Chapter 9
Geology, Soils, and Seismicity

9.1 Overview

This chapter evaluates potential impacts related to geology, soils, and seismicity that may be caused by the Proposed Project. The impact analysis considers potential impacts in light of existing laws and the physical geologic and soils conditions in the Project vicinity.

Resources used to prepare this chapter include geologic fault and soils maps produced by the California Department of Conservation (CDOC), the geotechnical investigation report prepared for the Proposed Project (Kleinfelder 2015), and the proponent's environmental assessment (PEA) submitted to the California Public Utilities Commission (CPUC) by NextEra Energy Transmission West (NEET West) (NEET West 2015).

9.2 Regulatory Setting

9.2.1 Federal Laws, Regulations, and Policies

National Earthquake Hazards Reduction Act

The National Earthquake Hazards Reduction Act of 1977 (Public Law 95-124) created the National Earthquake Hazards Reduction Program (NEHRP), establishing a long-term earthquake risk reduction program to better understand, predict, and mitigate risks associated with seismic events. Four federal agencies are responsible for coordinating activities under NEHRP: U.S. Geological Survey (USGS); National Science Foundation (NSF); Federal Emergency Management Agency (FEMA); and National Institute of Standards and Technology (NIST). Since its inception, NEHRP has shifted its focus from earthquake prediction to hazard reduction. The current program objectives (NEHRP 2009) are as follows:

1. Developing effective measures to reduce earthquake hazards;

2. Promoting the adoption of earthquake hazard reduction activities by federal, state, and local governments, national building standards and model building code organizations, engineers, architects, building owners, and others who play a role in planning and constructing buildings, bridges, structures, and critical infrastructure or "lifelines";

3. Improving the basic understanding of earthquakes and their effects on people and infrastructure through interdisciplinary research involving engineering, natural sciences, and social, economic, and decision sciences; and

4. Developing and maintaining the USGS seismic monitoring system (Advanced National Seismic System); the NSF-funded project aimed at improving materials, designs, and construction techniques (George E. Brown Jr. Network for Earthquake Engineering

Simulation); and the global earthquake monitoring network (Global Seismic Network).

Implementation of NEHRP objectives is accomplished primarily through original research, publications, and recommendations and guidelines for state, regional, and local agencies in the development of plans and policies to promote safety and emergency planning.

9.2.2 State Laws, Regulations, and Policies

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act (Public Resources Code § 2621 et seq.) was passed to reduce the risk to life and property from surface faulting in California. The Alquist-Priolo Act prohibits construction of most types of structures intended for human occupancy on the surface traces of active faults and strictly regulates construction in the corridors along active faults (earthquake fault zones). It also defines criteria for identifying active faults, giving legal weight to terms, such as "active," and establishes a process for reviewing building proposals in and adjacent to earthquake fault zones. Under the Alquist-Priolo Act, faults are zoned and construction along or across them is strictly regulated if they are "sufficiently active" and "well defined." Before a project can be permitted, cities and counties must require a geologic investigation to demonstrate that proposed buildings would not be constructed across active faults.

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act of 1990 (Public Resources Code §§ 2690-2699.6) establishes statewide minimum public safety standards for mitigation of earthquake hazards. While the Alquist-Priolo Act addresses surface fault rupture, the Seismic Hazards Mapping Act addresses other earthquake-related hazards, including strong ground shaking, liquefaction, and seismically induced landslides. Its provisions are similar in concept to those of the Alquist-Priolo Act. Under the Seismic Hazards Mapping Act, the State is charged with identifying and mapping areas at risk of strong ground shaking, liquefaction, landslides, and other seismic hazards, and cities and counties are required to regulate development within mapped seismic hazard zones. In addition, the act addresses not only seismically induced hazards but also expansive soils, settlement, and slope stability. Under the act, cities and counties may withhold the development permits for a site within seismic hazard zones until appropriate site-specific geologic and/or geotechnical investigations have been carried out and measures to reduce potential damage have been incorporated into the development plans.

California Building Code and International Building Code

Title 24 of the California Code of Regulations (CCR), also known as the California Building Standards Code (CBC), specifies standards for geologic and seismic hazards other than surface faulting. These codes are administered and updated by the California Building Standards Commission. The CBC specifies criteria for open excavation, seismic design, and load-bearing capacity directly related to construction in California.

The 2012 International Building Code (IBC) (known as the Uniform Building Code prior to 2000) was developed by the International Conference of Building Officials (ICBO) and is used by most states, including California, as well as local jurisdictions to set basic standards for acceptable design of structures and facilities. The IBC provides information on criteria for seismic design, construction, and load-bearing capacity associated with various buildings and other structures and features. Additionally, the IBC identifies design and construction requirements for addressing and mitigating potential geologic hazards. New construction generally must meet the requirements of the most recent version of the IBC.

