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4.6 GEOLOGY AND SOILS

Would the Proposed Project:	Potentially Significant Impact	Less-than-Significant Impact with Mitigation Incorporated	Less-than-Significant Impact	No Impact
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault?[1]			✓	
ii) Strong seismic ground shaking?			✓	
iii) Seismic-related ground failure, including liquefaction?			✓	
iv) Landslides?			✓	
b) Result in substantial soil erosion or the loss of topsoil?			✓	
c) Be located on a geologic unit or soil that is unstable or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?			✓	
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?			✓	
e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?				✓

[1] Refers to Divisions of Mines and Geology Special Publication #42

4.6.0 Introduction

This section describes the existing geologic and pedogenic soil conditions related to the proposed San Diego Gas & Electric Company (SDG&E) Tie Line (TL) 649 Wood-to-Steel Replacement Project (Proposed Project). This section analyzes the exposure of people and structures to substantial adverse effects involving strong seismic ground shaking, fault rupture, liquefaction, unstable soils, landslides, expansive soil, substantial soil erosion, or the loss of topsoil. By adhering to SDG&E's Proposed Project design and the recommendations provided in the Proposed Project-specific geotechnical investigations in the final design, construction of the Proposed Project will result in less-than-significant impacts related to geology and soils.

4.6.1 Methodology

The existing conditions and potential impacts associated with geologic hazards were primarily obtained from the geotechnical investigations prepared by Geocon Incorporated (Geocon) for the Proposed Project, which are included as Attachment 4.6–A: Geotechnical Investigation. Geocon reviewed the geologic literature for the region and performed a geotechnical investigation with field exploration, laboratory testing, and associated engineering analyses to evaluate the subsurface soil conditions along the Proposed Project alignment. The field exploration for the Proposed Project alignment included drilling geotechnical exploratory borings and a geophysical survey that consisted of seismic refraction survey lines. In addition to the research and analysis provided in Attachment 4.6–A: Geotechnical Investigation, a thorough review of available geologic resource literature relevant to the Proposed Project area was conducted independent of the analyses performed by Geocon. The materials reviewed include publications and/or data from the United States Geological Survey (USGS), the California Geological Survey (CGS), and other technical reports and resources. A reconnaissance-level field investigation was also performed on May 16, 2014.

4.6.2 Existing Conditions

Regulatory Background

The following subsections describe federal, state, and local regulations relevant to the Proposed Project.

Federal

No federal regulations related to geology and soils are relevant to the Proposed Project.

State

California Public Utilities Commission General Order 95

California Public Utilities Commission (CPUC) General Order (GO) 95 Rules for Overhead Line Construction provides general standards for the design and construction of overhead electrical lines.

Local

Because the CPUC has exclusive jurisdiction over the siting, design, and construction of the Proposed Project, the Proposed Project is not subject to local discretionary land use regulations.

The following discussion of the local regulations relating to geology and soils is provided for informational purposes. As outlined in the following subsections, the construction and operation of the Proposed Project will not conflict with any environmental plans, policies, or regulations adopted by agencies with jurisdiction over local regulations related to geology and soils.

County of San Diego General Plan and County Code

The Safety Element of the County of San Diego General Plan provides information about geologic and other hazards in the County.

Chapter 14, Article 2 of the San Diego County Code of Regulatory Ordinances contains regulations related to building and grading and erosion control. This chapter also sets forth the means for controlling soil erosion, sedimentation, and increased rates of water runoff and related environmental damage. These means are achieved by establishing minimum standards and providing regulations to protect downstream waterways and wetlands, and to promote the safety, public health, convenience, and general welfare of the community. The provisions in Chapter 14 apply to the unincorporated areas of San Diego County.

City of San Diego General Plan and Land Development Code

The Public Facilities, Services, and Safety Element of the City of San Diego General Plan provides information related to seismic, geologic, and structural hazards, which the City of San Diego must consider in all planning and development efforts.

Chapter 14, Article 2 of the City of San Diego Land Development Code provides regulations related to grading, storm water runoff, and drainage. This chapter also sets forth the means for controlling soil erosion, sedimentation, and increased rates of water runoff and related environmental damage. These means are achieved by establishing minimum standards and providing regulations to protect downstream waterways and wetlands, and to promote the safety, public health, convenience, and general welfare of the community.

