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4.6 GEOLOGY, SOILS AND MINERAL RESOURCES

Would the project:		Potentially Significant Impact	Potentially Significant Unless APMs 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? Refer to Division of Mines and Geology Special Publication 42.	☐	☐	☐	☑
ii.	Strong seismic ground shaking?	☐	☐	☑	☐
iii.	Seismic-related ground failure, including liquefaction?	☐	☐	☑	☐
iv.	Landslides?	☐	☑	☐	☐
b.	Result in substantial soil erosion or the loss of topsoil?	☐	☐	☑	☐
c.	Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?	☐	☑	☐	☐
d.	Be located on expansive soil, as defined by article 1803.5 of the California Building Code, creating substantial risks to life or property?	☐	☐	☑	☐
e.	Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?	☐	☐	☐	☑
f.	Result in the loss of availability of a known mineral resource that would be of value to the region and residents of the state?	☐	☐	☐	☑
g.	Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?	☐	☐	☐	☑

4.6.1 Introduction

This section of the PEA describes existing geologic, soil, and mineral resources within the Proposed Project area and potential impacts to these resources that could result from construction, operation, and maintenance of the Proposed Project.

Proposed Project construction activities would comply with all applicable federal, state, and local regulatory requirements. APMs are recommended, where applicable. With implementation of APMs, construction, operation, and maintenance of the Proposed Project are expected to have less than significant impacts on geologic, soil, and mineral resources.

4.6.2 Methodology

Preparation of this section was primarily based on review of geologic literature and unpublished documents that cover the Proposed Project area. These included publications from the USGS, the U.S. Soil Conservation Service, and the Department of Conservation California Geological Survey. Reports on a geotechnical investigation prepared for the San Juan Capistrano Substation (prepared by Geosyntec in 2012) and an engineering geologic reconnaissance and geologic hazard evaluation prepared for the transmission line alignment (prepared by URS in 2008) were also reviewed. General plans from the County of Orange, city of San Juan Capistrano, and city of San Clemente were reviewed for seismic and geologic hazards data. Planning documents and Environmental Impact Reports from areas adjacent to the Proposed Project route, the city of San Juan Capistrano, and the city of San Clemente were also reviewed.

4.6.3 Existing Conditions

4.6.3.1 Regulatory Setting

The key regulatory requirements relevant to the assessment of project impacts related to geologic, soil, and mineral resources include the following:

a) The Alquist-Priolo Special Studies Act of 1972 (Alquist-Priolo Act) which, in part, required the California Division of Mines and Geology (now the California Geological Survey) to compile maps of the surface traces of all known active faults in the State;

b) The 2010 California Building Code (CBC) (based on the 2009 International Building Code), which requires extensive structural seismic provisions and acceptable design criteria for relevant structures with respect to seismic design and load-bearing capacity;

c) CPUC G.O. 95, which designates rules and regulations for overhead electric line engineering; and

d) Government Code Sections 65302(f) and 65302.1, which requires a city to take seismic and other natural hazards into account in its planning programs and to outline them in the general plan.

4.6.3.2 Topographic Setting

The Proposed Project components are primarily located in a coastal marine environment in portions of the cities of San Juan Capistrano and San Clemente as well as in unincorporated Orange and San Diego Counties. The Proposed Project route begins in the city of San Juan Capistrano, located in the foothills of southern Orange County, near the southeastern tip of the Santa Ana Mountains and south of the San Joaquin Hills. The southern portion of the Proposed Project route runs through mainly mountainous and urbanized areas of San Clemente. The hills are incised by numerous drainages that generally flow south towards the Pacific Ocean.

The San Juan Capistrano Substation would be a re-built and modified modernization of the existing Capistrano Substation, all occurring within the existing property footprint. That substation is located in an urbanized area that is relatively flat. The Talega Substation also is an already existing substation that would remain in its current location, which is a relatively flat, more undeveloped area.

4.6.3.3 Geologic Setting

Regional Setting

The Proposed Project area is located within the southern Peninsular Ranges Physiographic Province, which is characterized by northwest-trending fault-bounded mountain ranges, broad intervening valleys, and low-lying coastal plains. The province has a long and active geologic history. In general, the Peninsular Ranges province is underlain by Jurassic metavolcanic and metasedimentary rocks and by Cretaceous igneous rocks of the Southern California batholith.

Landslide-prone Tertiary (Miocene) sedimentary deposits of the Capistrano Formation and the Monterey Formation underlie a large portion of the project region. These deposits have been folded and faulted, further complicating slope stability issues. The region is bounded by the Elsinore fault to the northeast and by the offshore extension of the Newport-Inglewood fault zone to the southwest.

Proposed Project Geologic Setting

The majority of the Proposed Project route is underlain by the Miocene Capistrano Formation and/or the Miocene Monterey Formation, which primarily consist of weak, layered, fine-grained claystone and siltstone. The 2008 URS report identified that extensive ancient landslides that are no longer active occur throughout the Proposed Project region that are thought to be relics of lower sea level conditions occurring more than 10,000 to 20,000 years before present. In addition, more localized recent landslides are relatively common along the alignment corridor that are mostly avoided by Proposed Project structure locations.

