spot (map symbol)

A spot where 0.1 to 3.0 percent of the soil surface is covered by rock fragments that are more than 10 inches in diameter in areas where the surface of the surrounding soil is covered by less than 0.01 percent stones.

Water bars

Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Weathering

All physical disintegration, chemical decomposition, and biologically induced changes in rocks or other deposits at or near the earth's surface by atmospheric or biologic agents or by circulating surface waters but involving essentially no transport of the altered material.

Well graded

Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wet spot (map symbol)

A somewhat poorly drained to very poorly drained area that is at least two drainage classes wetter than the named soils in the surrounding map unit.

Wilting point (or permanent wilting point)

The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow

The uprooting and tipping over of trees by the wind.