

D.13 Geology, Mineral Resources, and Soils – Contents

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D.13 Geology, Mineral Resources, and Soils

This section addresses the environmental setting and impacts related to the construction and operation of the Proposed Project and alternatives involving the issues of geologic and seismic hazards. The primary reason to define geologic and seismic hazards is to protect structures from physical damage and to minimize injury/death of people due to structure damage or collapse. Section D.13.1 provides a summary of existing geology, soils, and seismic conditions present along the right-of-way (ROW) of SDG&E's Sunrise Powerlink Transmission Project. Applicable regulations, plans, and standards are listed in Section D.13.2. Impacts and mitigation measures for the Proposed Project are presented in D.13.4 through D.13.13; and alternatives along the Proposed Project route are discussed in Sections D.13.14 through D.13.19.

D.13.1 Regional Setting and Approach to Data Collection

Baseline geologic, seismic, and soils information for the Proposed Project and surrounding area (as illustrated in Figure B-2) were collected from the Proponent's Environmental Assessment (PEA), literature, GIS data, and online materials. All sources used for the purposes of characterizing baseline conditions and conducting this analysis are referenced as appropriate. The literature and data review was supplemented by a brief field reconnaissance of the proposed ROW. The literature review and field reconnaissance focused on the identification of specific geologic hazards.

D.13.1.1 Regional Physiography

The Proposed Project crosses two major physiographic provinces in California: the Colorado Desert, and the Peninsular Ranges. As such, the region is geologically complex with a variety of rock types, faults, and geologic features. The route skirts the edges of and crosses fault-bounded mountain ranges, and crosses desert features such as playas, badlands¹, alluvial fans and pediments, and desert valleys dissected by numerous arroyos and washes.

Colorado Desert Region

The Colorado Desert region lies mostly at a low elevation and consists of desert basins with interspersed northwest-trending mountain ranges. In the Colorado Desert province, the Proposed Project route is located in the Imperial Valley portion of the Salton Trough. The Salton Trough is a topographic and structural trough that extends from southeastern California into Mexico and is about 130 miles long and as much as 70 miles wide. As a result of rifting and subsidence, the Salton Trough has been filled with sediments to a depth of up to 5 miles since the late Miocene, approximately 6 million years ago. The source of these sediments has been the local mountain ranges, as well as the ancestral and modern Colorado River. The lowest part of the trough is occupied by the Salton Sea, whose surface is at an elevation of more than 200 feet below sea level. Much of the land surrounding the Salton Sea in the Imperial and Coachella Valleys is below present sea level. This is the result of crustal thinning and subsidence caused by the same extensional tectonics that continue to form the Gulf of California today.

¹ Badlands are generally barren dissected and eroded hills and gullies that are formed in semiarid regions with sparse vegetation that experience high rates of erosion, usually formed in areas underlain by soft or weakly cemented fine grained geologic units.

Peninsular Ranges Region

In the project area the Peninsular Ranges Region can be divided into two geomorphic zones: mountains of the Peninsular Ranges to the east and the Coastal Plain to the west. The mountains of the Peninsular Ranges are a group of predominantly north-south trending ranges which stretch 900 miles from southern California to the southern tip of Mexico's Baja California peninsula. They are part of the North American Coast Ranges that run along the Pacific coast from Alaska to Mexico. Elevations range from about 500 to 11,500 feet above mean sea level (MSL). In the project area the Peninsular Ranges include the Laguna and Santa Rosa mountain ranges. Mountains of the Peninsular Ranges are primarily composed of extensive Mesozoic² granitic plutons, overlain in areas by metasedimentary rocks such as marbles, slates, schist, quartzites, and gneiss (Demere, 2007).

The Laguna Mountains are approximately 35 miles long and run in a northwest/southeast direction through eastern San Diego County. This mountain range also includes the In-Ko-Pah Mountains and Jacumba Mountains to the southeast and Cuyamaca Mountain to the west. The Laguna mountain range is bordered by the Cuyamaca area on the west, the Colorado Desert on the east, the Elsinore Fault to the north, and Sierra Juárez range at the Mexican border to the south. The highest point is Cuyapaipe Mountain at 6,378 feet. The mountains are largely contained within the Cleveland National Forest.

The Santa Rosa Mountains are a short peninsular range northeast of San Diego and extend for approximately 30 miles through Riverside, San Diego, and Imperial Counties along the western side of the Coachella Valley. The range connects on the northern end to the San Jacinto Mountains. The highest peak in the range is Toro Peak (elevation 8,716 feet), located approximately 22 miles south of Palm Springs.

The Coastal Plain area consists of a “layer cake” sequence of Tertiary³ to late Cretaceous⁴ marine and non-marine sedimentary rock units forming mesa and terraces primarily overlying Mesozoic granitic rocks. The terraces and mesas along the Coastal Plain were formed by fluctuations in relative elevations of the land and sea (uplift and sea level changes), which has resulted in the presence of ancient marine rocks preserved in locations of up to 900 feet above MSL and ancient river deposits in areas of as much as 1,200 feet above MSL. Resistant peaks of the underlying Mesozoic crystalline rocks (such as Rock Mountain, Black Mountain, and Cowles Mountain) poke through the younger Cretaceous and Tertiary sedimentary units. The “layer cake” of sedimentary rocks in the Coastal Plain area has been broken up into a number of distinct fault blocks in the southwestern part of the county by seismic event related to the local La Nacion and Rose Canyon fault zones. North of the La Jolla area the effects of faulting are not as great and the rock units are relatively undeformed (Demere, 2007).

² The Mesozoic era extended for roughly 180 million years: from 251 million years ago to when the Cenozoic Era began 65 million years ago.

³ The Tertiary Period is a major portion of the Cenozoic era, and includes the time between 1.6 and 65 million years ago.

⁴ The Cretaceous Period is one of three periods within the Mesozoic era. The Cretaceous Period occurred between 65 million years ago and 141 million years ago.

D.13.1.2 Geologic Conditions and Geologic Hazards

Geology

The proposed Sunrise Powerlink project route is underlain in various areas by sedimentary, volcanic, igneous, and metamorphic units ranging in age from Quaternary (approximately the last 1.6 million years) to Pre-Cenozoic (greater than 65 million years). Figure D.13-1 shows the geologic time scale indicating the breakdown of geologic time units and corresponding ages.

The proposed route crosses lacustrine deposits, alluvial plains and valleys, alluvial fans and pediments, mountain passes, and hills. From the California Division of Mines and Geology (CDMG), Geologic Map Sheet Series: Salton Sea Sheet, (CDMG, 1967), San Diego–El Centro Sheet (CDMG, 1962), Santa Ana Sheet (CDMG, 1966), scale 1:250,000, and geology and mineral resource maps from the for Imperial and San Diego Counties (CDMG, 1963), scale 1:125,000, were used to determine location and type of geologic units crossed by the project route. Descriptions of the geologic materials crossed by the proposed route are summarized in Table D.13-1, including type of unit, age, which link the unit may found along, a general physical description of the unit, and estimated excavation characteristics of the geologic unit. Approximate locations of these units along the project ROW are discussed in Section D.13.2 by link and approximate milepost (MP) locations.

Figure D.13-1. Geologic Time Scale
GEOLOGIC TIME SCALE

EON ERA	PERIOD	EPOCH	Age in millions of years before present	
Phanerozoic	Quaternary	Holocene	Present	
		Pleistocene	0.01	
	Tertiary	Neogene	Pliocene	1.6
			Miocene	5.3
			Oligocene	23.7
			Eocene	36.6
		Paleogene	Paleocene	57.8
				66.4
			Cretaceous	144
			Jurassic	206
	Paleozoic	Triassic	245	
		Permian	286	
		Carboniferous	Pennsylvanian	320
			Mississippian	360
Devonian		408		
Silurian		438		
Ordovician		505		
Cambrian		570		
Precambrian	Proterozoic		2500	
	Archean		3800	
	Hadean		4550	

Source: USGS, 2006b.

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Table D.13-1. Summary of Geologic Units along the Sunrise Powerlink Project

Unit Symbol	Geologic Unit	Age ³	Links	Description/Comment	Excavation Characteristics ¹
Qal	Alluvium	Holocene	All	Unconsolidated stream, river, and alluvial fan deposits consisting of primarily sand, silt, clay, and gravel.	Easy
Ql	Lake (lacustrine) deposits	Quaternary	Imperial Valley Link	Includes ancient Lake Coahuila (Cahuilla) deposits and other playa deposits. Composed of fossiliferous clay, silt, sand, and gravel.	Easy
Qt	Nonmarine terrace deposits	Quaternary	Imperial Valley and ABDSP Links	Extensively dissected and locally folded terrace deposits in the Borrego Valley.	Easy
Qm	Marine deposits and marine terrace deposits	Pleistocene	Coastal Link	Lindavista Formation - light gray to reddish-tan sandstone, siltstone, and local conglomerate.	Easy
Qc, Qc ₀	Nonmarine sedimentary deposits	Pleistocene	Imperial Valley Link Central Link	Qc - Brawley Formation consisting of deposits of lacustrine clays, sandstone, and pebble conglomerate. Qc ₀ - Extensively folded, faulted, and dissected alluvial fan deposits near the Elsinore Fault.	Easy
Ec	Nonmarine sedimentary rocks	Eocene	Coastal and Inland Valley Links	<u>Poway Group</u> Pomerado Conglomerate - Massive cobble conglomerate. Mission Valley Formation - friable sandstone. Stadium Conglomerate - Massive cobble conglomerate with interspersed lenses of fossiliferous sandstone.	Moderate
E	Marine sedimentary rocks	Eocene	Coastal Link	<u>La Jolla Group</u> Friars Formation - sandstone with interbeds of claystone. Scripps Formation - sandstone with occasional cobble-conglomerate interbeds. Ardath Shale - fossiliferous weakly fissile shale with local expansive claystone interbeds. Torrey Sandstone - arkosic, medium to coarse grained sandstone. Del Mar Formation - interbedded sandy claystone and coarse grained sandstone.	Easy to Moderate
gr	Granitic rocks	Mesozoic	All Links	gr - Undifferentiated granitic rocks including granite, granodiorite, tonalite, and diorite. gr ¹ - Tonalite (quartz diorite) and diorite. gr ⁹ - Granodiorite. gr ³ - Green Valley Tonalite. gr ⁶ - Woodson Mountain Granodiorite.	Difficult
bi	Basic intrusive rocks	Mesozoic	Inland Valley Link	Primarily gabbro, may contain some diorite.	Difficult
JTrv	Metavolcanic rocks	Jurassic and/or Triassic	Inland Valley and Coastal Links	Santiago Peak Volcanics - predominantly flows, tuff, breccia, and agglomerate of andesitic composition, some rhyolitic areas.	Difficult

Table D.13-1. Summary of Geologic Units along the Sunrise Powerlink Project

Unit Symbol	Geologic Unit	Age ³	Links	Description/Comment	Excavation Characteristics ¹
gr-m	Granitic and metamorphic rocks	Pre-Cenozoic	ABDSP, Central, and Inland Valley Links	Mixed granitic and metamorphic rocks consisting of migmatites, schist, and quartz diorite. Also includes mixed hybrid rock consisting of Julian Schist and Stonewall Granodiorite.	Difficult

Sources: CDMG, 1963, 1975, and 1977; USGS, 1962, 1966, and 1967.

1 Excavation characteristics are very generally defined as “easy,” “moderate,” or “difficult” based on increasing hardness of the rock unit. Excavation characteristic descriptions are general in nature and the actual ease of excavation may vary widely depending on site-specific subsurface conditions.

2 Agglomerate is a volcanic breccia formed by disruption of a solidified crust or hardened plug of lava. Blocks fit together as a loose mosaic or may be completely disordered.

3. See Figure D.13-1 for the corresponding breakdown of years for each geologic time period.

Slope Stability

Important factors that affect the slope stability of an area include the steepness of the slope, the relative strength of the underlying rock material, and the thickness and cohesion of the overlying colluvium. The steeper the slope and/or the less strong the rock, the more likely the area is susceptible to landslides. The steeper the slope and the thicker the colluvium, the more likely the area is susceptible to debris flows. Another indication of unstable slopes is the presence of old or recent landslides or debris flows.

Most of the proposed route does not cross any areas mapped as identified existing landslides; however, some of the sedimentary units may be susceptible to slope failures in areas with moderate to steep slopes and unfavorable bedding dip directions. Unmapped landslides and areas of localized slope instability may be encountered in the hills traversed by the Proposed Project route. Areas underlain by granitic rocks would most likely only be susceptible to surficial soil creep, or to rockfall in over-steepened areas.

Soils

The soils along the proposed route reflect the underlying rock type, the extent of weathering of the rock, the degree of slope, and the degree of human modification. The route crosses undeveloped land, small portions of agricultural and rural residential land, small portions of light industrial and commercial areas, and suburban residential areas. A summary of the significant characteristics (description, erosion hazard, expansive potential, and corrosion potential) of the major soil associations traversed by the proposed Sunrise Powerlink route is presented in Table D.13-2. General locations of these soil units along the project ROW are discussed below in Section D.13.2 under the appropriate link based on approximate milepost locations.

Potential soil erosion hazards vary depending on the use, conditions, and textures of the soils. For the purposes of this project, erosion hazard potential was extracted from the Hazard of Erosion and Suitability for Roads table from National Resource Conservation Service (NRCS) GIS soil databases for the San Diego County Area - CA638 (3/2006) and Imperial Valley Area - CA683 (10/2005). Two types of potential erosion hazard are presented in Table D.13-2: (1) hazard of erosion on roads and trails and (2) hazard of erosion off-road and off-trail. These two types of hazard represent the potential for soil erosion along the project from disturbances due to project construction.

Erosion hazard ratings for “Roads and Trails” apply to the potential for erosion on unsurfaced roads and trails and are ranked as follows:

- Slight – little or no erosion is likely.
- Moderate – some erosion is likely and simple erosion-control measures may be needed.
- Severe – significant erosion is expected and major erosion-control measures are needed.

“Off-Road and Off-Trail” erosion hazard ratings apply to the potential for sheet or rill erosion in areas where 50-75% of the areas has been exposed by ground disturbance (i.e., grading) and are ranked as follows:

- Slight – erosion is unlikely under ordinary climate conditions.
- Moderate – some erosion is likely and erosion-control measures may be needed.
- Severe – erosion is very likely and erosion-control measures are needed.
- Very severe – significant erosion is expected, loss of soil productivity and off-site damage are likely, and erosion-control measures would generally be costly and impractical.

The properties of soil which influence erosion by rainfall and runoff are ones that affect the infiltration capacity of a soil, and those which affect the resistance of a soil to detachment and being carried away by falling or flowing water. Soils containing high percentages of fine sands and silt and that are low in density, are generally the most erodible. These soil types generally coincide with soils such as young alluvium and other surficial deposits, which likely occur in areas throughout the project area. As the clay and organic matter content of these soils increases, the potential for erosion decreases. Clays act as a binder to soil particles, thus reducing the potential for erosion. However, while clays have a tendency to resist erosion, once eroded, they are easily transported by water. Clean, well-drained, and well-graded gravels and gravel-sand mixtures are usually the least erodible soils. Soils with high infiltration rates and permeabilities reduce the amount of runoff.

Corrosivity of soils is generally related to the following key parameters: soil resistivity; presence of chlorides and sulfates; oxygen content; and pH. Typically, the most corrosive soils are those with the lowest pH and highest concentration of chlorides and sulfates. High sulfate soils are corrosive to concrete and may prevent complete curing, reducing its strength considerably. Low pH and/or low resistivity soils could corrode buried or partially buried metal structures.

Expansive soils are characterized by their ability to undergo significant volume change (shrink and swell) due to variation in soil moisture content. Changes in soil moisture could result from a number of factors, including rainfall, landscape irrigation, utility leakage, and/or perched groundwater. Expansive soils are typically very fine grained with a high to very high percentage of clay.

Table D.13-2. Major Soils along the Proposed Sunrise Powerlink Transmission Line Project Route

Unit ID	Soil Association	Description	Hazard of Erosion		Shrink/Swell (Expansive) Potential	Risk of Corrosion	
			Off-Road/ Off-Trail	Roads/ Trails		Uncoated Steel	Concrete
s992	Indio-Gilman-Coachella	Very deep to deep, well or moderately well drained soils formed in alluvium and lacustrine basins. Soil types include fine to very fine sand, very fine to fine sandy loam, and loam.	Indio = Slight Not Rated	Indio = Slight to Moderate Not Rated	Low	High	Low
s993	Vint-Imperial-Glenbar-Gilman	Deep to very deep soils formed in stratified stream and missed alluvium. Soil types include loamy fine sand, silty clay, clay loam ¹ , and loam.	Slight	Slight	Low to High	High	Low to High
s994	Rositas-Orita-Carrizo-Aco	Very deep soils formed in eolian deposits and mixed alluvium. Soil types include: fine sand, loamy sand, gravelly fine sandy loam, extremely gravelly sand; and sandy loam. Local areas of desert pavement ² and desert varnish ² .	Slight to Moderate	Slight to Moderate	Low to Moderate	High	Low to Moderate
s995	Rock Outcrop-Rillito-Beeline-Badland	Includes areas of bare rock outcrop, very shallow poorly developed soils over bedrock, and very shallow to deep soils formed in alluvium. Soil types vary from shallow gravelly sandy loam to sandy loam and sandy loams to deep gravelly sandy loam and gravelly loam.	Not Rated	Not Rated	Low	Moderate to High	Low to Moderate
s996	Vint-Meloland-Indio	Soils formed on alluvial fans and in lacustrine basins in mixed alluvium and consist of very fine sandy loam, loamy fine sand, and silt loam.	Slight	Slight	Low to High	High	Low to Moderate
s997	Redding-Olivenhain	Deep to moderately deep soils formed in alluvial and marine terraces. Soil types consist primarily of gravelly loam and very cobbly loam.	Slight to Severe	Slight to Severe	Low to High	Moderate to High	Moderate
s998	Urban Land-Redding-Olivenhain	Deep to moderately deep soils formed in alluvial and marine terraces. Soil types consist primarily of gravelly loam and very cobbly loam.	Slight to Severe	Slight to Severe	Low to High	Moderate to High	Low to High
s999	Ramona-Placentia-Linne-Greenfield	Soils formed in alluvium consisting of fine sandy loam, sandy loam, coarse sandy loam, and loam. Linne soils are formed in material weathered from shale and sandstone and consist of clay loam.	Slight to Severe	Slight to Severe	Low to Moderate	Moderate to High	Low to Moderate
s1002	Marina-Urban Land-Chesterton	Soils formed on old terraces consisting of fine sandy loam and loamy sand.	Slight	Moderate	Low	Moderate to High	Low to Moderate
s1010	Sesame-Rock Outcrop-Cienba	Very shallow to moderately deep soils formed in material weathered from granitic and metamorphic rocks. Includes areas of bare rock outcrop. Soils types are primarily sandy loam, gravelly loam, and sandy clay loam.	Not Rated Cienba = Very Severe	Not Rated Cienba = Very Severe	Low to Moderate	Moderate	Low to Moderate

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Table D.13-2. Major Soils along the Proposed Sunrise Powerlink Transmission Line Project Route

Unit ID	Soil Association	Description	Hazard of Erosion		Shrink/Swell (Expansive) Potential	Risk of Corrosion	
			Off-Road/Off-Trail	Roads/Trails		Uncoated Steel	Concrete
s1012	Rock outcrop–Las Posas	Moderately deep, well drained soils formed in material weathered from basic igneous rocks. Soil types consist of fine sandy loam, loam, and clay loam. Includes areas of bare rock outcrop.	Slight to Moderate	Moderate to Severe	Low to High	Moderate to High	Low
s1013	San Miquel–Friant-Exchequer	Shallow soils formed in material weathered from metamorphic and metavolcanic rocks consisting of silt loam, clay and fine sandy loam.	Moderate to Very Severe	Moderate to Severe	Low to High	Moderate to High	Moderate to High
s1014	Tollhouse–Rock Outcrop–La Posta	Shallow to moderately deep soils formed on strongly sloping to steep slopes in weathered granitics consisting of coarse sandy loam and loamy coarse sand. Includes areas of bare rock outcrop.	Moderate	Severe	Low to Moderate	Moderate	Moderate
s1015	Hotaw-Crouch-Boomer	Moderately deep to very deep soils formed in material weathered from underlying granitic and metavolcanic rocks. Soil types are gravelly loam, coarse sandy loam, and gravelly and sandy clay loam.	Slight to Very Severe	Slight to Severe	Low to Moderate	Moderate	Moderate
s1016	Sheephead–Rock Outcrop–Bancas	Shallow to moderately deep soils formed in weathered bedrock material. Soil types include stony loam, loam, and cobbly fine sandy loam. Includes areas of bare rock outcrop.	Slight to Moderate	Slight to Severe	Low to Moderate	Moderate	Low to Moderate
s1018	Oak Glen–Mottsville-Calpine	Deep to very deep soils formed in granitic alluvium consisting primarily of gravelly sandy loam, gravelly loamy coarse sand, gravelly coarse sand, and coarse sandy loam.	Slight to Moderate	Slight to Moderate	Low	Moderate	Low to Moderate
s1019	Las Flores–Antioch	Las Flores soils are formed on marine terraces and consist of loamy sand. Antioch soils are formed on alluvial fans and terraces and consist primarily of loam and clay loam.	Slight to Moderate	Moderate to Severe	Low to High	Moderate to High	Low to Moderate
s1021	Rock Outcrop–Lithic Torriorthents	Includes areas of bare rock outcrop, and very shallow poorly developed soils over bedrock.	Not Rated	Not Rated	Low	Moderate	Low

Sources: NRCS State Soil Geographic Database STATSGO California GIS data, 1994 and 2006; NRCS website, 2006.

1 Loam soil is composed of a mixture of sand, silt, clay, and organic matter in evenly mixed particles of various sizes.

2 A desert pavement is a desert surface that is covered with closely packed, interlocking angular or rounded rock fragments of pebble and cobble size. Desert varnish is the thin red to black coating found on exposed rock surfaces in arid regions. Varnish is composed of clay minerals, oxides and hydroxides of manganese and/or iron. Both desert pavement and desert varnish take thousands of years to form.

Mineral Resources

Metallic and non-metallic mineral deposits occur along the Proposed Project ROW in both San Diego and Imperial Counties. The principal mineral commodities in San Diego County are sand, gravel, and crushed and broken stone. Other lesser, but important mineral commodities also produced in San Diego County are dimension stone, clay, gem, and other minerals, and salts (CDMG, 1963). Imperial County produces

a variety of mineral commodities, with gypsum, gravel, gold, manganese, pumice, and crushed stone accounting for most of the county's mineral production. Metallic mineral deposits are present in both counties in varying amounts and are primarily restricted to bedrock areas in the mountainous regions; gold, copper, and tungsten were the predominant metallic minerals (ores) mined in these counties (CDMG, 1977). However, no active ore deposits mines are currently located in the project vicinity.

Records for mining claims on BLM land were reviewed using the Bureau of Land Management Land and Mineral Records-LR2000 system website (BLM, 2006). No mining claims were identified within or near the Proposed Project route. GIS data from the U.S. Geological Service (USGS) Mineral Resource Data System (MRDS) for Imperial and San Diego Counties was reviewed to determine the potential for mine or quarries along the project ROW (USGS, 2006a). To be conservative, mining locations within 1,000 feet either side of the route were researched to allow for identification of mineral resource sites that may be within or infringing on the project ROWs. Additionally, a 1000-foot buffer was used because mapped locations commonly represent only one point at a mineral resource site which in reality may be a much larger site. Further, the location and presence of mineral resource sites were verified using aerial photos.

Fourteen sites with either mineral occurrences, or past or current mining activities are identified in the MRDS within 1,000 feet of the proposed route: two sand and gravel quarries; seven gold mines (3 producers and 4 prospects); one occurrence of gold, phosphorous, and tungsten; one past producer of tungsten; and one crushed stone producer. These sites are discussed in further detail below in Section D.13.2 under the appropriate Link based on location of the potential mineral resource.

A review of California Department of Conservation, Division of Oil, Gas, and Geothermal Resources (DOGGR) online maps indicates that no oil or gas fields are located in the vicinity of the Sunrise Powerlink project area. The San Diego County map indicates that three wildcat oil wells have been drilled in the Ocotillo Wells area, north of Highway 78 and the Ocotillo Wells Airport (DOGGR, 2004). Review of online DOGGR maps indicate that there are several geothermal fields in Imperial County near the project area; however, these fields are located east and north of the Proposed Project and are not crossed by the project ROW (CBC, 2001). Therefore, there is little to no potential for the project to impact petroleum or geothermal resources.

D.13.1.3 Faults and Seismicity

The seismicity of the project area is dominated by the northwest trending San Andreas fault system⁵ (see Figure D.13-2). The San Andreas Fault system responds to stress produced by the relative motions of the Pacific and North American Tectonic Plates. This stress is relieved by strain, predominantly as right lateral strike-slip faulting on the San Andreas and other related faults. The effects of this strain also include mountain building, basin development, deformation of Quaternary deposits, widespread regional uplift, and the generation of earthquakes (Wallace, 1990).

The southern California area is characterized by numerous geologically young faults. These faults can be classified as historically active, active, potentially active, or inactive, based on the following criteria (CGS, 1999):

⁵ The term "San Andreas fault system" refers to the network of faults with predominantly right-lateral strike-slip that collectively accommodate most of the relative motion between the North American and Pacific plates

- **Historically Active.** Faults that have generated earthquakes accompanied by surface rupture during historic time (approximately the last 200 years) and faults that exhibit a seismic fault creep
- **Active.** Faults that show geologic evidence of movement within Holocene time (approximately the last 11,000 years)
- **Potentially Active.** Faults that show geologic evidence of movement during the Quaternary (approximately the last 1.6 million years)
- **Inactive.** Faults that show direct geologic evidence of inactivity during all of Quaternary time or longer

Although it is difficult to quantify the probability that an earthquake will occur on a specific fault, this classification is based on the assumption that if a fault has moved during the Holocene epoch, it is likely to produce earthquakes in the future. Since periodic earthquakes accompanied by surface displacement can be expected to continue in the study area through the lifetime of the Proposed Project, the effects of strong groundshaking and fault rupture are of primary concern to safe operation of the proposed transmission line and associated facilities.

Faulting and historic seismicity in the project area is primarily limited to the eastern end of the project ROW within the Imperial Valley and the eastern Peninsula Ranges, and the far western end of the ROW near the coast. The western Peninsula Ranges and the mesas and terraces near the coast are crossed by few to no active faults and seismicity in these areas would primarily be related to seismic activity of nearby regional faults. Figure D.13-2 shows locations of significant active faults and historic earthquakes in the project area and surrounding region.

The most significant faults in the project area are those associated with the San Andreas fault system, which in the project area includes faults of the San Andreas, San Jacinto, and Elsinore fault zones.

- **San Andreas Fault Zone** is a 680-mile active right-lateral strike-slip complex of faults that has been responsible for many of the damaging earthquakes in Southern California in historical times. The San Andreas Fault Zone is the longest active fault in California and represents the boundary between the Pacific and North American plates. The Coachella segment of the San Andreas Fault extends from Cajon Pass (near Bakersfield) to the Salton Sea. Historically, the San Andreas Fault has produced “great” earthquakes that have caused significant surface rupture in southern California. The Coachella segment of the San Andreas follows the east side of the Salton Sea southward to the Imperial Valley where evidence of surface faulting disappears and a 40-km gap separates the south end of the San Andreas from the north end of the Imperial fault. The gap is commonly known as the Brawley Seismic Zone which consists of a well-defined zone of seismicity that transfers slip to the Imperial fault along a right-releasing step. A dominantly right-lateral strike-slip fault zone, the Imperial fault is the principal element of the San Andreas fault system in the southern Salton trough. There have been three earthquakes greater than M6 along the Imperial Fault since 1900 that have resulted in significant damage: the 1915, 1940, and 1979 Imperial Valley earthquakes. A discussion of earthquake classification is provided later in this section.

Figure D.13-2. Regional Active Faults and Historic Earthquakes
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- **San Jacinto Fault Zone** is a major element of the San Andreas fault system in southern California, with historic earthquakes (if not ground rupture) associated with most of its sections. The seismically active San Jacinto fault zone is a complex system of strike-slip fault segments connected by releasing and restraining bends and stepovers that extends for 240 km from the San Andreas Fault near Cajon Pass and extends southeastward through the Peninsular Ranges into southwestern Imperial Valley. The straightness, continuity, and high seismicity of the San Jacinto fault zone suggest that it may be currently the most important member of the system (Dorsey & Roering, 2005). Slip rates in the northern half of the fault system are around 12 mm/yr but are only around 4 mm/yr for faults in the southern half where strands overlap or are sub-parallel. The San Jacinto fault zone has produced at least 10 earthquakes between magnitudes (M) 6.0 and 6.6 since 1890, including the 1968 Borrego Mountain earthquake, and the 1987 Superstition Hills and Elmore Ranch earthquake.
- **Elsinore Fault Zone** is one of the largest in southern California, extending over 155 miles from the Los Angeles Basin southeastward to the Mexico Border where it continues southeast as the Laguna Salada Fault. In historical times, the Elsinore fault has been one of the quietest in southern California, with the main trace of the Elsinore fault zone having only experienced one historical event greater than M 5.2, an earthquake of about M 6.0 in 1910 near Temescal Valley (on the Glen Ivy segment) that produced no known surface rupture and did little damage. In the project area, the fault zone is divided into three segments, the Temecula, Julian, and Coyote Mountain segments, which cut diagonally across various Peninsular Range batholithic and pre-batholithic metamorphic terrain until reaching the southwestern margin of the Salton Trough as the Laguna Salada fault. In the project vicinity, the Elsinore Fault is double stranded, with the two strands approximately parallel to each other, separated by approximately 4 to 7.5 miles. Fault slip along this portion of the Elsinore Fault is distributed across these two strands of the fault. The western strand corresponds to the Julian segment of the Elsinore fault and the eastern strand correlates to the Earthquake Valley Fault zone. It is postulated that, based on the differences in total slip from the northern to the southern end of the Elsinore Fault zone, the Earthquake Valley Fault zone is accommodating a portion of the long-term strain and slip in this area (Thorup et al., 1997).

Active faults that could generate a large earthquake and cause significant seismic shaking are listed in Table D.13-3. Data presented in this table include distance to the Proposed Project ROW, fault length, maximum estimated earthquake, type of fault, and slip rates.

Table D.13-3. Significant Active Faults in the Sunrise Powerlink Project Vicinity

Fault	Approx Closest Distance to ROW (miles)	Fault Length (miles)	Max Estimated Earthquake Magnitude	Approx Slip Rate (mm/yr)
San Andreas: San Bernardino Segment	43.5	64	7.5	24.0
San Andreas: Coachella Segment	17.5	60	7.2	25.0
Brawley Seismic Zone	7	42	6.4	25
Brawley Fault Zone	9	15	6.5	20
Imperial	5.5	38	7.0	5.0
Superstition Mountain (part of the San Jacinto Fault Zone)	2	14	6.6	3.0
Superstition Hills (part of the San Jacinto Fault Zone)	0	14	6.6	2.0
Elmore Ranch (part of the San Jacinto Fault Zone)	0	18	6.6	1.0
San Jacinto: Borrego Segment	0	18	6.6	4.0
San Jacinto: Coyote Creek Segment	4.5	25	6.8	4.0

Table D.13-3. Significant Active Faults in the Sunrise Powerlink Project Vicinity

Fault	Approx Closest Distance to ROW (miles)	Fault Length (miles)	Max Estimated Earthquake Magnitude	Approx Slip Rate (mm/yr)
San Jacinto: Anza Segment	9	57	7.2	12.0
San Jacinto: San Jacinto Valley Segment	30.5	27	6.9	12.0
Elsinore: Julian Segment	0	47	7.1	5.0
Earthquake Valley (part of the Elsinore Fault Zone – Julian Segment)	2	12	6.5	NA
Elsinore: Coyote Mountain Segment	12	24	6.8	4.0
Elsinore: Temecula Segment	19	27	6.8	5.0
Laguna Salada	5.5	41	7.0	3.5
Rose Canyon	3.5	43	7.2	1.5
Newport-Inglewood: offshore section	24	41	7.1	1.5
Coronado Bank	14.5	115	7.6	3.0

Source: Cao et al., 2002, USGS website <http://earthquake.usgs.gov/regional/qfaults>, 2006.
NA = Not Available

Fault Rupture

A major factor to be considered in the seismic design of electric transmission lines crossing active faults is the amount and type of potential ground surface displacement along faults. In the Proposed Project area, several extremely complex zones of predominantly right-lateral strike-slip faults occur in the Imperial Valley and eastern Peninsula Ranges. The proposed route crosses a number of active faults capable of surface rupture, including segments of the San Jacinto and Elsinore fault zones. These faults have all been delineated as Alquist-Priolo Earthquake Fault Zones where they cross the Proposed Project ROW (see Section D.13.3.2 for information regarding the Alquist-Priolo Earthquake Fault Zoning Act).

Future earthquakes could occur anywhere along the various strands of the San Jacinto and Elsinore fault zones and other regional faults (including currently unknown faults) crossing the project ROW, although only earthquakes of M 6.0 or greater are likely to generate noticeable and/or damaging surface fault rupture and offset (CGS, 1996).

Strong Groundshaking

The intensity of the seismic shaking, or strong ground motion, during an earthquake is dependent on the distance between the Proposed Project area and the epicenter of the earthquake, the magnitude of the earthquake, and the geologic conditions underlying and surrounding the Proposed Project area. Earthquakes occurring on faults closest to the Proposed Project area would most likely generate the largest ground motion.

An earthquake is classified by the amount of energy released, which traditionally has been quantified using the Richter scale. Recently, seismologists have begun using a Moment Magnitude (M) scale because it provides a more accurate measurement of the size of major earthquakes. For earthquakes of less than M 7.0, the Moment and Richter Magnitude scales are nearly identical. For earthquake magnitudes greater than M 7.0, readings on the Moment Magnitude scale are slightly greater than a corresponding Richter Magnitude.

A review of historic earthquake activity from 1800 to 2005 indicates that many earthquakes of M6.0 or greater have occurred within 50 miles of the Proposed Project route (CGS, 2005). Figure D.13-2 shows locations of historic earthquakes in the project area and surrounding region. A summary of significant M6.0 or greater earthquake events is presented in Table D.13-4.

Table D.13-4. Significant Historic Earthquakes Affecting the Sunrise Powerlink Project Vicinity

Date (most recent events listed first)	Earthquake Name or General Location	Fault Involved, if Known	Magnitude ¹	Approximate Closest Distance to Project Route ¹
November 24, 1987	Superstition Hills Earthquake	Superstition Hills Fault	6.6	0.8
November 23, 1987	Elmore Ranch Fault	Elmore Ranch Fault Zone	6.2	5.1
October 15, 1979	1979 Imperial Valley Earthquake	Imperial, Brawley Fault Zone, Rico Faults	6.4	24.4
April 8, 1968	Borrego Mountain Earthquake	Coyote Creek segment of the San Jacinto Fault Zone	6.6	5.4
March 19, 1954	1954 San Jacinto Fault Earthquake	Clark Fault, part of the Anza segment of the San Jacinto Fault Zone	6.4	10.3
October 21, 1942	Fish Creek Mountains Earthquake	Coyote Creek segment of the San Jacinto Fault Zone	6.6	7.4
May 18, 1940	1940 Imperial Valley Earthquake	Imperial Fault	6.9	12.7
March 25, 1937	San Jacinto Fault (Terwilliger Valley) Earthquake	San Jacinto Fault	6.0	22.2
April 21, 1918	San Jacinto Earthquake	San Jacinto	6.8	40.1
June 22, 1915	1915 Imperial Valley Earthquake (two strong shocks about an hour apart)	Imperial Fault	6.1 and 6.3	11.3
December 25, 1899	San Jacinto Fault Earthquake, located southeast of San Jacinto	San Jacinto	6.5	43.2
May 28, 1892	Borrego Mountains, aftershock of the Laguna Salada Earthquake	Coyote Creek, part of the San Jacinto Fault Zone	6.8	4.5
February 9, 1890	North end of the Borrego Desert	Assumed on the San Jacinto	6.8	17.7

Source: Blake, 2000 (using CGS 1800-2005 EQ database); SCEC Website, 2006.

1. Earthquake magnitudes and locations before 1932 are estimated based on reports of damage and felt effects.

The intensity of earthquake-induced ground motions can be described using peak site accelerations, represented as a fraction of the acceleration of gravity (g). CGS Probabilistic Seismic Hazard Assessment (PSHA) Maps were used to estimate peak ground accelerations (PGAs) along the Proposed Project ROW, as shown in Figure D.13-3. Taking into consideration the uncertainties regarding the size and location of earthquakes and the resulting ground motions that can affect a particular site, PSHA Maps depict peak ground accelerations with a 10 percent probability of being exceeded in 50 years, which equals an annual probability of 1 in 475 of being exceeded each year. Estimated PGAs range from 0.2 g to > 0.8 g along the Proposed Project route, with the higher PGAs near active faults and in areas underlain by young sedimentary deposits. A more detailed breakdown of estimated peak ground accelerations and location along the Proposed Project is presented below in Section D.13.2 under the appropriate link based on approximate milepost location.

Another commonly used measure of earthquake intensity is the Modified Mercalli Scale, which is a subjective measure of the strength of an earthquake at a particular place as determined by its effects on persons, structures, and earth materials. The Modified Mercalli Scale for Earthquake Intensity is presented in Table D.13-5, along with a range of approximate average peak accelerations associated with each intensity value.

Table D.13-5. Modified Mercalli Scale for Earthquake Intensity

Intensity Value	Intensity Description	Average Peak Acceleration
I	Not felt except by a very few persons under especially favorable circumstances.	<0.0017 g
II	Felt only by a few persons at rest, especially on upper floors on buildings. Delicately suspended objects may swing.	
III	Felt noticeably indoors, especially on upper floors of buildings, but many people do not recognize it as an earthquake. Standing motor cars may rock slightly, vibration similar to a passing truck. Duration estimated.	0.0017-0.014 g
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 motor cars rocked noticeably.	0.014-0.039 g
V	Felt by nearly everyone, 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 g
VI	Felt by all, many frightened and run outdoors. Some heavy furniture moved; and fallen plaster or damaged chimneys. Damage slight.	0.092-0.18 g
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 persons driving motor cars.	0.18-0.34 g
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, walls. Heavy furniture overturned. Sand and mud ejected in small amounts. Changes in well water. Persons driving motor cars disturbed.	0.34-0.65 g
IX	Damage considerable in specially designed structures; well designed frame structures thrown out of plumb; great in substantial buildings, with partial collapse. Buildings shifted off foundations. Ground cracked conspicuously. Underground pipes broken.	0.65-1.24 g
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.	
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 g
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.	

Source: Bolt, 1988; Wald, 1999 (from USGS website: <http://pasadena.wr.usgs.gov/shake/pubs/regress/node3.html>).

Liquefaction

Liquefaction is the phenomenon in which saturated granular sediments temporarily lose their shear strength during periods of earthquake-induced, strong groundshaking. The susceptibility of a site to liquefaction is a function of the depth, density, and water content of the granular sediments, and the magnitude and frequency of earthquakes in the surrounding region. Saturated, unconsolidated silts, sands, and silty sands within 50 feet of the ground surface are most susceptible to liquefaction. Liquefaction-related phenomena include lateral spreading, ground oscillation, flow failures, loss of bearing strength, subsidence, and buoyancy effects (Youd, 1978). In addition, densification of the soil resulting in vertical settlement of the ground can also occur.

Due to the generally deep water table in most of the project area (with the exception of areas immediately adjacent to the Colorado River), liquefaction is not considered a potential hazard in most of the project area.

The CGS has recommended that the following geologic criteria be used in areas where existing subsurface data are not sufficient for quantitative evaluation of liquefaction hazard (CGS, 2004):

- Areas containing soil deposits of late Holocene age (current river channels and their historical floodplains, marshes, and estuaries) where the M7.5-weighted peak acceleration has a 10 percent probability of being exceeded in 50 years is greater than or equal to 0.10 g and the anticipated depth to saturated soil is less than 40 feet; or
- Areas containing soil deposits of Holocene age (less than 11,000 years), where the M7.5-weighted peak acceleration has a 10 percent probability of being exceeded in 50 years is greater than or equal to 0.20 g and the anticipated depth to saturated soil is less than 30 feet; or
- Areas containing soil deposits of latest Pleistocene age (between 11,000 years and 15,000 years), where the M7.5-weighted peak acceleration has a 10 percent probability of being exceeded in 50 years is greater than or equal to 0.30 g and the anticipated depth to saturated soil is less than 20 feet (CGS, 2004).

Shallow groundwater, less than 40 feet depth in Holocene deposits and/or less than 20 feet in latest Pleistocene deposits is only anticipated to occur along the project route where it crosses river channels, and perennial, intermittent and ephemeral streams and washes. However, in most of these areas these deposits are expected to be shallow. Deep potentially liquefiable soils (greater than 100 feet deep) are only expected to be found along the project ROW in the Imperial and Lower Borrego Valley areas. However, groundwater depths in the areas are anticipated to generally be greater than 100 feet resulting in a low potential for liquefaction-related phenomena.

Seismic Slope Instability

Most accounts of major historical earthquakes in the project region relate the occurrence of damaging landslides to earthquake groundshaking. Rockfall hazards are also likely effects of strong groundshaking. Locations susceptible to seismically induced failure include highly weathered and unconsolidated materials on moderate to steep slopes, especially areas of previously existing landslides. Rocks, either as individual boulders or as a mass of loose rocks on steep hillsides, can travel downslope during an earthquake with potentially damaging effects.

D.13.2 Environmental Setting for the Proposed Project

The consistency of the Proposed Project with applicable plans and policies is addressed in Section D.16, where there is specific discussion of each item that was determined in the Appendix 2 screening process to warrant further evaluation. Appendix 2 (Policy Screening Report) lists all plans and policies applicable to the Proposed Project, and presents a preliminary screening evaluation of these policies.

D.13.2.1 Imperial Valley Link

Geology

The Imperial Valley Link route generally traverses gently sloping to flat alluvial plains and playas of the Imperial Valley for its entire length from MP 0 to MP 60.9. Geologic units crossed by this segment are

alluvium (Qal), lake deposits of ancient Lake Coahuila (Ql), and Brawley Formation (Qc) (CDMG, 1962, 1965, and 1967, and 1977); descriptions of these units are provided in Table D.13-1. Approximate locations of these units along the Imperial Valley Link are listed below.

- Lake deposits of ancient Lake Coahuila (Ql): MPs 0-54, and a small outcrop at MP 57.8
- Brawley Formation (Qc): small outcrops between MPs 35-36 and 38-39
- Alluvium (Qal): MPs 54-60.9

Slope Stability

The project ROW along the Imperial Valley Link crosses flat to gently sloping terrain and is not likely to experience landslides or other slope failures.

Soils

Four soil associations are mapped along the Imperial Valley Link segment of the project route (s993, s994, s995, and s996). A summary of the basic characteristics of these soils is presented in Table D.13-2. The Vint-Meloland-Indio (s996) and Vint-Imperial-Glenbar-Gilman (s993) soil associations are present in the eastern portion of the segment and are formed primarily in Ancient Lake Coahuila lacustrine deposits. Rositas-Orita-Carrizo-Aco (s994) soils are found primarily along this segment in areas underlain by alluvium and some lake deposits and are known to contain areas of desert pavement. Small amounts of the Rock Outcrop-Rillito-Beeline-Badland association (s995) are found in areas underlain by Brawley Formation.

Hazard of erosion for these soils on-road/on-trail ranges from slight to moderate, and shrink/swell (expansive) potential varies from low to high. Corrosive potential of soils along the Imperial Valley Link range from moderate to high for uncoated steel and from low to high for concrete.

Approximate locations of soil associations along the Imperial Valley Link route are listed below.

- s996: MPs 0-2, 4.2-12, 13.2-14, 15.8-35.6, 36.2-39.2, and 41-53.9
- s994: MPs 2-4.2, 39.2-41, and 53.9-60.9
- s993: MPs 12-13.2 and 14-15.8
- s995: MPs 35.6-36.2

Mineral Resources

No known active mineral resource sites or BLM mining claims are located along this segment. Two MRDS sites listed as active sand and gravel producers are located along this portion of the Proposed Project, identified as the Wheeler Road Pit near MP 16 and San Felipe Wash Material Site near MP 41.5. A review of aerial photographs indicates that both sites are gravel quarry sites which appear to no longer be in use. Therefore, construction and operation of the Sunrise Powerlink transmission line along the proposed Imperial Link is not expected to interfere with future access to any mineral resources.

Seismicity

Fault Rupture. This segment crosses three active faults, the Superstition Hills Fault, the Elmore Ranch Fault Zone and the San Jacinto Fault. All three of these faults are within Alquist-Priolo zones where they cross the Proposed Project route, as shown in Figure D.13-4, Figure D.13-5, and Figure D.13-6. Between MPs 19.1 and 19.8 (just west of where the Proposed Project joins the Imperial Irrigation District (IID) 161 kV corridor), the Proposed Project route crosses several strands of the Superstition

Figure D.13-3. Estimated Peak Ground Accelerations
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Figure D.13-4. Superstition Hills Fault Crossing
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Figure D.13-5. Elmore Ranch Fault Crossing
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Figure D.13-6. San Jacinto Fault Crossing
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Hills Fault. Seven strands of the Elmore Ranch Fault Zone cross the Proposed Project route at approximately MPs 33.2, 34.7, 35.8, 37.7, and the last three between MPs 38.5 and 38.6 (2 to 3 miles south of where the Proposed Project would reach SR78 and turn west). The Imperial Valley Link also crosses two strands of the Borrego Mountain section of the San Jacinto Fault between approximately MPs 53.6 and 54 (about 2 miles east of the San Diego County line).

Groundshaking. As shown in Table D.13-3, the Imperial Valley Link is in close proximity to the San Andreas Fault Zone (about 17 miles away at the closest point) and the San Jacinto Fault Zone (crossed by the proposed route) for most of its length. Moderate to strong groundshaking from an earthquake on any of the faults in the vicinity of this segment should be expected. The peak horizontal accelerations⁶ for this segment are presented in Table D.13-6.

Liquefaction. Potential for liquefaction in this area is low due to anticipated depths of groundwater of greater than 100 feet. However, during large storms or a wet season, the water table may rise temporarily and sections of the proposed segment that cross active river washes and streams may be moderately susceptible to liquefaction if a strong earthquake occurs while the valley floor sediments are saturated.

Earthquake-Induced Landslides. This area is relatively flat and not likely to experience landsliding or slope failures due to earthquakes.

D.13.2.2 Anza-Borrego Link

Geology

The proposed Anza-Borrego Link project route traverses alluvial fans/terraces of the Lower Borrego Valley from MP 60.9 to approximately MP 69.8; and hills, mountain passes, and valleys of the Santa Rosa Mountain range from approximately MP 69.8 to 83.5. This segment of the project crosses the Lower Borrego Valley, the narrows between the northern ends of the Vallecito and Pinyon Mountains and the southern end of Pinyon Ridge, and Grapevine Canyon. Geologic units crossed by this segment of the project are alluvium (Qal), nonmarine terrace deposits (Qt), and mixed granitic and metamorphic rocks (gr-m) (CDMG, 1965 and 1963); descriptions of these units are listed in Table D.13-1. Approximate locations of these units along the project are listed below.

- Alluvium (Qal): MPs 60.9-63.5, 64-65, and 68.5-81
- Nonmarine terrace deposits (Qt): MPs 63.5-64 and 65-68.5
- Mixed granitic/metamorphic rocks (gr-m): MPs 81-83.5

Table D.13-6. Approximate Peak Ground Accelerations – Imperial Valley Link

Approximate Proposed Transmission Line Milepost	Total Length of Segments (miles)	Peak Ground Acceleration
0-5.4	5.4	0.4–0.5g
5.4-14.2 and 27.7-50	31.1	0.5–0.6g
14.2-16.3, 24.5-27.2, 50-56, and 59.5-60.9	12.2	0.6–0.7g
16.3-18.3, 21.7-24.5, 56-59.5	8.3	0.7–0.8g
18.3-21.7	3.4	>0.8g

Source: CGS, 2006; USGS, 2006b.

⁶ The horizontal peak acceleration is the maximum acceleration experienced by a particle of the earth's surface during the course of an earthquake. Higher peak accelerations means faster and thus more intense ground shaking.

One other geologic unit, granitic rocks, which is located close to the proposed route segment may be encountered in excavations beneath shallow layers of alluvium. These units could be encountered at approximately MPs 69.8-72 and MPs 78-81, and would be more difficult to excavate than the overlying alluvial deposits.

Slope Stability

The Anza-Borrego Link traverses flat to gently sloping valley floor and alluvial fan terrain between approximate MP 60.9 to 69.8 and 70.4 and 80, and is not likely to experience landslides or other slope failures in these areas. The project ROW passes below and along sloping hillside and mountain terrain between MPs 69.8 to 70.4 and between MPs 80 to 83.5. It does not cross any mapped landslides in these areas (CDMG, 1966) and the granitic terrain underlying these slopes is not typically prone to landslides.

Soils

Three soil associations are mapped along the Anza-Borrego Link segment of the project route (s994, s1016, and s1021). Basic characteristics of these soils are presented in Table D.13-2. Rositas-Orita-Carrizo-Aco (s994) soils are found primarily along this segment in areas underlain by alluvium and terrace deposits and are known to contain areas of desert pavement. Sheephead-Rock Outcrop-Bancas (s1016) and Rock Outcrop-Lithic Torriorthents (s1021) soils are likely to be encountered in areas underlain by shallow alluvium over bedrock and granitic and metamorphic bedrock.

Erosion hazard for these soils on-road/on-trail ranges from slight to moderate, and shrink/swell (expansive) potential varies from low to moderate. Corrosive potential of soils along the Anza-Borrego Link ranges from moderate to high for both uncoated steel and concrete.

Approximate locations of the soil associations are listed below.

- s994: MPs 60.9-80.3
- s1021: MPs 80.3-82.1
- s1016: MPs 82.1-83.5

Mineral Resources

No known active mines or BLM mining claims are identified along this segment. One MRDS site is located near MP 70.6, the Narrows Mine. This site is only listed as an occurrence and is located on the other side of SR78, approximately 800 feet south of the Proposed Project ROW. Construction or operation of the Proposed Project would not interfere with access to this location due to its distance from the ROW and the intervening major road. Because of this, the Proposed Project would not preclude access to any mineral resources found in the vicinity. Therefore, construction and operation of the Sunrise Powerlink transmission line along the proposed Anza-Borrego Link is not expected to interfere with future access to any mineral resources.

Seismicity

Fault Rupture. The Anza-Borrego Link transmission route does not cross any active or potentially active faults and is not likely to be affected by surface fault rupture.

Groundshaking. The proposed route segment is in close proximity to the San Andreas and San Jacinto Fault Zones for most of its length. Moderate to strong groundshaking caused by an earthquake on any of the faults in the vicinity of this segment should be expected. The peak horizontal accelerations for this segment are presented in Table D.13-7.

Table D.13-7. Approximate Peak Ground Accelerations – Anza-Borrego Link

Approximate Proposed Transmission Line Milepost	Total Length of Segments (miles)	Peak Ground Acceleration
81-83.5	2.5	0.3–0.4g
66.3-81	14.7	0.5–0.6g
60.9-66.3	5.4	0.6–0.7g

Source: CGS, 2006; USGS, 2006b.

Liquefaction. Potential for liquefaction in this area is low because alluvial areas along this link are limited to shallow deposits over bedrock that even if saturated are not likely to liquefy (gravely and bouldery alluvium of less than 50 feet in depth). However, during large storms or a wet season, the water table may rise temporarily. Pockets of finer grained alluvial deposits in areas where the transmission line crosses, and where it would be located within active river washes and streams, may be moderately susceptible to liquefaction if a strong earthquake occurs while the valley floor sediments are saturated.

Earthquake-Induced Landslides. Most accounts of large historical earthquakes in this area describe damaging landslides and rockfalls resulting from earthquake groundshaking (SCEDC, 2007). Therefore, portions of the Proposed Project ROW near moderate to steep slopes, primarily between MPs 69.8 to 70.4 and between MPs 80 to 83.5, may be susceptible to damage from landslides or rockfalls in the event of a large earthquake on nearby faults.

D.13.2.3 Central Link

Geology

The Central Link portion of the Proposed Project generally traverses sloping hillsides, mountain passes, and valleys from approximately MPs 83.5 to 110.8. The project traverses Grapevine and Hoover Canyons, the northern end of the San Felipe Hills, hills on the north and west of the Volcan Mountains, and along the edge of Valle De San Jose. Geologic units crossed by this segment of the project are alluvium (Qal), folded and faulted alluvial fan deposits (Qco), tonalite and diorite (gr^d), and mixed granitic and metamorphic rocks (gr-m) (CDMG, 1965 and 1963); descriptions of these units are listed in Table D.13-1. Approximate locations of these units along the project are listed below.

- Alluvium (Qal): MPs 96.4-97.2, and 105.2-107.5
- Folded/faulted alluvial fan deposits (Qco): MPs 96.2-96.6, 97.6-98.7, and a small outcrop at MP 93.9
- Tonalite and diorite (gr^d): MPs 84.2-86, 89.5-96.4, and 97.6-98.2
- Mixed granitic/metamorphic rocks (gr-m): 83.5-84.2, 86-89.5, 98.1-105.2, and 107.5-110.8.

Slope Stability

The Central Link traverses near and across gently sloping alluvial fans and moderately sloping hillside and mountain terrain. This portion of the project does not cross any mapped landslides and the granitic terrain underlying the slopes in the area are not typically prone to landslides.

Soils

Four soil associations are mapped along the Central Link segment of the project route (s1014, s1015, s1016, and s1018). Basic characteristics of these soils are presented in Table D.13-2. The Tollhouse–Rock Outcrop–La Posta (s1014) and Sheephead–Rock Outcrop–Bancas (s1016) soil associations are present in the eastern portion of the segment and are formed primarily on hill slopes underlain by granitic and metamorphic rocks. The western portion of this link is underlain by the Hotaw–Crouch–Boomer association (s1015) which is formed in material weathered from the underlying granitic and metamorphic rocks. Small amounts of the Oak Glen–Mottsville–Calpine association (s1018), which is formed in alluvial deposits, are located along this segment near the southern edge of Valle De San Jose. No soils with desert pavement are mapped along this alignment.