The Capistrano Formation consists of poorly consolidated, fossiliferous sandy siltstone and mudstone and underlies the northern portion of the Proposed Project route. Bedding plane failures have caused extensive landsliding in the San Juan Capistrano and San Clemente areas. The Monterey Formation consists of generally thinly bedded and highly jointed and fractured shale and siltstone with minor sandstone and limestone interbeds and underlies the southern portion of the Proposed Project route. In general, the Monterey Formation is deeply weathered and relatively weak. Local folding and out-of-slope bedding also contribute to the landslide susceptibility of this unit.

The geologic materials within the transmission line corridor have been uplifted and tilted as a result of complex folding and localized faulting. The pre-Quaternary Cristianitos fault, located approximately 3,500 feet east of the Talega Substation, is crossed by the existing transmission route. This fault is not active and is not a hazard for the Proposed Project but regional deformation associated with ancient movement of this fault zone produced pervasive folding that has resulted in moderate to steeply dipping strata, which in turn contributes to the occurrence of landslides. Minor faulting and subparallel fracturing is common throughout the area adjacent to the fault zone, which also contributes to slope failure.

Previous subsurface exploration performed at the San Juan Capistrano Substation indicates this portion of the Proposed Project area is underlain by shallow fill, alluvial deposits, and strata of the Capistrano Formation.

Geologic units in the Proposed Project area are described in detail in Table 4.6-1, Geologic Units Within the Proposed Project Area.

Table 4.6-1: Geologic Units within the Proposed Project Area

Symbol	Unit Name	Age	Description
Qls	Landslide deposits	Recent (Holocene)	Unconsolidated silt and sand deposits transported by landslide movement of eroded surface rocks (mainly Tcs, Tct).
Qt/Qtm	Non-marine and marine terrace deposits	Plio-Pleistocene	During seashore recession marine terraces were formed – sandy loam to loam; fluvial terrace deposits remain along the inland hills (non-marine) – form cobbly slope wash from erosion.
Qlh, Qch	La Habra/Coyote Hills Formations	Pliocene	La Habra Formation is found in the Coyote Hills and along the southern flank of the Puente Hills – fluvial sandstone, mudstone, and conglomerate (river terrace deposits). Mudstones and sandstones of the Coyote Hills Formation indicate an intertidal/lagoonal deposition, and crop out in the Coyote Hills.
Tfl, Tfu	Fernando Formation	Pliocene	Fernando Formation is a marine deposit composed of two members: lower Repetto Sandstone and upper Pico Sandstone.
Tn	Niguel Formation	Pliocene	Shallow marine deposit that overlies Tcs in the Mission Viejo area; consists of gray unconsolidated silty sandstone with abundant fossil sea shells.
Tcs, Tct	Capistrano Formation	Late Miocene to Early Pliocene	Poorly consolidated, fossiliferous sandy siltstone and mudstone. Highly prone to landsliding in the San Juan Capistrano and San Clemente areas.
Tplv, Tps, Tpy, Tpsc	Puente Formation	Late Miocene	Puente Formation consists of four members: La Vida Member (laminated diatomaceous siltstone with thin interbedded sandstone); Soquel Member (sandstone with interbedded siltstone and local conglomerate beds); Yorba Member (thin-bedded siltstone and local beds of sandstone and conglomerate); Sycamore Canyon Member (interbedded conglomerate, sandstone, and siltstone).

Table 4.6-1 (cont.): Geologic Units within the Proposed Project Area

Symbol	Unit Name	Age	Description
Tm	Monterey Shale	Middle Miocene	Massive accumulations of diatomite consisting of one-celled, glassy, plant shells; commercially mined. Fossils include fish scales, fish bones, and microfossils.
Tso	San Onofre Breccia	Miocene	Breccia formed from landslides and crystalline rocks and uplifted by faulting. The rocks and minerals include asbestos, serpentine, actinolite, fuchsite, epidote, chlorite, glaucophane, pyrite, magnetite, and quartzite.
Tt	Topanga Formation	Miocene	Marine formation with abundant fossils ranging from shark teeth to sea shells and microfossils.
Tv/Ts	Vaqueros/ Sespe Formations	Tertiary (Late Eocene to Early Miocene)	Interbedded, non-marine, red Sespe Formation and marine, buff-colored Vaqueros Formation containing invertebrate fossils.
Tsa	Santiago Formation	Tertiary (Eocene)	Yellow marine sandstone, siltstone, and cobble conglomerate; gradational contact with underlying Tsi.
Tsi	Silverado Formation	Tertiary (Paleocene)	Coal seams and clay deposits; coal deposits are in thin seams and are low-quality lignite. Mollusk fossils indicate deposition during the Paleocene Epoch of the Tertiary Period.
Kwp and Kws	The Williams Formation	Late Cretaceous	Divided into two members: the Pleasants Silty Sandstone (Kwp) and the Schulz Ranch Sandstone (Kws). Kws contains wavy bands of sandstone and beach lag cobbles, indicating that it may have been an ancient shoreline.
Klh	Holz Shale Member	Middle Cretaceous	Fine clay mixed with carbonized wood formed a sea shale that is the upper member of the Ladd Formation, which contains ammonite fossils.
Klb	Baker Canyon Conglomerate Member	Middle Cretaceous	Marine sandstone, beach cobbles, and sea shells including shallow water clams and snails comprise this formation, a fairly resistant sandstone that is a member of the Ladd Formation.
Kt	Trabuco Formation	Early Cretaceous	Conglomerate consisting of cobbles and boulders with red clay.
Jsp	Santiago Peak Volcanics	Jurassic	Volcanic lava formation with rocks from Jbc. Lava consists of hornblende andesite. Non-fossiliferous.

