

4.7. GEOLOGY, SOILS and PALEONTOLOGICAL RESOURCES

This section includes the following discussion and analysis related to geology, soils and paleontological resources: existing environmental and regulatory setting; criteria and methodology for evaluating impacts; and results of the impact assessment, including identification of potentially significant impacts and corresponding mitigation measures to avoid or substantially lessen such impacts to the extent feasible, as appropriate. The District received no scoping comments pertaining to geology, soils and paleontological resources (see PEIR Scoping Report in Appendix A of this document). Comments from the California Department of Conservation, Geologic Energy Management Division (CalGEM) regarding construction in proximity to existing oil and gas wells are addressed in Section 4.9. *Hazards and Hazardous Materials*.

The discussion of paleontological resources in the section is based on the “VCIP – Paleontology Memo” prepared by Earthview Science in June 2025. The paleontology memo is kept administratively confidential to avoid public disclosure of potential fossil localities.

4.7.1. Environmental Setting

4.7.1.1. GEOLOGY AND SOILS

Regional Geology

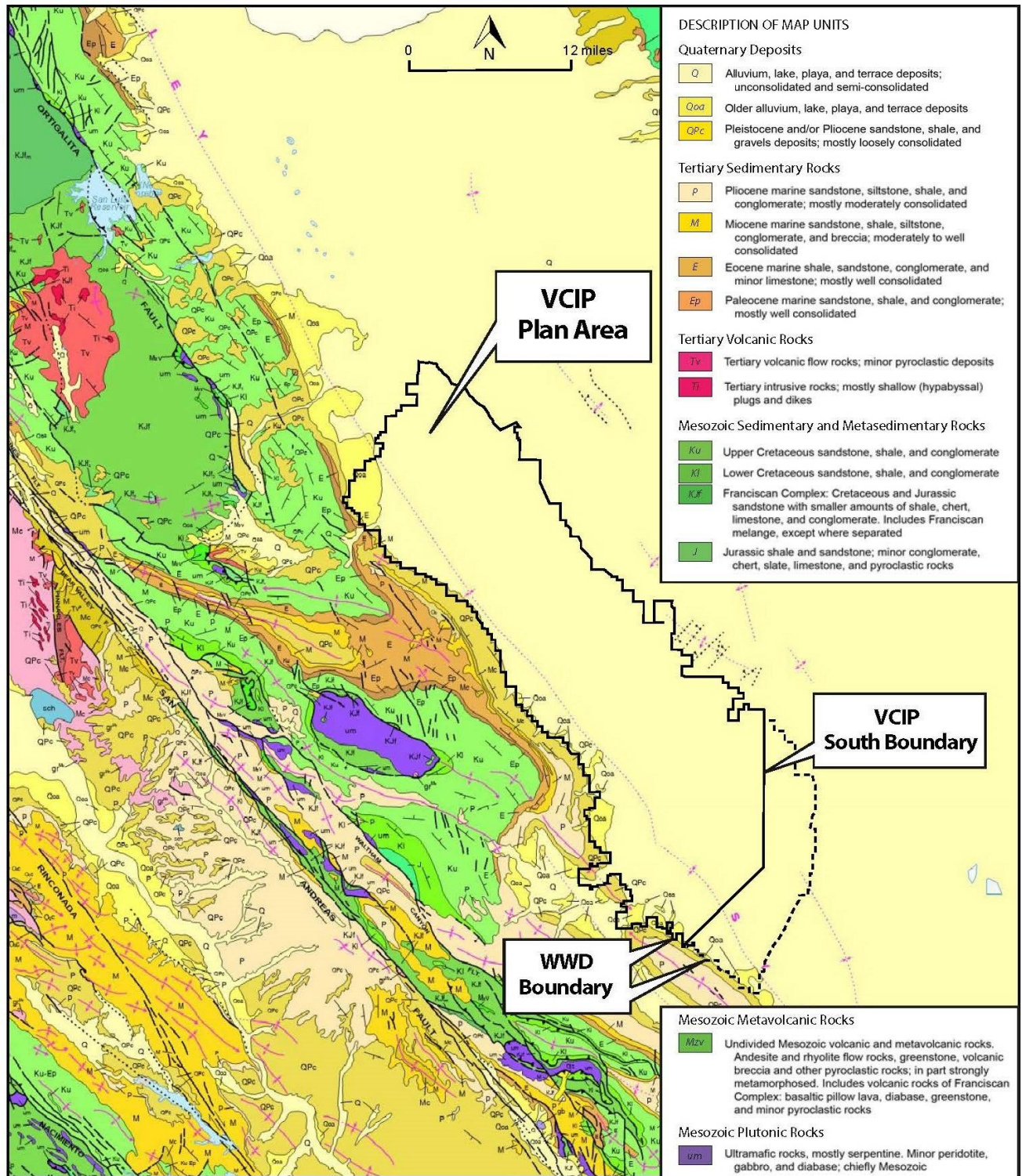
The VCIP Plan Area is in the Great Valley Geomorphic Province, a topographic and structural basin bounded on the east by the Sierra Nevada and on the west by the Coast Ranges. The Sierra Nevada are part of a fault block which dips gently to the southwest and forms the bedrock beneath the valley. This basement complex is composed of igneous and metamorphic rocks of pre-Tertiary age (see Figure 4.7-1). These, in turn, are overlain by Quaternary period alluvium, including older material from the Pleistocene Epoch (Ice Age) (about 2.6 million to 11,700 years ago), which is covered by a layer of more recent material from the Holocene Epoch (about 11,700 years ago to present). Over time, runoff from the adjacent mountain ranges flowed to margins of the San Joaquin Valley where they were deposited to form broad, low semi-conical features termed alluvial or fluvial fans (see Figure 4.7-2). These fans extended radially many miles from the points where the rivers left the steep mountain slopes. The western portions of the Plan Area are located on broad alluvial fans primarily created by sediments carried by Panoche Creek, Cantua Creek, and Arroyo Pasajero from the base of the Diablo Range to the west. The surficial material in the eastern portions of the Plan Area is composed of basin deposits from successive flood events along the low-lying central axis of the valley.

Topography and Physical Features

The Plan Area is characterized by very gradual slopes with ground elevations decreasing from southwest to northeast toward the central low-lying axis of the valley. Ground elevations on the valley floor portions of the Plan Area range from a high of about 500 feet above mean sea level on western border of the Plan Area to a low of about 150 feet elevation at the northeastern edge of the Plan Area near Mendota, reflecting an average downslope gradient of 0.4 percent.

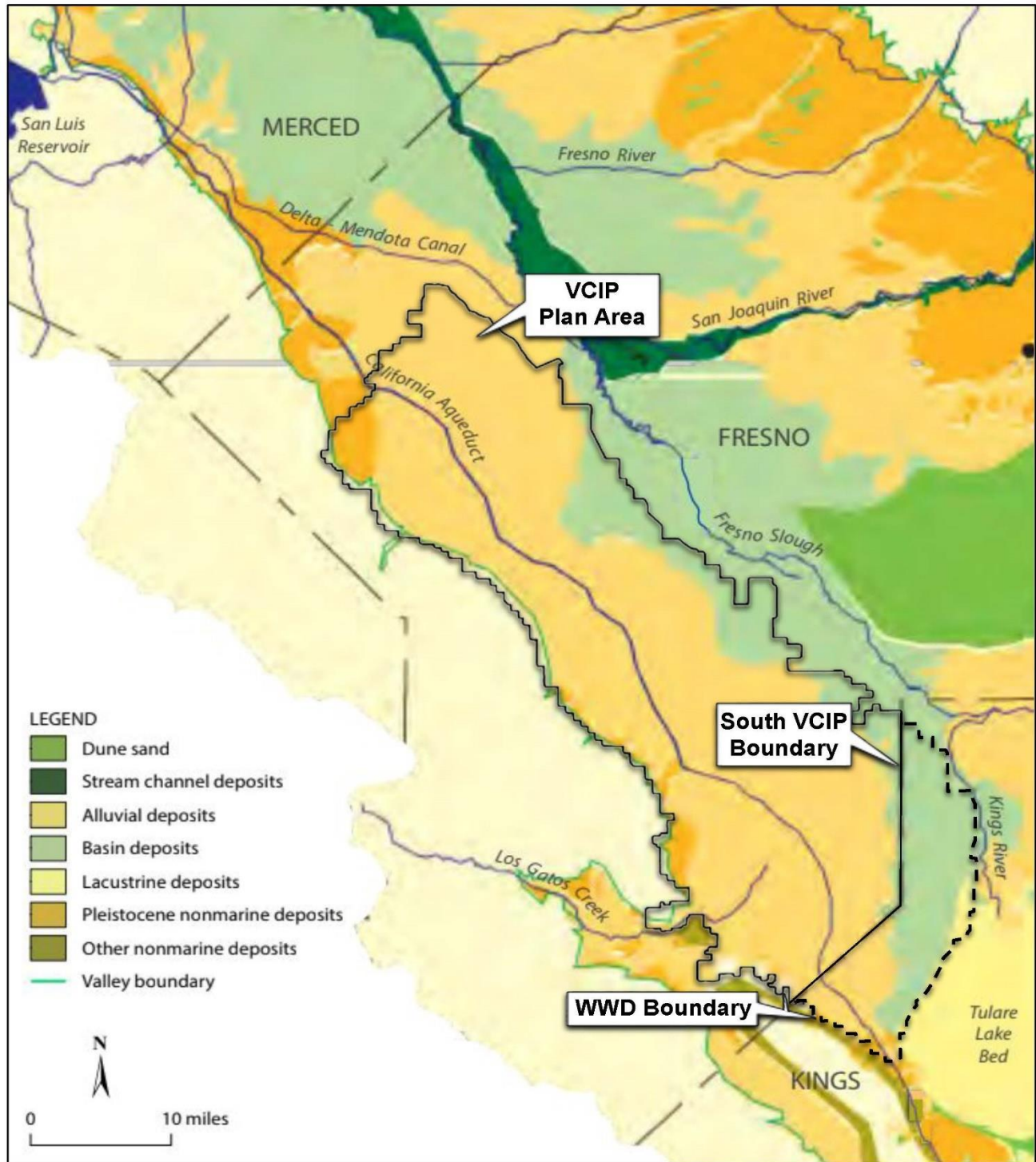
{00081423.1}

4. Environmental Impact Analysis
 4.7. Geology, Soils and Paleontological Resources



Source: California Geological Survey, 2025

General Geology
Figure 4.7-1



Source: USGS, 1998

Surficial Geology
Figure 4.7-2

Several drainage courses emerge from the Coast Ranges, the most prominent of which include Little Panoche Creek, Panoche Creek, the Cantua Creek System, and the Arroyo Pasajero Stream System. The San Luis Canal/California Aqueduct traverses the Plan Area in a southeasterly direction. Otherwise, there are no notable or unique geologic features within the VCIP Plan Area.