Hazard of erosion for these soils for off-road/off-trail ranges from slight to very severe and for on-road/on-trail ranges from slight to severe. Shrink/swell (expansive) potential of the soils associations along this link varies from low to moderate. Corrosive potential of soils along the Central Link are moderate for uncoated steel and range from low to moderate for concrete.

Approximate locations of these soil associations along the Central Link route are listed below.

- s1014: MPs 89.4-96.2
- s1015: MPs 100.1-110.8
- s1016: MPs 83.5-89.4
- s1018: MPs 96.2-100.1

Mineral Resources

No known active mines or BLM mining claims are identified along this segment.

Ten MRDS sites are located within 1000 feet either side of the Central Link alignment in Grapevine Canyon, Hoover Canyon, and near the northern end of Santa Ysabel Valley. The sites consist of 8 metallic mineral (ore) mines, 2 mapped ore occurrences, and one crushed/broken stone quarry. Four of the mapped sites are located in Grapevine Canyon ranging from 100 to 500 feet from the project ROW, and consist of 2 ore occurrences and 2 past producers (Grapevine Star Mine and Desert Star Mining). The five mapped MRDS sites in Hoover Canyon consist of gold mine/prospects ranging from 90 to 550 feet from the project ROW and are identified as the Hillside, Morning Star, Little Granite, Pine Ridge, and Sundown Mines. None of these sites is listed by the CGS (CDMG, 1999) as an active mine. However, if any of these sites were to be mined in the future during the project's construction or operation, the height and spacing of the transmission lines would provide adequate clearance for vehicles and equipment to cross the ROW under the lines if necessary.

One active quarry site was identified by the MRDS (USGS, 2006a) and the CGS (CDMG, 1999); the Moretti Pit operated by San Diego County of Public Works, located near the northern end of Santa Ysabel Valley. However, this site is located approximately 500 feet north of the Proposed Project ROW on the other side of Mesa Grande Road. Construction or operation of the Proposed Project would not interfere with access to this location due to its distance from the ROW and the intervening major road.

Given the distance of these sites from the ROW and the ability of mining-related equipment and vehicles to cross the ROW if necessary, construction and operation of the Sunrise Powerlink transmission line along the proposed Central Link is not expected to interfere with future access to any mineral resources.

Seismicity

Fault Rupture. This segment crosses the active Elsinore Fault (Julian Segment) at approximately MP 100.1, as shown in Figure D.13-8. The fault is included within an Alquist-Priolo zone in the area where the proposed Central Link project route crosses the fault. Recent research on the Julian segment of the Elsinore Fault indicates that this segment ruptures infrequently (approximately every 2000-3000 years, with the last earthquake occurring 1500-2000 years ago). Larger earthquakes could result in offsets ranging from 2 to 5 meters, depending on the size of the earthquake and length of the fault rupture (Thorup et al., 1997).

Table D.13-8. Approximate Peak Ground Accelerations – Central Link

Approximate Proposed Transmission Line Milepost	Total Length of Segments (miles)	Peak Ground Acceleration
109-110.8	1.8	0.2–0.3g
83.5-97, 101-105.5, and 107.6-109.5	19.9	0.3–0.4g
99-101	2	0.4–0.5g
97-99 and 105.5-120.2	16.7	0.5–0.6g

Source: CGS, 2006; USGS, 2006b.

Groundshaking. The proposed route segment is in close proximity to the Elsinore and San Jacinto Fault Zones for much of its length. Moderate to strong groundshaking could be caused by a significant earthquake on these faults or any of the other significant active faults in the vicinity of this segment. The peak horizontal accelerations for this segment are presented in Table D.13-8.

Liquefaction. Most of this link has too low a potential for liquefaction as it is primarily underlain by igneous bedrock. The Central Link may have moderate potential liquefaction in areas where the proposed segment crosses and is within active river washes and streams where local pockets of saturated and loose sandy soils may be located. These local pockets of loose sandy soils may be present within the flood plains of San Felipe Creek, Matagual Creek, Carrizo Creek, Carrista Creek, and Santa Ysabel Creek and could potentially liquefy in the event of a large earthquake.

Earthquake-Induced Landslides. Most accounts of historical earthquakes in this area describe damaging landslides resulting from earthquake groundshaking (SCEDC, 2007). Most of this link of the proposed route does not cross areas with significant slopes. Portions of the ROW through Grapevine and Hoover Canyons are located in areas near moderate slopes and may be susceptible to damage from landslides or rockfalls in the event of a large earthquake on nearby faults.

Proposed Central East Substation

Geology. The proposed Central East Substation would be located along the Central Link at approximately MP 91 on a gently sloping hill slope/stream terrace near the head of San Felipe Creek. The site is entirely underlain by tonalite and diorite (CDMG, 1965 and 1963).

Slope Stability. The substation site is on gently sloping terrain and is not likely to experience slope failure.

Soils. The site is underlain by the Tollhouse–Rock Outcrop–La Posta (s1014) soil association which includes outcrops of bare rock and soils formed in weathered granitics consisting of coarse sandy loam and loamy coarse sand. Hazard of erosion for this soil association for off-road/off-trail is ranked as moderate and for on-road/on-trail is ranked as severe. Shrink/swell (expansive) potential of this soil association varies from low to moderate. Corrosive potential of soils at the proposed Central East Substation is moderate for both uncoated steel and concrete.

Mineral Resources. No known mineral resources exist at or adjacent to the proposed East Central Substation site. Therefore, construction and operation of the proposed East Central Substation is not expected to interfere with future access to any mineral resources.

Seismicity. Although this site is not crossed by a mapped active fault, strands of the active Earthquake Valley fault trend directly toward the substation site, as shown in Figure D.13-8. If the substation facilities straddled unmapped but active strand of this fault, they would potentially be subject to damage from fault rupture and displacement in the event of an earthquake along this fault.

The site is located near to several active faults including the Elsinore and Earthquake Valley faults. Due to the nature of the underlying bedrock, the site is anticipated to only experience low to moderate ground-shaking due to seismic activity, with estimated peak ground accelerations of 0.2 to 0.3 g (CGS, 2006; USGS, 2006b). The site is not likely to experience seismically related slope failures or liquefaction-related phenomena due to the surrounding gently sloping terrain and the underlying granitic bedrock.

D.13.2.4 Inland Valley Link

Geology

The Inland Valley Link of the Proposed Project consists of both overhead and underground transmission line and traverses a mix of sloping hillsides, mesa and terraces, and valleys for its entire length from approximately MP 110.8 to 136.3. The project ROW traverses along the edge of Dye Mountain, through and along Swartz Canyon, near and along San Vicente Creek Canyons, and numerous unnamed hills and mesas dissected by small intervening drainages. This link of the proposed ROW crosses numerous geologic units along its length; geologic units crossed by this segment of the project are alluvium (Qal), Poway Group sedimentary rocks (Ec), gabbro (bi), Santiago Peak Volcanics (JTrv); tonalite and diorite (gr^d), granodiorite (gr^e), Woodson Mountain Granodiorite (gr^o), and mixed granitic and metamorphic rocks (gr-m) (CDMG, 1962, 1963, and 1965). These units are described in Table D.13-1. Approximate locations of these units along the overhead and underground portions of the Inland Valley Link segment of the Proposed Project are listed below.

Overhead Portions:

- Poway Group sedimentary rocks (Ec): MPs 127.2-127.4 and 132.7-136.3
- Gabbro (bi): small outcrop at 118.4
- Santiago Peak Volcanics (JTrv): MPs 129-131.1
- Tonalite and diorite (grt): MPs 114.7-118.1
- Granodiorite (gr^e): MPs 121.2-124.3
- Woodson Mountain Granodiorite (gr^o): MPs 124.3-127.2 and 127.4-129
- Mixed granitic/metamorphic rocks (gr-m): MPs 110.8-114.7 and 131.1-132.7

Underground Segments (MP 117.2 to 121.2):

- Tonalite and diorite (grt): MPs 117.2-118.1
- Alluvium (Qal): MPs 118.1-120.2
- Granodiorite (gr^e): MPs 120.2-121.2

Figure D.13-7. Elsinore Fault Zone Crossing
[CLICK HERE TO VIEW](#)

Figure D.13-8. Fault Location Map for Central East Substation
[CLICK HERE TO VIEW](#)

Slope Stability

The Inland Valley Link traverses near and across gently sloping alluvial fans and moderately sloping hillside terrain. This portion of the ROW does not cross any mapped landslides and slopes in the area underlain by the granitic and volcanic units are not typically prone to landslides. However, portions of the Inland Valley Link underlain by the landslide prone Poway Group sedimentary rocks may be susceptible to landslides and slope failures (CDMG, 1975).

Soils

Six soil associations are mapped along the Inland Valley Link segment of the project route (s998, s999, s1010, s1013, s1015, and s1016). Basic characteristics of these soils are presented in Table D.13-2. The Sesame–Rock Outcrop–Cienba (s1010), Hotaw–Crouch–Boomer (s1015), and Sheephead–Rock Outcrop–Bancas (s1016) soil associations are formed primarily on hill slopes underlain by granitic and metamorphic rocks. The Ramona–Placentia–Linne–Greenfield association (999) is located near the middle of this link near the intersection of Swartz and San Vicente Creek and is generally formed in sandstone and shale. The San Miquel–Friant–Exchequer association (s1013) generally corresponds to areas underlain by the Santiago Peak Volanics. The western end of this link is underlain by the Urban Land–Redding–Olivenhain association (s998) which is formed alluvial and marine terraces.

Hazard of erosion for these soils for off-road/off-trail ranges from slight to very severe and for on-road/on-trail ranges from slight to severe. Shrink/swell (expansive) potential of the soils associations along this link varies from low to high. Corrosive potential of soils along the Inland Valley Link ranges from moderate to high for uncoated steel and from low to high for concrete.

Approximate locations of these soil associations along the Inland Valley Link route are listed below.

- s998: MPs 132.2-136.3
- s999: MPs 118.2-120.2
- s1010: MPs 115-118.2 and 120.2-129.7
- s1013: MPs 129.7-132.2
- s1015: MPs 110.8-113
- s1016: MPs 113-115

Mineral Resources

No known active mines or BLM mining claims are identified along this segment. Additionally, no known mineral resource sites were identified by the MRDA database along the Inland Valley Link and no active mineral resource sites were identified by the CGS (CDMG, 1999). Construction and operation of the Sunrise Powerlink transmission line along the proposed Inland Valley Link ROW is not expected to interfere with future access to any mineral resources.

Seismicity

Fault Rupture. This segment does not cross any known active faults and is thus not likely to experience damage due to fault rupture and/or offset.

Groundshaking. No active faults are located in the vicinity of the Inland Valley Link ROW and therefore, strong groundshaking is not expected. However, moderate groundshaking could be caused in portions of this segment by a large earthquake on nearby significant active faults, i.e., the Elsinore or Rose Canyon faults. The peak horizontal accelerations for this segment are presented in Table D.13-9.

Table D.13-9. Approximate Peak Ground Accelerations – Inland Valley Link

Approximate Proposed Transmission Line Milepost	Total Length of Segments (miles)	Peak Ground Acceleration
120.2-132.5	12.3	0.1–0.2g
110.8-118.1 and 132.5-136.5	11.3	0.2–0.3g
118.1-120.2	1.9	0.3–0.4g

Source: CGS, 2006; USGS, 2006b.

Liquefaction. Most of this link has no to low potential for liquefaction as it is primarily underlain by older igneous, volcanic, and consolidated sedimentary bedrock units. The alluvial may have moderate potential liquefaction in areas where the proposed segment crosses and is within active river washes and streams, and where local pockets of loose sandy soils may have been deposited. These local pockets of loose sandy soils may be present within the flood plains of Swartz Canyon, San Vicente Creek, and other stream drainages that cross the project ROW and could potentially liquefy in the event of a large earthquake.

Earthquake-Induced Landslides. Most accounts of historical earthquakes in the San Diego area describe damaging landslides resulting from earthquake groundshaking (SCEDC, 2006). Most of the Inland Valley Link does not cross areas with significant slopes; however, portions of the project ROW underlain or downslope from the landslide prone Poway Group units may be damaged by seismically induced landslides. Portions of the Inland Valley Link along and near moderate to steep slopes underlain by granitic and volcanic units may be susceptible to damage from rockfall in the event of a large earthquake on nearby regional faults.

D.13.2.5 Coastal Link

Geology

The Coastal Link of the Proposed Project consists of both overhead and underground transmission line and generally traverses a mix of sloping hillsides, mesa and terraces, and valleys along its entire length from approximately MP 136.3 to the end of the project ROW at MP 149.9. The Coastal Link ROW traverses northwest along the mesas and terraces at the heads of San Clemente, Carrol, and Los Peñasquitos Canyons before turning westerly and crossing along the mesa, terraces and hillslopes on the northern side of Los Peñasquitos Canyon. The mesas and terraces crossed by the ROW are dissected by numerous small intervening drainages. Geologic units crossed by this segment of the project are alluvium (Qal), Linda Vista Formation (Qm), Poway Group sedimentary rocks (Ec), La Jolla Group sedimentary rocks (E), Santiago Peak Volcanics (JTrv); and granitic rocks (gr). Descriptions of these units are listed in Table D.13-1. Approximate locations of these units along the overhead and underground portions of the Coastal Link segment of the Proposed Project are listed below.

Overhead Portions:

- Alluvium (Qal): MPs 149.6-149.9
- Qm: MPs 146.8-147.1 and 147.8-149.6
- Poway Group sedimentary rocks (Ec): MPs 136.3-141, 141.7-143.3, and 147.8-148.6
- La Jolla Group sedimentary rocks (E): MPs 146.6-146.8, 147.1-147.6, and 148.6-149.4
- Granitic rocks (gr): MPs 141-141.7

Underground Segments (MP 142.3 to MP 146.6)

- Alluvium (Qal): MPs 145-146, expected to be shallow over La Jolla Group units
- Linda Vista Formation (Qm): MPs 144-144.7
- Poway Group sedimentary rocks (Ec): MPs 142.3-143.5
- La Jolla Group sedimentary rocks (E): MPs 146-146.6
- Santiago Peak Volcanics (JTrv): MPs 143.5-144

Slope Stability

The Coastal Link traverses near and across level to gently sloping mesas and terraces and moderately sloping hillside terrain. This portion of the ROW does not cross any mapped landslides. However, much of the of the Coastal Link is underlain by or downslope of the landslide prone Poway Group and La Jolla Group sedimentary rocks and may be susceptible to landslides and slope failures (CDMG, 1975).

Soils

Four soil associations are mapped along the Coastal Link segment of the project route (s997, s998, s1013, and s1019). A summary of the basic characteristics of these soils is presented in Table D.13-2. Most of this link is underlain by soils formed in alluvial and marine terraces: the Redding-Olivenhain association (s997) the Urban Land-Redding-Olivenhain association (s998), and the Las Flores-Antioch association (s1019). The San Miquel-Friant-Exchequer association (s1013) is generally formed in material weathered from metamorphic and metavolcanic rocks.

Hazard of erosion for these soils for off-road/off-trail ranges from slight to very severe and for on on-road/on-trail ranges from slight to severe. Shrink/swell (expansive) potential of the soils associations along this link varies from low to high. Corrosive potential of soils along the Coastal Link ranges from moderate to high for uncoated steel and from low to high for concrete.

Approximate locations of these soil associations along the Coastal Link route are listed below.

- s997: MPs 144.5-146
- s998: MPs 136.3-140.7, 142-144.5, and 148-149.9
- s1013: MPs 140.7-142
- s1019: MPs 146-148

Mineral Resources

No known active mines or BLM mining claims are identified within the Coastal Link. Additionally, no known mineral resource sites were identified by the MRDA database along this link and no active mineral resource sites were identified by the CGS (CDMG, 1999). Therefore, construction and operation of the Sunrise Powerlink transmission line along the proposed Coastal Link ROW is not expected to interfere with future access to any mineral resources.

Seismicity

Fault Rupture. This segment does not cross any known active faults and is thus not likely to experience damage due to fault rupture and/or offset.

Groundshaking. No significant active faults are located in the vicinity of the Coastal Link ROW; therefore, strong groundshaking is not expected. However, moderate groundshaking could be caused in portions of this segment by a large earthquake on nearby significant active faults (i.e., the Elsinore or Rose Canyon faults). The peak horizontal accelerations for this segment are presented in Table D.13-10.

Table D.13-10. Approximate Peak Ground Accelerations – Coastal Link

Approximate Proposed Transmission Line Milepost	Total Length of Segments (miles)	Peak Ground Acceleration
141.1-141.7 and 143.6-143.9	0.9	0.1-0.2g
136.3-141.1, 141.7-143.6, 143.9-144.8, and 146.3-149.9	11.2	0.2-0.3g
144.8-146.5	1.7	0.3-0.4g

Source: CGS, 2006; USGS, 2006b.

Liquefaction. Most of this link has no to low potential for liquefaction as it is primarily underlain by older igneous, volcanic, and consolidated sedimentary bedrock units. The alluvial deposits in Los Peñasquitos Canyon may have moderate potential liquefaction in areas with local pockets of loose sandy soils that may have become saturated and which could potentially liquefy in the event of a large earthquake.

Earthquake-Induced Landslides. Most accounts of historical earthquakes in the San Diego area describe damaging landslides resulting from earthquake groundshaking (SCEDC, 2006). Most of the Coastal Link does not cross areas with significant slopes. However, portions of the project underlain or downslope from the landslide prone Poway Group and La Jolla Group units may be damaged by seismically induced landslides in the event of a large earthquake on nearby regional faults.

D.13.3 Applicable Regulations, Plans, and Standards

Federal

Institute of Electrical and Electronics Engineers (IEEE) 693 “Recommended Practices for Seismic Design of Substations”

The Institute of Electrical and Electronics Engineers (IEEE) 693 “Recommended Practices for Seismic Design of Substations” was developed by the Substations Committee of the IEEE Power Engineering Society, and approved by the American National Standards Institute and the IEEE-SA Standards Board. This document provides seismic design recommendations for substations and equipment consisting of seismic criteria, qualification methods and levels, structural capacities, performance requirements for equipment operation, installation methods, and documentation. This recommended practice emphasizes the qualification of electrical equipment.

IEEE 693 is intended to establish standard methods of providing and validating the seismic withstand capability of electrical substation equipment. It provides detailed test and analysis methods for each type of major equipment or component found in electrical substations. This recommended practice is intended to assist the substation user or operator in providing substation equipment that will have a high probability of withstanding seismic events to predefined ground acceleration levels. It establishes standard

methods of verifying seismic withstand capability, which gives the substation designer the ability to select equipment from various manufacturers, knowing that the seismic withstand rating of each manufacturer's equipment is an equivalent measure. Although most damaging seismic activity occurs in limited areas, many additional areas could experience an earthquake with forces capable of causing great damage. This recommended practice should be used in all areas that may experience earthquakes.

Environmental Protection Agency – Clean Water Act

Stormwater runoff from construction activities can have a significant impact on water quality. As stormwater flows over a construction site, it picks up pollutants like sediment, debris, and chemicals. Polluted stormwater runoff can harm or kill fish and other wildlife. Sedimentation can destroy aquatic habitat and high volumes of runoff can cause stream bank erosion. Under the Clean Water Act, the NPDES Stormwater program requires operators of construction sites one acre or larger (including smaller sites that are part of a larger common plan of development) to obtain authorization to discharge stormwater under an NPDES construction stormwater permit and the development and implementation of stormwater pollution prevention plans (SWPPP) is the focus of NPDES stormwater permits for regulated construction activities.

Most states are authorized to implement the Stormwater NPDES permitting program. EPA remains the permitting authority in a few states, territories, and on most land in Indian Country. For construction (and other land disturbing activities) in areas where EPA is the permitting authority, operators must meet the requirements of the EPA Construction General Permit (CGP). In California, Stormwater NPDES permits on non-tribal and non-federal land are overseen by the State of California EPA (CalEPA).

A Storm Water Pollution Prevention Plan (SWPPP) must include a site description, including a map that identifies sources of stormwater discharges on the site, anticipated drainage patterns after major grading, areas where major structural and nonstructural measures will be employed, surface waters, including wetlands, and locations of discharge points to surface waters. The SWPPP also describes measures that will be employed, including at least protection of existing vegetation wherever possible, plus stabilization of disturbed areas of site as quickly as practicable, but no more than 14 days after construction activity has ceased.

Uniform Building Code

Published by the International Conference of Building Officials, the Uniform Building Code (UBC) provides complete regulations covering all major aspects of building design and construction relating to fire and life safety and structural safety. This is the code adopted by most western states. The provisions of the 1997 Uniform Building Code, Volume 1, contain the administrative, fire and life-safety, and field inspection provisions, including all nonstructural provisions and those structural provisions necessary for field inspections. Volume 2 contains provisions for structural engineering design, including those design provisions formerly in the UBC Standards. Volume 3 contains the remaining material, testing and installation standards previously published in the UBC Standards.

State

Alquist-Priolo Earthquake Fault Zoning Act of 1972

The Alquist-Priolo Earthquake Fault Zoning Act of 1972 (formerly the Special Studies Zoning Act) regulates development and construction of buildings intended for human occupancy to avoid the hazard of surface fault rupture. While this act does not specifically regulate overhead transmission lines, it does help define areas where fault rupture is most likely to occur. This Act groups faults into categories of active, potentially active, and inactive. Historic and Holocene age faults are considered active, Late Quaternary and Quaternary age faults are considered potentially active, and pre-Quaternary age faults are considered inactive. These classifications are qualified by the conditions that a fault must be shown to be “sufficiently active” and “well defined” by detailed site-specific geologic explorations in order to determine whether building setbacks should be established.

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act (the Act) of 1990 (Public Resources Code, Chapter 7.8, Division 2) directs the California Department of Conservation (DOC), Division of Mines and Geology (DMG) [now called California Geological Survey (CGS)] to delineate Seismic Hazard Zones. The purpose of the Act is to reduce the threat to public health and safety and to minimize the loss of life and property by identifying and mitigating seismic hazards. Cities, counties, and State agencies are directed to use seismic hazard zone maps developed by CGS in their land-use planning and permitting processes. The Act requires that site-specific geotechnical investigations be performed prior to permitting most urban development projects within seismic hazard zones.

California Building Code

The California Building Code (CBC, 2001) is based on the 1997 Uniform Building Code, with the addition of more extensive structural seismic provisions. Chapter 16 of the CBC contains definitions of seismic sources and the procedure used to calculate seismic forces on structures. As the Proposed Project route lies within UBC Seismic Zone 3, provisions for design must follow the requirements of Chapter 16.

Anza-Borrego Desert State Park

The, the Anza-Borrego Desert State Park (ABDSP) General Plan, dated February 11, 2005 creates a framework which guides day-to-day decisionmaking within the Park. The ABDSP General Plan contains several goal and guidelines to preserve and maintain the integrity of geological formations and protect the commonly erosive soils in the Park. Those relevant to the Proposed Project are listed below:

Goal – Geology 1: Protect and preserve the unique geological resources and features of ABDSP.

- Guideline - Geology 1c: Management plans and decisions with respect to facilities development and visitor access and recreation must recognize and accordingly mitigate negative impacts to these fragile geological features.
- Guideline - Geology 1d: Preserve fragile geological features, especially the badlands areas. Badlands are particularly vulnerable to destructive vehicle traffic and to a variety of other human activities. Care must be taken to maintain their integrity.

Goal – Soils 1: Protect sensitive soils and promote further understanding of the role of soils and soil biota in desert ecosystems.

- Guideline – Soils 1b: Identify and minimize visitor activities and park operations that have negative impacts on sensitive soils. Develop an understanding of the extent to which this impact further affects the water quality, plant communities, terrestrial invertebrates, birds, mammals, and other components of the region's ecosystems.
- Guideline – Soils 1c: Identify and protect natural sand sources that supply the material for sand dune systems throughout the Park.

Local

The safety elements of General Plans for the cities and the counties along the proposed route contain policies for the avoidance of geologic hazards and/or the protection of unique geologic features. A survey of general plans along the proposed route indicated that most municipalities require submittal of construction and operational safety plans for proposed construction in areas of identified geologic and seismic hazards for review and approval prior to issuance of permits. County and local grading ordinances establish detailed procedures for excavation and grading required for underground construction.

Imperial County

The Imperial County Department of Building & Planning oversees the management and implementation of the Rules and Regulations of the County and applicable State and Federal Laws as they relate to land use and development in unincorporated areas of the county. The Land Use Ordinance for the County of Imperial, Title 9, provides comprehensive land use regulations for all unincorporated areas of the County of Imperial. These regulations are adopted to promote and protect the public health, safety, and general welfare through the orderly regulation of land uses throughout the unincorporated areas of the County. The relevant portions of the Title 9 are Division 10 – Building, Grading and Sewage Regulations, Division 15 – Geological Hazards, Division 17 – Geothermal, and Division 20 – Surface Mining & Reclamation.

San Diego County

The San Diego Department of Planning and Land Use maintains and implements the County's general plan, zoning and grading ordinances, and ensures regulatory compliance with San Diego County Codes and Ordinances. The San Diego County Code of Regulatory Ordinances, Title 8, and Division 7 includes regulations related to grading, excavation, clearing, and mining in San Diego County. San Diego County also has a Grading Ordinance that would apply to the project.

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Environmental Impacts and Mitigation Measures for the Proposed Project

This section presents a discussion of impacts and mitigation measures for the Proposed Project. The discussion is divided into five geographic areas. Within each area, both construction impacts and operational impacts are addressed.

D.13.4 Significance Criteria and Approach to Impact Assessment

This section explains how impacts are assessed in Section D.13, and in Section D.13.4.1 presents the significance criteria on which impact determinations are based. In addition, Section D.13.4.2 lists the Applicant Proposed Measures relevant to Section D.13, and Section D.13.4.3 lists all impacts identified for the Proposed Project and alternatives.

D.13.4.1 Significance Criteria

Geologic conditions were evaluated with respect to the impacts the project may have on local geology, as well as the impact that specific geologic hazards may have upon the proposed transmission line and its related facilities. The significance of these impacts was determined on the basis of NEPA and CEQA statutes, guidelines and appendices, thresholds of significance developed by local agencies, government codes and ordinances. Impacts of the project on the geologic environment would be considered significant if project construction or operation would result in any of the following criteria being met:

- Project construction would trigger or accelerate erosion or the loss of topsoil.
- Project construction would result in the direct or indirect destruction or disturbance of landforms or unique geologic features.
- The Proposed Project would render known mineral and/or energy resources inaccessible.

Geologic impacts created as a result of the Proposed Project are significant if damage to project components from the following scenarios would potentially expose people or structures to substantial adverse effects, including the risk of loss, injury, or death:

- Project components would 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 landsliding, slope instability, subsidence, or collapse.
- Project components could be damaged if located on unsuitable soils, including corrosive, expansive, and compressible soils.
- Damage to project components due to seismic events (earthquakes), including fault rupture, and seismically induced groundshaking that results in landslides, liquefaction, settlement, lateral spreading, and/or surface cracking.

D.13.4.2 Applicant Proposed Measures

Applicant Proposed Measures (APMs) were identified by SDG&E in its Application to the CPUC. Table D.13-11 presents the APMs that are relevant to this section. Impact analysis assumes that all APMs will be implemented as defined in the table; mitigation measures are recommended in this section if it is determined that APMs do not fully reduce the significance of the impacts for which they are presented.

Table D.13-11. Applicant Proposed Measures – Geology, Mineral Resources, and Soils

APM No.	Description
GEO-APM-1	Widening or upgrading of existing access roads will be limited in areas where soils are very sensitive to disturbance to the extent feasible.
GEO-APM-2	<ol style="list-style-type: none"> 1. Vehicle and construction equipment use will be restricted to access roads and areas in the immediate vicinity of construction work sites to help reduce soil disturbance. 2. In agricultural areas, topsoil would be left in roughened condition. 3. When practical, construction activities will be avoided on wet soil to reduce the potential for soil compaction, rutting, and loss of soil productivity. 4. Disturbed areas will be returned to their pre-construction contours and allowed to revegetate naturally, or will be reseeded with an appropriate seed mixture if necessary. 5. Construction of access roads in inaccessible terrain will be reduced by using helicopters to place structures in select locations.
GEO-APM-3	Structure placement in areas of high shrink/swell potential will be avoided to the extent feasible.
GEO-APM-4	Structures will be placed in geologically stable areas, avoiding fault lines, brittle surface rock and bedrock, etc. to the extent feasible.
GEO-APM-5	Project construction activities will be designed and implemented to avoid or minimize new disturbance, erosion on manufactured slopes, and off-site degradation from accelerated sedimentation. Maintenance of cut and fill slopes created by project construction activities would consist primarily of erosion repair. Where revegetation is necessary to improve the success of erosion control, planting or seeding with native seed mix would be done on slopes.
GEO-APM-6	In areas where ground disturbance is substantial or where re-contouring is required (e.g., marshaling yards, tower sites, spur roads from existing access roads), surface restoration will occur as necessary for erosion control and revegetation. The method of restoration will normally consist of returning disturbed areas back to their original contour, reseeding (if required), installing cross drains for erosion control, placing water bars in the road, and filling ditches for erosion control. Potential for erosion will be minimized on access roads and other locations primarily with water bars. The water bars will be constructed using mounds of soil shaped to direct the flow of runoff and prevent erosion. Soil spoils created during ground disturbance or re-contouring shall be disposed of only on previously disturbed areas, or used immediately to fill eroded areas. Cleared vegetation can be hauled off-site to a permitted disposal location, or may be chipped or shredded to an appropriate size and spread in disturbed areas of the ROW with the approval of the biological monitor. To limit impact to existing vegetation, appropriately sized equipment (e.g., bulldozers, scrapers, backhoes, bucket-loaders, etc.) will be used during all ground disturbance and re-contouring activities.
GEO-APM-8	During construction, SDG&E would remove or stabilize boulders uphill of structures that pose potentially high risk of landslide damage to those structures and would position structures to span over potential landslide areas to the extent feasible.

D.13.4.3 Impacts Identified

A wide range of potential impacts, including loss of mineral resources, slope instability including landslides, debris flows and slope creep, and seismic hazards including surface fault rupture, strong groundshaking, liquefaction, and seismically induced landslides, was considered in this analysis. Each of these potential geologic and soils impacts is discussed in the following sections. Table D.13-12 lists the impacts identified for the Proposed Project and alternatives, along with the significance of each impact. Detailed discussions of each impact and the specific locations where each is identified are presented in the following sections. Impacts are classified as Class I (significant, cannot be mitigated to a level that is less than significant), Class II (significant, can be mitigated to a level that is less than significant), Class III (adverse, but less than significant), and Class IV (beneficial).

Table D.13-12. Impacts Identified – Proposed Project – Geology, Mineral Resources, and Soils

Impact No.	Description	Impact Significance
Proposed Project		
G-1	Erosion would be triggered or accelerated due to construction activities.	Class III
G-2	Unique geologic features would be damaged due to construction activities.	Class II
G-3	Project would expose people or structures to potential substantial adverse effects as a result of problematic soils.	Class II
G-4	Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure.	Class II and III
G-5	Project would expose people or structures to potential substantial adverse effects as a result of surface fault rupture at crossings of active faults.	Class II
G-6	Project would expose people or structures to potential substantial adverse effects as a result of slope instability created during excavation and/or grading.	Class II
G-7	Project would expose people or structures to potential substantial adverse effects as a result of landslides, earthflows, debris flows and/or rockfall.	Class II
Proposed Project – Future Transmission System Expansion		
G-1	Erosion would be triggered or accelerated due to construction activities.	Class II
G-3	Project would expose people or structures to potential substantial adverse effects as a result of problematic soils.	Class II
G-4	Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure.	Class II and III
G-5	Project would expose people or structures to potential substantial adverse effects as a result of surface fault rupture at crossings of active faults.	Class II
G-6	Project would expose people or structures to potential substantial adverse effects as a result of slope instability created during excavation and/or grading.	Class II
G-7	Project would expose people or structures to potential substantial adverse effects as a result of landslides, earthflows, debris flows, and/or rockfall.	Class II
G-9	Construction activities would interfere with access to known mineral resources.	Class II
Proposed Project– Connected Actions		
G-1	Erosion would be triggered or accelerated due to construction activities.	Class II and III
G-2	Unique geologic features would be damaged due to construction activities.	Class II
G-3	Project would expose people or structures to potential substantial adverse effects as a result of problematic soils.	Class II
G-4	Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure.	Class II and III
G-5	Project would expose people or structures to potential substantial adverse effects as a result of surface fault rupture at crossings of active faults.	Class II
G-6	Project would expose people or structures to potential substantial adverse effects as a result of slope instability created during excavation and/or grading.	Class II
G-7	Project would expose people or structures to potential substantial adverse effects as a result of landslides, earthflows, debris flows, and/or rockfall.	Class II

D.13.5 Imperial Valley Link Impacts and Mitigation Measures

The Proposed Project in this link includes about 61 miles of new 500 kV transmission line, entirely aboveground.

Environmental Impacts and Mitigation Measures

Construction Impacts

Impact G-1: Erosion would be triggered or accelerated due to construction activities (Class III)

Soils along this segment of the proposed route have a potential hazard of erosion for off-road/off-trail and on-road/on-trail ranging from slight to moderate. Excavation and grading for tower and switchyard foundations, series capacitor banks, work areas, access roads, and spur roads would loosen soil and trigger or accelerate erosion. SDG&E's APMs GEO-APM-1, -2, -5, and -6 (see Table D.13-11) would reduce the amount of erosion that would result from construction by limiting construction traffic and grading of existing roads in areas with sensitive soils, planning construction to minimize new ground disturbance, and using Best Management Practices (BMPs) such as sand bags and road bars, to control water erosion. In addition, a Stormwater Pollution Prevention Plan (SWPPP) that would limit erosion from the construction site would be required in accordance with the Clean Water Act. This would result in a less than significant impact (Class III); no additional mitigation is required.

Impact G-2: Unique geologic features would be damaged due to construction activities (Class II)

Construction activities such as grading and excavation from the Proposed Project could cause damage to desert pavement, which is a special concern in the desert areas of the proposed route. Desert pavement is a unique geologic/soil feature that takes thousands of years to form and protects the underlying silty and sandy soils from excessive wind and water erosion. Damage to desert pavement as a result of Project construction would potentially result in an extreme acceleration of erosion as well as damage a unique geologic feature resulting in a significant impact. At least one soil association along this segment of the proposed route, the Rositas-Orita-Carrizo-Aco (s994), is known to include areas of desert pavement. Therefore, Mitigation Measure G-2a would be implemented to protect desert pavement in areas underlain by the Rositas-Orita-Carrizo-Aco soil association and other desert soils with potential for desert pavement. Implementation of Mitigation Measure G-2a would reduce erosion impacts associated with damage to desert pavement areas to less than significant levels (Class II).

Mitigation Measures for Impact G-2: Unique geologic features would be damaged due to construction activities

G-2a Protect desert pavement. Grading for new access roads or work areas in areas covered by desert pavement shall be avoided or minimized. If avoidance of these areas is not possible, the desert pavement surface shall be protected from damage or disturbance from construction vehicles by use of temporary mats placed on the ground surface. A plan for identification and avoidance or protection of sensitive desert pavement shall be prepared and submitted to the CPUC and BLM for review and approval at least 60 days prior to start of construction. The plan shall define how protective measures will prevent destruction of desert pavement.

Operational Impacts

Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils (Class II)

Soils along this segment of the proposed route have a moderate to high potential to corrode steel and a low to high potential to corrode concrete. Corrosive subsurface soils may exist in places along the proposed

route. Corrosive soils would have a detrimental effect on concrete and metals. Depending on the degree of corrosivity of subsurface soils, concrete and reinforcing steel in concrete structures and bare-metal structures exposed to these soils would deteriorate, eventually leading to structural failures. Expansion potential for the soils along the segment ranges from low to high. Expansive soils can also cause problems to structures. Soils that exhibit shrink-swell behavior are clay-rich and react to changes in moisture content by expanding or contracting. Some of the natural soil types identified within this segment of the project area have moderate to high clay contents and many have moderate to high shrink-swell potential. Expansive soils may cause differential and cyclical foundation movements that can cause damage and/or distress to structures and equipment. In addition, potential impacts associated with loose sands or other compressible soils include excessive settlement, low foundation-bearing capacity, and limitation of year-round access to project facilities.

Application of standard design and construction practices and implementation of GEO-APM-3 (see Table D.13-11) would partially reduce the adverse affects of problematic soils by avoiding placement of structures in areas of high shrink/swell potential, to the extent feasible. However, actual locations of high shrink/swell (expansive) soils and the presence, absence, and location of corrosive soils needs to be determined to fully reduce the potential for adverse affects of problematic soils to less than significant. Unidentified expansive and corrosive soils could damage project structures and facilities potentially resulting in collapse. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to nearby people. Therefore, the Proposed Project would cause a significant impact. Implementation of Mitigation Measure G-3a (Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design) is required to ensure that impacts associated with problematic soils are reduced to less than significant levels (Class II).

Mitigation Measure for Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils

G-3a **Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design.** The design-level geotechnical studies to be performed by the Applicant shall identify the presence, if any, of potentially detrimental soil chemicals, such as chlorides and sulfates. Appropriate design measures for protection of reinforcement, concrete, and metal-structural components against corrosion shall be utilized, such as use of corrosion-resistant materials and coatings, increased thickness of project components exposed to potentially corrosive conditions, and use of passive and/or active cathodic protection systems. The geotechnical studies shall also identify areas with potentially expansive or collapsible soils and include appropriate design features, including excavation of potentially expansive or collapsible soils during construction and replacement with engineered backfill, ground-treatment processes, and redirection of surface water and drainage away from expansive foundation soils. Studies shall conform to industry standards of care and ASTM standards for field and laboratory testing. Study results and proposed solutions shall be provided to the CPUC and BLM for review and approval at least 60 days before final project design.

Impact G-4: Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure (Class II)

Moderate to severe groundshaking is expected in the event of an earthquake on the faults in the Imperial Valley area and from other major faults in the region, with estimated PGAs ranging from 0.4 to > 0.8 g. It is likely that the project facilities would be subjected to at least one moderate or larger earthquake occurring close enough to produce severe to strong groundshaking in the Imperial Valley Link area. SDG&E indicates in the PEA that project structures would be designed to withstand geolog-

ically induced stresses and that appropriate tower design accounting for lateral wind loads and conductor loads would likely exceed any creditable seismic loading, minimizing potential damage to tower structures from groundshaking. However, portions of the Imperial Valley Link alignment would be subject to local strong to severe groundshaking with vertical and horizontal ground accelerations that could exceed lateral wind loads, resulting in damage or collapse of project structures. Collapse of project structures would potentially result in power outages, damage to nearby roads or structures, and injury or death to nearby people. Therefore, the Proposed Project would cause a significant impact. To ensure that project structures are not damaged by strong to severe groundshaking, Mitigation Measure G-4a would be required to reduce impacts to less than significant (Class II).

Severe to strong groundshaking could result in liquefaction-related phenomena in sections of the proposed Imperial Valley segment that cross active river washes and streams where lenses and pockets of loose seasonally saturated sand may be present. This would potentially result in damage to project structures should a large earthquake occur during the periods when these soils are saturated. Therefore, the Proposed Project would cause a significant impact. However, to ensure that impacts associated with strong groundshaking and seismically induced ground failures would be less than significant (Class II), Mitigation Measure G-4b (Conduct geotechnical investigations for liquefaction) shall be implemented prior to final project design to ensure that people or structures are not exposed to hazards associated with strong seismic groundshaking.

Mitigation Measure for Impact G-4: Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure

- G-4a** **Reduce effects of groundshaking.** The design-level geotechnical investigations performed by the Applicant shall include site-specific seismic analyses to evaluate the peak ground accelerations for design of project components. Based on these findings, project structure designs shall be modified/strengthened, as deemed appropriate by the project engineer, if the anticipated seismic forces (high calculated peak vertical and horizontal ground accelerations due to severe groundshaking) are found to be greater than anticipated wind load stresses on project structures. Study results and proposed design modifications shall be provided to the CPUC and BLM for review and approval at least 60 days before final project design.
- G-4b** **Conduct geotechnical investigations for liquefaction.** Because seismically induced liquefaction-related ground failure has the potential to damage or destroy project components, the design-level geotechnical investigations to be performed by the Applicant shall include investigations designed to assess the potential for liquefaction to affect the approved project and all associated facilities, specifically at tower locations in areas with potential liquefaction-related impacts. Where these hazards are found to exist, appropriate engineering design and construction measures shall be incorporated into the project designs as deemed appropriate by the project engineer. Design measures that would mitigate liquefaction-related impacts could include construction of pile foundations, ground improvement of liquefiable zones, installation of flexible bus connections, and incorporation of slack in cables to allow ground deformations without damage to structures. Study results and proposed solutions to mitigate liquefaction shall be provided to the CPUC and BLM for review and approval at least 60 days before final project design.

Impact G-5: Project would expose people or structures to potential substantial adverse effects as result of surface fault rupture at crossings of active faults (Class II)

Project facilities would be subject to hazards of surface fault rupture at crossing of the active Superstition Hills, Elmore Ranch, and San Jacinto faults. Fault crossings, where multiple feet of displacement are expected along active faults, are best crossed as overhead lines with towers placed well outside the fault zone to allow for the flex in the conductor lines to absorb offset. In general, GEO-APM-4 requires that project structures be placed in stable areas avoiding fault lines. However, how fault lines shall be avoided and how the surface traces of the active faults will be accurately located is not specified and project structures could be damaged or collapse in the event of fault rupture beneath or adjacent to a tower due to inaccurate fault location during project design. Collapse of project structures would potentially result in power outages, damage to nearby roads or structures, and injury or death to people. Therefore, the Proposed Project would cause a significant impact. Mitigation Measure G-5a (Minimize project structures within active fault zones) is required for fault crossings to minimize the length of transmission line within fault zones and prevent placement of tower structures on active fault traces, reducing the impact to less than significant levels (Class II). Impacts associated with overhead active fault crossings would be reduced to less than significant levels (Class II) with implementation of Mitigation G-5a because the conductor would be able to distribute fault displacements over a comparatively long span and towers would be less likely to collapse in the event of an earthquake if not placed directly on an active fault trace.

Mitigation Measure for Impact G-5: Project would expose people or structures to potential substantial adverse effects as result of surface fault rupture at crossings of active faults

G-5a Minimize project structures within active fault zones. Prior to final project design SDG&E shall perform a geologic/geotechnical study to confirm the location of mapped traces of active and potentially active faults crossed by the project route. For crossings of active faults, the project design shall be planned so as not to locate towers or other project structures on the traces of active faults and in addition project components shall be placed as far as feasible outside the areas of mapped fault traces. Compliance with this measure shall be documented to the CPUC and BLM in a report submitted for review and approval at least 60 days prior to the start of construction.

Modifications to Imperial Valley Substation

SDG&E proposes to modify the existing substation to accommodate the termination of an additional 500 kV circuit which would include the installation of new line and bus dead-end structures, 500 kV circuit breakers and disconnect switches, communication interfaces and primary and backup metering equipment, as required. All proposed modifications and associated staging and access requirements would be located within the previously disturbed area of SDG&E substation property.

Environmental Impacts and Mitigation Measures

Construction Impacts from Modifications to Imperial Valley Substation

Impact G-1: Erosion would be triggered or accelerated due to construction activities (Class III)

Soils underlying the Imperial Valley Substation have a potential hazard of erosion, for both off-road/off-trail and on road/trail, of slight. Although potential hazard of erosion is slight, excavation for tower and switchyard foundations, and other substation equipment could loosen soil and trigger or accelerate erosion.

SDG&E's APMs GEO-APM-1, -2, -5, and -6 (see Table D.13-11) reduce the amount of erosion that would result from construction by limiting construction traffic and grading of existing roads in areas with sensitive soils, planning construction to minimize new ground disturbance, and using Best Management Practices (BMPs) such as sand bags and road bars, to control water erosion. In addition, a Stormwater Pollution Prevention Plan (SWPPP) that would limit erosion from the construction site would be required in accordance with the Clean Water Act. This would result in a less than significant impact (Class III).

Operational Impacts from Modifications to Imperial Valley Substation

No new geologic impacts would result at the existing Imperial Valley Substation due to the operation of new line structures and equipment similar to the respective structures already in place within the existing fenced area of the substation.

D.13.6 Anza-Borrego Link Impacts and Mitigation Measures

The Proposed Project in this link includes a new 500 kV transmission line, parts of which would have an underbuilt 92 kV or 69 kV transmission circuit, consisting of a total of 139 transmission support structures. In addition, there would be segments of both 92 kV and 69 kV transmission line relocated off of existing wood poles and installed underground within SR78.

Environmental Impacts and Mitigation Measures

Construction Impacts

Impact G-1: Erosion would be triggered or accelerated due to construction activities (Class III)

Soils along this segment of the proposed route have a potential hazard of erosion for off-road/off-trail and on-road/on-trail ranging from slight to moderate. Excavation and grading for tower foundations, trenches, work areas, access roads, and spur roads could loosen soil and trigger or accelerate erosion. SDG&E's APMs GEO-APM-1, -2, -5, and -6 (see Table D.13-11) reduce the amount of erosion that would result from construction by: limiting grading of existing roads in areas with sensitive soils, planning construction to minimize new ground disturbance, use of Best Management Practices (BMPs) such as sand bags and road bars, to control water erosion, and limiting construction traffic. In addition, a Stormwater Pollution Prevention Plan (SWPPP) that would limit erosion from the construction site would be required in accordance with the Clean Water Act. This would result in a less than significant impact (Class III).

Impact G-6: Project would expose people or structures to potential substantial adverse effects as a result of slope instability created during excavation and/or grading (Class II)

Construction consisting of grading and excavation along the foothills between MPs 69.8 to 70.4 and between MPs 80 to 83.5 would cause slope instability. Destabilization of natural or constructed slopes could occur as a result of construction activities due to excavation and/or grading operations. Excavation operations associated with tower foundation construction and grading operations for temporary and permanent access roads and work areas could result in slope instability, resulting in landslides, soil creep, or debris flows. Slope instability including landslides, earth flows, and debris flows has the potential to undermine foundations, cause distortion and distress to overlying structures, and displace or destroy project components. SDG&E's APMs GEO-APM-4 and -8 (see Table D.13-11) would partially reduce impacts related to slope instability by avoiding placing structures in unstable areas and removing or stabilizing

boulders upslope of structures thus reducing the threat of possible slope failures or rockfalls. However, the Proposed Project would still result in significant impacts if unidentified unstable slopes or areas of potentially unstable slopes were disturbed or undercut by construction activities resulting in slope failures. Slope failures would cause damage to the environment, to project or other nearby structures, and would potentially cause injury or death to workers and/or the public, a significant impact. To ensure that slope instability impacts would be reduced to less than significant (Class II), implementation of Mitigation Measure G-6a is required from between MPs 69.8 to 70.4 and between MPs 80 to 83.5 to delineate potential areas of unstable slopes near and within work areas and minimize construction-triggered slope failures by avoidance or implementation of slope stabilizing design measures.

Mitigation Measure for Impact G-6: Project would expose people or structures to potential substantial adverse effects as a result of slope instability created during excavation and/or grading

G-6a **Conduct geotechnical surveys for landslides and protect against slope instability.** The design-level geotechnical surveys conducted by the Applicant shall perform slope stability analyses in areas in areas of planned grading and excavation that cross and are adjacent to hills and mountains. These surveys will acquire data that will allow identification of specific areas with the potential for unstable slopes, landslides, earth flows, and debris flows along the approved transmission line route and in other areas of ground disturbance, such as grading for access and spur roads. The investigations shall include an evaluation of subsurface conditions, identification of potential landslide hazards, and provide information for development of excavation plans and procedures. If the results of the geotechnical survey indicate the presence of unstable slopes at or adjacent to Proposed Project structures, appropriate support and protection measures shall be designed and implemented to maintain the stability of slopes adjacent to newly graded or re-graded access roads, work areas, and project structures during and after construction, and to minimize potential for damage to project facilities. These design measures shall include, but are not limited to, retaining walls, visquene, removal of unstable materials, and avoidance of highly unstable areas. SDG&E shall document compliance with this measure prior to the final project design by submitting a report to the CPUC for review and approval at least 60 days before construction. The report shall document the investigations and detail the specific support and protection measures that will be implemented.

Operational Impacts

Impact G-3: Project would expose people or structures to potential substantial adverse effects as result of problematic soils (Class II)

Soils along this segment of the proposed route have a moderate to high potential to corrode steel and a low to moderate to corrode concrete. Corrosive subsurface soils may exist in places along the proposed route. Expansion potential for the soils along the segment ranges from low to high. Application of standard design and construction practices and implementation of GEO-APM-3 (see Table D.13-11) would partially reduce the adverse affects of problematic soils by avoiding placement of structures in areas of high shrink/swell potential, to the extent feasible. However, actual locations of high shrink/swell (expansive) soils and the presence, absence, and location of corrosive soils needs to be determined to fully reduce the potential for adverse affects of problematic soils to less than significant. Unidentified expansive and corrosive soils could damage project structures and facilities potentially resulting in collapse. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to nearby people, a significant impact. Accordingly, implementation of Mitigation Measure G-3a (Conduct geotechnical studies for soils to assess characteristics and

aid in appropriate foundation design) is required ensure that impacts associated with problematic soils are reduced to less than significant levels (Class II). The full text of the mitigation measures can be found in Appendix 12.

Mitigation Measure for Impact G-3: Project structures would expose people or structures to potential substantial adverse effects as result of problematic soils

G-3a Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design.

Impact G-4: Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure (Class II)

Moderate to severe groundshaking should be expected in the event of an earthquake on the faults in the Anza-Borrego Link area and from other major faults in the region, with estimated PGAs ranging from 0.3 to 0.7 g. It is likely that the project facilities would be subjected to at least one moderate or larger earthquake occurring close enough to produce severe to strong groundshaking in the Anza-Borrego Link area. SDG&E indicates in the PEA that project structures would be designed to withstand geologically induced stresses and that appropriate tower design accounting for lateral wind loads and conductor loads would likely exceed any creditable seismic loading, minimizing potential damage to tower structures from groundshaking. However, portions of the Anza Borrego Link alignment would be subject to local strong to severe groundshaking with vertical and horizontal ground accelerations that could exceed lateral wind loads, resulting in damage or collapse of project structures. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to people, a significant impact. Therefore, to ensure that project structures are not damaged by strong to severe groundshaking, implementation of Mitigation Measure G-4a (Reduce effects of groundshaking) is required, reducing impacts to less than significant (Class II).

Additionally, severe to strong groundshaking could result in seismically induced ground failures, including liquefaction-related phenomena and slope failures, along the Anza-Borrego Link. Portions of the proposed Anza-Borrego segment cross active river washes and streams where potentially liquefiable lenses and pockets of loose seasonally saturated sand may be present. This could result in liquefaction damage to project structures should a large earthquake occur while these soils are saturated, a significant impact. Seismically induced slope failures such as landslides and rockfalls could also occur along portions of the ROW in areas along and below moderate to steep slopes, between MPs 69.8 to 70.4 and between MPs 80 to 83.5, event of a large earthquake on nearby faults resulting in damage to or collapse of tower structures, a significant impact. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to people, a significant impact. However, to ensure that impacts associated with strong groundshaking and seismically induced ground failures would be reduced to less than significant levels (Class II), implementation of Mitigation Measures G-4b (Conduct geotechnical investigations for liquefaction) and G-6a (Conduct geotechnical surveys for landslides and protect against slope instability) are required.

Mitigation Measure for Impact G-4: Project would expose people or structures to potential substantial adverse effects as result of seismically induced groundshaking and/or ground failure

G-4a Reduce effects of groundshaking.

G-4b Conduct geotechnical investigations for liquefaction.

G-6a Conduct geotechnical surveys for landslides and protect against slope instability.

Impact G-7: Project would expose people or structures to potential substantial adverse effects as a result of landslides, earthflows, debris flows, and/or rockfall (Class II)

Slope instability including landslides, earth flows, debris flows, and rockfall during project operation has the potential to undermine foundations, cause distortion and distress to overlying structures, and displace or destroy project components or other nearby structures. The area where landslides could occur along the Anza-Borrogo Link is along the slopes between MPs 69.8 to 70.4 and between MPs 80 to 83.5 where towers are fairly close to the base of the mountains. SDG&E has proposed APMs GEO-APM-4 and -8 (see Table D.13-11) to ensure that project structures are located outside of areas with unstable slopes and that boulders are removed from slopes or stabilized. However, unidentified unstable slopes or areas of potentially unstable slopes could fail during the lifetime of the Proposed Project. Slope failures could cause collapse of project structures resulting in power outages, damage to nearby roads or structures, and injury or death to people, a significant impact. Implementation of Mitigation Measure G-6a (Conduct geotechnical surveys for landslides and protect against slope instability) is required between MPs 69.8 to 70.4 and between MPs 80 to 83.5. Mitigation Measure G-6a would reduce the impact to less than significant (Class II) by identification of potential slope failure sources, allowing project design to avoid them or implement slope stabilization practices.

Mitigation Measure for Impact G-7: Project would expose people or structures to potential substantial adverse effects as a result of landslides, earthflows, debris flows, and/or rockfall

G-6a Conduct geotechnical surveys for landslides and protect against slope instability.

D.13.7 Central Link Impacts and Mitigation Measures

The Central Link of the Proposed Project would include the termination of the new 500 kV transmission, the new Central East Substation, and a double-circuit 230 kV transmission line. The Central Link construction would include a total of 123 new 230 kV structures and 35 new 500 kV lattice towers, and associated access and spur roads. In addition, an existing 69 kV line in the Santa Ysabel area would be relocated to be adjacent to the new 230 kV line.

