

E.1.13 Geology, Mineral Resources, and Soils

The route of the I-8 Alternative would parallel the SWPL for the first 35.7 miles. The I-8 Alternative would then turn northwest, approaching the I-8 from the southeast, crossing to the north side of I-8 about a mile east of Boulevard, and then turning west and following the freeway. At MP I8-44.7, just east of the Campo Wind Farm, the transmission line would cross to the south side of the freeway and would remain on the south side of the freeway for 1.21 miles before crossing back to the north side of the freeway. The I-8 Alternative route would continue northwest parallel to the freeway, and into the Interstate 8 Substation Alternative at approximately MP I8-65, then continuing west for approximately 6 miles.

At MP I8-70.8 immediately east of the Viejas Reservation, the 500 kV line would cross over to the south side of I-8 before converting to a 230 kV underground line through a double transition structure. The route would continue underground, south of the I-8 in Alpine Boulevard for 8.8 miles, at which point the line would transition back to overhead. This alternative would then diverge from Interstate 8 heading generally north-northwest until joining the Proposed Project route at MP I8-92.7. The total length of this route would be 92.7 miles, 38.3 miles shorter than the proposed route to the same point.

E.1.13.1 Environmental Setting

Regional Physiography and Geology

The regional physiographic setting of the I-8 Alternative and Option routes is the same as the Proposed Project ROW and is discussed in Section D.13.1.1. The I-8 Alternative routes cross a variety of terrain including desert, mountain, valleys, and mesas.

Geology

The Interstate 8 (I-8) Alternative consists of both overhead and underground transmission line and traverses a mix of desert valley, sloping hillsides, mesa and terraces, and valleys. The alternative ROW crosses the northeastern edge of the Yuha Desert, along the southern edge of the Coyote Mountains, across and through the Jacumba, In-Ko-Pah, Laguna and Cuyamaca Mountains, and numerous unnamed hills and mesas dissected by small intervening drainages. It crosses many significant creeks and valleys including Tule Creek, McCain Valley, and Cameron Valley.

The I-8 Alternative crosses numerous geologic units along its length with primarily sedimentary units at the eastern end and igneous and metamorphic rocks along the remainder of the alignment. Descriptions of the geologic materials crossed by the I-8 Alternative route are summarized in Table E.1.13-1 including type of unit, age, a general physical description of the unit, and estimated excavation characteristics of the geologic unit. Approximate locations of these units along the alternative ROW are discussed below by approximate milepost locations.

Table E.1.13-1. Summary of Geologic Units along the Interstate 8 Alternative

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

Table E.1.13-1. Summary of Geologic Units along the Interstate 8 Alternative

Unit Symbol	Geologic Unit	Age	Description/Comment	Excavation Characteristics ¹
Qt	Nonmarine terrace deposits	Quaternary	Terrace deposits and older alluvial fan deposit, consisting of silt, sand, and gravel.	Easy
Pc	Nonmarine sedimentary deposits	Pliocene	Palm Spring Formation – interbedded conglomerate, arkosic sandstone, and red to gray siltstone and claystone.	Easy to Moderate
Pml	Marine sedimentary rocks	Pliocene	Imperial Formation – interbedded light grey to light yellow claystone with some sandstone, locally abundant shell ‘reefs’ and fossiliferous sandstone.	Easy to Moderate
Mv ^a	Andesitic volcanic rocks	Miocene	Alverson Canyon Formation – dark brown andesitic lava, breccia, and tuff.	
Ec	Nonmarine sedimentary rocks	Eocene	<u>Poway Group</u> Pomerado Conglomerate – light gray sandstone, massive reddish-tan conglomerate, and green-gray conglomerate. Stadium Conglomerate – Massive cobble conglomerate with interspersed lenses of fossiliferous sandstone.	Moderate
gr	Granitic rocks	Mesozoic	gr ₃ – Green Valley Tonalite. gr ₄ – La Posta Quartz Diorite. gr ₅ – Bonsall Tonalite. gr ₆ – Woodson Mountain Granodiorite.	Difficult
bi _i	Basic intrusive rocks	Mesozoic	Primarily Cuyamaca Gabbro, may contain some diorite.	Difficult
JTrv	Metavolcanic rocks	Jurassic and/or Triassic	Black Mountain Volcanics – massive greenstone, metavolcanic breccia, tuff, rhyolite, tuffaceous sandstone, metashale, and metaconglomerate.	Difficult
m	Metamorphic rocks	Pre-Cretaceous	Undifferentiated metamorphic rocks.	Difficult
ms	Metasedimentary rocks	Pre-Cretaceous	Julian Schist – quartz mica schist and quartzite (weathers to a dark reddish-brown platy rock).	Difficult
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

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.

Alluvium (Qal) occurs in numerous places along the entire length of the alternative ROW in valleys and stream channels. Near its eastern end the I-8 alternative ROW primarily crosses lake deposits of ancient Lake Coahuila (Ql), nonmarine terrace deposits (Qt), Palm Spring Formation (Pc), Imperial Formation (Pml), and Alverson Canyon Formation (Mv^a). The central and western portions of the I-8 Alternative cross geologic units consisting primarily of Green Valley Tonalite (gr₃), La Posta Quartz Diorite (gr₄), Bonsall Tonalite (gr₅), Woodson Mountain Granodiorite (gr₆), Julian Schist (ms), and mixed granitic and metamorphic rocks (gr-m). Units located only near the western end of the route are Poway Group (Ec), Black Mountain Volcanics (JTrv), and undifferentiated metamorphic rocks (m). These units are described in Table D.13-19 and approximate locations of these units along the Interstate 8 Alternative are listed below.

