4.6 Geology and Soils

This section describes the geologic resources, geologic hazards, and soils in the Proposed Project Area and discusses the affected environment and regulatory setting for geology and soils. Potential impacts are also discussed.

4.6.1 Environmental Setting

The Proposed Project is located within two minor physiographic regions of south-central California. Portions of the Proposed Project west of Poison Canyon on Highway 178 are located within the east-central Indian Wells Valley physiographic region. The Indian Wells Valley is bounded on the west by the Sierra Nevada Range, on the south by the El Paso Mountains, on the north by the Coso Range, and on the east by the Argus Range. Portions of the Proposed Project within and east of Poison Canyon are located in the northwestern Searles Valley physiographic region. The Searles Valley is bounded by the Argus Range on the west, the Slate Range on the north and east, and the Summit Range and Lava Mountains on the south. The floor of the Indian Wells Valley slopes gently toward China Lake and northwest of the Proposed Project area. The floor of Searles Valley slopes east from the Proposed Project area near Trona to Searles Lake. Poison Canyon connects the two valleys and drains eastward into Searles Valley.

The basement rocks of the Indian Wells and Searles Valleys consist of pre-Tertiary igneous and metamorphic rocks, which are overlain by consolidated Tertiary (Pliocene and Miocene) terrestrial sedimentary deposits. Within the Proposed Project area, Tertiary volcanic rocks occur only within Poison Canyon. Elsewhere within the Proposed Project area, a thick sequence of unconsolidated Pleistocene and Holocene alluvium, playa, lacustrine, and aeolian deposits are deposited above the older consolidated rocks. The unconsolidated materials underlying the majority of the Proposed Project area are of uncertain composition, but are likely as thick as 1,300 feet near the proposed Downs Substation expansion location, and shallower elsewhere within the Proposed Project area. Surface deposits across the majority of the Proposed Project area are alluvial (USGS 1991, Smith 2009). Portions of the Proposed Project along Highway 178 between Ridgecrest and Trona have thinner alluvial and colluvial deposits due to their proximity to bedrock and playa margins, especially within Poison Canyon.