Tectonics and Seismicity

No portions of the Plan Area are in an Alquist-Priolo Earthquake Fault Zone and no known active faults traverse the Plan Area (CGS 2015a). (An “active fault” is defined as a fault that has had surface displacement within the Holocene age, i.e., within the last 11,700 years.) However, there are several active faults in the Diablo Range to the west, including the San Andreas Fault Zone, the Nunez Fault Zone, and the Great Valley Fault System (see Figure 4.7-3). The nearest segment of the San Andreas fault is located 15 miles southwest of the Plan Area at Parkfield in southeast Monterey County. The San Andreas fault is estimated to be capable of producing a maximum magnitude (M) 7.7 earthquake along the segments nearest to the Plan Area. The Nunez fault is a designated Alquist-Priolo Earthquake Fault Zone and is located about 10 miles west of the Plan Area at its nearest point. The Great Valley Fault System, which runs parallel to and east of the San Andreas Fault Zone, is composed of blind thrust faults, which do not intersect the ground surface but can cause significant shaking and ground deformation.

Another active fault in the project vicinity is the Ortigalita Fault Zone which extends southeastward from the San Luis Reservoir for approximately 23 miles, and ends about 10 miles from the northwest corner of the Plan Area. The Ortigalita fault has an estimated maximum earthquake magnitude of 7.1 at its epicenter.

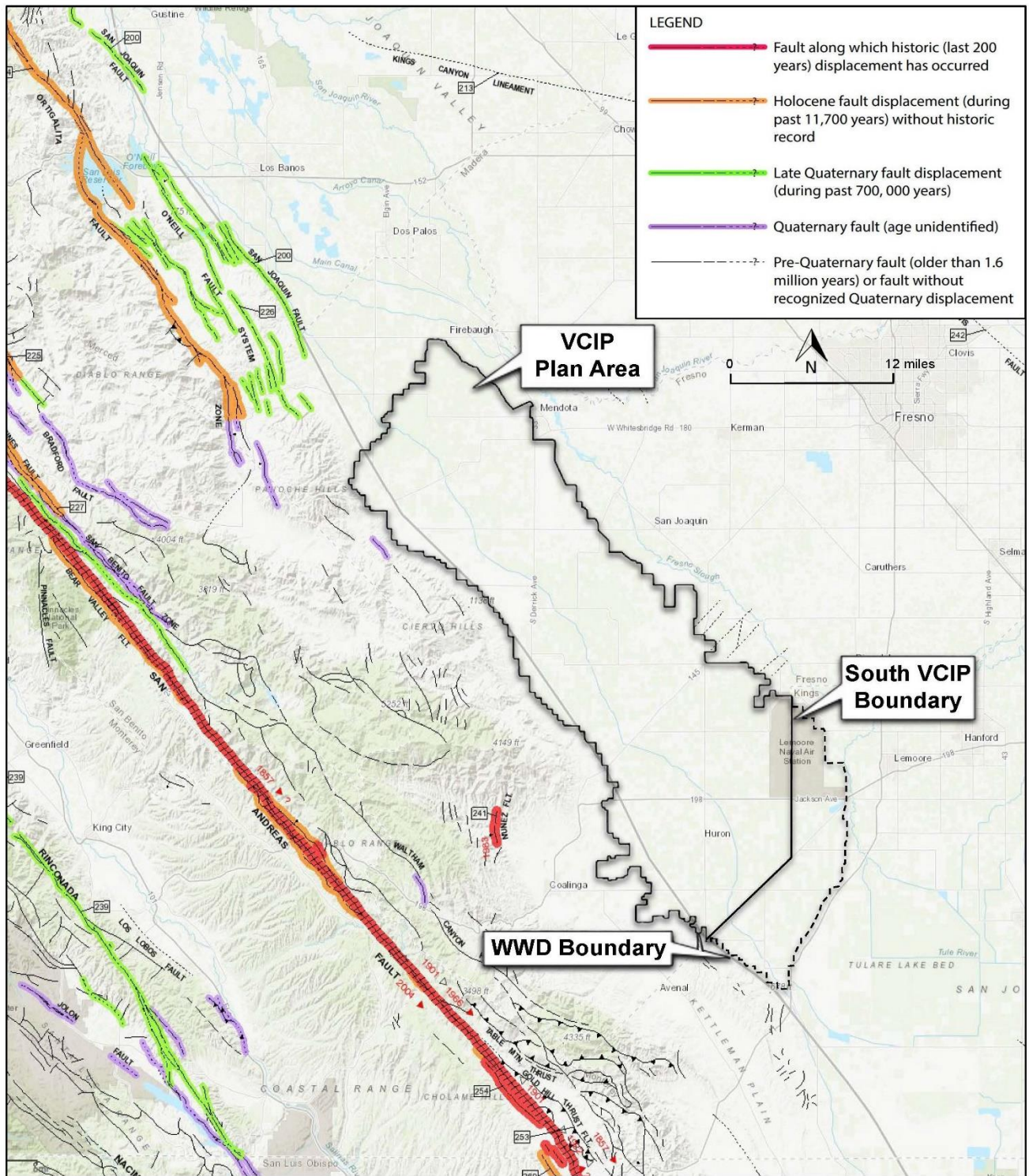
A high magnitude earthquake along the faults described above could cause moderate to high intensity ground shaking in the Plan Area (Fresno County 2023b; CGS 2000).

The most recent large earthquake near the Plan Area was the Kettleman Hills earthquake of August 1985, which had a magnitude of 6.0, and whose epicenter was located about 1 mile west of the Plan Area. It was preceded by the 1982 New Idria earthquake (M 4.8), approximately 10 miles west of the Plan Area, and the May 1983 Coalinga earthquake (M 6.5), approximately 5 miles west of the Plan Area. In June-July 1983, the Nunez earthquakes (M 6.0), occurred in the Nunez Fault Zone, a 3-mile-long fault zone located 2 miles northwest of Coalinga.

There are two inactive fault systems which run along the eastern edge of the Diablo Range to the northwest of the Plan Area. The first of these is the San Joaquin fault, which generally runs parallel to I-5 on the west and extends to within 7 miles of the Plan Area. The second is the O’Neill Fault System, which comprises a series of faults that run through the foothills of the Diablo Range in an approximately 7-mile-wide band extending from I-5 westward toward the Ortigalita Fault Zone and extends to within 5 miles of the Plan Area. These fault systems are not considered active or potentially active because there is no evidence that they were subject to displacement in the past 11,700 years, although the geologic record indicates activity in the past 700,000 years (CGS 2015b).

{00081423.1}

4. Environmental Impact Analysis
 4.7. Geology, Soils and Paleontological Resources



Source: California Geological Survey, 2025

Earthquake Faults
Figure 4.7-3

Seismic, Geologic, and Soils Hazards

Ground Shaking

The intensity of ground shaking at a given location will increase with earthquake magnitude and the distance of the site to a fault rupture. A common measure of ground motion during an earthquake is the Peak Ground Acceleration (PGA). The PGA varies from place to place and is dependent on the distance from the epicenter and the character of the underlying geology (e.g., hard bedrock, soft sediments, or artificial fills). U.S. Geological Survey (USGS) mapping indicates values of PGA that have a 10 percent probability of being exceeded in 50 years. Use of this probability level allows engineers to design structures to withstand ground motions that have a 90 percent chance of not occurring in the next 50 years, making buildings safer than if they were designed merely for the most probable events.

The Modified Mercalli Intensity (MMI) Scale assigns an intensity value based on the observed effects of ground shaking produced by an earthquake. The MMI values for shaking intensity range from I (earthquake not felt) to XII (damage nearly total). Significant structural damage typically does not occur until an event reaches an MMI value of IV.

According to the USGS, there is a 10 percent chance that the Plan Area could experience PGA values ranging from 0.20 to 0.40g over the next 50 years (g is the acceleration due to Earth's gravity, equivalent to g-force). The lower accelerations would be expected to occur along the eastern margins of the Plan Area near Mendota and the highest values would be expected to occur in the southwest portion of the Plan Area near Coalinga which is nearest to the causative faults (USGS 2014). The 0.20g PGA corresponds to an MMI value of VII which would be perceived as strong shaking and would result in light damage to structures. The 0.40g PGA corresponds to an MMI value of VIII which would be perceived as very strong shaking resulting in moderate damage to structures. There is a 90 percent chance that PGAs experienced on the project site over the next 50 years would be lower than these values for the locations indicated. Thus, these PGA values represent a conservative estimate of ground shaking levels that can be reasonably anticipated for the purposes of designing and constructing structures. For comparison, lands located near the San Andreas Fault Zone near Parkfield in Monterey County have a 10 percent chance of peak ground accelerations of 0.80g and greater, corresponding to an MMI value of IX which is perceived as violent shaking resulting in heavy damage to structures (USGS 2023).

Fault Rupture

Earthquakes are caused by the sudden displacement of earth along faults with a consequent release of stored strain energy. The fault slippage can often extend to the ground surface where it is manifested by sudden and abrupt breakage of ground along the surface trace of the fault. Damage resulting directly from fault rupture generally occurs only where structures are located immediate to the fault traces that rupture. No portion of the Plan Area is located within an Alquist-Priolo Earthquake Fault Zone. The closest known active or potentially active faults are the Ortigalita Fault Zone, the nearest occurrence of which is approximately 10 miles northwest of the Plan Area, and the Nunez Fault Zone, which is located 10 miles west of the southern portion of the Plan Area. There is no evidence indicating the presence of faults or fault traces in the Plan Area; therefore, the potential for fault rupture at the site is extremely low.

{00081423.1}

Liquefaction

Soil liquefaction is the phenomenon in which loose, saturated soil loses structural strength during high-intensity ground shaking due to induced shearing strains, which essentially transforms the soil into a liquid state resulting in ground failure or surface deformation. Liquefaction can result in total and differential settlement of structures. Conditions required for liquefaction typically include fine, well-sorted, loose sandy soil, high groundwater, higher intensity earthquakes, and particularly long duration of ground shaking. Ground accelerations of at least 0.10g and ground shaking durations of at least 30 seconds are needed to initiate liquefaction. The occurrence of liquefaction is generally limited to soils located within about 50 feet of the ground surface.

No regulatory mapping of liquefaction zones has been prepared by the California Geological Survey (CGS) for the Plan Area, with the nearest such mapping completed for Santa Clara County (CGS 2015a). In the eastern portions of the Plan Area, most soil series have high to moderate clay content, indicating a low susceptibility to liquefaction (see Figure 4.2-1 in Section 4.2. *Agriculture and Forestry Resources*). The nearest groundwater within eastern areas of the Plan Area was most recently (April 2017) mapped at 5 to 25 feet below the ground surface. Given the high clay content of soils in this area, the relatively high groundwater conditions would not be sufficient to induce liquefaction during a seismic event. In portions of the Plan Area west of the Aqueduct, soils tend to have lower clay content; however, groundwater elevations within the western areas of the Plan Area are generally 50 feet or more below the ground surface, indicating a low susceptibility to liquefaction (WWD 2017c). Along canals and ditches, where conditions may include saturated soil conditions and unconsolidated sediments, the potential for liquefaction would be greater. However, the overall potential for liquefaction would be low due to distance from the nearest causative faults in the Diablo Range.

Lateral spreading can occur with seismic ground shaking on slopes where saturated soils liquefy and flow toward the open slope face. There is a low potential for lateral spreading within the Plan Area site since it is essentially flat and does not include significant slopes. However, there is some potential for lateral spreading along the open channels of the canals and ditches that would be retained within the Plan Area.