Environmental Impacts and Mitigation Measures

Construction Impacts

Impact G-1: Erosion would be triggered or accelerated due to construction activities (Class III)

Soils along this segment of the proposed route have a potential hazard of erosion for off-road/off-trail ranging from slight to very severe and for on-road/on-trail ranging from slight to severe. Excavation and grading for tower foundations, work areas, access roads, and spur roads could loosen soil and trigger or accelerate erosion. SDG&E's APMs GEO-APM-1, -2, -5, and -6 (see Table D.13-11) reduce the amount of erosion that would result from construction by limiting construction traffic and grading of existing roads in areas with sensitive soils, planning construction to minimize new ground disturbance, and by using Best Management Practices (BMPs) such as sand bags and road bars, to control water erosion. In addition, a Stormwater Pollution Prevention Plan (SWPPP) that would limit erosion from the construction site would be prepared in accordance with the Clean Water Act. These requirements would ensure that impacts are less than significant level (Class III); no mitigation is required.

Impact G-6: Project would expose people or structures to potential substantial adverse effects as a result of slope instability created during excavation and/or grading (Class II)

Construction consisting of grading and excavation would cause slope instability along the Central Link along portions of the ROW through Grapevine and Hoover Canyons where the towers are close to the base of the mountains and are along and below moderate slopes. Destabilization of natural or constructed slopes could occur as a result of construction activities due to excavation and/or grading operations. Excavation operations associated with tower foundation construction and grading operations for temporary and permanent access roads and work areas would result in slope instability, resulting in landslides, soil creep, or debris flows. Slope instability including landslides, earth flows, and debris flows would potentially undermine foundations, cause distortion and distress to overlying structures, and displace or destroy project components. SDG&E's APMs GEO-APM-4 and -8 (see Table D.13-11) would partially reduce impacts related to slope instability by avoiding placing structures in unstable areas and removing or stabilizing boulders upslope of structures thus reducing the threat of possible slope failures or rockfalls. However, the Proposed Project would still result in significant impacts as unidentified unstable slopes or areas of potentially unstable slopes would potentially be disturbed or undercut by construction activities resulting in slope failures. Slope failures would potentially cause damage to the environment, to project or other nearby structures, and would potentially cause injury or death to workers and/or the public. Therefore, the Proposed Project would cause a significant impact. To ensure that slope instability impacts would be reduced to less than significant (Class II), implementation of Mitigation Measure G-6a (Conduct geotechnical surveys for landslides and protect against slope instability) is required in Grapevine and Hoover Canyons to delineate potential areas of unstable slopes near and within work areas and minimize construction-triggered slope failures by avoidance or implementation of slope stabilizing design measures. The full text of the mitigation measures can be found in Appendix 12.

Mitigation Measure for Impact G-6: Project would expose people or structures to potential substantial adverse effects as a result of slope instability created during excavation and/or grading

G-6a Conduct geotechnical surveys for landslides and protect against slope instability.

Operational Impacts

Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils (Class II)

Soils along the proposed Central Link route have a moderate potential to corrode steel and a low to moderate potential to corrode concrete. Corrosive subsurface soils may exist in places along the proposed route. Expansion potential for the soils along the segment ranges from low to moderate. Application of standard design and construction practices and implementation of GEO-APM-3 (see Table D.13-11) would partially reduce the adverse affects of problematic soils by avoiding placement of structures in areas of high shrink/swell potential, to the extent feasible. However, actual locations of high shrink/swell (expansive) soils and the presence, absence, and location of corrosive soils needs to be determined to fully reduce the potential for adverse affects of problematic soils to less than significant. Unidentified expansive and corrosive soils could damage project structures and facilities potentially resulting in collapse. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to nearby people, a significant impact. Accordingly, implementation of Mitigation Measure G-3a (Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design) would ensure that impacts associated with problematic soils are reduced to less than signifi-

cant levels (Class II). Knowledge of soil characteristics would allow specific tower design, ensuring structural integrity.

Mitigation Measure for Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils

G-3a Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design.

Impact G-4: Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure (Class II)

Moderate to strong groundshaking should be expected in the event of an earthquake on the faults in the Central Link area and from other major faults in the region, with estimated PGAs ranging from 0.2 to 0.6 g. It is likely that the project facilities would be subjected to at least one moderate or larger earthquake occurring close enough to produce strong groundshaking in the Central Link area. SDG&E indicates in the PEA that project structures would be designed to withstand geologically induced stresses and that appropriate tower design accounting for lateral wind loads and conductor loads would likely exceed any creditable seismic loading, minimizing potential damage to tower structures from groundshaking. However, portions of the Central Link alignment would be subject to local strong groundshaking with vertical and horizontal ground accelerations that could exceed lateral wind loads, resulting in damage or collapse of project structures. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to people, a significant impact. Therefore, to ensure that project structures are not damaged by strong groundshaking, implementation of Mitigation Measure G-4a (Reduce effects of groundshaking) would be required to ensure that project structures are not damaged by strong groundshaking, reducing impacts to less than significant (Class II).

Strong groundshaking would potentially result in seismically induced ground failures, including liquefaction-related phenomena and slope failures, along the Central Link. In the event a large earthquake occurs while there are seasonally saturated lenses and pockets of loose sand in areas where this Link crosses active river washes, streams, and floodplains, these sediments may liquefy, resulting in damage to project structures, a significant impact. Seismically induced slope failures such as landslides and rockfalls could occur in the event of a large earthquake along portions of the ROW through Grapevine and Hoover Canyons along and below moderate slopes resulting in damage to tower structures, a significant impact. Implementation of Mitigation Measures G-4b (Conduct geotechnical investigations for liquefaction) and G-6a (Conduct geotechnical surveys for landslides and protect against slope instability) would ensure that impacts associated with strong groundshaking and seismically induced ground failures are less than significant (Class II).

Mitigation Measure for Impact G-4: Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure

G-4a Reduce effects of groundshaking.

G-4b Conduct geotechnical investigations for liquefaction.

G-6a Conduct geotechnical surveys for landslides and protect against slope instability.

Impact G-5: Project would expose people or structures to potential substantial adverse effects as a result of surface fault rupture at crossings of active faults (Class II)

Project facilities would be subject to hazards of surface fault rupture at crossing of the active Elsinore Fault (Julian Segment), a significant impact. In general, GEO-APM-4 requires that project structures be placed in stable areas avoiding fault lines. However, how fault lines shall be avoided and how the surface traces of the active faults will be accurately located is not specified and project structures would potentially be damaged or collapse in the event of fault rupture beneath or adjacent to a tower due to inaccurate fault location during project design. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to people, a significant impact. Therefore, Mitigation Measure G-5a (Minimize project structures within active fault zones) is required for fault crossings to minimize the length of transmission line within fault zones and prevent placement of tower structures on active fault traces, to reduce the impact to less than significant levels (Class II). Impacts associated with overhead active fault crossings would be reduced to less than significant levels (Class II) with implementation of Mitigation G-5a because conductor would be able to distribute fault displacements over a comparatively long span and towers would be less likely to collapse in the event of an earthquake if not placed directly on an active fault trace.

Mitigation Measure for Impact G-5: Project would expose people or structures to potential substantial adverse effects as a result of surface fault rupture at crossings of active faults

G-5a Minimize project structures within active fault zones.

Impact G-7: Project would expose people or structures to potential substantial adverse effects as a result of landslides, earthflows, debris flows, and/or rockfall (Class II)

Slope instability including landslides, earth flows, debris flows, and rockfall during project operation has the potential to undermine foundations, cause distortion and distress to overlying structures, and displace or destroy project components. Slope failure such as landslides and rockfalls could occur along the Central Link along portions of the ROW through Grapevine and Hoover Canyons where the towers are close to the base of the mountains and are along and below moderate slopes. SDG&E's APMs GEO-APM-4 and -8 (see Table D.13-11) would partially reduce impacts related to landslide hazards during operations of the project. However, unidentified unstable slopes or areas of potentially unstable slopes could fail during the lifetime of the Proposed Project. Slope failures would cause collapse of project structures resulting in power outages, damage to nearby roads or structures, and injury or death to nearby people, a significant impact. To ensure that landslide impacts to project structures would be reduced to less than significant levels (Class II), implementation of Mitigation Measure G-6a (Conduct geotechnical surveys for landslides and protect against slope instability) is required along portions of the alignment in Grapevine and Hoover Canyons. This measure would allow tower design to incorporate site specific protection to improve stability.

Mitigation Measure for Impact G-7: Project would expose people or structures to potential substantial adverse effects as a result of landslides, earthflows, debris flows, and/or rockfall

G-6a Conduct geotechnical surveys for landslides and protect against slope instability.

Proposed Central East Substation

The new Central East Substation would include construction of buildings and facilities capable of accommodating one 500 kV transmission line from the Imperial Valley Substation and two 230 kV transmission lines going to the Sycamore Canyon Substation. Construction of the proposed substation would include site grading, installation of a 1.07-mile access road extending from S-2 to the substation gate, a

drainage plan, property and substation fencing, landscaping and installation of electrical facilities. Approximately 106 acres would be disturbed for construction of the substation site, and approximately 1.5 to 1.8 million cubic yards of cut and fill earthwork would be needed.

Environmental Impacts and Mitigation Measures

Construction Impacts

Impact G-1: Erosion would be triggered or accelerated due to construction activities (Class III)

The soils at the proposed substation site have a ranked potential hazard of erosion for off-road/off-trail of moderate and for on-road/on-trail of severe. Excavation and grading for construction of the substation and associated facilities would loosen soil and trigger or accelerate erosion. SDG&E's APMs GEO-APM-1, -2, -5, and -6 (see Table D.13-11) reduce the amount of erosion that would result from construction by limiting construction traffic and grading of existing roads in areas with sensitive soils, planning construction to minimize new ground disturbance, and by using Best Management Practices (BMPs) such as sand bags and road bars, to control water erosion. In addition, a Stormwater Pollution Prevention Plan (SWPPP) that would limit erosion from the construction site would be required in accordance with the Clean Water Act. This would result in a less than significant impact (Class III)

Operational Impacts

Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils (Class II)

Soils at the proposed substation site have a moderate potential to corrode both steel and concrete. Corrosive subsurface soils may exist in places at the proposed substation site. Expansion potential for the soils at the proposed substation site ranges from low to moderate. Application of standard design and construction practices and implementation of GEO-APM-3 (see Table D.13-11) would partially reduce the adverse affects of problematic soils by avoiding placement of structures in areas of high shrink/swell potential, to the extent feasible. However, actual locations of high shrink/swell (expansive) soils and the presence, absence, and location of corrosive soils needs to be determined to fully reduce the potential for adverse affects of problematic soils to less than significant. Unidentified expansive and corrosive soils could damage project structures and facilities potentially resulting in collapse. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to nearby people, a significant impact. Accordingly, implementation of Mitigation Measure G-3a (Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design) would ensure that potential impacts associated with problematic soils are reduced to less than significant levels (Class II).

Mitigation Measure for Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils

G-3a Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design.

Impact G-4: Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure (Class III)

Low to moderate groundshaking is expected at the proposed substation site in the event of an earthquake on the faults in the region, with estimated PGAs ranging from 0.2 to 0.3 g. SDG&E would fol-

low all applicable building codes and standard practices for substation construction including the Institute of Electrical and Electronics Engineers (IEEE) 693 “Recommended Practices for Seismic Design of Substations” and the 2001 California Building Code, As a result, potential impacts would be less than significant (Class III).

Impact G-5: Project would expose people or structures to potential substantial adverse effects as a result of surface fault rupture at crossings of active and potentially active faults (Class II)

For aboveground installations such as substations near active faults, SDG&E would follow standard design codes for facilities in seismic zones. In general, GEO-APM-4 requires that project structures be placed in stable areas avoiding fault lines. Although the proposed East Central Substation is not crossed by a mapped active fault, strands of the active Earthquake Valley fault trend directly toward the substation site, as shown in Figure D.13-9. The southern portion of the Earthquake Valley Fault is included in an Alquist-Priolo zone. If the substation facilities straddled unmapped but active strands of this fault, they would potentially be damaged by rupture propagated along the fault, a significant impact. This impact would be reduced to less than significant with implementation of Mitigation Measure G-5b (Class II).

Mitigation Measure for Impact G-5: Project would expose people or structures to potential substantial adverse effects as a result of surface fault rupture at crossings of active and potentially active faults

G-5b Minimize substation structures within active fault zones. SCE shall perform a geologic/geotechnical study to confirm the location of mapped traces of active and potentially active faults crossing the Central East Substation site. If active fault traces are identified by this study, the control building placement at the substation shall follow setback as required by California and San Diego County building codes. Other substation facilities and structures shall be placed so as not to straddle the active fault traces and shall be placed as far as feasible outside the area of mapped fault traces. Compliance with this measure shall be documented to the CPUC and BLM in a report submitted for review and approval at least 60 days prior to final project design.

Figure D.13-9. Earthquake Valley Fault Zone Crossing
[CLICK HERE TO VIEW](#)

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D.13.8 Inland Valley Link Impacts and Mitigation Measures

The Inland Valley Link consists of double-circuit 230 kV transmission lines including both overhead and underground segments. The overhead portion includes 125 new double-circuit 230 kV structures and two tubular steel transition structures located at each end of the underground segment. The Inland Valley Link would be underground between MP 117.2 and MP 121.2, following an unpaved access road within the Mount Gower Open Space Preserve and then following the Gunn Stage Road and San Vicente Road ROW in a southeasterly direction. Two trenches, separated by 20 feet, would be excavated for the double-circuit 230 kV underground segments within the Inland Valley Link.

Environmental Impacts and Mitigation Measures

Construction Impacts

Impact G-1: Erosion would be triggered or accelerated due to construction activities (Class III)

Soils along the proposed Inland Valley Link route have a potential hazard of erosion for off-road/off-trail ranging from slight to very severe and for on-road/on-trail ranging from slight to severe. Excavation and grading for tower foundations, work areas, access roads, and spur roads could loosen soil and trigger or accelerate erosion. SDG&E's APMs GEO-APM-1, -2, -5, and -6 (see Table D.13-11) reduce the amount of erosion that would result from construction by limiting construction traffic and grading of existing roads in areas with sensitive soils, planning construction to minimize new ground disturbance, and by using Best Management Practices (BMPs) such as sand bags and road bars, to control water erosion. In addition, a Stormwater Pollution Prevention Plan (SWPPP) that would limit erosion from the construction site would be required in accordance with the Clean Water Act. This would result in a less than significant impact (Class III).

Impact G-6: Project would expose people or structures to potential substantial adverse effects as a result of slope instability created during excavation and/or grading (Class II)

Construction consisting of grading and excavation along and adjacent to slopes underlain by the landslide prone Poway Group units could cause slope instability. Excavation operations associated with tower foundation construction, trenching for the underground section, and grading operations for temporary and permanent access roads and work areas could result in slope instability, that could undermine foundations, cause distortion and distress to overlying structures, and displace or destroy project components. SDG&E's APMs GEO-APM-4 and -8 (see Table D.13-11) would partially reduce impacts related to slope instability by avoiding placing structures in unstable areas and removing or stabilizing boulders upslope of structures thus reducing the threat of possible slope failures or rockfalls. However, the Proposed Project would still result in significant impacts if unidentified unstable slopes or areas of potentially unstable slopes were disturbed or undercut by construction activities resulting in slope failures. Slope failures could cause damage to the environment, to project or other nearby structures, and could cause injury or death to workers and/or the public, a significant impact. To ensure that slope instability impacts would be reduced to less than significant (Class II), implementation of Mitigation Measure G-6a (Conduct geotechnical surveys for landslides and protect against slope instability) is required in areas where the ROW traverses along and adjacent to slopes underlain by the landslide prone Poway Group to delineate potential areas of unstable slopes near and within work areas and minimize the potential from construction-triggered slope failures by avoidance or implementation of slope stabilizing design measures.

Mitigation Measure for Impact G-6: Project would expose people or structures to potential substantial adverse effects as a result of slope instability created during excavation and/or grading

G-6a Conduct geotechnical surveys for landslides and protect against slope instability.

Operational Impacts

Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils (Class II)

Soils along this segment of the proposed route have a moderate to high potential to corrode steel and a low to high potential to corrode concrete. Corrosive subsurface soils may exist in places along the proposed route. Expansion potential for the soils along the segment ranges from low to high. Application of standard design and construction practices and implementation of GEO-APM-3 (see Table D.13-11) would partially reduce the adverse effects of problematic soils by avoiding placement of structures in areas of high shrink/swell potential, to the extent feasible. However, actual locations of high shrink/swell (expansive) soils and the presence, absence, and location of corrosive soils needs to be determined to fully reduce the potential for adverse effects of problematic soils to less than significant. Unidentified expansive and corrosive soils could damage project structures and facilities potentially resulting in collapse. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to nearby people, a significant impact. Accordingly, implementation of Mitigation Measure G-3a (Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design) would ensure that potential impacts associated with problematic soils are reduced to less than significant levels (Class II).

Mitigation Measure for Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils

G-3a Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design.

Impact G-4: Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure (Class II and III)

Moderate groundshaking should be expected in the event of an earthquake on the faults in the Central Link area and from other major faults in the region, with estimated PGAs ranging from 0.1 to 0.4 g. It is likely that the project facilities would be subjected to at least one moderate or larger earthquake occurring close enough to produce severe to strong groundshaking in the Inland Valley Link area. Appropriate tower design accounting for lateral wind loads and conductor loads would likely exceed any creditable seismic loading minimizing potential damage to tower structures from moderate groundshaking, so the impact would be less than significant (Class III).

Moderate groundshaking could potentially result in seismically induced ground failures, including liquefaction-related phenomena and slope failures, along the Inland Valley Link. Portions of this Link cross active river washes, streams, and floodplains (i.e., Swartz Canyon, San Vicente Creek, and other stream drainages that cross the proposed ROW) where lenses and pockets of loose sand may be present and may become saturated seasonally. Such sediments could liquefy should a large earthquake occur while these soils are saturated, resulting in damage to project structures, a significant impact. Seismically induced slope failures such as landslides could also occur in the event of a large earthquake and would

occur along portions of the ROW along and adjacent to slopes underlain by the landslide prone Poway Group units, resulting in damage to or collapse of tower structures. Collapse of project structures would result in power outages, damage to nearby roads or structures, and injury or death to nearby people, a significant impact. To ensure that impacts associated with strong groundshaking and seismically induced ground failures are reduced to less than significant levels (Class II), implementation of Mitigation Measures G-4b (Conduct geotechnical investigations for liquefaction) and G-6a (Conduct geotechnical surveys for landslides and protect against slope instability) is required.

Mitigation Measure for Impact G-4: Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure

G-4b Conduct geotechnical investigations for liquefaction.

G-6a Conduct geotechnical surveys for landslides and protect against slope instability.

Impact G-7: Project would expose people or structures to potential substantial adverse effects as a result of landslides, earthflows, debris flows, and/or rockfall (Class II)

Slope instability including landslides, earth flows, and debris flows during project operation has the potential to undermine foundations, cause distortion and distress to overlying structures, and displace or destroy project components. The areas where landslides could occur along the Inland Valley Link are along and adjacent to slopes underlain by the landslide prone Poway Group units. SDG&E's APMs GEO-APM-4 and -8 (see Table D.13-11) would partially reduce impacts related to landslide hazards during operations of the project. However, unidentified unstable slopes or areas of potentially unstable slopes could fail during the lifetime of the Proposed Project. Slope failures could cause collapse of project structures resulting in power outages, damage to nearby roads or structures, and injury or death to nearby people, a significant impact. To ensure that landslide impacts to project structures would be reduced to less than significant levels (Class II), implementation of Mitigation Measure G-6a (Conduct geotechnical surveys for landslides and protect against slope instability) is required in these areas to assure that tower design is appropriate for site conditions.

Mitigation Measure for Impact G-7: Project would expose people or structures to potential substantial adverse effects as a result of landslides, earthflows, debris flows, and/or rockfall

G-6a Conduct geotechnical surveys for landslides and protect against slope instability.

D.13.9 Coastal Link Impacts and Mitigation Measures

The Coastal Link of the Proposed Project consists of construction of a single-circuit 230 kV transmission line between Sycamore Canyon Substation (MP 136.3) and the existing Peñasquitos Substation (MP 149.9). The Coastal Link of the Proposed Project would consist of both overhead and underground segments. The overhead portion of this link would require construction of 48 new structures and the underground portion would require excavation of a single trench for the single-circuit 230 kV line.

Environmental Impacts and Mitigation Measures

Construction Impacts

Impact G-1: Erosion would be triggered or accelerated due to construction activities (Class III)

Soils along this segment of the proposed route have a potential hazard of erosion for off-road/off-trail ranging from slight to very severe and for on-road/on-trail ranging from slight to severe. Excavation and grading for tower foundations, work areas, access roads, and spur roads would loosen soil and trigger or accelerate erosion. No areas of desert pavement are expected to occur along this link. SDG&E's APMs GEO-APM-1, -2, -5, and -6 (see Table D.13-11) reduce the amount of erosion that would result from construction by limiting construction traffic and grading of existing roads in areas with sensitive soils, planning construction to minimize new ground disturbance, and by using Best Management Practices (BMPs) such as sand bags and road bars, to control water erosion. In addition, a Stormwater Pollution Prevention Plan (SWPPP) that would limit erosion from the construction site would be required in accordance with the Clean Water Act. This would result in an adverse but less than significant impact (Class III).

Impact G-6: Project would expose people or structures to potential substantial adverse effects as a result of slope instability created during excavation and/or grading (Class II)

Construction consisting of grading and excavation along and adjacent to slopes underlain by the landslide prone Poway and La Jolla Group units could cause slope instability. Excavation operations associated with tower foundation construction, trenching for the underground section, and grading operations for temporary and permanent access roads and work areas could result in slope instability, that could undermine foundations, cause distortion and distress to overlying structures, and displace or destroy project components. SDG&E's APMs GEO-APM-4 and -8 (see Table D.13-11) would partially reduce impacts related to slope instability by avoiding placing structures in unstable areas and removing or stabilizing boulders upslope of structures thus reducing the threat of possible slope failures or rockfalls. However, the Proposed Project would still result in significant impacts if unidentified unstable slopes or areas of potentially unstable slopes were disturbed or undercut by construction activities resulting in slope failures. Slope failures could cause damage to the environment, to project or other nearby structures, and could cause injury or death to workers and/or the public, a significant impact. To ensure that slope instability impacts would be reduced to less than significant (Class II), implementation of Mitigation Measure G-6a (Conduct geotechnical surveys for landslides and protect against slope instability) is required in areas where the ROW traverses along and adjacent to slopes underlain by the landslide-prone Poway and La Jolla Group units to delineate areas of unstable slopes and to minimize the potential from construction-triggered slope failures by avoidance or implementation of slope stabilizing design measures. The full text of the mitigation measures can be found in Appendix 12.

Mitigation Measure for Impact G-6: Project would expose people or structures to potential substantial adverse effects as a result of slope instability created during excavation and/or grading

G-6a Conduct geotechnical surveys for landslides and protect against slope instability.

Operational Impacts

Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils (Class II)

Soils along the proposed Coastal Link route have a moderate to high potential to corrode steel and a low to high potential to corrode concrete. Corrosive subsurface soils may exist in places along the proposed route. Expansion potential for the soils along the segment ranges from low to high. Application of standard design and construction practices and implementation of GEO-APM-3 (see Table D.13-11) would partially reduce the adverse affects of problematic soils by avoiding placement of structures in areas of high shrink/swell potential, to the extent feasible. However, actual locations of high shrink/swell (expansive) soils and the presence, absence, and location of corrosive soils needs to be determined to fully reduce the potential for adverse affects of problematic soils to less than significant. Unidentified expansive and corrosive soils would damage project structures and facilities potentially resulting in collapse. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to nearby people, a significant impact. Accordingly, implementation of Mitigation Measure G-3a (Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design) would ensure that impacts associated with problematic soils are reduced to less than significant levels (Class II).

Mitigation Measure for Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils

G-3a Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design.

Impact G-4: Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure (Class II and III)

Moderate groundshaking should be expected in the event of an earthquake on the faults in the Coastal Link area and from other major faults in the region, with estimated PGAs ranging from 0.1 to 0.4 g. It is likely that the project facilities would be subjected to at least one moderate or larger earthquake occurring close enough to produce moderate groundshaking in the Coastal Link area. Appropriate tower design accounting for lateral wind loads and conductor loads would likely exceed any creditable seismic loading minimizing potential damage to tower structures from moderate groundshaking, reducing impacts to less than significant (Class III).

Moderate groundshaking along the Coastal Link could result in seismically induced ground failures, including liquefaction-related phenomena and slope failures. Portions of this Link that cross alluvial deposits in Los Peñasquitos Canyon, where lenses and pockets of loose sand may be present and may become saturated seasonally. These sediments could liquefy should a large earthquake occur while these soils are saturated, resulting in damage to project structures, a significant impact. Seismically induced slope failures such as landslides could occur in the event of a large earthquake along portions of the ROW along and adjacent to slopes underlain by the landslide prone Poway and La Jolla Group units, resulting in damage to or collapse of tower structures. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to nearby people, a significant impact. To ensure that impacts associated with strong groundshaking and seismically induced ground failures would be reduced to less than significant (Class II), implementation of Mitigation Measures G-4b (Conduct geotechnical investigations for liquefaction) and G-6a (Conduct geotechnical surveys for landslides and protect

against slope instability) is required. The investigations required by these studies would allow for appropriate site-specific design, reducing the risk of structure failure.

Mitigation Measure for Impact G-4: Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure

G-4b Conduct geotechnical investigations for liquefaction.

G-6a Conduct geotechnical surveys for landslides and protect against slope instability.

Impact G-7: Project would expose people or structures to potential substantial adverse effects as a result of landslides, earthflows, debris flows, and/or rockfall (Class II)

Slope instability including landslides, earth flows, and debris flows during project operations has the potential to undermine foundations, cause distortion and distress to overlying structures, and displace or destroy project components. The areas where landslides could occur along the Coastal Link are along and adjacent to slopes underlain by the landslide prone Poway and La Jolla Group units. SDG&E's APMs GEO-APM-4 and -8 (see Table D.13-11) would partially reduce impacts related to landslide hazards during operations of the project. However, unidentified unstable slopes or areas of potentially unstable slopes could fail during the lifetime of the Proposed Project. Slope failures could cause collapse of project structures resulting in power outages, damage to nearby roads or structures, and injury or death to nearby people, a significant impact. To ensure that landslide impacts to project structures would be reduced to less than significant levels (Class II), implementation of Mitigation Measure G-6a (Conduct geotechnical surveys for landslides and protect against slope instability) is required in these areas.

Mitigation Measure for Impact G-7: Project would expose people or structures to potential substantial adverse effects as a result of landslides, earthflows, debris flows, and/or rockfall

G-6a Conduct geotechnical surveys for landslides and protect against slope instability.

Modifications to Sycamore Canyon Substation

The existing Sycamore Canyon Substation would be modified to accommodate the termination of three new 230 kV transmission circuits, including installation of line dead-end structures, 230 kV circuit breakers and disconnect switches, other bus support structures, required protection relay panels, and communication interface equipment. All proposed modifications and associated staging and access requirements would be located within the previously disturbed area of SDG&E substation property.

Environmental Impacts and Mitigation Measures

Construction Impacts

Impact G-1: Erosion would be triggered or accelerated due to construction activities (Class III)

Soils underlying the Sycamore Substation, s998, have a potential hazard of erosion for both off-road/off-trail and on road/trail ranges from slight to severe. Excavation for tower and switchyard foundations, and other substation equipment could loosen soil and trigger or accelerate erosion. SDG&E's APMs GEO-APM-1, -2, -5, and -6 (see Table D.13-11) reduce the amount of erosion that would result from construction by limiting construction traffic and grading of existing roads in areas with sensitive soils,

planning construction to minimize new ground disturbance, and by using Best Management Practices (BMPs) such as sand bags and road bars, to control water erosion. In addition, a Stormwater Pollution Prevention Plan (SWPPP) that would limit erosion from the construction site would be required in accordance with the Clean Water Act. This would result in an adverse but less than significant impact (Class III).

Operational Impacts

No new geologic impacts would result at the existing Sycamore Canyon Substation due to operation of new line structures and equipment similar to the respective structures already in place within existing disturbed property of the substation.

Modifications to Peñasquitos Substation

The existing Peñasquitos Substation would be modified to accommodate the termination of one new 230 kV line and would include installation of 230 kV circuit breakers, 230 kV disconnect switches, bus support structures, required protection relay panels, and communication interface equipment. All work and associated staging areas and equipment would be located on previously disturbed areas within the boundaries of the existing SDG&E substation property.

Environmental Impacts and Mitigation Measures

Construction Impacts

Impact G-1: Erosion would be triggered or accelerated due to construction activities (Class III)

Soils underlying the Peñasquitos Substation, s998, have a potential hazard of erosion for both off-road/off-trail and on road/trail ranging from slight to severe. Excavation for tower and switchyard foundations, and other substation equipment could loosen soil and trigger or accelerate erosion. SDG&E's APMs GEO-APM-1, -2, -5, and -6 (see Table D.13-11) reduce the amount of erosion that would result from construction by limiting construction traffic and grading of existing roads in areas with sensitive soils, planning construction to minimize new ground disturbance, and by using Best Management Practices (BMPs) such as sand bags and road bars, to control water erosion. In addition, a Stormwater Pollution Prevention Plan (SWPPP) that would limit erosion from the construction site would be required in accordance with the Clean Water Act. This would result in an adverse but less than significant impact (Class III).

Operational Impacts

No new geologic impacts would result at the existing Peñasquitos Substation due to operation of new line structures and equipment similar to the respective structures already in place within the existing disturbed property of the substation.

D.13.10 Other System Upgrades – Impacts and Mitigation Measures

Additional system upgrades proposed under the SRPL Project include system upgrades at the existing San Luis Rey and South Bay Substations, including modifications to and construction of additional electrical equipment. In addition, the existing 69 kV overhead transmission line between the existing Sycamore Canyon and Elliot Substations would be reconducted.

Reconductor Sycamore Canyon to Elliot 69 kV Line

Impact G-1: Erosion would be triggered or accelerated due to construction activities (Class III)

The soils along the Sycamore Canyon to Elliot 69 kV Line have a ranked potential hazard of erosion for off-road/off-trail of moderate and for on-road/on-trail of severe. The reconductoring would require access road improvements and replacement of 11 existing poles and excavation and grading for these project components could loosen soil and trigger or accelerate erosion. Implementation of SDG&E's APMs GEO-APM-1, -2, -5, and -6 (see Table D.13-11) reduce the amount of erosion that would result from construction by limiting construction traffic and grading of existing roads in areas with sensitive soils, planning construction to minimize new ground disturbance, and by using Best Management Practices (BMPs) such as sand bags and road bars, to control water erosion. In addition, a Stormwater Pollution Prevention Plan (SWPPP) that would limit erosion from the construction site would be required in accordance with the Clean Water Act. This would result in an adverse but less than significant impact (Class III).

Modifications to San Luis Rey Substation

No new geologic impacts would result at the existing San Luis Rey Substation due to addition a third 230/69 kV transformer and associated equipment similar to the respective structures already in place at the substation within the existing disturbed property of the substation.

Modifications to South Bay Substation

No new geologic impacts would result at the existing South Bay Substation due to addition of new 69 kV 50MVAR shunt capacitor and associated equipment similar to the respective structures already in place at the substation within the existing disturbed property of the substation.

D.13.11 Future Transmission System Expansion

The Proposed Project would facilitate the possible future construction of additional 230 kV and 500 kV transmission lines. These lines are not proposed at this time, but because the construction of the Proposed Project would include a substation and create new transmission corridors that could be used by these additional circuits, impact analysis is presented in this EIR/EIS.

The 230 kV expansion facilities are addressed in Sections D.13.11.1 and D.13.11.2; the 500 kV expansion facilities are addressed in Sections D.13.11.3 and D.13.11.4.

D.13.11.1 Environmental Setting

As described in Section B.2.7, the Central East Substation that would be built as a part of the Proposed Project would accommodate up to six 230 kV circuits. Only two circuits are proposed by SDG&E at this time, but construction of additional 230 kV circuits out of the Central East Substation may be required within the next 10 years. This section considers the impacts of construction and operation of these potential future transmission lines. Based on information provided by SDG&E, there are four substation endpoints and five routes that would be most likely for these future lines; each is addressed below. Figure B-12a illustrates the potential routes of each of the 230 kV transmission lines.

Central East Substation to Sycamore Canyon or Peñasquitos Substation

The new 230 kV line would most likely follow the proposed SRPL project route from the Central East Substation to Sycamore Canyon Substation or Peñasquitos Substation. Therefore, the environmental setting for the new 230 kV line would be the same as for the proposed SRPL project. There are several minor deviations along the route as in the Central and Inland Links. In the Central Link the new 230 kV line would diverge from the Proposed Project at approximately MP 100 and follow the Santa Ysabel Existing ROW Alternative route (described in Section D.13.6.1) before rejoining the SRPL route at MP 109.5. In the Inland Valley Link, as well as following the SRPL route, a potential alignment may deviate from the SRPL route and follow the existing 69 kV line to the west past Creelman Substation, remaining north of San Diego Estates, and then turning south to rejoin the proposed SRPL route at MP 123.

Central Link

Geology. The Central Link portion of the Future Expansion along the proposed SRPL project generally traverses sloping hillsides, mountain passes, and valleys from the Central East Substation to approximately to MP 110.8. The project traverses hills on the north and west of the Volcan Mountains, along the southern edge of Valle De San Jose, and along the eastern edge of Santa Ysabel Valley. Geologic units crossed by this segment of the project are alluvium (Qal), folded and faulted alluvial fan deposits (Qco), gabbro and diorite (bi), tonalite and diorite (gr^r), and mixed granitic and metamorphic rocks (gr-m); descriptions of these units are listed in Table D.13-1.

Slope Stability. The new 230 kV Future Expansion transmission line route traverses near and across gently sloping alluvial fans and moderately sloping hillside terrain. This portion of the project does not cross any mapped landslides and the granitic terrain (bi, gr-m, and g^r) underlying the slopes in the area are not typically prone to landslides.

Soils. Three soil associations are mapped along the 230 kV Future Expansion route in the Central Link segment, s1014, s1015 and s1018. Basic characteristics of these soils are presented in Table D.13-2. The Tollhouse–Rock Outcrop–La Posta (s1014) soil association is present in the eastern portion of the segment and is formed primarily on hill slopes underlain by granitic and metamorphic rocks. The western portion of this link is underlain by the Hotaw–Crouch–Boomer association (s1015) which is formed in material weathered from the underlying granitic and metamorphic rocks. Small amounts of the Oak Glen–Mottsville–Calpine association (s1018), which is formed in alluvial deposits, are located along this segment near the southern edge of Valle De San Jose. No soils with desert pavement are mapped along this alignment.

Hazard of erosion for these soils for off-road/off-trail ranges from slight to very severe and for roads/trails ranges from slight to severe. Shrink/swell (expansive) potential of the soils associations along this link varies from low to moderate. Corrosive potential of soils along the Central Link are moderate for uncoated steel and range from low to moderate for concrete.

Mineral Resources. No known active BLM mining claims are identified along this segment. One active quarry site was identified by the MRDS (USGS, 2006a) and the CGS (CDMG, 1999), the Moretti Pit operated by San Diego County of Public Works, located near the northern end of Santa Ysabel Valley. However, this site is located approximately 500 feet north of the Future Expansion along the proposed SRPL project ROW on the other side of Mesa Grande Road. Construction or operation of future new

transmission lines along the Central Link alignment would not interfere with access to this location due to its distance from the ROW and the intervening major road.

Given the distance of this site from the ROW and the ability of mining-related equipment and vehicles to cross the ROW if necessary, construction and operation of the Future Expansion along the proposed SRPL project route in the Central Link is not expected to interfere with future access to any mineral resources.

Seismicity

Fault Rupture. The new 230 kV Future Expansion route would cross the active Elsinore Fault (Julian Segment) at approximately MP 100.1, shown in Figure D.13-7. The fault is included within an Alquist-Priolo zone in the area where the Future Expansion along the proposed SRPL project route crosses the fault. Recent research on the Julian segment of the Elsinore Fault indicates that this segment ruptures infrequently (approximately every 2000-3000 years, with the last earthquake occurring 1500-2000 years ago). Larger earthquakes could potentially result in offsets ranging from 2 to 5 meters, depending on the size of the earthquake and length of the fault rupture (Thorup et al., 1997).

Groundshaking. The Future Expansion along the proposed SRPL project route is in close proximity to the Elsinore and San Jacinto Fault Zones for much of its length. Moderate to strong groundshaking could be caused by a significant earthquake on these faults or any of the other significant active faults in the vicinity of this segment. The peak horizontal accelerations for this route range from 0.2 to 0.6 g, with the highest accelerations where the route crosses and is near the Elsinore Fault and the lowest at the western end.

Liquefaction. Most of this link has minimal potential for liquefaction as it is primarily underlain by igneous bedrock. The Central Link may have moderate potential liquefaction in areas where the Future Expansion along the proposed SRPL project route crosses and is within active river washes and streams where local pockets of saturated and loose sandy soils may be located. These local pockets of loose sandy soils may be present within the flood plains of Matagual Creek, Carrizo Creek, Carrista Creek, and Santa Ysabel Creek and could potentially liquefy in the event of a large earthquake.

Earthquake-Induced Landslides. Most accounts of historical earthquakes in this area describe damaging landslides resulting from earthquake groundshaking (SCEDC, 2006). Most of the Central Link does not cross through areas with significant slopes; Portions of the ROW areas along and near the moderately sloping hills of the Vulcan Mountains may be susceptible to damage from landslides or rockfalls in the event of a large earthquake on nearby faults.

Inland Valley Link

Geology. The new 230 kV Future Expansion route in the Inland Valley Link of the may consist of both overhead and underground transmission line following the proposed SRPL project route, with or without the deviation north of the San Diego Estates area, and would traverse a mix of sloping hillsides, mesa and terraces, and valleys for its entire length between approximately MP 110.8 to MP 136.3. The Future Expansion ROWs in the Inland Valley Link would traverse along the edge of Dye Mountain, through and along Swartz Canyon, near and along San Vicente Creek Canyons, and numerous unnamed hills and mesas dissected by small intervening drainages. The new 230 kV Future Expansion routes in the Inland Valley Link would cross numerous geologic units along its length; geologic units crossed by these routes are alluvium (Qal), Poway Group sedimentary rocks (Ec), gabbro (bi), Santiago Peak Volcanics (JTrv); tonalite

and diorite (gr^d), granodiorite (gr^g), Woodson Mountain Granodiorite (gr⁶), and mixed granitic and metamorphic rocks (gr-m). These units are described in Table D.13-1.

Slope Stability. The 230 kV Future Expansion routes in the Inland Valley Link traverse near and across gently sloping alluvial fans and moderately sloping hillside terrain. The 230 kV Future Expansion routes do not cross any mapped landslides and slopes in the areas underlain by the granitic and volcanic units are not typically prone to landslides. However, portions of the routes in the Inland Valley Link underlain by the landslide prone Poway Group sedimentary rocks may be susceptible to landslides and slope failures (CDMG, 1975).

Soils. Six soil associations are mapped along the Inland Valley Link segment of the 230 kV Future Expansion routes, s998, s999, s1010, s1013, s1015, and s1016. Basic characteristics of these soils are presented in Table D.13-2. The Sesame–Rock Outcrop–Cienba (s1010), Hotaw–Crouch–Boomer (s1015), and Sheephead–Rock Outcrop–Bancas (s1016) soil associations are formed primarily on hill slopes underlain by granitic and metamorphic rocks. The Ramona–Placentia–Linne–Greenfield association (999) is located near the middle of this link near the intersection of Swartz and San Vicente Creek and is generally formed in sandstone and shale. The San Miquel–Friant–Exchequer association (s1013) generally corresponds to areas underlain by the Santiago Peak Volcanics. The western end of this link is underlain by the Urban Land–Redding–Olivenhain association (s998) which is formed alluvial and marine terraces. No soils with desert pavement are mapped along this alignment.

Hazard of erosion for these soils for off-road/off-trail ranges from slight to very severe and for on roads/trails ranges from slight to severe. Shrink/swell (expansive) potential of the soils associations along this link varies from low to high. Corrosive potential of soils along the Inland Valley Link ranges from moderate to high for uncoated steel and from low to high for concrete.

Mineral Resources. No known active mines or BLM mining claims are identified along this segment. Additionally, no known mineral resource sites were identified by the MRDA database along the Inland Valley Link and no active mineral resource sites were identified by the CGS (CDMG, 1999). Construction and operation of the Future Expansion along the proposed SRPL project route in the Inland Valley Link is not expected to interfere with future access to any mineral resources.

Seismicity

Fault Rupture. This segment does not cross any known active faults and is thus not likely to experience damage due to fault rupture and/or offset.

Groundshaking. There are many large regional faults near this link with the potential to generate a significant earthquake; however, due to the distance between the faults and this transmission corridor, groundshaking is not expected. Moderate groundshaking could be caused in portions of this segment by a large earthquake on nearby significant active faults, i.e., the Elsinore or Rose Canyon faults. The peak horizontal accelerations for this segment range from 0.1 to 0.4g, with the highest accelerations in areas underlain by alluvial deposits.

Liquefaction. Most of this link has no to low potential for liquefaction as it is primarily underlain by older igneous, volcanic, and consolidated sedimentary bedrock units. The alluvial deposits may have moderate potential liquefaction in areas where the 230 kV Future Expansion routes cross and are within or near active river washes and streams, and where local pockets of loose sandy soils may have been deposited. These local pockets of loose sandy soils may be present within the flood plains of Swartz

Canyon, Santa Maria Valley, San Vicente Creek, and other stream drainages that cross the project ROW and could potentially liquefy in the event of a large earthquake.

Earthquake-Induced Landslides. Most accounts of historical earthquakes in the San Diego area describe damaging landslides resulting from earthquake groundshaking (SCEDC, 2006). Most of the Inland Valley Link does not cross through areas with significant slopes; however, portions of the project ROW underlain or downslope from the landslide prone Poway Group units may be damaged by seismically induced landslides. Portions of the Inland Valley Link along and near moderate to steep slopes underlain by granitic and volcanic units may be susceptible to damage from rockfall in the event of a large earthquake on nearby regional faults.

Coastal Link

Geology. The Coastal Link of the Future Expansion along the proposed SRPL project route consists of both overhead and underground transmission line and generally traverses a mix of sloping hillsides, mesa and terraces, and valleys along its entire length from approximately MP 136.3 to the end of the project ROW at MP 149.9. The Coastal Link ROW traverses northwest along the mesas and terraces at the heads of San Clemente, Carrol, and Los Peñasquitos Canyons before turning westerly and crossing along the mesa, terraces and hillslopes on the northern side of Los Peñasquitos Canyon. The mesas and terraces crossed by the ROW are dissected by numerous small intervening drainages. Geologic units crossed by this segment of the project are alluvium (Qal), Linda Vista Formation (Qm), Poway Group sedimentary rocks (Ec), La Jolla Group sedimentary rocks (E), Santiago Peak Volcanics (JTrv); and granitic rocks (gr). Descriptions of these units are listed in Table D.13-1.

Slope Stability. The Coastal Link traverses near and across level to gently sloping mesas and terraces and moderately sloping hillside terrain. This portion of the ROW does not cross any mapped landslides. However, much of the of the Coastal Link is underlain by or downslope of the landslide prone Poway Group and La Jolla Group sedimentary rocks and may be susceptible to landslides and slope failures (CDMG, 1975).

Soils. Four soil associations are mapped along the Coastal Link segment of the project route, s997, s998, s1013, and s1019. A summary of the basic characteristics of these soils is presented in Table D.13-2. Most of this link is underlain by soils formed in alluvial and marine terraces: the Redding-Olivenhain association (s997) the Urban Land-Redding-Olivenhain association (s998), and the Las Flores-Antioch association (s1019). The San Miguel-Friant-Exchequer association (s1013) is generally formed in material weathered from metamorphic and metavolcanic rocks. No soils with desert pavement are mapped along this alignment.

Hazard of erosion for these soils for off-road/off-trail ranges from slight to very severe and for on roads/trails ranges from slight to severe. Shrink/swell (expansive) potential of the soils associations along this link varies from low to high. Corrosive potential of soils along the Coastal Link ranges from moderate to high for uncoated steel and from low to high for concrete.

Mineral Resources. No known active mines or BLM mining claims are identified the Coastal Link. Additionally, no known mineral resource sites were identified by the MRDA database along this link and no active mineral resource sites were identified by the CGS (CDMG, 1999). Therefore, construction and operation of the Future Expansion along the proposed SRPL project route in the Coastal Link is not expected to interfere with future access to any mineral resources.

Seismicity

Fault Rupture. This segment does not cross any known active faults and is thus not likely to experience damage due to fault rupture and/or offset.

Groundshaking. There are many large regional faults near this link with the potential to generate a significant earthquake; however, due to their separation from the Coastal Link ROW strong groundshaking is not expected. However, moderate groundshaking could be caused in portions of this segment by a large earthquake on nearby significant active faults, i.e., the Elsinore or Rose Canyon faults. The peak horizontal accelerations for this segment range from 0.1 to 0.4g, with the highest accelerations in areas underlain by alluvial deposits.

Liquefaction. Most of this link has minimal potential for liquefaction as it is primarily underlain by older igneous, volcanic, and consolidated sedimentary bedrock units. The alluvial deposits in Los Peñasquitos Canyon may have moderate potential liquefaction in areas with local pockets of loose sandy soils that may have become saturated and which could potentially liquefy in the event of a large earthquake.

Earthquake-Induced Landslides. Most accounts of historical earthquakes in the San Diego area describe damaging landslides resulting from earthquake groundshaking (SCEDC, 2006). Most of the Coastal Link does not cross through areas with significant slopes. However, portions of the project underlain or downslope from the landslide prone Poway Group and La Jolla Group units may be damaged by seismically induced landslides in the event of a large earthquake on nearby regional faults.

Central East Substation to Mission Substation

The new 230 kV line would most likely follow the proposed SRPL project route from the Central East Substation to the Sycamore Canyon Substation. Therefore, the environmental setting for the future 230 kV line would be the same as for the proposed SRPL project from these locations. At the Sycamore Canyon Substation, the 230 kV line would turn southwest and would most likely follow an existing 69 kV transmission line corridor that runs between Sycamore Canyon and Elliot Substations. Approximately 6.0 miles of the Grazing Land are associated with the existing 69 kV transmission line corridor between the Sycamore Canyon and Elliot Substations. Installation of a future 230 kV line between the Sycamore Canyon and Elliot Substations would occur entirely on undeveloped land under the jurisdiction of the Department of Defense (i.e., MCAS Miramar). From Elliot Substation, the route would continue southwest for an additional 4.0 miles within the existing 69 kV corridor, through Mission Trails Regional Park, and crossing I-15 to terminate at the existing Mission Substation, located at 9060 Friars Road, which is 0.9 miles north of I-8 and 0.25 miles west of I-805. Below is a discussion of the general geology, soils, and seismic characteristics of the segment between the Sycamore Canyon and Mission Substations.

Geology. From the Sycamore Canyon Substation to the Mission Substation the new 230 kV transmission line would cross hills and mountains primarily underlain by Pleistocene Linda Vista Formation (Qm), Eocene Poway Group (Ec) and La Jolla Group (E), and Woodson Mountain Granodiorite (gr) in the Cowles Mountain area. Areas of Quaternary alluvium (Qal) and slopewash (Qt or Qsw) are located in the area where the alignment would cross the edge of Mission Valley. A general description of the characteristic of these units is presented in Table D.13-1.

Slope Stability. Portions of the alignment between Sycamore Canyon and Mission Substations cross gentle to moderate slopes underlain by the landslide prone Mission Valley Formation, which is part of

the Poway Group (Ec) (CDMG, 1962, 1963, and 1975). Areas underlain by or downslope of the landslide prone Poway Group sedimentary rocks and may be susceptible to naturally occurring landslides and slope failures. Additionally, oversteepening or undercutting of slopes naturally or during construction could also result in landslides.

Soils. From the Sycamore Canyon Substation to the Mission Substation the new 230 kV transmission line would be underlain by three mapped soil associations, the Urban Land-Redding-Olivenhain association (s998), the Marina-Urban Land-Chesterton association (s1002), and the san Miquel-Friant-Exchequer association (s1013). No soils with desert pavement are mapped along this alignment. Characteristic of these soils are presented in Table D.13-2.

Mineral Resources. There are no known active mineral resource sites or BLM claims along this portion of the new 230 kV alignment; therefore, there would be no impacts related to accessibility of mineral resources.

Seismicity. This portion of the new 230 kV alignment does not cross nor is in close proximity to any active faults. Estimated PGAs along the alignment range from 0.1g to 0.4g, with the higher PGAs primarily in alluvial areas. Most of this alignment is underlain by bedrock units and would not be susceptible to liquefaction-related phenomena. However, portions of the alignment underlain by alluvium with shallow or perched groundwater could liquefy in the event of a large local earthquake. Most accounts of historical earthquakes in the San Diego area describe damaging landslides resulting from earthquake groundshaking (SCEDC, 2006). Portions of the project cross moderately sloping hillside terrain where seismically induced landslides or rockfall could potentially occur in the event of a large earthquake on nearby regional faults.

Central East Substation to Los Coches Substation

The future 230 kV line would most likely follow the proposed SRPL project route from the Central East Substation to 1.0 mile south of the Creelman Substation (MP 122.2) in the Town of Ramona. Therefore, the environmental setting for the future 230 kV transmission line would be the same as for the proposed SRPL project from these locations. At MP 122.2, the future expansion 230 kV line would most likely turn south following the existing Creelman-Lakeside 69 kV corridor through unincorporated San Diego County and then 1.6 miles through largely hilly open space on the Barona Reservation east of the San Vicente Reservoir and west of the Barona Creek Golf Club, the Barona Valley Resort and Casino, and Oak Oasis Open Space Preserve. The route would then pass through or adjacent to Louis A. Stelzer County Park, cross the San Diego River and terminate at the existing Los Coches Substation 0.3 miles northwest of Lake Jennings near Lake Jennings County Park and the community of Lakeside. Below is a discussion of the general geology, soils, and seismic characteristics of the segment between the Creelman and Los Coches Substations.

Geology. The portion of the alignment between Creelman and Los Coches Substations crosses hill and valley terrain underlain by Quaternary alluvium (Qal), Eocene Pomerado Conglomerate (Ec), Mesozoic granitics consisting of the Bonsal Tonalite (gr₅) and Woodson Mountain Granodiorite (gr₆), and Pre-Cretaceous undifferentiated metamorphic rocks. A general description of the characteristic of these units is presented in Table D.13-1.

Slope Stability. Although this portion of the new 230 kV alignment crosses moderately sloping hillside and valley terrain, it is primarily underlain by granitic and metamorphic bedrock that is not generally susceptible to slope failures.

Soils. Between the Creelman and Los Coches Substations the new 230 kV transmission line would be underlain by four mapped soil associations, the Ramona-Placentia-Linne-Greenfield association (s999), the Marina-Urban Land-Chesterton association (s1002), the Sesame-Rock Outcrop-Cienba association (s1010), and the San Miguel-Friant-Exchequer association (s1013). No soils with desert pavement are mapped along this alignment. Characteristic of these soils are presented in Table D.13-2.

Mineral Resources. There are no known active mineral resource sites or BLM claims along this portion of the new 230 kV alignment; therefore, there would be no impacts related to accessibility of mineral resources.

Seismicity. This portion of the new 230 kV alignment does not cross nor is in close proximity to any active faults. Estimated PGAs along most of the alignment range from 0.1g to 0.2g, with pockets of 0.3 to 0.4g in areas underlain by alluvium. Most of this alignment is underlain by bedrock units and would not be susceptible to liquefaction-related phenomena. However, portions of the alignment underlain by alluvium with shallow or perched groundwater could liquefy in the event of a large local earthquake. Most accounts of historical earthquakes in the San Diego area describe damaging landslides resulting from earthquake groundshaking (SCEDC, 2006). Portions of the project cross moderately sloping hillside terrain where seismically induced landslides or rockfall could potentially occur in the event of a large earthquake on nearby regional faults.

Central East Substation to Escondido Substation

Northern Route. From the proposed Central East Substation, the future 230 kV transmission line route would travel west through Vista Irrigation District land paralleling the proposed SRPL route for approximately 6.6 miles to its intersection with SR79. At SR79 the line would diverge from the proposed SRPL route and would head north parallel to SR79 for approximately 1.2 miles to the intersection of Highway S2 with SR79 at the existing Warner Substation. From there the route would parallel the existing 69 kV corridor west across open space owned by Vista Irrigation District north of Lake Henshaw and then it would turn southwest, following the northwest edge of the lake to SR76.

At SR76 the route would turn west-northwest paralleling SR76 for 13.3 miles following the existing Warners-Rincon 69 kV transmission corridor across and/or bordering parcels of the Cleveland National Forest for approximately 4 miles and across La Jolla Reservation for 6 miles, crossing Cedar Creek, Plaisted Creek and Potrero Creek, and then into Rincon Substation, which is just north of the Rincon Reservation at the Highway S6 intersection with SR76. The hilly route along SR76 is primarily agricultural/open space with scattered rural residences.

At Rincon Substation the route would diverge from SR76 and would follow the existing Rincon-Escondido 69 kV corridor, generally parallel to Highway S6 south, crossing Potrero Creek, San Luis Rey River and a tributary to Paradise Creek, through the Rincon Reservation for 3 miles passing through some medium density single family residential and commercial land uses. South of the Rincon Reservation, the route would turn west in the Valley Center Substation area generally paralleling Highway S6, passing on the west side of Hellhole Canyon County Open Space Preserve (approximately 0.30 miles from the ROW), and then would turn south on the east side of Highway S6 for 1.6 miles before turning southwest, crossing Highway S6, and entering the City of Escondido after approximately 0.75 miles. The new line would most likely run adjacent to or cross Daley Ranch near Escondido. In the City of Escondido, the route would turn south and then southwest for approximately 8 miles following the existing 69 kV corridor into Escondido Substation.

Geology. The alignment for this new 230 kV transmission line would cross a mixture of hillside, mountain, and valley terrain. Geologic units expected to underlie the alignment include: Quaternary alluvium (Qal), Pleistocene nonmarine sedimentary units (Qc and Qco), Mesozoic granitic rocks including tonalite (gr^d) and granodiorite (gr^g), Mesozoic gabbro (bi), and undifferentiated Jurassic metavolcanic rocks (Ju). A general description of the characteristic of these units is presented in Table D.13-1.

