4.16 SOILS, GEOLOGY, AND SEISMICITY

This section analyzes and evaluates the potential impacts associated with the implementation of the project pertaining to soils, geology, and seismicity. The analysis includes a description of existing conditions and applicable regulations relating to soils, geology, and seismicity. The study area for the assessment is the same as the action alternative footprints described in Chapter 2, "Description of Alternatives."

4.16.1 Affected Environment

4.16.1.1 ENVIRONMENTAL SETTING

Physiography

The Alpine Meadows Ski Area (Alpine Meadows) is located in the Bear Creek Valley, and the Squaw Valley Ski Area (Squaw Valley) is located in the Olympic Valley. The Bear Creek and Olympic Valleys are classic alpine glacial valleys. Both are southeastern-facing and located northwest of Lake Tahoe. They rise from elevations between 6,200 feet and 6,900 feet above sea level (asl) to mountain peaks that rise to over 9,000 feet asl. The alternatives are proposed across a roughly 2-mile span through the steep, mountainous terrain between the two valleys (Exhibit 4.16-1).

The steep topography, geology, mountain climate, geomorphic processes, historic land use, and vegetation cover conditions in the Bear Creek watershed in Bear Creek Valley and the Squaw Creek watershed in Olympic Valley have contributed to erosion and sedimentation problems including stream channel instability and sedimentation impacts to water quality. Water quality impacts are discussed in detail in Section 4.17, "Hydrology and Water Quality." Sediment source estimates from the Squaw Creek watershed total maximum daily load (TMDL) studies (Lahontan Regional Water Quality Control Board 2006:2) indicate that approximately 60 percent of the sedimentation affecting the creek is related to human disturbances. Most of the sediment originates from upslope natural and disturbed areas (Undisturbed [37 percent], Dirt Roads [25 percent], and Graded Ski Runs [24 percent]).

Geology

The project is located in the northern portion of the Sierra Nevada geomorphic province of California, in the northwestern block of the Lake Tahoe Basin that extends from the lake northward to Truckee. The geology of the eastern Sierra Nevada, including the project area, is composed of primarily Cretaceous-age intrusive granitic rocks and Late Tertiary-age basaltic andesite and pyroclastic volcanic rocks (Saucedo 2005). Sylvester et al. (2012:24) interpret the complex assemblage of faults, intrusive bodies, and remnants of lava flows and pyroclastic rocks exposed in the vicinity of Squaw Valley to be Pliocene age stratovolcanoes from volcanic vents on Squaw Peak and KT22 (Exhibit 4.16-2).

The project vicinity was largely shaped by alpine glaciers that resulted in classic U-shaped valleys with steep side walls and a flat valley floors. Quaternary age geologic units include abundant glacial deposits (outwash and moraine deposits), talus deposits, and colluvial and alluvial fan deposits at the junction of the valley side slopes and valley floors (Saucedo 2005). Several generations of glaciation are characterized by terrace deposits within the Truckee area, north of the site (Holdrege & Kull 2015:5). From youngest to oldest, these glaciations are the Tioga, Tahoe, Donner, and Hobart glaciations. The Tioga and Tahoe glaciations peaked approximately 20,000 and 70,000 years ago, respectively. Tioga till is extensive at the surface in the Bear Creek and Olympic Valleys, extending from cirque headwalls at elevations of over 8,000 feet, all the way down the valleys to their confluence with the Upper Truckee River.