- Alluvium (Qal): I8-MPs 5.2–5.7, 6.0–7.7, 6.9–7.9, 8.0–10.1, 12.7 –13.1, 14.8–15.1, 15.3–15.6, 17.2–17.6, 18.0–23.3, 29.0–31.4, 32.3–34.3, 35.0–35.3, 51.0–51.1, 52.0–52.4, 53.0–53.1, 82.0–82.8, and 83.5–84.3.
- Lake deposits of ancient Lake Coahuila (Ql): I8-MPs 0–5.2.

- Nonmarine terrace deposits (Qt): I8-MPs 10.1–12.4 and 16.0–17.0.
- Palm Spring Formation (Pc): I8-MPs 5.7–6.0, 6.7–6.9, 7.9–8.0, 12.4–12.7, 13.1–14.8, 15.1–15.3, and 15.6–16.0.
- Imperial Formation (Pml): I8-MPs 17.0–17.2 and 17.6–18.0.
- Poway Group (Ec): I8-MPs 90.0–91.0.
- Green Valley Tonalite (gr₃): I8-MPs 66.0–66.6 and 70.0–82.0; underground between I8-MPs 70.8–79.6.
- La Posta Diorite (gr₄): I8-MPs 23.3–25.0, 25.5–29.0, 31.7–32.0, 38.0–51.0, 51.1–52.0, 52.4–53.0, and 53.1–53.4.
- Bonsall Tonalite (gr₅): I8-MPs 53.4–55.4, 58.6–63.3, 63.9–64.4, and 86.1–86.8.
- Woodson Mountain Granodiorite (gr₆): I8-MPs 66.6–70.0, 82.8–83.3, and 87.7–89.2.
- Black Mountain Volcanics (JTrv): I8-MPs 89.2–89.4 and 92.3–92.8.
- Undifferentiated metamorphic rocks (m): I8-MPs 83.3–83.5, 84.3–86.1, and 86.8–87.7.
- Julian Schist (ms): I8-MPs 55.4–58.6 and 64.4–66.0.
- Mixed granitic and metamorphic rocks (gr-m): I8-MPs 25.0–25.5, 31.4–31.7, 32.0–32.3, 35.3–38.0, and 89.4–90.0.

Slope Stability

The I-8 Alternative traverses near and across gently sloping alluvial fans and valley floor, and moderately sloping hillside terrain near its eastern end. West of I8-MP 22 the alignment begins to traverse hills, mesas, and valleys of the Jacumba, In-Ko-Pah, and Laguna Mountains. Although a large portion of the central and western portions of the I-8 alignment cross 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 would potentially trigger rock-falls or shallow soil slides. The hills at the easternmost end of the I-8 alternative alignment are underlain by landslide prone Poway Group units, and this area may be susceptible to landslides or other slope failures. Option 1 and Option 2 traverse moderate to gentle hills along the edges of Cottonwood Valley, on the north and south sides respectively. The slopes along these alignments are also primarily underlain by granitic units not prone to landslides.

Soils

A summary of the significant characteristics (description, erosion hazard, expansive potential, and corrosion potential) of the major soil associations traversed by the I-8 Alternative 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.

Numerous (12) soil associations are mapped along the I-8 Alternative alignment: s992, s994 through s996, s998, s1002, s1010, s1013 through s1016, and s1021. A summary of the basic characteristics of these soils is presented in Table D.13-2.

Four soil associations are present only at the eastern end of the I-8 alignment, s992, s994, s995, and s996. The Indio-Gilman-Coachella (s992), Rositas-Orita-Carrizo-Aco (s994), and Vint-Meloland-Indio (s996) are formed primarily in alluvium and Ancient Lake Coahuila lacustrine deposits. Rositas-Orita-Carrizo-Aco soils are known to contain areas of desert pavement. The Rock Outcrop-Rillito-Beeline-Badland association (s995) is found in areas underlain by Palm Spring and Imperial Formations. Hazard

of erosion for these soils for both off-road/off-trail and for 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 eastern end of the I-8 alignment ranges from moderate to high for uncoated steel and from low to moderate for concrete

Two soil associations found only near the western end of the alignment, s998 and s1002. The Urban Land-Redding-Olivenhain (s998) and Marina-Urban Land-Chesterton (s1002) are formed in alluvium, marine terraces, and older marine terrace deposits. Hazard of erosion for these soils for both off-road/off-trail and for on-road/on-trail ranges from slight to severe, and shrink/swell (expansive) potential varies from low to high. Corrosive potential of soils along the eastern end of the I-8 alignment ranges from moderate to high for uncoated steel and from low to high for concrete.

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.

Approximate locations of the soil associations along the I-8 Alternative are listed below, in order of approximate first order of appearance along the alignment.

- s994: I8-MPs 0-4.2, 7.9-13, 16.1-17.6, and 18.4-23.5
- s996: I8-MPs 4.2-7.9
- s995: I8-MPs 13-16.1 and 17.6-18.4
- s1021: I8-MPs 23.5-28
- s1016: I8-MPs 28-29.3, 31.6-32.2, and 34.2-38.5
- s992: I8-MPs 29.3-31.6 and 32.2-34.2
- s1014: I8-MPs 38.5-57 and 58.5-64.3
- s1015: I8-MPs 57-58.5 and 64.3-68.6
- s1010: I8-MPs 68.6-82 and 86.3-89
- s1002: I8-MPs 82-83.1 and 83.7-84.8
- s998: I8-MPs 83.1-83.7 and 89-91.7
- s1013: I8-MPs 84.8-86.3 and 91.7-92.8

Mineral Resources

General mineral resources in the region near the I-8 Alternative alignment are the same as for the Proposed Project. Records for mining claims on BLM land were reviewed using GIS data derived from the BLM Land and Mineral Records-LR2000 system. 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, 2006). No oil, gas, or geothermal fields are located in the vicinity of the SWPL alternative alignments (DOGGR, 2007). Therefore, there is little to no potential for the project to impact petroleum or geothermal resources.