Slope Stability. Although this new 230 kV alignment crosses moderately sloping hillside and mountain terrain, the hillside areas are primarily underlain by granitic and metamorphic bedrock that is not generally susceptible to slope failures.

Soils. The Northern Route Central East Substation to Escondido Substation new 230 kV transmission line would cross at least five soil associations. These include the Ramona-Placentia-Linne-Greenfield association (s999), the Sesame-Rock Outcrop-Cienba association (s1010), the Tollhouse-Rock Outcrop-La Posta association (s1014), the Hotaw-Crouch-Boomer association (s1015), and the Oak Glen-Mottsville-Calpine association (s1018). No soils with desert pavement are mapped along this alignment. The basic characteristics of these soil associations are presented in Table D.13-2. Other similar soils may also be encountered along the alignment.

Mineral Resources. There are no known active mineral resource sites or BLM claims along this new 230 kV alignment; therefore, there would be no impacts related to accessibility of mineral resources.

Seismicity. The eastern portion of this alignment is located in a seismically active area. Near the Central East Substation location the alignment would cross the projected trace of the active Earthquake Valley Fault (see Figure D.13-9). West of Warner Substation the alignment would cross and runs along several strands of the Temecula segment of the active Elsinore Fault Zone, from east of Lake Henshaw to and along part of Highway 76 (see Figure D.13-2). The remainder of the alignment does not cross nor is in close proximity to any active faults.

Faults near the eastern end of the alignment capable of causing damage to project structures include local strands of the Elsinore Fault Zone and the San Jacinto Fault Zone. Estimated PGAs along the alignment range from 0.1 g near the western end of the alignment to 0.7g near the eastern end adjacent to Lake Henshaw. Most of this alignment is underlain by bedrock units and would not be susceptible to liquefaction-related phenomena. However, portions of the alignment underlain by alluvium with shallow or perched groundwater could liquefy in the event of a large local earthquake. Most accounts of historical earthquakes in the San Diego area describe damaging landslides resulting from earthquake groundshaking (SCEDC, 2006). Portions of the project cross moderately sloping hillside terrain where seismically induced landslides or rockfall could potentially occur in the event of a large earthquake on nearby regional faults.

Southern Route. This route would follow the Proposed Project route from Central East Substation to Chicarita Substation where it would diverge from the Proposed Project alignment and head north to Escondido Substation. From Chicarita Substation the route would turn north and northwest along existing 230 kV and 69 kV transmission lines for approximately 6.2 miles. At this point the route would follow the existing 69 kV line east and north along the west bank of Lake Hodges, crossing in and out of the City of Escondido, for another 7.2 miles to terminate at Escondido Substation.

Geology. The alignment for this new 230 kV transmission line from Chicarita to Escondido Substations would cross a mixture of hillside, mountain, and valley terrain. Geologic units expected to underlie the alignment include: Quaternary alluvium (Qal), Pleistocene Lindavista Formation (Qm), Eocene Poway

Group (Ec) and La Jolla Group (E), Mesozoic granitic rocks including tonalite (gr^l) and granodiorite (gr^s), Mesozoic gabbro (bi), and Jurassic Santiago Peak Volcanics (JTrv). A general description of the characteristic of these units is presented in Table D.13-1.

Slope Stability. Areas of the Chicarita to Escondido 230 kV alignment crosses moderately sloping hillside and mountain terrain underlain by landslide prone formations of the Poway and La Jolla Groups. Areas underlain by or downslope of the landslide prone Poway and La Jolla Group sedimentary rocks may be susceptible to naturally occurring landslides and slope failures. Additionally, oversteepening or undercutting of these slopes naturally or during construction could also result in landslides. The hillside areas that are primarily underlain by granitic and metamorphic bedrock are not generally susceptible to slope failures.

Soils. The Chicarita Substation to Escondido Substation new 230 kV transmission line route would cross at least four soil associations. These include the Urban Land-Redding-Olivenhain association (s998), the Sesame-Rock Outcrop-Cienba association (s1010), the San Miquel-Friant-Exchequer association (s1013), and the Los Flores-Antioch association (s1019). No soils with desert pavement are mapped along this alignment. The basic characteristics of these soil associations are presented in Table D.13-2. Other similar soils may also be encountered along the alignment.

Mineral Resources. There are no known active mineral resource sites or BLM claims along this new 230 kV alignment; therefore, there would be no impacts related to accessibility of mineral resources.

Seismicity. This new Chicarita to Escondido 230 kV alignment does not cross nor is in close proximity to any active faults. Estimated PGAs along the alignment range from 0.1 g to 0.4g, with the higher PGAs primarily in alluvial areas. Most of this alignment is underlain by bedrock units and would not be susceptible to liquefaction-related phenomena. However, portions of the alignment underlain by alluvium with shallow or perched groundwater could liquefy in the event of a large local earthquake. Most accounts of historical earthquakes in the San Diego area describe damaging landslides resulting from earthquake groundshaking (SCEDC, 2006). Portions of the project cross moderately sloping hillside terrain where seismically induced landslides or rockfall could potentially occur in the event of a large earthquake on nearby regional faults.

D.13.11.2 Environmental Impacts

The future transmission expansion projects, if constructed, would be built by SDG&E because they are located within SDG&E's service territory. While it is likely that SDG&E would implement APMs similar to those that are included in the Sunrise Powerlink application, this cannot be assumed because SDG&E has not submitted an application to construct these projects. As a result, the APMs that were presented for the Proposed Project are converted to as mitigation measures in this section. This analysis also recommends mitigation measures similar to those that are recommended for the Proposed Project.

Construction Impacts

No soils with desert pavement are located along or at the above discussed future transmission expansion projects; therefore Impact G-2 (Unique geologic features would be damaged due to construction activities) would not occur. No active mines or BLM mining claims are located along the alignment and therefore Impact G-9 (Construction activities would interfere with access to known mineral resources) would not occur.

Impact G-1: Erosion would be triggered or accelerated due to construction activities (Class II)

Soils along the Future Expansion route have a potential hazard of erosion for off-road/off-trail ranging from slight to very severe and for on-roads/on-trails ranging from slight to severe. Excavation and grading for tower foundations, trenching for the underground sections, work areas, access roads, and spur roads could loosen soil and accelerate erosion. Mitigation measures would be required to limit grading of existing roads in areas with sensitive soils (Mitigation Measure G-1a). Other mitigation recommended includes use of erosion control procedures such as sand bags and road bars, to control water erosion and limiting construction traffic to minimize erosion (Mitigation Measure G-1b). In addition, a Stormwater Pollution Prevention Plan (SWPPP) that would limit erosion from the construction site would be required in accordance with the Clean Water Act. The implementation of these measures would reduce the potentially significant impact to less than significant levels (Class II). The full text of the mitigation measures can be found in Appendix 12.

Mitigation Measure for Impact G-1: Erosion would be triggered or accelerated due to construction activities

G-1a Limit modification of access roads. Widening or upgrading of existing access roads will be limited in areas where soils are very sensitive to disturbance to the extent feasible. [GEO-APM-1]

G-1b Implement erosion control procedures.

1. Vehicle and construction equipment use will be restricted to access roads and areas in the immediate vicinity of construction work sites to help reduce soil disturbance.
2. In agricultural areas, topsoil would be left in roughened condition.
3. When practical, construction activities will be avoided on wet soil to reduce the potential for soil compaction, rutting, and loss of soil productivity.
4. Disturbed areas will be returned to their pre-construction contours and allowed to revegetate naturally, or will be reseeded with an appropriate seed mixture if necessary.
5. Construction of access roads in inaccessible terrain will be reduced by using helicopters to place structures in select locations. [GEO-APM-2]

Impact G-6: Project would expose people or structures to potential substantial adverse effects as a result of slope instability created during excavation and/or grading (Class II)

Construction consisting of grading and excavation along and adjacent to slopes underlain by landslide prone or potentially unstable units could potentially cause slope instability. Excavation operations associated with tower foundation construction, trenching for the underground sections, and grading operations for temporary and permanent access roads and work areas could result in slope instability, that could undermine foundations, cause distortion and distress to overlying structures, and displace or destroy project components. Significant impacts would occur if unidentified unstable slopes or areas of potentially unstable slopes were disturbed or undercut by construction activities resulting in slope failures. Slope failures could cause damage to the environment, to project or other nearby structures, and could cause injury or death to workers and/or the public, a significant impact. Where slope instability impacts would be significant implementation, of Mitigation Measure G-6a (Conduct geotechnical surveys for landslides and protect against slope instability), Mitigation Measure G-6b (Place structures in stable areas), and Mitigation Measure G-6c (Avoid or remove unstable slope elements) would be applied to reduce the impacts to less than significant (Class II) by delineating potential areas of unstable slopes

near and within work areas and minimizing the potential from construction-triggered slope failures by avoidance or implementation of slope stabilizing design measures.

Mitigation Measure for Impact G-6: Excavation or grading during construction could cause slope instability

- G-6a** **Conduct geotechnical surveys for landslides and protect against slope instability.**
- G-6b** **Place structures in stable areas.** Structures will be placed in geologically stable areas, avoiding fault lines, brittle surface rock and bedrock, etc. to the extent feasible. [GEO-APM-4]
- G-6c** **Avoid or remove unstable slope elements.** During construction, SDG&E would remove or stabilize boulders uphill of structures that pose potentially high risk of landslide damage to those structures and would position structures to span over potential landslide areas to the extent feasible. [GEO-APM-8]

Operational Impacts

Impact G-5 (Project structures could be damaged by surface fault rupture) would only occur in the Central Link segment of the 230 kV Future System Expansion because no active faults are crossed in the Inland Valley or Coastal Link segments.

Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils (Class II)

Soils along the Future Expansion routes have a potential to corrode steel and concrete. Corrosive subsurface soils may exist in places along the Future Expansion routes. There is also potential for soils with expansion potential along the Future Expansion routes. Expansive and corrosive soils could damage project structures and facilities potentially resulting in collapse. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to nearby people, a significant impact. Accordingly, implementation of Mitigation Measures G-3a (Conduct Geotechnical Studies for Soils to Assess Characteristics and Aid in Appropriate Foundation Design) and G-3b (Avoid structure placement in high shrink/swell areas) would be applied to reduce impacts to less than significant (Class II).

Mitigation Measure for Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils

- G-3a** **Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design.**
- G-3b** **Avoid structure placement in high shrink/swell areas.** Structure placement in areas of high shrink/swell potential will be avoided to the extent feasible. [GEO-APM-3]

Impact G-4: Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure (Class II and III)

Moderate to strong groundshaking should be expected in the event of an earthquake on the faults along the Future Expansion areas and from other major faults in the region, with estimated PGAs ranging from 0.2 to 0.6 g. It is likely that the project facilities would be subjected to at least one moderate or larger earthquake occurring close enough to produce strong groundshaking. SDG&E indicates in the SRPL

PEA that project structures would be designed to withstand geologically induced stresses and that appropriate tower design accounting for lateral wind loads and conductor loads would “likely” exceed any creditable seismic loading, minimizing potential damage to tower structures from groundshaking. However, portions of the Future Expansion areas would be subject to local strong groundshaking with vertical and horizontal ground accelerations that could exceed lateral wind loads, resulting in damage or collapse of project structures. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to nearby people, a significant impact. Therefore, to ensure that project structures are not damaged by strong to severe groundshaking, implementation of Mitigation Measure G-4a (Reduce effects of groundshaking) would be applied to reduce impacts to less than significant (Class II).

Strong groundshaking could potentially result in seismically induced ground failures, including liquefaction and slope failures. Portions of the Future Expansion lines that cross active river washes, streams, and floodplains where lenses and pockets of loose sand may be present and may become saturated seasonally, resulting in liquefaction damage to project structures should a large earthquake occur while these soils are saturated, is a potentially significant impact. Slope failures such as landslides and rockfalls could occur in the event of a large earthquake along portions of the Future Expansion routes along and near moderate slopes and areas underlain by the landslide prone Poway Group units, potentially resulting in damage to tower structures, are a significant impact.

Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to nearby people, a significant impact. However, to ensure that impacts associated with strong groundshaking and seismically induced ground failures would be mitigated to less than significant levels (Class II), implementation of Mitigation Measures G-4b (Conduct geotechnical investigations for liquefaction) and G-6a through G-6c (Conduct geotechnical surveys for landslides and protect against slope instability, Place structures in stable areas, and Avoid or remove unstable slope elements) would be applied.

Mitigation Measure for Impact G-4: Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure

- G-4a** **Reduce effects of groundshaking.**
- G-4b** **Conduct geotechnical investigations for liquefaction.**
- G-6a** **Conduct geotechnical surveys for landslides and protect against slope instability.**
- G-6b** **Place structures in stable areas.** [GEO-APM-4]
- G-6c** **Avoid or remove unstable slope elements.** [GEO-APM-8]

Impact G-5: Project would expose people or structures to potential substantial adverse effects as a result of surface fault rupture at crossings of active faults (Class II)

The potential new 230 kV Future System Expansion alignments in the Central Link segment would cross the active Elsinore Fault Zone; therefore project facilities would be subject to hazards of surface fault rupture at the crossings of the active Elsinore Fault. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to people, a significant impact. Therefore, Mitigation Measure G-5a (Minimize project structures within active fault zones) and Mitigation Measure G-6b (Place structures in stable areas) would be applied for fault crossings to minimize the length of transmission line within fault zones and prevent placement of tower structures on active fault traces and reduce the impact to less than significant levels (Class II). Impacts associated with overhead active fault

crossings would be reduced to less than significant levels (Class II) with implementation of Mitigation Measures G-5a and G-6b because proper placement of conductors would allow distribution of fault displacements over a comparatively long span and towers would be less likely to collapse in the event of an earthquake if not placed directly on an active fault trace.

Mitigation Measure for Impact G-5: Project would expose people or structures to potential substantial adverse effects as a result of surface fault rupture at crossings of active faults

G-5a Minimize project structures within active fault zones.

G-6b Place structures in stable areas. [GEO-APM-4]

Impact G-7: Project would expose people or structures to potential substantial adverse effects as a result of landslides, earthflows, debris flows, and/or rockfall (Class II)

Slope instability including landslides, earth flows, debris flows, and rock fall has the potential to undermine foundations, cause distortion and distress to overlying structures, and displace or destroy project components. This could occur where towers are sited fairly close to the base of the mountains. Unidentified unstable slopes or areas of potentially unstable slopes could fail during the lifetime of the transmission lines, resulting in collapse of project structures and consequent power outages, damage to nearby roads or structures, and injury or death to people, a significant impact. Implementation of Mitigation Measures G-5a (Minimize project structures within active fault zones), G-6a (Conduct geotechnical surveys for landslides and protect against slope instability), Mitigation Measure G-6b (Place structures in stable areas), and Mitigation Measure G-6c (Avoid or remove unstable slope elements) would reduce the impact to less than significant (Class II) by identification of potential slope failure sources, and allowing project design to avoid them or implement slope stabilization practices.

Mitigation Measure for Impact G-7: Project would expose people or structures to potential substantial adverse effects as a result of landslides, earthflows, debris flows, and/or rockfall

G-5a Minimize project structures within active fault zones.

G-6a Conduct geotechnical surveys for landslides and protect against slope instability.

G-6b Place structures in stable areas. [GEO-APM-4]

G-6c Avoid or remove unstable slope elements. [GEO-APM-8]

D.13.11.3 Environmental Setting – 500 kV Future Transmission System Expansion

As described in Section B.7.2 and illustrated in Figure B-12b, the potential Future 500 kV Circuit would connect the proposed Central East Substation to the Southern California Edison (SCE) transmission system at a new substation north of Interstate 15 (I-15), about 20 miles west of SCE's Valley Substation.

Geology. The alignment for this new 500 kV transmission line would cross a mixture of hillside, mountain, and valley terrain. Geologic units expected to underlie the alignment include: Quaternary alluvium (Qal), Pleistocene nonmarine sedimentary units (Qc and Qco), Pleistocene basaltic rocks (Qpv^b), Mesozoic granitic rocks including tonalite (gr^d), quartz monzonite (gr^a), and granodiorite (gr^g), Mesozoic gabbro (bi), and Jurassic Santiago Peak Volcanics (JTrv) and undifferentiated metavolcanic rocks (Ju). A general description of the characteristic of these units is presented in Table D.13-1.

Slope Stability. Although this new 500 kV alignment crosses moderately to steeply sloping hillside and mountain terrain, the hillside areas are primarily underlain by granitic and metamorphic bedrock that is not generally susceptible to slope failures.

Soils. The new 500 kV transmission line route from Central East Substation to connect with SCE would traverse at least six soil associations. These would include the Sesame-Rock Outcrop-Cienba association (s1010), the Rock Outcrop-Los Posas association (s1012), the San Miquel-Friant-Exchequer association (s1013), the Tollhouse-Rock Outcrop-La Posta association (s1014), the Hotaw-Crouch-Boomer association (s1015), and the Oak Glen-Mottsville-Calpine association (s1018). No soils with desert pavement are mapped along this alignment. The basic characteristics of these soil associations are presented in Table D.13-2. Other similar soils will likely also be encountered along the alignment.

Mineral Resources. There are no known BLM claims along this new 500 kV alignment. One active gravel quarry site, identified as the Pala Pit owned by Hansen Aggregate, is located along the alignment within the San Luis Rey River flood plain (USGS, 2006a) near milepost 40.

Seismicity

Fault Rupture. The eastern and northern portions of this alignment, and the Rainbow Substation area are located in seismically active areas near the Elsinore Fault Zone. Near the Central East Substation location the 500 kV alignment would potentially cross the projected trace of the active Earthquake Valley Fault (see Figure D.13-9) as it exited the substation. West of Warner Substation the alignment would cross and runs along several strands of the Temecula segment of the active Elsinore Fault Zone, from east of Lake Henshaw to and along part of Highway 76 (see Figure D.13-2) to approximately mile 21 along the alignment. The alignment would near, but stay just west of, the Elsinore Fault Zone again in the vicinity of the Rainbow Substation, before turning west away from the fault zone and then north. The alignment would again cross the Elsinore Fault Zone near the northern end, north of Lake Elsinore.

Groundshaking. Faults near this potential 500 kV alignment capable of causing damage to project structures include local strands of the Elsinore Fault Zone and the San Jacinto Fault Zone (near the eastern end). Estimated PGAs along the alignment range from 0.1 g to 0.7g. The higher accelerations of 0.5 to 0.7g are primarily located along the alignment where it crosses and is in proximity to the Elsinore Fault Zone. The lower accelerations, 0.2 to 0.4g, are generally located along the alignment where it is further from the Elsinore Fault Zone, i.e., the westerly portions of the alignment.

Liquefaction. Most of this alignment is underlain by bedrock units and would not be susceptible to liquefaction-related phenomena. However, portions of the alignment underlain by alluvium with shallow or perched groundwater could liquefy. This results in a moderate potential for liquefaction in areas where the route crosses and is within active river washes and streams where local pockets of saturated and loose sandy soils may be located. These local pockets of loose sandy soils may be present within the flood plains of Buena Vista Creek, San Luis Rey River, and other and other stream drainages that cross the alignment and could potentially liquefy in the event of a large earthquake.

Earthquake-Induced Landslides. Most accounts of historical earthquakes in the San Diego area describe damaging landslides resulting from earthquake groundshaking (SCEDC, 2006). Portions of the project cross moderately to steeply sloping hillside and mountain terrain where seismically induced landslides or rockfalls could potentially occur in the event of a large earthquake on nearby regional faults.

D.13.11.4 Environmental Impacts – 500 kV Future Transmission System Expansion

The future transmission expansion projects, if constructed, would be built by SDG&E because they are located within SDG&E's service territory. While it is likely that SDG&E would implement APMs similar to those that are included in the Sunrise Powerlink application, this cannot be assumed because SDG&E has not submitted an application to construct these projects. As a result, the APMs that were presented for the Proposed Project are converted to as mitigation measures in this section. This analysis also recommends mitigation measures similar to those that are recommended for the Proposed Project.

Construction Impacts

No soils with desert pavement are located along or at the above discussed future transmission expansion projects; therefore Impact G-2 (Unique geologic features would be damaged due to construction activities) would not occur.

Impact G-1: Erosion would be triggered or accelerated due to construction activities (Class II)

Soils along the Future Expansion route have a potential hazard of erosion for off-road/off-trail ranging from slight to very severe and for on-roads/on-trails ranging from slight to severe. Excavation and grading for tower foundations, trenching for the underground sections, work areas, access roads, and spur roads could loosen soil and accelerate erosion. Mitigation measures would be required to limit grading of existing roads in areas with sensitive soils (Mitigation Measure G-1a). Other mitigation recommended includes use of erosion control procedures such as sand bags and road bars, to control water erosion and limiting construction traffic to minimize erosion (Mitigation Measure G-1b). In addition, a Stormwater Pollution Prevention Plan (SWPPP) that would limit erosion from the construction site would be required in accordance with the Clean Water Act. The implementation of these measures would reduce the potentially significant impact to less than significant levels (Class II). The full text of the mitigation measures can be found in Appendix 12.

Mitigation Measure for Impact G-1: Erosion would be triggered or accelerated due to construction activities

G-1a **Limit modification of access roads.** [GEO-APM-1]

G-1b **Implement erosion control procedures.** [GEO-APM-2]

Impact G-6: Project would expose people or structures to potential substantial adverse effects as a result of slope instability created during excavation and/or grading (Class II)

Construction consisting of grading and excavation along and adjacent to slopes underlain by landslide prone or potentially unstable units could potentially cause slope instability. Excavation operations associated with tower foundation construction, trenching for the underground sections, and grading operations for temporary and permanent access roads and work areas could result in slope instability, that could undermine foundations, cause distortion and distress to overlying structures, and displace or destroy project components. Significant impacts would occur if unidentified unstable slopes or areas of potentially unstable slopes were disturbed or undercut by construction activities resulting in slope failures. Slope failures could cause damage to the environment, to project or other nearby structures, and could cause injury or death to workers and/or the public, a significant impact. Where slope instability impacts would be significant, along portions of the potential future 500 kV circuit route along and near moderate to steep slopes and in areas underlain by the landslide prone Poway Group units, implementation of

Mitigation Measure G-6a (Conduct geotechnical surveys for landslides and protect against slope instability), Mitigation Measure G-6b (Place structures in stable areas), and Mitigation Measure G-6c (Avoid or remove unstable slope elements) would be applied to reduce the impacts to less than significant (Class II) by delineating potential areas of unstable slopes near and within work areas and minimizing the potential from construction-triggered slope failures by avoidance or implementation of slope stabilizing design measures.

Mitigation Measure for Impact G-6: Excavation or grading during construction could cause slope instability

G-6a Conduct geotechnical surveys for landslides and protect against slope instability.

G-6b Place structures in stable areas. [GEO-APM-4]

G-6c Avoid or remove unstable slope elements. [GEO-APM-8]

Impact G-9: Construction activities would interfere with access to known mineral resources (Class II)

The potential future 500 kV circuit route crosses an active sand and gravel quarries near milepost 40 where it crosses the San Luis Rey River, the Pala Pit owned by Hansen Aggregate. Construction operations for the potential future 500 kV circuit route could potentially interfere with daily ongoing mining operations at this active quarry, a significant impact. Implementation of Mitigation Measure G-9a is required to ensure that this impact would be reduced to less than significant levels (Class II).

Mitigation Measure for Impact G-9: Construction activities would interfere with access to known mineral resources

G-9a **Coordinate with quarry operations.** Operations and management personnel for quarries within the project route shall be consulted regarding locations of active mining and for coordination of construction activities in and through those areas. A plan to avoid or minimize interference with mining operations shall be prepared in conjunction with mine/quarry operators prior to construction. SDG&E shall document compliance with this measure prior to the start of construction by submitting the plan to the CPUC and BLM for review at least 60 prior to the start of construction.

Operational Impacts

Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils (Class II)

Soils along the potential future 500 kV circuit route have varying potential to corrode steel and concrete. Corrosive subsurface soils may exist in places along the potential future 500 kV circuit route. There is also potential for soils with expansion potential along the potential future 500 kV circuit route. Expansive and corrosive soils could damage project structures and facilities potentially resulting in collapse. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to nearby people, a significant impact. Accordingly, implementation of Mitigation Measures G-3a (Conduct Geotechnical Studies for Soils to Assess Characteristics and Aid in Appropriate Foundation Design) and G-3b (Avoid structure placement in high shrink/swell areas) would be applied to reduce impacts to less than significant (Class II).

Mitigation Measure for Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils

G-3a Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design.

G-3b Avoid structure placement in high shrink/swell areas. [GEO-APM-3]

Impact G-4: Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure (Class II and III)

Moderate to severe groundshaking should be expected in the event of an earthquake on the faults along the potential future 500 kV circuit route and from other major faults in the region, with estimated PGAs ranging from 0.2 to 0.7 g. It is likely that the project facilities would be subjected to at least one large earthquake occurring close enough to produce strong to severe groundshaking. SDG&E indicates in the SRPL PEA that project structures would be designed to withstand geologically induced stresses and that appropriate tower design accounting for lateral wind loads and conductor loads would “likely” exceed any creditable seismic loading, minimizing potential damage to tower structures from groundshaking. However, portions of the potential future 500 kV circuit route would be subject to local strong to severe groundshaking with vertical and horizontal ground accelerations that could exceed lateral wind loads, resulting in damage or collapse of project structures. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to nearby people, a significant impact. Therefore, to ensure that project structures are not damaged by strong to severe groundshaking, implementation of Mitigation Measure G-4a (Reduce effects of groundshaking) would be applied to reduce impacts to less than significant (Class II).

Strong groundshaking could potentially result in seismically induced ground failures, including liquefaction and slope failures. Portions of the potential future 500 kV circuit route that cross active river washes, streams, and floodplains where seasonally saturated lenses and pockets of loose sand may be present could liquefy should a large earthquake occur while these soils are saturated, resulting in liquefaction damage to project structures, a significant impact. Slope failures such as landslides and rockfalls could occur in the event of a large earthquake along portions of the potential future 500 kV circuit route along and near moderate to steep slopes and in areas underlain by the landslide prone Poway Group units, potentially resulting in damage to tower structures, are a significant impact.

Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to nearby people, a significant impact. However, to ensure that impacts associated with strong groundshaking and seismically induced ground failures would be mitigated to less than significant levels (Class II), implementation of Mitigation Measures G-4b (Conduct geotechnical investigations for liquefaction) and G-6a through G-6c (Conduct geotechnical surveys for landslides and protect against slope instability, Place structures in stable areas, and Avoid or remove unstable slope elements) would be applied.

Mitigation Measure for Impact G-4: Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure

G-4a Reduce effects of groundshaking.

G-4b Conduct geotechnical investigations for liquefaction.

G-6a Conduct geotechnical surveys for landslides and protect against slope instability.

G-6b Place structures in stable areas. [GEO-APM-4]

G-6c Avoid or remove unstable slope elements. [GEO-APM-8]

Impact G-5: Project would expose people or structures to potential substantial adverse effects as a result of surface fault rupture at crossings of active faults (Class II)

The potential future 500 kV circuit route crosses strands of the active Elsinore Fault Zone several times, and potentially crosses strands of the active Earthquake Valley Fault. Project facilities of the potential future 500 kV circuit route would be subject to hazards of surface fault rupture at these fault crossings. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to people, a significant impact. Therefore, Mitigation Measure G-5a (Minimize project structures within active fault zones) and Mitigation Measure G-6b (Place structures in stable areas) would be applied for fault crossings to minimize the length of transmission line within fault zones and prevent placement of tower structures on active fault traces and reduce the impact to less than significant levels (Class II). Impacts associated with overhead active fault crossings would be reduced to less than significant levels (Class II) with implementation of Mitigation Measures G-5a and G-6b because proper placement of conductors would allow distribution of fault displacements over a comparatively long span and towers would be less likely to collapse in the event of an earthquake if not placed directly on an active fault trace.

Mitigation Measure for Impact G-5: Project would expose people or structures to potential substantial adverse effects as a result of surface fault rupture at crossings of active faults

G-5a Minimize project structures within active fault zones.

G-6b Place structures in stable areas. [GEO-APM-4]

Impact G-7: Project would expose people or structures to potential substantial adverse effects as a result of landslides, earthflows, debris flows, and/or rockfall (Class II)

Slope instability including landslides, earth flows, debris flows, and rock fall has the potential to undermine foundations, cause distortion and distress to overlying structures, and displace or destroy project components. This could occur along portions of the potential future 500 kV circuit route along and near moderate to steep slopes and in areas underlain by the landslide prone Poway Group units. Unidentified unstable slopes or areas of potentially unstable slopes could fail during the lifetime of the transmission lines, resulting in collapse of project structures and consequent power outages, damage to nearby roads or structures, and injury or death to people, a significant impact. Implementation of Mitigation Measures G-5a (Minimize project structures within active fault zones), G-6a (Conduct geotechnical surveys for landslides and protect against slope instability), Mitigation Measure G-6b (Place structures in stable areas), and Mitigation Measure G-6c (Avoid or remove unstable slope elements) would reduce the impact to less than significant (Class II) by identification of potential slope failure sources, and allowing project design to avoid them or implement slope stabilization practices.

Mitigation Measure for Impact G-7: Project would expose people or structures to potential substantial adverse effects as a result of landslides, earthflows, debris flows, and/or rockfall

G-5a Minimize project structures within active fault zones.

G-6a Conduct geotechnical surveys for landslides and protect against slope instability.

G-6b Place structures in stable areas. [GEO-APM-4]

G-6c Avoid or remove unstable slope elements. [GEO-APM-8]

D.13.12 Connected Actions and Indirect Effects

Section B.6 describes the other projects that have been found to be related to the Sunrise Powerlink Project. They fall into two categories:

- **Connected Actions.** The four projects found to be connected to the Sunrise Powerlink Project are the Stirling Energy Systems solar facility, two components of the IID 230 kV transmission system upgrades, the Esmeralda–San Felipe Geothermal Project, and the Jacumba Substation. Those projects are addressed in Sections D.13.12.1 through D.13.12.4.
- **Indirect Effects.** One project, the SCE La Rumorosa Wind Project, would create effects as a result of the construction and operation of the Sunrise Powerlink Project. That project is addressed in Section D.13.12.5.

D.13.12.1 Stirling Energy Systems Solar Two LLC Project

As agreed in a Power Purchase Agreement (PPA) approved by the CPUC, SDG&E would purchase up to 900 MW of solar power produced at a proposed 8,000-acre Concentrating Solar Power (CSP) facility in the Imperial Valley (see Section B.6.1). At least 600 MW of this total would be transmitted via the SRPL. Stirling Energy Systems (SES) Solar Two, LLC would construct, own and operate the CSP facility and an associated 230 kV transmission line. The CSP site would be leased by SES from BLM, and additional individual private parcels within the site boundaries would be acquired. The transmission line would be constructed within a new ROW easement just north of and adjacent to the SWPL.

As described in Section B.6, the CPUC and BLM have determined that the Stirling CSP facility and associated 230 kV transmission line are so closely related to the Proposed Project as to be considered “connected actions” under the National Environmental Policy Act (NEPA). Therefore, the Stirling site and transmission line are discussed in this EIR/EIS in order to fully disclose the potential for this project to be constructed as a result of the presence of the SRPL (if it is approved and constructed). Types of mitigation that would likely reduce potentially significant impacts of the Stirling CSP facility and transmission line have been included in the environmental impact analysis below, however, implementation of specific mitigation measures would be developed and executed by Stirling Energy Systems at the time of project permitting and approval.

Approval of the SRPL would not result in automatic approval of the Stirling CSP facility or transmission line discussed below, and the project would require SES permit applications to CEC and BLM and compliance with CEQA and NEPA, followed by approvals from the CEC and BLM prior to construction on BLM lands.

Environmental Setting

Geology. The Stirling CSP site and associated 230 kV transmission line generally would be located on gently sloping terrain. Geologic units underlain by the project are alluvium (Qal), lake deposits of ancient Lake Coahuila (Ql), nonmarine terrace deposits (Qt), and nonmarine sedimentary deposits of the Palm Spring Formation; descriptions of these units are provided in Table D.13-13.

Table D.13-13. Summary of Geologic Units Underlying the Stirling CSP Site

Unit Symbol	Geologic Unit	Age	Description/Comment	Excavation Characteristics ¹
Qal	Alluvium	Holocene	Unconsolidated stream, river, and alluvial fan deposits consisting of primarily sand, silt, clay, and gravel.	Easy
Ql	Lake (lacustrine) deposits	Quaternary	Includes ancient Lake Coahuila (Cahuilla) deposits and other playa deposits. Composed of fossiliferous clay, silt, sand, and gravel.	Easy
Qt	Nonmarine terrace deposits	Quaternary	Extensively dissected and locally folded terrace deposits in the Borrego Valley.	Easy
Pc	Nonmarine sedimentary deposits	Pliocene	Palm Spring Formation - interbedded conglomerate, arkosic sandstone, and red to gray siltstone and claystone.	Easy to Moderate

Sources: CDMG, 1963, 1975, and 1977; USGS, 1962, 1966, and 1967.

1 Excavation characteristics are very generally defined as "easy," "moderate," or "difficult" based on increasing hardness of the rock unit. Excavation characteristic descriptions are general in nature and the actual ease of excavation may vary widely depending on site-specific subsurface conditions.

2. See Table D.13-1 for the corresponding breakdown of years for each geologic time period.

Slope Stability. The Stirling Solar site is on gently sloping terrain; elevation at the site ranges from 0 to 100 feet (BLM, 1998). This gently sloping to flat terrain is not likely to experience landslides or other slope failures.

Soils. Two soil associations are mapped at the site, the Rositas-Orita-Carrizo-Aco and Vint-Meloland-Indio associations (s994 and s996, respectively). Most of the site is underlain by the Rositas-Orita-Carrizo-Aco (s994) soil association, with the Vint-Meloland-Indio soil association (s996) underlying the eastern portion of the site. A summary of the basic characteristics of these soils is presented in Table D.13-2.

Hazard of erosion for these soils off-road/off-trail and on roads/trails ranges from slight to moderate, and shrink/swell (expansive) potential varies from low to high. Corrosive potential of soils expected to occur at the site are high for uncoated steel and range from low to moderate for concrete.

Mineral Resources. No active mines or BLM mining claims are located on the site. Plaster City, which is located at the northern edge of the SES site, has a large gypsum plant operated by United States Gypsum which produces gypsum board (drywall). The U.S. Gypsum site also includes large stockpiles of gypsum at the southern edge of the facility for use in their manufacturing; however, the mines for this facility are located greater than 100 miles to the north of the site. Therefore, construction and operation of the Stirling CSP facility and associated transmission line would not interfere with access to mineral resources.

Approximately 525 miles of permanent, gravel access roads will be constructed at the site (Stirling, 2007c) and SES anticipates using gravel resources at the site to the extent possible. An estimated 800,000 cubic yards of gravel will be required for road construction at the site (Stirling, 2007c). There are also several active gravel pits in Imperial County in the vicinity of the site which could be used to supply gravel for construction.

Seismicity. The Stirling CSP facility and associated transmission line are located in a seismically active portion of southern California. Several significant active faults capable of producing large damaging earthquakes are located in the vicinity of the Stirling Solar site. These include the Laguna Salada fault, the Elsinore fault (Coyote Mountain segment), and the Superstition Mountain and Superstition Hills faults (both part of the San Jacinto Fault Zone). Characteristics of these faults are presented below in Table D.13-14.

Table D.13-14. Significant Active Faults in the Stirling CSP Site Vicinity

Fault	Approx. Closest Distance to site (miles)	Fault Length (miles)	Max Estimated Earthquake Magnitude	Approx. Slip Rate (mm/yr)
Elsinore: Coyote Mountain Segment	10	24	6.8	4.0
Laguna Salada	2	41	7.0	3.5
Superstition Mountain (part of the San Jacinto Fault Zone)	10	14	6.6	3.0
Superstition Hills (part of the San Jacinto Fault Zone)	10	14	6.6	2.0

Source: Cao et al., 2002, USGS website <http://earthquake.usgs.gov/regional/qfaults>, 2006.

Additionally, although not an expected source of significant large earthquakes, the short but active Yuha Wells fault transects the Stirling Solar site trending northeast across the area (SCEDC, 2007). The Yuha Wells fault is a recently mapped fault, and appears to be a left-lateral fault approximately 8.7 miles in length with the most recent surface rupture in the late Quaternary period (SCEDC, 2007). The Yuha Wells fault cuts off and offsets the Coyote segment of the Elsinore fault from the Laguna Salada fault, which are both part of the Elsinore Fault Zone. There has also been minor seismic activity along this fault consisting of numerous small earthquakes including a magnitude 4.0 in 1999.

Seismicity – Fault Rupture. The SES site and the associated transmission line are crossed by the active Yuha Wells fault, and although this fault is short and not expected to generate large significantly damaging earthquakes, fault rupture could occur along its length from moderate earthquakes along its length or from sympathetic movement from large earthquakes on the nearby Elsinore or Laguna Salada faults.

Seismicity – Groundshaking. As shown in Table D.13-14, the Stirling Solar site and associated transmission line are in close proximity to active faults of the Elsinore and the San Jacinto Fault Zones. Moderate to strong groundshaking from an earthquake on any of the faults in the vicinity of the site should be expected. The estimated PGAs along the SES transmission alignment primarily range from 0.4-0.5g with some small areas of 0.5-0.6g; and PGAs for the Stirling CSP facility site are estimated to primarily be between 0.5-0.6g, with local small areas of 0.4-0.5g.

Seismicity – Liquefaction. Potential for liquefaction in this area is low due to anticipated depths of groundwater of greater than 100 feet. However, during large storms or a wet season, the water table may rise temporarily and sections of the SES transmission line that cross active river washes and streams may be moderately susceptible to liquefaction if a strong earthquake occurs while the valley floor sediments are saturated.

Seismicity – Earthquake-Induced Landslides. The Stirling Solar site and transmission line are located on gently sloping terrain and are not likely to experience landslides or other slope failures as a result of earthquakes.

Environmental Impacts and Mitigation Measures

Construction Impacts

No construction impacts related to construction-triggered slope failures (Impact G-6) would occur associated with this project due to the flat to gently terrain underlying the site and transmission alignment. No impacts related to Impact G-9 (Construction activities would interfere with access to known mineral resources) are expected for this project as no known active mineral resource sites or BLM claims are located at the SES site or along the transmission alignment.

Impact G-1: Erosion would be triggered or accelerated due to construction activities (Class III)

SES plans to construct permanent gravel access roads between every other row of solar-concentrating dishes. SES expects intermittent truck traffic on gravel roads associated with the washing maintenance process. The SES facility will be located on a site that is gently sloped, and the hazard of erosion for soils anticipated to occur at the site ranges from slight to moderate. Grading for access roads could loosen soil and accelerate erosion. Implementation of BMPs would minimize erosion. In addition, a Stormwater Pollution Prevention Plan (SWPPP) that would limit erosion from the construction site would be required in accordance with the State General Construction Permit and the Clean Water Act. This would result in a less than significant impact (Class III).

Impact G-2: Unique geologic features would be damaged due to construction activities (Class II)

Construction activities such as grading and excavation for the Proposed Project could cause damage to desert pavement. Desert pavement is a unique geologic/soil feature that takes thousands of years to form, and protects the underlying silty and sandy soils from excessive wind and water erosion. Damage to desert pavement could result in an extreme acceleration of erosion. One soil association that underlies the site, the Rositas-Orita-Carrizo-Aco (s994), is known to include areas of desert pavement. Therefore, mitigation would need to be implemented to protect areas of desert pavement. Mitigation measures would be required to limit grading of existing roads in areas with sensitive soils (Mitigation Measure G-1a). Other mitigation recommended includes use of erosion control procedures such as sand bags and road bars, to control water erosion and limiting construction traffic to minimize erosion (Mitigation Measure G-1b). Additionally Mitigation Measure G-2a could be applied to protect desert pavement in areas underlain by the Rositas-Orita-Carrizo-Aco soil association and other desert soils with potential for desert pavement. These measures would reduce impacts associated with damage to desert pavement areas to less than significant (Class II). The full text of the mitigation measures can be found in Appendix 12.

Mitigation Measures for Impact G-2: Unique geologic features would be damaged due to construction activities

- G-1a** **Limit modification of access roads.** [GEO-APM-1]
- G-1b** **Implement erosion control procedures.** [GEO-APM-2]
- G-2a** **Protect desert pavement.**

Operational Impacts

Damage to project structures from seismically induced landslides (Impact G-4) and naturally occurring landslides, earthflows, debris flows and/or rock fall (Impact G-7) is unlikely to occur at the project site or along the associated transmission alignment due to the flat to gently sloping nature of the underlying terrain.

Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils (Class II)

Soils expected to occur at the site have a high potential to corrode steel and a low to moderate potential to corrode concrete. Corrosive subsurface soils may also exist at the site. Corrosive soils could have a detrimental effect on concrete and metals. Depending on the degree of corrosivity of subsurface soils, concrete and reinforcing steel in concrete structures and uncoated steel structures exposed to these soils

could deteriorate, eventually leading to structural failures. Expansion potential for the soils expected to occur at the site ranges from low to high. Expansive soils can also cause problems to structures. Soils that exhibit shrink-swell behavior are clay rich and react to changes in moisture content by expanding or contracting. Expansive soils may cause differential and cyclical foundation movements that can cause damage and/or distress to structures and equipment. Damage to or collapse of project structures due to unsuitable soil conditions could have adverse impacts on the reliability of peak electrical supply and could expose people or structures to substantial adverse effects.

Application of standard design and construction practices and implementation of Mitigation Measure G-3b (Avoid structure placement in high shrink/swell areas) would partially reduce the adverse affects of problematic soils by avoiding placement of structures in areas of high shrink/swell potential, to the extent feasible. However, actual locations of high shrink/swell (expansive) soils and the presence, absence, and location of corrosive soils needs to be determined to fully reduce the potential for adverse affects of problematic soils to less than significant. Unidentified expansive and corrosive soils would damage project structures and facilities potentially resulting in collapse. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to nearby people, a significant impact. Accordingly, Mitigation Measure G-3a (Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design) would be applied to ensure that impacts associated with problematic soils would be reduced to less than significant levels (Class II).

Mitigation Measure for Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils

- G-3a** **Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design.**
- G-3b** **Avoid structure placement in high shrink/swell areas.** Structure placement in areas of high shrink/swell potential will be avoided to the extent feasible. [GEO-APM-3]

Impact G-4: Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure (Class II)

Moderate to strong groundshaking should be expected in the event of an earthquake on the faults near the Stirling CSP facility and associated transmission line and from other major faults in the region, with estimated PGAs ranging from 0.4 to 0.6 g. Project structures would be designed to withstand geologically induced stresses. Generally appropriate tower design for the transmission line towers would account for lateral wind loads and conductor loads would likely exceed any creditable seismic loading, minimizing potential damage to tower structures from groundshaking. However, portions of the Stirling CSP transmission line would be subject to local strong groundshaking with vertical and horizontal ground accelerations that could exceed lateral wind loads, resulting in damage or collapse of project structures. Additionally the other Stirling CSP facility structures would also be subject to local strong groundshaking, potentially resulting in damage to these structures. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to nearby people, a significant impact. Therefore, to ensure that project structures are not damaged by strong groundshaking, application of standard design practices and implementation of mitigation measures such as Mitigation Measure G-4a (Reduce effects of groundshaking) would be applied to reduce impacts to less than significant (Class II).

Moderate to strong groundshaking could result in liquefaction-related phenomena in sections of the 230 kV transmission line that cross active river washes and streams where lenses and pockets of loose sand may be present and may become saturated seasonally during large storms or a wet season. This could

result in damage to project structures should a large earthquake occur during the periods when these soils are saturated, a significant impact. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to nearby people, a significant impact. However, to ensure that impacts associated with strong groundshaking and seismically induced ground failures would be mitigated to less than significant levels (Class II), implementation of mitigation such as Mitigation Measure G-4b (Conduct geotechnical investigations for liquefaction) would need be applied to reduce impacts to less than significant (Class II). Seismically induced slope failures would not occur along this alternative due to its flat terrain.

Mitigation Measure for Impact G-4: Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure

G-4a Reduce effects of groundshaking.

G-4b Conduct geotechnical investigations for liquefaction.

Impact G-5: Project would expose people or structures to potential substantial adverse effects as a result of surface fault rupture at crossings of active faults (Class II)

Project facilities would be subject to hazards of surface fault rupture at any crossings of the active Yuha Wells fault. Although the Yuha Wells fault is not included in an Alquist-Priolo zone it is classified as an active fault and movement on this fault could potentially result in damaging surface fault rupture. Transmission line fault crossings, where multiple feet of displacement are expected along active faults, are best crossed as overhead lines with towers placed well outside the fault zone to allow for the flex in the conductor lines to absorb offset. Other facilities at the SES site could be damaged if structures are placed on, adjacent to, or straddling an active fault trace of the Yuha Wells fault. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to people, a significant impact. For aboveground installations such as substations or solar collectors crossing faults, SES would follow standard design codes and practices for facilities in seismic zones and implement Mitigation Measure G-6b (Place structures in stable areas) which would require that project structures be placed in stable areas avoiding fault lines. In addition, measures such as Mitigation Measure G-5a (Minimize project structures within active fault zones) would be required for fault crossings to minimize the length of transmission line within fault zones and prevent placement of project structures on active fault traces, reducing the impact to less than significant levels (Class II).

Mitigation Measure for Impact G-5: Project would expose people or structures to potential substantial adverse effects as a result of surface fault rupture at crossings of active faults

G-5a Minimize project structures within active fault zones.

G-6b Place structures in stable areas. [GEO-APM-4]

D.13.12.2 IID Transmission System Upgrades

As part of Phase 2 of the Imperial Valley Study Group's development plan (see Section A.4.3), IID would construct a new 230 kV line from the Bannister Substation to a new San Felipe 500/230 kV Substation to interconnect to the proposed Imperial Valley to San Diego 500 kV line (i.e., the Sunrise Powerlink line). This San Felipe Substation could potentially provide an additional interconnection between the IID and CAISO systems, and thus another point for the delivery of renewable resources to Southern California loads. IID would construct, own and operate these upgrades.

As described in Section B.6, the CPUC and BLM have determined that these IID Transmission System Upgrades are so closely related to the Proposed Project as to be considered “connected actions” under the National Environmental Policy Act (NEPA). Therefore, IID Transmission System Upgrades are discussed in this EIR/EIS in order to fully disclose the potential for a Bannister-San Felipe 230 kV transmission line and new San Felipe 500/230 kV Substation to be constructed as a result of the presence of the SRPL (if it is approved and constructed). Types of mitigation that would likely reduce potentially significant impacts of the IID Transmission System Upgrades projects have been included in the environmental impact analysis below, however, implementation of specific mitigation measures would be developed and executed by IID at the time of project permitting and approval.

Approval of the SRPL would not result in automatic approval of the IID Transmission System Upgrades discussed below, and the projects would require applications by IID, compliance with CEQA and NEPA, followed by approvals from the BLM prior to construction on BLM lands.

Environmental Setting

Geology. The San Felipe Substation site and the IID 230 kV route generally would traverse gently sloping to flat alluvial plains and playas of the Imperial Valley for its entire length. Geologic units crossed by this segment are alluvium (Qal), lake deposits of ancient Lake Coahuila (Ql), and Brawley Formation (Qc); descriptions of these units are provided in Table D.13-1. Approximate locations of these units along the Imperial Valley Link are listed below:

- Ql: MPs IID-0 to IID-22, and a small outcrop at MP IID-25.8
- Qc: Small outcrops between MPs IID 3 to IID-4 and MPs IID-6 to IID-7
- Qal: MPs IID-22 to IID-26.3 and at the new San Felipe Substation (MP IID-26.3)

Slope Stability. The substation site and the transmission line ROW would cross flat to gently sloping terrain and would not likely experience landslides or other slope failures.

Soils. Three soil associations are mapped on the San Felipe Substation site and along the IID 230 kV route, s994, s995, and s996. A summary of the basic characteristics of these soils is presented in Table D.13-2. The Vint-Meloland-Indio (s996) is present in the eastern portion of the route and is formed primarily in Ancient Lake Coahuila lacustrine deposits. Rositas-Orita-Carrizo-Aco (s994) soils are found primarily along this route in areas underlain by alluvium and some lake deposits and are known to contain areas of desert pavement. Small amounts of the Rock Outcrop-Rillito-Beeline-Badland association (s995) are found in areas underlain by Brawley Formation.

Hazard of erosion for these soils off-road/off-trail and on roads/trails ranges from slight to moderate, and shrink/swell (expansive) potential varies from low to high. Corrosive potential of soils along the Imperial Valley Link range from moderate to high for uncoated steel and from low to high for concrete.

Approximate locations of soil associations along the IID 230 kV route and within the San Felipe Substation site (MP IID-26.3) are listed below and are shown in Figure D.13-5.

- s996: MPs IID-0 to IID-3.6, MPs IID-4.2 to IID-7.2, and MPs IID-9 to IID-21.9
- s994: MPs IID-7.2 to IID-9, and MPs IID-21.9 to 26.3 and the San Felipe Substation site
- s995: MPs IID-3.6 to IID-4.2.

Mineral Resources. No known active mineral resource sites or BLM mining claims are located along the route or within the new substation site. One MRDS site listed as active sand and gravel producer is

located near MP IID-9.5 and identified as the San Felipe Wash Material Site. A review of aerial photographs indicates that the site was a gravel quarry that no longer appears to be in use.

Seismicity. The project area is located in a seismically active portion of southern California characterized by numerous geologically young faults. General seismicity of this area is discussed in Section D.13.2.3 Imperial Valley Link. Specific seismic issues pertaining to this project are discussed below:

Seismicity – Fault Rupture. This segment crosses two active faults: the Elmore Ranch Fault Zone and the San Jacinto Fault. Both of these faults are within Alquist-Priolo zones where they cross the 230 kV route. Seven strands of the Elmore Ranch Fault Zone cross the 230 kV route at approximately MPs IID-2.2, IID-2.7, IID-3.8, IID-5.7, and the last three between MPs IID-6.5 and IID-6.6. The 230 kV route would also cross two strands of the Borrego Mountain section of the San Jacinto Fault between approximately MPs IID-21.6 and IID-22.

Seismicity – Groundshaking. Moderate to strong groundshaking from an earthquake on any of the faults in the vicinity of this segment should be expected. The peak horizontal accelerations for this segment are presented in Table D.13-6.

Seismicity – Liquefaction. Potential for liquefaction in this area is low due to anticipated depths of groundwater of greater than 100 feet. However, during large storms or a wet season, the water table may rise temporarily and sections of the 230 kV line that cross active river washes and streams may be moderately susceptible to liquefaction if a strong earthquake occurs while the valley floor sediments are saturated.

Seismicity – Earthquake-Induced Landslides. This area is relatively flat and not likely to experience landsliding or slope failures due to earthquakes.

Environmental Impacts and Mitigation Measures

Construction Impacts

No construction impacts related to construction-triggered slope failures (Impact G-6) would occur associated with this project due to the flat to gently terrain underlying the substation site and transmission alignment. No impacts related to Impact G-9 (Construction activities would interfere with access to known mineral resources) are expected for this project as no known active mineral resource sites or BLM claims are located at the substation site or along the transmission alignment.

Impact G-1: Erosion would be triggered or accelerated due to construction activities (Class II)

Soils along this segment of the proposed route have a potential hazard of erosion for off-road/off-trail and on roads/trails ranging from slight to moderate. Excavation and grading for tower and switchyard foundations, series capacitor banks, work areas, access roads, and spur roads could loosen soil and accelerate erosion. Towers (approximately 171 total) would be located with spans of approximately 900 feet and disturbance would be between 64 to 79 square feet depending on tower design. Implementation of Mitigation Measures G-1a (Limit modification of access roads), G-1b (Implement erosion control procedures), G-1c (Avoid new disturbance, erosion, and degradation), and G-1d (Restore surfaces for erosion control and revegetation) would reduce the amount of erosion that would result from construction by: limiting grading of existing roads in areas with sensitive soils, planning construction to minimize new ground disturbance, using BMPs such as sand bags and road bars to control water erosion, and limiting construction traffic to minimize erosion. A Stormwater Pollution Prevention Plan (SWPPP)

that would limit erosion from the construction site would be required in accordance with the State General Construction Permit and the Clean Water Act. Although impacts could be significant, implementation of Mitigation Measures G-1a, G-1b, G-1c, and G-1d would ensure that any impacts would be less than significant impact (Class II). The full text of the mitigation measures can be found in Appendix 12.

Mitigation Measures for Impact G-1: Erosion would be triggered or accelerated due to construction activities

- G-1a** **Limit modification of access roads.** [GEO-APM-1]
- G-1b** **Implement erosion control procedures.** [GEO-APM-2]
- G-1c** **Avoid new disturbance, erosion, and degradation.** Project construction activities will be designed and implemented to avoid or minimize new disturbance, erosion on manufactured slopes, and off-site degradation from accelerated sedimentation. Maintenance of cut and fill slopes created by project construction activities would consist primarily of erosion repair. Where revegetation is necessary to improve the success of erosion control, planting or seeding with native seed mix would be done on slopes. [GEO-APM-5]
- G-1d** **Restore surfaces for erosion control and revegetation.** In areas where ground disturbance is substantial or where re-contouring is required (e.g., marshaling yards, tower sites, spur roads from existing access roads), surface restoration will occur as necessary for erosion control and revegetation. The method of restoration will normally consist of returning disturbed areas back to their original contour, reseeding (if required), installing cross drains for erosion control, placing water bars in the road, and filling ditches for erosion control. Potential for erosion will be minimized on access roads and other locations primarily with water bars. The water bars will be constructed using mounds of soil shaped to direct the flow of runoff and prevent erosion. Soil spoils created during ground disturbance or re-contouring shall be disposed of only on previously disturbed areas, or used immediately to fill eroded areas. Cleared vegetation can be hauled off-site to a permitted disposal location, or may be chipped or shredded to an appropriate size and spread in disturbed areas of the ROW with the approval of the biological monitor. To limit impact to existing vegetation, appropriately sized equipment (e.g., bulldozers, scrapers, backhoes, bucket-loaders, etc.) will be used during all ground disturbance and re-contouring activities. [GEO-APM-6]

Impact G-2: Unique geologic features would be damaged due to construction activities (Class II)

Desert pavement areas are a special concern in the desert areas of the 230 kV route. Desert pavement is a unique geologic/soil feature that takes thousands of years to form and protects the underlying silty and sandy soils from excessive wind and water erosion. Damage to desert pavement could result in an extreme acceleration of erosion. At least one soil association along this segment of the proposed route, the Rositas-Orita-Carrizo-Aco (s994), is known to include areas of desert pavement. Mitigation Measures G-1a (Limit modification of access roads) and G-1b (Implement erosion control procedures) would limit construction traffic and grading of new and existing roads in areas with sensitive soil and restricting construction traffic to existing access roads could be applied to reduce impacts. Additional, mitigation, such as Mitigation Measure G-2a, would need to be implemented to protect desert pavement between MP IID-7.2 to IID-9, and IID-21.9 to the San Felipe Substation. These measures would reduce impacts associated with damage to desert pavement areas to less than significant (Class II).