Seismic Settlement

Seismic settlement may occur as saturated and unsaturated granular soils become rearranged during ground shaking resulting in volume reduction, surface deformation, and potential settlement of overlying structural improvements. The magnitude of seismic settlement is a function of the relative density of the soil and the magnitude of cyclic shear stress caused by seismic ground motion. Earthquake-induced settlement has the greatest potential to occur where loose granular materials such as sandy soils are present above the groundwater table. The potential for the occurrence of an earthquake capable of promoting seismic settlement is low throughout the Plan Area where clay soils are most prevalent and loose sandy soils are absent, although sandy loam soils occur along the base of the western foothills and along major drainage courses. The general potential for significant surface deformation resulting from seismic settlement is considered low for the Plan Area.

Landslides

No regulatory mapping of landslide zones has been prepared by the CGS for the Plan Area, with the nearest such mapping completed for Santa Clara County (CGS 2014). USGS landslide mapping shows that the Plan Area is not within a landslide hazard area; the nearest landslide areas are in the Diablo Range to the west (USGS 2025b). Due to its relatively level terrain, the Plan Area has a very low susceptibility to landslide hazard. {00081423.1}

Subsidence

Ground subsidence is the gradual settling of the Earth's surface due to the movement of earth below the ground surface. Subsidence is typically caused when overdrafting of a groundwater basin reduces the upward hydraulic pressure that supports the overlying land surface, resulting in consolidation and compaction of the underlying soils. Subsidence has the potential to damage infrastructure, including reducing the freeboard and flow capacity of the San Luis Canal/California Aqueduct and irrigation delivery canals and pipelines, as well as causing structural damage to bridges, roads, flood control facilities and other structures. Additionally, the compression of the water bearing zones results in permanent reduction of the water storage capacity of the aquifer. Large areas of the San Joaquin Valley, including the Plan Area, have been subject to subsidence from groundwater use for many years. Between 1926 and 1970, the land on the Panoche Fan in the Plan Area subsided by up to 24 feet (DWR 2020, Fig. 2-54). Between 1967 and 2015, the land in the vicinity subsided by up to 2.0 feet (DWR 2020, Fig. 2-57). As discussed in Section 4.10. *Hydrology and Water Quality*, groundwater pumping in the area may temporarily increase during drought years when the District's CVP contract water allocation is curtailed. Subsidence may result from cumulative water withdrawals from many agricultural wells.

Subsidence generally occurs as a region-wide change in surface elevation, although localized differential displacements and settlement of the ground surface can damage foundations and structures. Under the Groundwater Sustainability Plan (GSP) adopted by the District in 2020, an important goal is to limit subsidence to levels that do not lead to undesirable results, such as impacts to infrastructure, including the San Luis Canal/California Aqueduct. The GSP is discussed in detail in Section 4.10. *Hydrology and Water Quality*.

Soils

The most recent comprehensive soil survey of western Fresno County was completed in 2006 by the National Resources Conservation Service (NRCS), formerly the Soil Conservation Service (SCS). According to that soil survey, there are five main soil types in the Plan Area, including the Ciervo, Cerini, Tranquillity, Lethent, and Westhaven soils. The Ciervo series is characterized by very deep, moderately well drained, clay soils and is found on the eastern portions of alluvial fans along the center of the Plan Area. The Cerini series is characterized by very deep, well drained, clay loam soils and is found on alluvial fans in the northwestern and south-central portions of the Plan Area. The Tranquillity series is characterized by very deep, somewhat poorly draining clay soils and is found on distal portions of alluvial fans in the northeastern portion of the Plan Area. The Lethent series is characterized by very deep, moderately well drained, clay loam soils and is found on unburied fan remnants in the southeastern portion of the Plan Area. The Westhaven series is characterized by very deep, well drained, loam or clay loam soils and is found on alluvial fans in the south central and southwestern portions of the Plan Area (NRCS 2006).

The dominant soil textures within the Plan Area include clay loam, clay, and sandy loam. The clay loam soils are found throughout the Plan Area, while the clay soils are dominant in the northeastern area located east of the San Luis Canal/California Aqueduct and north of State Route 145 (see Figure 4.2-1 in Section 4.2. *Agriculture and Forestry Resources*). The sandy loam soils are found in limited areas along the foothills of the Diablo Range and along major drainage courses. The soil texture affects both hydraulic conductivity (percolation rate) and drainage capability, with the fine clay soils exhibiting the poorest absorption and drainage capabilities, while the coarser textured soils, such as the sandy loams, have higher hydraulic

{00081423.1}

conductivity and drainage capability. In general, drainage capability and hydraulic conductivity decrease from west to east in the Plan Area, corresponding to increasingly high clay content of the soils. All soil units within the Plan Area have a high potential corrosivity to uncoated steel, and moderate to high potential corrosivity to concrete (NRCS 2006).

Soil Expansion

Expansive soils are typically associated with fine-grained clayey soils that have the potential to shrink and swell during seasonal wetting and drying cycles. The ability of clayey soil to change volume with variations in moisture content can result in uplift or cracking to foundation elements or other rigid structures such as slabs-on-grade, rigid pavements, or other slabs or hardscape founded on these soils. Most of the soils covering the Plan Area are clays or clay loam soils which have a high shrink-swell (i.e., expansion) potential. The sandy loam soils in the western portions of the Plan Area have low expansion potential (NRCS 2006).

Erosion Potential

Within most of the Plan Area, the combination of clayey soils and nearly flat terrain results in negligible potential for erosion by stormwater runoff. On the alluvial fans western portions of the Plan Area, the localized sloping terrain and looser soil cover result in a somewhat greater, but still low potential for erosion (NRCS 2006).

Due to high wind conditions that occur periodically in spring, wind erosion is prevalent on the west side of the San Joaquin Valley where the Plan Area is located. This results in the loss of topsoil and crops, adverse public health effects (by airborne dispersal of spores causing Valley Fever), reduced visibility resulting in automobile accidents, and damage to public facilities.

Groundwater Conditions

The San Joaquin Valley is underlain by deep water-bearing alluvial deposits. For planning purposes, DWR divides the valley into groundwater basins and subbasins. The Plan Area is located entirely within the Westside Subbasin of the San Joaquin Groundwater Basin. The boundaries of the Westside Subbasin correspond closely with the boundaries of the District.

The Westside Subbasin consists of two main water-bearing zones, an upper and a lower zone, separated by the impervious Corcoran Clay formation. Corcoran Clay divides the groundwater system into two major aquifers – a confined aquifer below (Lower Aquifer) and a semi-confined aquifer above (Upper Aquifer). Within the Plan Area, the Corcoran Clay layer ranges in thickness from approximately 20 to 100 feet, and occurs at depths ranging from approximately 400 to 800 feet (DWR 2020, Figures 2-30 and 2-31).

Based upon the District's December 2015 Deep Groundwater Mapping (the most recent available), the depth to the Upper Aquifer is variable throughout the Plan Area, ranging from a high of about 50 feet below surface grade (BSG) just south of Mendota, to a low of almost 400 feet BSG in the vicinity of NAS Lemoore in the southeast (WWD 2017a).

An additional water-bearing zone occurs near the ground surface and is referred to as shallow (perched) groundwater. Based upon the District's Shallow Groundwater Surface mapping for April 2017 (the most recent available), the depth to shallow groundwater throughout the eastern portions of the Plan Area ranges from 5 to 45 feet BSG, while nearest groundwater in the Plan Area west of the Aqueduct is generally below 50 feet

BSG (WWD 2017c). Groundwater table elevations fluctuate with time since they are dependent upon seasonal precipitation, irrigation, groundwater pumping, and climatic conditions, as well as other factors. (See Sections 4.2. Agriculture and Forestry Resources, 4.10. Hydrology and Water Quality, and 4.17. Utilities and Service Systems, for additional discussions of groundwater conditions.)

4.7.1.2. PALEONTOLOGICAL RESOURCES

The following discussion of paleontological resources is based on the “VCIP – Paleontology Memo” prepared by Earthview Science in June 2025. The paleontology memo is kept administratively confidential to avoid public disclosure of potential fossil localities.

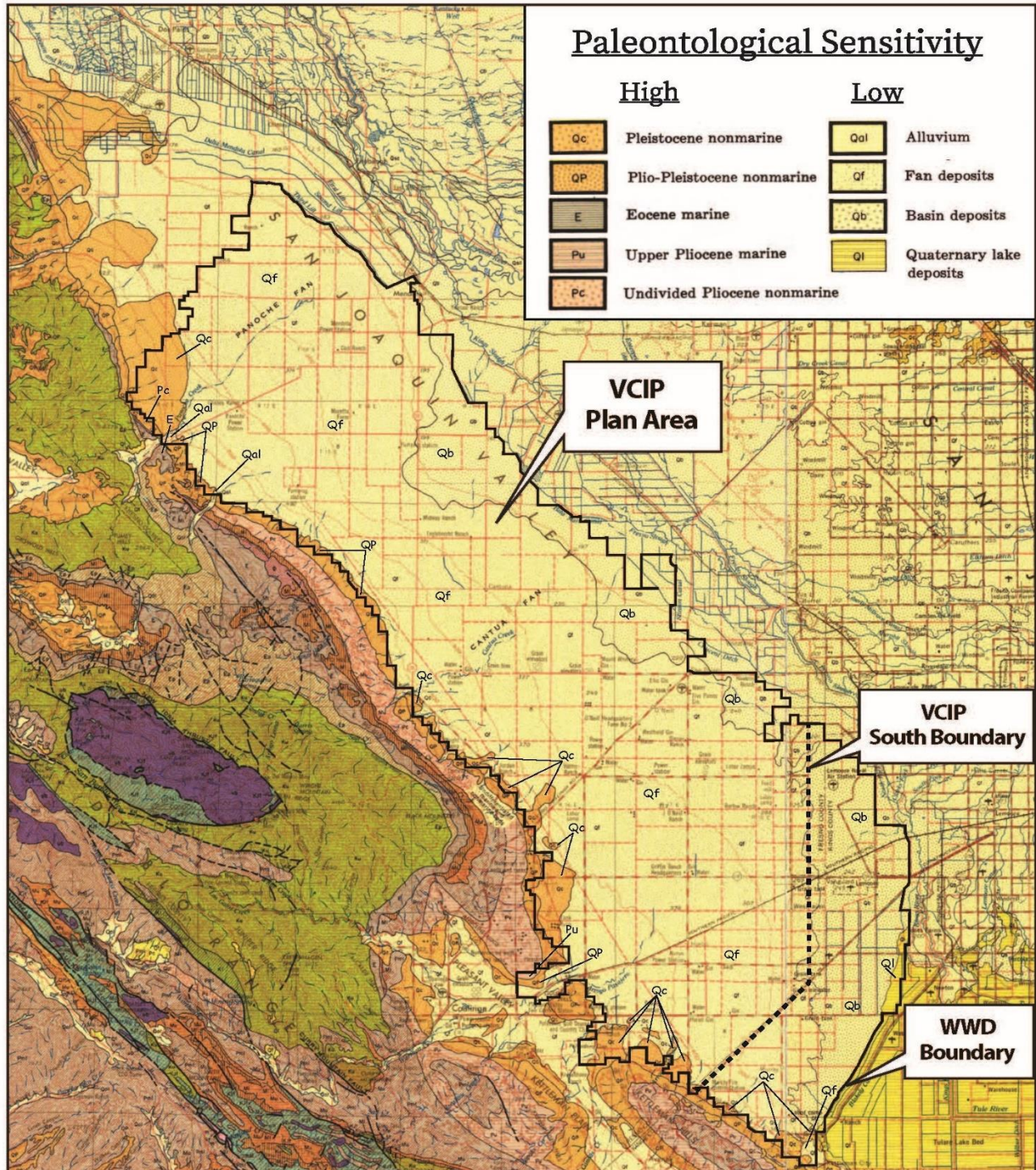
Paleontological resources comprise fossils – the remains or traces of once-living organisms preserved in sedimentary deposits – together with the geologic context in which they occur. Fossils are scientifically important as they provide the only available direct evidence of the anatomy, geographic distribution, and paleoecology of organisms of the past. Significant paleontological resources may include vertebrate fossils and their associated taphonomic (fossilization) and environmental indicators; invertebrate fossils; and/or plant fossils. It is noted that no vertebrate fossil localities have been recorded within the Plan Area, with the nearest fossil sites located near Tranquillity, Coalinga, the Delta-Mendota Canal, and the Tulare Lakebed (EVS 2025).