9.2.3 Local Laws, Regulations, and Policies

The CPUC has exclusive jurisdiction over the siting and design of electric transmission facilities. Therefore, it is exempt from local land use and zoning regulations. However, CPUC General Order (G.O.) 131-D states that in locating electric transmission facilities, the public utilities shall consult with the local agencies regarding land use matters. CPUC and NEET West have been in contact with applicable local agencies for the Proposed Project, and local laws and regulations are presented here for consideration of potential impacts related to geology, soils, and seismicity.

San Diego County General Plan

The Safety Element of the San Diego County General Plan (County of San Diego 2011) contains goals and policies related to geologic hazards and seismic safety. These include policies to locate development in areas where risk to people or resources is minimized or a minimum of 50 feet from active or potentially active faults; requiring development to include engineering measures to reduce seismic and geologic hazard risk in accordance with the CBC and IBC; prohibit high occupancy uses, essential facilities, and uses that permit significant amounts of hazardous materials within Alquist-Priolo and other identified hazard zones; and directing development away from areas with high landslide, mudslide, or rock fall potential when engineering solutions have been determined to be infeasible.

County of San Diego Grading Ordinance

The County of San Diego Grading Ordinance requires property owners or persons proposing to conduct grading or clearing within the County to obtain a grading permit. General precautions required by the Grading Ordinance include removing all loose dirt from the grading site and providing adequate erosion control or drainage devices, debris basins, or other safety devices. The Grading Ordinance includes a number of design standards and performance requirements that serve to prevent erosion and minimize loss of topsoil (County of San Diego 2012).

9.3 Environmental Setting

9.3.1 Regional Geologic and Topographical Setting

The Proposed Project would be located in the Peninsular Ranges Geomorphic Province, approximately 12 miles west of the Laguna Mountains (NEET West 2015). The Peninsular Ranges is a series of mountain ranges separated by northwest trending valleys, subparallel to faults branching from the San Andreas Fault (CGS 2002).

The geologic character of western San Diego County and the Peninsular Ranges Geomorphic Province can generally be traced back to ancient processes of subduction[1] and crustal uplift (Walawender No Date). During the Mesozoic Era[2] (200 million years ago), present day San Diego County was underwater, as ocean waters extended eastward to Arizona and northern Mexico (Walewender No Date). Over time, the sedimentary rocks that had formed in the shallow seas off the coast of North America were subducted under the Continental Plate, leading to the formation of metamorphic[3] and igneous[4] rocks. As the subducted material was drawn downwards, it melted or partially melted from exposure to heat from the earth's core and then rose upward to form the different rock types that exist today (e.g., gabbro, schist, gneiss, etc.) (Walawender No Date). Following uplift, these igneous and metamorphic rocks were then eroded at varying rates based on their composition, leading to the present-day topography in the region.

9.3.2 Local Geology

Consistent with the regional geologic character described above, the California Geologic Survey (CGS) maps the Proposed Project site as an area characterized by Mesozoic, granitic rocks (CGS 2016). This was confirmed during the geotechnical investigation performed for the Proposed Project, where granitic rocks of the Corte Madera Monzogranite and Cuyamaca Gabbro were encountered underneath the surficial units below the entire proposed Static VAR compensator (SVC) site and the proposed transmission line alignment (Kleinfelder 2015). Samples of these materials taken from the geotechnical borings revealed that the majority of this unit is appreciably decomposed, ranging from completely weathered to highly weathered (Kleinfelder 2015). Below the decomposed granite, impenetrable granitic material was encountered at depths from 5 to 25 feet below ground surface (bgs) when the augers refused on the hard surface and the borings were terminated (Kleinfelder 2015). Additionally, although not encountered in the borings during the geotechnical investigation for the Proposed Project, a 2009 study by URS Corporation for the San Diego Gas & Electric (SDG&E) Suncrest Substation documented Jurassic to Triassic area metamorphic rocks near the west end of the transmission line alignment, near the proposed riser pole location (Kleinfelder 2015).

9.3.3 Soils

The proposed SVC would be located within an area mapped as Fallbrook sandy loam, as shown in Figure 9-1. Additionally, portions of the proposed transmission line would pass through areas mapped as Cieneba very rocky coarse sandy loam and Cieneba coarse sandy loam (Natural Resources Conservation Service [NRCS] 2016). According to the Soil Survey for the San Diego Area, CA (Soil Conservation Service [SCS] 1973), the Fallbrook series consists of well-drained, moderately deep to deep sandy loams that formed in material weathered in

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[1] Subduction is a geological process that takes place at convergent boundaries of tectonic plates where one plate moves under another and is forced down into the mantle.

[2] The Mesozoic Era is an interval of geological time from about 252 to 66 million years ago. The era is subdivided into three major periods: the Triassic, Jurassic, and Cretaceous.