City of Chula Vista General Plan and City Code

The Environmental Element of the City of Chula Vista General Plan provides information related to geologic and other hazards in the City of Chula Vista.

Title 14, Chapter 14.20 of the Chula Vista Municipal Code provides regulations related to storm water management and discharge control. Title 15, Chapter 15.04 of the Chula Vista Municipal Code provides regulations related to excavation, grading, clearing, grubbing and fills. These chapters also set forth the means for controlling soil erosion, sedimentation, and increased rates of water runoff and related environmental damage. These means are achieved by establishing minimum standards and providing regulations to protect downstream waterways and wetlands, and to promote the safety, public health, convenience, and general welfare of the community.

Environmental Setting

Geologic Setting

The Proposed Project is located in the Peninsular Ranges geomorphic province. The Peninsular Ranges geomorphic province extends approximately 900 miles from the Transverse Ranges and the Los Angeles Basin south to the southern tip of Baja California, and it varies in width from approximately 30 to 100 miles. The province is characterized by mountainous terrain on the east, composed mostly of Mesozoic igneous and metamorphic rocks; and relatively low-lying coastal terraces to the west, underlain by Upper Cretaceous-, Tertiary-, and Quaternary-age sedimentary rocks. Most of the coastal region of San Diego County, including the general Proposed Project area, occurs within this coastal region and is underlain by sedimentary rock. Specifically, the Proposed Project site in this portion of the province is underlain by Pliocene, Pleistocene, and Holocene deposits. Geologic units and characteristics are identified in Table 4.6-1: Geological Formations within the Proposed Project Area.

Table 4.6-1: Geological Formations within the Proposed Project Area

Geological Formation	Symbol	Geologic Age	Approximate Number of Existing Poles within Formation Type	Approximate Distance Crossed (miles)
Lindavista Formation	Ql	Pleistocene or Pliocene	13	0.7
Landslide Deposits	Qls	Holocene and Pleistocene	4	0.2
Marine Beach Deposits	Qmb	Holocene	0	0.1
Older Alluvium	Qoa	Holocene and Pleistocene	17	0.9
Terrace Deposits	Qt	Pleistocene	16	0.7
Young Alluvium	Qya	Holocene	32	1.9
Fanglomerate	OTf	Pleistocene and Tertiary	13	0.8
Mission Valley Formation	Tmv	Eocene	7	0.5
Otay Formation	To	Oligocene	35	1.8

Source: San Diego State University, 2015

The borings conducted by Geocon indicated that the Proposed Project site and vicinity are generally underlain by five surficial soil types and five geologic formations. The surficial units consist of undocumented fill, topsoil, colluvium, alluvium, and landslide deposits. The formational materials consist of Terrace Deposits, Otay Formation, Fanglomerate Deposits, Mission Valley Formation, and Santiago Peak Volcanoes. The soil type(s) and geologic unit(s) encountered at each boring location are depicted in Appendix A: Field Investigation of Attachment 4.6–A: Geotechnical Investigation.

Faults, Seismicity, and Related Hazards

Faults

In comparison to other parts of Southern California, the immediate San Diego area has a relatively quiet seismic history. The historical pattern of seismic activity in coastal San Diego has generally been characterized as a broad scattering of small- to moderate-magnitude earthquakes, whereas the surrounding regions of Southern California—such as the Imperial Valley, northern Baja California, and the nearby offshore regions—are characterized by a higher rate of seismicity. The geologic structure of Southern California is dominated by right-lateral strike-slip faults associated with the movement of two tectonic plates—the Pacific Plate and the North American Plate. The San Andreas Fault system, which lies east of San Diego County, marks the principal boundary element between these plates. The La Nacion fault zone is the closest known potentially active fault. Much of the San Diego coastal area lies within the Rose Canyon fault zone, a zone of right-lateral faults. Table 4.6-2: Faults in the Vicinity of the Proposed Project lists the potentially active faults in San Diego County.