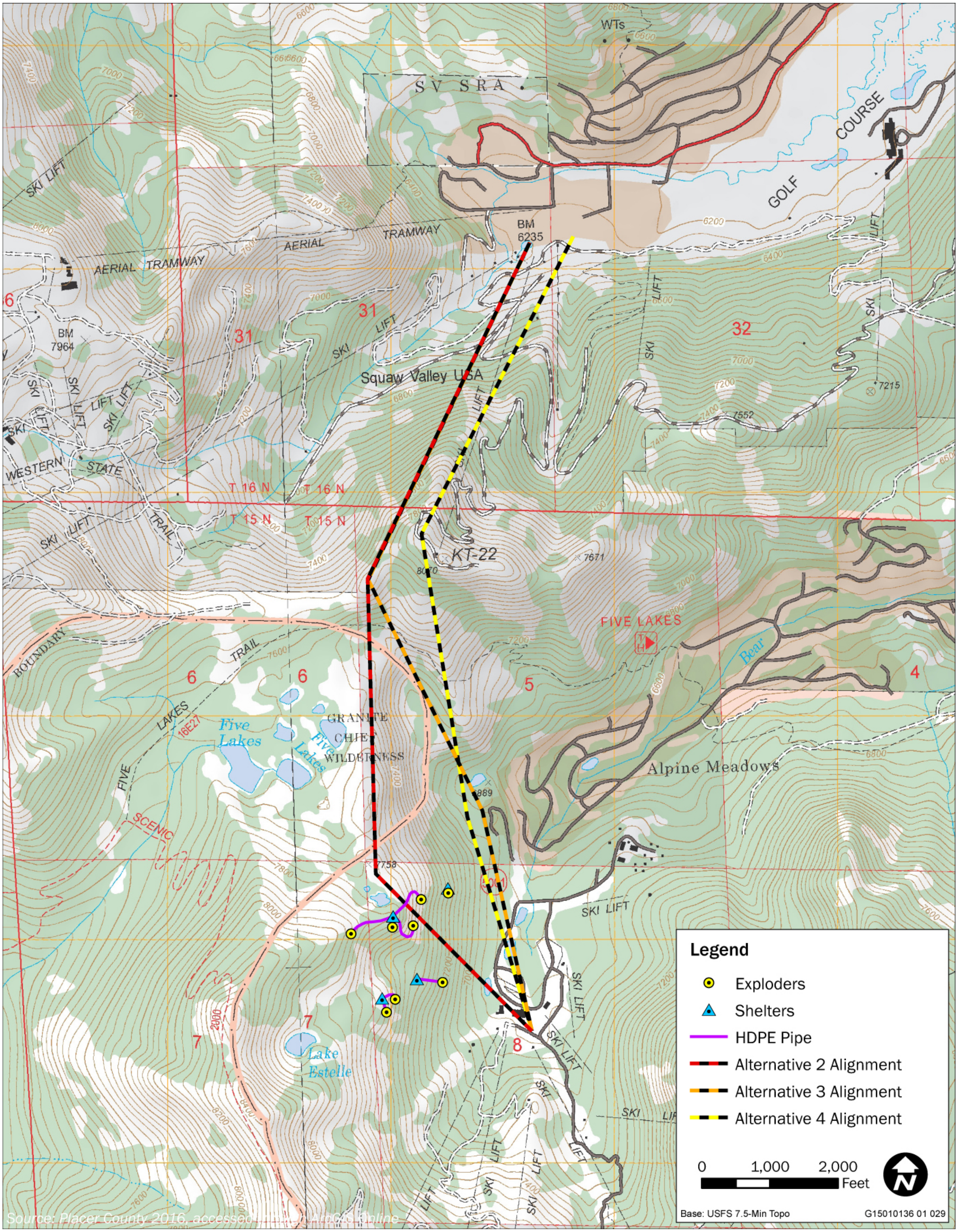
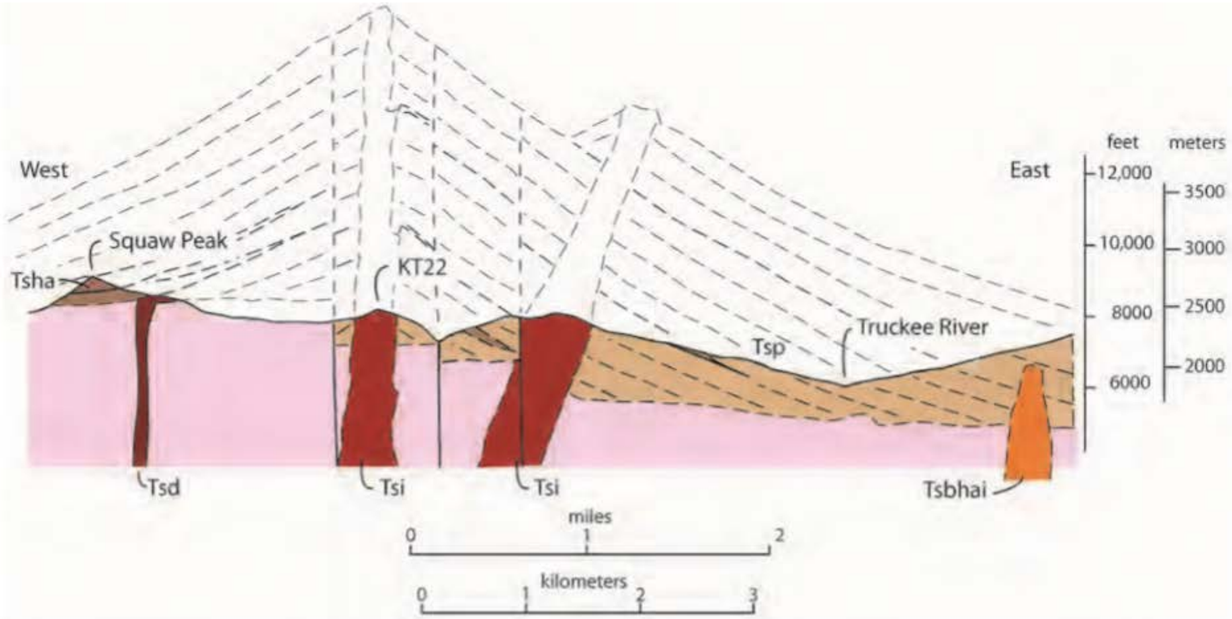