Due to the correlations between geologic formations and the potential for fossil occurrence, the paleontological sensitivity of an area can be predicted based on the area’s geology. The surface soils of the Plan Area are underlain by alluvium deposited during the Quaternary period (approximately 2.6 million years ago to present). Quaternary alluvium is further divided into a number of subunits, including the following two main units which occur in the Plan Area: Quaternary fan deposits (Qf), consisting of materials eroded from the Coast Ranges forming alluvial fans, which comprise the majority of the surface materials in the Plan Area; and Quaternary basin deposits (Qb), located along the eastern margin of the Plan Area, which was formed by flood flows and overbank events along the Kings River, Fresno Slough, and San Joaquin River (see Figure 4.7-4).

Also included in the Plan Area, but much less prevalent, are the following two units: Quaternary alluvium (Qal), which occurs along the major drainage courses entering the valley from the western foothills; Pleistocene nonmarine (Qc) and Plio-Pleistocene nonmarine (QP/QTt) which both occur along the base of the Diablo Range along the western margins of the Plan Area. An additional unit - Quaternary lake deposits (Ql) – occurs in association with the Tulare Lakebed in Kings County, and is not found in the Plan Area but extends slightly into the southeastern margin of the District’s service area in Kings County (EVS 2025).

On a temporal scale, the Quaternary period is divided into two epochs or ages, including the Pleistocene Epoch (about 2.6 million to 11,700 years ago) and the more recent Holocene Epoch (about 11,700 years ago to present). The Pleistocene Epoch (informally termed the Ice Age) is the depositional period that yields vertebrate fossils. The Holocene deposits, which comprise more recent layers that were deposited on top of the Pleistocene material, yield few, if any, vertebrate fossils and thus have a low paleontological sensitivity. However, the thickness of the Holocene layer covering the paleontologically sensitive Pleistocene (or older Quaternary) alluvium is highly variable, so the depth of the older Quaternary alluvium at a given location is uncertain.

{00081423.1}



Sources: Earthview Science, 2025
 California Geological Survey, 2025

Paleontological Sensitivity
 Figure 4.7-4

The older Quaternary alluvial deposits (Qc) have yielded numerous significant vertebrate fossils at two sites in western Merced and Fresno counties (approximately 30 miles northwest of the Plan Area and 4 miles east of the Plan Area, respectively) and are considered to have high paleontological resources potential. The specimens found include land mammals such as deer, mammoth, camel, horse, bison, badger, mole, rabbit, gray fox, and coyote, as well as birds, reptiles and fish. Within the areas with Quaternary fan (Qf) and basin (Qb) deposits, the Holocene materials at the surface are typically too young to contain fossilized material. In these areas, the more sensitive Pleistocene material is typically several feet or more below the surface and thus the Qf and Qb deposits have a low potential to yield paleontological resources in the upper soil layers. It is considered highly unlikely that fossils are present within Qf or Qb deposits at depths shallower than 5 feet below the ground surface, but fossils may be present at depth within the underlying Pleistocene Qc material, and in the Plio-Pleistocene QP/QTt (EVS 2025).

In summary, the recent alluvial deposits that cover most of the Plan Area have a low sensitivity for paleontological resources at or near the ground surface, but sensitivity is high in the underlying older alluvium which may occur deeper than five feet below the ground surface. Along the western margins of the Plan Area, the Pleistocene and Plio-Pleistocene deposits both have high sensitivity for paleontological resources.

4.7.2. Regulatory Context

The following is an overview of the principal statutes, regulations, plans and programs related to geology, soils and paleontology applicable to the VCIP. A comprehensive overview of the regulatory context related to geology, soils and paleontology is provided section 8.1 (Geologic and Seismic Hazards) of the *Fresno County 2040 General Plan Background Report* (Fresno County 2023b) which is available at <https://www.fresnocountyca.gov/files/sharedassets/county/v/2/public-works-and-planning/development-services/planning-and-land-use/general-plan/fcgpr-background-report-2023-05-10.pdf>.

4.7.2.1. GEOLOGY AND SOILS

Federal

Earthquake Hazards Reduction Act

The Earthquake Hazards Reduction Act (EHRA) of 1977 (42 U.S.C. § 7701 et seq.) established the National Earthquake Hazards Reduction Program as a long-term earthquake risk reduction program for the United States which focuses on: developing effective measures to reduce earthquake hazards; promoting the adoption of earthquake hazard reduction activities by federal, state, and local governments, national standards and model code organizations, engineers, architects, building owners, etc.; and improving the understanding of earthquakes and their effects on people and infrastructure through interdisciplinary research.

{00081423.1}

State

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act of 1972 (formerly the Alquist-Priolo Special Studies Zone Act) (Pub. Res. Code, § 2621 et seq.) requires the delineation of zones along active faults in California. The purpose of the Alquist-Priolo Act is to regulate development on or near active fault traces to reduce the hazards associated with fault rupture and to prohibit the location of most structures for human occupancy across these traces. Cities and counties must regulate certain development projects within the zones, including the preparation of geologic investigations to demonstrate that development sites are not threatened by future surface displacement. There are two Alquist-Priolo Earthquake Fault Zones mapped in the foothills of the Diablo Range to the west of the Plan Area. These include the Ortigalita Fault Zone located approximately 10 miles northwest of the Plan Area, and the Nunez Fault Zone located approximately 10 miles west of the southern portion of the Plan Area. No other Alquist-Priolo Fault Zone Maps cover any part of the Plan Area (CGS 1986).

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act of 1990 (Pub. Res. Code, § 2690 et seq.) is intended to protect the public from the effects of strong ground shaking, liquefaction, landslides, or other ground failure/hazards caused by earthquakes (not including surface faulting which is regulated by the Alquist-Priolo Act). This act requires the State Geologist to delineate seismic hazard zones and requires cities, counties, and other local permitting agencies to regulate certain development projects within these zones. Before a development permit is granted for a site within a seismic hazard zone, a geotechnical investigation of the site must be conducted and appropriate mitigation measures incorporated into the project design. There are no Seismic Hazard Maps that include the Plan Area (CGS 2015a).

California Building Code

The California Building Code (CBC) is Part 2 of the California Building Standards Code (CBCS) which is codified as Title 24 of the California Code of Regulations (CCR). The purpose of the CBC is to regulate building design and construction and is separate from related codes such as the Electrical Code, Plumbing Code, Mechanical Code, Fire Code, Energy Code, etc. Chapter 18 of the CBC requires analysis of slope stability, liquefaction, and surface rupture attributable to faulting or lateral spreading, plus an evaluation of lateral pressures on basement and retaining walls, liquefaction and soil strength loss, and lateral movement or reduction in foundation soil-bearing capacity. It also addresses measures to be considered in structural design, which may include ground stabilization, selecting appropriate foundation type and depths, selecting appropriate structural systems to accommodate anticipated displacements, or any combination of these measures.

While the significance criteria in Appendix G of the CEQA Guidelines refers to 1994 Uniform Building Code (UBC) Table 18-1-B for identification of expansive soils, the updated 2019 and 2022 editions of the CBC no longer cite this table. Instead, CBC section 1803.5.3 directs building officials to require specific soil tests to determine if soils are expansive. CBC section 1808.6 also contains design criteria for expansive soils and includes measures to address the effects of expansive soils, including slab-on-grade foundations, removal of expansive soil, and soil stabilization techniques.

{00081423.1}

NPDES General Construction Permit

The Central Valley Regional Water Quality Control Board (CVRWQCB) administers the National Pollutant Discharge Elimination System (NPDES), which protects water quality during construction activities disturbing one or more acres of land. The NPDES program requires preparation of a risk assessment and a Storm Water Pollution Prevention Plan (SWPPP) under the NPDES General Construction Permit prior to beginning construction. The risk assessment and SWPPP must be prepared by a state-qualified SWPPP preparer. The SWPPP provides specific construction-related best management practices (BMPs) to prevent soil erosion and loss of topsoil. Section 4.10. *Hydrology and Water Quality* provides additional discussion of SWPPP requirements.

Fresno County

Fresno County General Plan

The 2024 Fresno County General Plan (Fresno County 2024b) includes the following goals and policies related to geology, soils and paleontological resources that may be relevant to the VCIP and Transmission Corridors:

Health and Safety Element

D. Seismic and Geologic Hazards

GOAL HS-D To minimize the loss of life, injury, and property damage due to seismic and geologic hazards.

Policy HS-D.3 **Soils and Geologic Seismic Analysis**
The County shall require that a soils engineering and geologic-seismic analysis be prepared by a California-registered engineer or engineering geologist prior to permitting development, including public infrastructure projects, in areas prone to geologic or seismic hazards (i.e., fault rupture, ground shaking, lateral spreading, lurch cracking, fault creep, liquefaction, subsidence, settlement, landslides, mudslides, unstable slopes, or avalanche).

Policy HS-D.4 **Soils and Geologic-seismic Structure Design**
The County shall require all proposed structures, additions to structures, utilities, or public facilities situated within areas subject to geologic-seismic hazards as identified in the soils engineering and geologic-seismic analysis to be sited, designed, and constructed in accordance with applicable provisions of the California Building Code (Title 24 of the California Code of Regulations) and other relevant professional standards to minimize or prevent damage or loss and to minimize the risk to public safety.

Policy HS-D.5 **Alquist-Priolo Earthquake Fault Act**
Pursuant to the Alquist-Priolo Earthquake Fault Zoning Act (Public Resources Code, Chapter 7.5), the County shall not permit any structure for human occupancy to be placed within designated Earthquake Fault Zones unless the specific provisions of the Act and Title 14 of the California Code of Regulations have been satisfied.

{00081423.1}

Policy HS-D.7 Soils Report

The County shall require a soils report by a California-registered engineer or engineering geologist for any proposed development, including public infrastructure projects, that requires a County permit and is located in an area containing soils with high “expansive” or “shrink-swell” properties. Development in such areas shall be prohibited unless suitable design and construction measures are incorporated to reduce the potential risks associated with these conditions.

Policy HS-D.8 Minimize Soil Erosion

The County shall seek to minimize soil erosion by maintaining compatible land uses, suitable building designs, and appropriate construction techniques. Contour grading, where feasible, and revegetation shall be required to mitigate the appearance of engineered slopes and to control erosion.