Table 4.6-1 (cont.): Geologic Units within the Proposed Project Area

Symbol	Unit Name	Age	Description
Jbc	Bedford Canyon Formation	Triassic to Jurassic	Metasedimentary rocks that include argillite, quartzite, slate, and small exposures of shale and limestone with poorly preserved mollusk fossils.
Sources: Morton, 1976; California Division of Mines and Geology, 1981; Stadum, 2007.			

4.6.3.4 Faulting and Seismicity

The Alquist-Priolo Act required the California Division of Mines and Geology (now the California Geological Survey) to compile maps of the surface traces of all known active faults in the State. By definition, an active fault is one that is "sufficiently active and well-defined," with evidence of surface displacement within Holocene time (about the last 11,000 years). Active fault zones are the locations in the State with the most potential for surface fault rupture. A potentially active fault is one that has evidence of displacement within the Quaternary Period (last 1.6 million years). Potentially active faults are considered to also represent possible surface rupture hazards, although to a lesser degree than active faults. In contrast to active or potentially active faults, faults considered inactive have not moved in the last 1.6 million years.

Several active and potentially active faults occur within and adjacent to Orange County; however, there are no known active or potentially active faults or Alquist-Priolo Act earthquake fault zones within the Proposed Project area. The closest known active fault is an offshore segment of the Newport-Inglewood fault located approximately 5.9 miles to the southwest. This segment has not been mapped under the Alquist-Priolo Act because it is offshore. The closest active fault that is zoned by the Alquist-Priolo Act is the Elsinore Fault zone, located approximately 15 miles to the east/northeast. Other active regional faults that also have the potential to produce high-magnitude earthquakes in the Proposed Project region are listed in Table 4.6-2, Known Active Faults within the Proposed Project Area.

Table 4.6-2: Known Active Faults Within the Proposed Project Area

Fault Name	Type of Fault/Slip Rate (mm/yr)	Last Major Rupture	Estimated Maximum Credible Earthquake (Richter Magnitude)
Newport-Inglewood	*RLSS/0.6	1933	6.0-7.4
Palos Verdes	RR/0.1-3	Holocene	6.0-7.1
Whittier	RLSS/2.5-3	Holocene	6.0-7.2
Elsinore	RLSS/4	1910	6.5-7.5
San Jacinto	RLSS/7-17	1968	6.5-7.5
San Andreas	RLSS/20-35	1857 (Mojave Segment)	6.8-8.0
Notes: *RLSS-Right lateral strike slip			

Fault Rupture

There are no known active or potentially active faults or Alquist-Priolo Act earthquake fault zones within the Proposed Project footprint area. Therefore, there are no locations within the Proposed Project footprint area that are prone to surface fault rupture.

Strong Seismic Shaking

Strong ground motion or intensity of seismic shaking during an earthquake is dependent on the distance from the epicenter of the earthquake, the magnitude of the earthquake, and the geologic conditions underlying and surrounding the area. All of southern California is considered to be a seismically active region. The Orange County area is subject to strong seismic shaking from regional earthquakes that may occur on active faults that are located distant from the Proposed Project. Active faults close enough to the Proposed Project route to cause strong seismic ground shaking are listed in Table 4.6-2.

4.6.3.5 Geologic Hazards

Subsidence

The primary causes of most subsidence are human activities, including groundwater or petroleum withdrawal from large alluvial basins with thick accumulations of unconsolidated sediments, and drainage of organic soils. Regional lowering of land elevation occurs gradually over time. Subsidence is not a significant risk for the Proposed Project because it does not occur over any large alluvial basins, and because the project does not involve the withdrawal of fluid from geologic materials.

Landslides

Landslide potential is high in steeply sloped areas underlain by surficial or bedded sedimentary deposits where the bedding planes are oriented in an out-of-slope direction (bedding planes that are dipping with a dip angle that is close to or less than the slope face angle). Human factors such as over-steepening/overloading of slopes or introduction of excessive water in soil pores or joints and fractures in rock can also lead to landslides. The principal natural factors contributing to landslides are topography, geology and precipitation.