Exhibit 4.16-1 Topography of Project Area



Source: Sylvester et al. 2012:24

Exhibit 4.16-2 Interpretation of Faults, Intrusive Bodies, and Remnants of Lava Flows and Pyroclastic Rocks in the Vicinity of Squaw Valley

The Squaw Valley base station locations under all action alternatives would be located on Holocene/Pleistocene alluvial fan deposits (Qf) and Quaternary till (Qt) (Saucedo 2005) (Exhibit 4.16-3). The upper unit is about 10–20 feet thick, consisting of unconsolidated stream channel sands and fine (clay/silt) overbank deposits associated with the post-glacial meadow processes. The alignments for Alternatives 2 and 3 then head southwest over Pliocene basalt and andesite intrusive rocks (Pib/Pia) toward Cretaceous/Jurassic granite and granodiorite (KJgd/KJgr). The Squaw Valley mid-station under Alternatives 2 and 3 is located within these units. Under Alternative 4, the Squaw Valley mid-station is located farther northeast within Pliocene volcanic units (andesite). The alignment for Alternative 2 then heads directly south to the Alpine Meadows mid-station which is also located on Cretaceous and/or Jurassic granodiorite. Alternatives 3 and 4 take a more southeastern trajectory over Cretaceous and/or Jurassic granite and granodiorite (KJgr) to the Alpine Meadows mid-station. The Alpine Meadows base terminal is also proposed in Quaternary till (Qt).

Faulting and Seismicity

Seismic Conditions

The Donner Pass region and the north end of Lake Tahoe lie in a tectonically active area. Eastern Placer County is in the seismically active border with the Basin and Range province (Placer County 2016:4-66). Within this region is the Tahoe-Sierra Frontal Fault Zone (Howle et al. 2012:1087). This zone of faults stretches north northwestward across the west part of the Tahoe basin from Carson Pass through Donner Pass and continues north (Schweickert et al. 2004:311). A U.S. Geological Survey study concluded that faults in the Tahoe-Sierra frontal fault zone pose a substantial seismic hazard for the Lake Tahoe region and could generate earthquakes with magnitudes ranging from 6.3 to 6.9 (Geological Society of America 2012:1). There is a high potential for the project area to be subject to at least moderate shaking from earthquake activity one or more times over the next century. The probability of earthquake shaking in the next 50 years in eastern Placer County along the State Route 89 corridor between Lake Tahoe and Truckee is estimated to be 21–30 percent (Placer County 2016:4-74).