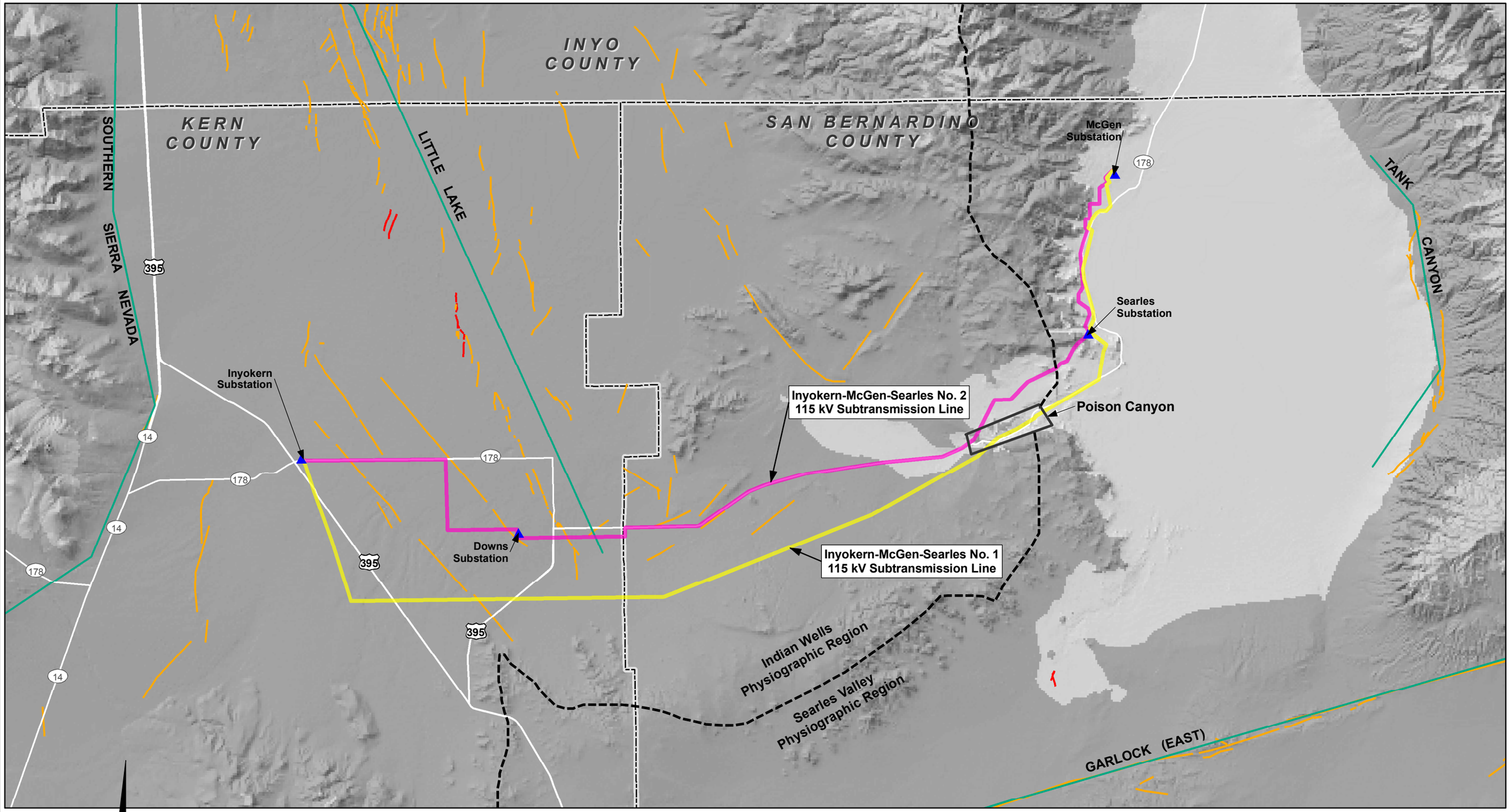
Soils at the Downs Substation expansion location, Inyokern Substation, and the 115 kV subtransmission line west of Poison Canyon consist of an association of the Cajon, Wasco, and Rosamond soil series (State Soil Geographic [STATSGO] Map Unit CA635). These soils are classified as deep to very deep, well to excessively drained, and typically form on flat to gently sloping alluvial sediments. A review of STATSGO data indicates that the land near and around Downs Substation is sandy to gravelly, and as a consequence may be prone to caving during

excavation (CSRL 2010). Soils in the vicinity of Searles Substation consist primarily of the Rosamond, Rosamond-Variant, and Gila soil series (STATSGO Map Unit CA339). Soils in the vicinity of McGen Substation and soils east of Poison Canyon and south of Searles Substation along the 115 kV subtransmission line route consist of primarily of the Cajon and Arizo soil series (STATSGO Map Units CA931). Soils of Map Units CA339 and CA931 are typically deep, well drained, and formed from granitic parent material or granitic alluvium. Like the soils present at the Downs and Inyokern Substations, dominant soil series of both map units are prone to caving during shallow excavations (CSRL 2010). Soils within Poison Canyon along the 115 kV subtransmission line route (STATSGO Map Unit CA919) are typically shallow, well drained, and formed from granitic parent material with calcite veins (CSRL 2010).

The proposed Downs Substation expansion is located approximately one mile west of the nearest mapped Alquist-Priolo fault. No Alquist-Priolo faults are mapped in the vicinity of the Inyokern, McGen, or Searles Substations. No Alquist-Priolo faults cross the route of the Inyokern-McGen-Searles No. 1 115 kV subtransmission line. The existing route of the Inyokern-McGen-Searles No. 2 115 kV subtransmission line does cross an Alquist-Priolo fault near the intersection of East Church Avenue and South Fire Opal Street in Ridgecrest (CDMG 2000).

The Inyokern and Downs Substations and the 115 kV subtransmission lines within Indian Wells Valley are located at the southern edge of the Little Lake fault zone. The Little Lake fault zone (see Figure 4.6-1) is composed of numerous short (i.e., less than six miles) faults which are present within and north of Ridgecrest (SCEDC 2010). The Little Lake zone includes the Ridgecrest and Rademaker Hills Faults, which have displaced quaternary sediments and shown historical movement within the City boundaries (Kern County 1975).