Fault Rupture

The onshore portion of the Rose Canyon fault zone extends along the northeast flank of Mount Soledad in La Jolla and continues southward along the eastern margins of Mission Bay. Between Mission Bay and San Diego Bay, the zone widens and diverges. Although portions of this fault zone in the Mount Soledad, Rose Canyon, and downtown San Diego areas have been designated as Aliquist-Priolo Earthquake Fault Zones, none of the work areas associated with the Proposed Project lie in an Aliquist-Priolo Earthquake Fault Zone. The Alquist-Priolo Earthquake Fault Zoning Act of 1972, formerly known as the Special Studies Zoning Act, regulates construction and development of buildings intended for human occupancy to avoid rupture hazards from surface faults. This act does not specifically regulate overhead power lines, but it does aid in defining areas where fault rupture is most likely to occur.

Strands of the Rose Canyon fault zone have been mapped within relatively close proximity to the Proposed Project. The smaller but potentially active La Nacion fault zone lies approximately 0.3 mile to the west of the Proposed Project. The Proposed Project is approximately 5.3 miles southeast of the Rose Canyon fault zone, approximately 15.3 miles northeast of the Coronado Bank fault zone, and approximately 39 miles southwest of the Elsinore fault zone. Table 4.6-2: Faults in the Vicinity of the Proposed Project lists active earthquake events and estimated site accelerations for the faults considered most likely to subject the Proposed Project area to ground shaking.

Strong Ground Motion

Strong ground motion or intensity of seismic shaking during an earthquake depends on the distance from the epicenter of the earthquake, the magnitude of the earthquake, and the geologic conditions underlying and surrounding the area. Structures founded on thick, soft soil deposits are more likely to experience destructive shaking, with higher amplitude and lower frequency, than structures founded on bedrock.

Table 4.6-2: Faults in the Vicinity of the Proposed Project

Fault	Proximity to the Proposed Project	Approximate Fault Length (miles)	Maximum Magnitude Events		
			Maximum Estimated Earthquake Magnitude	Slip Rate (mm/yr)	Peak Site Acceleration (g)
La Nacion Fault Zone	0.3 miles west	30	6.6	<0.2	0.422
San Ysidro Fault Zone	1.8 miles southwest	9	Unknown	<0.2	0.429
Chula Vista Fault	3.3 miles northwest	2	Unknown	Unknown	0.458
Rose Canyon Fault Zone, Silver Strand Section	5.3 miles northwest	19	7.2	1.5	0.504
Coronado Bank Fault Zone, Coronado Bank Section	15.3 miles southwest	185	7.6	3.0	0.633
San Diego Trough	22.2 miles southwest	97	7.7	1 to 5	0.440
Elsinore Fault Zone, Julian Section	39.1 miles northeast	76	7.1	5.0	0.754
San Jacinto Fault Zone, Coyote Creek Section	59.1 miles northeast	41	6.8	4.0	0.960

Sources: USGS, 2015b; DOC, 2015a, 2015b, and 2015d; San Diego Natural History Museum, 2015
Note: mm/year = millimeters per year

An earthquake is commonly described by the amount of energy released, which has traditionally been quantified using the Richter scale. However, seismologists have recently begun using a Moment Magnitude scale because it provides a more accurate measurement of a major earthquake's size. The Moment Magnitude and Richter scales are almost identical for earthquakes of less than magnitude 7.0. Moment Magnitude scale readings are slightly greater than a corresponding Richter scale reading for earthquakes with magnitudes greater than 7.0. The maximum magnitude earthquake is defined by the CGS as the maximum earthquake that appears capable of occurring under the presently known tectonic framework. Table 4.6-2: Faults in the Vicinity of the Proposed Project lists the nearest fault systems to the Proposed Project area, as well as their known maximum values of magnitude, slip rates, and peak site accelerations.

The probabilistic seismic hazard assessment (PSHA) for the State of California considers a range of possible earthquake sources and estimates their characteristic magnitudes to generate a probability map for ground shaking. The PSHA maps depict values of peak ground acceleration (Pga) that have a 10-percent probability of being exceeded in 50 years, expressed as a fraction of the acceleration due to gravity (g). Based on the CGS Probabilistic Seismic Hazards Ground Motion Interpolator, the peak ground acceleration for the Proposed Project is approximately 0.221 g, which is within Modified Mercalli Scale Intensity Range VII, as shown in Table 4.6-3: Earthquake Intensity Scale. This Pga value typically indicates a violent earthquake capable of causing heavy damage, including general damage to foundations; shifting of frame structures off foundation, if not bolted; possible damage to reservoirs; breakage of underground pipes; and appearance of conspicuous cracks in ground.