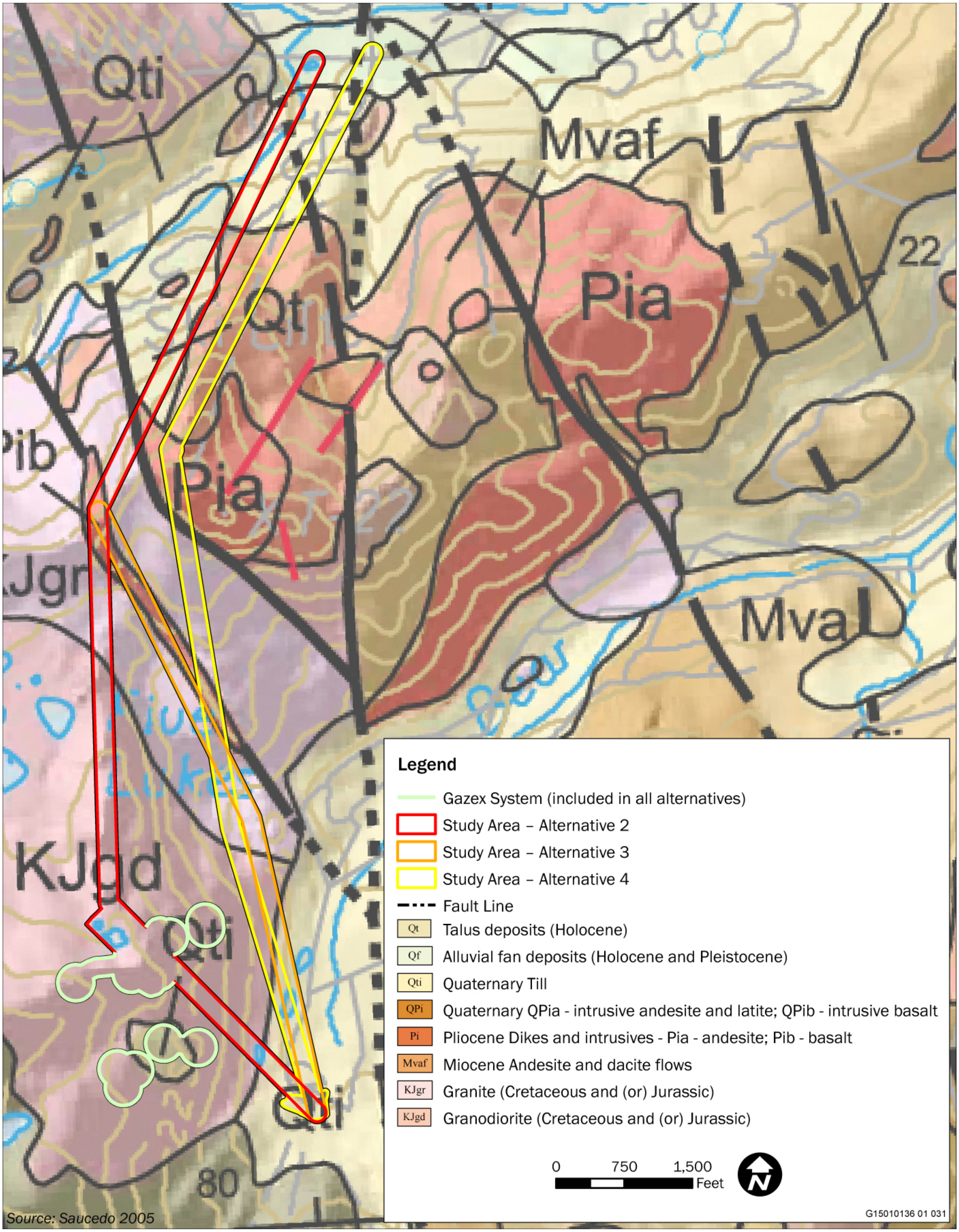


Exhibit 4.16-3 Geology of Project Area

The project site is not located in a designated Alquist-Priolo active fault zone (Holdrege & Kull 2015:14).

Faults and Fault Rupture

Geologic maps show several active and potentially active faults located near the project area. Several fault strands have been mapped on the floor of Lake Tahoe (Schweickert et al. 2004:303), three of which extend onto land at the north end of the lake: The West Tahoe-Dollar Point Fault and two splays from it termed the Carnelian Bay and Agate Bay faults. The Dog Valley fault, approximately 4.6 miles northeast; a group of unnamed faults approximately 6.5 to 8 miles northeast; and the Polaris fault, approximately 10 miles northeast, are other potentially active faults in the vicinity. Earthquakes associated with these faults may cause strong ground shaking in the project area.

In addition to damage from ground shaking, rupture of one or more faults in the vicinity could result in damage to structures; however most of the fault traces in the project area appear to be inactive and represent joint patterns in rock formations rather than active faults (Holdrege & Kull 2015:14).

Ground Failure/Liquefaction

Secondary seismic hazards can result from ground shaking and may include liquefaction and ground failure. Liquefaction is a phenomenon wherein loose, saturated, granular soil deposits lose shear strength because of excess pore water pressure. Cyclic loading, such as what could occur during an earthquake, typically causes the increase in pore water pressure and subsequent liquefaction. Based on the results of a site assessment conducted by Holdrege & Kull (2015:14), the near-surface soil near the base stations of the gondola consist of medium dense to dense granular soil types. The sloping portions of the site are rock with little to no overlying soil. These soil profiles have a low potential for liquefaction and related ground failure (Holdrege & Kull 2015:14).

Subsidence

Land surface subsidence can be induced by tectonic deformations and seismically induced settlements. Lateral spreading is the horizontal movement of fractured rock or soil toward an open face, such as a streambank or the open side of fill embankments, resulting from liquefaction of adjacent materials. The potential for failure from subsidence and lateral spreading is highest in areas where there is a high groundwater table, where there are relatively soft and recent alluvial deposits, and where creek banks are relatively high. The project area does not generally contain areas of recent alluvial deposits, high ground water, or creek banks; therefore, there is a low potential for subsidence or lateral spreading in the proposed gondola alignments.

Soils

Several different soil types are mapped by the Natural Resources Conservation Service (NRCS) across the project area, including units from the Rock Outcrop, Ledford, Meiss, Tallac, and Tinker Series (NRCS 2014) (Exhibit 4.16-4).

Soil throughout most of the project area is very thin and those mapped in the Rock Outcrop Series include Rock outcrop, granitic (GRG); Rock outcrop, volcanic (VRG); and Ledford variant-Rock outcrop complex, 30- to 75-percent slopes (WRG). The Rock Outcrop soil units are described as unweathered bedrock with an average thickness of 0–4 inches. The Ledford variant-Rock outcrop complex (WRG) soil unit is formed on mountain slopes, is excessively drained, has a high permeability rate, and is typically underlain by bedrock at shallow depths. The Meiss-Rock Outcrop complex (MIG3) is also is underlain by bedrock at shallow depths.

The Tallac Series soil units (TAE, TAF, TBE, TBF, THF) are mapped in the area of the base stations and along the slopes immediately adjacent to the valley floor within Squaw Valley. The Tallac soil units generally form on glacial moraines, are moderately well drained, have a moderately low to moderately high permeability rate and an average depth to the water table of 42–60 inches.