[3] Metamorphic rocks are the product of transformation of an existing rock. The original rock is subjected to high heat and pressure, causing profound physical and/or chemical changes in the rock. Examples of metamorphic rocks include gneiss and schist.

[4] Igneous rocks are formed through the cooling and solidification of magma or lava. Igneous rocks may form either below the surface as intrusive (plutonic) rocks or on the surface as extrusive (volcanic) rocks.

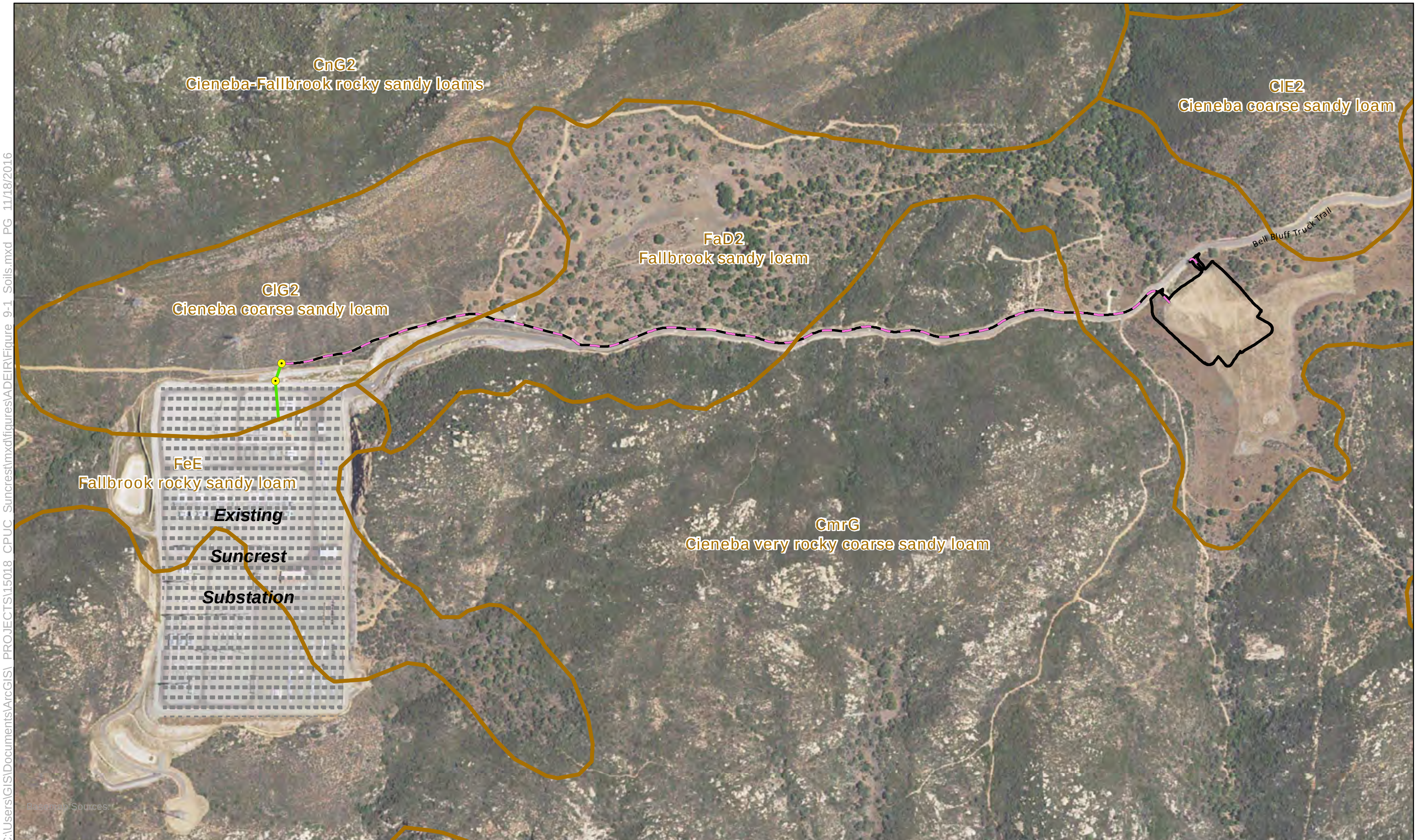
place from grandiorite. The Cieneba series consists of excessively drained, very shallow to shallow coarse sandy loams (SCS 1973).

In addition to the soil classes mapped by the NRCS, due to the history of the Project site and substantial grading effort undertaken for the construction of Bell Bluff Truck Trail and the SDG&E Suncrest Substation, there is likely some artificial fill present in the Project area (Kleinfelder 2015). Between the SDG&E Suncrest Substation and the proposed SVC site, the grading effort for construction of Bell Bluff Truck Trail included both cut and fill embankment (Kleinfelder 2015). However, artificial fill was only encountered in one boring location (along Bell Bluff Truck Trail, near the middle of the proposed alignment) during the geotechnical investigation, consisting of a clayey sand and extending to a depth of approximately 3 feet bgs. The geotechnical investigation report anticipates most of the fill in the Project area to be less than five feet in depth, with isolated areas up to a maximum of 10 feet in depth (Kleinfelder 2015).