The Airport Lake fault zone is located approximately 10 miles north of the location of the proposed Downs Substation expansion and the proposed new 115 kV subtransmission line segment, and somewhat closer to Inyokern Substation. The Airport Lake fault zone is similar to the Little Lake fault zone in that it consists of a highly fragmented zone of short fault segments. Both the Little Lake and Airport Lake fault zones are composed of primarily north- to northwest-trending right-lateral strike-slip faults. The Garlock Fault, a major east-west trending fault, is located approximately 12 miles south of the Proposed Project area. The Garlock Fault is a major geologic feature of southern California and forms the boundary between the Sierra Nevada range to the north and the Mojave Block to the south (SCEDC 2010).



0 3 6 Miles

LEGEND

INYOKERN-MCGEN-SEARLES 115 KV SUBTRANSMISSION LINE

- NO. 1 115 kV SUBTRANSMISSION LINE
- NO. 2 115 kV SUBTRANSMISSION LINE
- COUNTY BOUNDARY
- 178 STATE HIGHWAY
- 385 U.S. ROUTE
- SUBSTATION
- APPROXIMATE BOUNDARY BETWEEN THE INDIAN WELLS AND SEARLES VALLEY PHYSIOGRAPHIC REGIONS
- POISON CANYON

FAULT CLASSIFICATION (RECENCY OF MOVEMENT)

- HISTORIC FAULTS (<200 YEARS)
- HOLOCENE FAULTS (<11,000 YEARS)

OTHER SEISMOGENIC FAULTS

- FAULT TRACE

SOURCE:

1. FAULT CLASSIFICATION - BRYANT, W.A. (COMPILER) 2005
2. OTHER FAULTS - CAO ET AL. 2003
3. SHADE RELIEF - CAL ATLAS 2004

SOUTHERN CALIFORNIA EDISON
DOWNS SUBSTATION EXPANSION PROJECT
KERN AND SAN BERNARDINO COUNTIES, CALIFORNIA
PROPONENT'S ENVIRONMENTAL ASSESSMENT

FAULT MAP

SOUTHERN CALIFORNIA EDISON
An EDISON INTERNATIONAL® Company
ARCADIS

FIGURE
4.6-1

Other faults in the vicinity of the Proposed Project that are not included in the Alquist-Priolo Fault Zone Maps have been mapped by the California Geological Survey (CGS). As displayed on Figure 4.6-1, faults with Holocene displacement (during the past 11,700 years) but no historic record of movement would be crossed by the Inyokern-McGen-Searles No. 1 115 kV subtransmission line approximately 0.5 miles west of Highway 395. Other Holocene faults would be crossed in multiple locations by the Inyokern-McGen-Searles No. 2 115 kV subtransmission line along Highway 178 west and east of the existing Downs Substation. The proposed Downs Substation expansion would be located approximately 1,200 feet northeast of a mapped Holocene fault. No Holocene or historically active faults are mapped by CGS in the vicinity of the Searles or McGen Substations (CGS 2010).

The Proposed Project is located within a region of high seismic activity known as the Eastern California Shear Zone. This area is generally located between the San Andreas Fault near the City of Indio to the south and the Owens Valley to the north. Several earthquake "swarms" (typically one major earthquake followed by up to thousands of aftershocks) have occurred within the Little Lake and Airport Lake fault zones since 1980. An earthquake swarm centered around the City of Ridgecrest and extending north was active between 1980 and 1991. A subsequent earthquake swarm occurred between 1992 and 1994 southeast of Ridgecrest (SCEDC 2010).

More recently, an earthquake swarm triggered by the 5.4 and 5.8 magnitude earthquakes of August 17 and September 20, 1995, respectively, occurred east of Ridgecrest. At the time, the magnitude 5.8 earthquake was the most powerful to occur in Southern California since the 1994 Northridge earthquake, and is the largest earthquake ever recorded within the Indian Wells Valley. Over 1,900 aftershocks were recorded within two weeks of the second main earthquake. Minor (less than one inch) surface slip was observed, but not along the main fault segment presumed associated with the two main events (SCEDC 2010).

No surface ruptures of the Garlock Fault have occurred in historical times, but recent earthquakes have occurred within the associated fault zone. The Southern California Earthquake Center predicts that earthquake magnitudes between 6.8 and 7.6 could occur due to rupture of this fault in the future.