The Modified Mercalli Scale is another common measure of earthquake intensity, subjective measures of earthquake strength at a particular place as determined by its effects on people, structures, and earth materials. Table 4.6-3: Earthquake Intensity Scale presents the Modified Mercalli scale for earthquake intensity, including a range of approximate average peak accelerations associated with each intensity value.

Liquefaction

Liquefaction occurs when loose sands and silts that are saturated with water behave like liquids when strong ground shaking occurs. Seismic waves can cause the pore pressure in the soils to build until the soil grains lose contact, thereby causing the soil to lose tensile strength and behave like a liquid. Higher pore pressure occurs as the soil attempts to compact in response to the shaking, resulting in less grain-to-grain soil contact and thus a loss of strength. Typically, loose, fine-grained sands and silts below the water table are the most susceptible to liquefaction. Medium dense sands and silts below the water table may also liquefy if the shaking is of sufficient severity and duration. In addition, structures supported by a liquefying soil may sustain damage due to loss of foundation support.

According to the County of San Diego Guidelines for Determining Significance of Geologic Hazards, the areas within the county that have the highest potential for liquefaction are those with loose, sandy soils combined with a shallow groundwater table; they are typically located in alluvial river valleys or basins and floodplains. Approximately 19 percent of the Proposed Project alignment is located within potential areas of liquefaction. The County of San Diego's report discusses the hydric soils found within the County, including Riverwash, which is located

Table 4.6-3: Earthquake Intensity Scale

Intensity Value	Intensity Description	Average Peak Acceleration Range (g)
I	Not felt except by very few people under especially favorable circumstances.	<0.0017
II	Felt only by a few people at rest, especially on upper floors of buildings. Delicately suspended objects may swing.	0.0017–0.014
III	Felt noticeably indoors, especially on upper floors of buildings, but many people do not recognize it as an earthquake. Standing cars may rock slightly, and vibrations are similar to a passing truck. Duration estimated.	
IV	During the day, felt indoors by many, outdoors by few. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation is like a heavy truck striking building. Standing cars rock noticeably.	0.014–0.039
V	Felt by nearly everyone, and many awakened. Some dishes and windows broken; a few instances of cracked plaster; unstable objects overturned. Disturbances of trees, poles may be noticed. Pendulum clocks may stop.	0.039–0.092
VI	Felt by all, many frightened and run outdoors. Some heavy furniture moves and plaster falls or chimneys are damaged. Damage slight.	0.092–0.18
VII	Everybody runs outdoors. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable in poorly built or badly designed structures; some chimneys broken. Noticed by people driving cars.	0.18–0.34
VIII	Damage slight in specially designed structures; considerable in ordinary substantial buildings, with partial collapse; great in poorly built structures. Panel walls thrown out of frame structures. Fall of chimneys, factory stacks, columns, monuments, and walls. Heavy furniture overturned. Sand and mud ejected in small amounts. Changes in well water. People driving cars disturbed.	0.34–0.65
IX	Damage considerable in specially designed structures; great in substantial buildings, with partial collapse. Well-designed frame structures thrown out of plumb. Buildings shifted off foundations. Ground cracked conspicuously. Underground pipes broken.	0.65–1.24
X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations; ground badly cracked. Rails bent. Landslides considerable from riverbanks and steep slopes. Shifted sand and mud. Water splashed (slopped) over banks.	>1.24

Intensity Value	Intensity Description	Average Peak Acceleration Range (g)
XI	Few, if any, masonry structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipelines completely out of service. Earth slumps and land slips in soft ground. Rails bent greatly.	>1.24
XII	Damage total. Practically all works of construction are damaged greatly or destroyed. Waves seen on ground surface. Lines of sight and level are distorted. Objects are thrown upward into the air.	

Sources: Bolt, 1998; Wald, 1999

along portions of the Proposed Project alignment as the surficial deposits. Based on the County of San Diego Guidelines for Determining Significance of Geologic Hazards, liquefaction is not known to have occurred in San Diego County; however, liquefaction has occurred in the Imperial Valley as a result of earthquakes with magnitude 6.0 or higher. According to Attachment 4.6–A: Geotechnical Investigation, alluvial deposits were encountered in approximately seven borings as the surficial soils. However, the potential for liquefaction is considered low due to the presence of relatively dense soil and the lack of near-surface permanent groundwater.