The geotechnical investigation tested three soil samples taken from the proposed SVC location for their expansive[5] properties. Test results on one of the samples showed an expansion index (EI)[6] of 4, while test results on the other two showed the soils were non-expansive. Based on these results, and on visual evaluations of the topsoil and colluvial soil variability throughout the site, the geotechnical investigation report concluded these materials may be classified in the low expansion range (Kleinfelder 2015).

[5] Expansive soils are characterized by their ability to undergo significant volume changes (shrink or swell) in response to changes in moisture content (Kleinfelder 2015). Such volume changes can cause damage to buildings via settlement or heave of structures or concrete slabs supported on grade.

[6] Expansion index (EI) is a system used to provide an indication of swelling potential of a compacted soil. The classification of potential expansion of soils using EI is as follows: 0-20 (Very Low); 21-50 (Low); 51-90 (Medium); 91-130 (High); >130 (Very High).



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0 500 1,000
Feet

Prepared by:

Horizon WATER and ENVIRONMENT

Soil Unit Boundary
Source: NRCS SSURGO
San Diego Subbasin 2016

SVC Area
Overhead Transmission Line
Underground Transmission Line
Riser Pole Structure

Note: Project feature locations are approximate.

Figure 9-1
Soils in the Project Area

Suncrest Dynamic Reactive Power Support Project

9.3.4 Seismicity

The Proposed Project location is not in immediate proximity to any recently active faults, and is not within an Alquist-Priolo Earthquake Hazard Zone (CGS 2016). The nearest fault which has experienced displacement within the last 11,700 years (i.e., Holocene age) is the Elsinore fault (CGS 2010), which is located approximately 18 miles east-northeast of the Project site. Figure 9-1 shows faults in the Project vicinity. While there are several quaternary (age undifferentiated) (i.e., older than 700,000 years) faults in the Project vicinity, as shown on Figure 9-1, these are not considered active.[7]

Table 9-1. Proximity of the Project Site to Regional Faults

Fault Zone	Fault	Approximate Distance from Proposed Project (Miles)	Last Known Major Displacement
Elsinore	Julian Section	18	Within last 11,700 years
	Coyote Mountain Section	29	Within last 11,700 years
Rose Canyon	Silver Strand	34	Within last 11,700 years
	Coronado	35	Within last 11,700 years
	Spanish Bight	37	Within last 11,700 years
San Jacinto	Coyote Creek	45	1968
	Superstition Hills	61	1987