Fifteen MRDS sites are located along and within 1000 feet of the I-8 Alternative alignment. The sites consist of 3 ore mines, 3 mapped ore occurrences, 3 sand and gravel quarries, one sand and gravel occurrence, 4 granite/crushed-broken stone quarries, and one clay pit. Six of the mapped sites are located in Imperial County and generally range from 200 to 990 feet from the I-8 alignment, with one site (the Oco-

tillo Material Pit) located crossing the alignment. The I-8 alternative ROW crosses the southern edge of the Ocotillo Material Pit near MP I8-19; the site is owned by Masters Construction and is in active production of sand and gravel (Masters Construction, 2007). The remaining 5 sites in Imperial County are past producers of sand and gravel and clay, and occurrences of sand and gravel and feldspar and due to their distance from the ROW future access to mineral resources at these sites is not likely to be affected by construction of this alternative.

Two of the 11 mineral resource sites in San Diego County are located adjacent to or crossing the I-8 alternative ROW; both are active-quarry sites, one sand and gravel pit (Ennis Pit, owned by Hansen Aggregate) and one granite/crushed-broken stone quarry (TTT Quarry, owned by Superior Ready Mix). Both sites are just south of the ROW, adjacent to each other, and located between MP I8-89.5 and 90.5. The remaining 9 sites range from 50 to 950 feet from the ROW, and consist of past and current producers of sand and gravel, and stone (crushed and granite) quarries, and ore mines and occurrences that because of their distance from the alignment access to mineral resources at these sites would not be affected by this alignment.

Four mapped active BLM mining claims are crossed by the I-8 Alternative ROW between approximately I8-MPs 25-26.1, 57.6-59.7, and 60.8-61.2. At least one sand and gravel operation is active: a mine is located in the Southeast 1/4 of Section 15, T16S, R9E. In this location, mining is currently taking place around the existing SWPL tower and there is not adequate space for another tower within 400 feet. Figure E.1.13-1A shows the location of the existing tower (shown in a circle) and the existing ROW can be seen because it follows the access road (adjacent to dotted line in photo). This 200-foot ROW was granted by BLM to SDG&E in 1982 (BLM File# CACA 5865).



Figure E.1.13-1A. SWPL Tower in Mine Area

Seismicity

Fault Rupture. This alternative crosses one active fault, the Yuha Wells Fault, at approximately MP I8-8.8. The Yuha Wells fault is a fairly recently mapped northeast-southwest trending fault which offsets the Laguna Salada fault from the main trace of the Elsinore fault. Although the Elsinore Fault is not mapped crossing the I-8 alternative ROW, it does trend toward the alignment with its mapped trace approximately 1500 feet north of the ROW between I8-MPs 18-18.5. This portion of the Elsinore fault is within

an Alquist-Priolo zone. The configuration of these faults in relation to the I-8 alternative is shown in Figure E.1.13-1.

Groundshaking. No significant active faults capable of producing large earthquakes are located in the immediate vicinity of the western two thirds of the I-8 Alternative ROW; therefore strong groundshaking is not expected along these portions of the alignment. However, moderate to strong groundshaking could be caused near the eastern end of this alternative 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 E.1.13-2.

Table E.1.13-2. Approximate Peak Ground Accelerations – I-8 Alternative

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
0-4.6, 6.8-6.9, 10.9-12.4, 13.0-17.0, 17.6-18.5, 19.0-22.1, 22.6-23.0, and 23.4-23.5	14.7	0.4–0.5g
4.6-6.8, 6.9-10.9, 12.4-13.0, 17.0-17.6, and 18.5-19.0	7.9	0.5–0.6g

Source: CGS, 2006; USGS, 2006a.

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. Portions of the alignment underlain by granitic, volcanic, and metamorphic bedrock would not be subject to liquefaction.

Earthquake-Induced Landslides. The eastern end of the alignment is relatively flat and not likely to experience landsliding or slope failures due to earthquakes. The remainder of the alignment crosses numerous hills, valleys, and plateaus across the Jacumba and In-Ko-Pah 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. Additionally the hills at the easternmost end of the I-8 alternative alignment are underlain by landslide prone Poway Group units which would be susceptible to earthquake triggered landslides or other slope failures.

Figure E.1.13-1. Yuha Wells Fault Crossing and Elsinore Fault Zone Vicinity

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E.1.13.2 Environmental Impacts and Mitigation Measures

The applicable regulations, plans, and standards and significance criteria for the I-8 Alternative and options would be the same as for the Proposed Project, in Section D.13.3 and D.13.4. Table E.1.13-3 summarizes the impacts of the Interstate 8 Alternative on geology, mineral resources, and soils.

Table E.1.13-3. Impacts Identified – Interstate 8 Alternative – Geology, Mineral Resources and Soils

Impact No.	Description	Impact Significance
Interstate 8 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
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
Interstate 8 Alternative Substation and All Options		
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-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 Impacts

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 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 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-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 project. Damage to desert pavement could result in an extreme acceleration of erosion as well as damage a unique geologic feature. 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-1a 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-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)

Destabilization of natural or constructed slopes would potentially occur as a result of construction activities due to excavation and/or grading operations for the I-8 Alternative. Construction consisting of grading and excavation within the hills of the Jacumba, In-Ko-Pah, and Laguna Mountains west of I-8 MP 22 would potentially cause slope instability, triggering rock-falls or landslides. The hills at the easternmost end of the I-8 alternative alignment are underlain by landslide prone Poway Group units, and this area may be particularly susceptible to slope failures. Slope instability including landslides, rockfalls, 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 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.

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

The I-8 Alternative crosses the edges of two active sand and gravel quarries and one granite/crushed-broken stone quarry. In Imperial County the I-8 alternative ROW crosses through the southern portion

of the Ocotillo Material Pit near MP I8-19 (as shown in Figure E.1.13-1A). The site is owned by Masters Construction and is in active production of sand and gravel and appears to be actively quarrying along the existing SWPL and potential future I-8 Alternative alignment.