Open Space and Conservation Element

J. Historical, Cultural, and Geological Resources

GOAL OS-J To identify, protect, and enhance Fresno County’s important historical, archeological, paleontological, geological, and cultural sites and their contributing environment, and promote and encourage preservation, restoration, and rehabilitation of Fresno County’s historically significant resources in order to promote historical awareness, community identify [sic], and to recognize the county’s valued assets that have contributed to past county events, trends, styles of architecture, and economy.

Policy OS-J.12 Geologic Resource Preservation

In approving new development, the County shall ensure, to the maximum extent practicable, that the location, siting, and design of any project be subordinate to significant geologic resources.

Fresno County Solar Facility Guidelines

The Fresno County Solar Facility Guidelines (Fresno County 2017c) contain the following requirement that is relevant to geology and soils:

4. Identify (with supporting data) the current soil type and mapping units of the parcel pursuant to the standards of the California State Department of Conservation and the Natural Resources Conservation Service.

A discussion of the consistency of VCIP projects with the Fresno County Solar Facility Guidelines is provided in Section 4.11. *Land Use and Planning*.

Fresno County Ordinance Code

Fresno County Ordinance Code (County Ordinance Code), section 15.08.010, adopts and incorporates by reference the 2022 Edition of the CBC, with certain exceptions and amendments. The CBC is described earlier in this section.

{00081423.1}

Fresno County Grading Ordinance

The Fresno County Grading and Excavation Ordinance (Chapter 15.28 of the County Ordinance Code) sets forth rules and regulations related to excavation, grading, and earthwork construction, including fills and embankments. The ordinance sets forth safety and environmental control measures for construction practices (Fresno County 2024c).

Fresno County Local Agency Management Program (LAMP)

Pursuant to Water Code section 13291(b)(3), the Fresno County Local Agency Management Program (LAMP) was established in 2017 for the purpose of regulating the design, installation, and operation of on-site wastewater treatment systems (OWTS) within the County. The program covers septic tank and leach field systems for the treatment and disposal of wastewater where conveyance to public sanitary sewers is not available. The Fresno County Public Works and Planning Department is responsible for the review and approval of proposed septic systems to ensure compliance with all applicable standards to protect groundwater quality (Fresno County 2017b).

Fresno County Improvement Standards

The Fresno County Improvement Standards serve as an engineering reference for Fresno County staff and private parties in the design and construction of improvements for public works projects and private development improvements. The standards include engineering design specifications for construction of streets, water supply systems, storm drainage, and sewage systems, as well as requirements for geotechnical reports for the proposed improvements (Fresno County 1966).

4.7.2.2. PALEONTOLOGICAL RESOURCES

State

California Public Resources Code (PRC)

California Public Resources Code (PRC) section 5097.5 states: “[a] person shall not knowingly and willfully excavate upon, or remove, destroy, or deface any...vertebrate paleontological site ... or... paleontological ... feature, situated on public lands, except with the express permission of the public agency having jurisdiction over the lands.”

Fresno County

The following Fresno County General Plan goal and policy relate to paleontological resources:

Open Space and Conservation Element

K. Historical, Cultural, and Geological Resources

GOAL OS-J To identify, protect, and enhance Fresno County’s important historical, archeological, paleontological, geological, and cultural sites and their contributing environment, and promote and encourage preservation, restoration, and rehabilitation of Fresno County’s

{00081423.1}

historically significant resources in order to promote historical awareness, community identify [sic], and to recognize the county’s valued assets that have contributed to past county events, trends, styles of architecture, and economy.

Policy OS-J.4

Cultural Resources Protection and Mitigation

The County shall require that discretionary development projects, as part of any required CEQA review, identify and protect important historical, archeological, tribal, paleontological, and cultural sites and resources. For projects requiring ground disturbance and located within a high or moderate cultural sensitivity areas, a cultural resources technical report may be warranted, including accurate archival research and site surveys conducted by qualified cultural resources practitioners. The need to prepare such studies shall be determined based on the tribal consultation process and initial outreach to local or state information centers.

Professional Paleontological Standards

The Society of Vertebrate Paleontology (SVP), a national, scientific organization of professional vertebrate paleontologists, has established “Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontological Resources.” These guidelines establish detailed protocols for assessment of an area’s potential to hold paleontological resources (i.e., the area’s “sensitivity”), and outline measures to follow to mitigate adverse impacts to known or unknown fossil resources during project development. Absent specific agency guidelines, most professional paleontologists adhere to the SVP assessment, mitigation, and monitoring requirements set forth in the SVP standard procedures.

4.7.3. Environmental Impact Analysis

METHODOLOGY

Evaluation of potential impacts related to geology, soils, and paleontological was based on a review of maps and plans that may be relevant to the VCIP Plan Area, including the General Plan and “General Plan Background Report” of Fresno County, mapping and data published by the USGS the CGS, and the NRCS.

The evaluation of impacts to paleontological resources is based on the “VCIP – Paleontology Memo” prepared by Earthview Science in June 2025. The paleontology memo is kept administratively confidential to avoid public disclosure of potential fossil localities.

The analysis also considers current policies and regulatory requirements that may apply to VCIP projects, including those identified in *Section 4.7.2 Regulatory Context*, above.

{00081423.1}

SIGNIFICANCE CRITERIA

Based on Appendix G of the CEQA Guidelines, implementation of the VCIP would be considered to result in a significant impact related to geology, soils, or paleontological resources if it would:

- 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 Uniform Building Code (1994)¹, creating substantial direct or indirect risks to life or property.
- e. Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water.
- f. Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.

4.7.3.1. DIRECT AND INDIRECT EFFECTS

Valley Clean Infrastructure Plan

Impact GEO-1. Rupture of Known Earthquake Fault

There are no known active or potentially active earthquake faults in proximity to the VCIP Plan Area; therefore, the potential for impact from fault rupture is extremely low and not reasonably foreseeable. (*Less-than-Significant Impact*)

The VCIP Plan Area is not located within an Alquist-Priolo Earthquake Fault Zone. The closest mapped fault zones are the Nunez Fault, located 10 miles west, and the Ortigalita Fault Zone, located approximately 10 miles northwest of the Plan Area. The nearest segment of the San Andreas Fault Zone is located approximately 15 miles southwest of the Plan Area (see Figure 4.7-1). There is no evidence indicating the presence of active

¹ The 2022 Edition of the California Building Code (CBC) is adopted and incorporated by reference into the Fresno County Ordinance Code, at section 15.08.010, with certain exceptions and amendments.
{00081423.1}

faults or fault traces within the immediate vicinity of the VCIP Plan Area. As such, potential hazards due to fault rupture within the Plan Area are extremely low, potential impacts are not reasonably foreseeable, and the potential impact associated with VCIP implementation is *less-than-significant*.

Mitigation Measures: No mitigation is required.

Impact GEO-2. Seismic Ground Shaking

Moderate to strong ground shaking expected within the VCIP Plan Area during a moderate to severe earthquake could result in damage to solar generating facilities, energy storage systems, substation, and transmission and gen-tie lines; however, any potential impacts would be addressed through compliance with existing regulations, standards, and codes. (*Less-than-Significant Impact*)

Large or moderate earthquakes centered on faults in the Coast Ranges to the west would result in ground shaking that could cause damage to structures within the VCIP Plan Area. The greatest potential damage would result from an earthquake centered on the San Andreas Fault System, the Ortigalita Fault Zone, the Nunez Fault, or the Great Valley Fault System. As discussed in Section 4.7.1. *Environmental Setting* above, there is a 10 percent chance that a major earthquake centered on a nearby fault segment could result in a peak horizontal ground accelerations (PGA) of 0.20g to 0.40g within the Plan Area over the next 50 years, with the intensity of shaking increasing from east to west within the Plan Area. These PGAs correspond to a Modified Mercalli Index intensity ratings of VII and VIII which would be perceived as strong to very strong shaking resulting in light to moderate damage to structures.

Ground shaking would cause dynamic loading resulting in stress to buildings and structures. However, as described in Section 4.7.2. *Regulatory Context* above, the solar facilities and energy storage systems would be required to be designed and constructed to withstand substantial ground shaking in accordance the seismic design criteria of the CBC (which is incorporated into the Fresno County Building Code). The CBC provisions applicable to solar development within the Plan Area provide for a high degree of seismic strength and resistance to lateral forces (strong shaking) in construction to minimize risks to public safety and damage to property, corresponding to the magnitude of the seismic events reasonably expected in the region based on the best available science. Seismic design specifications for VCIP projects would be recommended by a California registered professional geotechnical engineer and incorporated into the construction plans for projects constructed as part of the VCIP.

For each energy resource and infrastructure project constructed under the VCIP, a geotechnical investigation will be conducted prior to engineering design for the project to determine the detailed soil characteristics of the site. This will provide the basis for engineering recommendations and specifications regarding soil preparation, foundation design, solar array support specifications, pavement design, excavations, and other construction considerations to be followed during implementation of VCIP projects.

Prior to issuance of grading and building permits, the geotechnical reports, construction plans and specifications for each project will be subject to approval by the Fresno County Building and Safety Team, with follow-up inspections to ensure compliance. The VCIP substations, transmission lines, and gen-tie lines would

{00081423.1}

be constructed in accordance with seismic engineering design in compliance with the International Building Code (IBC) and the Institute of Electrical and Electronics Engineers (IEEE) standards. Based on design parameters established by the geotechnical investigations, all VCIP structures would be designed to resist or accommodate location-specific ground motions and conform to the seismic design standards. Compliance with existing regulations, codes, and standards would ensure that potential adverse effects from seismic ground shaking would be *less than significant*.

Mitigation Measures: No mitigation is required.

Impact GEO-3. Liquefaction, Lateral Spreading, and Seismic Settlement

There is potential for seismically-induced liquefaction, lateral spreading, and settlement within the VCIP Plan Area which could result in damage to foundations and structures; however, any potential impacts would be addressed through compliance with existing regulations, codes, and standards. (*Less-than-Significant Impact*)

Liquefaction

Liquefaction would typically pose a hazard where liquefaction-prone conditions are present, such as a combination of loose granular soils and shallow groundwater. Within the Plan Area, most soil series have a moderate to high clay content, indicating a low susceptibility to liquefaction. Although perched groundwater conditions occur within the Plan Area, these areas are typically associated with stiff clay soils which are not prone to liquefaction. However, there may be localized instances where liquefaction potential may exist, such as along stream beds and other water bodies, where conditions may include saturated soil conditions and unconsolidated sediments.

Lateral Spreading

Lateral spreading can occur with seismic ground shaking on slopes where saturated soils liquefy and flow toward the open slope face. There is generally low potential for lateral spreading within the Plan Area since the land is essentially flat and does not include significant slopes. However, there is some potential for lateral spreading along the open channels of the canals and ditches that may be retained within some VCIP project sites.

Seismic Settlement

Seismic settlement may occur as saturated and unsaturated granular soils become rearranged during ground shaking resulting in volume reduction and surface deformation. The magnitude of seismic settlement is a function of the relative density of the soil and the magnitude of cyclic shear stress caused by seismic ground motion. The potential occurrence of an earthquake with the capability of promoting seismic settlement within the Plan Area is generally low where the surface material consists mainly of moderate to very stiff clay soils. Some seismic settlement could occur in isolated locations where unconsolidated soils are present above the groundwater table.