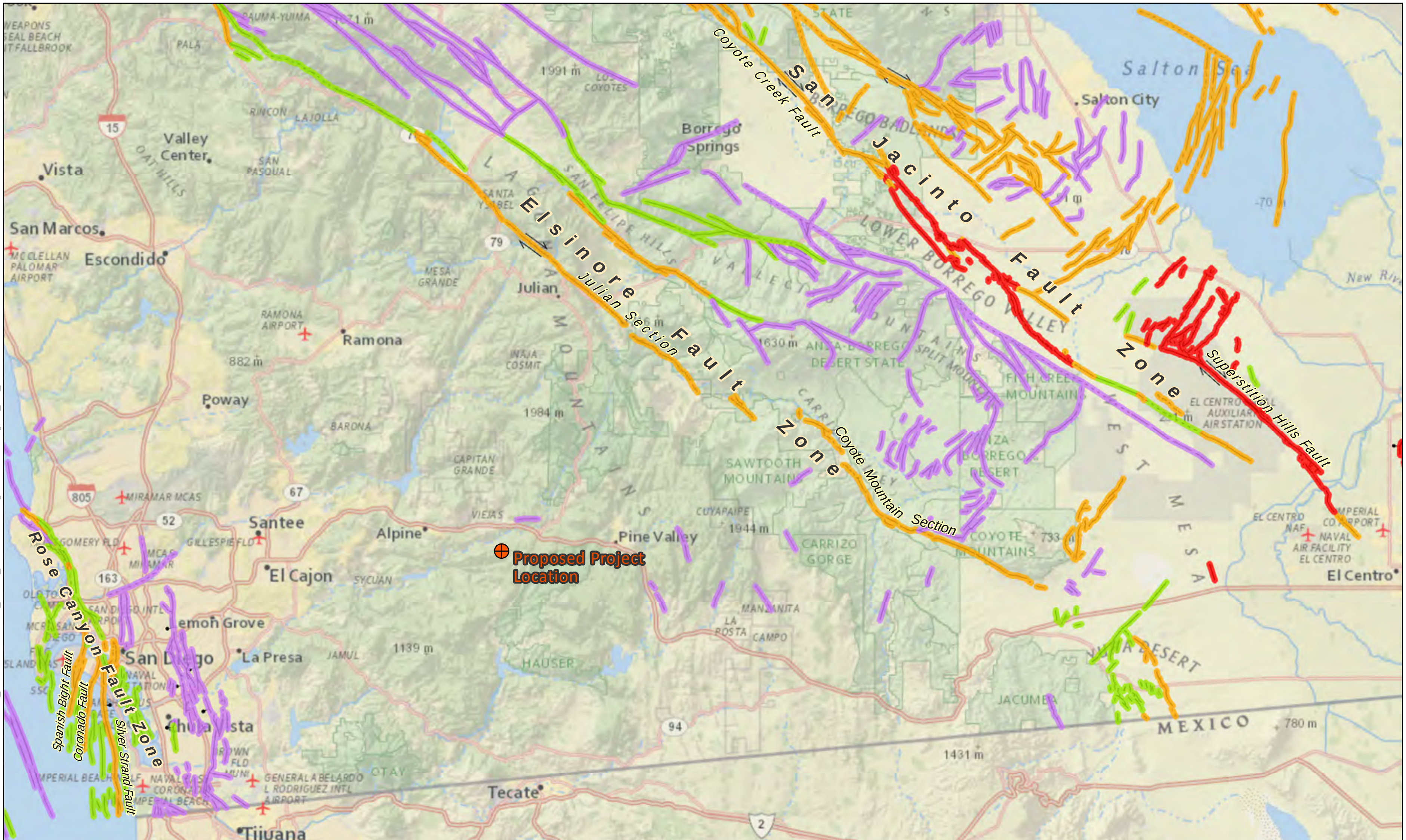
Source: CGS 2010

In general, the San Diego region has a relatively inactive seismic history compared to surrounding southern California areas, such as the Imperial Valley, northern Baja California, and offshore regions (NEET West 2015).

The Elsinore Fault Zone, located approximately 18 miles from the Proposed Project, is one of the largest faults in southern California; however, it has been one of the quietest in historical times (Southern California Earthquake Data Center [SCEDC] 2016a). The most recent surface rupture is estimated to have occurred at some time in the 18th Century AD. The most recent earthquake occurred in 1910 when a magnitude 6 quake struck near Temescal Valley (SCEDC 2016a).

The Rose Canyon Fault is thought to have had at least one late Holocene rupture, with the date of the earthquake most likely occurring sometime between 1450 and 1769 AD (Southern California Edison 2012). The San Jacinto Fault Zone is considered the most active fault zone in the area, with the most recent surface rupture occurring on April 9, 1968, when a magnitude 6.5 earthquake occurred on the Coyote Creek fault segment (SCEDC 2016b). According to the Southern California Earthquake Data Center (SCEDC), probable magnitudes on the San Jacinto Fault Zone are 6.5 to 7.5, with the interval between surface ruptures estimated at between 100 and 300 years, per segment (SCEDC 2016b).

[7] The USGS considers a fault to be active if it has moved one or more times in the last 10,000 years (USGS 2016).



Proposed Project Location

Faults
(by recency of movement)

- *Historic (past 200 years)*
- *Holocene (past 11,700 years)*
- *Late Quaternary (past 700,000 years)*
- *Quaternary (age undifferentiated)*

Prepared by:
Horizon Water and Environment

Sources: Content may not reflect National Geographic's current map policy.
Sources: National Geographic, Esri, DeLorme, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.
USGS, California Geological Survey

Figure 9-2
Faults in the Project Vicinity

Suncrest Dynamic Reactive Power Support Project

Ground Shaking

Ground shaking can cause substantial damage to buildings and is typically the most destructive force from earthquakes. The Modified Mercalli Intensity (MMI) scale, shown in Table 9-2, is the current standard used throughout the U.S. for describing ground shaking. The MMI scale is a ranking system based on observed effects: less intense earthquakes are typically rated on the basis of individual accounts, whereas higher intensity events are rated based on observed structural damage.

Table 9-2. Modified Mercalli Intensity Scale

Intensity	Shaking	Description/Damage
I	Not Felt	Not felt except by a very few under especially favorable conditions.
II	Weak	Felt only by a few persons at rest, especially on upper floors of buildings.
III	Weak	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	Light	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Moderate	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Strong	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Very Strong	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Severe	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Violent	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Extreme	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.