In San Diego County the I-8 Alternative ROW crosses the northern edges of two adjacent quarries located between mileposts 89.5 and 90.5, the Ennis Pit owned by Hansen Aggregate which is in active production of sand and gravel and the TTT Quarry owned by Superior Ready Mix which is an active granite/crushed-broken stone quarry. Construction operations for the I-8 Alternative would potentially interfere with daily ongoing mining operations at these active quarries and potentially render mineral resources inaccessible. Therefore there is 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) by coordinating construction activities with the quarry operations and therefore avoiding or minimizing interference.

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

G-9a **Coordinate with quarry operations.** SDG&E shall coordinate with operations and management personnel, and with BLM, to determine status of and plans for active quarries adjacent to or crossed by project alignments. SDG&E shall develop a plan to avoid or minimize interference with mining operations in conjunction with mine/quarry operators prior to construction, and submit it for review and approval to the BLM and CPUC. If mine operators are out of compliance with BLM lease requirements, SDG&E shall coordinate with all parties to resolve the situation and shall demonstrate compliance with this measure prior to the start of construction by submitting the plan to the CPUC and BLM for review at least 60 days prior to the start of construction. If active mining areas require a reroute of the existing SWPL or the Interstate 8 Alternative route, SDG&E shall provide a detailed map documenting proposed new tower and access road location(s), as well as a summary of environmental impacts that would occur (biological and cultural resources surveys must be completed).

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 I-8 Alternative route have a moderate to high potential to corrosion for uncoated steel and a low to high potential to corrosion 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. 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 or destroy project structures and facilities. Collapse of project structures would potentially 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 geo-technical 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)

Minor to strong groundshaking should be expected along the I-8 Alternative in the event of an earthquake on the faults near the I-8 Alternative and from other major faults in the region, with estimated PGAs ranging from 0.1 to 0.6 g. Expected groundshaking (moderate to strong) is highest along the eastern third of the alignment, from approximately mileposts I8-0 to I8-23.5, with estimated PGAs from 0.4 to 0.6 miles along this portion of the alternative alignment. Moderate groundshaking (0.3-0.4g) may also be expected at the far western end of the alignment between mileposts I8-82.0 to I8-83.1 and I8-83.6 to I8-84.9. 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 I-8 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 of structures, and injury or death to people. Therefore there is a significant impact. To ensure these adverse effects will not occur Mitigation Measure G-4a (Reduce effects of groundshaking) is required, reducing impacts to less than significant (Class II).

Moderate to strong groundshaking would potentially result in seismically induced ground failures, including liquefaction-related phenomena and slope failures along the I-8 Alternative in areas where estimated PGAs range from 0.3-0.6g. Portions of the alternative within these areas that cross active river washes and streams where seasonally saturated lenses and pockets of loose sand may be present could liquefy and 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 would potentially occur along portions of the alternative ROW in areas along and near moderate to steep slopes, west of I8-22 where the alignment crosses areas of estimated PGAs between 0.3g to 0.6g. 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 is 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 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-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 the crossing of the Yuha Wells Fault at milepost I8-8.8; and would potentially be subject to fault rupture where the Alquist-Priolo zoned Elsinore Fault approaches within approximately 1500 feet north of the ROW between I8-MPs 18-18.5 and trends across the fault (see Figure E.1.13-1). 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 would potentially result in power outages, damage to nearby roads or structures, and injury or death to people, a significant impact. Thus, 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).

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 rock fall 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 would potentially cause damage to project structures are along moderate to steep slopes west of I8-22 where the I-8 alignment crosses the mountains and near the western end of the alignment where it crosses slopes underlain by 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.

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.

E.1.13.3 Interstate 8 Alternative Substation

Environmental Setting

Geology. The Interstate 8 Alternative Substation site is underlain entirely by Julian Schist (ms).

Slope Stability. The Interstate 8 Alternative 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 landsliding on oversteepened slopes.

Soils. The Interstate 8 Alternative Substation site is located on soils of the Hotaw-Crouch-Boomer association (s1015). This soil association is primarily formed in material weathered from the underlying granitic and metamorphic bedrock. 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 moderate. Corrosive potential of these soils is moderate for both uncoated steel and concrete. The Interstate 8 Substation would be approximately 37 acres in size and would require local grading.

Mineral Resources. No mineral resource sites or active BLM mining claims are located at or near the Interstate 8 Substation Alternative site.

Seismicity – Fault Rupture. The Interstate 8 Substation Alternative site is not crossed by or in the immediate vicinity of any active faults and would thus not be subject to surface fault rupture.

Seismicity – Groundshaking. No significant active faults capable of producing large earthquakes are located in the immediate vicinity the Interstate 8 Alternative Substation therefore strong groundshaking is not expected along the alignment. The peak horizontal accelerations for the Interstate 8 Substation Alternative site are approximately 0.1-0.2g.

Seismicity – Liquefaction. The Interstate 8 Alternative Substation site is underlain by metamorphic bedrock and would not be subject to liquefaction.

Earthquake-Induced Landslides. The Interstate 8 Alternative 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.

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 at this Substation Alternative 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)

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

Excavation and grading for substation facilities, tower foundations, 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. 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).

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 I-8 Alternative 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. 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 I-8 Alternative 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 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 there is 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.

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 I-8 Alternative Substation site have a moderate 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. 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 or destroy project structures

and facilities. Collapse of project structures would potentially 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)

Minor groundshaking could result in seismically induced slope failures such as landslides and rockfalls at the I-8 Substation Alternative site in areas along and adjacent to moderate slopes. This would potentially result in damage to project structures, a significant impact. 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. 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 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 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.

E.1.13.4 Interstate 8 Route Options

Campo North Option

The Campo North Option would remain on the north side of the freeway between I-8 MP-44.7 and I-8 MP 45.9.