The California Geological Survey has mapped landslide areas in the San Juan Capistrano and San Clemente areas. Extensive ancient (more than 10,000 to 20,000 years old) landslide deposits derived from the Capistrano and Monterey formations have been mapped throughout the Proposed Project area, and localized more recent landslide deposits are also relatively common in these formations where geologic conditions susceptible to slope movement still occur. The URS Corporation conducted an evaluation of landslide hazards along the Proposed Project transmission line route. The location of most of the Proposed Project transmission poles are located outside of areas identified by URS as either ancient or more recent landslide deposits. Several of the proposed transmission line pole locations are in or adjacent to areas mapped as recent landslide deposits, and a larger number are located in or adjacent to ancient landslide deposits.

In addition, several additional proposed pole locations were identified to have other factors that could cause susceptibility to slope movement including relatively steep slopes, thick clayey surficial deposits, nearby localized water seeps, and soil creep. Conditions at proposed transmission line pole locations susceptible to slope instability would require appropriate engineering measures as further described in Section 4.6.4, Potential Impacts.

Geosyntec Consultants evaluated the potential for landslides at the San Juan Capistrano Substation site and determined that landslides are not a potential hazard at that location. The Talega Substation occurs on an ancient landslide and a more recent landslide has occurred on the adjacent slope to the west, therefore landslides are a potential hazard there but that is the existing condition and does not change with the Proposed Project.

Liquefaction and Lateral Spreading

Liquefaction is a seismic phenomenon in which loose, saturated, fine-grained granular soils behave similar to a fluid when subjected to high-intensity ground shaking. An increase in pore pressure occurs as the soil attempts to compact in response to the shaking, resulting in less grain-to-grain soil contact and, therefore, loss of strength. Liquefaction occurs when three general conditions exist: shallow groundwater (40 feet below ground surface or less); low-density, fine-grained sandy soils; and high-intensity ground motion. Effects of liquefaction on level ground can include sand boils, settlement, and bearing capacity failures below structural foundations.

The California Geological Survey has mapped the liquefaction potential in the San Juan Capistrano and San Clemente areas. None of the locations of Proposed Project structures are within areas mapped as potentially susceptible to liquefaction except for the proposed locations of transmission line Pole Nos. 8, 9, and 10 (refer to Figure 3-7, Sheet 3), which are proximal to the San Juan Creek stream channel. At these locations, URS determined that there is a low liquefaction hazard potential for proposed Pole Nos. 8 and 10 and a low to moderate hazard potential for Pole No. 9. The geotechnical investigation report for the San Juan Capistrano Substation also identifies the probability of liquefaction at that location to be very low, citing the density of the underlying geologic materials and the depth to ground water of 41.5 feet.

Lateral spreads involve lateral displacement of large, intact soil blocks down gentle slopes or in the direction of a steep free face such as a stream bank. Lateral spreading can occur in fine-grained, sensitive soils such as quick clays, particularly if remolded or disturbed by construction and grading. Loose, granular soils present on gentle slopes and underlain by a shallow water table commonly produce lateral spreads through liquefaction. Conditions conducive to lateral spreading include gentle surface slope, a shallow water table, and liquefiable cohesionless soil. These conditions commonly are found along streams banks, canals, or cut slopes in recent alluvial or deltaic deposits. Structures located at the head of the slide may be pulled apart and those at the toe of the slide may buckle or compress. The potential for lateral spreading in the Proposed Project area is similar to that for liquefaction, that is, lateral spreading is not a material hazard except for a low potential at transmission line Pole Nos. 8 and 10 and a low to moderate potential at Pole No. 9.

Soil Collapse

Soil collapse occurs when added moisture causes bonds between soil particles to weaken, which allows the soil structure to collapse and the ground surface to subside. Collapsible soils are generally low-density, fine-grained combinations of clay and sand left by mudflows that have dried, resulting in the formation of small air pockets in the subsurface. The addition of moisture reduces the strength of the soil, resulting in collapse or subsidence. Mudflows typically are found downslope from steep canyons. The Proposed Project area is generally not located downslope from any steep canyons (except for the Talega Substation); therefore, the potential for the presence of mudflows and associated collapsible soils is generally considered to be low.

4.6.3.6 Soil Units and Series

Major mapped soil units present in the Proposed Project area are described in Table 4.6-3, Soil Units Within the Proposed Project Area.

Table 4.6-3: Soil Units within the Proposed Project Area

Soil Series	Description	Slope	Runoff Rate	Shrink-Swell Potential	Erosion Potential
Alo Clay	Well-drained clays in foothills	9 to 50 percent	Moderate	High	Moderate
Bonsanko Clay	Well-drained clays and clay loams	9 to 50 percent	Rapid	High	Moderate to High
Botella Clay Loam	Well-drained loams and clay loams	2 to 15 percent	Moderate	Moderate	Moderate
Callegus Clay Loam	Well-drained clay loams on uplands	50 to 75 percent	Rapid	Moderate	High
Cieneba Sandy Loam	Somewhat excessively drained sandy loams in foothills	15 to 30 percent	Moderate	Low	Moderate
Corralitos Loamy Sand	Moderately well-drained loamy sands	--	Low	Low	Moderate
Cropley Clay	Moderately well- to well-drained clays	2 to 9 percent	Moderate to Rapid	High	Moderate
Myford Sandy Loam	Moderately well-drained sandy loams	2 to 9 percent	Rapid	Low	Moderate
Sorrento Loam	Well-drained clay loams	2 to 9 percent	Low to Moderate	Low to Moderate	Low
Yorba Gravelly Sandy Loam	Deep, well-drained gravelly sandy loams	Variable	Moderate to Rapid	Low	Moderate