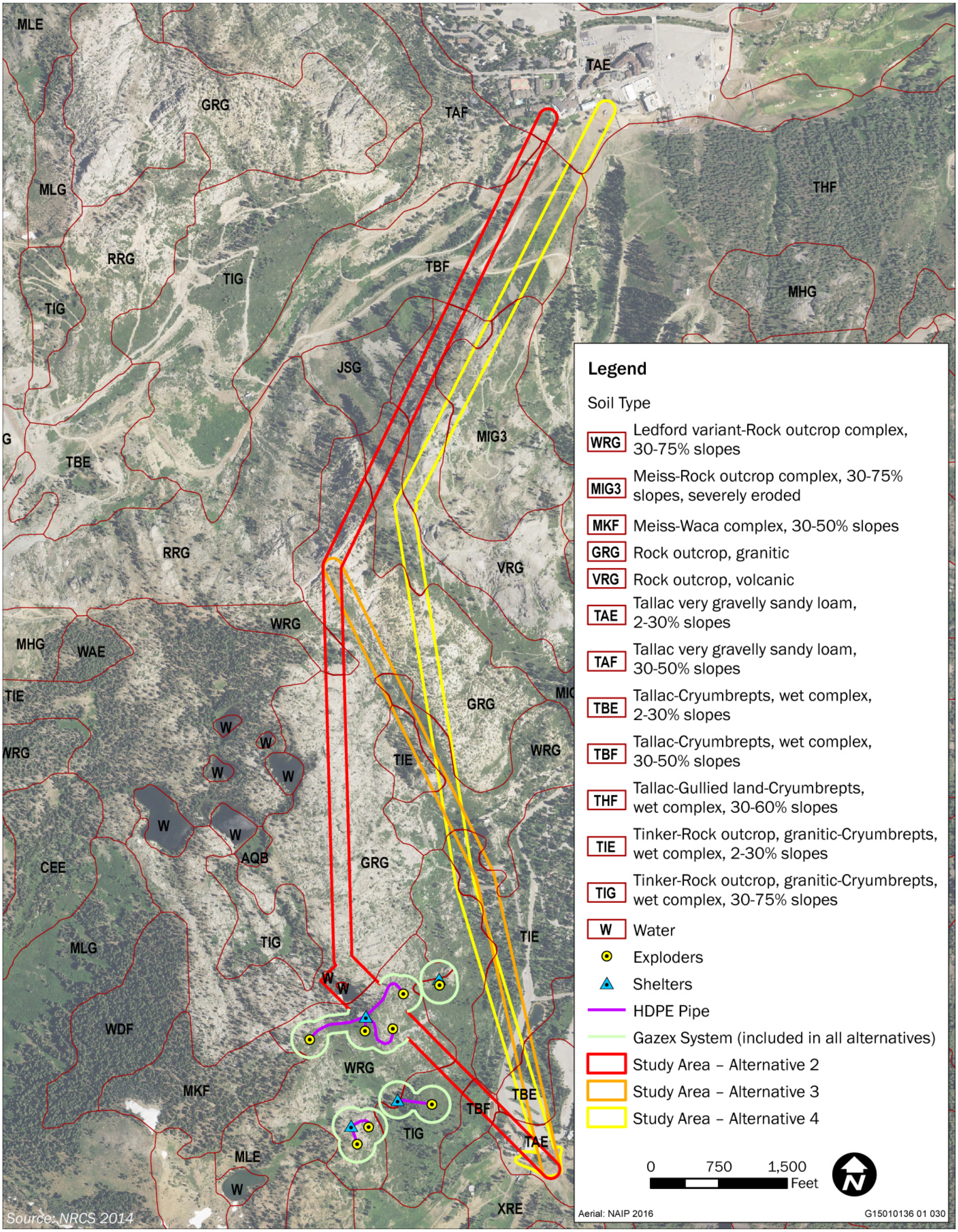


Exhibit 4.16-4 Soils of Project Area

The Tinker Series soil unit is mapped along the slopes above Alpine Meadows near the south segment of the gondola alignments (TIE, TIG). This unit typically forms on glacial moraines, is well drained, has a very low to moderately low permeability rate and an average depth to the water table exceeding 80 inches.

The corridors along which the gondola would be installed under the action alternatives contain soils within Tahoe National Forest (TNF) Soil Groups A and C. Soil Group A consists of highly erodible, granite-derived parent material. These soils are generally thin and poorly developed and are easily detached from the granitic substrate below. The central segment (between the Alpine Meadows mid-station and the Squaw Valley mid-station) is principally bald-faced granite outcroppings with an occasional thin veneer of this coarse soil. These soils are highly susceptible to erosion with even light disturbance; therefore, movement of equipment over this terrain, and installation of towers could result in loss of soil. Because soils in Soil Group A are not effective at propagating and maintaining vegetative cover, maintenance of soil productivity requires a much higher level of soil coverage than that which is currently present over this area. On slopes greater than 35 percent, the minimum soil coverage required for soils in Group A is 70 percent, and as high as 90 percent on slopes over 50 percent.