Environmental Setting

Geology. The Campo North Option crosses similar geology to the corresponding portion of the I-8 Alternative, the La Posta Diorite (gr⁴) from mileposts CN-0 to CN-1.4.

Slope Stability. The Campo North Option traverses moderate to gentle hills that are primarily underlain by granitic units not typically prone to landslides.

Soils. The Campo North Option crosses the same soil association as the corresponding portion of the I-8 Alternative, the s1014 – Tollhouse–Rock Outcrop–La Posta association. This soil association has a hazard of erosion for off-road/off-trail of moderate and for on-road/on-trail of severe, shrink/swell (expansive) potential varying from low to moderate, and corrosive potential of moderate for both uncoated steel and concrete.

Mineral Resources. No mineral resource sites or active BLM Mining claims are located along the Campo North Option.

Seismicity – Fault Rupture. The Campo North Option does not cross any active faults and would thus not be subject to surface fault rupture.

Seismicity – Groundshaking. No significant active faults capable of producing large earthquakes are located in the immediate vicinity the Campo North Option ROW; therefore strong groundshaking is not expected along the alignment. The peak horizontal accelerations for the Campo North Option is approximately 0.1-0.2g for its entire 1.4-mile length.

Seismicity – Liquefaction. This option is underlain by granitic bedrock would not be subject to liquefaction.

Earthquake-Induced Landslides. The Campo North Option crosses moderately sloping hills and valleys across the southern end of the Laguna Mountains, and although most of this alignment is underlain by igneous bedrock, earthquake triggered rock falls and shallow landslides could occur.

Construction Impacts

No desert pavement is mapped along the Campo North Option and thus Impact G-2 (Unique geologic features would be damaged due to construction activities) is not expected to occur along 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 and access roads would loosen soil and trigger or accelerate erosion. Soils along route have an erosion hazard of erosion for off-road/off-trail of moderate and for on-road/on-trail of 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 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)

Destabilization of natural or constructed slopes would potentially occur as a result of construction activities due to excavation and/or grading operations for the Campo North Option if construction were to result in oversteepened slopes. 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. 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 Campo North Option would still result in significant impacts if unidentified unstable slopes or areas of potentially unstable slopes were disturbed or undercut by con-

struction 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, 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.

Operational Impacts

There would be no impacts associated with this alternative route 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 along the Campo North Option route have a moderate 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 along the 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 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, 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)

Minor groundshaking could result in seismically induced slope failures such landslides and rockfalls the Campo North Option route in areas along and adjacent to moderate slopes. This could result in damage to project structures, a significant impact. Collapse of project structures would potentially result in power outages, damage to nearby roads of structures, and injury or death to people Therefore there is a significant impact. To ensure that impacts associated with seismically induced slope failures from strong

groundshaking 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 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.

Buckman Springs Underground Option

The Buckman Springs Underground Option would continue north of I-8, at MP I8-55 would transition to an underground 230 kV line for 2 miles, and then transition back to a 500 kV overhead line; this option is approximately 2.4 miles long.

Environmental Setting

Geology. The Buckman Springs Underground Option crosses similar geology to the corresponding portion of the I-8 Alternative, however this option crosses only one unit along its 2.4-mile alignment; the Bonsall Tonalite (gr_s).

Slope Stability. The Buckman Springs Underground Option traverses moderate to gentle hills along the north edges of Cottonwood Valley. The slopes along this alignment are primarily underlain by granitic units not prone to landslides.

Soils. The Buckman Springs Underground Option crosses the same soil association as the corresponding portion of the I-8 Alternative, the s1014 association (Tollhouse–Rock Outcrop–La Posta). This soil association has a hazard of erosion for off-road/off-trail of moderate and for on-road/on-trail of severe, shrink/swell (expansive) potential varying from low to moderate, and corrosive potential of moderate for both uncoated steel and concrete.

Mineral Resources. No mineral resource sites are located along the Buckman Springs Underground Option. The northern end of the West Buckman Springs Option crosses part of an active BLM mining claim from approximately MPs BSW-5.1 to BSW-5.6. These claims are not currently being mined, and construction and operation of a transmission line in the Buckman Springs Underground ROW is not expected to interfere with future access to any mineral resources within these claims. However, if any of these sites were to be mined in the future during project 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

Seismicity – Fault Rupture. The Buckman Springs Underground Option does not cross any active faults and would thus not be subject to surface fault rupture.

Seismicity – Groundshaking. No significant active faults capable of producing large earthquakes are located in the immediate vicinity the Buckman Springs Underground ROW; therefore strong groundshaking is not expected along the alignment. The peak horizontal accelerations for the Buckman Springs Underground Option are approximately 0.1-0.2g for its entire 2.4-mile length.

Seismicity – Liquefaction. This option is underlain by granitic bedrock would not be subject to liquefaction.

Earthquake-Induced Landslides. The Buckman Springs Underground Option crosses moderately sloping hills and valleys across the southern end of the Laguna Mountains, and although most of this alignment is underlain by igneous bedrock, earthquake triggered rock falls and shallow landslides could occur.

Construction Impacts

No desert pavement is mapped along the Buckman Springs Underground Option and thus Impact G-2 (Unique geologic features would be damaged due to construction activities) is not expected to occur along 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 and access roads would loosen soil and trigger or accelerate erosion. Soils along route have an erosion hazard of erosion for off-road/off-trail of moderate and for on-road/on-trail of 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 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)

Destabilization of natural or constructed slopes would potentially occur as a result of construction activities due to excavation and/or grading operations for the Buckman Springs Underground Option if construction were to result in oversteepened slopes. 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. 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 Buckman Springs Underground Option 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 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.

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 Buckman Springs Underground Option route have a moderate 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 along the route which would potentially damage project structures. 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 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)

Minor groundshaking would potentially result in seismically induced slope failures such landslides and rockfalls the Buckman Springs Underground Option route in areas along and adjacent to moderate slopes. This would potentially result in damage to project structures, a significant impact. Collapse of project structures could result in power outages, damage to nearby roads of structures, and injury or death to people, a significant impact. To ensure that impacts associated with seismically induced slope failures from strong groundshaking would be reduced to less than significant levels (Class II), implementation of 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 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.