Source: USGS 1989

The Project site is located in an area mapped by the CGS as low risk for potential earthquake shaking, as it is west of the significant faults in the region (i.e., San Jacinto, Elsinore) (CGS 2008). However, given that the Project site is within a seismically-active region (i.e., southern California), it can be expected to be impacted by shaking from regional earthquakes at some point during the life of the Project (Kleinfelder 2015). According to the geotechnical investigation report, the most significant seismic event likely to affect the Project site would be an earthquake with a moment magnitude of approximately 7.3M resulting from a rupture on the Julian segment of the Elsinore fault, which is located approximately 18 miles northeast of the Project site (Kleinfelder 2015). The PEA, submitted to CPUC by the project proponent, NEET West, estimated a peak ground acceleration (PGA)[8] of 0.215g for the Project area (NEET West 2015). This translates to a MMI rank of VII, or "Very Strong."

Liquefaction and Subsidence

Soil liquefaction is a phenomenon that occurs when saturated sandy or silty soils lose strength during cyclic loading, as caused by earthquakes. During the loss of strength, the soil acquires "mobility" sufficient to permit both horizontal and vertical movements, behaving like a liquid. The factors known to influence liquefaction potential are soil type and depth, grain size, density, groundwater level, degree of saturation, and the intensity and duration of ground shaking. The greatest potential for liquefaction occurs in areas where the water table is less than 20 feet bgs and where soils consist of relatively uniform, low-density sands. Clayey-type soils are generally not subject to liquefaction. The probability of liquefaction correlates directly with the intensity and duration of ground shaking (i.e., the stronger and/or longer the earthquake, the greater the chance of liquefaction). Subsidence, or seismically induced settlement, is the settlement or lowering of the ground surface that may be caused by fault movement, slope instability, or liquefaction and compaction of the soil at the site (City of San Diego 2007).

The Proposed Project site does not appear to be located in an area with high potential for liquefaction, as indicated on the County of San Diego's hazard mitigation planning liquefaction map (County of San Diego 2009a). The County's map shows liquefaction layers in the area of El Cajon and along the Sweetwater River drainage, but not the Project site. The County's map also shows the Project site as being within an area of low liquefaction risk with respect to peak ground acceleration (County of San Diego 2009a). As described in the Project geotechnical investigation report (Kleinfelder 2015), the majority of the Project site is underlain at depth by very dense soil and weathered rock, with some limited areas of shallow alluvium, colluvium, and compacted fill. Due to these characteristics, and the fact that groundwater was not encountered within the soil units, the geotechnical investigation report concludes that the potential for liquefaction and seismic related settlement across the majority of the site is low (Kleinfelder 2015).

Landslide and Slope Failure

Landslides are deep-seated ground failures (several tens to hundreds of feet deep) in which a large section of a slope detaches and slides downhill (Kleinfelder 2015). Not to be confused with minor slope failures (e.g.., slumps), landslides can cause extensive damage to structures both above and below the slide mass (Kleinfelder 2015). In general, landslides may occur in steeply sloped areas during seismic events, though the slope material, saturation, and other factors play important roles in the probability of a landslide occurrence.

According to the geotechnical investigation report prepared for the Proposed Project, the natural slopes within the Project area are composed of granitic material that typically are not

[8] The PEA notes that PGA in the vicinity of the Proposed Project was determined using the CGS Probabilistic Seismic Hazard Assessment (PSHA) ground motion interpolator. Based on uncertainties in the size and location of earthquake events, the PSHA interpolator depicts PGAs with a 10 percent probability of exceedance in 50 years or an annual probability of one in 475 of being exceeded each year (NEET West 2015).

prone to landsliding on low to moderate slopes and in most cases even on steep slopes are not prone to deep-seated failures (Kleinfelder 2015). The geotechnical investigation report noted that during the site reconnaissance of the Project site area, the slope surfaces were observed and no signs of past slope instability were identified (Kleinfelder 2015). Based on their observations and the characteristics of the slopes at the site, the report authors concluded that the hazard with respect to landsliding at the proposed SVC site would be low, and would be low to moderate for the most significant slope along the transmission line alignment at the western end of the site above the existing SDG&E Suncrest Substation (Kleinfelder 2015). This assessment is supported by County of San Diego's hazard mitigation planning rain-induced landslide map (County of San Diego 2009b), which indicates that the Proposed Project site is not in an area of high landslide or soil slip susceptibility.

9.4 Impact Analysis

9.4.1 Methodology

Potential impacts related to geology, soils, and seismicity from the Proposed Project are evaluated qualitatively in consideration of the existing characteristics of the Project site and existing laws and regulations, as described in the preceding sections of this chapter. The analysis relies on the geotechnical evaluation conducted for the Proposed Project (Kleinfelder 2015). Potential impacts are considered with respect to the applicable State CEQA Guidelines Appendix G significance criteria, described below.

9.4.2 Criteria for Determining Significance

According to Appendix G of the State CEQA Guidelines, the Proposed Project would have a significant effect related to geology and soils if it would meet any of the following conditions:

A. Expose people or structures to potential substantial adverse effects, including:
   - the risk of loss, injury, or death involving rupture of a known earthquake fault;
   - strong seismic ground shaking;
   - seismic-related ground failure, including liquefaction; or
   - 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, creating substantial risks to life or property; or

E. Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for disposal of waste water.

