E.3.13 Geology, Mineral Resources, and Soils

The Route D Alternative would diverge north from the I-8 Alternative at MP I8-70.3, passing primarily through the Cleveland National Forest. This alternative would end at the South Central Substation Alternative, where it would join the Proposed Project route. This alternative is 17.3 miles long.

E.3.13.1 Environmental Setting

Geology

The Route D Alternative traverses hills and valleys of the Cuyamaca Mountains for its entire length. Geologic units crossed by the Route D Alternative ROW consist of Bonsall Tonalite (gr_5), Woodson Mountain Granodiorite (gr_6), Cuyamaca Gabbro (bi_1), and mixed granitic and metamorphic rocks (gr-m). These units are described in Table D.13-19. Approximate locations of these units along the Route D Alternative are listed below.

- Bonsall Tonalite (gr_5): MPs D-0.7 to D–1.5 and MPs D-2.3 to D–7.8
- Woodson Mountain Granodiorite (gr_6): MPs D-0 to D–0.7
- Cuyamaca Gabbro (bi_1): MPs D-1.5 to D-2.3
- Mixed granitic and metamorphic rocks (gr-m): MPs D-7.8 to D-17.3

Slope Stability. The Route D Alternative traverses across moderate slopes of the Cuyamaca Mountains for its entire length which are underlain by primarily by granitic and metamorphic bedrock. This alignment does not cross any mapped landslides and the granitic and metamorphic terrain underlying the slopes in the area are not typically prone to landslides, although it may be susceptible to rock-fall and shallow landslides in over-steepened areas.

Soils. Four soil associations are mapped underlying the Route D Alternative, s1010, s1012, s1015, and s1016. Basic characteristics of these soils are presented in Table D.13-20. The Sesame–Rock Outcrop–Cienba (s1010), the Rock Outcrop–Las Posas (s1012), the Hotaw-Crouch-Boomer (s1015), and the Sheephead–Rock Outcrop–Bancas (s1016) associations are all formed in material weathered from the underlying granitic and metamorphic rocks. The risk of erosion for off-road/off-trail soils ranges from slight to very severe and for on-road/on-trail ranges from slight to severe. Shrink/swell (expansive) potential of these soil associations varies from low to high. Corrosive potential of soils along the Route D Alternative route are moderate to high for uncoated steel and low to moderate for concrete.

Approximate locations of the soil associations along the Route D Alternative are listed below, in order of approximate first order of appearance along the alignment.

- s1010: MPs D-0 to D-1.4 and MPs D-2.8 to D-8.0
- s1012: MPs D-1.4 to D–2.8
- s1015: MPs D-8.0 to D–10.8
- s1016: MPs D-10.8 to D–17.3

Mineral Resources. Two MRDS sites are located along and within 1000 feet of the Route D Alternative alignment. The sites consist of two underground gold mines, one listed as active and the other as a past producer. The active site is approximately 60 feet west of the ROW at about MP D-10.85 and the past producing site is about 700 feet west of the ROW at about MP D-10.8. These two mine sites are located on the one mapped active BLM mining claim that is crossed by the Route D Alternative ROW.

The ROW crosses the claim near its northeastern corner, approximately between mileposts D-10.8 and D-11. However, approximate tower locations for the Route D Alternative would be greater than 700 feet north and south of the active mine site and therefore construction for the Route D Alternative would not impact access or mining operations at this site.

Seismicity – Fault Rupture. This alternative does not cross any known active faults and is thus not likely to experience damage due to fault rupture and or offset. No active faults are located in the immediate vicinity of this alternative.

Seismicity – Groundshaking. The Route D Alternative would be susceptible to only minor groundshaking from an earthquake on any of the regional or nearby active faults. Estimated peak horizontal accelerations for this alignment are 0.1g to 0.2g from mileposts D-0 to D-5.9 and 0.2 to 0.3g for the remainder of the alignment to milepost D-17.3. This minor groundshaking would not result in any potential damage to the Route D Alternative alignment structures.

Seismicity – Liquefaction. This alignment has no potential for liquefaction as it is primarily underlain by igneous and metamorphic bedrock.

Earthquake-Induced Landslides. Most accounts of historical earthquakes in this area describe damaging landslides resulting from earthquake groundshaking (SCEC, 2006). However, moderately sloping hills of the Cuyamaca Mountains that the Route D Alternative route traverses are entirely underlain by igneous and metamorphic bedrock and the minor expected groundshaking would preclude any significant slope failures due to earthquakes in the area.

The applicable regulations, plans, and standards as well as the significance criteria for the Route D Alternative Geology, Minerals, and Soils are the same as for the Proposed Project. Please see Section D.13.3 and D.13.4.