West Buckman Springs Option

The route the West Buckman Springs Option would cross to the south side of the interstate at MP I8-54 and head west, crossing the Pacific Crest National Scenic Trail and would follow Buckman Springs Road north for approximately 4 miles before rejoining the I-8 Alternative alignment; this option is approximately 5.6 miles in length.

Environmental Setting

Geology. The West Buckman Springs Option crosses similar geology to the corresponding portion of the I-8 Alternative; however, this option crosses three units versus only two mapped units along the equivalent I-8 alignment. Units crossed by this alignment option are: alluvium (Qal), Bonsall Tonalite (gr_s), and Julian Schist (ms). Approximate locations of these units along this option are listed below.

- Alluvium (Qal): MPs BSW-1.1 to BSW-1.5.
- Bonsall Tonalite (gr_s): MPs BSW-0 to BSW-1.1 and MPs BSW-1.5 to BSW-5.3.
- Julian Schist (ms): MPs BSW-5.3 to BSW-5.6.

Slope Stability. The West Buckman Springs Option traverses moderate to gentle hills along the southern edges of Cottonwood Valley. The slopes along this alignment are primarily underlain by granitic units not prone to landslides.

Soils. The West Buckman Springs Option crosses two soil associations along its 5.6-mile alignment: s1014 (Tollhouse–Rock Outcrop–La Posta) and s1018 (Oak Glen–Mottsville–Calpine). The Tollhouse–Rock Outcrop–La Posta soils are primarily formed in material weathered from the underlying granitic rocks and the Oak Glen–Mottsville–Calpine is generally formed in granitic alluvium. These soil associations have a hazard of erosion for off-road/off-trail ranging from slight to moderate and for on-road/on-trail ranging from slight to severe; the shrink/swell (expansive) potential of the soils varies from low to moderate; and the soils have corrosive potential of moderate for uncoated steel and ranging from low to moderate for concrete.

Approximate locations of these units along this option are listed below.

- s1014: MPs BSW-0 to BSW-1.0, MPs BSW-1.6 to BSW-3.1, and MPs BSW-3.6 to BSW-5.6
- s1018: MPs BSW-1.0 to BSW-1.6 and MPs BSW-3.1 to BSW-3.6

Mineral Resources. No mineral resource sites are located along the West Buckman Springs Option and it does not cross any active BLM mining claims.

Seismicity – Fault Rupture. The West Buckman Springs Option does not cross any active faults and would thus not be subject to surface fault rupture.

Seismicity – Groundshaking. No significant active faults capable of producing large earthquakes are located in the immediate vicinity the West Buckman Springs Option ROW; therefore strong groundshaking is not expected along the alignment. The peak horizontal accelerations for the Buckman Springs Underground Option are presented in Table E.1.13-4.

Table E.1.13-4. Approximate Peak Ground Accelerations – I-8 Alternative

Approximate West of Buckman Springs (Milepost)	Total Length of Segments (miles)	Peak Ground Acceleration
BSW-0 to BSW-1.1 and BSW-1.5 to BSW-5.6	5.2	0.1-0.2g
BSW-1.1 to BSW-1.5	0.4	0.3-0.4g

Source: CGS, 2006; USGS, 2006a.

Liquefaction. Potential for liquefaction along this option is primarily isolated to areas near creeks and washes underlain by young alluvial deposits which could liquefy during an earthquake if perched groundwater were present. Portions of the alignment underlain by granitic and metamorphic bedrock would not be subject to liquefaction.

Earthquake-Induced Landslides. The West of Buckman Springs Option crosses moderately sloping hills and valleys across the southern edges of Cottonwood Valley, and although most of the sloping portions of this alignment are underlain by igneous and metamorphic bedrock, earthquake triggered rock falls and shallow landslides could occur.

Construction Impacts

No desert pavement is mapped along the West of Buckman Springs Option and thus Impact G-2 (Unique geologic features would be damaged due to construction activities) is not expected to occur along 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 and access roads would loosen soil and trigger or accelerate erosion. Soils along route have an erosion hazard of erosion for off-road/off-trail ranging from slight to moderate 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 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)

Destabilization of natural or constructed slopes would potentially occur as a result of construction activities due to excavation and/or grading operations for the West of Buckman Springs Option if construction were to result in oversteepened slopes. 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. 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 West Buckman Springs Option 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 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.

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 West of Buckman Springs Option route have a corrosive potential of moderate for uncoated steel and ranging from low to moderate for concrete. Expansion potential for the soils varies from low to moderate. Corrosive and expansive subsurface soils may exist in places along the route which would potentially damage project structures. 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 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)

Minor to moderate groundshaking could result in seismically induced slope failures such landslides and rockfalls the West of Buckman Springs Option route in areas along and adjacent to moderate slopes. This could result in damage to project structures, a potentially significant impact. Collapse of project structures could result in power outages, damage to nearby roads of structures, and injury or death to people, a significant impact. To ensure that impacts associated with seismically induced slope failures from strong groundshaking would be reduced to less than significant levels (Class II), implementation of 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 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.

South Buckman Springs Option

The route would follow the Modified Route D Alternative route for its first 4 miles (see Section E.4). It would follow the southern boundary of the Cleveland National Forest, then continue due west at the point where the Modified Route D Alternative would turn southwest at MP MD-4.5. This option would continue 2 miles to the west and southwest, turn northwest along Buckman Springs Road, and join the West Buckman Springs Option at about MP BSW-1.7. This route option is shown in detail on Figure E.1.1-4c and regionally on Figure E.1.1-1.