Criteria Dismissed from Further Consideration

The Proposed Project would not generate wastewater, other than small amounts of wastewater associated with use of portable sanitary restrooms by construction workers during construction. Additionally, the Proposed Project would not tie into the municipal sewer system and would not involve installation or use of any septic tanks or alternative wastewater disposal systems. Therefore, Criterion E is dismissed from further analysis and not discussed further.

9.4.3 Environmental Impacts

Impact GEO-1: Potential to Expose People or Structures to Substantial Adverse Effects Associated with Rupture of a Known Earthquake Fault, Strong Seismic Ground Shaking, Seismic-Related Ground Failure, or Landslides (Less than Significant with Mitigation)

Rupture of a Known Earthquake Fault

Based on the distance to known active faults, it is unlikely that the Proposed Project would exacerbate fault rupture conditions or otherwise subject people or structures to substantial adverse effects resulting from the rupture of a known active earthquake fault. This conclusion is supported by the Project's geotechnical investigation report, which concludes that the hazard with respect to fault rupture is nominal (Kleinfelder 2015). If a surface fault rupture were to occur within or across the Project site, it would not likely expose people to adverse effects because the SVC facility would be operated remotely with no staff typically on-site. A surface fault rupture at the Project site could damage the SVC facility or transmission line, potentially resulting in cascading and deleterious effects on the rest of the regional electric transmission system; however, as described above, this is not considered a likely occurrence. This impact would be **less than significant.**

Strong Seismic Ground Shaking

It is possible the Project location may experience strong seismic ground shaking at some point during the life of the Project. An earthquake or strong seismic ground shaking at the Proposed Project location would be unlikely to expose people to adverse effects because typically no people would be present at the SVC facility. The SVC facility would be operated remotely and workers would only be present at the site infrequently for short periods during routine inspection and maintenance activities.

Strong seismic ground shaking at the Project site could potentially cause damage to the SVC facility or underground transmission line; however, this may be considered unlikely given the estimated PGA for the Project area as it corresponds to the MMI. According to the MMI, during an event of VII intensity (the maximum intensity seismic event that may be expected at the Project location), damage is negligible in buildings of good design and construction (see Table 9-2). If the SVC or transmission line were to experience damage due to ground shaking from a regional earthquake, it could potentially cause the facility to lose functional efficiency or require the facility be taken off-line for some period of time to conduct repairs. This scenario could result in adverse effects on the regional electric transmission system, potentially contributing to blackouts or other failures.

To ensure the Proposed Project facilities could withstand any potential ground shaking at the Project site, and that the facilities are constructed on suitable geologic material so as to negate or minimize the effects of possible shaking, the Proposed Project would implement **Mitigation Measure GEO-1**, which would require adherence to the recommendations in the Project geotechnical investigation report. With implementation of this mitigation measure, it is anticipated that the potential for substantial adverse effects associated with seismic ground shaking would be less than significant. This impact would be less than significant with mitigation.

Mitigation Measure GEO-1: Implement Recommendations in the Project Geotechnical Investigation Report.

NEET West and/or its contractors shall implement the recommendations contained in the geotechnical investigation report prepared for the Proposed Project by Kleinfelder, dated September 2015 (see Appendix H, *Geotechnical Investigation Report*). These include recommendations for a geotechnical engineer to be present during construction to evaluate the suitability of excavated soils for use as engineered fill, and to observe and test site preparation and fill placement.

Seismic-Related Ground Failure

As described in Section 9.3, "Environmental Setting," the risk of liquefaction or substantial settlement in the Project area is considered low. The majority of the Project site is underlain at depth by very dense soil and weathered rock, with some limited areas of shallow alluvium, colluvium, and compacted fill (Kleinfelder 2015). Additionally, groundwater was not encountered within any of the soil units during the geotechnical investigation (Kleinfelder 2015).

The Proposed Project would implement Mitigation Measure GEO-1, which would require implementation of the recommendations in the Project geotechnical investigation report. These recommendations include requirements for excavation and scarification of suitable ground surface for construction, parameters for soils used as engineered fill, and requirements for compaction of structural fill placed below foundations or laid pipe, all of which would serve to reduce the potential for liquefaction or settlement during a seismic event.

If seismic-related ground failure were to occur on the Project site during the life of the Project, it could potentially result in damage to the SVC facility or transmission line. This scenario could result in adverse effects to the regional transmission system, potentially contributing to blackouts or other failures. However, as described above, this is considered an unlikely occurrence, especially with implementation of Mitigation Measure GEO-1. This impact would be less than significant with mitigation.