Mitigation Measures for Impact G-2: Unique geologic features would be damaged due to construction activities

- G-1a** **Limit modification of access roads.** [GEO-APM-1]
- G-1b** **Implement erosion control procedures.** [GEO-APM-2]
- G-2a** **Protect desert pavement.**

Operational Impacts

Damage to project structures from seismically induced landslides (Impact G-4) and naturally occurring landslides, earthflows, debris flows and/or rock fall (Impact G-6) is unlikely to occur at the substation site or along the transmission alignment due to the flat to gently sloping nature of the underlying terrain.

Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils (Class II)

Soils along this segment of the proposed route have a moderate to high potential to corrode steel and a low to high potential to corrode concrete. Corrosive subsurface soils may exist in places along the proposed route. Corrosive soils could have a detrimental effect on concrete and metals. Depending on the degree of corrosivity of subsurface soils, concrete and reinforcing steel in concrete structures and bare-metal structures exposed to these soils could deteriorate, eventually leading to structural failures. Expansion potential for the soils along the segment ranges from low to high. Expansive soils can also cause problems to structures. Soils that exhibit shrink-swell behavior are clay-rich and react to changes in moisture content by expanding or contracting. Some of the natural soil types identified within the IID Transmission Upgrades area have moderate to high clay contents and many have moderate to high shrink-swell potential. Expansive soils may cause differential and cyclical foundation movements that can cause damage and/or distress to structures and equipment. In addition, potential impacts associated with loose sands or other compressible soils include excessive settlement, low foundation-bearing capacity, and limitation of year-round access to project facilities. Damage to or collapse of project structures due to unsuitable soil conditions could have adverse impacts on the reliability of peak electrical supply and could expose people or structures to substantial adverse effects. Unidentified expansive and corrosive soils could damage project structures and facilities potentially resulting in collapse. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to people, a significant impact. Application of standard design and construction practices and implementation of Mitigation Measure G-3b (Avoid structure placement in high shrink/swell areas) would partially reduce the adverse affects of problematic soils by avoiding placement of structures in areas of high shrink/swell potential, to the extent feasible. Implementation of measures such as Mitigation Measure G-3a (Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design) would be required to delineate locations of high shrink/swell (expansive) soils and the presence, absence, and location of corrosive soils to fully reduce the potential for adverse affects of problematic soils to less than significant (Class II).

Mitigation Measure for Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils

- G-3a** **Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design.**
- G-3b** **Avoid structure placement in high shrink/swell areas.** [GEO-APM-3]

Impact G-4: Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure (Class II and III)

Moderate to severe groundshaking should be expected in the event of an earthquake on the faults in the IID Transmission System Upgrades area and from other major faults in the region, with estimated PGAs ranging from 0.4 to > 0.8 g. It is likely that the project facilities would be subjected to at least one moderate or larger earthquake occurring close enough to produce severe to strong groundshaking in the IID area. Generally appropriate tower design accounting for lateral wind loads and conductor loads would likely exceed any creditable seismic loading, minimizing potential damage to tower structures from groundshaking; however, vertical and horizontal peak ground accelerations from local strong to severe groundshaking could potentially exceed lateral wind loads, resulting in damage or collapse of tower structures, a significant impact. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to nearby people, a significant impact. However, to ensure that impacts associated with strong groundshaking would be mitigated to less than significant levels (Class II), implementation of measures such as Mitigation Measure G-4a (Reduce effects of groundshaking) would be implemented to reduce impacts to less than significant (Class II).

Strong to severe groundshaking with estimated PGAs of 0.6-0.8g may be expected at the substation site. However, SDG&E would follow all applicable building codes and standard practices for substation construction including the Institute of Electrical and Electronics Engineers (IEEE) 693 “Recommended Practices for Seismic Design of Substations” and the 2001 California Building Code and as a result, potential impacts would be less than significant (Class III).

Severe to strong groundshaking could result in liquefaction-related phenomena in sections of the 230 kV transmission line that cross active river washes and streams where lenses and pockets of loose sand may be present and may become saturated seasonally during large storms or a wet season. This could result in damage to project structures should a large earthquake occur during the periods when these soils are saturated, a significant impact. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to nearby people, a significant impact. However, to ensure that impacts associated with strong groundshaking and seismically induced ground failures would be mitigated to less than significant levels (Class II), implementation of measures such as Mitigation Measure G-4b (Conduct geotechnical investigations for liquefaction) would need to be implemented prior to final project design to ensure that people or structures are not exposed to hazards associated with strong seismic groundshaking. Seismically induced slope failures would not occur along this alternative due to its flat terrain.

Mitigation Measure for Impact G-4: Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure

G-4a Reduce effects of groundshaking.

G-4b Conduct geotechnical investigations for liquefaction.

Impact G-5: Project would expose people or structures to potential substantial adverse effects as a result of surface fault rupture at crossings of active faults (Class II)

Project facilities would be subject to hazards of surface fault rupture at crossing of the active Elmore Ranch and San Jacinto faults. Fault crossings, where multiple feet of displacement are expected along active faults, are best crossed as overhead lines with towers placed well outside the fault zone to allow

for the flex in the conductor lines to absorb offset. Correct placement of towers outside of active fault zones would allow the conductors to distribute fault displacements over a comparatively long span and remove the potential that towers would collapse due to fault rupture through or adjacent to a tower foundation. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to people, a significant impact. Impacts associated with overhead active fault crossings would be reduced to less than significant levels (Class II) with implementation of Mitigation Measure G-6b (Place structures in stable areas) which requires that project structures be placed in stable areas avoiding fault lines and Mitigation Measure G-5a (Minimize project structures within active fault zones) which would require accurate location of active fault traces to ensure they are avoided by project structures.

Mitigation Measure for Impact G-5: Project would expose people or structures to potential substantial adverse effects as a result of surface fault rupture at crossings of active faults

G-5a Minimize project structures within active fault zones.

G-6b Place structures in stable areas. [GEO-APM-4]

D.13.12.3 Esmeralda–San Felipe Geothermal Project

An EIS is currently being prepared by BLM to analyze the leasing of geothermal resources exploration, development, and utilization in the Truckhaven Geothermal Leasing Area (Truckhaven) located in western Imperial County, California (refer to Figure B-46). Currently, BLM has non-competitive geothermal lease applications pending for portions of this land, including lease applications from Esmeralda Energy, LLC (Esmeralda); however, the land must first be assessed under NEPA regulations before granting leases. Under the Proposed Action analyzed in the EIS, BLM would approve the pending non-competitive leases and offer competitive leases for all other available lands at Truckhaven.

The Esmeralda–San Felipe Geothermal Project would develop 20 MW of geothermal resources within the Truckhaven Geothermal Leasing Area; however, Esmeralda is not able to submit a project application to BLM for the Esmeralda–San Felipe Geothermal Project until their pending lease applications with BLM for Truckhaven are approved. In the absence of a formal Project application, it is assumed that roughly half of the components identified under the Reasonably Foreseeable Development (RFD) scenario in BLM’s Truckhaven EIS would apply to the Esmeralda–San Felipe Geothermal Project. Additionally, the description of the environmental setting and likely impacts are partially adapted from the Draft EIS for the Truckhaven Geothermal Leasing Area (February 2007). The RFD describes the anticipated development that would occur at Truckhaven to facilitate geothermal resources exploration, development and utilization should the leases be approved by BLM and include new wells, a power plant and transmission lines, as described in Section B.6.3. Geothermal energy uses heat from the earth, extracted through geothermal wells in the form of steam or brine, which is then transported via pipeline and used to drive turbines, which drive electricity generation.

As described in Section B.6, the CPUC and BLM have determined that the Esmeralda–San Felipe Geothermal Project is so closely related to the Proposed Project as to be considered a “connected action” under the National Environmental Policy Act (NEPA). Therefore, the Esmeralda–San Felipe Geothermal Project is discussed in this EIR/EIS in order to fully disclose the potential for a new geothermal plant and associated linears to be constructed as a result of the presence of the SRPL (if it is approved and constructed). Types of mitigation that would likely reduce potentially significant impacts of the Esmeralda–San Felipe Geothermal Project have been included in the environmental impact analysis below; how-

ever, implementation of specific mitigation measures would be developed and executed by Esmeralda at the time of project permitting and approval.

Approval of the SRPL would not result in automatic approval of the Esmeralda–San Felipe Geothermal Project discussed below, and the project would require applications by Esmeralda Energy, LLC, compliance with CEQA and NEPA, followed by approvals from the BLM prior to construction on BLM lands.

Environmental Setting

Geology. The region that includes the Esmeralda–San Felipe Geothermal Project is part of the Colorado Desert geomorphic province. The Salton trough is a prominent geologic feature, which includes the Salton Sea and Imperial Valley. The Salton trough was created by the pull-apart basin bordered by the San Andreas transformation system to the northeast and the San Jacinto fault zone to the southwest. Surface deposits near the project area include the following, which are listed from youngest to oldest: Holocene or recent surficial deposits including alluvium (Qal), Lake Cahuilla deposits (Ql), and sand dunes (Qd); Pleistocene Brawley Formation (Qc), a fine-grained sandstone and mudstone from the Colorado River; the Pliocene Borrego Formation (Tl), consisting of mudstone and clay stone mostly from the Colorado River; a Pliocene transitional unit of mudstone and sandstone; and the Pliocene Diablo formation (P), which includes cross-bedded Colorado River-derived sandstone and red massive mudstone.

Slope Stability. The Truckhaven area consists of flat to gently sloping terrain and would not likely experience landslides or other slope failures.

Soils. Most of the Truckhaven area is underlain by soils belonging to the Rillito-Beeline-badland soil association (s995). Vint-Meloland-Indio soils (s996) are present in the southern portion of the Truckhaven area. Other soil associations present in relatively small portions of the project area include Indio-Gilman-Coachella (s992) in the northeast and Rositas-Orita-Carrizo-Aco (s994) in the southwest. Summaries of the basic characteristics of these soils are presented in Tables D.13-2.

Mineral Resources. No known active mineral resource sites or BLM mining claims are located in the Truckhaven Geothermal Leasing Area. The project is located in a geothermal field; however, this project is related to development of this resource and would actually be increasing access to this resource.

Seismicity. The project area is located in a seismically active portion of southern California characterized by numerous geologically young faults. General seismicity of this area is discussed in Section D.13.2.3 Imperial Valley Link. Specific seismic issues pertaining to this project are discussed below.

Seismicity – Fault Rupture. No known active faults cross the Truckhaven area; therefore, surface fault rupture is not likely to occur at the site. However, several active faults are located near the site and it is possible that transmission lines needed to connect this facility to other transmission systems could cross these faults.

Seismicity – Groundshaking. Moderate to strong groundshaking from an earthquake on any of the faults in the vicinity of this site should be expected. The estimated PGAs for the Truckhaven area range from 0.4 to 0.6g.

Seismicity – Liquefaction. Potential for liquefaction in this area is low due to anticipated depths of groundwater of greater than 100 feet. However, during large storms or a wet season, the water table may rise temporarily and areas where project facilities are near or cross active river washes and streams may be

moderately susceptible to liquefaction if a strong earthquake occurs while the valley floor sediments are saturated.

Seismicity – Earthquake-Induced Landslides. This area is relatively flat and not likely to experience landsliding or slope failures due to earthquakes.

Environmental Impacts and Mitigation Measures

As stated in BLM's Draft EIS for the Truckhaven Geothermal Leasing Area, the following BMPs and other mitigation measures would be included/considered in Plans of Operation, which are required for surface-disturbing activities, in order to minimize adverse impacts to resources and uses in the Truckhaven Geothermal Leasing Area, which includes the Esmeralda-San Felipe Geothermal Project area:

- A detailed geotechnical analysis would be performed prior to the construction of any structures; so they could be sited to avoid any hazards from subsidence or liquefaction (i.e., the changing of a saturated soil from a relatively stable solid state to a liquid during earthquakes or nearby blasting.).

Construction Impacts

No construction impacts related to construction-triggered slope failures (Impact G-6) would occur associated with this project due to the flat to gently terrain underlying the Truckhaven site and surrounding areas. No impacts related to Impact G-9 (Construction activities would interfere with access to known mineral resources) are expected for this project as no known active mineral resource sites or BLM claims are located at the site.

Impact G-1: Erosion would be triggered or accelerated due to construction activities (Class II)

The construction activities associated with geothermal exploration and development have the potential to disturb soil potentially triggering or accelerating erosion. Accelerated wind and water-induced erosion may result from earthmoving activities associated with construction of the Esmeralda-San Felipe Geothermal Project. Soils devoid of vegetation have the highest potential for erosion. The hazard of erosion of the soils underlying the Truckhaven area ranges from slight to moderate for both on-road/on-trail and off-road/on-trail. Mitigation Measures G-1a (Limit modification of access roads), G-1b (Implement erosion control procedures), G-1c (Avoid new disturbance, erosion, and degradation), and G-1d (Restore surfaces for erosion control and revegetation) could be applied to reduce the amount of erosion that would result from construction by limiting construction traffic and grading of existing roads in areas with sensitive soils, planning construction to minimize new ground disturbance, and using BMPs such as sand bags and road bars to control water erosion. Additionally, a Stormwater Pollution Prevention Plan (SWPPP) that would limit erosion from the construction site would be required in accordance with the State General Construction Permit and the Clean Water Act. Although impacts could be significant, implementation of Mitigation Measures G-1a, G-1b, G-1c, and G-1d would ensure that any impacts would be less than significant impact (Class II). The full text of the mitigation measures can be found in Appendix 12.

Mitigation Measures for Impact G-1: Erosion would be triggered or accelerated due to construction activities

G-1a Limit modification of access roads. [GEO-APM-1]

- G-1b** **Implement erosion control procedures.** [GEO-APM-2]
- G-1c** **Avoid new disturbance, erosion, and degradation.** [GEO-APM-5]
- G-1d** **Restore surfaces for erosion control and revegetation.** [GEO-APM-6]

Impact G-2: Unique geologic features would be damaged due to construction activities (Class II)

Desert pavement areas are a special concern in the desert areas near Truckhaven. Desert pavement is a unique geologic/soil feature that takes thousands of years to form and protects the underlying silty and sandy soils from excessive wind and water erosion. Damage to desert pavement could result in an extreme acceleration of erosion. The Rositas-Orita-Carrizo-Aco (s994) soil association in the southwest portion of Truckhaven is known to include areas of desert pavement. Mitigation Measures G-1a (Limit modification of access roads) and G-1b (Implement erosion control procedures) would limit construction traffic and grading of new and existing roads in areas with sensitive soil and restricting construction traffic to existing access roads could be applied to reduce impacts. Additional, mitigation, such as Mitigation Measure G-2a, would need to be implemented to protect desert pavement in areas underlain by the Rositas-Orita-Carrizo-Aco (s994) soil association. These measures would reduce impacts associated with damage to desert pavement areas to less than significant (Class II).

Mitigation Measures for Impact G-2: Unique geologic features would be damaged due to construction activities

- G-1a** **Limit modification of access roads.** [GEO-APM-1]
- G-1b** **Implement erosion control procedures.** [GEO-APM-2]
- G-2a** **Protect desert pavement.**

Operational Impacts

Damage to project structures from seismically induced landslides (Impact G-4) and naturally occurring landslides, earthflows, debris flows and/or rock fall (Impact G-6) is unlikely to occur at the Truckhaven site or along associated transmission alignments due to the flat to gently sloping nature of the underlying terrain.

Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils (Class II)

Soils in the Truckhaven area have a low to high potential to corrode steel and a low to moderate potential to corrode concrete. Corrosive subsurface soils may exist in places at the Truckhaven site. Expansion potential for the soils in the Truckhaven area ranges from low to high. Depending on the degree of corrosivity of subsurface soils, concrete and reinforcing steel in concrete structures and bare-metal structures exposed to these soils could deteriorate, eventually leading to structural failures. Expansive soils can also cause problems to structures. Soils that exhibit shrink-swell behavior are clay-rich and react to changes in moisture content by expanding or contracting. Expansive soils may cause differential and cyclical foundation movements that can cause damage and/or distress to structures and equipment. In addition, potential impacts associated with loose sands or other compressible soils include excessive settlement, low foundation-bearing capacity, and limitation of year-round access to project facilities. Damage to or collapse of project structures due to unsuitable soil conditions could have adverse impacts on the reliability of peak electrical supply and could expose people or structures to substantial adverse effects. Unidentified expansive and corrosive soils could damage project structures and facilities potentially

resulting in collapse. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to people, a significant impact. Application of standard design and construction practices and implementation of Mitigation Measure G-3b (Avoid structure placement in high shrink/swell areas) and Mitigation Measure G-3a (Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design) would be required as part of the detailed geotechnical analysis that would be conducted by the applicant to delineate locations of high shrink/swell (expansive) soils and the presence, absence, and location of corrosive soils to fully reduce the potential for adverse affects of problematic soils to less than significant (Class II).

Mitigation Measure for Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils

G-3a Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design.

G-3b Avoid structure placement in high shrink/swell areas. [GEO-APM-3]

Impact G-4: Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure (Class II and III)

Potential geologic hazards associated with earthquakes include ground shaking, ground rupture, landslides, and liquefaction-related phenomena. Moderate to strong groundshaking should be expected in the event of an earthquake on the faults in the Truckhaven area and from other major faults in the region, with estimated PGAs ranging from 0.4 to 0.6 g. Geothermal power plant structures and any associated transmission lines would need to be designed to withstand these ground motions. The applicant would follow all applicable building codes and standard practices for power plant construction as required by the CEC including: Title 24, California Code of Regulations, which adopts the current edition of the CBC as minimum legal building standards; the 2001 California Building Code (CBC) for design of structures; the 1996 Structural Engineers Association of California's Recommended Lateral Force Requirements, for seismic design; ASME-American Society of Mechanical Engineers Boiler and Pressure Vessel Code, and the NEMA-National Electrical Manufacturers Association; and as a result, potential impacts would be less than significant (Class III).

Generally appropriate tower design accounting for lateral wind loads and conductor loads would likely exceed any creditable seismic loading, minimizing potential damage to tower structures from groundshaking; however, vertical and horizontal peak ground accelerations from local strong groundshaking could potentially exceed lateral wind loads, resulting in damage or collapse of tower structures, a significant impact. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to nearby people, a significant impact. However, to ensure that impacts associated with strong groundshaking would be mitigated to less than significant levels (Class II), implementation of measures such Mitigation Measure G-4a (Reduce effects of groundshaking) would be required as part of the detailed geotechnical analysis that would be conducted by the applicant.

Strong groundshaking could result in liquefaction-related phenomena in areas where project facilities are near to and cross active river washes and streams where lenses and pockets of loose sand may be present and may become saturated seasonally during large storms or a wet season. This could result in damage to project structures should a large earthquake occur during the periods when these soils are saturated, a significant impact. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to nearby people, a significant impact. However, to ensure that impacts associated with strong groundshaking and seismically induced ground failures would be

mitigated to less than significant levels (Class II), implementation of measures such as Mitigation Measure G-4b (Conduct geotechnical investigations for liquefaction) would need to be implemented prior to final project design to ensure that people or structures are not exposed to hazards associated with strong seismic groundshaking. Seismically induced slope failures would not occur along this alternative due to its flat terrain.

Mitigation Measure for Impact G-4: Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure

G-4a **Reduce effects of groundshaking.**

G-4b **Conduct geotechnical investigations for liquefaction.**

Impact G-5: Project would expose people or structures to potential substantial adverse effects as a result of surface fault rupture at crossings of active faults (Class II)

The nearest active faults to the Truckhaven Geothermal Leasing Area are the Superstition Hills, Elmore Ranch, and San Jacinto faults. Without a formal application it is not known where Esmeralda-San Felipe Geotechnical Project facilities would be sited. It is possible that the transmission lines required to interconnect to the IID or SDG&E system may traverse active faults. Fault crossings, where multiple feet of displacement are expected along active faults, are best crossed as overhead lines with towers placed well outside the fault zone to allow for the flex in the conductor lines to absorb offset. Correct placement of towers outside of active fault zones would allow the conductors to distribute fault displacements over a comparatively long span and remove the potential that towers would collapse due to fault rupture through or adjacent to a tower foundation. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to people, a significant impact. Impacts associated with overhead active fault crossings would be reduced to less than significant levels (Class II) with implementation of Mitigation Measure G-6b (Place structures in stable areas) which requires that project structures be placed in stable areas avoiding fault lines and Mitigation Measure G-5a (Minimize project structures within active fault zones) which would require accurate location of active fault traces to ensure they are avoided by project structures.

Mitigation Measure for Impact G-5: Project would expose people or structures to potential substantial adverse effects as a result of surface fault rupture at crossings of active faults

G-5a **Minimize project structures within active fault zones.**

G-6b **Place structures in stable areas. [GEO-APM-4]**

D.13.12.4 Jacumba Substation

In its testimony during the CPUC's Phase 1 hearings on the need and economics of the Proposed Project, SDG&E staff stated that a new 230/500 kV substation would be required to allow future wind generation projects to transmit generated power via the existing 500 kV Southwest Powerlink (SWPL) transmission line. The SWPL currently has limited available capacity, but if the Sunrise Powerlink Project is approved and constructed, some electricity currently carried by the SWPL will be transmitted via Sunrise, making more capacity available on the SWPL. There are a number of possible new wind generation projects near the Jacumba area (about 5 miles west of the San Diego/Imperial County line), some in San Diego County (Crestwood wind area) and some in Mexico (La Rumorosa wind area). Therefore, the impacts of this substation are evaluated as part of the Proposed Project.

This 230/500 kV substation would allow incoming transmission lines at 230 kV from wind farms in either the Crestwood or La Rumorosa areas. The power would be transformed to 500 kV in order to allow it to be transmitted via the SWPL to the Miguel Substation in San Diego. The substation is assumed to occupy about 20 acres, and while its location has not been defined by SDG&E, for the purposes of this EIR/EIS it is assumed to be located just east of the point where the Interstate 8 Alternative diverges from the SWPL. Figure B-47 illustrates the approximate location and size of the substation area. The impacts of this substation are also evaluated as a part of the wind component of the Non-Wires In-Area Renewable Generation Alternative, as defined and analyzed in Section E.5. Approval of the SRPL would not result in automatic approval of the Jacumba Substation discussed below, and the project would require applications by SDG&E, and compliance with CEQA and NEPA.

Environmental Setting

Regional Physiography: The general physiographic setting of the Jacumba Substation is the same as the Peninsular Ranges Region of the Proposed Project ROW and is discussed in Section D.13.1.1.

Geology: The Jacumba Substation sits on a mesa. The SWPL ROW crosses the Jacumba Mountains, and numerous unnamed hills and mesas dissected by small intervening drainages. The Jacumba Substation crosses a couple of geologic units along its length. Descriptions of the geologic materials crossed by the substation route are summarized in Table D.13-15 including type of unit, age, a general physical description of the unit, and estimated excavation characteristics of the geologic unit.

Table D.13-15. Summary of Geologic Units along the Jacumba Substation

Unit Symbol	Geologic Unit	Age	Description/Comment	Excavation Characteristics ¹
Qal	Alluvium	Holocene	Unconsolidated stream, river, and alluvial fan deposits consisting of primarily sand, silt, clay, and gravel.	Easy
gr-m	Granitic and metamorphic rocks	Pre-Cenozoic	Mixed granitic and metamorphic rocks consisting of migmatites, schist, and quartz diorite. Also includes mixed hybrid rock consisting of Julian Schist and Stonewall Granodiorite.	Difficult

The Jacumba Substation would sit on MP I8-35 of the Interstate 8 Alternative ROW, and the approximate locations of these units within the Substation are listed below.

- Alluvium (Qal): MPs I8-32.3 to I8-34.3, I8-35.0 to I8-35.3
- Mixed granitic and metamorphic rocks (gr-m): MPs I8-35.3 to I8-38.0

Slope Stability

The Jacumba Substation traverses hills, mesas, and valleys of the Jacumba, In-Ko-Pah, and Laguna Mountains. Although this crosses moderately sloping hills and valleys, these areas are underlain primarily by granitic and volcanic units which are not prone to landslides. However, excavation and grading for the project would potentially trigger rock-falls or shallow soil slides.

Soils

A summary of the significant characteristics (description, erosion hazard, expansive potential, and corrosion potential) of the major soil associations along MP I8-35 on which the Jacumba Substation would

site is presented in Table D.13-2. General characteristics and locations of these soil units along the alternative ROW are discussed below based on approximate milepost locations. The substation occurs on and around MP I-8 35, corresponding to s1016.

Most of the soil associations underlying the center and western end of the alignment, s1010, s1013 through s1016 are primarily formed in material weathered from the underlying granitic and metamorphic rocks. Hazard of erosion for these soils for off-road/off-trail ranges from slight to very severe and for on-road/on-trail ranges from slight to severe, and shrink/swell (expansive) potential varies from low to high. Corrosive potential of these soils ranges from moderate to high for uncoated steel and from low to high for concrete.

Mineral Resources

General mineral resources in the region near the Jacumba Substation are the same as for the Proposed Project (See Section E.1.13 for specifics for the Interstate 8 Alternative MP I8-35). Additionally, GIS data from the USGS Mineral Resource Data System (MRDS) for Imperial and San Diego Counties was reviewed for mine or quarries within 1000 feet of the alternative alignment (USGS, 2006a). No oil, gas, or geothermal fields are located in the vicinity of the SWPL alternative alignments which includes MP I8-35, on which the Jacumba Substation is sited (DOGGR, 2007). Therefore, there is little to no potential for the project to impact petroleum or geothermal resources.

Seismicity

Fault Rupture. This Jacumba Substation crosses no active faults.

Groundshaking. No significant active faults capable of producing large earthquakes are located in the immediate vicinity of the substation; therefore strong groundshaking is not expected. However, moderate to strong groundshaking could be caused near the substation by a large earthquake on nearby significant active faults, i.e., the Imperial, Elsinore, or Laguna Salada faults. The peak horizontal accelerations for the I-8 Alternative are presented in Table D.13-16 and those that are pertinent to the siting of the Jacumba Substation are presented below.

Table D.13-16. Approximate Peak Ground Accelerations – Jacumba Substation

Approximate Interstate 8 Alternative (I8) Milepost	Total Length of Segments (miles)	Peak Ground Acceleration
31.3-32.5, 35.2-50.9, 51.0-52.0, 52.1-82.0, 83.1-83.6, and 84.9-92.8	56.2	0.1-0.2g
23.5-29.0 and 34.1-35.0	6.4	0.2-0.3g
22.1-22.6, 23-23.4, 29.0-31.3, 32.5-34.1, 35.0-35.2, 50.9-51.0, 52.0-52.1, 82.0-83.1, and 83.6-84.9	7.6	0.3-0.4g

Liquefaction. Potential for liquefaction along this alignment is primarily isolated to areas near creeks and washes underlain by young alluvial and lacustrine deposits which could liquefy during an earthquake if perched groundwater were present. Potential for liquefaction in other areas underlain by alluvium and lacustrine deposits near the eastern end of the alignment is generally low due to anticipated depths of groundwater of greater than 100 feet.

Earthquake-Induced Landslides. The Jacumba Substation is surrounded by numerous hills, valleys, and plateaus across the Jacumba and In-Ko-Pah Mountains, and although most of this portion of the substation is underlain by igneous and metamorphic bedrock, earthquake triggered rock falls and shallow landslides could occur.

Earthquake-Induced Landslides. The Jacumba Substation site is located on a flat to gently sloping plateau. Slopes beyond the edge of the plateau are moderately sloping and primarily underlain by granitic bedrock. The underlying Julian Schist may be prone to earthquake triggered landsliding on the nearby slopes and the moderately sloping hills underlain by igneous bedrock could be susceptible to earthquake triggered rock falls and shallow landslides.

No desert pavement is mapped at this site and thus Impact G-2 (Unique geologic features would be damaged due to construction activities) is not expected to occur at the Jacumba Substation site. No known active mineral resource sites or BLM claims are located along this alignment, therefore there are no impacts related to Impact G-9 (Construction activities would interfere with access to known mineral resources)

Environmental Impacts and Mitigation Measures

Construction Impacts

Impact G-1: Erosion would be triggered or accelerated due to construction activities (Class III)

Excavation and grading for substation facilities and access roads would loosen soil and trigger or accelerate erosion. Soils along route have an erosion hazard for off-road/off-trail ranges from slight to very severe and for on-road/on-trail ranges from slight to severe. Mitigation Measures G-1a, G-1b, G-1c, and G-1d reduce the amount of erosion that would result from construction by limiting construction traffic and grading of existing roads in areas with sensitive soils, planning construction to minimize new ground disturbance, using of Best Management Practices (BMPs) such as sand bags and road bars, to control water erosion. In addition, a Stormwater Pollution Prevention Plan (SWPPP) that would limit erosion from the construction site would be required in accordance with the Clean Water Act. This would result in a less than significant impact (Class III). The full text of the mitigation measures can be found in Appendix 12.

Mitigation Measures for Impact G-1: Erosion would be triggered or accelerated due to construction activities (Class III)

- G-1a** **Limit modification of access roads.** [GEO-APM-1]
- G-1b** **Implement erosion control procedures.** [GEO-APM-2]
- G-1c** **Avoid new disturbance, erosion, and degradation.** [GEO-APM-5]
- G-1d** **Restore surfaces for erosion control and revegetation.** [GEO-APM-6]

Impact G-6: Project would expose people or structures to potential substantial adverse effects as a result of slope instability created during excavation and/or grading (Class II)

Destabilization of natural or constructed slopes could occur as a result of construction activities due to excavation and/or grading operations for the Jacumba Substation if construction were to result in oversteepened slopes underlain by Julian Schist. Slope instability including landslides, rock falls, earth flows, and debris flows has the potential to undermine foundations, cause distortion and distress to overlying structures, and displace or destroy project components. Mitigation Measure G-6b would partially reduce impacts related to slope instability by avoiding placing structures in unstable areas and removing or stabilizing boulders upslope of structures thus reducing the threat of possible slope failures or rockfalls. However, the Jacumba Substation would still result in significant impacts if unidentified unstable slopes or areas of potentially unstable slopes were disturbed or undercut by construction activities resulting in

slope failures. Slope failures could cause damage to the environment, to project or other nearby structures, and could cause injury or death to workers and/or the public, a significant impact. To ensure that slope instability impacts would be reduced to less than significant (Class II), implementation of Mitigation Measure G-6a is required to delineate potential areas of unstable slopes near and within work areas and minimize the potential from construction triggered slope failures by avoidance or implementation of slope stabilizing design measures.

Mitigation Measure for Impact G-6: Project would expose people or structures to potential substantial adverse effects as a result of slope instability created during excavation and/or grading

G-6a **Conduct geotechnical surveys for landslides and protect against slope instability.**

G-6b **Place structures in stable areas. [GEO-APM-4]**

Operational Impacts

There would be no impacts associated with this alternative on project structures due to ground shaking or seismically induced liquefaction (Impact G-4), fault rupture (Impact G-5), or due to landslides, earthflows, debris flows and/or rock fall during project operation (Impact G-7).

Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils (Class II)

Soils at the Jacumba Substation site have a moderate to high potential to corrosion for both uncoated steel and concrete. Expansion potential for the soils varies from low to moderate. Corrosive and expansive subsurface soils may exist in places at the substation site which would potentially damage project structures. Therefore there would be a significant impact. Application of standard design and construction practices and implementation of Mitigation Measure G-3b would partially reduce the adverse affects of problematic soils by avoiding placement of structures in areas of high shrink/swell potential, to the extent feasible. However, actual locations of high shrink/swell (expansive) soils and the presence, absence, and location of corrosive soils needs to be determined to fully reduce the potential for adverse affects of problematic soils to less than significant. Unidentified expansive and corrosive soils could damage project structures and facilities potentially resulting in collapse. Collapse of project structures would potentially result in power outages, damage to nearby roads or structures, and injury or death to nearby people. Therefore there would be a significant impact. Accordingly, implementation of Mitigation Measure G-3a (Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design) would ensure that impacts associated with problematic soils are reduced to less than significant levels (Class II).

Mitigation Measure for Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils

G-3a **Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design.**

G-3b **Avoid structure placement in high shrink/swell areas. [GEO-APM-3]**

Impact G-4: Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure (Class II)

Minor groundshaking would potentially result in seismically induced slope failures such landslides and rockfalls at the Jacumba Substation site in areas along and adjacent to moderate slopes. This would

potentially result in damage to project structures. Collapse of project structures would potentially result in power outages, damage to nearby roads of structures, and injury or death to people. Therefore, there would be a significant impact. To ensure that impacts associated with seismically induced ground failures from strong groundshaking would be reduced to less than significant levels (Class II), implementation of Mitigation Measure G-6a is required prior to final project design to ensure that people or structures are not exposed to hazards associated with seismic groundshaking.

Mitigation Measure for Impact G-4: Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure

G-6a Conduct geotechnical surveys for landslides and protect against slope instability.

D.13.12.5 SCE La Rumorosa Wind Project

Environmental Setting

United States

Geology. The 1.7-mile transmission alignment between the U.S./Mexico border and the Jacumba Substation crosses hills and valley of the Jacumba Mountain and is primarily underlain by Quaternary alluvium (Qal) and mixed granitic and metamorphic rocks (gr-m). A general description of the characteristic of these units is presented in Section E.1.13 in Table E.1.13-1.

Slope Stability. This 1.7-mile alignment traverses near and across gently sloping alluvial fans and valley floor, and moderately sloping hillside terrain. Although a large portion of the alignment cross moderately sloping hills and valleys, these areas are underlain primarily by granitic and metamorphic units which are not typically prone to landslides. However, excavation and grading for the project could potentially trigger rock-falls or shallow soil slides.

Soils. The RWD transmission line alignment in the United States traverses at least two soil associations; the Indio-Gilman-Coachella (s992) and the Sheephead-Rock Outcrop-Bancas association (s1016). Hazard of erosion for these soils for off-road/off-trail ranges from slight to moderate and for on-road/on-trail ranges from slight to severe. Shrink/swell (expansive) potential of the soils associations along this alignment varies from low to moderate. Corrosive potential of soils along the alignment ranges from moderate to high for uncoated steel and from low to moderate for concrete. No soils with desert pavement are mapped at this site. The basic characteristics of these soil associations are presented in Table D.13-2. Other similar soils may also be encountered along the alignment.

Mineral Resources. There are no known active mineral resource sites or BLM claims along the alignment. The alignment does cross one closed BLM placer mining claim. Therefore, there would be no impacts related to accessibility of mineral resources.

Seismicity. The transmission alignment does not cross nor is in close proximity to any active faults and is therefore not likely to be damaged by fault rupture. The site may experience moderate groundshaking from earthquakes on nearby significant active faults, i.e., the Elsinore, or Laguna Salada located east of the alignment. Estimated PGAs along the alignment range from 0.1 g to 0.4g, with the higher PGAs in areas underlain by alluvial deposits. Portions of the site alignment are underlain by Quaternary alluvium and would likely be susceptible to liquefaction-related phenomena in areas underlain by saturated sandy deposits. The alignment crosses numerous hills, valleys, and plateaus across the Jacumba Mountains, and

although most of this portion of the alignment is underlain by igneous and metamorphic bedrock, earthquake triggered rock falls and shallow landslides could occur.

Mexico

Regional Physiography. The principal mountain system in Baja California traverses the state longitudinally, beginning with the Sierra de Juárez in the north and continuing in the South as the Sierra de San Pedro Mártir, at which point this mountain chain divides into many smaller peaks until reaching South Baja California. This formation has given rise to a variety of topography, valleys, peaks, grasslands, etc. These mountains are a continuation of the San Diego Mountain chain and as such display similar physiography as those discussed in Section D.13.1.1 (GobBC, 2007)

Geology. The Baja California peninsula underwent geologic conditions and tectonic movement that gave rise to the geologic structure and physical orientation, primarily seen in the mountain ranges along the length of the state. These mountain chains have a massive granite base (batholith,) most evident in the North and hidden in the South of the state under large amounts of volcanic materials. (GobBC, 2007)

Slope Stability. The RWD wind farm and transmission line (both on the existing Tijuana/Mexicali ROW and on a new ROW) traverses hills, mesas, and valleys of the Sierra de Juárez Mountains. Although this crosses moderately sloping hills and valleys, these areas are underlain primarily by granitic and volcanic units which are not typically prone to landslides. However, excavation and grading for the project could potentially trigger rock-falls or shallow soil slides. (GobBC, 2007)

Soils. A summary of the significant characteristics (description, erosion hazard, expansive potential, and corrosion potential) of the major soil associations traversed by the RWD wind farm and transmission line are shown below. This data was taken from the official Baja California website.

- **Regosol.** This soil is characterized by not having distinct soil layers. It has a general clear tone and is found in beaches and dunes, and on mountain sides. It is often accompanied by litosols and rock formation. It has varied fertility and often rocky.
- **Litosol.** This soil is distinguished by having a depth of less than 10 centimeters. It is found on mountains and steep slopes. It can be sandy or more clay like and can be susceptible to erosion, depending on the topography of the region.
- **Fluvisol.** This soil is distinguished by being formed by water borne particles. It is a poorly developed soil and is found in all areas of Baja California that are near lakes or mountains. It frequently has alternating layers of sand, clay, or pebbles.

Most of the soil associations underlying the region are primarily formed in material weathered from the underlying granitic and metamorphic rocks. Hazard of erosion for these soils was unavailable.

Mineral Resources. General mineral resources in the region of the RWD wind farm and transmission line are possible granite and quartz deposits within the Sierra de Juárez region. However, as the facilities will be located near an existing town and along an already existing ROW, there is little to no potential for the project to be impacted by geothermal resources (GobBC, 2007).

Seismicity

Fault Rupture. The RWD wind farm and transmission line crosses no active faults (SCEDC, 2006).

Groundshaking. No significant active faults capable of producing large earthquakes are located in the immediate vicinity of the RWD wind farm and transmission line; therefore strong groundshaking is not expected. However, moderate to strong groundshaking could be caused near the transmission line by a large earthquake on nearby significant active faults, i.e., the Imperial, Elsinore, or Laguna Salada faults. The peak horizontal accelerations for this region are similar to the extension of the transmission line within the United States

Liquefaction. Potential for liquefaction along this alignment is primarily isolated to areas near creeks and washes underlain by young alluvial and lacustrine deposits which could liquefy during an earthquake if perched groundwater were present. Potential for liquefaction in other areas underlain by alluvium and lacustrine deposits near the eastern end of the alignment is generally low due to anticipated depths of groundwater of greater than 100 feet.

Earthquake-Induced Landslides. The RWD wind farm and transmission line is surrounded by numerous hills, valleys, and plateaus across the Sierra de Juárez Mountains, and although most of this portion of the transmission line is underlain by igneous and metamorphic bedrock, earthquake triggered rock falls and shallow landslides could occur.

Environmental Impacts and Mitigation Measures

Construction Impacts

No impacts associated with this project would occur to desert pavement as there is no desert pavement within the Jacumba and La Rumorosa regions (Impact G-2). No impacts associated with this project would occur from construction activities interfering with access to known mineral resources (Impact G-7).

Impact G-1: Erosion would be triggered or accelerated due to construction activities (Class II for the United States, No Available Data for Mexico)

United States and Mexico. Excavation and grading for wind tower foundations, trenching for underground power, transmission lines, access/spur roads, switchyard, substation, and operation and maintenance facilities would loosen soil and accelerate erosion. While no data is available for the severity of the soil erosion hazard in the La Rumorosa area in Mexico, along the U.S./Mexico border it can be assumed that the soil erosion hazard would be similar to the parcel within the United States. Should this occur, it would be a significant impact.

Available mitigation includes limiting grading of existing roads in areas with sensitive soils; using of Best Management Practices (BMPs) such as sand bags and road bars, to control water erosion; and limiting construction traffic to minimize erosion. In addition, a Stormwater Pollution Prevention Plan (SWPPP) that would limit erosion from the construction site would be required in accordance with the Clean Water Act. Implementation of such measures would result in a less than significant impact (Class II). The full text of the mitigation measures can be found in Appendix 12.

Mitigation Measures for Impact G-1: Erosion would be triggered or accelerated due to construction activities

G-1a **Limit modification of access roads.** [GEO-APM-1]

G-1d **Restore surfaces for erosion control and revegetation.** [GEO-APM-6]

Impact G-6: Project would expose people or structures to potential substantial adverse effects as a result of slope instability created during excavation and/or grading (Class II)

United States and Mexico. Destabilization of natural or constructed slopes would potentially occur as a result of construction activities due to excavation and/or grading operations. Construction consisting of grading and excavation within the hillsides forming the RWD project area would potentially cause slope instability, triggering rock-falls or landslides. Slope instability including landslides, earth flows, and debris flows has the potential to undermine foundations, cause distortion and distress to overlying structures, and displace or destroy project components. This would be a significant impact.

The potential for excavation or grading to cause slope instability is mitigable to less than significant levels (Class II). Available mitigation includes avoiding placing structures in unstable areas, and removing or stabilizing boulders upslope of structures thus reducing the threat of possible slope failures or rock falls. Mitigation Measure G-3b, G-6a, and G-6b are recommended.

Mitigation Measures for Impact G-6: Project would expose people or structures to potential substantial adverse effects as a result of slope instability created during excavation and/or grading

G-3b **Avoid structure placement in high shrink/swell areas.** [GEO-APM-3]

G-6a **Conduct geotechnical surveys for landslides and protect against slope instability.**

G-6b **Place structures in stable areas.** [GEO-APM-4]

Operational Impacts

Impact G-5 (Transmission line and tower structures could be damaged by surface fault rupture at crossings of active faults) would not occur because the RWD project does not cross any known active faults.

Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils (Class II for the United States; No Available Data for Mexico)

United States and Mexico. Soils near the RWD project sites in the United States have moderate to high potential for corrosion to uncoated steel and a low to moderate potential for corrosion to concrete. Expansion potential for the soils varies from low to moderate. Corrosive and expansive subsurface soils may exist in places along the proposed route which would potentially damage project structures. Collapse of project structures would potentially result in power outages, damage to nearby roads or structures, and injury or death to nearby people. This would be a significant impact. No data is available for the potential of the soils comprising the RWD project sites in Mexico for corrosion to uncoated steel and for corrosion to concrete, however along the U.S./Mexico border, it can be assumed that the corrosion and expansion potential would be similar to that within the United States.

The potential for project structures to be damaged by problematic soils is mitigable to less than significant levels (Class II) through application of standard design and construction practices and implementation of mitigation. Mitigation includes application of standard design and construction practices, and reducing the adverse affects of problematic soils by avoiding placement of structures in areas of high shrink/swell potential, to the extent feasible. Mitigation Measure G-3a is also recommended.

Mitigation Measures for Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils G-3a Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design

G-3b Avoid structure placement in high shrink/swell areas. [GEO-APM-3]

Impact G-4: Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure (Class II and III)

United States and Mexico. The RWD project area would experience moderate groundshaking in the event of a large earthquake on major faults in the region. Seismically induced groundshaking would potentially damage project structures. Collapse of project structures would potentially result in power outages, damage to nearby roads or structures, and injury or death to nearby people. This would be a significant impact. However, appropriate transmission line design accounting for lateral wind loads would likely exceed any creditable seismic loading from moderate groundshaking, thus minimizing potential damage to structures from groundshaking related to earthquakes on faults in the region of the RWD project. This would result in a less than significant impact (Class III). Appropriate turbine design accounting for lateral wind loads would likely exceed any creditable seismic loading from moderate groundshaking, thus minimizing potential damage to turbine structures from groundshaking related to earthquakes on faults in the region of the RWD project. This would result in a less than significant impact (Class III).

Moderate groundshaking would potentially result in seismically induced ground failures, including liquefaction and slope failures along the RWD project. Seismically induced slope failures such as landslides and rockfalls would potentially occur along the moderate to steep slopes that comprise the RWD project area. This would result in damage to project structures. Collapse of project structures would potentially result in power outages, damage to nearby roads or structures, and injury or death to nearby people. This would be a potentially significant impact.

The potential for project structures to be damaged by seismically induced groundshaking and/or ground failure is mitigable to less than significant levels (Class II). Mitigation includes placement of structures in geologically stable areas and avoidance of fault lines where feasible. Mitigation Measures G-4a, G-4b, G-5a, and G-6a are also recommended.

Mitigation measures for Impact G-4: Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure

G-4a Reduce effects of groundshaking.

G-4b Conduct geotechnical investigations for liquefaction.

G-5a Minimize project structures within active fault zones.

G-6a Conduct geotechnical surveys for landslides and protect against slope instability.

Impact G-7: Project would expose people or structures to potential substantial adverse effects as a result of landslides, earthflows, debris flows, and/or rockfall (Class II)

United States and Mexico. Slope instability including landslides, earth flows, debris flows, and rock fall has the potential to undermine foundations, cause distortion and distress to overlying structures, and displace or destroy associated project components. Given the moderate to steep slopes that comprise the RWD project area, slope instability presents a significant impact.

The potential for project structures to be damaged by landslides, earthflows, debris flows, and/or rock fall is mitigable to less than significant levels (Class II). Mitigation includes ensuring that project structures are located outside of areas with unstable slopes and that boulders are removed from slopes or stabilized. Mitigation Measure G-3b and G-6a are recommended.

Mitigation Measure for Impact G-7: Project would expose people or structures to potential substantial adverse effects as a result of landslides, earthflows, debris flows, and/or rockfall

G-3b **Avoid structure placement in high shrink/swell areas.** GEO-APM-3]

G-6a **Conduct geotechnical surveys for landslides and protect against slope instability.**

D.13.13 Overall Geology Impacts of Proposed Project

Construction Impacts

Soil erosion would be accelerated due to construction activities throughout the Proposed Project area, Future Transmission System Expansion, and the Connected Actions and Indirect Effects regions. APMs (see Table D.13-11) would reduce the amount of overall soil erosion that would result from construction activities for the Proposed Project. Mitigation Measures would do the same for the Connected Actions and Indirect Effects. APMs and Mitigation Measures would limit construction traffic and the grading of existing roads composed of sensitive soils, and use BMPs to control water erosion. In addition, a Stormwater Pollution Prevention Plan (SWPPP) that would limit erosion from a construction site would be required in accordance with the Clean Water Act. These soil erosion impacts would result in a less than significant impact (Class II and Class III). Soil erosion impacts caused by construction or modification of Substations within the Proposed Project would result in less than significant impacts (Class III).

In the Imperial Valley Link and in the SES, IID, and Esmeralda-San Felipe Geothermal Connected Action, desert pavement is a unique geologic/soil feature that takes thousands of years to form and protects the underlying silty and sandy soils from excessive wind and water erosion. Project construction including grading and excavation could result in damage to this unique geologic feature. Damage to desert pavement would result in extreme acceleration of erosion, a significant impact (Class II). Mitigation Measure G-2a would be implemented to protect desert pavement in the Imperial Valley Link and along the Connected Actions indicated above.

Excavation or grading during construction of the Proposed Project, Future Transmission System Expansion, and Connected Action and Indirect Effects would cause slope instability. There are areas within the Anza-Borrego Link, Inland Valley Link, and Central Link that could be susceptible to slope instability during construction. In the Connected Action and Indirect Effects, areas within the Jacumba Substation and the RWD project could be susceptible to slope instability during construction. Mitigation Measure G-6a would reduce the impact to a less than significant level (Class II). Mitigation Measure G-6a requires that the applicant perform design-level geotechnical surveys in areas of planned grading and excavation that cross and are adjacent to hills and mountains. Based on the results of the geotechnical survey, appropriate support and protection measures shall be designed and implemented to maintain the stability of slopes.

Operation Impacts

The Proposed Project, including the Proposed Central East Substation, and the Connected Actions and Indirect Effects would expose people or structures to substantial adverse effects as a result of damage to project components by problematic soils, such as soils with a high potential to corrode steel and concrete, as well as expansive soils. Soils along the Proposed Project route have a moderate to high potential to corrode steel and a low to high potential to corrode concrete. Mitigation Measure G-3a would ensure that impacts associated with problematic soils are reduced to less than significant levels (Class II). Mitigation Measure G-3a would require the applicant, SDG&E or other, to conduct studies for soils to assess characteristics to aid in appropriate foundation design.

The Proposed Project and the Connected Actions and Indirect Effects would expose project structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure. The Proposed Project route can expect moderate to severe groundshaking in the event of an earthquake on faults that are near the project route (Class II and III). The potential for seismically induced damage occurs primarily in the Imperial Valley, Anza-Borrego, and Central Links in areas where strong to severe groundshaking is expected. The potential for seismically induced damage in the Connected Actions occurs primarily in the SES, IID, and Esmeralda-San Felipe Geothermal Projects. Mitigation Measure G-4a requires site-specific seismic analyses to evaluate the peak ground accelerations for design of project components (Class II).

Moderate to severe groundshaking could potentially result in seismically induced ground failures, including liquefaction and slope failures and project structures would be exposed to potential substantial adverse effects as a result. Specific areas that are or could become saturated (e.g., active river crossings) along the Proposed Project ROW could potentially result in liquefaction-related phenomena. Mitigation Measure G-4b was developed to reduce the liquefaction-related damage to the transmission system. There are areas within the Anza-Borrego Link, Inland Valley Link, and Central Link that could be susceptible to seismically induced slope failures. Mitigation Measure G-6a would reduce the impact to a less than significant level (Class II). Mitigation Measures G-4b requires that a design-level geotechnical investigation be conducted in tower locations with liquefaction potential and where these hazards are found to exist, appropriate engineering design and construction measures shall be incorporated in the project design. Mitigation Measure G-6a requires that the applicant perform design-level geotechnical surveys in areas that cross and are adjacent to hills and mountains that may be prone to landslides, and based on the results of the geotechnical survey, appropriate support and protection measures shall be designed and implemented to maintain the stability of slopes.

The Proposed Project and the Connected Actions and Indirect Effects would expose people or structures to substantial adverse effects as a result of surface fault rupture at crossings of active faults. Project facilities in the Imperial Valley Link would be subject to hazards of surface fault rupture at crossing of the active Superstition Hills, Elmore Ranch, and San Jacinto Faults. Project facilities in the Central Link would be subject to hazards of surface rupture at crossing of the active Elsinore Fault. The proposed East Central Substation would be subject to hazards of surface rupture along the southern portion of the Earthquake Valley fault trend. SES project facilities would be subject to hazards of surface fault rupture at any crossings of the active Yuha Wells fault. The IID project facilities would be subject to hazards of surface fault rupture at crossing of the active Elmore Ranch and San Jacinto faults. The nearest active faults to the Truckhaven Geothermal Leasing Area are the Superstition Hills, Elmore Ranch, and San Jacinto faults. Mitigation Measure G-5a was developed to minimize the damage to project structures from surface fault rupture at active fault crossings. The Mitigation Measure requires the applicant to perform geologic/geotechnical studies to confirm the location of mapped traces of active

and potential faults crossed by the project route. The towers shall be placed as far as feasible outside the area of mapped fault traces. Implementation of the Mitigation Measure would reduce the impact to a less than significant level (Class II).

The Proposed Project would expose people or structures to substantial adverse effects along the Anza-Borrego Link and Inland Valley Link as a result of damage to project components by landslides, earthflows, debris flows, and/or rockfall. Slope instability including landslides, earth flows, debris flows, and rockfall has the potential to undermine foundations, cause distortion and stress to overlying structures, and displace or destroy project components (Class II). Mitigation Measure G-6a requires the applicant to conduct geotechnical surveys for landslides and protect against slope instability.

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Environmental Impacts and Mitigation Measures for Alternatives Along Proposed Project Route

Table D.13-17 summarizes the impacts that have been identified for the alternatives along the Proposed Project route.