{00081423.1}

It is noted that the phenomenon of seismic settlement is sometimes referred to as “subsidence.” However, subsidence is more typically considered to be the result of groundwater pumping and consequent soil compression. Subsidence generally occurs as a region-wide change in surface elevation, although localized differential displacements and settlement of the ground surface can damage foundations and structures. Under the Groundwater Sustainability Plan (GSP) adopted by the District in 2020, an important goal is to limit subsidence to levels that do not lead to undesirable results, such as impacts to infrastructure, including the San Luis Canal/California Aqueduct. The District and Fresno County, in cooperation with state and federal agencies, are currently implementing a subsidence monitoring network throughout the Westside Subbasin. Any groundwater use by VCIP projects would be consistent with the GSP and within the limits the District’s Rules and Regulations (see Section 4.10. *Hydrology and Water Quality*). Construction of potential VCIP projects is not expected to cause or exacerbate subsidence. Any changes to existing subsidence conditions during VCIP implementation would be detected by the subsidence monitoring network. If necessary, the District may use data from the subsidence monitoring network to adjust management of the Westside Subbasin to avoid the exacerbation of existing subsidence issues. (See Section 4.7.1. *Environmental Setting* above for a brief description of subsidence.)

As discussed under Impact GEO-2, the VCIP energy resource projects would be designed in accordance with applicable CBC seismic design standards. The VCIP infrastructure improvements would be designed and constructed in compliance with the International Building Code (IBC) and the Institute of Electrical and Electronics Engineers (IEEE) standards. All structures would be designed as prescribed in project-specific design recommendations by a California-registered professional geotechnical engineer. Measures to minimize potential damage resulting from seismically-induced ground failure hazards may include removal of soils from below the bottom of footings and replacement of the soils with engineered fill, surcharging to induce settlement before construction, installing supporting posts and piles in dense soil below the unstable soils, or other foundation design measures.

Adherence to building and electrical codes and standards, including implementation of engineering seismic design specifications in the project geotechnical report, would adequately address impacts related to ground failure, including liquefaction, lateral spreading, and seismic settlement. Compliance with existing regulations, codes, and required design standards would ensure that potential adverse effects related to seismically-induced ground failures would be *less than significant*.

Mitigation Measures: No mitigation is required.

Impact GEO-4. Landslide Hazard

The level terrain of the VCIP Plan Area has very low potential for landslides, and thus there would be no impact from landslide hazards to project construction, operation, or decommissioning. (No Impact)

The terrain is relatively level throughout the Plan Area and there are no mapped landslides or lands mapped as susceptible to landslides within the Plan Area or immediate vicinity. As such, the VCIP Plan Area has a very low

{00081423.1}

potential for landslides and there would be no impact from landslide hazards associated with construction, operation, or decommissioning of VCIP energy resource and infrastructure projects.

Mitigation Measures: No mitigation is required.

Impact GEO-5. Expansive Soils

Most soil units within the VCIP Plan Area consist of clay soils that have high potential for expansion, which could result in potential damage to foundations and structures; however, any potential impacts would be addressed through compliance with existing regulations, codes, and standards. (*Less-than-Significant Impact*)

Expansive soils are typically associated with fine-grained clayey soils that have the potential to shrink and swell during seasonal wetting and drying cycles. The ability of clayey soil to change volume with variations in moisture content can result in uplift or cracking to foundation elements or other rigid structures such as slabs-on-grade, rigid pavements, or other slabs or hardscape founded on these soils. Most of the soils within the Plan Area are clays or clay loam soils which have a high shrink-swell (i.e., expansion) potential. The sandy loam soils in the western portions of the Plan Area have low expansion potential.

Potential hazards related to expansive soil conditions are addressed in the CBC, which requires design-level geotechnical investigations to identify and characterize expansive soil conditions and make project-specific engineering design recommendations to avoid structural damage due to soils expansion. The design recommendations would specify the most appropriate form of foundation design, based on the nature and extent of expansive soils beneath the planned project structures, foundations, and pads. The potential damage from soils expansion would be reduced by several alternative engineering measures (e.g., over-excavation and replacement with non-expansive soils; extending building foundations below the zone of shrink and swell; use of geofabrics as moisture barriers), as recommended by the project geotechnical engineer. The VCIP elements that may require special foundation design include the substations, battery storage systems, and O&M buildings, which collectively would occupy less than one percent of the typical solar facility site. The design specifications would be enforced by the Fresno County Building and Safety Team which would review and approve the project construction plans prior to issuance of grading and building permits and would follow-up with inspections to ensure compliance.

The VCIP infrastructure elements such as substations, transmission lines, and gen-tie lines would be designed and constructed pursuant to the International Building Code (IBC) and the Institute of Electrical and Electronics Engineers (IEEE) standards. Based on design parameters established by the geotechnical investigations, the structural elements of the infrastructure projects would be designed to resist or accommodate location-specific expansive soils. Compliance with existing regulations, codes, and standards would ensure that potential adverse effects related to expansive soils would be *less than significant*.

Mitigation Measures: No mitigation is required.

{00081423.1}

Impact GEO-6. Erosion Potential

Development of the VCIP energy resource and infrastructure projects could cause water- and wind-related soil erosion during construction and operation of the solar and energy facilities; however, with implementation of erosion control measures specified in the state-mandated Storm Water Pollution Prevention Plans (SWPPPs) for each VCIP project, the potential erosion impacts would be less than significant. (*Less-than-Significant Impact*)

Development of the VCIP energy resource and infrastructure projects would involve site clearing, rough grading, soil compaction, and trenching for solar arrays and internal driveways, excavations for substation foundations, and drilling for transmission and gen-tie footings. Once vegetation is removed, the exposed and disturbed soil would be temporarily more susceptible to erosion from wind and rain. (See Section 4.10. *Hydrology and Water Quality, Impact HYD-3* for a detailed discussion of impacts associated with erosion and sedimentation.) Within the Plan Area, the combination of clay soils and nearly flat terrain result in a generally low natural potential for erosion by rainfall and runoff. However, the seasonal high wind conditions result in high potential for wind erosion on exposed soils within the Plan Area; however, the potential for dust generation during construction would be minimized by implementation of Dust Control Plans as approved by the San Joaquin Valley Air Pollution Control District (SJVAPCD). The erosion controls required during grading and construction of all VCIP projects, including infrastructure projects, would be specified in the state-mandated SWPPPs to be prepared prior to commencement of site grading. SWPPPs include standard requirements for preservation of existing vegetation when feasible, staged seeding and revegetation as work progresses, and establishment of permanent vegetation. At the time of decommissioning for each project, another SWPPP would be required to address stormwater runoff during this final project phase. Implementation of the required SWPPPs would result in *less-than-significant* erosion impacts during grading, construction, and decommissioning of VCIP facilities. (See Section 4.10. *Hydrology and Water Quality* for a detailed discussion of SWPPPs.)

Erosion potential during operation of the VCIP facilities would be negligible. As described in Section 4.10. *Hydrology and Water Quality*, the solar arrays would occupy approximately 90 percent of each site, with the ground beneath retained in vegetative cover. Internal driveways composed of permeable gravel or compacted earth would comprise approximately nine (9) percent of each site. It is anticipated that less than one (1) percent of each site would consist of impervious surfaces. These areas would be revegetated, as noted above and described in Impact HYD-3. In addition, each project would be subject to the provisions of the SWPPP which address post-construction stormwater runoff. The absence of exposed soils during operations, and the virtually flat topography would not be conducive to erosion (see Figure 4.1-1). Almost all rainwater would percolate into the ground within a short period, and the relatively minor volumes of runoff that could be generated during more intense storm events would be retained within each project site. Therefore, the very low potential for erosion impacts to occur during the operational phases of the VCIP facilities would be *less than significant*.

Mitigation Measures: No mitigation is required.

{00081423.1}

Impact GEO-7. Soil Corrosivity

Corrosive soils within the VCIP Plan Area could cause damage to project structures, foundations, and utilities; however, any potential impacts would be addressed through compliance with existing regulations, codes, and standards. (*Less-than-Significant Impact*)

The soil units throughout the Plan Area have a high potential corrosivity to uncoated steel, and a moderate to high potential corrosivity to concrete (NRCS 2006). Unless buried steel and concrete elements are properly treated, the site soil conditions could cause damage to such buried structures under moist environments.

Potential hazards related to solar and energy storage structures due to corrosive soil conditions are addressed in the CBC, which requires design-level geotechnical investigations to identify the potential for corrosion and make corresponding project-specific engineering design recommendations. Measures to minimize potential damage to underground steel and concrete structures due to corrosive soils may include the use of corrosion resistant materials, coatings, and cathodic protection for buried steel, and selection of the appropriate type of cement and water/cement ratio, as recommended by the project geotechnical engineer.

The VCIP infrastructure projects would be designed and constructed pursuant to the IBC and the IEEE standards. Based on design and treatment measures established by the geotechnical investigations, the buried elements of the infrastructure projects would be designed for protection from potential soil corrosivity.

Compliance with existing regulations, codes, and standards would ensure that potential adverse effects related to soil corrosivity would be *less than significant*.

Mitigation Measures: No mitigation is required.

Impact GEO-8. Soil Suitability for Wastewater Disposal

The domestic wastewater disposal requirements for operation of VCIP facilities would be provided by septic tanks and leach fields designed and constructed in accordance with County requirements, ensuring that the soils would be capable of adequately accommodating the effluent generated by the VCIP projects. (*Less-than-Significant Impact*)

During construction and decommissioning of VCIP solar and energy storage projects, wastewater disposal would be provided by portable chemical toilets which would be serviced by a private contractor. During project operation, the solar and energy storage facilities would utilize on-site septic tanks and leach fields for disposal of wastewater associated with each project's Operations and Maintenance (O&M) building. Each project septic system would include a septic tank and an associated leach field. To ensure that the project soils would be capable of supporting disposal of the wastewater effluent generated by the O&M facilities, each project septic system would be designed in accordance with the Fresno County Plumbing Code, the Fresno County Improvement Standards, and the design criteria of the Fresno County Local Area

{00081423.1}

Management Program (LAMP) as approved by the State Water Resources Control Board (SWRCB) (Fresno County 2017b). Adherence to these requirements would ensure that the soils in the planned leach field areas would be capable of adequately accommodating the wastewater effluent generated by the VCIP facilities. In soils with insufficient percolation for conventional septic systems, wastewater disposal would require a specially designed or engineered system. The septic systems would be subject to the approval of the Water and Natural Resources Division and the Building and Safety Division of the Fresno County Department of Public Works and Planning.

During construction of the substations, transmission lines, and gen-tie lines, it is expected that portable toilet facilities would provide wastewater service for construction workers. No permanent employees would be required for the transmission and gen-tie lines, so permanent wastewater facilities would not be required once that infrastructure is completed. It is likely that the VCIP collection substations would include permanent staff, in which case the substations would include septic systems designed and constructed in accordance with County requirements as described above.

In summary, domestic wastewater disposal systems at VCIP facilities would be designed and constructed as required by state-mandated design criteria and standards, such that potential impacts related to soil suitability for wastewater disposal would be *less than significant*.