Landslides

Although the Project site is located in an area of generally steep terrain, the area is not considered especially prone to landslides. The natural slopes within the Project area are composed of granitic material that typically are not prone to landsliding on low to moderate slopes and in most cases even on steep slopes are not prone to deep-seated failures (Kleinfelder 2015). Additionally, during the site reconnaissance, the geotechnical investigation observed slope surfaces and did not identify any signs of past slope instability. The County of San Diego also does not identify the Project area as a high-risk area for landslides (County of San Diego 2009b).

The Proposed Project would involve blasting during Project construction, which could potentially create a pathway for initiation of a landslide (i.e., through percussive ground vibrations); however, the proposed blasting would be low-energy and would only be used to break up hard rock material during excavations for the SVC and transmission line. Ground vibrations from blasting alone would not be anticipated to generate a landslide without other contributing factors, such as heavy rains or weak, unstable slopes. Additionally, the Proposed Project would require preparation of a blasting plan, in accordance with **Mitigation Measure HAZ-2**, which would address ground vibrations and maximum peak particle velocity for ground movement in compliance with Chapter 3 (Control of Adverse Effects) in the Blasting Guidance Manual of the U.S. Department of Interior Office of Surface Mining Reclamation and Enforcement. Given the composition of the slopes in the Project area and implementation of HAZ-2, blasting would not be anticipated to have the potential to generate a landslide. This impact would be less than significant with mitigation.

Impact GEO-2: Cause Substantial Erosion or Loss of Topsoil (Less than Significant with Mitigation)

Construction of the Proposed Project would involve excavation for construction of the SVC foundations and for installation of the transmission line. This would open the potential for erosion or loss of topsoil to occur by cutting the natural ground surface and exposing loose soil to the wind or rain. Operation of heavy equipment during Project construction also would have the potential to cause erosion if the equipment is operated off-road, thereby disturbing the natural ground surface. In addition to loss of topsoil, erosion can result in adverse effects to water quality and aquatic organisms.

As described in Chapter 12, *Hydrology and Water Quality,* the Proposed Project would implement **Mitigation Measure HYD/WQ-1**, which would require implementation of best management practices (BMPs) for erosion control. These measures would be complimentary to any erosion control measures included in the stormwater pollution prevention plan (SWPPP) that would be prepared for the Proposed Project. Because construction of the Proposed Project would disturb more than 1 acre of land, it would be required to obtain a General Construction Stormwater Permit pursuant to Section 402 of the Clean Water Act (CWA).

With implementation of Mitigation Measure HYD/WQ-1 and preparation and implementation of the SWPPP, substantial erosion and loss of topsoil caused by the Proposed Project would be unlikely to occur. This impact would be less than significant with mitigation.

Impact GEO-3: Potential to be Located on a Geologic Unit That is Unstable or That May Become Unstable (Less than Significant with Mitigation)

The Project site is not considered unstable with respect to possible liquefaction or subsidence. The majority of the Project site is underlain at depth by very dense soil and weathered rock, with some limited areas of shallow alluvium, colluvium, and compacted fill (Kleinfelder 2015). Due to the history of the Project site, artificial fill may be present in portions of the site, but the geotechnical investigation report anticipates fill to be less than five feet in depth with isolated areas up to a maximum of 10 feet in depth (Kleinfelder 2015).

Given the composition of the materials underlying the Project site, it is unlikely that the Proposed Project would exacerbate existing unstable geologic conditions. Standard mechanical excavation techniques during Project construction would be unlikely to cause instability or adverse effects, such as on- or off-site landslides, liquefaction, or subsidence. Blasting during Project construction would have greater potential to result in adverse effects related to geological instability, but the blasting would be low-energy and would follow industry standards to minimize any potential to result in slope failures or landslides. In accordance with **Mitigation Measure HAZ-2**, a blasting plan would be prepared prior to project construction, which would address ground vibrations and maximum peak particle velocity for ground movement, including provisions to monitor and assess compliance with the ground vibration and peak particle velocity requirements. Additionally, the Proposed Project would implement Mitigation Measure GEO-1, which would require implementation of the recommendations in the Project geotechnical investigation report, including those related to proper site preparation and placement of suitable structural fill.

With implementation of Mitigation Measures HAZ-2 and GEO-1, the potential for the Project to be located on a geologic unit that is unstable or may become unstable would be less than significant. This impact would be less than significant with mitigation.

Impact GEO-4: Potential to be Located on Expansive Soil, Creating Substantial Risks to Life or Property (Less than Significant)

The soils underlying the proposed SVC site showed low expansive potential, according to testing conducted for the geotechnical investigation report. Though not tested in the geotechnical investigation, the soils underlying Bell Bluff Truck Trail and the proposed transmission line would be anticipated to have similar expansive properties. In general, sandy loam soils are not as prone to expansion as clay-type soils, and the granular decomposed granitic materials underlying much of the Project area, noted in the geotechnical investigation report, would be considered to have a very low to low expansion potential (Kleinfelder 2015). Therefore, this impact would be less than significant.

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