Table D.13-17. Impacts Identified – Alternatives – Geology, Mineral Resources, and Soils		
Impact No.	Description	Impact Significance
FTHL Eastern Alternative		
G-1	Erosion would be triggered or accelerated due to construction activities.	Class III
G-3	Project would expose people or structures to potential substantial adverse effects as a result of problematic soils.	Class II
G-4	Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure.	Class II
SDG&E West of Dunaway Alternative		
G-1	Erosion would be triggered or accelerated due to construction activities.	Class III
G-2	Unique geologic features would be damaged due to construction activities.	Class II
G-3	Project would expose people or structures to potential substantial adverse effects as a result of problematic soils.	Class II
G-4	Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure.	Class II
SDG&E West Main Canal–Huff Road Modification Alternative		
G-1	Erosion would be triggered or accelerated due to construction activities.	Class III
G-3	Project would expose people or structures to potential substantial adverse effects as a result of problematic soils.	Class II
G-4	Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure.	Class II
Partial Underground 230 kV ABDSP SR78 to S2 Alternative		
G-1	Erosion would be triggered or accelerated due to construction activities.	Class III
G-2	Unique geologic features would be damaged due to construction activities.	Class II
G-3	Project would expose people or structures to potential substantial adverse effects as a result of problematic soils.	Class II
G-4	Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure.	Class II
G-5	Project would expose people or structures to potential substantial adverse effects as a result of surface fault rupture at crossings of active faults.	Class II (Class I with All UG Option)
G-6	Project would expose people or structures to potential substantial adverse effects as a result of slope instability created during excavation and/or grading.	Class II
G-7	Project would expose people or structures to potential substantial adverse effects as a result of landslides, earthflows, debris flows, and/or rockfall.	Class II
Partial Underground 230 kV ABDSP SR78 to S2 Alternative – All Underground Option		
G-5	Project would expose people or structures to potential substantial adverse effects as a result of surface fault rupture at crossings of active faults.	Class I
Overhead 500 kV ABDSP within Existing ROW Alternative		
G-1	Erosion would be triggered or accelerated due to construction activities.	Class III

Table D.13-17. Impacts Identified – Alternatives – Geology, Mineral Resources, and Soils

Impact No.	Description	Impact Significance
G-2	Unique geologic features would be damaged due to construction activities.	Class II
G-3	Project would expose people or structures to potential substantial adverse effects as a result of problematic soils.	Class II
G-4	Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure.	Class II
G-6	Project would expose people or structures to potential substantial adverse effects as a result of slope instability created during excavation and/or grading.	Class II
G-7	Project would expose people or structures to potential substantial adverse effects as a result of landslides, earthflows, debris flows, and/or rockfall.	Class II
Santa Ysabel Existing ROW Alternative		
G-1	Erosion would be triggered or accelerated due to construction activities.	Class III
G-3	Project would expose people or structures to potential substantial adverse effects as a result of problematic soils.	Class II
G-4	Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure.	Class II
G-5	Project would expose people or structures to potential substantial adverse effects as a result of surface fault rupture at crossings of active faults.	Class II
Santa Ysabel Partial Underground Alternative		
G-1	Erosion would be triggered or accelerated due to construction activities.	Class III
G-3	Project would expose people or structures to potential substantial adverse effects as a result of problematic soils.	Class II
G-4	Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure.	Class II
Santa Ysabel SR79 All Underground Alternative		
G-1	Erosion would be triggered or accelerated due to construction activities.	Class III
G-3	Project would expose people or structures to potential substantial adverse effects as a result of problematic soils.	Class II
G-4	Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure.	Class II
G-5	Project would expose people or structures to potential substantial adverse effects as a result of surface fault rupture at crossings of active faults.	Class I
SDG&E Mesa Grande Alternative		
G-1	Erosion would be triggered or accelerated due to construction activities.	Class III
G-3	Project would expose people or structures to potential substantial adverse effects as a result of problematic soils.	Class II
G-4	Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure.	Class III
CNF Existing 69 kV Route Alternative		
G-1	Erosion would be triggered or accelerated due to construction activities.	Class III
G-3	Project would expose people or structures to potential substantial adverse effects as a result of problematic soils.	Class II
Oak Hollow Road Underground Alternative		
G-1	Erosion would be triggered or accelerated due to construction activities.	Class III
G-3	Project would expose people or structures to potential substantial adverse effects as a result of problematic soils.	Class II

Table D.13-17. Impacts Identified – Alternatives – Geology, Mineral Resources, and Soils

Impact No.	Description	Impact Significance
San Vicente Road Transition Alternative		
G-1	Erosion would be triggered or accelerated due to construction activities.	Class III
G-3	Project would expose people or structures to potential substantial adverse effects as a result of problematic soils.	Class II
Chuck Wagon Road Transition Alternative		
G-1	Erosion would be triggered or accelerated due to construction activities.	Class III
G-3	Project would expose people or structures to potential substantial adverse effects as a result of problematic soils.	Class II
Pomerado Road to Miramar Area North		
G-1	Erosion would be triggered or accelerated due to construction activities.	Class III
G-3	Project would expose people or structures to potential substantial adverse effects as a result of problematic soils.	Class II
G-4	Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure.	Class II and III
G-6	Project would expose people or structures to potential substantial adverse effects as a result of slope instability created during excavation and/or grading.	Class II
G-7	Project would expose people or structures to potential substantial adverse effects as a result of landslides, earthflows, debris flows, and/or rockfall.	Class II
Los Peñasquitos Canyon Preserve–Mercy Road Alternative		
G-1	Erosion would be triggered or accelerated due to construction activities.	Class III
G-3	Project would expose people or structures to potential substantial adverse effects as a result of problematic soils.	Class II
G-4	Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure.	Class II and III
G-5	Project would expose people or structures to potential substantial adverse effects as a result of surface fault rupture at crossings of active faults.	Class II
G-6	Project would expose people or structures to potential substantial adverse effects as a result of slope instability created during excavation and/or grading.	Class II
G-7	Project would expose people or structures to potential substantial adverse effects as a result of landslides, earthflows, debris flows, and/or rockfall.	Class II
Black Mountain to Park Village Road Underground Alternative		
G-1	Erosion would be triggered or accelerated due to construction activities.	Class III
G-3	Project would expose people or structures to potential substantial adverse effects as a result of problematic soils.	Class II
Coastal Link System Upgrade Alternative		
G-1	Erosion would be triggered or accelerated due to construction activities.	Class III
Top of the World Substation Alternative		
G-1	Erosion could be triggered or accelerated due to construction activities.	Class III
G-3	Project would expose people or structures to potential substantial adverse effects as a result of problematic soils.	Class II
G-4	Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure.	Class III

D.13.14 Imperial Valley Link Alternatives Impacts and Mitigation Measures

There are three alternatives analyzed in the Imperial Valley Link, the FTHL Eastern Alternative, the SDG&E West of Dunaway Alternative, and the SDG&E West Main Canal–Huff Road Modification Alternative.

D.13.14.1 FTHL Eastern Alternative

This alternative was developed by the EIR/EIS team as a way to avoid almost 2 miles within the Flat-Tailed Horned Lizard (FTHL) Management Area. Instead the 500 kV overhead route would follow section lines within agricultural lands and would be approximately 1.5 miles shorter than the proposed route.

Environmental Setting

Geology. The proposed FTHL Eastern (FTHL) alternative route traverses gently sloping to flat lake deposits of ancient Lake Coahuila (Ql) for its entire length from MPs FTHL-0 to FTHL-4.6.

Slope Stability. The FTHL alternative ROW crosses flat to gently sloping terrain and is not likely to experience landslides or other slope failures.

Soils. Two soil associations are mapped along the FTHL alternative ROW, s993 and s996. A summary of the basic characteristics of these soils is presented in Table D.13-2. The Vint-Meloland-Indio (s996) and Vint-Imperial-Glenbar-Gilman (s993) soil associations are formed primarily in Ancient Lake Coahuila lacustrine deposits. Hazard of erosion for these soils off-road/off-trail and on-road/on-trail is slight. Corrosive potential of soils along the FTHL alternative are high for uncoated steel and range from low to high for concrete, and the shrink/swell (expansive) potential varies from low to high.

Approximate locations of soil associations along this alternative are listed below.

- s996: MPs FTHL-0 to FTHL-2.0, and MP sFTHL-3.9 to FTHL-4.6.
- s993: MPs FTHL-2.0 to FTHL-3.9.

Mineral Resources. No known active mineral resource sites or BLM mining claims are located along this alternative route.

Seismicity. The FTHL alternative does not cross any active faults, and is thus not likely to experience fault rupture. This alternative, however, is in close proximity to faults of the San Andreas Fault Zone and moderate to strong groundshaking from an earthquake on nearby faults should be expected. Estimated PGAs for this alternative are 0.4g to 0.5 g for the first 2.6 miles of the route and 0.5 to 0.6 g for the remaining 2 miles (SCEDC, 2006). Potential for liquefaction in this area is generally low due to anticipated depths of groundwater of greater than 100 feet. However, shallow perched groundwater may exist near the irrigation canals crossed by the FTHL route, resulting in liquefaction potential in these areas. This terrain along this alignment is flat and therefore would not experience landsliding or slope failures due to earthquakes.

Environmental Impacts and Mitigation Measures

Construction Impacts

No construction impacts related to construction-triggered slope failures (Impact G-6) would occur associated with this alternative due to the flat terrain. No impacts related to Impact G-9 (Construction activities would interfere with access to known mineral resources) are expected for this alignment as no known active mineral resource sites or BLM claims are located along it.

Impact G-1: Erosion would be triggered or accelerated due to construction activities (Class III)

Excavation and grading for tower foundations, trenches, work areas, access roads, and spur roads could loosen soil and trigger or accelerate erosion. Soils along this segment of the proposed route have a slight potential hazard of erosion for both off-road/off-trail and on-road/on-trail. SDG&E's APMs GEO-APM-1, -2, -5, and -6 (see Table D.13-11) reduce the amount of erosion that would result from construction by: limiting grading of existing roads in areas with sensitive soils, planning construction to minimize new ground disturbance, use of Best Management Practices (BMPs) such as sand bags and road bars, to control water erosion, and limiting construction traffic. In addition, a Stormwater Pollution Prevention Plan (SWPPP) that would limit erosion from the construction site would be required in accordance with the Clean Water Act. This would result in an adverse but less than significant impact (Class III).

Operational Impacts

There would be no impacts associated with this alternative on project structures due to fault rupture (Impact G-5) or landslides, earthflows, debris flows, and/or rockfall during project operation (Impact G-7) because it does not cross any active faults and the terrain is flat.

Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils (Class II)

Soils along the FTHL alternative route have a high potential to corrode steel and a low to high potential to corrode concrete. Expansion potential for the soils is low to high. Corrosive and expansive subsurface soils may exist in places along the proposed route which could potentially damage project structures, a significant impact. Application of standard design and construction practices and implementation of GEO-APM-3 (see Table D.13-11) would partially reduce the adverse affects of problematic soils by avoiding placement of structures in areas of high shrink/swell potential, to the extent feasible. However, actual locations of high shrink/swell (expansive) soils and the presence, absence, and location of corrosive soils needs to be determined to fully reduce the potential for adverse affects of problematic soils to less than significant. Unidentified expansive and corrosive soils could damage project structures and facilities potentially resulting in collapse. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to nearby people, a significant impact. Accordingly, implementation of Mitigation Measure G-3a (Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design) would ensure that potential impacts associated with problematic soils are reduced to less than significant levels (Class II). The full text of the mitigation measures can be found in Appendix 12.

Mitigation Measure for Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils

G-3a Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design

Impact G-4: Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure (Class II)

Moderate to strong groundshaking along the FTHL Alternative should be expected in the event of an earthquake on the faults in the Imperial Link area and from other major faults in the region, with estimated PGAs ranging from 0.4 to 0.6 g. SDG&E indicates in the PEA that project structures would be designed to withstand geologically induced stresses and that appropriate tower design accounting for lateral wind loads and conductor loads would likely exceed any creditable seismic loading, minimizing potential damage to tower structures from groundshaking. However, portions of the FTHL alternative alignment would be subject to local strong groundshaking with vertical and horizontal ground accelerations that could exceed lateral wind loads, resulting in damage or collapse of project structures. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to people, a significant impact. Therefore, to ensure that project structures are not damaged by strong to severe groundshaking, implementation of Mitigation Measure G-4a (Reduce effects of groundshaking) is required to ensure that project structures are not damaged by strong groundshaking, reducing impacts to less than significant (Class II).

Strong groundshaking could potentially result in liquefaction-related ground failures along the FTHL alternative where the alignment crosses irrigation canals and perched groundwater and pockets of loose sand may exist. This could result in damage to or collapse of tower structures, a significant impact. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to people, a significant impact. However, to ensure that impacts associated with strong groundshaking and seismically induced ground failures would be mitigated to less than significant levels (Class II), implementation of Mitigation Measures G-4b (Conduct geotechnical investigations for liquefaction) is required prior to final project design to ensure that people or structures are not exposed to hazards associated with strong seismic groundshaking. Seismically induced slope failures would not occur along this alternative due to its flat terrain.

Mitigation Measure for Impact G-4: Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure

G-4a Reduce effects of groundshaking.

G-4b Conduct geotechnical investigations for liquefaction.

D.13.14.2 SDG&E West of Dunaway Alternative

This 6.1-mile alternative was suggested by SDG&E and approved by the proposed land use developer in the area. It would be an overhead 500 kV line, and would be 2.2 miles longer than the Proposed Project.

Environmental Setting

Geology. The SDG&E West of Dunaway (WD) Alternative generally traverses gently sloping to flat alluvial plains and playas of the Imperial Valley for its entire length from WD-MP 0 to WD-MP 6.1. Geologic units crossed by this segment are alluvium (Qal), lake deposits of ancient Lake Coahuila (Ql), and Palm Spring Formation (Pc); descriptions of these units are provided in Table D.13-1 and Table D.13-18 (below in Section D.13.12). Approximate locations of these units along the SDG&E West of Dunaway Alternative are listed below.

- Alluvium (Qal): MPs WD-1.2 to WD-1.6 and MPs WD-1.9 to WD-2.7.
- Lake deposits of ancient Lake Coahuila (Ql): MPs WD-0 to WD-1.2 and MPs WD-2.7 to WD-6.1.
- Palm Spring Formation (Pc): small outcrop between MPs WD-1.6 to WD-1.9.

Slope Stability. The SDG&E West of Dunaway alternative ROW crosses flat to gently sloping terrain and is not likely to experience landslides or other slope failures.

Soils. Two soil associations are mapped along the SDG&E West of Dunaway Alternative ROW, s994 and s996. A summary of the basic characteristics of these soils is presented in Table D.13-2. The Rositas-Orita-Carrizo-Aco (s994) and Vint-Meloland-Indio (s996) soil associations are formed primarily in eolian deposits and mixed alluvium and Ancient Lake Coahuila lacustrine deposits. Hazard of erosion for these soils off-road/off-trail and on-road/on-trail ranges from slight to moderate. Corrosive potential of soils along the this alternative are high for uncoated steel and range from low to moderate for concrete, and the shrink/swell (expansive) potential varies from low to high.

Approximate locations of soil associations along the route are listed below.

- s994: MPs WD-3.5 to WD-5.7.
- s996: MPs WD-0 to WD-3.5 and MPs WD-5.7 to WD-6.1.

Mineral Resources. No known active mineral resource sites or BLM mining claims are located along this alternative route.

Seismicity. The SDG&E West of Dunaway Alternative does not cross any active faults, and is thus not likely to experience fault rupture. This alternative, however, is in close proximity to faults of the San Andreas Fault Zone and moderate to strong groundshaking from an earthquake on nearby faults should be expected. Estimated PGAs for this alternative are 0.5 to 0.6 g for the entire route length (6.1 miles) (SCEDC, 2006). Potential for liquefaction in this area is generally low due to anticipated depths of groundwater of greater than 100 feet. However, seasonally perched groundwater may exist in areas where the alignment crosses river washes and streams, which could result in liquefaction-related ground failures if an earthquake were to occur while sediments were saturated. This area is relatively flat and therefore would not experience landsliding or slope failures due to earthquakes.

Environmental Impacts and Mitigation Measures

Construction Impacts

No construction impacts related to construction-triggered slope failures (Impact G-6) would occur associated with this alternative due to the flat terrain. No impacts related to Impact G-9 (Construction activities would interfere with access to known mineral resources) are expected for this alignment as no known active mineral resource sites or BLM claims are located along it.

Impact G-1: Erosion would be triggered or accelerated due to construction activities (Class III)

Excavation and grading for tower foundations, trenches, work areas, access roads, and spur roads would loosen soil and trigger or accelerate erosion. Soils along this segment of the proposed route have a slight to moderate potential hazard of erosion for both off-road/off-trail and on-road/on-trail. SDG&E's APMs GEO-APM-1, -2, -5, and -6 (see Table D.13-11) reduce the amount of erosion that would result from construction by limiting construction traffic and grading of existing roads in areas with sensitive soils, planning construction to minimize new ground disturbance, and by using Best Management Practices (BMPs) such as sand bags and road bars, to control water erosion. In addition, a Stormwater Pollution Prevention Plan (SWPPP) that would limit erosion from the construction site would be required in accordance with the Clean Water Act. This would result in an adverse but less than significant impact (Class III).

Impact G-2: Unique geologic features would be damaged due to construction activities (Class II)

Construction activities such as grading and excavation for the Proposed Project could cause damage to desert pavement areas, which is a special concern in the desert areas of the alternative route. Damage to desert pavement could result in an extreme acceleration of erosion as well as damage a unique geologic feature, a significant impact. One soil association along this alternative route, the Rositas-Orita-Carrizo-Aco (s994), is known to include areas of desert pavement. Therefore, Mitigation Measure G-2a is recommended to protect desert pavement in areas underlain by the Rositas-Orita-Carrizo-Aco soil association and other desert soils with potential for desert pavement. Implementation of Mitigation Measure G-2a would reduce impacts associated with damage to desert pavement areas to less than significant (Class II).

Mitigation Measures for Impact G-2: Erosion would be triggered or accelerated due to construction activities

G-2a Protect desert pavement.

Operational Impacts

There would be no impacts associated with this alternative on project structures due fault rupture (Impact G-5) or landslides, earthflows, debris flows, and/or rockfall during project operation (Impact G-7) due to lack of proximity to active faults and the flat terrain.

Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils (Class II)

Soils along the SDG&E West of Dunaway Alternative route have a high potential to corrode steel and a low to high potential to corrode concrete. Expansion potential for the soils is low to high. Corrosive and expansive subsurface soils may exist in places along the proposed route which could potentially damage project structures, a significant impact. Application of standard design and construction practices and implementation of GEO-APM-3 (see Table D.13-11) would partially reduce the adverse affects of problematic soils by avoiding placement of structures in areas of high shrink/swell potential, to the extent feasible. However, actual locations of high shrink/swell (expansive) soils and the presence, absence, and location of corrosive soils needs to be determined to fully reduce the potential for adverse affects of problematic soils to less than significant. Unidentified expansive and corrosive soils could damage project structures and facilities potentially resulting in collapse. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to nearby people, a significant impact. Accordingly, implementation of Mitigation Measure G-3a (Conduct geotechnical studies for soils

to assess characteristics and aid in appropriate foundation design) would ensure that potential impacts associated with problematic soils are reduced to less than significant levels (Class II).

Mitigation Measure for Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils

G-3a Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design.

Impact G-4: Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure (Class II)

Moderate to strong groundshaking is expected along the SDG&E West of Dunaway Alternative route in the event of an earthquake on the faults in the Imperial Link area and from other major faults in the region, with estimated PGAs ranging from 0.5 to 0.6 g. SDG&E indicates in the PEA that project structures would be designed to withstand geologically induced stresses and that appropriate tower design accounting for lateral wind loads and conductor loads would likely exceed any creditable seismic loading, minimizing potential damage to tower structures from groundshaking. However, portions of the SDG&E West of Dunaway alternative would be subject to local strong groundshaking with vertical and horizontal ground accelerations that could exceed lateral wind loads, resulting in damage or collapse of project structures. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to people, a significant impact. Therefore, to ensure that project structures are not damaged by strong to severe groundshaking, implementation of Mitigation Measure G-4a (Reduce effects of groundshaking) is required, reducing impacts to less than significant (Class II).

Strong groundshaking could result in liquefaction-related ground failures along the SDG&E West of Dunaway alternative where the alignment crosses river washes and streams and seasonally perched groundwater could liquefy if an earthquake were to occur while sediments were saturated. This could result in damage to or collapse of tower structures, a significant impact. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to people, a significant impact. To ensure that impacts associated with strong groundshaking and seismically induced ground failures would be mitigated to less than significant levels (Class II), implementation of Mitigation Measures G-4b (Conduct geotechnical investigations for liquefaction) is required prior to final project design to ensure that people or structures are not exposed to hazards associated with strong seismic groundshaking. Seismically induced slope failures would not occur along this alternative due to its flat terrain.

Mitigation Measures for Impact G-4: Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure

G-4a Reduce effects of groundshaking.

G-4b Conduct geotechnical investigations for liquefaction.

D.13.14.3 SDG&E West Main Canal–Huff Road Modification Alternative

This 4.9-mile alternative would follow the IID Westside Main Canal to the east-northeast, and then turn north on Huff Road. Existing IID 92 kV transmission lines are located on the west side of Huff Road along most of this segment; however, where the IID line would turn northwest, this alternative would continue straight along Huff Road to reconnect with the Proposed Project 0.2 miles south of Wheeler

Road (MP 15.9). The lengths of the alternative and the proposed routes would be essentially the same; however, this route would avoid direct effects to the Bullfrog Farms and also to the Raceway development.

Environmental Setting

Geology. The SDG&E West Main Canal–Huff Road Modification Alternative route (WMC) traverses gently sloping to flat lake deposits of ancient Lake Coahuila (Ql) for its entire length from MPs WMC-0 to WMC-4.9.

Slope Stability. The SDG&E West Main Canal–Huff Road Modification Alternative ROW crosses flat to gently sloping terrain and is not likely to experience landslides or other slope failures.

Soils. Two soil associations are mapped along the SDG&E West Main Canal–Huff Road Modification Alternative route, s993 and s996. A summary of the basic characteristics of these soils is presented in Table D.13-2. The Vint-Meloland-Indio (s996) and Vint-Imperial-Glenbar-Gilman (s993) soil associations are formed primarily in Ancient Lake Coahuila lacustrine deposits. Hazard of erosion for these soils off-road/off-trail and on-road/on-trail is slight. Corrosive potential of soils along the WMC alternative are high for uncoated steel and range from low to high for concrete, and the shrink/swell (expansive) potential varies from low to high.

Approximate locations of soil associations along the WMC alternative route are listed below.

- s993: MPs WMC-2.3 to WMC-4.5.
- s996: MPs WMC-0 to WMC-2.3, and MPs WMC-4.5 to WMC-4.9.

Mineral Resources. No known active mineral resource sites or BLM mining claims are located along this alternative route.

Seismicity. The SDG&E West Main Canal–Huff Road Modification Alternative does not cross any active faults, and is thus not likely to experience fault rupture. This alternative, however, is in close proximity to faults of the San Andreas Fault Zone and moderate to severe groundshaking from an earthquake on nearby faults is expected. Estimated PGAs for this alternative are 0.5g to 0.6 g for the first 2.5 miles of the route and 0.6 to 0.7 g for the remaining 2.4 miles of the alignment (SCEDC, 2006). Potential for liquefaction in this area is generally low due to anticipated depths of groundwater of greater than 100 feet. However, shallow perched groundwater may exist near irrigation canals crossed by the WMC alternative route, resulting in liquefaction potential in these areas. This terrain along this alignment is flat and therefore would not experience landsliding or slope failures due to earthquakes.

Environmental Impacts and Mitigation Measures

Construction Impacts

This alternative traverses flat terrain and therefore no impacts related to construction-triggered slope failures (Impact G-6) would occur associated with this alternative. This alignment does not cross any areas mapped as containing desert pavement, therefore no impacts related to damage to unique geologic features (Impact G-2) are expected. No impacts related to Impact G-9 (Construction activities would interfere with access to known mineral resources) are expected for this alignment as no known active mineral resource sites or BLM claims are located along it.

Impact G-1: Erosion would be triggered or accelerated due to construction activities (Class III)

Excavation and grading for tower foundations, trenches, work areas, access roads, and spur roads for the SDG&E West Main Canal–Huff Road Modification Alternative could loosen soil and trigger or accelerate erosion. Soils along this segment of the proposed route have a slight potential hazard of erosion for both off-road/off-trail and on-road/on-trail and the soils along the route are not known to include areas of desert pavement. SDG&E's APMs GEO-APM-1, -2, -5, and -6 (see Table D.13-11) reduce the amount of erosion that would result from construction by: limiting grading of existing roads in areas with sensitive soils, planning construction to minimize new ground disturbance, use of Best Management Practices (BMPs) such as sand bags and road bars, to control water erosion, and limiting construction traffic. In addition, a Stormwater Pollution Prevention Plan (SWPPP) that would limit erosion from the construction site would be required in accordance with the Clean Water Act. This would result in a less than significant impact (Class III).

Operational Impacts

There would be no impacts associated with this alternative on project structures due to fault rupture (Impact G-4) due to lack of proximity to active faults nor from landslides, earthflows, debris flows, and/or rockfall during project operation (Impact G-6) due to the flat terrain.

Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils (Class II)

Soils along the SDG&E West Main Canal–Huff Road Modification Alternative route have a high potential to corrode steel and a low to high potential to corrode concrete. Expansion potential for the soils is low to high. Corrosive and expansive subsurface soils may exist in places along the proposed route which could potentially damage project structures, a significant impact. Application of standard design and construction practices and implementation of GEO-APM-3 (see Table D.13-11) would partially reduce the adverse affects of problematic soils by avoiding placement of structures in areas of high shrink/swell potential, to the extent feasible. However, actual locations of high shrink/swell (expansive) soils and the presence, absence, and location of corrosive soils needs to be determined to fully reduce the potential for adverse affects of problematic soils to less than significant. Unidentified expansive and corrosive soils could damage project structures and facilities potentially resulting in collapse. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to nearby people, a significant impact. Accordingly, implementation of Mitigation Measure G-3a (Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design) would ensure that potential impacts associated with problematic soils are reduced to less than significant levels (Class II).

Mitigation Measure for Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils

G-3a Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design.

Impact G-4: Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure (Class II)

Moderate to severe groundshaking should be expected along the SDG&E West Main Canal–Huff Road Modification Alternative route in the event of an earthquake on the faults in the Imperial Link area and

from other major faults in the region, with estimated PGAs ranging from 0.5 to 0.7 g. SDG&E indicates in the PEA that project structures would be designed to withstand geologically induced stresses and that appropriate tower design accounting for lateral wind loads and conductor loads would likely exceed any creditable seismic loading, minimizing potential damage to tower structures from groundshaking. However, portions of the SDG&E West Main Canal–Huff Road Modification Alternative alignment would be subject to local strong to severe groundshaking with vertical and horizontal ground accelerations that could exceed lateral wind loads, resulting in damage or collapse of project structures. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to people, a significant impact. Therefore, to ensure that project structures are not damaged by strong to severe groundshaking, implementation of Mitigation Measure G-4a (Reduce effects of groundshaking) is required to reduce impacts to less than significant (Class II).

Strong groundshaking could potentially result in liquefaction-related ground failures along the SDG&E West Main Canal–Huff Road Modification Alternative where the alignment crosses irrigation canals and perched groundwater and pockets of loose sand may exist. This could result in damage to or collapse of tower structures. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to people, a significant impact. However, to ensure that impacts associated with strong groundshaking and seismically induced ground failures would be mitigated to less than significant levels (Class II), implementation of Mitigation Measures G-4b (Conduct geotechnical investigations for liquefaction) is required prior to final project design to ensure that people or structures are not exposed to hazards associated with strong seismic groundshaking. Seismically induced slope failures would not occur along this alternative due to its flat terrain.

Mitigation Measures for Impact G-4: Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure

G-4a Reduce effects of groundshaking.

G-4b Conduct geotechnical investigations for liquefaction.

D.13.15 Anza-Borrego Link Alternatives Impacts and Mitigation Measures

Two alternatives are considered in the Anza-Borrego Link: the Partial Underground 230 kV ABDSP SR78 to S2 Alternative (also considered with an All Underground Option) and the Overhead 500 kV ABDSP within Existing ROW Alternative.

D.13.15.1 Partial Underground 230 kV ABDSP SR78 to S2 Alternative

This alternative was developed by the EIR/EIS team and would include installation of a double-circuit bundled 230 kV line (as opposed to an overhead 500 kV with the Proposed Project) that would be installed underground in SR78 through ABDSP. The proposed Central East Substation would not be constructed with this alternative and approximately 2 miles of transmission line (one mile of 500 kV and one mile of 230 kV) to and from that substation would be eliminated. Instead a new 500 kV/230 kV substation would be constructed adjacent to the existing IID San Felipe Substation to accommodate the new transmission line.

There is also an All Underground Option considered for this alternative, in which the entire length of the 230 kV transmission line between the San Felipe Substation and the connection to the Proposed Project would be installed underground in Highways SR78 and S2.

Environmental Setting

Geology. The proposed Partial Underground 230 kV ABDSP SR78 to S2 Alternative route traverses alluvial fans/terraces of the Lower Borrego Valley: hills, mountain passes, and valleys of the Santa Rosa Mountain range. This alternative traverses underground along Split Mountain Road and SR78 through the Lower Borrego Valley, the narrows between the northern ends of the Vallecito and Pinyon Mountains, across Yaqui Flats, and through Sentenec Canyon. As the route exits the western side of Sentenec Canyon the alignment turns northwest and parallel to S2 (San Felipe Road) along the eastern edge of San Felipe Valley, where it transitions overhead several times as it crosses the active Earthquake Valley fault zone. Geologic units crossed by this alternative are alluvium (Qal), nonmarine terrace deposits (Qt), tonalite and diorite (gr^t), and mixed granitic and metamorphic rocks (gr-m); descriptions of these units are listed in Table D.13-1. Approximate locations of these units along the project are listed below.

Underground:

- Alluvium (Qal): MPs SR-0 to SR-6.5, MPs SR-12.3 to SR-22.0, and MPs SR-26.0 to SR-28.7.
- Nonmarine terrace deposits (Qt): MPs SR-6.5 to SR-12.3.
- Mixed granitic and metamorphic rocks (gr-m): MPs SR-22.0 to SR-24.85 and MPs SR-25.9 to SR-26.0.

Overhead (approximately MPs SR-24.85 to SR-25.9 and MPs SR-28.7 to SR-38.1):

- Alluvium (Qal): MPs SR-28.7 to SR-30.0, and SR-34.3 to SR-35.7.
- Tonalite and diorite (gr^t): MPs SR-34.0 to SR-34.3 and SR-35.7 to SR-38.1.
- Mixed granitic and metamorphic rocks (gr-m): MPs SR-24.85 to SR-25.9 and SR-30.0 to SR-34.0.

Slope Stability. The Partial Underground 230 kV ABDSP SR78 to S2 Alternative traverses flat to gently sloping valley floor and alluvial fan terrain between approximate MPs SR-0 to SR-12, MPs SR-14.5 to SR-18, MPs SR-21 to SR-22, and MPs SR-26 to SR-31, and is not likely to experience landslides or other slope failures in these areas. The alternative ROW passes near to and along sloping hillside and mountain terrain between MPs SR-12 to SR-14.5, MPs SR-18 to SR-21, MPs SR-22 to SR-26, and between MPs SR-31 to SR-38.1. It does not cross any mapped landslides in these areas and the granitic terrain (gr, gr^t, and gr-m) underlying these slopes is not typically prone to landslides. However, rock slide or rockfall could potentially be triggered by over-steepened slopes.

Soils. Four soil associations are mapped along the Partial Underground 230 kV ABDSP SR78 to S2 alternative route, s994, S1014, s1016, and s1021. Basic characteristics of these soils are presented in Table D.13-2. Rositas-Orita-Carrizo-Aco (s994) soils are found primarily along this alignment in areas underlain by alluvium and terrace deposits. The Tollhouse-Rock Outcrop-La Posta (s1014), Sheephead-Rock Outcrop-Bancas (s1016) and Rock Outcrop-Lithic Torriorthents (s1021) association soils are present in the western portion of the alternative alignment and are formed primarily on hill slopes underlain by granitic and metamorphic rocks and shallow alluvium over granitic and metamorphic bedrock.

Erosion hazard for these soils for off-road/off-trail ranges from slight to moderate and for on-road/on-trail ranges from slight to severe. Shrink/swell (expansive) potential varies from low to moderate. Corrosive potential of soils along the Partial Underground 230 kV ABDSP SR78 to S2 alternative route range from moderate to high for both uncoated steel and concrete.

Approximate locations of the soil associations are listed below:

- s994: MPs SR-0 to SR-22.1, MPs SR-26.1 to SR-31.0, and MPs SR-34.0 to SR-35.7.
- s1014: MPs SR-36.5 to SR-38.1.
- s1016: MPs SR-35.7 to SR-36.5.
- s1021: MPs SR-22.1 to SR-26.1 and MPs SR-31.0 to SR-34.0.

Mineral Resources. No known active mines or BLM mining claims are identified along this alternative. Two MRDS site are located within 1000 feet of this alternative. One site is located near MP SR-14.6, the Narrows Mine, and is only listed as an occurrence and is located approximately 800 feet south of SR78 and the alternative ROW. The second site, listed as the Buckthorn Deposit, is located near MP SR-24 approximately 400 feet northwest of the alignment ROW. The Buckthorn Deposit site is listed as a past producer of feldspar and the site is no longer evident on aerial photographs. Therefore, construction and operation of the Sunrise Powerlink transmission line along the proposed Partial Underground 230 kV ABDSP SR78 to S2 alternative alignment is not expected to interfere with future access to any mineral resources.

Seismicity – Fault Rupture. The Partial Underground 230 kV ABDSP SR78 to S2 Alternative route crosses strands of the Alquist-Priolo zoned Earthquake Valley fault zone three times, a zone of numerous small strands between MPs SR-24.6 and SR-25.6, at MP SR-29, and at MP SR-29.2, as shown in Figure D.13-18. The alignment also crosses within and parallel to the eastern side of the Alquist-Priolo zone for the Earthquake Valley fault zone between MPs SR-30.2 and SR-30.7. Although this alternative does not cross the San Jacinto fault, it does traverse very near to the mapped fault trace and crosses the western side of the Alquist-Priolo zone for this portion of the fault.

Seismicity – Groundshaking. The alternative is in close proximity to the San Jacinto and Elsinore Fault Zones for most of its length. Moderate to severe groundshaking caused by an earthquake on any of the faults in the vicinity of this segment should be expected. The peak horizontal accelerations for this segment are presented in Table D.13-18.

Seismicity – Liquefaction. Potential for liquefaction in this area is low because alluvial areas along this alternative are limited to shallow deposits over bedrock that even if saturated are not likely to liquefy (gravely and bouldery alluvium of less than 50 feet in depth). However, during large storms or a wet season, the water table may rise temporarily and pockets of finer grained alluvial deposits in areas where the proposed segment crosses and is within active river washes and streams may be moderately susceptible to liquefaction if a strong earthquake occurs while the valley floor sediments are saturated.

Earthquake-Induced Landslides. Most accounts of large historical earthquakes in this area describe damaging landslides and rockfalls resulting from earthquake groundshaking (SCEDC, 2006). Therefore, overhead portions of the alternative ROW near moderate to steep slopes, between MPs SR-22 to SR-26 and between MPs SR-31 to SR-38.1, may be susceptible to damage from landslides or rockfalls in the event of a large earthquake on nearby faults.

Table D.13-18. Approximate Peak Ground Accelerations – Partial Underground 230 kV ABDSP SR78 to S2 Alternative

Approximate Alternative (SR) Transmission Line Milepost	Total Length of Segments (miles)	Peak Ground Acceleration
21.9-23.7 and 35.9-38.1	4.1	0.3-0.4g
23.7-25.5 and 32.0-34.0	3.8	0.4-0.5g
11.0-21.9 and 35.0-35.9	11.8	0.5-0.6g
0.7-1.5, 8.9-11.0, 25.5-32.0, and 34.0-35.0	10.4	0.6-0.7g
0-0.7, 1.5-3.7, and 6.0-8.9	5.8	0.7-0.8g
3.7-6.0	2.3	>0.8g

Source: CGS, 2006; USGS, 2006b.

Environmental Impacts and Mitigation Measures

Construction Impacts

No impacts related to Impact G-9 (Construction activities would interfere with access to known mineral resources) are expected for this alignment as no known active mineral resource sites or BLM claims are located along it.

Impact G-1: Erosion would be triggered or accelerated due to construction activities (Class III)

Excavation and grading for tower foundations, trenches, work areas, access roads, and spur roads along the Partial Underground 230 kV ABDSP SR78 to S2 Alternative route would loosen soil and trigger or accelerate erosion. Soils along alternative alignment have an erosion hazard for off-road/off-trail ranges from slight to moderate and for on-road/on-trail ranges from slight to severe. SDG&E's APMs GEO-APM-1, -2, -5, and -6 (see Table D.13-11) reduce the amount of erosion that would result from construction by limiting construction traffic and grading of existing roads in areas with sensitive soils, planning construction to minimize new ground disturbance, and by using Best Management Practices (BMPs) such as sand bags and road bars, to control water erosion. In addition, a Stormwater Pollution Prevention Plan (SWPPP) that would limit erosion from the construction site would be required in accordance with the Clean Water Act. This would result in an adverse but less than significant impact (Class III).

Impact G-2: Unique geologic features would be damaged due to construction activities (Class II)

Construction activities such as grading and excavation from the Proposed Project could cause damage to desert pavement areas, which is a special concern in the desert areas of the route. Damage to desert pavement would result in an extreme acceleration of erosion as well as damage a unique geologic feature, a significant impact. One soil association along this alternative route, the Rositas-Orita-Carrizo-Aco (s994), is known to include areas of desert pavement. Therefore, Mitigation Measure G-2a is required to protect desert pavement in areas underlain by the Rositas-Orita-Carrizo-Aco soil association and other desert soils with potential for desert pavement. Implementation of Mitigation Measure G-2a would reduce impacts associated with damage to desert pavement areas to less than significant (Class II). The full text of the mitigation measures can be found in Appendix 12.

Mitigation Measures for Impact G-2: Erosion could be triggered or accelerated due to construction activities

G-2a Protect desert pavement.

Impact G-6: Project would expose people or structures to potential substantial adverse effects as a result of slope instability created during excavation and/or grading (Class II)

Construction consisting of grading and excavation along the foothills between MPs SR-12 to SR-14.5, SR-18 to SR-21, SR-22 to SR-26, and between MPs SR-31 to SR-38.1 could cause slope instability. Destabilization of natural or constructed slopes could occur as a result of construction activities due to excavation and/or grading operations. Excavation operations associated with tower foundation construction, trench excavation for vaults and underground conduits, and grading operations for temporary and permanent access roads and work areas could result in slope instability, resulting in landslides, soil creep, or debris flows. Slope instability including landslides, earth flows, and debris flows has the potential to undermine foundations, cause distortion and distress to overlying structures, and displace or destroy project com-

ponents. SDG&E's APMs GEO-APM-4 and -8 (see Table D.13-11) would partially reduce impacts related to slope instability by avoiding placing structures in unstable areas and removing or stabilizing boulders upslope of structures thus reducing the threat of possible slope failures or rockfalls. However, the Proposed Project would still result in significant impacts as unidentified unstable slopes or areas of unstable slopes can be disturbed or undercut by construction activities resulting in slope failures. Slope failures could cause damage to the environment, to project or other nearby structures, and could cause injury or death to workers and/or the public, a significant impact. To ensure that slope instability impacts would be reduced to less than significant (Class II), implementation of Mitigation Measure G-6a is required from between MPs SR-12 to SR-14.5, MPs SR-18 to SR-21, MPs SR-22 to SR-26, and between MPs SR-31 to SR-38.1 to delineate areas of unstable slopes near and within work areas and to minimize the potential from construction-triggered slope failures by avoidance or implementation of slope stabilizing design measures.

Mitigation Measure for Impact G-6: Project would expose people or structures to potential substantial adverse effects as a result of slope instability created during excavation and/or grading

G-6a Conduct geotechnical surveys for landslides and protect against slope instability.

Operational Impacts

Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils (Class II)

Soils along the Partial Underground 230 kV ABDSP SR78 to S2 Alternative route have a moderate to high potential to corrode uncoated steel and concrete. Expansion potential for the soils is low to moderate. Corrosive and expansive subsurface soils may exist in places along the proposed route which could potentially damage project structures, a significant impact. Application of standard design and construction practices and implementation of GEO-APM-3 (see Table D.13-11) would partially reduce the adverse effects of problematic soils by avoiding placement of structures in areas of high shrink/swell potential, to the extent feasible. However, actual locations of high shrink/swell (expansive) soils and the presence, absence, and location of corrosive soils needs to be determined to fully reduce the potential for adverse effects of problematic soils to less than significant. Unidentified expansive and corrosive soils could damage project structures and facilities potentially resulting in collapse. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to nearby people, a significant impact. Accordingly, implementation of Mitigation Measure G-3a (Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design) would ensure that impacts associated with problematic soils are reduced to less than significant levels (Class II).

Mitigation Measure for Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils

G-3a Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design.

Impact G-4: Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure (Class II)

Moderate to severe groundshaking should be expected along the Partial Underground 230 kV ABDSP SR78 to S2 Alternative route in the event of an earthquake on the faults in the Anza Borrego area and from other major faults in the region, with estimated PGAs ranging from 0.5 to > 0.8 g. SDG&E indicates

in the PEA that project structures would be designed to withstand geologically induced stresses and that appropriate tower design accounting for lateral wind loads and conductor loads would likely exceed any creditable seismic loading, minimizing potential damage to tower structures from groundshaking. However, portions of the Partial Underground 230 kV ABDSP SR78 to S2 Alternative route would be subject to local strong to severe groundshaking with vertical and horizontal ground accelerations that could exceed lateral wind loads, resulting in damage or collapse of project structures. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to people, a significant impact. Underground portions of the alternative alignment could also be damaged by strong to severe groundshaking, resulting in power outages or damage to roads containing the underground components. Portions of underground alignments most susceptible to shaking damage include the structures and cable at the point of underground transition where shearing may occur; rigid structures such as vaults, cable connections, and conduits; and areas along the alignment where geologic material transitions occur which results in differential seismic wave propagation, loose materials amplify seismic waves. Implementation of Mitigation Measure G-4a (Reduce effects of groundshaking) is required to ensure that project structures are not damaged by strong groundshaking, reducing impacts to less than significant (Class II).

Strong to severe groundshaking could potentially result in liquefaction-related ground failures along the Partial Underground 230 kV ABDSP SR78 to S2 Alternative where the alignment crosses river washes and streams and seasonally perched groundwater could liquefy should an earthquake occur while sediments were saturated. Seismically induced slope failures such as landslides and rockfalls could also be triggered by groundshaking from a large earthquake on nearby faults and could along the slopes between MPs SR-24.85 to SR-25.9 and MPs SR-31 to SR-38.1 where towers are close to the base of the mountains. These seismically induced ground failures could result in damage to or collapse of tower structures, a significant impact. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to people, a significant impact. However, to ensure that impacts associated with seismically induced ground failures would be mitigated to less than significant levels (Class II), implementation of Mitigation Measures G-4b (Conduct geotechnical investigations for liquefaction) and G-6a (Conduct geotechnical surveys for landslides and protect against slope instability) is required prior to final project design to ensure that people or structures are not exposed to hazards associated with strong to severe seismic groundshaking.

Mitigation Measures for Impact G-4: Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure

- G-4a Reduce effects of groundshaking.**
- G-4b Conduct geotechnical investigations for liquefaction.**
- G-6a Conduct geotechnical surveys for landslides and protect against slope instability.**

Impact G-5: Project would expose people or structures to potential substantial adverse effects as a result of surface fault rupture at crossings of active faults (Class II)

Project facilities would be subject to hazards of surface fault rupture at crossing of the Earthquake Valley Fault and could be subject to fault ruptures in areas where the alignment is with Alquist-Priolo zones for nearby active faults, such as where the alignment crosses the San Jacinto fault Alquist-Priolo zone between MPs SR-3.2 and SR-3.8. Fault crossings, where multiple feet of displacement are expected along active faults, are best crossed as overhead lines with towers placed well outside the fault zone to allow for the flex in the conductor lines to absorb offset. In general, GEO-APM-4 requires that project structures be placed in stable areas avoiding fault lines. However, how fault lines shall be avoided and

how the surface traces of the active faults will be accurately located is not specified and project structures could be damaged or collapse in the event of fault rupture beneath or adjacent to a tower due to inaccurate fault location during project design. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to people, a significant impact. Therefore, Mitigation Measure G-5a (Minimize project structures within active fault zones) is required for fault crossings to minimize the length of transmission line within fault zones and prevent placement of tower structures on active fault traces, reducing the impact to less than significant levels (Class II). Impacts associated with overhead active fault crossings would be reduced to less than significant levels (Class II) with implementation of Mitigation G-5a because conductors would be able to distribute fault displacements over a comparatively long span and towers would be less likely to collapse in the event of an earthquake if not placed directly on an active fault trace.

Mitigation Measure for Impact G-5: Project would expose people or structures to potential substantial adverse effects as a result of surface fault rupture at crossings of active faults

G-5a Minimize project structures within active fault zones.

Impact G-7: Project would expose people or structures to potential substantial adverse effects as a result of landslides, earthflows, debris flows, and/or rockfall (Class II)

Slope instability including landslides, earth flows, debris flows, and rockfall during project operation has the potential to undermine foundations, cause distortion and distress to overlying structures, and displace or destroy project components. The area where landslides could cause damage to project structures is along the slopes between MPs SR-24.85 to SR-25.9 and between MPs SR-31 to SR-38.1 where towers are close to the base of the mountains. SDG&E's APMs GEO-APM-4 and -8 (see Table D.13-11) would partially reduce impacts related to slope instability by avoiding placing structures in unstable areas and removing or stabilizing boulders upslope of structures thus reducing the threat of possible slope failures or rockfalls. However, the Proposed Project would still result in significant impacts if unidentified unstable slopes or areas of potentially unstable slopes were disturbed or undercut by construction activities resulting in slope failures. Slope failures could cause damage to the environment, to project or other nearby structures, and could cause injury or death to workers and/or the public, a significant impact. To ensure that slope instability impacts would be reduced to less than significant (Class II), implementation of Mitigation Measure G-6a (Conduct geotechnical surveys for landslides and protect against slope instability) is required between MPs SR-22 to SR-26 and MPs SR-31 to SR-38.1.

Mitigation Measure for Impact G-7: Project would expose people or structures to potential substantial adverse effects as a result of landslides, earthflows, debris flows, and/or rockfall

G-6a Conduct geotechnical surveys for landslides and protect against slope instability.

All Underground Option

Most of the impacts of the All Underground Option would be similar to those of the Partial Underground ABDSP SR78 to S2 Alternative, as described above. This option would have more severe impacts related to crossing of active faults, because it would include underground crossings of the Earthquake Valley Fault, and a long underground segment that follows the fault trace itself.

Impact G-5: Project would expose people or structures to potential substantial adverse effects as a result of surface fault rupture at crossings of active faults (Class I)

Project facilities would be subject to hazards of surface fault rupture where the underground route crosses strands of the Earthquake Valley fault zone and within its associated Alquist-Priolo zone along

and sub-parallel to MP SR-2 and SR78. The portions of the All Underground Option for the ABDSP Partial UG Alternative route that crosses and is within the Earthquake Valley fault zone are at substantial risk of damage should an earthquake and ground rupture occur along this portion of the fault. Displacement of the fault at these crossings could result in significant damage to the underground cables and other associated facilities, resulting in power outages, a significant impact. Although no mitigation measure can reduce the likelihood of fault rupture, proper preparation and design can reduce the potential for damage to underground power lines crossing and within the fault rupture zone. In the event of damage to the lines due to fault rupture, Mitigation Measure G-5c (Minimize Damage to Underground Transmission Lines) would significantly reduce the amount of time necessary to effect repairs, and would also minimize damage to the underground segment of the transmission line within and adjacent to the Earthquake Valley fault zone. However, despite implementation of this mitigation, fault rupture along the underground portion of the alignment would result still result in significant impact (Class I).

Mitigation Measure for Impact G-5: Project would expose people or structures to potential substantial adverse effects as a result of surface fault rupture at crossings of active faults

G-5c Minimize Damage to Underground Transmission Lines.

D.13.15.2 Overhead 500 kV ABDSP within Existing ROW Alternative

The alternative would differ from the proposed route in the Grapevine Canyon area (in the Angelina Springs Cultural District), in the vicinity of Tamarisk Grove Campground, and in a few areas east of Tamarisk Grove Campground along SR78. The alternative would remain within the existing SDG&E 69 kV ROW/easement. This alternative would eliminate towers within State-designated Wilderness. Undergrounding of the existing 69 kV and 92 kV lines would not occur with this alternative; those lines would be underbuilt on Delta lattice towers.

The *East of Tamarisk Grove Campground 150-Foot Option* was suggested by SDG&E in which the alternative would follow the Proposed Project route in the 150-foot proposed alignment, and not the existing ROW, between the eastern Park boundary (MP 60.9) to Tamarisk Grove Campground (MP 74.8) near the SR78/Highway S3 intersection. Similar to the Proposed Project described in Section B.2.2, SDG&E would underbuild and underground the existing 92 kV and 69 kV lines.

Environmental Setting

Geology. The Overhead 500 kV ABDSP within Existing ROW (OH) alternative follows the same general alignment as the proposed Anza Borrego Link project route, with minor modifications to the route to remain within the existing SDG&E 69 kV ROW/easement in the Grapevine Canyon area. This alternative crosses alluvial fans/terraces of the Lower Borrego Valley, the narrows between the northern ends of the Vallecito and Pinyon Mountains and the southern end of Pinyon Ridge, and Grapevine Canyon. Geologic units crossed by this segment of the project are alluvium (Qal), nonmarine terrace deposits (Qt), and mixed granitic and metamorphic rocks (gr-m); descriptions of these units are listed in Table D.13-1. Approximate locations of these units along the project are listed below.

- Alluvium (Qal): MPs OH-0 to OH-2.6, MPs OH-3.0 to OH-4.0, MPs OH-7.5 to OH-19.2, and MPs OH-19.5 to OH-20.2.
- Nonmarine terrace deposits (Qt): MPs OH-2.6 to OH-3.0 and MPs OH-4.0 to OH-7.5.
- Mixed granitic and metamorphic rocks (gr-m): MPs OH-19.2 to OH-19.5 and MPs OH-20.2 to OH-22.2.

One other geologic unit, granitic rocks (gr), which is located close to the Overhead 500 kV ABDSP within Existing ROW Alternative may be encountered in excavations beneath shallow layers of Alluvium (Qal) between approximately MPs OH-9 to OH-10, and would be more difficult to excavate than the overlying alluvial deposits.

Slope Stability. The Overhead 500 kV ABDSP within Existing ROW traverses flat to gently sloping valley floor and alluvial fan terrain between approximate MPs 60.9 to 69.8 and MPs 70.4 and 80, and is not likely to experience landslides or other slope failures in these areas. The project ROW passes near to and along sloping hillside and mountain terrain between MPs OH-8.9 to OH-9.5 and between MPs OH-19 to OH-22.5. It does not cross any mapped landslides in these areas and the granitic terrain (gr-m and gr) underlying these slopes is not prone to landslides.

Soils. Three soil associations are mapped along the Overhead 500 kV ABDSP within Existing ROW Alternative route, s994, s1016, and s1021. Basic characteristics of these soils are presented in Table D.13-2. Rositas-Orita-Carrizo-Aco (s994) soils are found primarily along this segment in areas underlain by alluvium and terrace deposits. Sheephead–Rock Outcrop–Bancas (s1016) and Rock Outcrop–Lithic Torrior-thents (s1021) soils are likely to be encountered in areas underlain by shallow alluvium over granitic and metamorphic bedrock.

Erosion hazard for these soils for both off-road/off-trail and on-road/on-trail ranges from slight to moderate, and shrink/swell (expansive) potential varies from low to moderate. Corrosive potential of soils along this alternative range from moderate to high for both uncoated steel and concrete.

Approximate locations of the soil associations are listed below.

- s994: MPs OH-0 to OH-19.5.
- s1021: MPs OH-21.0 to OH-22.5.
- s1016: MPs OH-19.5 to OH-21.0.

Mineral Resources. No known active mines or BLM mining claims are identified along this segment. One MRDS site is located near MP OH-9.7, the Narrows Mine; this site is only listed as an occurrence and is located on the other side of SR78, approximately 800 feet south of the alternative alignment ROW. Therefore, construction and operation of the Sunrise Powerlink transmission line along this alternative alignment is not expected to interfere with future access to any mineral resources.

Seismicity – Fault Rupture. The Overhead 500 kV ABDSP within Existing ROW route does not cross any active or potentially active faults and is not likely to be affected by surface fault rupture.

Seismicity – Groundshaking. The Overhead 500 kV ABDSP within Existing ROW route segment is in close proximity to the San Andreas and San Jacinto Fault Zones for most of its length. Moderate to strong groundshaking caused by an earthquake on any of the faults in the vicinity of this segment should be expected. The peak horizontal accelerations for this segment are presented in Table D.13-19.

Table D.13-19. Approximate Peak Ground Accelerations – Overhead 500 kV ABDSP within Existing ROW

Approximate Alternative (OH) Transmission Line Milepost	Total Length of Segments (miles)	Peak Ground Acceleration
20.3-22.3	2	0.3–0.4g
5.3-20.3	15	0.5–0.6g
0-5.3	5.3	0.6–0.7g

Source: CGS, 2006; USGS, 2006b.

Seismicity – Liquefaction. Potential for liquefaction in this area is low because alluvial areas along this alternative are limited to shallow deposits over bedrock that even if saturated are not likely to liquefy (gravely and bouldery alluvium of less than 50 feet in depth). However, during large storms or a wet season, the water table may rise temporarily and pockets of finer grained alluvial deposits in areas where the proposed segment crosses and is within active river washes and streams may be moderately susceptible to liquefaction if a strong earthquake occurs while the valley floor sediments are saturated.

Earthquake-Induced Landslides. Most accounts of large historical earthquakes in this area describe damaging landslides and rockfalls resulting from earthquake groundshaking (SCEDC, 2006). Therefore, portions of the Overhead 500 kV ABDSP within Existing ROW near moderate to steep slopes, primarily between MPs OH-8.9 to OH-9.5 and between MPs OH-19 to OH-22.5, may be susceptible to damage from landslides or rockfalls in the event of a large earthquake on nearby faults.

Environmental Impacts and Mitigation Measures

Construction Impacts

No impacts related to Impact G-9 (Construction activities would interfere with access to known mineral resources) are expected for this alignment as no known active mineral resource sites or BLM claims are located along it.

Impact G-1: Erosion would be triggered or accelerated due to construction activities (Class III)

Excavation and grading for tower foundations, trenches, work areas, access roads, and spur roads could loosen soil and trigger or accelerate erosion. Soils along this alternative alignment have an erosion hazard for off-road/off-trail ranges from slight to moderate and for on-road/on-trail ranges from slight to severe. SDG&E's APMs GEO-APM-1, -2, -5, and -6 (see Table D.13-11) reduce the amount of erosion that would result from construction by: limiting grading of existing roads in areas with sensitive soils, planning construction to minimize new ground disturbance, use of Best Management Practices (BMPs) such as sand bags and road bars, to control water erosion, and limiting construction traffic. In addition, a Stormwater Pollution Prevention Plan (SWPPP) that would limit erosion from the construction site would be required in accordance with the Clean Water Act. This would result in an adverse but less than significant impact (Class III).