Soil Group C soils comprise the rest of the action alternative corridors. Group C soils in the project area include Tallac, Tinker, and Ledford. If left undisturbed, these soils are not prone to excessive sedimentation because of their hydrologic characteristics. These soils, however, have a deeper profile relative to other soils within the TNF, and are more supportive of forest vegetation, especially relative to Group A soils. To maintain soil productivity, Group C soils require 40-percent coverage at slopes greater than 35 percent, and 65-percent coverage at slopes greater than 50 percent.

Common limitations for project area soil types are discussed below.

<u>Erosion Potential</u>

Erosion is the process by which soil and rock are broken down and transported to a different location. Erosive processes include rainfall, surface runoff, glacial activity, wind abrasion, chemical dissolution, and gravity in the form of mass wasting. Human activities can accelerate the rate of erosion, causing a wide variety of detrimental effects including sedimentation of waterways, slope instability, and loss of productivity. The primary erosive forces present within the plan area are water and wind erosion.

Factors that influence the erosion potential of a soil include vegetative cover; soil properties such as soil texture, structure, rock fragments and depth; steepness and slope length; and climatic factors such as the amount and intensity of precipitation. The NRCS soil surveys provide an erosion hazard rating (NRCS 2014). This rating is based on slope and soil erosion factor (K). The predicted soil loss is caused by sheet or rill erosion (which happens when shallow flows of water causing sheet erosion are concentrated into rills and increase both in speed and scouring capacity) areas where 50–75 percent of the surface has been exposed by disturbance. The hazard is described as “slight,” “moderate,” “severe,” or “very severe.” A rating of “slight” indicates that erosion is unlikely under ordinary conditions; “moderate” indicates that some erosion is likely and that erosion-control measures may be needed; “severe” indicates that erosion is very likely and that erosion-control measures, including revegetation of bare areas, are advised; and “very severe” indicates that significant erosion is expected, loss of soil productivity and off-site damage are likely, and erosion-control measures are costly and generally impractical (NRCS 2014).

The erosion potential of soils within the project area generally range between 0.10 and 0.15 (NRCS 2014), which are low erodibility ratings. Ratings are low because of the low runoff potential of the soil. Because the soils allow for the free and unimpeded transmission of water through the soil when fully saturated, less water flows over the soil, reducing the amount of soil that would be eroded by water action.

As identified above, soil throughout most of the central part of the action alternative alignments is very thin and mapped as Rock outcrop, granitic (GRG), Rock outcrop, volcanic (VRG), and Ledford variant-Rock outcrop complex, 30- to 75-percent slopes (WRG). The GRG and VRG units are not rated for erosion hazard. However, the off-trail/off-road, and trail erosion hazard for the WRG unit is classified as very severe. Although the erosion hazard is high, the depth to bedrock is shallow and therefore there is minimal soil available to erode.

The Tallac Series soil units (TAE, TAF, TBE, TBF, THF) occupy the area of the base stations and along the slopes immediately adjacent to the valley floor within Squaw Valley. The Tallac soil units generally have a moderate erosion hazard for both off-trail/off-road and trail; however, the soils with slopes greater than 30 percent have a severe soil hazard rating.

The Tinker Series soil unit (TIE, TIG) occurs along the slopes above Alpine Meadows near the south segment of action alternative alignments. The erosion hazard is classified as moderate except where slopes exceed 30 percent, where it is classified as very severe. Though the erosion hazard can be high, the depth to bedrock is shallow and therefore and therefore there is minimal soil available to erode.

Depth to Bedrock

Depth to bedrock is a potentially limiting feature of soils depending on the planned land use and relative depth to a restrictive soil horizon. If excavation is required for construction or development activities, bedrock can pose challenges to engineering design. Depth to bedrock or duripan (cemented soil horizon) in the project area is between zero and 41 inches, depending on the soil type (NRCS 2014).

Expansive Soils

Expansive soils (also known as shrink-swell soils) contain expansive clay minerals that can absorb significant amounts of water and are prone to large changes in volume in response to changes in water content. When an expansive soil becomes wet, water is absorbed, and it increases in volume, and as the soil dries it contracts and decreases in volume. This (often-repeated) change in volume can produce enough force and stress on buildings and other structures to damage foundations and walls.

One measure of the shrink-swell potential of a soil is linear extensibility. Linear extensibility is a measure of the change in volume of a soil dried from a completely saturated state in a laboratory setting. Generally, it is reported as a percent change. Soils with less than 3-percent volume change are classified as having a low shrink-swell potential. The soils within the project area do not contain a significant amount of clay, and as a result have a low linear extensibility of approximately 1.5 percent.