Mitigation Measures: No mitigation is required.

Impact GEO-9. Loss of Paleontological Resources

Construction of VCIP energy resource and infrastructure projects could result in the destruction of paleontological resources. (*Less-than-Significant Impact with Mitigation*)

The following evaluation of impacts to paleontological resources is based on the “VCIP – Paleontology Memo” prepared by Earthview Science in June 2025 (EVS 2025). The paleontology memo is kept administratively confidential to avoid public disclosure of potential fossil localities.

As discussed in Section 4.7.1. *Environmental Setting*, the Holocene-age alluvial fan (Qf) and basin (Qb) deposits underlie the majority of the Plan Area, including most of the potential Development Focus Areas (DFAs), all of the VCIP collection substations and connecting transmission corridors, and most of the gen-tie lines. These areas have a low paleontological resource potential because they are generally too young to preserve significant fossils; however, the older Pleistocene-age alluvium underlies the younger alluvium at depth. The depth at which the older sensitive geologic material occurs is variable, and although its depth at a given location is unknown, it is generally considered to be more than 5 feet below the ground surface in the areas overlain with Holocene alluvial fan and basin deposits within the Plan Area. Although the subsurface older alluvium is considered to have a high potential for paleontological resources, there are no recorded fossil locations within the Plan Area, and the solar and energy storage projects constructed within and near the Plan Area over the past 15 years have not encountered any fossil material.

{00081423.1}

Within the solar PV projects, steel posts supporting the solar mounting systems would be driven 5 to 8 feet into the ground, with depths varying up to 6 feet in clay soils and up to 8 feet into looser soils. The deeper posts may extend into the sensitive older alluvium, but since the Plan Area is composed mainly of clay soils, the majority of the posts would extend to the shallower depths (i.e., up to 6 feet deep). Although 5 feet is considered the minimum depth at which older alluvium may be encountered, it is likely that the upper Holocene layer may extend deeper than 5 feet in the alluvial fans that comprise most of the Plan Area (Consera 2025). Even in sensitive strata, fossil localities are very rare and isolated, and do not appear in continuous layers. Considering that no fossil discoveries have been reported within the Plan Area, particularly during the past ten years when thousands of acres of solar facilities have been constructed in the Plan Area, the probability that the support posts would encounter fossil material is very low (Bell 2025). The support posts would consist of C-channels composed of thin angle-steel which have a very small footprint. Considering the very low probability that support posts for VCIP solar projects would damage paleontological resources, the potential impact of the support posts to paleontological resources is considered *less than significant*. (Bell 2025)

Trenching for medium-voltage underground electrical conduits would be up to 4 feet deep and thus would be unlikely to extend into the older alluvium. Excavations for substation foundations could be up to 10 feet deep, and drilling for transmission and gen-tie towers would reach depths of 30 to 55 feet. Thus, while most near-surface construction for VCIP projects would not affect the paleontologically sensitive older Pleistocene alluvium, the excavations for construction of facilities at depth could result in destruction of paleontological resources within these strata.

Some potential DFA lands are located along the western margins of the Plan Area where the high sensitivity Pleistocene and Plio-Pleistocene deposits are exposed at the ground surface. Any excavation that would occur in these areas could result in destruction of paleontological resources.

In summary, most of the construction activity associated with VCIP implementation would take place at or near the ground surface in lands with low paleontological sensitivity and would not have a reasonably foreseeable potential impact on paleontological resources. Construction that involves excavations more than 5 feet deep within the Holocene deposits on valley floor area, or that involves any ground disturbance in older Pleistocene materials along the western margins of the VCIP Plan Area, could result in significant impacts to paleontological resources. The potential impacts to paleontological resources resulting from VCIP implementation would be reduced to less-than-significant levels by implementation of Mitigation Measure GEO-1 at the project-specific level.

Mitigation Measure GEO-1: Protection of Paleontological Resources

To avoid potentially significant impacts to paleontological resources from VCIP implementation, the following mitigation measures are applicable at the project-specific level. The lands subject to development under the VCIP are classified as having either high or low paleontological sensitivity. Therefore, the following mitigation measures are separated into three groups, as follows: a) Measures applicable to all VCIP development; b) Measures applicable to lands with high paleontological sensitivity; and c) Measures applicable to lands with low paleontological sensitivity.

{00081423.1}

a) **Measures Applicable to All VCIP Development**

- i) **Retain Qualified Paleontologist.** Prior to initial ground disturbance, the project proponent shall retain a Qualified Paleontologist, defined as a paleontologist who meets the Society of Vertebrate Paleontology's (SVP) standards.
- ii) **Worker Education and Awareness Program (WEAP) Training.** Prior to commencement of ground disturbing activities for construction, the Qualified Paleontologist or his or her designee, shall conduct WEAP training for construction personnel regarding the appearance of fossils and the procedures for notifying paleontological staff should fossils be discovered by construction staff.
- iii) **Unexpected Fossil Discovery.** In the event of a fossil discovery by construction personnel, all work within 50 feet of the find (the "exclusion zone") shall cease, and the Qualified Paleontologist shall be contacted to evaluate the significance of the resource and make recommendations for the treatment, recovery, and curation of the resource, as appropriate. Work within the exclusion zone shall not recommence until the Qualified Paleontologist has completed the site evaluation and recovery process.

b. **Additional Mitigation Measures Applicable Only to Lands with High Paleontological Sensitivity.** Some DFA lands along the western margins of the VCIP Plan Area are located within areas where high sensitivity Pleistocene and Plio-Pleistocene deposits are exposed at the ground surface. The following mitigation measures apply to VCIP projects on these lands:

- i) **Prepare Paleontological Resource Management Plan (PRMP).** Prior to the commencement of ground-disturbing activities (i.e., during construction or decommissioning), the Qualified Paleontologist shall prepare a PRMP for the project. The PRMP shall, based upon the site-specific characteristics applicable to each project, establish field reconnaissance methodology; paleontological monitoring procedures; communication protocols to be followed if an unanticipated fossil discovery is made during project development; and preparation, curation, and reporting requirements.
- ii) **Construction/Decommissioning Monitoring.** As recommended by the PRMP, full-time monitoring shall be required during ground-disturbing activities, including visual inspection of excavated or graded areas and trench sidewalls for evidence of fossils. If a paleontological resource is discovered, the monitor shall divert the construction equipment around the find temporarily until it is assessed for scientific significance and collected and the steps described in "a.iii" above shall be implemented. Monitoring efforts can be reduced or eliminated at the discretion of the Qualified Paleontologist if no fossil resources are encountered after initiation of ground disturbing activity.

c. **Additional Mitigation Measures Applicable Only to Lands with Low Paleontological Sensitivity.** Most of the lands within the VCIP Plan Area are in low sensitivity Holocene-era fan and basin deposits which are underlain by high sensitivity older Pleistocene deposits at depths of at least 5 feet below the ground surface. The following additional mitigation measures apply to VCIP projects on these lands:

- i) **Spot Checking and Construction/Decommissioning Monitoring.** Within these areas, excavations of 5 feet or deeper shall be initially spot checked to determine whether excavations will disturb older alluvial deposits where scientifically important fossils may be present. In the event that

{00081423.1}

paleontologically sensitive sediments are observed, full-time monitoring shall be initially implemented for excavations which extend to the depth of the older alluvial deposits. Ground disturbing activity that does not exceed 5 feet in depth shall not require paleontological spot-checking or monitoring. If it is determined that only sediments that are not conducive to fossil preservation would be disturbed by excavation, the monitoring program should be reduced or suspended as recommended by the Qualified Paleontologist. In the event of a fossil discovery, the steps prescribed in “a.iii” above shall be implemented.

Significance After Mitigation: Less-than-significant impact. Project-level application of the above mitigation measures during construction and decommissioning of VCIP energy resource and infrastructure projects would reduce potential impacts related to paleontological resources to-less-than-significant.

4.7.3.2. TRANSMISSION CORRIDORS OUTSIDE THE VCIP

Transmission corridors for delivery of solar generation from VCIP projects to urban electricity markets in northern and southern California have been identified at a conceptual level in this PEIR to allow a general discussion of environmental impacts associated with transmission line development in these corridors for informational purposes. These transmission delivery corridors extend far beyond the District’s boundaries and are not part of the VCIP. Planning and approval of these outside transmission lines are under the jurisdiction of state and federal energy regulatory agencies, public utilities, and cities and counties traversed by the transmission corridors. The following discussion provides an overview of potential impacts of these outside transmission lines with respect to geology, soils, and paleontological resources.

Geology and Soils

The delivery transmission lines extending outside the Plan Area to regional load centers would stretch a total corridor length of approximately 348 miles and would pass through 10 counties with widely varying terrain and geological and soils conditions. The northern transmission corridor would commence on the deep soils of the valley floor and then follow the lower foothills of the Diablo Range for most of its length before entering the valley again in Alameda County. The western transmission corridor would commence on the valley floor and then traverse the Coast Ranges and pass through two small valleys on the way to Moss Landing. The southern transmission corridor would extend south along the valley floor before traversing the Tehachapi Mountains and the Antelope Valley to its terminus near Acton. All of these outside transmission corridors would pass over or alongside existing active earthquake faults and would be subject to potential fault rupture and severe ground shaking, as well as related seismic hazards such as liquefaction, lateral spreading, and seismic settlement. In the mountain areas, the transmission corridors would be subject to potential landslides and soils erosion, and in the valley floor areas, the corridors would be subject to areas with expansive and corrosive soils. The transmission facilities would not require septic systems, so soil suitability for wastewater disposal would not be an issue.

To reduce risks from geologic and soils hazards to acceptable levels, all transmission infrastructure would be routed, designed, and constructed in accordance with seismic engineering and geotechnical soils engineering design specifications in compliance with the IBC and the IEEE standards, as well as construction standards applicable to federal and state regulated utilities, as applicable. All structures would be designed as

{00081423.1}

prescribed in project-specific design recommendations by a California-registered professional geotechnical engineer. All construction would be subject to SWPPPs to control erosion and water quality impacts during construction.

Compliance with existing regulations, codes, and standards would ensure that potential geologic and soils hazards and impacts associated with the outside transmission lines would be *less than significant*.

Paleontological Resources

Potential impacts to paleontological resources can occur wherever a fossil-bearing geological formation is exposed at the ground surface or occurs at shallow depths and ground disturbing activities or excavations are planned within these formations. In the valley floor segments of the transmission corridors, the surface material consists of alluvial Holocene-era deposits which were formed too recently to contain fossils. This surface alluvium has a low paleontological sensitivity, but the potential for fossil discoveries increases at depths where the older Pleistocene deposits occur. In the mountain areas of the Coastal Ranges and Tehachapis, the geologic composition is highly variable, and paleontological sensitivity generally ranges from low to high depending on the formation. Construction of the outside transmission lines could result in significant impacts to paleontological resources depending on location.

All outside transmission line projects would be subject to environmental review under CEQA (and NEPA for federal transmission projects), which would involve construction-level evaluation of paleontological resources. These evaluations would be conducted by a qualified professional paleontologist in all cases because all transmission corridors would have at least a low potential for paleontological resources (i.e., at depths below 5 feet in Holocene-era surface deposits), and no corridors will be entirely classified as having “no paleontological sensitivity.” Depending on the sensitivity of the formations affected within any transmission segment, the mitigation measures prescribed would reflect the degree of probability of fossil discovery. These mitigation measures would be the same as or similar to those identified in Mitigation Measure GEO-1 above, which reflect standard, professionally prescribed measures for various conditions of paleontological sensitivity.