E.3.13.2 Environmental Impacts and Mitigation Measures

Table E.3.13-1 summarizes the impacts of the Route D Alternative on geology, mineral resources, and soils.

Table E.3.13-1. Impacts Identified – Route D Alternative – Geology, Mineral Resources, and Soils

Impact No.	Description	Impact Significance
Route D Alternative		
G-1	Erosion would be triggered or accelerated due to construction activities.	Class III
G-3	Project would expose people or structures to potential substantial adverse effects as a result of problematic soils.	Class II
G-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
Central South Substation Alternative		
G-1	Erosion would be triggered or accelerated due to construction activities.	Class III
G-3	Project would expose people or structures to potential substantial adverse effects as a result of problematic soils.	Class II

Construction Impacts

No desert pavement is mapped along Route D Alternative and thus Impact G-2 (Unique geologic features would be damaged due to construction activities) is not expected to occur along this route. No impacts associated with this alternative would occur from construction activities interfering with access to known mineral resources (Impact G-9).

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

Excavation and grading for tower foundations, work areas, access roads, and spur roads would loosen soil and trigger or accelerate erosion. Soils along the Route D Alternative route have an erosion hazard for off-road/off-trail ranging from slight to very severe and for on-road/on-trail ranges from slight to severe. SDG&E's 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, limiting grading of existing roads in areas with sensitive soils, planning construction to minimize new ground disturbance, and by use of Best Management Practices (BMPs) such as sand bags and road bars to control water erosion. In addition, a Stormwater Pollution Prevention Plan (SWPPP) that would limit erosion from the construction site would be required in accordance with the Clean Water Act. This would result in a less than significant impact (Class III).

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 Route D Alternative. Construction consisting of grading and excavation within the hills of the Cuyamaca Mountains would potentially cause slope instability, triggering rock-falls or landslides. Slope instability including landslides, earth flows, and debris flows has the potential to undermine foundations, cause distortion and distress to overlying structures, and displace or destroy project components. SDG&E's GEO-APM-4 and -8 (see Table D.13-10) 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 Route D Alternative would still result in significant impacts if unidentified unstable slopes were disturbed or undercut by construction activities resulting in slope failures. Slope failures would potentially cause damage to the environment, to project or other nearby structures, and could cause injury or death to workers and/or the public. Therefore there is a significant impact. To ensure that impacts associated with slope instability 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 seismically induced groundshaking and/or ground failure (Impact G-4) or to fault rupture (Impact G-5) due to the lack of proximity of active faults to the alternative.

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

Soils along the Route D Alternative ROW have moderate to high potential for corrosion to uncoated steel and a low to moderate potential for corrosion to concrete. Expansion potential for the soils varies from low to high. 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.13-10) 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. Therefore there is a significant impact. Accordingly, implementation of Mitigation Measure G-3a (Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design) would ensure that impacts associated with problematic soils are reduced to less than significant levels (Class II).

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

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

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. Landslides and rock-falls would potentially cause damage to project structures along moderate to steep slopes as the Route D Alternative alignment crosses the Cuyamaca Mountains. SDG&E's GEO-APM-4 and -8 (see Table D.13-10) would partially reduce impacts related to landslide hazards during operations of the project. However unidentified unstable slopes or areas of potentially unstable slopes would potentially fail during the lifetime of the Route D Alternative. Slope failures would potentially cause collapse of project structures resulting in power outages, damage to nearby roads or structures, and injury or death to nearby people. Therefore there is 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.3.13.3 Central South Substation Alternative

The Route D Alternative would require use of the Central South Substation Alternative in order to convert from 500 kV to 230 kV. This substation would be located on private land at the north end of the Route D Alternative segment and along the proposed route's 230 kV segment, west of the crossing of the San Diego River gorge. Figure E.3.1-2 illustrates the location of the substation.

Environmental Setting

Geology. The Central South Substation Alternative is located on a gently sloping plateau along crest of Dye Mountain and is underlain by mixed granitic and metamorphic rocks (gr-m). Descriptions of this unit are listed in Table D.13 1.

Slope Stability. The Central South Substation Alternative is located on a gently sloping plateau near the top of Dye Mountain. This site is not located on or adjacent to any mapped landslides and slopes in the area are underlain by granitic bedrock units which are not typically prone to landslides.

Soils. The Central South Substation Alternative is underlain by the Sheephead–Rock Outcrop–Bancas (s1016) soil association which is formed in material weathered from the underlying granitic and metamorphic rocks. Basic characteristics of this soil association are presented in Table D.13-2. The risk of erosion for off-road/off-trail soils ranges from slight to severe, and for on-road/on-trail soils ranges from slight to moderate. Shrink/swell (expansive) potential of this soil association varies from low to moderate. Corrosive potential of soils at the Central South Substation Alternative site are moderate for uncoated steel and low to moderate for concrete.