Slope Instability

Strong ground motion can result in rockfall hazards and/or slope instability. The slopes most susceptible to earthquake-induced failure include those with highly weathered and unconsolidated materials on moderately steep to steep slopes (especially in areas of previously existing landslides). Generally, slopes that are 15 percent or greater are considered steep.

Landslides occur when masses of rock, earth, or debris move down a slope; these include rock falls, deep failure of slopes, and shallow debris flows. The actuators of landslides can be either natural events—such as earthquakes, rainfall, and erosion—or human activities. Those induced by humans are most commonly related to large grading activities (which can cause new slides or reactivate old ones when compacted fill is placed on potentially unstable slopes) or introduced surface water or groundwater that results in saturated or supersaturated soils.

Excavation operations can contribute to landslides when lateral support near the base of unstable hillside areas is removed. Conditions to be considered with regard to slope instability include slope inclination, soil characteristics, presence of groundwater, and degree of soil saturation. Slopes throughout the Proposed Project area are moderate to very steep—as much as 33 percent in some instances. Areas of high landslide susceptibility occur in the Proposed Project area, particularly where fine sands are situated on very steep or eroded slopes.

Wildfires can also increase the potential for landslides because the rainfall that is normally absorbed into hillslope soils can run off almost instantly after vegetation has been removed by wildfire. As a result, creeks and drainage areas can experience runoff that is much greater and more rapid than normal. Highly erodible soils in a burn scar allow flood waters to entrain large amounts of ash, mud, boulders, and unburned vegetation. According to information provided by the USGS, the Proposed Project is not located in potential debris flow areas.

Differential Settlement

If the soil beneath a structure settles non-uniformly, the structure can be damaged. The reasons for differential settlement are usually traced to differences in bearing characteristics of the soils. Alternatively, a portion of the soil beneath a structure may lose strength during an earthquake due to liquefaction. Non-uniform liquefaction results in differential compaction. Unconsolidated or weakened geologic units in the Proposed Project alignment, including areas underlain by alluvium and highly weathered rock, may be subject to differential settlement. Approximately 37 percent of the Proposed Project alignment (pole locations 8, 11 through 18.5, 19.1, 50.2 through 78, A, G, and H) is located within Quaternary alluvium deposits.

Subsidence

Subsidence occurs most often when fluids are withdrawn from the ground, removing partial support for previously saturated soils. More rarely, subsidence occurs due to tectonic down-warping during earthquakes. The majority of soil units within the Proposed Project area have a low capacity to hold water.

Soils

Approximately 12 distinct soil units are crossed by the right-of-way (ROW) for the Proposed Project, although several of these units are grouped within the same (approximately seven) soil series. The soil characteristics along the Proposed Project alignment are summarized in Table 4.6-4: Soils in the Proposed Project Area.

Expansive or Collapsible Soils

Expansive soils are characterized by the ability to undergo significant volume change (shrink and swell) as a result of variation in soil moisture content. Soil moisture content can change due to many factors, including perched groundwater, landscape irrigation, rainfall, and utility leakage. Expansive soils are commonly very fine-grained with a high to very high percentage of clay. Expansive soils in the Proposed Project area are listed in Table 4.6-4: Soils in the Proposed Project Area. Expansive clay soils underlie approximately 81 percent of the Proposed Project alignment.

4.6.3 Impacts

The following subsections describe the criteria of significance used to assess potential impacts to geology and soils that may result from implementation of the Proposed Project, and examine those potential impacts.

Significance Criteria

Standards of significance were derived from Appendix G of the California Environmental Quality Act Guidelines. Impacts to geology and soils would be considered significant if the Proposed Project:

- Exposes people or structures to potential substantial adverse effects involving fault rupture, strong seismic ground shaking, liquefaction, or landslides
- Results in substantial soil erosion or the loss of topsoil
- Is located on a geologic unit or soil that is unstable, or that would become unstable as a result of the Proposed Project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse
- Is located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property