In summary, with the evaluation of paleontological sensitivity for each outside transmission project, as required under CEQA (and NEPA where applicable) during project-specific environmental review, and the identification and implementation of appropriate mitigation measures for each project, as required by the approving agencies in each case, the impacts to paleontological resources related to the construction of the outside transmission lines would be *less-than-significant with mitigation*.

4.7.3.3. CUMULATIVE IMPACTS

Geology and Soils

Geologic and soils impacts tend to be highly localized and generally do not extend beyond individual project boundaries. Given the relatively flat terrain of the Plan Area and its vicinity, and the absence of large-scale geologic hazards, such as large deep-seated landslides, or potential mud slides or debris flows that would extend beyond project boundaries, it is highly unlikely that geologic and soils impacts would extend beyond the boundaries of the Plan Area. Erosion and sedimentation impacts can extend beyond project boundaries to downstream areas within a project’s drainage area. However, as discussed in Section 4.10. *Hydrology and* {00081423.1}

Water Quality, the natural drainage pattern in the Plan Area has been highly engineered and modified such that any stormwater runoff generated within a given project site would be retained within the site and would not flow downstream. Therefore, the geographic scope for the cumulative analysis of geologic and soils impacts is conservatively defined to extend no more than ½ mile beyond the boundaries of the VCIP Plan Area. Lands located at greater distances have no potential to contribute to cumulatively significant geology and soils impacts in combination with the less-than-significant geology and soils impacts associated with VCIP implementation.

The potential geology and soils impacts associated with the VCIP energy resource and infrastructure projects, as well as the potential geology and soils impacts associated with other cumulative projects, would be addressed on a site-specific basis for each project in accordance with local building codes and regulations, and state and federal construction standards and requirements (as applicable to the infrastructure projects), as prescribed in the seismic and soils design recommendations by the geotechnical engineers for each project. The vulnerability of each cumulative project to seismic and soil hazards would be subject to confirmation and detailed characterization through the completion of geotechnical investigations required prior to the development of each project site or transmission corridor. The specified soil engineering measures would be expected to fully address or avoid all potentially hazardous geologic and soils conditions for each project. Therefore, the cumulative geologic and soils impacts would be *less than significant*, and in any case the contribution to any cumulative impact from VCIP energy resource and infrastructure projects would *not be cumulatively considerable*.

Paleontological Resources

The potential for cumulative destruction of paleontological resources is statewide in scope and impact. For purposes of this analysis, the geographic scope of the cumulative impact analysis for paleontological resources with respect to VCIP implementation includes the cumulative projects in the western parts of Fresno and Kings Counties as listed in Table 4.0-2 and shown in Figure 4.0-1.

As is the case for the VCIP energy resource and infrastructure projects, the surface soils at almost all of the cumulative project sites consist of Holocene deposits which are too recent to contain fossils. At each site, older Pleistocene deposits, which are known to include vertebrate fossils, underlay the surface materials at varying depths which may be as shallow as five feet beneath the ground surface. While grading and construction activities in the near-surface soils are unlikely to encounter fossils, deeper excavations, trenching and underground construction have the potential to disturb intact paleontological material. Given the potential for impacts to paleontological resources at each cumulative project site, the approvals of those projects did and will include conditions to avoid or mitigate potential paleontological impacts during project grading, excavation, and construction. Like the paleontological mitigation measures identified for the VCIP projects in Mitigation Measure GEO-1 above, required measures include work stoppage and consultation with a qualified paleontologist if fossils are encountered, and requirements for proper handling and curation of any fossils discovered. For each cumulative project, the implementation of these measures would limit potential paleontological impacts to less-than-significant levels. Moreover, with implementation of Mitigation Measure GEO-1 above, the contribution to any cumulative impact from the VCIP energy resource and infrastructure projects *would not be cumulatively considerable*.

{00081423.1}

Transmission Corridors Outside the VCIP

Geology and Soils

As discussed above, the outside transmission corridors would be subject to potential geologic hazards such as fault rupture, ground shaking, lateral spreading, liquefaction, seismic settlement, and landslides, as well as soils hazards such as soils expansion, erosion, and corrosivity. Each of the outside transmission projects would be subject to existing regulations, codes, and construction standards which would ensure that these projects are designed to avoid potential impacts related to geologic and soils hazards. Therefore, the geology and soils impact of the outside transmission lines would be less than significant, and the contribution to any cumulative impact would not be considerable. While consideration of cumulative geology and soils impacts of development in the 10 affected counties is beyond the scope of this PEIR, it is reasonable to assume that all cumulative projects would be constructed in accordance with local building codes and other applicable standards and that the cumulative impact would not be significant. Given that the contribution to any geology and soils impact from the outside transmission projects would not be cumulatively considerable, the geology and soils impact of construction of the outside transmission lines would be *cumulatively less than significant*.

Paleontological Resources

As discussed above, the outside transmission lines would traverse lands that range from low to high in paleontological sensitivity. Previously undiscovered fossils could be destroyed by transmission construction projects unless mitigated. Each transmission project would require evaluation for paleontological sensitivity, as required under CEQA (and NEPA as applicable) during project-specific environmental review. With identification and implementation of appropriate mitigation measures for each project, as required by the lead agencies in each case, impacts to paleontological resources resulting from the construction of the outside transmission lines would be less than significant and the contribution to any cumulative impact would not be considerable. Consideration of cumulative paleontological impacts of development in the 10 affected counties is beyond the scope of this PEIR; however, it is reasonable to assume that all cumulative projects proposed in paleontologically sensitive areas would be subject to mitigation measures that would ensure fossil protection and preservation. Moreover, given that the contribution to any paleontological impact from the outside transmission projects would not be cumulatively considerable, as discussed above, the paleontological impact associated with construction of the outside transmission lines would be *cumulatively less than significant*.

4.7.4. References – Geology, Soils, and Paleontological Resources

- Bell 2025 Bell, Allysa, Ph D., Senior Paleontologist, Stantec Consulting. *Personal Communication with Bert Verrips, February 21, 2025.*
- CGS 1986 California Department of Conservation (DOC), California Geological Survey (CGS). *Alquist-Priolo Earthquake Fault Zone Maps – Los Banos, Ortigalita Peak, Ortigalita Peak NW, San Luis Dam, Pacheco Pass.* Effective July 1, 1986.
<http://maps.conservation.ca.gov/cgs/informationwarehouse/index.html?map=regulatorymaps>

{00081423.1}

CGS 2000	California Department of Conservation (DOC), California Geological Survey (CGS). 2000. <i>Epicenters of and Areas Damaged by M > 5 California Earthquakes, 1800-1999 (Map)</i> . https://www.conservation.ca.gov/cgs/documents/publications/map-sheets/MS_049.pdf
CGS 2015a	California Department of Conservation (CDOC), California Geological Survey (CGS). 2015. <i>California Geological Survey Information Warehouse – Regulatory Maps</i> . https://maps.conservation.ca.gov/cgs/informationwarehouse/index.html?map=regulatorymaps
CGS 2015b	California Department of Conservation (DOC), California Geological Survey (CGS). 2015. <i>Fault Activity Map of California</i> . CGS Geologic Data Map No. 6. http://maps.conservation.ca.gov/cgs/fam/
Conserva 2025	Conserva, MariaElena, Ph D., Senior Paleontologist, Earthview Science. <i>Personal Communication with Bert Verrips, February 21, 2025</i> .
DWR 2020	California Department of Water Resources (DWR). January 2020. <i>Groundwater Sustainability Plan – 5-022.09 Westside</i> . https://sgma.water.ca.gov/portal/gsp/preview/8
EVS 2025	Earthview Science (EVS). June 2025. <i>Valley Clean Infrastructure Plan – Paleontology Memo</i> . [The Paleontology Memo is kept administratively confidential by Westlands Water District per Government Code Section 7927.000 and Section 7927.005.]
Fresno County 1966	County of Fresno. October 1966. <i>Fresno County Improvement Standards</i> . https://www.fresnocountyca.gov/files/sharedassets/county/v/1/vision-files/files/59043-improvement-standards-1966.pdf
Fresno County 2017b	County of Fresno. October 2017. <i>Fresno County Local Area Management Program (LAMP)</i> . https://www.fresnocountyca.gov/files/sharedassets/county/v/1/vision-files/files/39300-fresno-county-lamp-2019.pdf
Fresno County 2017c	County of Fresno. <i>Solar Facility Guidelines</i> . As revised by BOS on December 12, 2017. https://www.fresnocountyca.gov/Departments/Public-Works-and-Planning/divisions-of-public-works-and-planning/development-services-division/planning-and-land-use/photovoltaic-facilities/photovoltaic-facilities-p-1621
Fresno County 2023b	County of Fresno. April 2023. <i>Fresno County General Plan Background Report – Public Review Draft</i> . https://www.fresnocountyca.gov/files/sharedassets/county/v/2/public-works-and-planning/development-services/planning-and-land-use/general-plan/fcgrp-background-report-2023-05-10.pdf
Fresno County 2024b {00081423.1}	Fresno County. February 2024. <i>Fresno County General Plan Policy Document, Final Draft</i> . https://www.fresnocountyca.gov/files/sharedassets/county/v/3/public-

[works-and-planning/development-services/planning-and-land-use/environmental-impact-reports/general-plan-review/fcgrpr_general-plan_prd-county_01-12_24-clean.pdf](#)

- Fresno County 2024c County of Fresno. 2024. *Fresno County Ordinance Code*. As amended through December 10, 2024. https://library.municode.com/ca/fresno_county/codes/code_of_ordinances?nodeId=FRCOORCO
- NRCS 2006 U.S. Department of Agriculture (USDA), Natural Resources Conservation Service. November 2006. *Soil Survey of Fresno County California, Western Part*. <https://archive.org/details/usda-general-soil-map-soil-survey-of-fresno-county-california-western-part/mode/2up>
- USGS 2014 U.S. Geological Survey (USGS). 2014. *Seismic Hazard Maps for Coterminous United States, 2014*. http://pubs.usgs.gov/sim/3325/pdf/SIM3325_sheet1.pdf
- USGS 2023 U.S. Geological Survey (USGS). 2023. *ShakeMap Manual*. <http://usgs.github.io/shakemap/>
- USGS 2025b U.S. Geological Survey (USGS). *U.S. Landslide Inventory and Susceptibility*. Accessed April 21, 2025. <https://usgs.maps.arcgis.com/apps/webappviewer/index.html?id=ae120962f459434b8c904b456c82669d>
- WWD 2017a Westlands Water District (WWD). February 2017. *Generalized Depth to Groundwater in the Upper Zone – December 2015*. <https://wwd.ca.gov/wp-content/uploads/2018/01/gd-2015-unconfined.pdf>
- WWD 2017c Westlands Water District (WWD). December 2017. *Generalized Depth to Shallow Groundwater Surface – April 2017*. <https://wwd.ca.gov/wp-content/uploads/2018/01/sgw-gd-april-2017.pdf>

{00081423.1}