4.6.2 Regulatory Setting

4.6.2.1 Federal

Clean Water Act—The Clean Water Act is the primary federal law in the United States governing the protection of water quality through the goals of eliminating water pollution and providing for standards of water quality necessary for human sports and recreation. Because Proposed Project

construction would disturb a surface area greater than one acre, SCE would be required to obtain coverage under the National Pollution Discharge Elimination System General Permit for Storm Water Discharges Associated with Construction Activity, Water Quality Order No. 2009-0009-DWQ, NPDES No. CAS000002 ("2009 Construction General Permit" or "CGP"). Compliance with the CGP requires that the applicant submit a Storm Water Pollution Prevention Plan (SWPPP). The regulatory framework of the Clean Water Act is further described in Section 4.9, Hydrology and Water Quality.

4.6.2.2 State

Alquist-Priolo Earthquake Fault Zoning Act—The Alquist-Priolo Earthquake Fault Zoning Act was enacted by the State of California in 1971 to mitigate the hazard of surface faulting to structures planned for human occupancy and to other critical structures. These other critical structures include structures intended for human occupancy associated with industrial and commercial uses. Regulatory zones established by the State (known as Earthquake Fault Zones) are used by government agencies during planning and review processes for new construction. Although Earthquake Fault Zones are located near the Proposed Project, no zones occur on the Proposed Project area; therefore, the Act does not apply to the Proposed Project.

Porter-Cologne Water Quality Act – Water Code Section 13000-13002—The Porter-Cologne Water Quality Control Act (Porter-Cologne) provides a comprehensive water quality management system for the protection of California waters. Porter-Cologne designates the State Water Resources Control Board (SWRCB) as the ultimate authority over State water rights and water quality policy, and also establishes nine Regional Water Quality Control Boards (RWQCB) to oversee water quality on a day-to-day basis at the local/regional level. The SWRCB and RWQCBs have the responsibility of granting permits for certain point-source discharges, and for construction and storm water runoff, and either waste discharge requirements or conditioned water quality certification for other discharges.

The SWRCB and RWQCBs are responsible for developing and implementing regional basin plans to regulate all pollutant or nuisance discharges that may affect either surface water or groundwater. Basin Plans are prepared by the RWQCBs to establish water quality standards for both surface and groundwater bodies within their respective jurisdictions. Specifically, Basin Plans designate beneficial uses for surface and groundwater, set narrative and numerical objectives that must be attained or maintained to protect the designated beneficial uses, and describe implementation programs to protect all waters in the region.

The RWQCBs regulate discharges in waters within their respective jurisdictions through the administration of NPDES permits, waste discharge requirements, and water quality certification.

Water quality certification is administered by the RWQCBs to ensure that projects with federal permits do not violate State water quality standards.

Seismic Hazards Mapping Act—The Seismic Hazards Mapping Act was enacted by the State of California in 1990 to protect public safety from the effects of strong ground shaking, liquefaction, landslides, or other ground failure, and other hazards caused by earthquakes. Discussion of potential hazards required under this Act is presented in Section 4.6.3.

4.6.2.3 Local

The City of Ridgecrest currently uses the 2007 California Building Code (CBC). The City contracts with Kern County to conduct inspections; the County identifies that "[a] foundation and soils investigation is likely required per CBC chapter 18" prior to issuance of a building permit.

City of Ridgecrest Draft General Plan—Goal HS-5 under the City of Ridgecrest Draft General Plan Health & Safety Element aims to "Minimize loss of life and reduce to a minimum the loss or disruption of the flow of goods and services and destruction of property that could result from seismic and/or geologic activity." Policies applicable to the Proposed Project under this goal are as follows:

> <u>HS-5.3: Detailed Soils and Geologic Reports</u>: The City shall require detailed geologic and soils investigations for development within areas that have a high potential for soil and geologic hazards or in areas where slopes exceed 20 percent. Investigations should include:
>
> 1. The evaluation of liquefaction potential of land on which all structures other than one- or two-story wood-frame dwellings are to be built.
>
> 2. The investigation of faults for development in the vicinity of a potentially active or active fault. The need for and distance of any setback of buildings for human occupancy from the fault shall be determined by the geologic and soil investigation and approved by the City.
>
> <u>HS-5.19: Northeast Kern County Soils Survey</u>: The City shall utilize information and erosion mitigation measures within the Northeast Kern County Soils Survey by the U.S. Soil Conservation Service in the development review process.
>
> <u>HS-5.21: Soil Erosion</u>: The City shall require new development to implement measures that minimize soil erosion from wind and water related to construction. Measures may include, but not be limited to, the following:

(1) Grading requirements that limit grading to the amount necessary to provide stable areas for structural foundations, street rights-of-way, parking facilities, or other intended uses, and/or;

(2) Construction techniques that utilize site preparation, grading, and best management practices that provide erosion and sediment control to prevent construction-related contaminants from leaving development sites and polluting local waterways.

4.6.3 Significance Criteria

The significance criteria for assessing the impacts to geology and soils come from the CEQA Environmental Checklist. A project causes a potentially significant impact if it would:

- Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving 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); or strong seismic ground shaking; or seismic-related ground failure, including liquefaction; or landslides;

- Result in substantial soil erosion or the loss of topsoil;

- 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 an on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse;

- Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property.

4.6.4 Impact Assessment

Construction and operation of the Proposed Project would result in less than significant impacts for the following CEQA criteria:

Would the Proposed Project expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving 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); or strong seismic ground shaking; or seismic related ground failure, including liquefaction; or landslides?

Less than Significant Impact. The proposed Downs Substation expansion, the new 115 kV subtransmission line segment at the Downs Substation location, and the Inyokern-McGen-Searles No. 1 115 kV subtransmission line (on which a portion of the proposed fiber optic telecommunication cable would be installed) are not located within a known fault zone as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map, and do not cross a Holocene fault as mapped by CGS.

The Inyokern-McGen-Searles No. 2 115 kV subtransmission line (on which the other portion of the proposed fiber optic telecommunication cable would be installed) crosses an Alquist-Priolo Earthquake Fault Zone near the intersection of East Church Avenue and South Fire Opal Street in Ridgecrest (Figure 4.6-1) (CDMG 2000). No other components of the Proposed Project, including the proposed expansion of Downs Substation and the proposed new 115 kV subtransmission line segment, would be built within the Fault Zone. The addition of the fiber optic telecommunication cable would not be expected to add substantial instability to most of the existing overhead structures on which the cable would be installed. Because the installation of the fiber optic telecommunication cable would violate SCE's windloading criteria on six subtransmission poles near Trona which are located outside of any fault area, these poles would be replaced as part of the Proposed Project. Only new infrastructure that would be installed within a Fault Zone is the fiber optic telecommunication cable that would be installed on the Inyokern-McGen-Searles No. 1 115 kV subtransmission line; this cable would be installed on existing subtransmission poles that are designed to a wind loading standard that also has additional benefits for seismic loading, thus reducing the risk of a pole failing during a seismic event. In addition, only a short portion of the 115 kV subtransmission line (and fiber optic telecommunication cable) would be within the Fault Zone. Therefore, exposure to adverse effects resulting from the surface rupture of a known seismic fault would be less than significant.

The majority of the Proposed Project area is underlain by poorly consolidated sedimentary rocks and alluvial sediments; therefore, damage suffered from seismic ground shaking would tend to be more severe than in areas of more consolidated bedrock. Even though the Proposed Project is located in an area that is susceptible to earthquake forces, the structures would not be utilized for human occupancy and would be designed consistent with the Institute of Electrical and Electronic Engineers (IEEE) 693 Recommended Practices for Seismic Design of Substations. Similarly, the Proposed Project's 115 kV subtransmission lines would be designed consistent with California Public Utilities Commission General Order 95 to withstand seismic loading. Impacts would be less than significant.

Liquefaction and landslides are considered to pose less than significant risks within the Proposed Project area. Project areas within the City of Ridgecrest are not located within a "potential liquefaction hazard" area, as mapped by the City of Ridgecrest (1994, Fig. 8-8). Similarly, no other Proposed Project components are located in areas with high risk of liquefaction, primarily due to the depth of the water table across the Proposed Project area. The majority of the Proposed Project area is essentially flat, and so landslides are not anticipated. The 115 kV subtransmission line right-of-way (ROW), along Highway 178 between Ridgecrest and Trona passes through areas where slopes adjacent to the ROW are covered by weathered bedrock and colluvium that may be susceptible to landsliding during seismic events. However, because no faults are mapped in these areas of steep slopes adjacent to the ROW (CGS 2010), potential for seismic related ground failure is considered less than significant.