Table 4.6-4: Soils in the Proposed Project Area

Soil Type	Soil Unit	Slope (percent)	Permeability	Erosion Potential	Expansive (Yes/No)	Pole Location Number
Diablo clay	DaC	2 to 9	Slow	Moderate	Yes	108, 108.1, 109, 112, 113, 114
	DaD	9 to 15		Moderate		1, 15, 50.2, 55, 56, 110, 111, 115, 116
	DaE	15 to 30		Severe		32 through 34, 40, 43, 46 through 54, 57, 59 through 65
	DaF	30 to 50		Severe		18 through 18.2, 19 through 31, C, D, E
Linne clay loam	LsE	9 to 30	Moderately Slow	Severe	Yes	5 through 8, 101 through 107
Olivenhain cobbly loam	OhC	2 to 9	Very Slow	Slight	Yes	67 through 73.1, 76
	OhE	9 to 30		Moderate	No	4
	OhF	30 to 50		Severe		2, 3, 66, 74, 78 through 82, 87, 97 through 100
Riverwash	Rm	--	Rapid	Slight	No	39, 41, 42, 44, 45, 58, F, G
Salinas clay loam	SbC	2 to 9	Moderately Slow	Moderate	Yes	9 through 14, 16, 17, 18.3, 18.31, 18.4, 18.5, 35 through 38, A, B
Stockpen gravelly clay loam	SuA	0 to 2	Very Slow	Slight	Yes	83 through 86, 88 through 96
Visalia gravelly sandy loam	VdB	2 to 5	Moderately Rapid	Slight	No	75, 77, H

Sources: United States Department of Agriculture (USDA), 2015a and 2015b

- Is located on soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater

Question 4.6a – Human Safety and Structural Integrity

i. Earthquake Fault Rupture – Less than Significant Impact

The Proposed Project does not cross an Aliquist-Priolo Earthquake Fault Zone. As described in Section 4.6.2 Existing Conditions, the La Nacion fault zone is the nearest potentially active fault to the Proposed Project, located approximately 0.3 mile west of the alignment. The Rose Canyon Fault Zone, located approximately 5.3 miles northwest of the Proposed Project, is the dominant source of potential ground motion at the site. Earthquakes on the Rose Canyon Fault with a maximum magnitude of 7.2 represent the potential for seismic ground shaking at the site. Research studies to assess faulting for most of the various fault sections have documented Holocene activity for the length of the Rose Canyon Fault Zone, which means that this fault has been active within the past 11,000 years.

The Proposed Project involves wood-to-steel pole replacement for the existing power line. The new steel poles will be installed in accordance with the CPUC's GO 95, which provides general standards for the design and construction of overhead electric lines. In addition, the new steel poles will be more structurally sound than the existing wood poles. SDG&E will also consider the recommendations of the Proposed Project-specific geotechnical report for foundation design parameters when finalizing the design.

Given that the Proposed Project is located in an area of a known active fault, a fault rupture could occur. Such a rupture could cause a disruption in services and potentially damage the line. However, a review of applicable codes (e.g., GO 95) and industry construction standards, along with the preliminary engineering calculations performed for the Proposed Project, show that the forces resulting from seismic loading will be less than those generated by wind and broken conductor loading on the poles. Therefore, seismic ground motion need not be considered for the design of the poles. Accordingly, the Proposed Project will be able to withstand the effects of a fault rupture, and impacts will be less than significant.

ii. Strong Seismic Shaking – Less-than-Significant Impact

As shown in Table 4.6-2: Faults in the Vicinity of the Proposed Project, the Proposed Project is located in an area that may be subject to relatively strong seismic shaking due to earthquakes that occur along the nearby faults. As discussed in Section 4.6.2 Existing Conditions, the peak ground acceleration for the Proposed Project is approximately 0.221 g. A peak ground acceleration of 0.221 g is within Intensity Range VII, as shown in Table 4.6-3: Earthquake Intensity Scale. As previously discussed, forces resulting from seismic loading are expected to be less than forces generated by wind and broken conductor loading on the poles. Therefore, seismic ground motion need not be considered for design of the poles. Accordingly, the incorporation of the engineering practices required by GO 95 and other industry standards will ensure that people and structures are not exposed to hazards associated with strong seismic ground shaking. As a result, impacts will be less than significant.

iii. Ground Failure – Less-than-Significant Impact

As described in Section 4.6.2 Existing Conditions, the Proposed Project alignment is not located within an Alquist-Priolo Earthquake Fault Zone. Rose Canyon Fault Zone, located approximately 5.3 miles northwest of the alignment, is the dominant source of potential ground motion in the Proposed Project area. The Proposed Project area could be subjected to moderate to severe ground shaking in the event of an earthquake along any of the faults listed in Table 4.6-2: Faults in the Vicinity of the Proposed Project or other faults in the southern California/northern Baja California region.