Source: USDA, 2012

4.6.3.7 Mineral Resources

Silver, lead, tin, and zinc mines in the Santa Ana Mountains are located in the Bedford Canyon Formation. Limited quantities of ore have been recovered since 1870. Mining in the Santa Ana Mountains has had little success because the formation has been fractured and faulted, which has offset the ore veins, making them impossible to trace. Limestone has been quarried in some parts of the mountains, but the mines are presently inactive. Some deposits of gypsum have also been mined.

Present extractive operations in Orange County are limited to construction materials (sand, gravel, borrow, riprap, and aggregate), industrial minerals (sand for glass, foundry, and ganister; clay for ceramics, pipe, tile, and cement manufacture) and petroleum. There are no known significant mineral resources along the Proposed Project route.

4.6.4 Potential Impacts

4.6.4.1 Significance Criteria

Standards of impact significance were derived from Appendix G of the *CEQA Guidelines*. Under these guidelines, the Proposed Project could have a potentially significant impact to geology and soils if it would:

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 (refer to Division of Mines and Geology Special Publication 42);
    ii. Strong seismic ground shaking;
    iii. Seismic-related ground failure, including liquefaction; or
    iv. Landslides;
b) Result in substantial soil erosion or the loss of topsoil;
c) Be located on a geologic unit that is unstable, or that would become unstable as a result of the project, and potentially result in on-site or off-site landsliding, lateral spreading, subsidence, liquefaction, or collapse;
d) Be located on expansive soil, as defined by article 1803.5 of the CBC, creating substantial risk 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 the disposal of wastewater.

Mineral Resources

Impacts to mineral resources may be considered significant if they:

a) Result in the loss of availability of a known mineral resource that would be of value to the region and residents of the state; or

b) Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan.

4.6.4.2 Question 6a(i) – 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?

Construction– No Impact

No portion of the Proposed Project is located in an Alquist-Priolo Act earthquake fault zone. There are no active or potentially active faults in proximity to the San Juan Capistrano Substation, the Talega Substation, or along the Proposed Project transmission route. The closest known active fault is the Newport-Inglewood fault located approximately 5.9 miles to the southwest. No recognized active faults underlie the Proposed Project area; therefore, no impacts from fault rupture are expected.

Operation & Maintenance – No Impact

SDG&E currently maintains and operates extensive existing electric transmission, distribution and substation facilities throughout the Proposed Project site. SDG&E's existing operations and maintenance activities constitute the baseline against which the impacts of the Proposed Project are evaluated and no portion of the existing lines and facilities are located in an Alquist-Priolo Act earthquake fault zone, nor are there any active or potentially active faults in proximity to the facilities or along the transmission route. Operations and maintenance activities for the Proposed Project would not materially increase in frequency or intensity, and any future potential maintenance-related construction projects would be evaluated under G.O. 131-D and CEQA for purposes of assessing whether further CPUC approval is required. Therefore, the operations and maintenance of the Proposed Project would not result in any potential impacts relating to fault rupture.

4.6.4.3 Question 6a(ii) – Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving strong seismic ground shaking?

Construction – Less than Significant Impact

Various faults are capable of generating strong seismic ground shaking in the Proposed Project area. However, because of the short construction period and the low likelihood of a moderate to large earthquake to occur during this time, the potential for construction personnel to experience strong seismic ground shaking is low. Due to the short construction period, the risk of exposure of people or structures to strong seismic ground shaking during construction is less than significant.

Operation & Maintenance – Less Than Significant Impact

SDG&E currently maintains and operates extensive existing electric transmission, distribution and substation facilities throughout the Proposed Project site. SDG&E's existing operations and maintenance activities constitute the baseline against which the impacts of the Proposed Project are evaluated, and no portion of the existing lines and facilities are located in an Alquist-Priolo Act earthquake fault zone, nor are there any active or potentially active faults in proximity to the facilities or along the transmission route. Operations and maintenance activities for the Proposed Project would not materially increase in frequency or intensity, and any future operations and maintenance activities will be evaluated under G.O. 131-D and CEQA for purposes of assessing whether further CPUC approval is required.

All of the existing facilities at the Capistrano Substation, including the existing former utility structure constructed in 1918, would be replaced with facilities and structures that conform to current seismic standards. The new San Juan Capistrano Substation would be engineered and constructed to withstand strong ground movement and moderate ground deformation. Substation structures are designed in accordance with the recommendations of American Society of Civil Engineers (ASCE) Manual of Practice 113 (Substation Structure Design Guide) and Institute of Electrical and Electronics Engineers (IEEE) 693 (Recommended Practices for Seismic Design of Substations) along with applicable requirements of ASCE 07-10 (Minimum Design Loads for Buildings and Other Structures), substation buildings and walls such as the gas insulated substation buildings and the control houses are designed in accordance with the CBC. Design and construction of overhead transmission portions of the Proposed Project would conform to CPUC G.O. 95, industry practice, and SDG&E internal structural design requirements. These transmission design requirements of G.O. 95, industry requirements, and SDG&E internal requirements for wind loading combined with broken phase loading all exceed those for seismic accelerations. Underground facilities are generally not subject to direct effects of shaking because they are confined by surrounding soil. With the application of engineering principals and compliance with design standards outlined in G.O. 95 applied to minimize damage from seismic shaking, the risk of damage to the Proposed Project due to strong seismic shaking is less than significant.