Mass Wasting

Slope Stability

Slope instability includes landslides, debris flows, and rock fall. The project area is located on the steep slopes of Squaw Valley and Alpine Meadows, which have potential for landslides, debris flows, and rock fall. No landslides are located within the areas of the alignments and the potential for them to occur in the site area is low because of the relatively competent nature of underlying and adjacent materials (Holdrege & Kull 2015:6). There is one small scar from a small landslide east of Alternatives 3 and 4 (Holdrege & Kull 2013:6). The slide is located in volcanic soil, is only about 100 square feet in area, and about 1 foot deep. It appears to be a small translational slide that was saturated and failing on the shallow rock surface. Small debris flows and flash floods have occurred in the past in the east and/or west gullies in the vicinity of the Alternative 3 and 4 alignments extending down to Alpine Meadows Road. However, because of the lack of or very thin soil at and above the site, debris flows cannot be very large. Debris flows and flash floods at the site are confined to small channels and are not a significant hazard (Holdrege & Kull 2013).

A debris flow occurred in the south fork of Squaw Creek during the 1997 New Year storm event (Holdrege & Kull 2015:6). It was a high energy event that carried a significant amount of sand and cobbles and caused damage to structures. Although storms as large as the 1997 event are uncommon, rain-on-snow events are common, and there is the potential for similar debris flow events to occur in the project area from seismic activity or during large storm events.

Rock falls are relatively rare and unpredictable events. Because of the relatively gentle topography at the end terminals, potential damage because of rock falls in these locations is low. The planned alignment, although generally near ridge tops, traverses across talus slopes that may be prone to rock fall. The volcanic rock is closely fractured into relatively small irregular-shaped clasts that would have relatively low energy during a rock fall event. The granitic rock is strong, competent rock and rock falls are uncommon. The potential damage because of rock fall is low. In the event of a forest fire, the risk of landslide, debris flow, and rock fall may increase (Holdrege & Kull 2015:6). The increased occurrence of large wildfires in the western United States has increased the importance of understanding potential hazards posed by debris flows produced by burned watersheds (Cannon et al. 2010:127). The variables most strongly correlated with the occurrence of debris flow after wildfire are relief ratio (high relief ratios indicate steep slopes); basin ruggedness; percent of area burned (and at what severity); and soil characteristics, such as the sorting of the burned soil grain-size distribution, available water capacity, percent clay, soil thickness, and soil permeability (Cannon et al. 2010:132). The percent of the basin burned at a combination of high and moderate severities and the average storm intensity were significantly correlated with debris-flow occurrence after a wildfire. Soil properties, including the percent clay, percent organic matter, hydrologic group, liquid limit, and sorting of the burned soil grain-size distribution, were also identified as significant factors with debris flow occurrence after wildfire (Cannon et al. 2010:132).

Avalanches

Snow avalanches are a natural phenomenon resulting from the interaction of site-specific terrain, weather, and snowpack conditions. Because these factors are highly variable in any given year, determining return probabilities for potentially destructive avalanches is imprecise. In the 1980s, Placer County commissioned studies of avalanche hazard zones and produced maps delineating avalanche hazard areas. These hazard areas were divided into four categories displaying the anticipated probability of avalanche. The resulting avalanche hazard maps became the basis for Placer County's Potential Avalanche Hazard Area (PAHA) maps, which designate areas that are subject to potential avalanche danger with an occurrence probability of more than 1 in 100 per year. In determining land uses within these areas, the greatest concern is the determination of the maximum size avalanche that individual paths can produce (design avalanche) and the return period (e.g., 1 in 100 per year) of the design avalanche for individual avalanche paths. The PAHA maps were incorporated into the Placer County Avalanche Ordinance, which provides specifications for development within the PAHAs (Heywood 2013:1)

As noted above, Squaw Valley and Alpine Meadows are in a steep mountainous area that is subject to high energy mass movements including snow avalanches. Portions of the project area are within potential avalanche run out zones. Snow instability and avalanches in the Sierra Nevada predominately occur during or immediately after heavy precipitation. Specific meteorological conditions can increase the risk that an avalanche will occur. The Sierra Nevada and Alpine Meadows are located in a maritime climate with a maritime snowpack which tends to be deep, warm, and strong (Heywood 2013:5). Some of the characteristics of a maritime climate and snowpack include deep snowpacks (over 3 meters), warm temperatures (20–40°F), high-density snow (10–20 percent ice by volume), and frequent storms with high precipitation rates. Under these conditions, most avalanches occur as "direct action" avalanches (i.e., the avalanche is directly caused by precipitation or wind), and they tend to occur during or immediately following storms (Heywood 2013:5). Midwinter rain events are common and wet avalanches can occur throughout winter (Heywood 2013:5).