Soil liquefaction occurs within relatively loose, cohesionless sands located below the water table that are subjected to ground accelerations from earthquakes. Typical soils with the potential for liquefaction are located in alluvial river valleys or basins and floodplains. Alluvial deposits were encountered as the surficial soils in several borings. The liquefaction potential of the alluvial deposits encountered in these borings is considered low due to the presence of relatively dense soil and the lack of near-surface permanent groundwater. In the vicinity of these borings, the condition of alluvial deposits is expected to be similar to the conditions encountered in these borings.

In addition, the Proposed Project poles are individual structures that are not considered sensitive to differential settlement. Therefore, impacts resulting from seismic-related ground failure are expected to be less than significant.

iv. Landslides – Less-than-Significant Impact

Hazards related to slope instability and landslides are generally associated with foothill areas and mountain terrain, as well as steep riverbanks and levees. The Proposed Project will be predominantly located in areas with moderately to steeply sloping terrain, where the potential for localized shallow landsliding is increased. Soil composition within the Proposed Project area varies greatly, ranging from relatively flat sandy alluvial deposits to steeply sloping igneous rock land. Sandy soil types are more prone to extreme displacement than other soil types. Sandy soils within the Proposed Project area are located east of the State Route (SR-) 125 crossing and at the point where the alignment turns south. However, these areas do not generally contain slopes as steep as other portions of the Proposed Project. The majority of the Proposed Project is located on stable soil types, although very steep slopes are located throughout the area.

Ground-disturbing activities during construction—including vegetation trimming, trenching, and excavation during pole and underground duct bank installation—have the potential to increase surface instability. However, the sloping landscape and underlying soil formations will be taken into account in the design of the Proposed Project to minimize the potential impact of landslide on the poles. The final design will consider the recommendations provided in the Proposed Project-specific geotechnical investigation provided in Attachment 4.6–A: Geotechnical Investigation, and pole depth and foundation diameter will be engineered for the site-specific conditions.

Because ground disturbance for the Proposed Project will exceed one acre, SDG&E will obtain coverage under the California State Water Resources Control Board (SWRCB) General Permit for Storm Water Discharges Associated with Construction Activity Order No. 2009-009-DWQ.

To obtain coverage under the permit, SDG&E will develop and submit Permit Registration Documents, including a Notice of Intent, Storm Water Pollution Prevention Plan (SWPPP), risk assessment, site map, certification, and annual fee to the SWRCB, before initiating construction activities. The SWPPP will identify best management practices (BMPs) for each activity that has the potential to degrade surrounding water quality through erosion, sediment runoff, and other pollutants. These BMPs will then be implemented and monitored throughout the Proposed Project by a qualified SWPPP practitioner. SDG&E will implement BMPs, including slope stabilization and revegetation, where appropriate, in areas where ground disturbance or trimming is required. Therefore, the limited ground disturbance required for the Proposed Project will not likely create instability that could result in increased landslides. As a result, impacts will be less than significant.

Question 4.6b – Soil Erosion or Topsoil Loss

Construction – Less-than-Significant Impact

The Proposed Project primarily involves the replacement of the existing wood poles in previously disturbed areas, and existing access roads and overland access routes will be used for travel to work sites and pole locations. Permanent disturbance will result from the access road modifications. The modified road will be compacted and stabilized along the edges to prevent soil erosion. The majority of the ground disturbance will be temporary in nature, and attributed to pole excavation, trenching, staging yards, and stringing sites. Following removal of existing poles and installation of the new steel poles, disturbed areas will be returned to near pre-construction conditions using native soil excavated on site during construction activities.

Ground-disturbing activities will expose soil to erosion by removing the vegetative cover and compromising the soil structure. Rain and wind may further detach soil particles and transport them off site. As mentioned in Section 4.6.2 Existing Conditions, approximately 51 percent of the Proposed Project area contains soils with a severe potential for erosion.

To reduce the potential for erosion and topsoil loss in impacted areas of the Proposed Project, SDG&E will implement BMPs to manage exposed soil and temporary stockpiles, as required by the SWPPP. Because of the limited extent of earth-disturbing activities and the limited nature of the Proposed Project's construction, substantial erosion or loss of topsoil is not expected to occur. As a result, the potential for soil erosion or topsoil loss will be less than significant.