4.6.4.4 Question 6a(iii) – Expose people or structures to potential substantial adverse effects, including seismic-related ground failure, including Liquefaction?

Construction – Less Than Significant Impact

Shaking from a moderate to large regional earthquake can potentially result in liquefaction where groundwater is shallow (i.e., within 40 feet of ground surface) and soils consist of uncompacted, granular materials. Based on its 2012 geotechnical study, Geosyntec concluded that due to the relatively dense nature of geologic material underlying the San Juan Capistrano Substation and groundwater deeper than 40 feet below ground surface, the risk of liquefaction in the San Juan Capistrano portion of the Proposed Project area is very low.

The only Proposed Project structures that would be located in an area mapped to be susceptible to liquefaction conditions are a few poles in a short segment of the Proposed Project at Pole Nos. 8, 9 and 10. Those locations, which are proximal to the San Juan Creek stream channel, were found to be potentially susceptible to liquefaction (refer to Figure 3-7, Sheet 3).

At those locations, URS in its engineering and geologic reconnaissance and landslide hazard evaluation determined that there is a low liquefaction hazard potential for proposed Pole Nos. 8 and 10 and a low to moderate hazard potential for Pole No. 9. That short segment of transmission line construction is the only portion of the Proposed Project located in geologic conditions prone to liquefaction. Because of the short construction period in this area and the low likelihood of a moderate to large earthquake to occur during this time, the risk of construction personnel being exposed to earthquake-induced liquefaction is less than significant.

Operation & Maintenance – No Impact

SDG&E currently maintains and operates extensive existing electric transmission, distribution and substation facilities throughout the Proposed Project site. SDG&E's existing operations and maintenance activities constitute the baseline against which the impacts of the Proposed Project are evaluated. Operations and maintenance activities for the Proposed Project would not materially increase in frequency or intensity, and any future potential maintenance-related construction projects will be evaluated under G.O. 131-D and CEQA for purposes of assessing whether further CPUC approval is required.

4.6.4.5 Question 6a(iv) – Expose people or structures to potential substantial adverse effects, including landslides?

Construction – Less than Significant Impact with Incorporation of APMs

A geologic hazard evaluation conducted by URS in 2008 evaluated the pole locations along the Proposed Project transmission line route for the presence of geologic hazards that may affect new tower and pole locations. That evaluation identified approximately 30 areas in which recent or ancient landslides have occurred along the Proposed Project transmission line route due to unstable slope conditions, the majority of which are associated with shale, siltstone, and claystone of the Capistrano and Monterey geologic formations. Those locations in which landslides have been mapped are primarily within Transmission Line Segments 1 (near Pole Nos. 12 through 14), Segment 2, Segment 3, and Segment 4. Steep slopes along the transmission line segments listed above may make other areas also susceptible to landslides. In contrast, according to the Geosyntec report, the potential for landslides or other slope instability is not a significant hazard at the San Juan Capistrano Substation and, because no new grading, drainage or footprint changes are proposed at the Talega Substation, the Proposed Project would not affect the potential for landslides or the potential for the Talega Substation to be affected by landslides.

The 2008 URS geologic hazards study indicates that none of the proposed transmission line facilities appear to be in immediate danger from landslides or associated slope instability. However, the sites for transmission line poles within Segments 2 through 4, as well as Pole Nos. 12 through 14 in Segment 1 are located where there appears to be a risk for potential slope instability.

Slope destabilization conditions could result (where existing slope stability issues are present) from Proposed Project construction activities such as grading that could alter slope stability factors. Prior to construction, an engineering-level geotechnical investigation would be performed along the transmission line route at each pole location that is in or near a mapped landslide or other unstable slope condition (as outlined in the 2008 URS report), to: (1) delineate

specific transmission line pole locations susceptible to slope instability; and (2) determine appropriate engineering design measures to ensure that the Proposed Project does not materially increase slope stability risks and to minimize the potential for damage to Proposed Project structures in the event of landslides. The investigation will identify site-specific protective measures that SDG&E will implement to minimize the potential for damage to the structures in the event of landslides. The types of measures typically used for this sort of condition include augmented grading practices, expanded erosion control measures, and deeper foundations, most of which have been used by SDG&E in other transmission line locations. The above engineering studies are outlined as APM's at the end of this section. Based on the current geotechnical reports, there are no slope stabilization issues that cannot be adequately addressed through the identified APM's. Furthermore, the APM's are considered feasible and adequate to address slope stability issues based on the current geotechnical report findings.