Impact G-2: Unique geologic features would be damaged due to construction activities (Class II)

Construction activities such as grading and excavation from the Proposed Project could cause damage to desert pavement areas, which is a special concern in the desert areas of the route. Damage to desert pavement as a result of project construction would result in an extreme acceleration of erosion as well as damage to a unique geologic feature, resulting in a significant impact. One soil association along this alternative route, the Rositas-Orita-Carrizo-Aco (s994), is known to include areas of desert pavement. Therefore, Mitigation Measure G-2a is required to protect desert pavement in areas underlain by the Rositas-Orita-Carrizo-Aco soil association and other desert soils with potential for desert pavement. Implementation of Mitigation Measure G-2a would reduce impacts associated with damage to desert pavement areas to less than significant (Class II).

Mitigation Measures for Impact G-2: Erosion could be triggered or accelerated due to construction activities

G-2a Protect desert pavement.

Impact G-6: Project would expose people or structures to potential substantial adverse effects as a result of slope instability created during excavation and/or grading (Class II)

Construction consisting of grading and excavation along the foothills between MPs OH-8.9 to OH-9.5 and between MPs OH-19 to OH-22.5 would potentially cause slope instability. Destabilization of natural or constructed slopes could occur as a result of construction activities due to excavation and/or grading operations. Excavation operations associated with tower foundation construction and grading operations for temporary and permanent access roads and work areas could result in slope instability, resulting in landslides, soil creep, or debris flows. Slope instability including landslides, earth flows, and debris flows has the potential to undermine foundations, cause distortion and distress to overlying structures, and displace or destroy project components. SDG&E's APMs GEO-APM-4 and -8 (see Table D.13-11) would partially reduce impacts related to slope instability by avoiding placing structures in unstable areas and removing or stabilizing boulders upslope of structures thus reducing the threat of possible slope failures or rockfalls. However, the Proposed Project would still result in significant impacts if unidentified unstable slopes or areas of potentially unstable slopes were disturbed or undercut by construction activities resulting in slope failures. Slope failures would potentially cause damage to the environment, to project or other nearby structures, and could cause injury or death to workers and/or the public, a significant impact. To ensure that slope instability impacts would be reduced to less than significant (Class II), implementation of Mitigation Measure G-6a is required from between MPs OH-8.9 to OH-9.5 and between MPs OH-19 to OH-22.5 to delineate areas of unstable slopes near and within work areas and to minimize construction-triggered slope failures by avoidance or implementation of slope stabilizing design measures.

Mitigation Measure for Impact G-6: Project would expose people or structures to potential substantial adverse effects as a result of slope instability created during excavation and/or grading

G-6a Conduct geotechnical surveys for landslides and protect against slope instability.

Operational Impacts

There would be no impacts due to fault rupture (Impact G-5) associated with this alternative because of lack of active faults near to or crossing the alternative.

Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils (Class II)

Soils along the Overhead 500 kV ABDSP within Existing ROW Alternative route have a moderate to high potential to corrode uncoated steel and concrete. Expansion potential for the soils is low to moderate. Corrosive and expansive subsurface soils may exist in places along the proposed route which would potentially damage project structures, a significant impact. Application of standard design and construction practices and implementation of GEO-APM-3 (see Table D.13-11) would partially reduce the adverse affects of problematic soils by avoiding placement of structures in areas of high shrink/swell potential, to the extent feasible. However, actual locations of high shrink/swell (expansive) soils and the presence, absence, and location of corrosive soils needs to be determined to fully reduce the potential for adverse affects of problematic soils to less than significant. Unidentified expansive and corrosive

soils could damage project structures and facilities potentially resulting in collapse. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to nearby people, a significant impact. Accordingly, implementation of Mitigation Measure G-3a (Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design) would ensure that impacts associated with problematic soils are reduced to less than significant levels (Class II).

Mitigation Measure for Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils

G-3a Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design.

Impact G-4: Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure (Class II)

Moderate to severe groundshaking is expected along the Overhead 500 kV ABDSP within Existing ROW Alternative route in the event of an earthquake on the faults in the Anza-Borrego area and from other major faults in the region, with estimated PGAs ranging from 0.3 to 0.7 g. SDG&E indicates in the PEA that project structures would be designed to withstand geologically induced stresses and that appropriate tower design accounting for lateral wind loads and conductor loads would likely exceed any creditable seismic loading, minimizing potential damage to tower structures from groundshaking. However, portions of the Overhead 500 kV ABDSP within Existing ROW Alternative alignment would be subject to local strong to severe groundshaking with vertical and horizontal ground accelerations that could exceed lateral wind loads, resulting in damage or collapse of project structures. Collapse of project structures would potentially result in power outages, damage to nearby roads or structures, and injury or death to people, a significant impact. Therefore, to ensure that project structures are not damaged by strong to severe groundshaking, implementation of Mitigation Measure G-4a (Reduce effects of groundshaking) is required to ensure that project structures are not damaged by strong groundshaking, reducing impacts to less than significant (Class II).

Severe to strong groundshaking could result in seismically induced ground failures, including liquefaction-related phenomena and slope failures, along the Overhead 500 kV ABDSP within Existing ROW Alternative route. Portions of the alternative that cross active river washes and streams where seasonally saturated lenses and pockets of loose sand may be present would potentially liquefy should a large earthquake occur while these soils are saturated resulting in damage to or collapse of project structures, a significant impact. Seismically induced slope failures such as landslides and rockfalls could also be triggered along portions of the alternative ROW in areas along and below moderate to steep slopes, between MPs OH-8.9 to OH-9.5 and MPs OH-19 to OH-22.5, resulting in damage to or collapse of tower structures. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to people, a significant impact. However, to ensure that impacts associated with strong groundshaking and seismically induced ground failures would be mitigated to less than significant levels (Class II), implementation of Mitigation Measures G-4b (Conduct geotechnical investigations for liquefaction) and G-6a (Conduct geotechnical surveys for landslides and protect against slope instability) is required prior to final project design to ensure that people or structures are not exposed to hazards associated with strong to severe seismic groundshaking.

Mitigation Measure for Impact G-4: Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure

- G-4a Reduce effects of groundshaking.**
- G-4b Conduct geotechnical investigations for liquefaction.**
- G-6a Conduct geotechnical surveys for landslides and protect against slope instability.**

Impact G-7: Project would expose people or structures to potential substantial adverse effects as a result of landslides, earthflows, debris flows, and/or rockfall (Class II)

Slope instability including landslides, earth flows, debris flows, and rockfall during project operation has the potential to undermine foundations, cause distortion and distress to overlying structures, and displace or destroy project components or other nearby structures. The area where landslides could cause damage to project structures is along the slopes between MPs OH-8.9 to OH-9.5 and MPs OH-19 to OH-22.5 where towers are close to the base of the mountains. SDG&E has proposed APMs GEO-APM-4 and -8 (see Table D.13-11) to reduce impacts related to landslide hazards during operations of the project by avoiding placing structures in unstable areas and removing or stabilizing boulders upslope of structures, potential sources for future rockfalls and/or landslides. However, the Partial Underground 230 kV ABDSP SR78 to S2 Alternative route could still be impacted by slope failures, which could cause collapse of project structures resulting in power outages, damage to nearby roads or structures, and injury or death to people, a significant impact. To ensure that significant impacts to the project from potential slope failures would be mitigated to less than significant levels (Class II), implementation of Mitigation Measure G-6a (Conduct geotechnical surveys for landslides and protect against slope instability) is required between MPs OH-8.9 to OH-9.5 and between MPs OH-19 to OH-22.5 to allow for identification of potential slope failure sources, and thus allow project design to avoid them or implement slope stabilization practices.

Mitigation Measure for Impact G-7: Project would expose people or structures to potential substantial adverse effects as a result of landslides, earthflows, debris flows, and/or rockfall

- G-6a Conduct geotechnical surveys for landslides and protect against slope instability.**

D.13.16 Central Link Alternatives Impacts and Mitigation Measures

Four Central Link Alternatives are considered in this section: the Santa Ysabel Existing ROW Alternative, the Santa Ysabel Partial Underground Alternative, the Santa Ysabel SR79 All Underground Alternative, and the Mesa Grande Alternative.

D.13.16.1 Santa Ysabel Existing ROW Alternative

This alternative would follow an existing 69 kV transmission line ROW on the west side of SR79 in the northern half and east of SR79, along the toe of the hill slope in the southern portion of the alternative. This route would pass east of the existing Santa Ysabel Substation and continue to follow the existing 69 kV line south of SR78 until it rejoins the proposed corridor.

Environmental Setting

Geology. The Santa Ysabel Existing ROW alternative route (SYR) traverses sloping hillsides and valleys along the western side of the Volcan Mountains, and along the eastern edge of Santa Ysabel Valley. Geo-

logic units crossed by this segment of the project are folded and faulted alluvial fan deposits (Qco), gabbro and diorite (bi), and mixed granitic and metamorphic rocks (gr-m); descriptions of these units are listed in Table D.13-1. Approximate locations of these units along the project are listed below.

- Folded and faulted alluvial fan deposits (Qco): MPs SYR-0 to SYR-0.1.
- Gabbro and diorite (bi): MPs SYR-1.6 to SYR-2.3 and MPs SYR-8.4 to SYR-8.6.
- Mixed granitic and metamorphic rocks (gr-m): MPs SYR-0.1 to SYR-1.6, MPs SYR-2.3 to SYR-8.4, and MPs SYR-8.6 to SYR-9.0.

Slope Stability. The Santa Ysabel Existing ROW alternative route traverses near and across gently sloping alluvial fans and moderately sloping hillsides. This alignment does not cross any mapped landslides and the granitic terrain (gr-m and bi) underlying the slopes in the area are not typically prone to landslides.

Soils. One soil association is mapped underlying the entire length of the Santa Ysabel Existing ROW alternative route, s1015. Basic characteristics of these soils are presented in Table D.13-2. The Hotaw-Crouch-Boomer association (s1015) is formed in material weathered from the underlying granitic and metamorphic rocks. The hazard of off-road/off-trail soil erosion ranges from slight to very severe and for on-road/on-trail ranges from slight to severe. Shrink/swell (expansive) potential of this soil association varies from low to moderate. Corrosive potential of soils along the Santa Ysabel Existing ROW alternative route are moderate for both uncoated steel concrete.

Mineral Resources. No known active mines, mineral resource sites, or BLM mining claims are located along this alternative route.

Seismicity – Fault Rupture. This segment crosses the active Elsinore Fault (Julian Segment) at approximately MP 0.2, shown in Figure D.13-10. The fault is included within an Alquist-Priolo zone in the area where the Santa Ysabel Existing ROW alternative route crosses the fault. Recent research on the Julian segment of the Elsinore Fault indicates that this segment ruptures infrequently (approximately every 2000-3000 years, with the last earthquake occurring 1500-2000 years ago). Larger earthquakes could potentially result in offsets ranging from 2 to 5 meters, depending on the size of the earthquake and length of the fault rupture (Thorup et al., 1997).

Seismicity – Groundshaking. The Santa Ysabel Existing ROW Alternative route segment is in close proximity to the Elsinore Fault Zone for its entire length. Moderate to strong groundshaking would be caused by a significant earthquake on this fault or any of the other significant active faults in the vicinity of this segment. The peak horizontal accelerations for this segment are presented in Table D.13-20.

Table D.13-20. Approximate Peak Ground Accelerations – Santa Ysabel Existing ROW Alternative

Approximate Alternative (SYR) Transmission Line Milepost	Total Length of Segments (miles)	Peak Ground Acceleration
0.1-3.3 and 4.9-9.0	7.3	0.3-0.4g
0-0.1 and 3.3-4.9	1.7	0.4-0.5g

Source: CGS, 2006; USGS, 2006b.

Seismicity – Liquefaction. Most of this alternative has no to low potential for liquefaction as it is primarily underlain by igneous bedrock. The Santa Ysabel Existing ROW Alternative route may have moderate potential liquefaction in areas where the alignment crosses and is within active washes and flood plains of Santa Ysabel Creek and its associated tributaries, where local pockets of saturated and loose sandy soils may be located. These local pockets of loose sandy soils would potentially liquefy in the event of a large earthquake.

Earthquake-Induced Landslides. Most accounts of historical earthquakes in this area describe damaging landslides resulting from earthquake groundshaking (SCEDC, 2006). Most of Santa Ysabel Existing ROW Alternative route does not cross areas with significant slopes; however, portions of the ROW are located along and near moderately sloping hills of the Vulcan Mountains and may be susceptible to damage from landslides or rockfalls in the event of a large earthquake on nearby faults.

Environmental Impacts and Mitigation Measures

Construction Impacts

No desert pavement is mapped along this alternative and thus Impact G-2 (Unique geologic features would be damaged due to construction activities) is not expected to occur along this alternative. No construction impacts related to construction-triggered slope failures (Impact G-6) would occur associated with this alternative due to the gently sloping terrain crossed by and adjacent to the alternative alignment. No known active mineral resource sites or BLM claims are located along this alignment; therefore, there are no impacts related to Impact G-9 (Construction activities would interfere with access to known mineral resources).

Impact G-1: Erosion would be triggered or accelerated due to construction activities (Class III)

Excavation and grading for tower foundations, trenches, work areas, access roads, and spur roads would loosen soil and trigger or accelerate erosion. Soils along the Santa Ysabel Existing ROW Alternative route have an erosion hazard for off-road/off-trail ranges from slight to very severe and for on-road/on-trail ranges from slight to severe. SDG&E's APMs GEO-APM-1, -2, -5, and -6 (see Table D.13-11) reduce the amount of erosion that would result from construction by limiting construction traffic and grading of existing roads in areas with sensitive soils,

Figure D.13-10. Santa Ysabel Alternatives Elsinore Fault Crossing
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planning construction to minimize new ground disturbance, and by using Best Management Practices (BMPs) such as sand bags and road bars, to control water erosion. In addition, a Stormwater Pollution Prevention Plan (SWPPP) that would limit erosion from the construction site would be required in accordance with the Clean Water Act. This would result in an adverse but less than significant impact (Class III).

Operational Impacts

There would be no impacts associated with this alternative on project structures due to landslides, earth-flows, debris flows, and/or rockfall during project operation (Impact G-7) due to the gently to moderately sloping terrain traversed by the route.

Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils (Class II)

Soils along the Santa Ysabel Existing ROW Alternative route have a moderate potential to corrode uncoated steel and concrete. Expansion potential for the soils is low to moderate. Corrosive and expansive subsurface soils may exist in places along the proposed route which could potentially damage project structures, a significant impact. Application of standard design and construction practices and implementation of GEO-APM-3 (see Table D.13-11) would partially reduce the adverse affects of problematic soils by avoiding placement of structures in areas of high shrink/swell potential, to the extent feasible. However, actual locations of high shrink/swell (expansive) soils and the presence, absence, and location of corrosive soils needs to be determined to fully reduce the potential for adverse affects of problematic soils to less than significant. Unidentified expansive and corrosive soils would potentially damage project structures and facilities resulting in collapse. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to nearby people, a significant impact. Accordingly, implementation of Mitigation Measure G-3a (Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design) would ensure that impacts associated with problematic soils are reduced to less than significant levels (Class II). The full text of the mitigation measures can be found in Appendix 12.

Mitigation Measure for Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils

G-3a Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design.

Impact G-4: Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure (Class II)

Moderate to strong groundshaking is expected along the Santa Ysabel Existing ROW Alternative route in the event of an earthquake on the faults in the Central Link area and from other major faults in the region, with estimated PGAs ranging from 0.3 to 0.5 g. SDG&E indicates in the PEA that project structures would be designed to withstand geologically induced stresses and that appropriate tower design accounting for lateral wind loads and conductor loads would likely exceed any creditable seismic loading, minimizing potential damage to tower structures from groundshaking. However, portions of the Santa Ysabel Existing ROW Alternative alignment would be subject to local strong groundshaking with vertical and horizontal ground accelerations that could exceed lateral wind loads, resulting in damage or collapse of project structures. Collapse of project structures would potentially result in power outages, damage to nearby roads or structures, and injury or death to people. Therefore, the Proposed Project would cause a significant impact. To ensure that project structures are not damaged by strong to severe

groundshaking, implementation of Mitigation Measure G-4a (Reduce effects of groundshaking) is required to ensure that project structures are not damaged by strong groundshaking, reducing impacts to less than significant (Class II).

Strong groundshaking could potentially result in liquefaction-related ground failures along the Santa Ysabel Existing ROW alternative route. Liquefaction-related ground failures would occur where the alignment crosses and is within active washes and flood plains of Carrista and Santa Ysabel Creeks and their associated tributaries should an earthquake occur while sediments were saturated by seasonally perched groundwater. This could result in damage to or collapse of project structures, a potentially significant impact. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to nearby people, a significant impact. However, to ensure that impacts associated with strong groundshaking and seismically induced ground failures would be mitigated to less than significant levels (Class II), implementation of Mitigation Measure G-4b (Conduct geotechnical investigations for liquefaction) is required prior to final project design to ensure that people or structures are not exposed to hazards associated with strong seismic groundshaking. Seismically induced slope failures would not occur along this alternative due to the moderately to gently sloping terrain crossed by the route.

Mitigation Measure for Impact G-4: Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure

G-4a Reduce effects of groundshaking.

G-4b Conduct geotechnical investigations for liquefaction.

Impact G-5: Project would expose people or structures to potential substantial adverse effects as a result of surface fault rupture at crossings of active faults (Class II)

Project structures would be subject to hazards of surface fault rupture at the crossing of the Elsinore fault. Fault crossings, where multiple feet of displacement are expected along active faults, are best crossed as overhead lines with towers placed well outside the fault zone to allow for the flex in the conductor lines to absorb offset. In general, GEO-APM-4 requires that project structures be placed in stable areas avoiding fault lines. However, how fault lines shall be avoided and how the surface traces of the active faults will be accurately located is not specified and project structures would potentially be damaged or collapse in the event of fault rupture beneath or adjacent to a tower due to inaccurate fault location during project design. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to people. Thus, the Santa Ysabel Existing ROW Alternative route would result in a significant impact. Therefore, implementation of Mitigation Measure G-5a is required for fault crossings to minimize the length of the transmission line within fault zones. Impacts associated with overhead active fault crossings would be reduced to less than significant levels (Class II) with implementation of Mitigation G-5a because conductor would be able to distribute fault displacements over a comparatively long span and towers would be less likely to collapse in the event of an earthquake if not placed directly on an active fault trace.

Mitigation Measure for Impact G-5: Project would expose people or structures to potential substantial adverse effects as a result of surface fault rupture at crossings of active faults

G-5a Minimize project structures within active fault zones.

D.13.16.2 Santa Ysabel Partial Underground Alternative

This 230 kV alternative would begin at MP 105.5 where the proposed route would join Mesa Grande Road at the base of the hills at the western side of the Santa Ysabel Valley. The alternative would transition underground at the southern side of Mesa Grande Road and would travel underground in Mesa Grande Road, SR79 and then, south of SR78, following property lines for approximately one mile to rejoin the proposed route at approximately MP 109.5 where it would transition overhead. The route would be 0.7 miles longer than the proposed route.

Environmental Setting

Geology. The Santa Ysabel Partial Underground Alternative route (SYPU) traverses gently sloping hill-sides and valleys through and along the edge of the Santa Ysabel Valley. This alternative traverses underground along paved and unpaved access and rural roads, State Routes 78 and 79, and along property boundaries. Geologic units crossed by this segment of the project are alluvium (Qal) and mixed granitic and metamorphic rocks (gr-m); descriptions of these units are listed in Table D.13-1. Approximate locations of these units along the project are listed below.

- Alluvium (Qal): MPs SYPU-0 to SYPU-0.4.
- Mixed granitic and metamorphic rocks (gr-m): MPs SYPU-0.4 to SYPU-5.0.

Slope Stability. The Santa Ysabel Partial Underground Alternative route traverses near and across flat to gently sloping alluvial fans and valley floor. This alignment does not cross any mapped landslides and the gentle slopes in the area would not be prone to landslides.

Soils. One soil association is mapped underlying the entire length of the Santa Ysabel Partial Underground Alternative route, s1015. Basic characteristics of this soil association are presented in Table D.13-2. The Hotaw-Crouch-Boomer association (s1015) is formed in material weathered from the underlying granitic and metamorphic rocks. The hazard of off-road/off-trail soil erosion ranges from slight to very severe and for on-road/on-trail ranges from slight to severe. Shrink/swell (expansive) potential of this soil association varies from low to moderate. Corrosive potential of soils along the Santa Ysabel Partial Underground alternative route are moderate for both uncoated steel concrete.

Mineral Resources. No known active mines, mineral resource sites, or BLM mining claims are located along the Santa Ysabel Partial Underground Alternative route.

Seismicity – Fault Rupture. This alternative does not cross any active faults, and is thus not likely to experience fault rupture.

Seismicity – Groundshaking. The Santa Ysabel Partial Underground Alternative route is in close proximity to the Elsinore Fault Zone and moderate to strong groundshaking from an earthquake on nearby faults should be expected. Estimated PGAs for this alternative are 0.5g to 0.6 g for the first 1 mile of the route and 0.3 to 0.4 g for the remaining 4 miles of the alignment (SCEDC, 2006).

Seismicity – Liquefaction. Most of this link has no to low potential for liquefaction as it is primarily underlain by igneous bedrock. The Santa Ysabel Partial Underground Alternative route may have moderate potential liquefaction in areas where the alignment crosses and is within active washes and flood plains of Santa Ysabel Creek and its associated tributaries, where local pockets of saturated and loose sandy soils may be located. These local pockets of loose sandy soils would potentially liquefy in the event of a large earthquake.

Earthquake-Induced Landslides. Most accounts of historical earthquakes in this area describe damaging landslides resulting from earthquake groundshaking (SCEDC, 2006). However, the Santa Ysabel Partial Underground Alternative route does not cross areas with significant slopes and therefore would not be likely to experience landsliding or slope failures due to earthquakes

Environmental Impacts and Mitigation Measures

Construction Impacts

No desert pavement is mapped along this alternative and thus Impact G-2 (Unique geologic features would be damaged due to construction activities) is not expected to occur along this alternative. No construction impacts related to construction-triggered slope failures (Impact G-6) would occur associated with this alternative due to the gently sloping terrain traversed by this route. No known active mineral resource sites or BLM claims are located along this alignment; therefore, there are no impacts related to Impact G-9 (Construction activities would interfere with access to known mineral resources).

Impact G-1: Erosion would be triggered or accelerated due to construction activities (Class III)

Excavation and grading for tower foundations, trenches, work areas, access roads, and spur roads would loosen soil and trigger or accelerate erosion. Soils along this segment of the Santa Ysabel Partial Underground Alternative route have an erosion hazard for off-road/off-trail ranges from slight to very severe and for on-road/on-trail ranges from slight to severe. SDG&E's APMs GEO-APM-1, -2, -5, and -6 (see Table D.13-11) reduce the amount of erosion that would result from construction by limiting construction traffic and grading of existing roads in areas with sensitive soils, planning construction to minimize new ground disturbance, and by using Best Management Practices (BMPs) such as sand bags and road bars, to control water erosion. In addition, a Stormwater Pollution Prevention Plan (SWPPP) that would limit erosion from the construction site would be required in accordance with the Clean Water Act. This would result in a less than significant impact (Class III).

Operational Impacts

There would be no impacts associated with this alternative on project structures due to fault rupture (Impact G-5) because the alignment does not cross any active fault, nor due to landslides, earthflows, debris flows, and/or rockfall during project operation (Impact G-7) due to the gentle to moderately sloping terrain crossed by the route.

Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils (Class II)

Soils along the Santa Ysabel Partial Underground Alternative route have a moderate potential to corrode uncoated steel and concrete. Expansion potential for the soils is low to moderate. Corrosive and expansive subsurface soils may exist in places along the proposed route which could potentially damage project structures, a significant impact. Application of standard design and construction practices and implementation of GEO-APM-3 (see Table D.13-11) would partially reduce the adverse affects of problematic soils by avoiding placement of structures in areas of high shrink/swell potential, to the extent feasible. However, actual locations of high shrink/swell (expansive) soils and the presence, absence, and location of corrosive soils needs to be determined to fully reduce the potential for adverse affects of problematic soils to less than significant. Unidentified expansive and corrosive soils could damage project structures and facilities potentially resulting in collapse. Collapse of project structures

could result in power outages, damage to nearby roads or structures, and injury or death to nearby people, a significant impact. Accordingly, implementation of Mitigation Measure G-3a (Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design) would ensure that impacts associated with problematic soils are reduced to less than significant levels (Class II).

Mitigation Measure for Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils

G-3a Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design.

Impact G-4: Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure (Class II)

Moderate to strong groundshaking should be expected in the event of an earthquake on the faults in the Santa Ysabel Partial Underground Alternative route area and from other major faults in the region, with estimated PGAs ranging from 0.3 to 0.6 g. SDG&E indicates in the PEA that project structures would be designed to withstand geologically induced stresses and that appropriate tower design accounting for lateral wind loads and conductor loads would likely exceed any creditable seismic loading, minimizing potential damage to tower structures from groundshaking. However, portions of portions of this alignment (MPs SYPU-0 to SYPU-1) would be subject to local strong groundshaking with vertical and horizontal ground accelerations that could exceed lateral wind loads, resulting in damage or collapse of project structures. Underground portions of the alternative alignment could also be damaged by strong groundshaking. Portions of underground alignments most susceptible to shaking damage include the structures and cable at the point of underground transition where shearing may occur; rigid structures such as vaults, cable connections, and conduits; and areas along the alignment where geologic material transitions occur which results in differential seismic wave propagation, loose materials amplify seismic waves. Collapse or shearing of project structures could result in power outages, damage to nearby roads or structures, and injury or death to people, a significant impact. Therefore, to ensure that project structures are not damaged by strong to severe groundshaking, implementation of Mitigation Measure G-4a (Reduce effects of groundshaking) is required to ensure that project components are not damaged by strong groundshaking, reducing impacts to less than significant (Class II).

Strong groundshaking could potentially result in liquefaction-related ground failures along the Santa Ysabel Partial Underground Alternative route. Liquefaction-related ground failures could occur where the alignment crosses and is within active washes and flood plains of Santa Ysabel Creek and its associated tributaries should an earthquake occur while sediments were saturated by seasonally perched groundwater. This could result in damage to or collapse of project components, a potentially significant impact. Collapse of project components could result in power outages, damage to nearby roads or structures, and injury or death to people, a significant impact. However, to ensure that impacts associated with strong groundshaking and seismically induced ground failures would be mitigated to less than significant levels (Class II), implementation of Mitigation Measure G-4b (Conduct geotechnical investigations for liquefaction) is required and shall be implemented prior to final project design to ensure that people or structures are not exposed to hazards associated with strong seismic groundshaking. Seismically induced slope failures would not occur along this alternative due to its gently sloping terrain.

Mitigation Measure for Impact G-4: Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure

G-4a Reduce effects of groundshaking.

G-4b Conduct geotechnical investigations for liquefaction.

D.13.16.3 Santa Ysabel SR79 All Underground Alternative

Environmental Setting

Geology. The Santa Ysabel SR79 All Underground Alternative route (SYAU) traverses sloping hillsides and valleys along the western side of the Volcan Mountains. Geologic units crossed by this segment of the project are folded and faulted alluvial fan deposits (Qco), gabbro and diorite (bi), and mixed granitic and metamorphic rocks (gr-m); descriptions of these units are listed in Table D.13-1. Approximate locations of these units along the project are listed below.

- Folded and faulted alluvial fan deposits (Qco): MPs SYAU-0 to SYAU-0.1.
- Mixed granitic and metamorphic rocks (gr-m): MPs SYAU-0.1 to SYAU-5.2.

Seismicity – Fault Rupture. This segment crosses the active Elsinore Fault (Julian Segment) overhead at approximately MP 0.2 before transitioning underground, shown in Figure D.13-10. After transitioning underground the alignment will run parallel to and within SR79, which along the Elsinore Fault Zone between approximately MPs SYAU-0.2 and SYAU-3.7. The Elsinore Fault Zone is included within an Alquist-Priolo zone in the area where the Santa Ysabel SR79 All

Underground Alternative overhead route crosses the fault and where it would transition underground. Larger earthquakes on this fault could potentially result in offsets ranging from 2 to 5 meters, depending on the size of the earthquake and length of the fault rupture (Thorup et al., 1997).

Seismicity – Groundshaking. The Santa Ysabel SR79 All Underground Alternative route segment is in close proximity to the Elsinore Fault Zone for its entire length. Moderate to strong groundshaking could be caused by a significant earthquake on this fault or any of the other significant active faults in the vicinity of this segment. The peak horizontal accelerations for this segment are presented in Table D.13-21 Santa Ysabel SR79 All Underground Alternative

Impact G-5: Project would expose people or structures to potential substantial adverse effects as a result of surface fault rupture at crossings of active faults (Class I)

The Santa Ysabel All Underground Alternative crosses and is located within the Elsinore fault zone and its associated mapped A-P zone. The northernmost portion of this alternative is an overhead alignment and crosses the Elsinore fault and it's associated A-P zone approximately between MPs SYAU-0 and SYAU-0.2. Additionally a large portion of the underground alignment for this alternative is located within and adjacent to the known trace of the Elsinore Fault zone along and parallel to SR79 from

Table D.13-21. Approximate Peak Ground Accelerations – Santa Ysabel SR79 All Underground Alternative

Approximate Alternative (SYAU) Transmission Line Milepost	Total Length of Segments (miles)	Peak Ground Acceleration
4.8-5.2	0.4	0.3–0.4g
0-4.8	4.8	0.4–0.5g

Source: CGS, 2006; USGS, 2006a.

SYAU-0.2 to approximately SYAU-3.7. This portion of the Elsinore fault is known to be active, but has not yet been Alquist-Priolo zoned due to lack of detailed study to accurately locate the strands of the fault along this zone. The Elsinore fault is A-P zoned to the north and south of this segment of the fault. Displacement of the Elsinore fault where the overhead portion crosses the fault and where the underground alignment is located adjacent to and within the fault zone could result in significant damage to and/or collapse of tower structures, underground cables and vaults, and other associated facilities, resulting in power outages, damage to nearby roads or structures, and injury or death to people, a significant impact.

In general, SDG&E's GEO-APM-4 requires that project structures be placed in stable areas avoiding fault lines. However, how fault lines shall be avoided and how the surface traces of the active faults will be accurately located is not specified and project structures could be damaged or collapse in the event of fault rupture beneath or adjacent to a tower due to inaccurate fault location during project design. Therefore, Mitigation Measure G-5a is required for the Santa Ysabel SR79 All Underground Alternative route where the overhead portion of the alignment crosses the Elsinore fault to minimize the length of the transmission line within the fault zones and reduce the potential that towers would be placed on active strands of the fault. Impacts associated with this overhead active fault crossing would be reduced to less than significant levels (Class II) with implementation of Mitigation G-5a because the conductor would be able to distribute fault displacements over a comparatively long span and towers would be less likely to collapse in the event of an earthquake if not placed directly on an active fault trace.

The underground portions of the Santa Ysabel SR79 All Underground Alternative route that are within and adjacent to the Elsinore fault zone are at substantial risk of damage should an earthquake and ground rupture occur along this portion of the fault. Although no mitigation measure can reduce the likelihood of fault rupture, proper preparation and design can reduce the potential for damage to underground power lines crossing and within the fault rupture zone. In the event of damage to the lines due to fault rupture, Mitigation Measure G-5c (Minimize Damage to Underground Transmission Lines) would significantly reduce the amount of time necessary to effect repairs, and also minimize damage to the underground segment of the transmission line within and adjacent to the Elsinore fault zone and shall be completed prior to construction. However, despite implementation of this mitigation, the potential for fault rupture along the underground portion of the alignment would still result in significant impact (Class I).

Mitigation Measures for Impact G-5: Project would expose people or structures to potential substantial adverse effects as a result of surface fault rupture at crossings of active faults

G-5a Minimize project structures within active fault zones.

G-5c Minimize Damage to Underground Transmission Lines. Site-specific geotechnical investigations will be performed at locations where underground portions of the SYAU transmission line route crosses and is within the Elsinore Fault Zone and may intersect fault traces. Where significant potential for fault surface rupture is identified, appropriate engineering measures, such as installing breakaway connections and strategically locating splice boxes outside of the fault zone, will be implemented to protect sensitive equipment and limit the extent of potential repairs. Additionally, underground crossing of the active fault traces shall be made as close to perpendicular to the fault as possible to make the segment cross the shortest distance within an active fault zone and cable vaults on either side of the fault shall be oversized, leaving as much slack as possible in the cables to absorb any offset.

Operation and maintenance measures will be implemented to prepare for potential fault-rupture scenarios and facilitate timely repair of facilities. Preparation measures will include, but not be limited to, storage and maintenance of spare parts and equipment that may be needed to repair or temporarily bypass portions of the transmission line damaged as a result of fault surface rupture. Spare parts and equipment would be stored at the nearby Santa Ysabel Substation or other nearby facilities.

D.13.16.4 Mesa Grande Alternative

This alternative to a one-mile portion of the proposed overhead 230 kV route was proposed by the landowner and also by SDG&E in order to reduce the visibility of the overhead line west of Mesa Grande Road. It would diverge from the proposed route at MP 102.2, and rejoin it before MP 104.

Environmental Setting

Geology. The SDG&E Mesa Grande Alternative route (MG) traverses sloping hillsides west of the Volcan Mountains. This alternative crosses mixed granitic and metamorphic rocks (gr-m) for its entire length (1.8 miles); descriptions of this unit are listed in Table D.13-1.

Slope Stability. The SDG&E Mesa Grande Alternative route traverses near and across gently to moderately sloping hillsides. This alignment does not cross any mapped landslides and the granitic terrain (gr-m) underlying the slopes in the area are not typically prone to landslides.

Soils. One soil association is mapped underlying the entire length of the SDG&E Mesa Grande Alternative route, s1015. Basic characteristics of this soil association is presented in Table D.13-2. The Hotaw-Crouch-Boomer association (s1015) is formed in material weathered from the underlying granitic and metamorphic rocks. The hazard of off-road/off-trail soil erosion ranges from slight to very severe and for on-road/on-trail ranges from slight to severe. Shrink/swell (expansive) potential of this soil association varies from low to moderate. Corrosive potential of soils along the SDG&E Mesa Grande Alternative route are moderate for both uncoated steel concrete.

Mineral Resources. No known active mines, mineral resource sites, or BLM mining claims are located along this alternative route.

Seismicity. This alternative does not cross any active faults, and is thus not likely to experience fault rupture. This alternative, however, is in close proximity to the Elsinore Fault Zone and could experience moderate groundshaking from an earthquake on nearby faults. Estimated PGAs for this alternative are 0.3g to 0.4 g for entire length of the alignment (SCEDC, 2006). There is no potential for liquefaction along the SDG&E Mesa Grande alternative route as it is entirely underlain by granitic bedrock. This terrain along this alignment is gently to moderately sloping hillsides underlain by granitic terrain (gr-m) not typically prone to landslides, and thus would not likely experience landsliding or slope failures due to earthquakes.

Environmental Impacts and Mitigation Measures

Construction Impacts

No desert pavement is mapped along this alternative and thus Impact G-2 (Unique geologic features would be damaged due to construction activities) is not expected to occur along this alternative. No con-

struction impacts related to construction-triggered slope failures (Impact G-6) would occur associated with this alternative due to the gently sloping terrain crossed by and adjacent to the alternative alignment. No known active mineral resource sites or BLM claims are located along this alignment; therefore, there are no impacts related to Impact G-9 (Construction activities would interfere with access to known mineral resources).

Impact G-1: Erosion would be triggered or accelerated due to construction activities (Class III)

Excavation and grading for tower foundations, trenches, work areas, access roads, and spur roads would loosen soil and trigger or accelerate erosion. Soils along the SDG&E Mesa Grande Alternative route have an erosion hazard for off-road/off-trail ranges from slight to very severe and for on-road/on-trail ranges from slight to severe. SDG&E's APMs GEO-APM-1, -2, -5, and -6 (see Table D.13-11) reduce the amount of erosion that would result from construction by limiting construction traffic and grading of existing roads in areas with sensitive soils, planning construction to minimize new ground disturbance, and by using Best Management Practices (BMPs) such as sand bags and road bars, to control water erosion. In addition, a Stormwater Pollution Prevention Plan (SWPPP) that would limit erosion from the construction site would be required in accordance with the Clean Water Act. This would result in an adverse but less than significant impact (Class III).

Operational Impacts

There would be no impacts associated with this alternative on project structures due to seismically induced ground failure (Impact G-4), fault rupture (Impact G-5), or due to landslides, earthflows, debris flows, and/or rockfall during project operation (Impact G-7).

Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils (Class II)

Soils along the SDG&E Mesa Grande Alternative route have a moderate potential to corrode uncoated steel and concrete. Expansion potential for the soils is low to moderate. Corrosive and expansive subsurface soils may exist in places along the proposed route which could potentially damage project structures, a significant impact. Application of standard design and construction practices and implementation of GEO-APM-3 (see Table D.13-11) would partially reduce the adverse affects of problematic soils by avoiding placement of structures in areas of high shrink/swell potential, to the extent feasible. However, actual locations of high shrink/swell (expansive) soils and the presence, absence, and location of corrosive soils needs to be determined to fully reduce the potential for adverse affects of problematic soils to less than significant. Unidentified expansive and corrosive soils could damage project structures and facilities potentially resulting in collapse. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to nearby people, a significant impact. Accordingly, implementation of Mitigation Measure G-3a (Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design) would ensure that impacts associated with problematic soils are reduced to less than significant levels (Class II).

Mitigation Measure for Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils

G-3a Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design.

Impact G-4: Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure (Class III)

Moderate groundshaking should be expected along the SDG&E Mesa Grande Alternative route in the event of an earthquake on the faults in the Central Link area and from other major faults in the region, with estimated PGAs ranging from 0.3 to 0.4g along the SDG&E Mesa Grande alternative route. Seismically induced groundshaking could potentially damage project structures, a significant impact. However, appropriate tower design accounting for lateral wind loads and conductor loads would likely exceed any creditable seismic loading minimizing potential damage to tower structures from groundshaking. This would result in a less than significant impact (Class III).

D.13.17 Inland Valley Link Alternatives Impacts and Mitigation Measures

Four alternatives are considered within the Inland Valley Link: the CNF Existing 69 kV Route Alternative, the Oak Hollow Road Underground Alternative, the San Vicente Road Transition Station Alternative, and the Chuck Wagon Road Alternative.

D.13.17.1 CNF Existing 69 kV Route Alternative

This 0.5-mile alternative segment would start at MP 111.3 where the proposed 230 kV and existing 69 kV transmission lines would be routed west for 0.5 miles and then south for approximately 0.5 miles to avoid Cleveland National Forest (CNF). The alternative would remain in the existing 69 kV ROW heading southwest through Cleveland National Forest to rejoin the proposed route at MP 111.8. This alternative would be 0.5 miles shorter than the Proposed Project and the existing 69 kV transmission line would not need to be relocated out of the existing ROW.

Environmental Setting

Geology. The CNF Existing 69 kV Route Alternative traverses gently to moderately sloping hillsides along Dye Mountain and is underlain for its entire length by mixed granitic and metamorphic rocks (gr-m). Descriptions of this unit are listed in Table D.13 1.

Slope Stability. The CNF Existing 69 kV Route Alternative traverses across gently to moderately sloping hillside terrain. This portion of the alignment does not cross any mapped landslides and slopes in the area are underlain by the granitic bedrock units which are not typically prone to landslides.

Soils. One soil association is mapped underlying the entire length of the CNF Existing 69 kV Route Alternative, s1015. Basic characteristics of this soil association are presented in Table D.13-2. The Hotaw-Crouch-Boomer association (s1015) is formed in material weathered from the underlying granitic and metamorphic rocks. The hazard of off-road/off-trail soil erosion ranges from slight to very severe and for on-road/on-trail ranges from slight to severe. Shrink/swell (expansive) potential of this soil association varies from low to moderate. Corrosive potential of soils along the CNF Existing 69 kV Route Alternative route are moderate for both uncoated steel concrete.

Mineral Resources. No known active mines or BLM mining claims are identified along this segment. Additionally, no known mineral resource sites were identified by the MRDA database or by the CGS (CDMG, 1999). Therefore, construction and operation of the Sunrise Powerlink transmission line along the proposed CNF Existing 69 kV Route Alternative alignment is not expected to interfere with future access to any mineral resources.

Seismicity. The CNF Existing 69 kV Route Alternative does not cross any known active faults and is thus not likely to experience damage due to fault rupture and/or offset. No active faults are located in the immediate vicinity of this alternative. The alignment could experience minor groundshaking from an earthquake on nearby faults with estimated PGAs of 0.2g to 0.3g for entire length of this alignment (SCEDC, 2006). However, appropriate tower design accounting for lateral wind loads and conductor loads would exceed any creditable seismic loading from minor groundshaking, preventing damage to tower structures. There is no potential for liquefaction along the CNF Existing 69 kV Route Alternative alignment as it is entirely underlain by granitic bedrock. This terrain along this alignment is gently to moderately sloping hillsides underlain by granitic terrain (gr-m) not typically prone to landslides, and thus would not likely experience seismically triggered landsliding or slope failures.

Construction Impacts

No desert pavement is mapped along this alternative and thus Impact G-2 (Unique geologic features would be damaged due to construction activities) is not expected to occur along this alternative. No construction impacts related to construction-triggered slope failures (Impact G-6) would occur associated with this alternative due to the gently sloping terrain crossed by and adjacent to the alternative alignment. No known active mineral resource sites or BLM claims are located along this alignment; therefore, there are no impacts related to Impact G-9 (Construction activities would interfere with access to known mineral resources).

Impact G-1: Erosion would be triggered or accelerated due to construction activities (Class III)

Excavation and grading for tower foundations, trenches, work areas, access roads, and spur roads would loosen soil and trigger or accelerate erosion. Soils along CNF Existing 69 kV Route Alternative alignment have an erosion hazard for off-road/off-trail ranges from slight to very severe and for on-road/on-trail ranges from slight to severe. SDG&E's APMs GEO-APM-1, -2, -5, and -6 (see Table D.13-11) reduce the amount of erosion that would result from construction by limiting construction traffic and grading of existing roads in areas with sensitive soils, planning construction to minimize new ground disturbance, and by using Best Management Practices (BMPs) such as sand bags and road bars, to control water erosion. In addition, a Stormwater Pollution Prevention Plan (SWPPP) that would limit erosion from the construction site would be required in accordance with the Clean Water Act. This would result in a less than significant impact (Class III).

Operational Impacts

There would be no impacts associated with this alternative on project structures due to seismically induced groundshaking and/or ground failure (Impact G-4), fault rupture (Impact G-5), or due to landslides, earthflows, debris flows, and/or rockfall during project operation (Impact G-7).

Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils (Class II)

Soils along the CNF Existing 69 kV Route Alternative alignment have a moderate potential to corrode uncoated steel and concrete. Expansion potential for the soils is low to moderate. Corrosive and expansive subsurface soils may exist in places along the proposed route which could potentially damage project structures, a significant impact. Application of standard design and construction practices and implementation of GEO-APM-3 (see Table D.13-11) would partially reduce the adverse affects of problematic soils by avoiding placement of structures in areas of high shrink/swell potential, to the extent feasible. However, actual locations of high shrink/swell (expansive) soils and the presence, absence, and location

of corrosive soils needs to be determined to fully reduce the potential for adverse affects of problematic soils to less than significant. Unidentified expansive and corrosive soils could damage project structures and facilities potentially resulting in collapse. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to nearby people, a significant impact. Accordingly, implementation of Mitigation Measure G-3a (Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design) would ensure that impacts associated with problematic soils are reduced to less than significant levels (Class II). The full text of the mitigation measures can be found in Appendix 12.

Mitigation Measure for Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils

G-3a Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design

D.13.17.2 Oak Hollow Road Underground Alternative

The purpose of this alternative would be to extend the proposed underground to the east of Mount Gower County Open Space Preserve so the line would be underground through the valley area. The alternative would require 0.6 miles of additional underground 230 kV transmission line, and the existing 69 kV would remain overhead.

Environmental Setting

Geology. The Oak Hollow Road Underground Alternative route traverses gently sloping hills along the northern edge of Swartz Canyon and is underlain for its entire length by tonalite and diorite (gr^d). Descriptions of this unit are listed in Table D.13 1.

Slope Stability. The Oak Hollow Road Underground Alternative route traverses across gently sloping hillside terrain. This portion of the alignment does not cross any mapped landslides and slopes in the area underlain by the granitic bedrock units are not typically prone to landslides.

Soils. One soil association is mapped underlying the entire length of the Oak Hollow Road Underground Alternative route, s1010. Basic characteristics of this soil association are presented in Table D.13-2. The Sesame–Rock Outcrop–Cienba association (s1010) is formed in material weathered from the underlying granitic and metamorphic rocks. Hazard of erosion for these soils for both off-road/off-trail and for on-road/on-trail ranges from not rated to very severe. Shrink/swell (expansive) potential of this soil association varies from low to moderate. Corrosive potential of soils along the Oak Hollow Road Underground alternative route is moderate for both uncoated steel and low to moderate for concrete.

Mineral Resources. No known active mines or BLM mining claims are identified along this segment. Additionally, no known mineral resource sites were identified by the MRDA database or by the CGS (CDMG, 1999). Therefore, construction and operation of the Sunrise Powerlink transmission line along the Oak Hollow Road Underground Alternative alignment is not expected to interfere with future access to any mineral resources.

Seismicity. This alternative does not cross any known active faults and is thus not likely to experience damage due to fault rupture and/or offset. No active faults are located in the immediate vicinity of this alternative. This alignment could experience minor groundshaking from an earthquake on nearby faults with estimated PGAs of 0.2g to 0.3g for entire length of this alignment (SCEDC, 2006); however,

standard engineering practices would prevent any damage to the alternative structures and line due to minor groundshaking. There is no potential for liquefaction along the Oak Hollow Road Underground Alternative alignment as it is entirely underlain by granitic bedrock. This terrain along this alignment is gently to moderately sloping hillsides underlain by granitic terrain (gr^d) not typically prone to landslides, and thus would not likely experience seismically triggered landsliding or slope failures.

Environmental Impacts and Mitigation Measures

Construction Impacts

No desert pavement is mapped along this alternative and thus Impact G-2 (Unique geologic features would be damaged due to construction activities) is not expected to occur along this alternative. No construction impacts related to construction-triggered slope failures (Impact G-6) would occur associated with this alternative due to the gently sloping terrain crossed by and adjacent to the alternative alignment. No known active mineral resource sites or BLM claims are located along this alignment; therefore, there are no impacts related to Impact G-9 (Construction activities would interfere with access to known mineral resources).

Impact G-1: Erosion would be triggered or accelerated due to construction activities (Class III)

Excavation and grading for tower foundations, trenches, work areas, access roads, and spur roads could loosen soil and trigger or accelerate erosion. Soils along the Oak Hollow Road Underground alternative alignment have an erosion hazard for off-road/off-trail and for on-road/on-trail ranging from not rated to very severe. SDG&E's APMs GEO-APM-1, -2, -5, and -6 (see Table D.13-11) reduce the amount of erosion that would result from construction by limiting construction traffic and grading of existing roads in areas with sensitive soils, planning construction to minimize new ground disturbance, and by using Best Management Practices (BMPs) such as sand bags and road bars, to control water erosion. In addition, a Stormwater Pollution Prevention Plan (SWPPP) that would limit erosion from the construction site would be required in accordance with the Clean Water Act. This would result in a less than significant impact (Class III).

Operational Impacts

There would be no impacts associated with this alternative on project structures due to seismically induced groundshaking and/or ground failure (Impact G-4), fault rupture (Impact G-5), or due to landslides, earthflows, debris flows, and/or rockfall during project operation (Impact G-7).

Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils (Class II)

Soils along the Oak Hollow Road Underground Alternative route have a moderate potential to corrode uncoated steel and low to moderate potential to corrode concrete. Expansion potential for the soils is low to moderate. Corrosive and expansive subsurface soils may exist in places along the proposed route which could potentially damage project structures, a significant impact. Application of standard design and construction practices and implementation of GEO-APM-3 (see Table D.13-11) would partially reduce the adverse affects of problematic soils by avoiding placement of structures in areas of high shrink/swell potential, to the extent feasible. However, actual locations of high shrink/swell (expansive) soils and the presence, absence, and location of corrosive soils needs to be determined to fully reduce the potential for adverse affects of problematic soils to less than significant. Unidentified expansive and

corrosive soils could damage project structures and facilities potentially resulting in collapse. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to nearby people, a significant impact. Accordingly, implementation of Mitigation Measure G-3a (Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design) would ensure that impacts associated with problematic soils are reduced to less than significant levels (Class II).

Mitigation Measure for Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils

G-3a Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design.

D.13.17.3 San Vicente Road Transition Alternative

The alternative would move the transition structure from its proposed location along San Vicente Road (MP 121.9) approximately 0.3 miles west to MP 122.2. The underground line would follow San Vicente Road within a 60-foot ROW for an additional 2,100 feet and would cross under an existing Creelman–Los Coches 69 kV transmission line, before it would turn north and would travel through open space for approximately 200 feet to the overhead transition point.

Environmental Setting

Geology. The San Vicente Road Transition Alternative route traverses gently sloping hills along the western edge of San Vicente Valley and is underlain for its entire length by granodiorite (gr⁶). Descriptions of this unit are listed in Table D.13 1.

Slope Stability. The San Vicente Road Transition Alternative route traverses across gently sloping hillside terrain. This alternative alignment does not cross any mapped landslides and slopes in the area underlain by the granitic bedrock units are not typically prone to landslides on gentle slopes.

Soils. One soil association is mapped underlying the entire length of the San Vicente Road Transition Alternative route, s1010. Basic characteristics of this soil association are presented in Table D.13-2. The Sesame–Rock Outcrop–Cienba association (s1010) is formed in material weathered from the underlying granitic and metamorphic rocks. Hazard of erosion for these soils for both off-road/off-trail and for on-road/on-trail ranges from not rated to very severe. Shrink/swell (expansive) potential of this soil association varies from low to moderate. Corrosive potential of soils along the San Vicente Road Transition Alternative route is moderate for both uncoated steel and low to moderate for concrete.

Mineral Resources. No known active mines or BLM mining claims are identified along this segment. Additionally, no known mineral resource sites were identified by the MRDA database or by the CGS (CDMG, 1999). Therefore, construction and operation of the Sunrise Powerlink transmission line along the San Vicente Road Transition Alternative alignment is not expected to interfere with future access to any mineral resources.

Seismicity. This alternative does not cross any known active faults and is thus not likely to experience damage due to fault rupture and/or offset. No active faults are located in the immediate vicinity of this alternative and it is only expected to experience minor groundshaking from an earthquake on nearby faults, with estimated PGAs of 0.1g to 0.2g for entire length of this alignment (SCEDC, 2006). Thus it would not likely be damaged by groundshaking. There is no potential for liquefaction along the San Vicente

Road Transition alternative alignment as it is entirely underlain by granitic bedrock. The terrain along this alignment is gently to moderately sloping hillsides underlain by granitic terrain (gr⁶) not typically prone to landslides, and thus would not likely experience seismically triggered landsliding or slope failures.

Environmental Impacts and Mitigation Measures

Construction Impacts

No soils with desert pavement are mapped along this alternative and thus Impact G-2 (Unique geologic features would be damaged due to construction activities) is not expected to occur along this alternative. No construction impacts related to construction-triggered slope failures (Impact G-6) would occur associated with this alternative due to the gently sloping terrain crossed by and adjacent to the alternative alignment. No known active mineral resource sites or BLM claims are located along this alignment; therefore, there are no impacts related to Impact G-9 (Construction activities would interfere with access to known mineral resources).

Impact G-1: Erosion would be triggered or accelerated due to construction activities (Class III)

Excavation and grading for tower foundations, trenches, work areas, access roads, and spur roads could loosen soil and trigger or accelerate erosion. Soils along the San Vicente Road Transition alternative alignment have an erosion hazard for off-road/off-trail and for on-road/on-trail ranging from not rated to very severe. SDG&E's APMs GEO-APM-1, -2, -5, and -6 (see Table D.13-11) reduce the amount of erosion that would result from construction by limiting construction traffic and grading of existing roads in areas with sensitive soils, planning construction to minimize new ground disturbance, and by using Best Management Practices (BMPs) such as sand bags and road bars, to control water erosion. In addition, a Stormwater Pollution Prevention Plan (SWPPP) that would limit erosion from the construction site would be required in accordance with the Clean Water Act. This would result in a less than significant impact (Class III).

Operational Impacts

There would be no impacts associated with this alternative on project structures due to seismically induced groundshaking and/or ground failure (Impact G-4), fault rupture (Impact G-5), or due to landslides, earthflows, debris flows, and/or rockfall during project operation (Impact G-7).

Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils Class II)

Soils along the San Vicente Road Transition Alternative route have a moderate potential to corrode uncoated steel and low to moderate potential to corrode concrete. Expansion potential for the soils is low to moderate. Corrosive and expansive subsurface soils may exist in places along the proposed route which could potentially damage project structures, a significant impact. Application of standard design and construction practices and implementation of GEO-APM-3 (see Table D.13-11) would partially reduce the adverse affects of problematic soils by avoiding placement of structures in areas of high shrink/swell potential, to the extent feasible. However, actual locations of high shrink/swell (expansive) soils and the presence, absence, and location of corrosive soils needs to be determined to fully reduce the potential for adverse affects of problematic soils to less than significant. Unidentified expansive and corrosive soils could damage project structures and facilities potentially resulting in collapse. Collapse

of project structures could result in power outages, damage to nearby roads or structures, and injury or death to nearby people, a significant impact. Accordingly, implementation of Mitigation Measure G-3a (Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design) would ensure that impacts associated with problematic soils are reduced to less than significant levels (Class II).

Mitigation Measure for Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils

G-3a Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design.

D.13.17.4 Chuck Wagon Road Alternative

This alternative would diverge from the proposed route in San Vicente Boulevard, turning south in Chuck Wagon Road approximately 0.2 miles east of the proposed transition point at MP 121.7. It would continue south for approximately 1.6 miles before passing under the existing Creelman–Los Coches 69 kV transmission line ROW. At this point, the route would transition to overhead and turn west for approximately 1.2 miles to rejoin the proposed route at MP 125.6.