Environmental Setting

Geology. South Buckman Springs Option crosses similar geology to the corresponding portion of the I-8 Alternative. Units crossed by this alignment option are: alluvium (Qal) and Bonsall Tonalite (gr₅). Approximate locations of these units along this option are listed below.

- Alluvium (Qal): MPs BSS-0.6 to BSS-1.3 and MPs BSS-2.4 to BSS-3.2.
- Bonsall Tonalite (gr₅): MPs BSS-0 to BSS-0.6, MPs BSS-1.3 to BSS-2.4, and MPs BSS-3.2 to BSS-4.

Slope Stability. South Buckman Springs Option traverses moderate to gentle hills and valley terrain along the edges and across Cameron and Cottonwood Valleys. The slopes along this alignment are primarily underlain by granitic units not prone to landslides.

Soils. South Buckman Springs Option crosses two soil associations along its 4.1-mile alignment: s1014 (Tollhouse–Rock Outcrop–La Posta) and s1018 (Oak Glen–Mottsville–Calpine). The Tollhouse–Rock Outcrop–La Posta soils are primarily formed in material weathered from the underlying granitic rocks and the Oak Glen–Mottsville–Calpine is generally formed in granitic alluvium. These soil associations have a hazard of erosion for off-road/off-trail ranging from slight to moderate and for on-road/on-trail ranging from slight to severe; the shrink/swell (expansive) potential of the soils varies from low to moderate; and the soils have corrosive potential of moderate for uncoated steel and ranging from low to moderate for concrete.

Approximate locations of these units along this option are listed below.

- s1014: MPs BSS-0 to BSS-0.8 and MPs BSS-3.1 to BSS-4.1
- s1018: MPs BSS-0.8 to BSS-3.1

Mineral Resources. No mineral resource sites are located along the Buckman Springs Option 3 – South Buckman Springs Option and it does not cross any active BLM mining claims.

Seismicity – Fault Rupture. The Buckman Springs Option 3 – South Buckman Springs Option does not cross any active faults and would thus not be subject to surface fault rupture.

Seismicity - Groundshaking. No significant active faults capable of producing large earthquakes are located in the immediate vicinity the Buckman Springs Option 3 – South Buckman Springs Option ROW; therefore strong groundshaking is not expected along the alignment. The peak horizontal accelerations for this Option are presented in Table E.1.13-5.

Table E.1.13-5. Approximate Peak Ground Accelerations – South Buckman Springs Option

Approximate South Buckman Springs Option (BSS) Mileposts	Total Length of Segments (miles)	Peak Ground Acceleration
BSS-0 to BSS-0.8, BSS-1.2 to BSS-1.5, and BSS-23.2 to BSS-4.1	2.0	0.1-0.2g
BSS-0.8 to BSS-1.2 and BSS-1.5 to BSS-3.2	2.1	0.3-0.4g

Source: CGS, 2006; USGS , 2006a.

Liquefaction. Potential for liquefaction along this option exists in the areas near creeks and washes in Cameron and Cottonwood Valleys which are underlain by alluvial deposits which could liquefy during an earthquake if saturated. Portions of the alignment underlain by granitic bedrock would not be subject to liquefaction.

Earthquake-Induced Landslides. South Buckman Springs Option crosses gently to moderately sloping hills and valleys across the edges of Cameron and Cottonwood Valleys, and although most of the sloping portions of this alignment are underlain by igneous bedrock, earthquake triggered rock falls and shallow landslides could occur.

Construction Impacts

No desert pavement is mapped along the South Buckman Springs Option and thus Impact G-2 (Unique geologic features would be damaged due to construction activities) is not expected to occur along 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 and access roads would loosen soil and trigger or accelerate erosion. Soils along route have an erosion hazard of erosion for off-road/off-trail ranging from slight to moderate 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 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)

Destabilization of natural or constructed slopes would potentially occur as a result of construction activities due to excavation and/or grading operations for the South Buckman Springs Option if construction were to result in oversteepened slopes. 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. 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 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 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

There would be no impacts associated with the South Buckman Springs Option route on project structures due to 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 along the South Buckman Springs Option route have a corrosive potential of moderate for uncoated steel and ranging from low to moderate for concrete. Expansion potential for the soils varies from low to moderate. Corrosive and expansive subsurface soils may exist in places along the 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 would potentially 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, 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 groundshaking would potentially result in seismically induced ground failures, including liquefaction-related phenomena and slope failures along the South Buckman Springs Option alignment where estimated PGAs range from 0.3-0.4g. Portions of the alternative within areas that cross active river washes

and streams where saturated lenses and pockets of loose sand may be present would potentially liquefy and damage to project structures in the event of a large earthquake, a significant impact. Seismically induced slope failures such as landslides and rockfalls would potentially occur along portions of the alternative ROW in areas along and near moderate slopes along the edges of Cameron and Cottonwood Valleys. This would potentially result in damage to project structures, a potentially significant impact. Collapse of project structures would potentially result in power outages, damage to nearby roads of structures, and injury or death to people, 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 Measures G-4b (Conduct geotechnical investigations for liquefaction) and G-6a (Conduct geotechnical surveys for landslides and protect against slope instability) are 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-4b Conduct geotechnical investigations for liquefaction.

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

E.1.13.5 Future Transmission System Expansion for Interstate 8 Alternative

As described in Section E.1.1, the Interstate 8 Alternative Substation that would be built as a part of the Interstate 8 Alternative would accommodate up to six 230 kV circuits and a 500 kV circuit. Only two 230 kV circuits are proposed by this alternative at this time, but construction of additional 230 kV circuits and a 500 kV circuit out of the Interstate 8 Alternative Substation may be required in the future. This section considers the impacts of construction and operation of these potential future transmission lines. There are three routes that are most likely for these future lines; each is addressed below. Figure E.1.1-6 illustrates the potential routes of the transmission lines.