Implementation of the engineering-level geotechnical survey and recommended design measures as set forth in APM GEO-2 would reduce the risk of construction impacts from landslides and the risk of impacting slope stability to less than significant levels.

Operation & Maintenance – No Impact

SDG&E currently maintains and operates extensive existing electric transmission, distribution and substation facilities throughout the Proposed Project site. SDG&E's existing operations and maintenance activities constitute the baseline against which the impacts of the Proposed Project are evaluated. Operations and maintenance activities for the Proposed Project would not materially increase in frequency or intensity, and any future potential maintenance-related construction projects would be evaluated under G.O. 131-D and CEQA for purposes of assessing whether further CPUC approval is required.

4.6.4.6 Question 6b – Result in substantial soil erosion or the loss of topsoil?

Construction – Less Than Significant Impact

Construction would occur along the existing ROW/transmission line corridor and the proposed transmission line would include steel poles, graded pads, and new access roads or spurs that would need to be graded as needed. Soil erosion or loss of topsoil could result from excavation or grading activities during construction.

Soil erosion and topsoil loss would be controlled by implementing SDG&E's *BMP Manual* during design and construction of the Proposed Project. In addition, the Proposed Project would comply with the General Permit for Discharges of Stormwater Runoff Associated with Construction Activity (Construction General Permit) which would include the preparation of a SWPPP (refer to Section 4.8, Hydrology and Water Quality for additional information on the Construction General Permit). Surface disturbance would be minimized to the extent consistent with safe and efficient completion of the Proposed Project scope of work. Topsoil would be salvaged from areas where grading would otherwise result in loss of topsoil, and the salvaged soil would be used to reclaim areas of temporary construction disturbance. Once temporary surface disturbances are complete, areas that would not be subject to additional disturbance would be stabilized by landscaping. Considering these measures, impacts to soil erosion and loss of topsoil would be less than significant.

Operation & Maintenance – No Impact

SDG&E currently maintains and operates extensive existing electric transmission, distribution and substation facilities throughout the Proposed Project site. SDG&E's existing operations and maintenance activities constitute the baseline against which the impacts of the Proposed Project are evaluated. Operations and maintenance activities for the Proposed Project would not materially increase in frequency or intensity, and any future potential maintenance-related construction projects would be evaluated under G.O. 131-D and CEQA for purposes of assessing whether further CPUC approval is required. Therefore the Proposed Project's operation and maintenance would have no impacts relating to soil erosion or loss of topsoil.

4.6.4.7 Question 6c – Be located on a geologic unit that is unstable, or that would become unstable as a result of the project, and potentially result in on-site or off-site landsliding, lateral spreading, subsidence, liquefaction, or collapse?

Construction – Less than Significant Impact with Incorporation of APMs

The potential for liquefaction and landslide related impacts are addressed in Sections 4.6.4.4 and 4.6.4.5, respectively.

As described in Section 4.6.3.5, Geologic Hazards, lateral spreading is not a material hazard for the Proposed Project except for a low potential at transmission line Pole Nos. 8 and 10 and a low to moderate potential at Pole No. 9. Because of the short construction period in this area the probability of a moderate to large earthquake occurring during this time is low, and the probability of consequential lateral spreading is even lower since it is not certain that it would occur even if strong ground shaking does. Therefore, the risk of lateral spreading during construction is less than significant.

Construction would have no subsidence impact because the Proposed Project does not involve the withdrawal of subsurface fluids that can cause subsidence, nor would it impact sedimentary materials that are particularly prone to subsidence.

As described in Section 3.6.3.5, collapsible soil deposits are not anticipated to be present in the Proposed Project construction areas. A possible exception is at the Talega Substation. However, the Proposed Project includes only minor alterations to the Talega Substation that do not have the potential to impact or be impacted by collapsible soils even if such soils are present.

Operation & Maintenance – No Impact

SDG&E currently maintains and operates extensive existing electric transmission, distribution and substation facilities throughout the Proposed Project site. SDG&E's existing operations and maintenance activities constitute the baseline against which the impacts of the Proposed Project are evaluated. Operations and maintenance activities for the Proposed Project would not materially increase in frequency or intensity, and any future potential maintenance-related construction projects would be evaluated under G.O. 131-D and CEQA for purposes of assessing whether further CPUC approval is required.

There is nothing about the Proposed Project operations and maintenance that differs from the existing conditions in terms of subsidence or collapsible soils, and thus there are no potential impacts as a result of subsidence or collapsible soils associated with the Proposed Project.

4.6.4.8 Question 6d – Be located on expansive soil, as defined by article 1803.5 of the California Building Code, creating substantial risk to life or property?

Construction – Less Than Significant Impact

Expansive soils are clayey soils that have a high plasticity index. Typical shallow reinforced concrete spread footing foundations, such as those proposed for the San Juan Capistrano Substation site, can be affected by expansive soils if they are present close to the ground surface. However, the geotechnical investigation for the San Juan Capistrano Substation demonstrated that the majority of near-surface soils at the substation site have a low to moderate expansion potential and do not meet the CBC criteria for expansive soil. Grading at the San Juan Capistrano Substation would follow recommendations of the geotechnical investigation report, including separately stockpiling and performing additional expansion potential testing on clayey soils, and avoiding the use of expansive soils for backfill within the upper 36 inches below the final grade to ensure that project facilities are not adversely impacted by them. Therefore, the impact of expansive soils on structures at the San Juan Capistrano Substation would be less than significant.