Environmental Setting

Geology. The underground portion of the Chuck Wagon Road Alternative route is in flat to gently sloping roadway along the northern side of San Vicente Creek and the overhead portion crosses moderate to gently sloping hills and tributary creeks also along the northern side of San Vicente Creek. This alternative is underlain for its entire length by Woodson Mountain Granodiorite (gr^o). Descriptions of this unit are listed in Table D.13 1.

Slope Stability. The Chuck Wagon Road Alternative route traverses across moderate to gently sloping hillside terrain. This alignment does not cross any mapped landslides and slopes in the area underlain by the granitic bedrock units are not typically prone to landslides.

Soils. One soil association is mapped underlying the entire length of the Chuck Wagon Road Alternative route, s1010. Basic characteristics of this soil association is presented in Table D.13-2. The Sesame–Rock Outcrop–Cienba association (s1010) is formed in material weathered from the underlying granitic rocks. Hazard of erosion for these soils for both off-road/off-trail and for on-road/on-trail ranges from not rated to very severe. Shrink/swell (expansive) potential of this soil association varies from low to moderate. Corrosive potential of soils along the Chuck Wagon Road Alternative route is moderate for both uncoated steel and low to moderate for concrete.

Mineral Resources. No known active mines or BLM mining claims are identified along this segment. Additionally, no known mineral resource sites were identified by the MRDA database or by the CGS (CDMG, 1999). Therefore, construction and operation of the Sunrise Powerlink transmission line along the Chuck Wagon Road Alternative alignment is not expected to interfere with future access to any mineral resources.

Seismicity. This alternative does not cross any known active faults and is thus not likely to experience damage due to fault rupture and/or offset. No active faults are located in the immediate vicinity of this alternative. Only minor groundshaking is expected to occur along this alignment in the event of an earthquake on nearby faults, with estimated PGAs of 0.1g to 0.2g for entire length of this alignment

(SCEDC, 2006), thus damage to project structures is not likely due to groundshaking. There is no potential for liquefaction along the Chuck Wagon Road Alternative alignment as it is entirely underlain by granitic bedrock. This terrain along this alignment is gently to moderately sloping hillsides underlain by granitic terrain (gr₆) not typically prone to landslides, and thus would not likely experience seismically triggered landsliding or slope failures.

Environmental Impacts and Mitigation Measures

Construction Impacts

No soils with desert pavement are mapped along this alternative and thus Impact G-2 (Unique geologic features would be damaged due to construction activities) is not expected to occur along this alternative. No construction impacts related to construction-triggered slope failures (Impact G-6) would occur associated with this alternative due to the gently sloping terrain crossed by and adjacent to the alternative alignment. No known active mineral resource sites or BLM claims are located along this alignment; therefore, there are no impacts related to Impact G-9 (Construction activities would interfere with access to known mineral resources).

Impact G-1: Erosion would be triggered or accelerated due to construction activities (Class III)

Excavation and grading for trenches, tower foundations, work areas, access roads, and spur roads would loosen soil and trigger or accelerate erosion. Soils along the Chuck Wagon Road Alternative alignment have an erosion hazard for off-road/off-trail and for on-road/on-trail ranging from not rated to very severe. SDG&E's APMs GEO-APM-1, -2, -5, and -6 (see Table D.13-11) reduce the amount of erosion that would result from construction by limiting construction traffic and grading of existing roads in areas with sensitive soils, planning construction to minimize new ground disturbance, and by using Best Management Practices (BMPs) such as sand bags and road bars, to control water erosion. In addition, a Stormwater Pollution Prevention Plan (SWPPP) that would limit erosion from the construction site would be required in accordance with the Clean Water Act. This would result in a less than significant impact (Class III).

Operational Impacts

There would be no impacts associated with this alternative on project structures due to seismically induced groundshaking and/or ground failure (Impact G-4), fault rupture (Impact G-5), or due to landslides, earthflows, debris flows, and/or rockfall during project operation (Impact G-7).

Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils (Class II)

Soils along the Chuck Wagon Road Alternative route have a moderate potential to corrode uncoated steel and low to moderate potential to corrode concrete. Expansion potential for the soils is low to moderate. Corrosive and expansive subsurface soils may exist in places along the proposed route which could potentially damage project structures, a significant impact. Application of standard design and construction practices and implementation of GEO-APM-3 (see Table D.13-11) would partially reduce the adverse affects of problematic soils by avoiding placement of structures in areas of high shrink/swell potential, to the extent feasible. However, actual locations of high shrink/swell (expansive) soils and the presence, absence, and location of corrosive soils needs to be determined to fully reduce the potential for adverse affects of problematic soils to less than significant. Unidentified expansive and corrosive soils could damage project structures and facilities potentially resulting in collapse. Collapse of project structures

could result in power outages, damage to nearby roads or structures, and injury or death to nearby people, a significant impact. Accordingly, implementation of Mitigation Measure G-3a (Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design) would ensure that impacts associated with problematic soils are reduced to less than significant levels (Class II).

Mitigation Measure for Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils

G-3a Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design.

D.13.18 Coastal Link Alternatives Impacts and Mitigation Measures

Four alternatives are considered within the Coastal Link: the Pomerado Road to Miramar Area North Alternative, the Los Peñasquitos Canyon Preserve and Mercy Road Alternative, the Black Mountain to Park Village Road Underground Alternative, and the Coastal Link System Upgrade Alternative.

D.13.18.1 Pomerado Road to Miramar Area North Alternative

This alternative would be underground with the exception of the east and west ends where the line is overhead within existing SDG&E transmission ROWs. This alternative would exit the Sycamore Substation at MCAS Miramar overhead westerly within an existing ROW toward Pomerado Road. The line would transition to underground beneath Pomerado Road in the vicinity of Legacy Road, then continuing underground in Miramar Road, Kearny Villa Road, Black Mountain Road, Activity Road, Camino Ruiz, Miralani Drive, Arjons Drive, Trade Place, Camino Santa Fe, Carroll Road/Carroll Canyon Road and Scranton Road. At the western end, the line would transition to overhead and would be located within the existing 230 kV ROW heading northward into the Peñasquitos Substation.

Environmental Setting

Geology. The Pomerado Road to Miramar Area North Alternative route consists of both overhead and underground transmission line and generally traverses a mix of sloping hillsides, mesa and terraces, and valleys along its entire length. The underground portion of the alignment is within developed and graded roadways along the mesas and terraces along and near Carroll Canyon. The overhead portion traverses northwesterly across mesas, terraces and hillslopes on the southern and northern side of Los Peñasquitos Canyon. Geologic units crossed by this alternative alignment are alluvium (Qal), Linda Vista Formation (Qm), Poway Group sedimentary rocks (Ec), and La Jolla Group sedimentary rocks (E). Descriptions of these units are listed in Table D.13-1. Approximate locations of these units along the overhead and underground portions of the Pomerado Road to Miramar Area North Alternative alignment are listed below.

Underground Segments (MPs PM-0 to PM-10.7):

- Linda Vista Formation (Qm): MPs PM-4.3 to PM-4.7, MPs PM-6.3 to PM-7.7, and MPs PM-8.3 to PM-8.6
- Poway Group sedimentary rocks (Ec): MPs PM-0 to PM-4.3, MPs PM-4.7 to PM-6.3, MPs PM-7.7 to PM-8.3, and MPs PM-8.6 to PM-8.8
- La Jolla Group sedimentary rocks (E): MPs PM-8.8 to PM-10.7

Overhead Portions (MPs PM-10.7 to PM-12.8):

- Alluvium (Qal): MPs PM-11.8 to PM-12.0
- Qm: MPs PM-11.1 to PM-11.6 and MPs PM-12.4 to PM-12.8
- La Jolla Group sedimentary rocks (E): MPs PM-10.7 to PM-11.1, MPs PM-11.6 to PM-11.8, and MPs PM-12.0 to PM-12.4

Slope Stability. The Pomerado Road to Miramar Area North Alternative route traverses near and across level to gently sloping mesas and terraces and moderately sloping hillside terrain. This alignment does not cross any mapped landslides; however, most of this alternative is underlain by the landslide prone Poway Group and La Jolla Group sedimentary rocks. Underground portions of the alignment near and along the edges of natural slopes and overhead portions of the alignment crossing hills and slopes may be susceptible to landslides and slope failures (CDMG, 1975).

Soils. Three soil associations are mapped along the Pomerado Road to Miramar Area North Alternative route (s997, s998, and s1019). A summary of the basic characteristics of these soils is presented in Table D.13-2. Soils of the Redding-Olivenhain (s997), Urban Land-Redding-Olivenhain (s998), and Las Flores-Antioch (s1019) associations are formed in alluvial and marine terraces. The hazard of off-road/off-trail soil erosion and for on-road/on-trail ranges from slight to severe. Shrink/swell (expansive) potential of the soils associations along the Pomerado Road to Miramar Area North alignment varies from low to high. Corrosive potential of soils along this alternative ranges from moderate to high for uncoated steel and from low to high for concrete.

Approximate locations of these soil associations along the Pomerado Road to Miramar Area North route are listed below.

Underground Portion:

- s997: MPs PM-3.1 to PM-9.9
- s998: MPs PM-0 to PM-3.1
- s1019: MPs PM-9.9 to PM-10.7

Overhead Portion:

- s998: MPs PM-12.2 to PM-12.8
- s1019: MPs PM-10.7 to PM-12.2

Mineral Resources. No known active BLM mining claims are identified along the Pomerado Road to Miramar Area North alignment. One mineral resource site was identified by the CGS and MRDA database within 1000 feet of this alternative, the Carroll Canyon sand and gravel pit operated by Vulcan Materials. This is an active sand and gravel quarry; however, this site is located within Carroll Canyon, approximately 700 to 1000 feet north of this alternative alignment. The Pomerado Road to Miramar Area North Alternative alignment would not interfere with access to this location because the route would be constructed in existing city streets and would not infringe on the boundaries of the sand and gravel operation. The Pomerado Road to Miramar Area North Alternative would not preclude access to any mineral resources found in the vicinity and therefore construction and operation of the Sunrise Powerlink transmission line along this alignment is not expected to interfere with future access to any mineral resources.

Seismicity. This alternative does not cross any known active faults and is thus not likely to experience damage due to fault rupture and/or offset. No active faults are located in the immediate vicinity of this

alternative. However, structures for this alternative alignment could experience minor to moderate groundshaking from an earthquake on nearby significant active faults (i.e., the Elsinore or Rose Canyon faults). Distribution of peak horizontal accelerations along this alignment is presented in Table D.13-23.

Most of this alternative has no to low potential for liquefaction as it is primarily underlain by older consolidated sedimentary bedrock units. The alluvial deposits in Los Peñasquitos Canyon may have moderate potential liquefaction in areas with local pockets of saturated loose sandy soils could potentially liquefy during a large earthquake.

Earthquake-Induced Landslides. Most accounts of historical earthquakes in the San Diego area describe damaging landslides resulting from earthquake groundshaking (SCEDC, 2006). Most of the Pomerado Road to Miramar Area North Alternative alignment does not cross areas with significant slopes. However, this alternative is almost entirely underlain by the landslide prone Poway Group and La Jolla Group units and portions are along or near slopes that may be damaged by seismically induced landslides in the event of a large earthquake on nearby regional faults.

Table D.13-22. Approximate Peak Ground Accelerations – Pomerado Road to Miramar Area North

Approximate Alternative (PM) Milepost	Total Length of Segments (miles)	Peak Ground Acceleration
0-3.4, 9.1-11.8, and 12.0-12.8	6.9	0.2–0.3g
3.4-9.1 and 11.8-12.0	5.9	0.3–0.4g

Source: CGS, 2006; USGS, 2006b.

Environmental Impacts and Mitigation Measures

Construction Impacts

No soils with desert pavement are mapped along this alternative and thus Impact G-2 (Unique geologic features would be damaged due to construction activities) is not expected to occur along this alternative.

Impact G-1: Erosion would be triggered or accelerated due to construction activities (Class III)

Excavation and grading for tower foundations, trenches, work areas, access roads, and spur roads would loosen soil and trigger or accelerate erosion. Soils along Pomerado Road to Miramar Area North route have an erosion hazard for both off-road/off-trail and for on-road/on-trail ranging from slight to severe. SDG&E’s APMs GEO-APM-1, -2, -5, and -6 (see Table D.13-11) reduce the amount of erosion that would result from construction by limiting construction traffic and grading of existing roads in areas with sensitive soils, planning construction to minimize new ground disturbance, and by using Best Management Practices (BMPs) such as sand bags and road bars, to control water erosion. In addition, a Stormwater Pollution Prevention Plan (SWPPP) that would limit erosion from the construction site would be required in accordance with the Clean Water Act. This would result in a less than significant impact (Class III).

Impact G-6: Project would expose people or structures to potential substantial adverse effects as a result of slope instability created during excavation and/or grading (Class II)

Construction consisting of grading and excavation along and adjacent to slopes underlain by the landslide-prone Poway and La Jolla Group units could cause slope instability. Excavation operations associated with tower foundation construction, trenching for the underground section, and grading operations for temporary and permanent access roads and work areas could result in slope instability, that could undermine foundations, cause distortion and distress to overlying structures, and displace or destroy project compo-

nents. SDG&E's APMs GEO-APM-4 and -8 (see Table D.13-11) would partially reduce impacts related to slope instability by avoiding placing structures in unstable areas and removing or stabilizing boulders upslope of structures thus reducing the threat of possible slope failures or rockfalls. However, construction of the Pomerado Road to Miramar Area North route would still result in significant impacts if unidentified unstable slopes or areas of potentially unstable slopes were disturbed or undercut by construction activities resulting in slope failures. Slope failures could cause damage to the environment, to project or other nearby structures, and could cause injury or death to workers and/or the public, a significant impact. To ensure that slope instability impacts would be reduced to less than significant (Class II), implementation of Mitigation Measure G-6a (Conduct geotechnical surveys for landslides and protect against slope instability) is required in areas where the ROW traverses along and adjacent to slopes underlain by the landslide-prone Poway and La Jolla Group units to delineate areas of unstable slopes near and within work areas and to minimize the potential from construction-triggered slope failures by avoidance or implementation of slope stabilizing design measures. The full text of the mitigation measures can be found in Appendix 12.

Mitigation Measure for Impact G-6: Project would expose people or structures to potential substantial adverse effects as a result of slope instability created during excavation and/or grading

G-6a Conduct geotechnical surveys for landslides and protect against slope instability.

Operational Impacts

There would be no impacts associated with this alternative on the project due fault rupture (Impact G-5) as the alignment does not cross any active faults.

Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils (Class II)

Soils along the Pomerado Road to Miramar Area North route have a moderate to high potential to corrode uncoated steel and low to high potential to corrode concrete. Expansion potential for the soils ranges from low to high. Corrosive and expansive subsurface soils may exist in places along this alternative route which could damage project structures, a significant impact. Application of standard design and construction practices and implementation of GEO-APM-3 (see Table D.13-11) would partially reduce the adverse affects of problematic soils by avoiding placement of structures in areas of high shrink/swell potential, to the extent feasible. However, actual locations of high shrink/swell (expansive) soils and the presence, absence, and location of corrosive soils needs to be determined to fully reduce the potential for adverse affects of problematic soils to less than significant. Unidentified expansive and corrosive soils could damage project structures and facilities potentially resulting in collapse. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to nearby people, a significant impact. Accordingly, implementation of Mitigation Measure G-3a (Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design) would ensure that impacts associated with problematic soils are reduced to less than significant levels (Class II).

Mitigation Measure for Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils

G-3a Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design.

Impact G-4: Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure (Class II and III)

Minor to moderate groundshaking should be expected along the Pomerado Road to Miramar Area North alignment in the event of an earthquake on significant active local or regional faults, with estimated PGAs ranging from 0.2 to 0.4 g. Appropriate tower design accounting for lateral wind loads and conductor loads would likely exceed any creditable seismic loading minimizing potential damage to tower structures from groundshaking, and standard engineering practices would reduce potential for damage to underground structures and transmission line from minor groundshaking along this alternative. This would result in a less than significant impact from seismically induced groundshaking for this alternative (Class III).

Moderate groundshaking could potentially result in liquefaction-related ground failures along the Pomerado Road to Miramar Area North Alternative where the alignment crosses alluvial deposits in Los Peñasquitos Canyon. Loose sandy alluvial sediments saturated by perched groundwater along Los Peñasquitos Creek could liquefy in during a large earthquake. Slope failures such landslides and rockfalls could also be triggered by groundshaking from a large earthquake on nearby faults and could occur along the slopes underlain by the landslide-prone units of the Poway and La Jolla Groups. Seismically induced ground failures could result in damage to or collapse of project components, a significant impact. Collapse of project components could result in power outages, damage to nearby roads or structures, and injury or death to people, a significant impact. However, to ensure that impacts associated with seismically induced ground failures would be mitigated to less than significant levels (Class II), implementation of Mitigation Measures G-4b (Conduct geotechnical investigations for liquefaction) and G-6a (Conduct geotechnical surveys for landslides and protect against slope instability) are required and shall be implemented prior to final project design to ensure that people or structures are not exposed to hazards associated with seismic groundshaking.

Mitigation Measures for Impact G-4: Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure

G-4b Conduct geotechnical investigations for liquefaction.

G-6a Conduct geotechnical surveys for landslides and protect against slope instability.

Impact G-7: Project would expose people or structures to potential substantial adverse effects as a result of landslides, earthflows, debris flows, and/or rockfall (Class II)

Slope instability including landslides, earth flows, debris flows, and rockfall during project operation has the potential to undermine foundations, cause distortion and distress to overlying structures, and displace or destroy project components. The area where landslides could occur and cause damage to project structures is along and adjacent to slopes underlain by the landslide-prone Poway and La Jolla Group units. SDG&E's APMs GEO-APM-4 and -8 (see Table D.13-11) would partially reduce impacts related to slope instability by avoiding placing structures in unstable areas and removing or stabilizing boulders upslope of structures thus reducing the threat of possible slope failures or rockfalls. However, the Pomerado Road to Miramar Area North Alternative alignment would still result in significant impacts if unidentified unstable slopes or areas of potentially unstable slopes were to fail during the lifetime of the Proposed Project, causing damage or collapse to project components. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to nearby people, a significant impact. To ensure that slope instability impacts would be reduced to less than significant

(Class II), implementation of Mitigation Measure G-6a (Conduct geotechnical surveys for landslides and protect against slope instability) is required for areas underlain and adjacent to the landslide-prone Poway and La Jolla Group units.

Mitigation Measure for Impact G-7: Project would expose people or structures to potential substantial adverse effects as a result of landslides, earthflows, debris flows, and/or rockfall

G-6a Conduct geotechnical surveys for landslides and protect against slope instability.

D.13.18.2 Los Peñasquitos Canyon Preserve–Mercy Road Alternative

This alternative route would bypass the Chicarita Substation and connect to existing ROW along Scripps Poway Parkway in the vicinity of Ivy Hill Drive. The line would then transition to underground and follow Scripps Poway Parkway/Mercy Road, Mercy Road, Black Mountain Road, and finally Park Village Drive, where the alternative route would rejoin the proposed route.

Environmental Setting

Geology. The Los Peñasquitos Canyon Preserve–Mercy Road Alternative route consists of an underground transmission line that traverses a mix of sloping hillsides, mesa and terraces, along and within developed and graded roadways. Geologic units crossed by this alternative alignment are alluvium (Qal), Linda Vista Formation (Qm), Poway Group sedimentary rocks (Ec), La Jolla Group sedimentary rocks (E), Santiago Peak Volcanics (JTrv), and granitic rocks (gr). Descriptions of these units are listed in Table D.13-1.

Approximate locations of these units along the Los Peñasquitos Canyon Preserve–Mercy Road Alternative alignment are listed below.

- Alluvium (Qal): MPs LPCM-2.2 to LPCM-2.6
- Linda Vista Formation (Qm): MPs LPCM-3.45 to LPCM-3.6
- Poway Group sedimentary rocks (Ec): MPs LPCM-0 to LPCM-0.4 ands MPs LPCM-2.7 to LPCM-3.0
- La Jolla Group sedimentary rocks (E): MP LPCM-3.4 to LPCM-3.45
- Santiago Peak Volcanics (JTrv): MPs LPCM-0.9 to LPCM-2.2, MPs LPCM-2.6 to LPCM-2.7, and MPs LPCM-3.0 to LPCM-3.4
- Granitic rocks (gr): MPs LPCM-0.4 to LPCM-0.9

Slope Stability. The Los Peñasquitos Canyon Preserve–Mercy Road Alternative route traverses within graded roads across level to gently sloping mesas and terraces. This alignment does not cross any mapped landslides. However, portions of this alternative are underlain by the landslide-prone Poway Group sedimentary rocks and segments of the alignment adjacent to and along hills and slopes underlain by Poway Group units may be susceptible to landslides and slope failures if disturbed during construction (CDMG, 1975).

Soils. Two soil associations are mapped along the Los Peñasquitos Canyon Preserve–Mercy Road Alternative route (s998, and s1013). A summary of the basic characteristics of these soils is presented in Table D.13-2. This alternative is underlain by soils formed in alluvial and marine terraces [the Urban Land–Redding–Olivenhain association (s998)] and by soils formed in material weathered from metamorphic and metavolcanic rocks [the San Miquel–Friant–Exchequer association (s1013)]. The hazard of off-road/off-trail soil erosion ranges from slight to very severe and for on-road/on-trail ranges from slight

to severe. Shrink/swell (expansive) potential of the soils associations along this link varies from low to high. Corrosive potential of soils along this alternative ranges from moderate to high for uncoated steel and from low to high for concrete.

Approximate locations of these soil associations along the Los Peñasquitos Canyon Preserve–Mercy Road Alternative route are listed below.

- s998: MPs LPCM-0.1 to LPCM-2.1
- s1013: MPs LPCM-0 LPCM-0.1 ands MPs LPCM-2.1 to LPCM-3.6

Mineral Resources. No known active BLM mining claims and no MRDS sites are identified along the Los Peñasquitos Canyon Preserve–Mercy Road Alternative. Therefore, construction and operation of the Sunrise Powerlink transmission line along this alignment is not expected to interfere with future access to any mineral resources.

Seismicity. This alternative does not cross any known active faults and is thus not likely to experience damage due to fault rupture and/or offset. No active faults are located in the immediate vicinity of this alternative. However, structures for this alternative alignment could experience minor to moderate groundshaking from an earthquake on nearby significant active faults (i.e., the Elsinore or Rose Canyon faults). Estimated peak horizontal accelerations that may occur along this alignment are presented in Table D.13-23.

Table D.13-23. Approximate Peak Ground Accelerations – Los Peñasquitos Canyon Preserve–Mercy Road Alternative

Approximate Alternative (LPCM) Milepost	Total Length of Segments (miles)	Peak Ground Acceleration
0-2.0 and 2.6-3.4	2.8	01.-0.2g
2.0-2.2 and 3.4-3.6	0.4	0.2–0.3g
2.2-2.6	0.4	0.3–0.4g

Source: CGS, 2006; USGS, 2006b.

Most of this alternative has no to low potential for liquefaction as it is primarily underlain by older consolidated sedimentary and igneous (volcanic and granitic) bedrock units. The alluvial deposits where the alignment crosses Los Peñasquitos Creek may have moderate potential liquefaction in areas with local pockets of saturated loose sandy soils and could potentially liquefy during a large earthquake.

Earthquake-Induced Landslides. Most accounts of historical earthquakes in the San Diego area describe damaging landslides resulting from earthquake groundshaking (SCEDC, 2006). Most of the Los Peñasquitos Canyon Preserve–Mercy Road Alternative alignment traverses gently sloping graded roads and does not cross areas with significant slopes. However, portions of this alternative is underlain by units of the landslide-prone Poway and La Jolla Groups and sections of the alignment that are along or near the edge of slopes could be damaged by seismically induced landslides in the event of a large earthquake on nearby faults.

Environmental Impacts and Mitigation Measures

Construction Impacts

No soils with desert pavement are mapped along this alternative and thus Impact G-2 (Unique geologic features would be damaged due to construction activities) is not expected to occur along this alternative. No known active mineral resource sites or BLM claims are located along this alignment; therefore, there are no impacts related to Impact G-9 (Construction activities would interfere with access to known mineral resources).

Impact G-1: Erosion would be triggered or accelerated due to construction activities (Class III)

Excavation and grading for transition tower foundations, trenches, work areas, and access roads would loosen soil and trigger or accelerate erosion. Soils along Los Peñasquitos Canyon Preserve–Mercy Road Alternative route have an erosion hazard for off-road/off-trail ranging from slight to very severe and for on-road/on-trail ranging from slight to severe. SDG&E’s APMs GEO-APM-1, -2, -5, and -6 (see Table D.13-11) reduce the amount of erosion that would result from construction by limiting construction traffic and grading of existing roads in areas with sensitive soils, planning construction to minimize new ground disturbance, and by using Best Management Practices (BMPs) such as sand bags and road bars, to control water erosion. In addition, a Stormwater Pollution Prevention Plan (SWPPP) that would limit erosion from the construction site would be required in accordance with the Clean Water Act. This would result in a less than significant impact (Class III).

Impact G-6: Project would expose people or structures to potential substantial adverse effects as a result of slope instability created during excavation and/or grading (Class II)

Construction consisting of grading and excavation along and adjacent to slopes underlain by the landslide prone Poway and La Jolla Group units could cause slope instability. Excavation operations associated with transition tower foundation construction, trenching for the underground transmission line, and grading operations for temporary and permanent access roads and work areas could result in slope instability, that could undermine foundations, cause distortion and distress to overlying structures, and displace or destroy project components. SDG&E’s APMs GEO-APM-4 and -8 (see Table D.13-11) would partially reduce impacts related to slope instability by avoiding placing structures in unstable areas and removing or stabilizing boulders upslope of structures thus reducing the threat of possible slope failures or rockfalls. However, the Proposed Project would still result in significant impacts if unidentified unstable slopes or areas of potentially unstable slopes were disturbed or undercut by construction activities resulting in slope failures. Slope failures could cause damage to the environment, to project or other nearby structures, and could cause injury or death to workers and/or the public, a significant impact. To ensure that slope instability impacts would be reduced to less than significant (Class II), implementation of Mitigation Measure G-6a (Conduct geotechnical surveys for landslides and protect against slope instability) is required in areas where the ROW traverses along and adjacent to slopes underlain by the landslide prone Poway and La Jolla Group units to delineate areas of unstable slopes near and within work areas and to minimize the potential from construction-triggered slope failures by avoidance or implementation of slope stabilizing design measures.

Mitigation Measure for Impact G-6: Project would expose people or structures to potential substantial adverse effects as a result of surface fault rupture at crossings of active faults

G-6a Conduct geotechnical surveys for landslides and protect against slope instability.

Operational Impacts

There would be no impacts associated with this alternative on the project due to fault rupture (Impact G-4) because no active faults cross the alignment nor from landslides, earthflows, debris flows, and/or rockfall during project operation (Impact G-6) due to the gently sloping terrain crossed by the alternative alignment.

Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils (Class II)

Soils along the Los Peñasquitos Canyon Preserve–Mercy Road Alternative route have a moderate to high potential to corrode uncoated steel and low to high potential to corrode concrete. Expansion potential for the soils ranges from low to high. Corrosive and expansive subsurface soils may exist in places along this alternative route which could potentially damage project structures, a significant impact. Application of standard design and construction practices and implementation of GEO-APM-3 (see Table D.13-11) would partially reduce the adverse effects of problematic soils by avoiding placement of structures in areas of high shrink/swell potential, to the extent feasible. However, actual locations of high shrink/swell (expansive) soils and the presence, absence, and location of corrosive soils needs to be determined to fully reduce the potential for adverse effects of problematic soils to less than significant. Unidentified expansive and corrosive soils could damage project structures and facilities potentially resulting in collapse. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to nearby people, a significant impact. Accordingly, implementation of Mitigation Measure G-3a (Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design) would ensure that impacts associated with problematic soils are reduced to less than significant levels (Class II).

Mitigation Measure for Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils

G-3a Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design.

Impact G-4: Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure (Class II and III)

Minor to moderate groundshaking should be expected in the event of an earthquake on significant active local or regional faults, with estimated PGAs ranging from 0.1 to 0.4 g. However, appropriate tower design accounting for lateral wind loads and conductor loads would likely exceed any creditable seismic loading minimizing potential damage to transition tower structures and standard engineering practices would reduce potential for damage to the underground structures and transmission line from minor to moderate groundshaking along this alternative. This would result in a less than significant impact from seismically induced groundshaking for the alternative (Class III).

Moderate groundshaking could potentially result in liquefaction-related ground failures along the Los Peñasquitos Canyon Preserve–Mercy Road Alternative where the alignment crosses alluvial deposits in Los Peñasquitos Canyon. Loose sandy alluvial sediments saturated by perched groundwater along Los Peñasquitos Creek could liquefy in during a large earthquake. Slope failures could be triggered by seismic shaking in areas of the alignment along or near slopes underlain by the landslide prone Poway and La Jolla Group units. This could result in damage to or collapse of project structures, a significant impact. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury people, a significant impact. However, to ensure that impacts associated with strong groundshaking and seismically induced ground failures would be mitigated to less than significant levels (Class II), implementation of Mitigation Measure G-4b (Conduct geotechnical investigations for liquefaction) and Mitigation Measure G-6a (Conduct geotechnical surveys for landslides and protect against slope instability) is required and shall be implemented prior to final project design to ensure that people or structures are not exposed to hazards associated with seismic groundshaking

Mitigation Measure for Impact G-4: Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure

G-4b Conduct geotechnical investigations for liquefaction.

G-6a Conduct geotechnical surveys for landslides and protect against slope instability.

Impact G-7: Project would expose people or structures to potential substantial adverse effects as a result of landslides, earthflows, debris flows, and/or rockfall (Class II)

Slope instability including landslides, earth flows, and debris flows during project operation has the potential to undermine foundations, cause distortion and distress to overlying structures, and displace or destroy project components. The areas where landslides could occur along the Los Peñasquitos Canyon Preserve–Mercy Road Alternative route are along and adjacent to slopes underlain by the landslide prone Poway Group units. SDG&E’s APMs GEO-APM-4 and -8 (see Table D.13-11) would partially reduce impacts related to landslide hazards during operations of the project. However, unidentified unstable slopes or areas of potentially unstable slopes could fail during the lifetime of the Proposed Project. Slope failures could cause collapse of project structures resulting in power outages, damage to nearby roads or structures, and injury or death to nearby people, a significant impact. To ensure that landslide impacts to project structures would be reduced to less than significant levels (Class II), implementation of Mitigation Measure G-6a (Conduct geotechnical surveys for landslides and protect against slope instability) is required in these areas.

Mitigation Measure for Impact G-7: Project would expose people or structures to potential substantial adverse effects as a result of landslides, earthflows, debris flows, and/or rockfall

G-6a Conduct geotechnical surveys for landslides and protect against slope instability.

D.13.18.3 Black Mountain to Park Village Road Underground Alternative

This alternative would deviate from the Proposed Project alignment where the route approaches Black Mountain Road. Under this alternative, the line would remain underground but would be located underneath Black Mountain Road and would turn west onto Park Village Drive, following the project alignment into the Peñasquitos Substation via the Los Peñasquitos Canyon Preserve.

Environmental Setting

Geology. The Black Mountain to Park Village Road Underground (BMPV) Alternative route consists of an underground transmission line that traverses a gently sloping mesa, along and within developed and graded roadways. Geologic units crossed by this alternative alignment are Linda Vista Formation (Qm), La Jolla Group sedimentary rocks (E), and Santiago Peak Volcanics (JTrv). Descriptions of these units are listed in Table D.13-1.

Approximate locations of these units along the Los Peñasquitos Canyon Preserve–Mercy Road Alternative alignment are listed below.

- Linda Vista Formation (Qm): MPs BMPV-0.9 to BMPV-1.1
- La Jolla Group sedimentary rocks (E): MPs BMPV-0.8 to BMPV-0.9
- Santiago Peak Volcanics (JTrv): MPs BMPV-0 to BMPV-0.8

Slope Stability. The Black Mountain to Park Village Road Underground Alternative route traverses graded roads across a level to gently sloping mesa and the alignment does not cross any mapped landslides (CDMG, 1975).

Soils. The Black Mountain to Park Village Road Underground Alternative route is underlain by one soil association, s998 – Urban Land–Redding-Olivenhain, along its entire route. A summary of the basic characteristics of this soil association is presented in Table D.13-2. The Urban Land–Redding-Olivenhain association (s998) is primarily formed in alluvial and marine terrace deposits. The hazard of off-road/off-trail soil erosion and for on-road/on-trail ranges from slight to severe. Shrink/swell (expansive) potential of the soil association along this route varies from low to high. Corrosive potential of soils along the Black Mountain to Park Village Road Underground Alternative ranges from moderate to high for uncoated steel and from low to high for concrete.

Mineral Resources. No known active BLM mining claims and no MRDS sites are identified along the Black Mountain to Park Village Road Underground Alternative. Therefore, construction and operation of the Sunrise Powerlink transmission line along this alignment is not expected to interfere with future access to any mineral resources.

Seismicity. This alternative does not cross any known active faults and is thus not likely to experience damage due to fault rupture and/or offset. No active faults are located in the immediate vicinity of this alternative. Only minor groundshaking would be expected along this alignment from an earthquake on nearby or regional faults which is not likely to cause damage to the underground structures. Estimated peak horizontal accelerations that may occur along this alignment are presented in Table D.13-24.

This alternative has no to low potential for liquefaction as it is primarily underlain by older consolidated sedimentary and volcanic bedrock units.

Earthquake-Induced Landslides. Most accounts of historical earthquakes in the San Diego area describe damaging landslides resulting from earthquake groundshaking (SCEDC, 2006). However, the Black Mountain to Park Village Road Underground Alternative alignment traverses gently sloping graded roads and does not cross areas with significant slopes.

Environmental Impacts and Mitigation Measures

Construction Impacts

No desert pavement is mapped along this alternative and thus Impact G-2 (Unique geologic features would be damaged due to construction activities) is not expected to occur along this alternative. No known active mineral resource sites or BLM claims are located along this alignment; therefore, there are no impacts related to Impact G-9 (Construction activities would interfere with access to known mineral resources). No construction impacts related to construction-triggered slope failures (Impact G-6) would occur associated with this alternative because the alignment traverses gently sloping graded roads.

Table D.13-24. Approximate Peak Ground Accelerations – Black Mountain to Park Village Road Underground Alternative

Approximate Alternative (BMPV) Milepost	Total Length of Segments (miles)	Peak Ground Acceleration
0-0.8	0.8	0.1-0.2g
0.8-1.1	0.3	0.2-0.3g

Source: CGS, 2006; USGS, 2006b.

Impact G-1: Erosion would be triggered or accelerated due to construction activities (Class III)

Excavation and grading for trenches and work areas would loosen soil and trigger or accelerate erosion. Soils along Black Mountain to Park Village Road Underground Alternative route have an erosion hazard for both off-road/off-trail and for on-road/on-trail ranging from slight to severe. I SDG&E's APMs GEO-APM-1, -2, -5, and -6 (see Table D.13-11) reduce the amount of erosion that would result from construction by limiting construction traffic and grading of existing roads in areas with sensitive soils, planning construction to minimize new ground disturbance, and by using Best Management Practices (BMPs) such as sand bags and road bars, to control water erosion. In addition, a Stormwater Pollution Prevention Plan (SWPPP) that would limit erosion from the construction site would be required in accordance with the Clean Water Act. This would result in a less than significant impact (Class III).

Operational Impacts

There would be no impacts associated with this alternative on the project due to seismically induced groundshaking and/or slope failures (Impact G-4), fault rupture (Impact G-5), or from landslides, earthflows, debris flows, and/or rockfall during project operation (Impact G-7) due to lack of proximity to active faults and because it traverses gently sloping graded roads.

Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils (Class II)

Soils along the Black Mountain to Park Village Road Underground Alternative route have a moderate to high potential to corrode uncoated steel and low to high potential to corrode concrete. Expansion potential for the soils ranges from low to high. Corrosive and expansive subsurface soils may exist in places along this alternative route which could potentially damage project structures, a significant impact. Application of standard design and construction practices and implementation of GEO-APM-3 (see Table D.13-11) would partially reduce the adverse affects of problematic soils by avoiding placement of structures in areas of high shrink/swell potential, to the extent feasible. However, actual locations of high shrink/swell (expansive) soils and the presence, absence, and location of corrosive soils needs to be determined to fully reduce the potential for adverse affects of problematic soils to less than significant. Unidentified expansive and corrosive soils could damage project structures and facilities potentially resulting in collapse. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to nearby people, a significant impact. Accordingly, implementation of Mitigation Measure G-3a (Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design) would ensure that impacts associated with problematic soils are reduced to less than significant levels (Class II).

Mitigation Measure for Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils

G-3a Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design.

D.13.18.4 Coastal Link System Upgrade Alternative

The Coastal Link System Upgrade Alternative would be a system modification to install a third 230/69 kV transformer at the existing Sycamore Canyon Substation. Expansion of the Sycamore Canyon Substation would occur within the existing substation easement. Additionally, SDG&E would either (a)

install a new 230/138 kV transformer at the existing Encina Substation or (b) upgrade (reconductor) the existing Sycamore Canyon-Chicarita 138 kV circuit using 34 existing wood frame structures.

Environmental Setting

The setting for the Coastal Link System Upgrade Alternative would be the same as that of the Coastal Link of the Proposed Project, as described in Section D.13.2.4.

Environmental Impacts and Mitigation Measures

The Coastal Link System Upgrade Alternative would eliminate the impacts associated with the Proposed Project segment between Sycamore Canyon and Peñasquitos Substations. Impacts would be less than significant, occurring within existing corridors and within fence lines of SDG&E facilities.

Impact G-1: Erosion would be triggered or accelerated due to construction activities (Class III)

The soils along the reconductoring segment has a ranked potential hazard of erosion for off-road/off-trail of moderate and for on-road/on-trail of severe. The reconductoring could require access road improvements and replacement of existing poles. Excavation and grading for these project components could loosen soil and trigger or accelerate erosion. Implementation of SDG&E's APMs GEO-APM-1, -2, -5, and -6 (see Table D.13-11) reduce the amount of erosion that would result from construction by limiting construction traffic and grading of existing roads in areas with sensitive soils, planning construction to minimize new ground disturbance, and by using Best Management Practices (BMPs) such as sand bags and road bars, to control water erosion. In addition, a Stormwater Pollution Prevention Plan (SWPPP) that would limit erosion from the construction site would be required in accordance with the Clean Water Act. This would result in an adverse but less than significant impact (Class III).

D.13.19 Top of the World Substation Alternative Impacts and Mitigation Measures

The substation site would be located approximately one mile west of the proposed Central East Substation on Vista Irrigation District land. The transmission line routes into the substation would follow the Proposed Project route to approximately MP 92.7, then the alternative 500 kV route would turn west for 1.1 miles to enter the alternative site. Exiting the substation the line would travel southwest for 400 feet and then west and north-northwest to rejoin the Proposed Project around MP 95.

Environmental Setting

Geology. The Top of the World Substation Alternative is located on a gently sloping plateau near the northern end of the Vulcan Mountains and is underlain by tonalite and diorite (gr⁴). Descriptions of this unit are listed in Table D.13 1.

Slope Stability. The Top of the World Substation Alternative is located on a gently sloping plateau, is not located on or adjacent to any mapped landslides, and is underlain by granitic bedrock units which are not typically prone to landslides.

Soils. The Top of the World Substation Alternative is underlain by the Tollhouse-Rock Outcrop-La Posta (s1014) soil association which is formed in material weathered from the underlying granitic rocks.

Basic characteristics of this soil association are presented in Table D.13-2. Hazard of erosion for these soils for off-road/off-trail is moderate and severe for on-road/on-trail. Shrink/swell (expansive) potential of this soil association varies from low to moderate. Corrosive potential of soils at the Top of the World Substation Alternative site are moderate for both uncoated steel and concrete.

Mineral Resources. No known active BLM mining claims are identified at or near this site. Additionally, no known mineral resource sites were identified by the MRDA database or by the CGS (CDMG, 1999). Therefore, construction and operation of the Top of the World Substation Alternative is not expected to interfere with future access to any mineral resources.

Seismicity. The Top of the World Substation Alternative is not crossed by any known active faults and is thus not likely to experience damage due to fault rupture and/or offset. No active faults are located in the immediate vicinity of this alternative. The site is expected to experience minor to moderate ground-shaking, estimated PGAs of 0.3g to 0.4g, due to earthquakes on nearby faults (SCEDC, 2006). There is no potential for liquefaction at the site as it is entirely underlain by granitic bedrock. The gently sloping to level terrain at this site would not likely experience seismically triggered landsliding or slope failures.

Environmental Impacts and Mitigation Measures

Construction Impacts

No desert pavement is mapped at this site and thus Impact G-2 (Unique geologic features would be damaged due to construction activities) is not expected to occur along this alternative. No known active mineral resource sites or BLM claims are located at or adjacent to the alternative substation site; therefore, there are no impacts related to Impact G-9 (Construction activities would interfere with access to known mineral resources). No construction impacts related to construction-triggered slope failures (Impact G-6) would occur associated with this substation alternative due the gently sloping granitic terrain traversed by the route.

Impact G-1: Erosion would be triggered or accelerated due to construction activities (Class III)

Excavation and grading for foundations, trenches, work areas, access roads for construction of the Top of the World Substation Alternative would loosen soil and trigger or accelerate erosion. Soils along at the site have an moderate erosion hazard for off-road/off-trail and a severe erosion hazard for on-road/on-trail. SDG&E's APMs GEO-APM-1, -2, -5, and -6 (see Table D.13-11) reduce the amount of erosion that would result from construction by limiting construction traffic and grading of existing roads in areas with sensitive soils, planning construction to minimize new ground disturbance, and by using Best Management Practices (BMPs) such as sand bags and road bars, to control water erosion. In addition, a Stormwater Pollution Prevention Plan (SWPPP) that would limit erosion from the construction site would be required in accordance with the Clean Water Act, which would further limit potential soil erosion at the site during construction. This would result in a less than significant impact (Class III).

Operational Impacts

There would be no impacts associated with this alternative on project structures due to seismically induced ground failure (Impact G-4), fault rupture (Impact G-5), or due to landslides, earthflows, debris flows, and/or rockfall during project operation (Impact G-7) due to lack of proximity to active faults, the underlying granitic terrain, and the gently sloping terrain at the site.

Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils (Class II)

Soils at the Top of the World Substation Alternative site have a moderate potential to corrode uncoated steel and concrete. Expansion potential for the soils is low to moderate. Corrosive and expansive subsurface soils may exist in places at the substation site which could potentially damage project structures, a significant impact. Application of standard design and construction practices and implementation of GEO-APM-3 (see Table D.13-11) would partially reduce the adverse affects of problematic soils by avoiding placement of structures in areas of high shrink/swell potential, to the extent feasible. However, actual locations of high shrink/swell (expansive) soils and the presence, absence, and location of corrosive soils needs to be determined to fully reduce the potential for adverse affects of problematic soils to less than significant. Unidentified expansive and corrosive soils could damage project structures and facilities potentially resulting in collapse. Collapse of project structures could result in power outages, damage to nearby roads or structures, and injury or death to nearby people, a significant impact. Accordingly, implementation of Mitigation Measure G-3a (Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design) would ensure that impacts associated with problematic soils are reduced to less than significant levels (Class II).

Mitigation Measure for Impact G-3: Project would expose people or structures to potential substantial adverse effects as a result of problematic soils

G-3a Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design.

Impact G-4: Project would expose people or structures to potential substantial adverse effects as a result of seismically induced groundshaking and/or ground failure (Class III)

Minor to moderate groundshaking is expected at the Top of the World Substation Alternative in the event of an earthquake on the faults in the region, with estimated PGAs ranging from 0.3 to 0.4 g. SDG&E would follow all applicable building codes and standard practices for substation construction including the Institute of Electrical and Electronics Engineers (IEEE) 693 "Recommended Practices for Seismic Design of Substations" and the 2001 California Building Code. As a result, impacts from groundshaking would be less than significant (Class III).

D.13.20 Mitigation Monitoring, Compliance, and Reporting Table

Table D.13-26 presents the mitigation monitoring, compliance and reporting table for Geology, Mineral Resources, and Soils. Mitigation measures not originating in this section do not appear in the table; they appear only in the mitigation monitoring, compliance and reporting table for the section in which they were originally recommended. For a summary of all impacts and their respective mitigation measures, please see the Impact Summary Tables at the end of the Executive Summary.

Sections D.13.11 and D.13.12 recommend mitigation measures for the projects described under Future Transmission System Expansion and Connected Actions/Indirect Effects. Those mitigation measures are presented for consideration by the agencies that will issue permits for construction of the connected and future projects. Because those projects would not be constructed as a result of approval of the Sunrise Powerlink Project, the recommended mitigation measures are not included in this mitigation monitoring table.

Table D.13-25. Mitigation Monitoring Program – Geology, Mineral Resources, and Soils

MITIGATION MEASURE	G-2a: Protect desert pavement. Grading for new access roads or work areas in areas covered by desert pavement shall be avoided or minimized. If avoidance of these areas is not possible, the desert pavement surface shall be protected from damage or disturbance from construction vehicles by use of temporary mats on the surface. A plan for identification and avoidance or protection of sensitive desert pavement shall be prepared and submitted to the CPUC and BLM for review and approval at least 60 days prior to start of construction.
Location	All project locations where desert pavement occurs.
Monitoring / Reporting Action	Review plan and ensure that it is implemented in the field.
Effectiveness Criteria	Construction activities do not damage desert pavement.
Responsible Agency	CPUC, BLM, USFWS
Timing	Prior to and during construction.

Table D.13-25. Mitigation Monitoring Program – Geology, Mineral Resources, and Soils

MITIGATION MEASURE	G-3a: Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design. The design-level geotechnical studies to be performed by the Applicant shall identify the presence, if any, of potentially detrimental soil chemicals, such as chlorides and sulfates. Appropriate design measures for protection of reinforcement, concrete, and metal-structural components against corrosion shall be utilized, such as use of corrosion-resistant materials and coatings, increased thickness of project components exposed to potentially corrosive conditions, and use of passive and/or active cathodic protection systems. The geotechnical studies shall also identify areas with potentially expansive or collapsible soils and include appropriate design features, including excavation of potentially expansive or collapsible soils during construction and replacement with engineered backfill, ground-treatment processes, and redirection of surface water and drainage away from expansive foundation soils. Studies shall conform to industry standards of care and ASTM standards for field and laboratory testing. Study results and proposed solutions shall be provided to the CPUC and BLM for review and approval at least 60 days before final project design.
Location	All project locations where permanent project structures will be installed.
Monitoring / Reporting Action	Review study results. Ensure that study recommendations are implemented during construction.
Effectiveness Criteria	Project structures are not damaged by problematic soils.
Responsible Agency	CPUC, BLM
Timing	Prior to and during construction.
MITIGATION MEASURE	G-4a: Reduce effects of groundshaking. The design-level geotechnical investigations performed by the Applicant shall include site-specific seismic analyses to evaluate the peak ground accelerations for design of project components. Based on these findings, project structure designs shall be modified/strengthened, as deemed appropriate by the project engineer, if the anticipated seismic forces (high calculated peak vertical and horizontal ground accelerations due to severe groundshaking) are found to be greater than anticipated wind load stresses on project structures. Study results and proposed design modifications shall be provided to the CPUC and BLM for review and approval at least 60 days before final project design.
Location	All project locations where seismically induced groundshaking would potentially occur.
Monitoring / Reporting Action	Review study results. Ensure that study recommendations are implemented during construction.
Effectiveness Criteria	Project structures are not damaged by liquefaction or lateral spreading.
Responsible Agency	CPUC, BLM
Timing	Prior to and during construction.
MITIGATION MEASURE	G-4b: Conduct geotechnical investigations for liquefaction. Because seismically induced liquefaction-related ground failure has the potential to damage or destroy project components, the design-level geotechnical investigations to be performed by the Applicant shall include investigations designed to assess the potential for liquefaction to affect the approved project and all associated facilities, specifically at tower locations in areas with potential liquefaction-related impacts. Where these hazards are found to exist, appropriate engineering design and construction measures shall be incorporated into the project designs as deemed appropriate by the project engineer. Design measures that would mitigate liquefaction-related impacts could include construction of pile foundations, ground improvement of liquefiable zones, installation of flexible bus connections, and incorporation of slack in cables to allow ground deformations without damage to structures. Study results and proposed solutions to mitigate liquefaction shall be provided to the CPUC and BLM for review and approval at least 60 days before final project design.
Location	All project areas where liquefaction would potentially occur.
Monitoring / Reporting Action	Review study results. Ensure that study recommendations are implemented during construction.
Effectiveness Criteria	Project structures are not damaged by liquefaction or lateral spreading.

Table D.13-25. Mitigation Monitoring Program – Geology, Mineral Resources, and Soils

Responsible Agency	CPUC, BLM
Timing	Prior to and during construction.
MITIGATION MEASURE	G-5a: Minimize project structures within active fault zones. Prior to final project design SDG&E shall perform a geologic/geotechnical study to confirm the location of mapped traces of active and potentially active faults crossed by the project route. For crossings of active faults, the project design shall be planned so as not to locate towers or other project structures on the traces of active faults and in addition project components shall be placed as far as feasible outside the areas of mapped fault traces. Compliance with this measure shall be documented to the CPUC and BLM in a report submitted for review and approval at least 60 days prior to the start of construction.
Location	All Project locations that would cross active faults.
Monitoring / Reporting Action	Review report. Ensure that that the recommendations of the report are implemented during construction.
Effectiveness Criteria	Project structures are not damaged by surface fault rupture.
Responsible Agency	CPUC, BLM
Timing	Prior to and during construction.
MITIGATION MEASURE	G-5b: Minimize substation structures within active fault zones. SCE shall perform a geologic/geotechnical study to confirm the location of mapped traces of active and potentially active faults crossing the Central East Substation site. If active fault traces are identified by this study, the control building placement at the substation shall follow setback as required by California and San Diego County building codes. Other substation facilities and structures shall be placed so as not to straddle the active fault traces and shall be placed as far as feasible outside the area of mapped fault traces. Compliance with this measure shall be documented to the CPUC and BLM in a report submitted for review and approval at least 60 days prior to final project design.
Location	All Project locations that would cross active and potentially active faults.
Monitoring / Reporting Action	Review plan. Ensure that that the plan is implemented during construction.
Effectiveness Criteria	Project structures are not damaged by surface fault rupture.
Responsible Agency	CPUC, BLM
Timing	Prior to and during construction.
MITIGATION MEASURE	G-5c: Minimize Damage to Underground Transmission Lines. Site-specific geotechnical investigations will be performed at locations where underground portions of the SYAU transmission line route crosses and is within the Elsinore Fault Zone and may intersect fault traces. Where significant potential for fault surface rupture is identified, appropriate engineering measures, such as installing breakaway connections and strategically locating splice boxes outside of the fault zone, will be implemented to protect sensitive equipment and limit the extent of potential repairs. Additionally, underground crossing of the active fault traces shall be made as close to perpendicular to the fault as possible to make the segment cross the shortest distance within an active fault zone and cable vaults on either side of the fault shall be oversized, leaving as much slack as possible in the cables to absorb any offset. Operation and maintenance measures will be implemented to prepare for potential fault-rupture scenarios and facilitate timely repair of facilities. Preparation measures will include, but no be limited to, storage and maintenance of spare parts and equipment that may be needed to repair or temporarily bypass portions of the transmission line damaged as a result of fault surface rupture. Spare parts and equipment would be stored at the nearby Santa Ysabel Substation or other nearby facilities.
Location	In proximity to Elsinore and Earthquake Valley Faults.
Monitoring / Reporting Action	Review report. Ensure that that the recommendations of the report are implemented during construction.
Effectiveness Criteria	Project structures are not damaged by surface fault rupture.

Table D.13-25. Mitigation Monitoring Program – Geology, Mineral Resources, and Soils

Responsible Agency	CPUC, BLM
Timing	Prior to and during construction.
MITIGATION MEASURE	G-6a: Conduct geotechnical surveys for landslides and protect against slope instability. The design-level geotechnical surveys conducted by the Applicant shall perform slope stability analyses in areas in areas of planned grading and excavation that cross and are adjacent to hills and mountains. These surveys will acquire data that will allow identification of specific areas with the potential for unstable slopes, landslides, earth flows, and debris flows along the approved transmission line route and in other areas of ground disturbance, such as grading for access and spur roads. The investigations shall include an evaluation of subsurface conditions, identification of potential landslide hazards, and provide information for development of excavation plans and procedures. If the results of the geotechnical survey indicate the presence of unstable slopes at or adjacent to Proposed Project structures, appropriate support and protection measures shall be designed and implemented to maintain the stability of slopes adjacent to newly graded or re-graded access roads, work areas, and project structures during and after construction, and to minimize potential for damage to project facilities. These design measures shall include, but are not limited to, retaining walls, visquene, removal of unstable materials, and avoidance of highly unstable areas. SDG&E shall document compliance with this measure prior to the final project design by submitting a report to the CPUC for review and approval at least 60 days before construction. The report shall document the investigations and detail the specific support and protection measures that will be implemented.
Location	All Project locations where slope instability would potentially occur.
Monitoring / Reporting Action	Review study results. Ensure that study recommendations are implemented during construction.
Effectiveness Criteria	Project structures are not damaged by slope instability.
Responsible Agency	CPUC, BLM
Timing	Prior to and during construction.
MITIGATION MEASURE	G-9a: Coordinate with quarry operations. Operations and management personnel for quarries within the project route shall be consulted regarding locations of active mining and for coordination of construction activities in and through those areas. A plan to avoid or minimize interference with mining operations shall be prepared in conjunction with mine/quarry operators prior to construction. SDG&E shall document compliance with this measure prior to the start of construction by submitting the plan to the CPUC and BLM for review at least 60 prior to the start of construction.
Location	All Project locations that would cross active and potentially active quarries.
Monitoring / Reporting Action	Verify coordination has taken place and an agreement has been reached.
Effectiveness Criteria	Project does not render known mineral resource inaccessible.
Responsible Agency	CPUC, BLM
Timing	Sixty (60) days prior to the start of project construction.

D.13.21 References

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