Mineral Resources. No known active BLM mining claims are identified at or near this site. Additionally, no known mineral resource sites were identified by the MRDA database or by the CGS (CDMG, 1999). Therefore construction and operation of the Central South Substation Alternative is not expected to interfere with future access to any mineral resources.

Seismicity. The Central South Substation Alternative is not crossed by any known active faults and is not likely to experience damage due to fault rupture and or offset. No active faults are located in the immediate vicinity of this alternative. The site is only expected to experience minor groundshaking, estimated PGAs of 0.2g to 0.3g, due to earthquakes on nearby faults (CGS, 2006) which is not likely to cause damage to substation structures. There is no potential for liquefaction at the site as it is entirely underlain by granitic bedrock. The gently sloping to level terrain at this site would not likely experience seismically triggered landsliding or slope failures.

Environmental Impacts and Mitigation Measures

Construction Impacts

No desert pavement is mapped along the Central South Substation Alternative and thus Impact G-2 (Unique geologic features would be damaged due to construction activities) is not expected to occur at this site. No construction impacts related to construction triggered slope failures (Impact G-6) would occur associated with this substation alternative due to the level to gently sloping terrain of the site. No impacts associated with this alternative would occur from construction activities interfering with access to known mineral resources (Impact G-9).

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

Excavation and grading for foundations, trenches, work areas, access roads for construction of the Central South Substation Alternative would potentially loosen soil and trigger or accelerate erosion. Soils along at the site have an erosion hazard for off-road/off-trail ranges from slight to severe and for on-road/on-trail ranges from slight to moderate. SDG&E's GEO-APM-1, -2, -5, and -6 (see Table D.13-10) 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, which would further limit potential soil erosion at the site during construction. This would result in a less than significant impact (Class III).

Operational Impacts

There would be no impacts associated with this alternative on project structures due to seismically induced groundshaking and/or ground failure (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) due to lack of proximity to active faults, the underlying granitic terrain, and the gently sloping terrain at the site.

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

Soils at the Central South Substation Alternative site have a moderate potential for corrosion to uncoated steel and a low to moderate potential of corrosion to concrete. Expansion potential for the soils is 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.13-10) 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 would potentially result in power outages, damage to nearby roads or structures, and injury or death to nearby people. Therefore there is a significant impact. Accordingly, implementation of Mitigation Measure G-3a (Conduct geotechnical studies for soils to assess characteristics and aid in appropriate foundation design) prior to final project design would ensure that impacts associated with problematic soils are reduced to less than significant levels (Class II).

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

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

E.3.13.4 Future Transmission System Expansion

For the Proposed Project and route alternatives along the Proposed Project route, Section B.2.7 identifies Future Transmission System Expansion routes for both 230 kV and 500 kV future transmission lines. These routes are identified, and impacts are analyzed in Section D of this EIR/EIS, because SDG&E has indicated that transmission system expansion is foreseeable, possibly within the next 10 years. For the SWPL alternatives, 500 kV and 230 kV expansions would also be possible. The potential expansion routes for the Route D Alternative are described in the following paragraphs.

230 and 500 kV Future Transmission System Expansion

The Route D Alternative would begin at approximately MP I8-70 and would head northward until it reached the Central South Substation Alternative at approximately MP 114.5 of the Proposed Project. The Route D Alternative would convert to 230 kV at the Central South Substation and a double-circuit 230 kV line would be constructed southwest from that substation to the Sycamore Canyon Substation. The Central South Substation would accommodate up to six 230 kV circuits and an additional 500 kV circuit. Only two 230 kV circuits are proposed at this time, but construction of additional 230 kV circuits and a 500 kV circuit out of the Central South Substation may be required in the future. There are two routes that are most likely for these future lines; each is addressed below. Figure E.1.1-6 illustrates the potential routes of the future transmission lines.

Additional 230 and 500 kV circuits could follow the Proposed Project corridor starting at MP 114.5. The routes could either: (1) follow the Proposed Project corridor southwest to the Chicarita Substation and then follow the Proposed Project's 230 kV Future Transmission Expansion System (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). See Section D.13.2, D.13.7, D.13.8, and D.13.9 for the Geology, Mineral Resources, and Soils setting, impacts, and mitigation measures for the Central, Inland Valley, and Coastal Links of the Proposed Project. See Section D.13.11 for the Geology, Mineral Resources, and Soils setting, impacts, and mitigation measures for the Future Transmission System Expansion of the Proposed Project.