The Proposed Project includes only minor alterations to the Talega Substation that do not include grading or changes to drainage and do not have the potential to impact or be impacted by expansive soils even if such soils are present. Therefore, the impact of expansive soils at this location would be less than significant.

Soil types identified along the Proposed Project transmission line route include several units with a moderate to high shrink-swell (expansion) potential. Expansive soils are taken into account during the design phase for transmission structure foundations. Transmission structure foundations (i.e., those for poles and towers) are typically deep-drilled, pier-reinforced concrete foundations that are designed for the structural properties of the various soil layers, taking into account the properties of stronger and weaker soil layers, as well as maximum allowable deflections and rotations. As such, expansive soils are not expected to have a significant adverse impact on transmission line structures.

Operation & Maintenance – No Impact

SDG&E currently maintains and operates extensive existing electric transmission, distribution and substation facilities throughout the Proposed Project site. SDG&E's existing operations and maintenance activities constitute the baseline against which the impacts of the Proposed Project are evaluated. Operations and maintenance activities for the Proposed Project would not materially increase in frequency or intensity, and any future potential maintenance-related construction projects will be evaluated under G.O. 131-D and CEQA for purposes of assessing whether further CPUC approval is required. As with the baseline condition, operation and maintenance of the Proposed Project would not include activities that have the potential to impact or be impacted by expansive soils. Therefore, no impact is expected.

4.6.4.9 Question 6e – Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?

Construction and Operation & Maintenance – No Impact

The Proposed Project would not involve the installation of a septic tank or alternative wastewater disposal system; therefore, no impact would occur.

4.6.4.10 Question 6f – Result in the loss of availability of a known mineral resource that would be of value to the region and residents of the state?

Construction and Operation & Maintenance – No Impact

No mineral resources are known to exist at the San Juan Capistrano Substation or the Talega Substation, or along the Proposed Project route, nor are any designated in the vicinity of the Proposed Project by the cities of San Juan Capistrano and San Clemente or by Orange County; therefore, the Proposed Project would not result in the loss of availability of a known mineral resource and no impact would occur.

4.6.4.11 Question 6g – Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?

Construction and Operation & Maintenance – No Impact

No mineral resources are known to exist at the San Juan Capistrano or Talega Substations, or along the Proposed Project route, nor are any designated in the vicinity of the Proposed Project by the cities of San Juan Capistrano and San Clemente or by Orange County; therefore, the Proposed Project would not result in the loss of availability of a locally important mineral resource recovery site and no impact would occur.

4.6.5 Applicant Proposed Measures

The potential impacts related to geology, soils, and mineral resources identified above can be adequately addressed by implementing the engineering and regulatory standard, practices and guidelines, previously described in this section, and the APMs described below.

GEO-1 Conduct an Engineering-level Geotechnical Investigation for Liquefaction Potential and Implement Recommended Design Measures. A geologic hazard evaluation was conducted by URS in 2008 to evaluate the pole locations along the Proposed Project transmission line route for the presence of geologic hazards that may affect the new towers and poles The geologic hazard evaluation indicated the presence of geologic conditions potentially susceptible to liquefaction at the locations of proposed Pole Nos. 8, 9 and 10. Prior to construction, an engineering-level geotechnical investigation would be performed at these locations under the supervision of a California Certified Engineering Geologist or California licensed Geotechnical Engineer to further evaluate the liquefaction potential at each of these pole locations and to develop design measures to minimize the potential for damage to Proposed Project structures in the event of strong ground shaking. Recommendations of the geotechnical investigation would be incorporated into the final design for these structures. These recommendations would include augmented grading practices, expanded erosion control measures and deeper foundations.

GEO-2 Conduct an Engineering-level Geotechnical Survey for Landslides and Implement Recommended Design Measures to Ensure Slope Stability is not Impacted and the Potential for Damage to Protect Structures is Minimized. A geologic hazard evaluation was conducted by URS in 2008 to evaluate the structure locations along the Proposed Project transmission line route for the presence of geologic hazards that may affect the new towers and poles. The geotechnical hazard evaluation identified areas with recent and ancient landslides along the Proposed Project transmission line route due to unstable slope conditions in portions of both the Capistrano and Monterey formations. Prior to construction, an engineering-level geotechnical investigation would be performed at each pole location along the transmission line route that is in or near a mapped landslide or other unstable slope condition. This investigation would be performed under the supervision of a California Certified Engineering Geologist or California licensed Geotechnical Engineer, and would identify protection measures to be designed and implemented to ensure that the Proposed Project does not materially increase slope stability risks and to minimize potential for damage to Proposed Project structures in the event of landslides. These recommendations would include augmented grading practices, expanded erosion control measures and deeper foundations.

4.6.6 References

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