Operation and Maintenance – No Impact

SDG&E will periodically conduct required maintenance of the Proposed Project facilities. Operation and maintenance activities for the Proposed Project will be conducted in the same manner as the existing facilities. Operation and maintenance activities are expected to decrease slightly as a result of the Proposed Project due to the lower maintenance requirements of the replacement steel poles relative to the existing wood poles. Existing access roads and the widened access road will be utilized to access the new poles. Because no new roads will be constructed during operation, and maintenance of facilities will be less frequent than for the existing power line, there will be no impacts from topsoil loss associated with operation and maintenance of the Proposed Project.

Question 4.6c – Geologic Unit Instability

Construction – Less-than-Significant Impact

As described previously in the response to Question 4.6a – Human Safety and Structural Integrity, power line facilities are engineered to withstand strong ground movement and moderate ground deformation, and the new steel poles will provide increased structural support compared to the existing wood poles. The Proposed Project crosses steeply sloping terrain; therefore, the potential for slope failure may exist in some areas. However, the work areas located in steep terrain will require relatively little ground disturbance in any one location, and construction methods that limit ground disturbance will be used. Thus, construction activities are not expected to result in soil destabilization.

The Proposed Project is not likely to be subject to subsidence because construction activities at these sites will not involve the withdrawal of substantial groundwater that typically causes subsidence. The portion of the Proposed Project alignment between pole locations 51 and 75 is composed of young alluvium deposits, likely the least stable geologic unit in the Proposed Project area. However, the new steel poles will generally be located in the immediate vicinity of the existing wood poles and will have greater structural integrity within these and other areas of the Proposed Project. In addition, the potential for liquefaction in San Diego County is considered to be low. The majority of the Proposed Project is located in areas with stable geological formations and soil types. As a result, impacts associated with geologic unit and soil instability will be less than significant.

Operation and Maintenance – No Impact

SDG&E will periodically conduct required maintenance activities of the Proposed Project facilities. Operation and maintenance activities for the Proposed Project will be conducted in the same manner as the existing facilities. Operation and maintenance activities are expected to decrease slightly as a result of the Proposed Project due to the lower maintenance requirements of the replacement steel poles relative to the existing wood poles. Existing access roads and the widened access road will be utilized to access the new poles. Because no new roads will be constructed during operation, and facility maintenance activities will be less frequent than for the existing power line, there will be no impacts associated with operation and maintenance of the Proposed Project.

Question 4.6d – Expansive Soils

Construction – Less-than-Significant Impact

As described in the County of San Diego Guidelines for Determining Significance of Geologic Hazards, certain types of clay soils expand when saturated and shrink when dried. Extremely expansive soils may damage Proposed Project poles and can result in collapse. Power outages, damage to nearby roads or structures, and injury or death to nearby people may result from collapse of Proposed Project poles. As described in Section 4.6.2 Existing Conditions, expansive soils underlie approximately 81 percent of the Proposed Project alignment. However, the new steel poles will be designed for the soil types in the Proposed Project area in accordance with the recommendations in Attachment 4.6–A: Geotechnical Investigation to prevent potential pole

collapse. Therefore, potential impacts associated with expansive soils are anticipated to be less than significant.

Operation and Maintenance – No Impact

SDG&E will periodically conduct required maintenance activities of the Proposed Project facilities. Operation and maintenance activities for the Proposed Project will be conducted in the same manner as the existing facilities. Operation and maintenance activities are expected to decrease slightly as a result of the Proposed Project due to the lower maintenance requirements of the replacement steel poles relative to the existing wood poles. Existing access roads and the widened access road will be utilized to access the new poles. Because no new roads will be constructed during operation, and maintenance of existing facilities will be required less frequently than for the existing power line, there will be no impacts associated with expansive soils from the operation and maintenance of the Proposed Project.

Question 4.6e – Septic Suitability – *No Impact*

Soil permeability is a consideration for projects that require septic system installation. Because the Proposed Project will not involve the installation of a septic tank or alternative wastewater disposal system, no impacts will occur.

4.6.4 Applicant-Proposed Measures

Because the Proposed Project will not result in any significant impacts to geology or soils, no applicant-proposed measures have been proposed.

4.6.5 References

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