The facilities envisioned in the Proposed Project would be designed consistent with IEEE 693 and CPUC GO 95. The facilities would not be designed or utilized for human occupancy. The majority of the Proposed Project components are not located within a known fault zone and do not cross a known fault; existing infrastructure would be used where fiber optic telecommunication cable crosses a fault. The majority of the Proposed Project components are located in flat areas (where landslides are not a concern) and in areas that are not categorized as a liquefaction hazard area. Those project components that are located in areas where landslides may be a concern are located in rural, unpopulated areas. Therefore, less than significant impacts would occur under this criterion as a result of the Proposed Project.

Would the Proposed Project result in substantial soil erosion or the loss of topsoil?

Less than Significant Impact. Soils within the vicinity of the Proposed Project are well to excessively drained and have high infiltration rates (CSRL 2010). Due to the flat topography across the majority of the Proposed Project area, no substantial increase in soil loss is anticipated as a result of construction or operation activities. Areas of trenching for installation of underground fault return conductors at the proposed Downs Substation expansion would present the highest risk of adverse impacts. Increased rates of soil erosion are not expected to result from the installation of new TSPs and LWS poles for the new proposed 115 kV subtransmission line segment or replacement of six existing wood poles on the existing Inyokern-McGen-Searles No. 1 115 kV subtransmission line route. Fiber optic telecommunication cable installation in areas of existing overhead structures is not expected to create surface disturbances that would cause significant levels of soil erosion. Potential soil erosion could increase due to ground movement resulting from seismic activities (Kern County 1975), but would not be affected by the Proposed Project.

Soils across the Proposed Project area are considered to be a poor source of topsoil (CSRL 2010); therefore, the Proposed Project would not create a substantial loss of topsoil.

The nature of the soils in the Proposed Project area, and the limited excavation and grading necessary, would result in less than significant impacts occurring under this criterion as a result of the Proposed Project.

Would the Proposed Project 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 an on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?

Less than Significant Impact. Lateral spreading, subsidence, and liquefaction are not considered to present general hazards within the City of Ridgecrest (Kern County 1975). Because similar geologic (Smith 2009) and hydrologic conditions (CDWR 2003) are present at other locations within the Proposed Project area, hazards of lateral spreading, subsidence, and liquefaction are likewise considered to be less than significant at the proposed Downs Substation expansion and along the 115 kV subtransmission line ROWs. Unstable soils are not expected to be present at any locations within the Proposed Project area. Therefore, no impacts resulting from soil instability are expected.

A site-specific geotechnical investigation would be completed at the proposed Downs Substation expansion area prior to construction activities. The site-specific geotechnical investigation would identify potential problems related to soil instability and recommend mitigation measures. The presence or absence of collapsible soils has not been specifically determined for the proposed Down Substation expansion area. Any collapsible soils would be identified and addressed as part of the location-specific geotechnical investigation. If present, collapsible soils can typically be mitigated to a level of less than significant impact with commonly utilized remedial grading practices. Detailed soil survey maps are not available for the Proposed Project area. However, STATSGO data (CSRL 2010) indicate that soil caving during trenching may be a minor problem during the construction phase due to the non-cohesive and granular nature of the soils. The presence of infrastructure along all portions of the Proposed Project suggests that local soils probably do not pose critical obstacles to construction of the Proposed Project. Therefore, less than significant impacts would occur under this criterion as a result of the Proposed Project.

Would the Proposed Project be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?

Less than Significant Impact. Soils within the area of the Proposed Project are not considered to be expansive due to their high sand content and low clay content. Therefore, there are no anticipated substantial risks to life or property created by Proposed Project activities due to soil expansion. However, because location-specific soil data does not exist, this criterion would be examined under the site-specific geotechnical investigation.

4.6.5 Applicant Proposed Measures

Because the Proposed Project would result in less than significant impacts to the geology and soils, no Applicant Proposed Measures are offered.

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