Environmental Setting – 230 and 500 kV Future Transmission System Expansion

The future 230 and/or 500 kV lines from the Interstate 8 Alternative Substation would most likely follow one or more of the following routes:

Interstate 8 Route Including Underground Within Alpine Boulevard

The Interstate 8 route including underground within Alpine Boulevard would only be applicable for future 230 kV lines. Additional 230 kV circuits could be installed underground within Alpine Boulevard, with appropriate compact duct banks and engineering to avoid, or possibly relocate, existing utilities. See Section E.1.13.1 and E.1.13.2 for a description of the Environmental Setting and Mitigation Measures for Geology, Mineral Resources, and Soils for the Interstate 8 Alternative. The future transmission line route would follow the Interstate 8 Alternative's 230 kV route to the point where it meets the Proposed Project at MP 131. The future transmission route would then join the proposed route corridor to the west, continuing past the Sycamore Canyon Substation to the Chicarita Substation. See Sections D.13.2, D.13.8, and D.13.9 for a description of the Environmental Setting and Mitigation Measures for Geology, Mineral Resources, and Soils of the Inland Valley Link and the Coastal Link of the Proposed Project. The Interstate 8 230 kV future transmission route could then follow the Proposed Project's 230 kV Future Transmission Expansion route from Chicarita to the Escondido Substation shown in Figure B-12a. See Section D.13.11 for a description of the Environmental Setting and Mitigation Measures for the Proposed Project's Future Transmission Expansion route.

Route D Alternative Corridor

Additional 230 or 500 kV circuits could follow the Route D Alternative corridor to the north of Descanso, after following the Interstate 8 Alternative 230 kV route from the Interstate 8 Substation to MP I8 70.3. The Environmental Setting and Mitigation Measures for Geology, Mineral Resources, and Soils of the Route D Alternative can be found in Section E.3.13.1 and in Section E.3.13.2. It should be noted, however, that the Route D Alternative Geology, Mineral Resources, and Soils impacts and mitigation measures are for a 500 kV transmission line, and the Interstate 8 future transmission line as detailed above could be either a 500 kV line or a 230 kV line.

The Route D corridor would connect with the Proposed Project corridor at Milepost 114.5, and could then follow either: (1) the Proposed Project southwest to the Chicarita Substation and then follow the Proposed Project's 230 kV Future Transmission Expansion route (see description in Section B.2.7) from Chicarita to the Escondido Substation; or (2) the Proposed Project northeast to the Proposed Central East Substation and then follow the Proposed Project's 500 kV Future Transmission Expansion route shown in Figure B-12b (see description in Section B.2.7) to connect with SCE's existing Serrano-Valley 500 kV line in Riverside County. See Section D.13.2 for more information on the Geology, Mineral Resources, and Soils setting of the Central, Inland Valley, and Coastal Links of the Proposed Project.

For the Geology, Mineral Resources, and Soils setting, impacts, and mitigation measures of the Proposed Project's 230 kV Future Transmission Expansion route and the Proposed Project's 500 kV Future Transmission Expansion route see Section D.13.11.

Interstate 8 Alternative with Modified Route D alignment and West of Forest Alignment

The future 230 or 500 kV lines could follow the proposed Interstate 8 Alternative route from the Interstate 8 Alternative Substation until reaching the Modified Route D Alternative corridor (within the 368 Corridor identified by the Department of Energy's Draft West-wide Corridor Programmatic EIS) and then follow the Modified Route D Alternative corridor south for 11 miles to MP MD-26. For the Geology, Mineral Resources, and Soils setting and impacts along the Modified Route D corridor see Section E.4.13. At MP MD-26, new 230 or 500 kV circuits would turn west and connect with the northernmost segment of the West of Forest Alternative route as described in Section E.1.1. This route would meet up with the Interstate 8 Alternative at approximately MP I8-79 and would follow the Interstate 8 Alternative's overhead 230 kV route to the point where it meets the Proposed Project at MP 131. The future transmission route would then join the proposed route corridor to the west, continuing past the Sycamore Canyon Substation to the Chicarita Substation. It could then follow the Proposed Project's 230 kV Future Transmission Expansion route (see description in Section B.2.7) from Chicarita to the Escondido Substation.

MP MD-26 to MP I8-79

The new 230 or 500 kV line would most likely follow the West of Forest ROW from MP MD-26 to MP I8-79.

Geology. From MP MD-26 to MP I8-79 the new 230 or 500 kV transmission line would cross hills and valleys primarily underlain by Basic intrusive rocks (bi₁), Granitic rocks (gr₆), Granitic rocks (gr₃). The alignment may cross areas of Quaternary alluvium (Qal), Granitic and metamorphic rocks (gr-m) and Metamorphic rocks (m) near the northern end as it approaches and crosses the Harbison Canyon area. A general description of the characteristic of these units is presented in Table D.13-1.

Soils. From MP MD-26 to MP I8-79 the new 230 or 500 kV transmission line would be underlain by three mapped soil associations, the Rock Outcrop–Las Posas association (s1012), the Sesame–Rock Outcrop–Cienba association (s1010), 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 or 500 kV alignment; therefore, there would be no impacts related to accessibility of mineral resources.

Seismicity. This portion of the 230 or 500 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 a high PGAs occurring 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 account of historical earthquakes in the San Diego area describe damaging landslides from earthquake groundshaking (SCEC, 2006). Portions of the future transmission lines would 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.

Environmental Impacts – 230 or 500 kV Future Transmission System Expansion

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 transmission 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 moderate to severe. Excavation and grading for tower foundations, 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). Please note, 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 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: 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. 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 would expose people or structures to potential substantial adverse effects as a result of surface fault rupture at crossings of active faults) would not occur because no active faults in this segment of the future transmission lines.

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 transmission routes have a low to high potential to corrode steel and concrete. Corrosive subsurface soils may exist in places along the future transmission routes. There is also low to high expansion potential for soils along the future transmission 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 transmission 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 transmission routes 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-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]