Active avalanche mitigation involves frequently triggering small slides to help reduce the potential buildup of enough snow to result in large avalanches. Passive avalanche mitigation or protection involves avoidance of avalanche areas or construction of snow stabilizing, resisting, or deflecting structures. Because of the potential for avalanches, the Squaw Valley and Alpine Meadows Ski Patrols routinely perform avalanche control operations including clearing the area of avalanche hazard. The primary methods of active avalanche control are detonation of "hand charges" placed by ski patrol staff and triggering of avalanches by firing artillery at Alpine Meadows. There is also one Gazex exploder (the same device included as part of the proposed project) used at Squaw Valley.

Based on a review of the Wilson 1982 Placer County Avalanche Ordinance PAHA Map, Heywood 2014 PAHA Map, and Mears 1987 Placer County Avalanche Map, avalanche paths are mapped in the three proposed gondola alignments (Exhibit 4.16-5). Based on the Heywood report (2014:24), a portion of the north segment of Alternatives 2 and 3 gondola alignment is in the Powder Horn Avalanche path. This avalanche

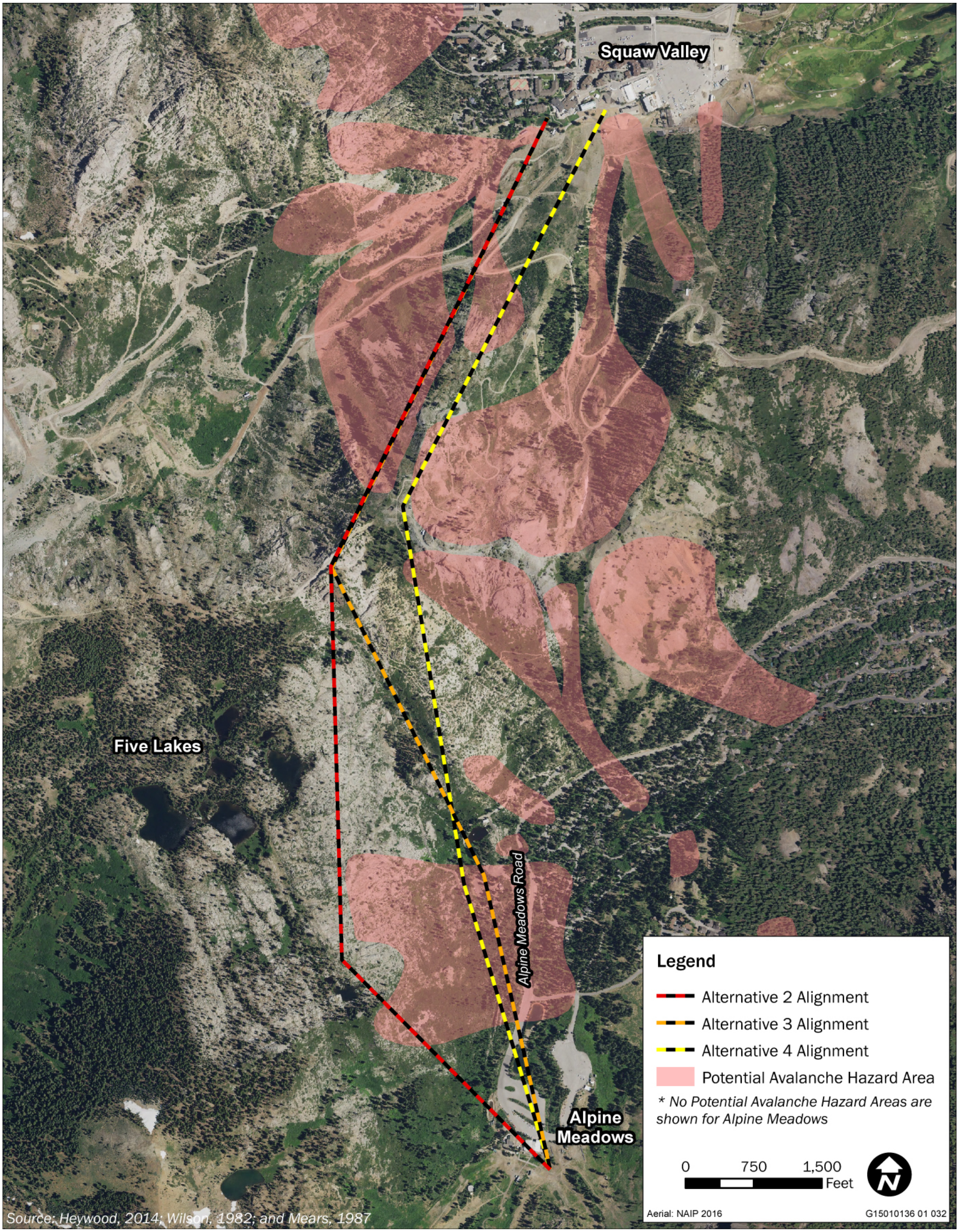


Exhibit 4.16-5 Avalanche Paths

path is a large complex path that has produced large destructive avalanches. A portion of the north segment of the proposed gondola alignment for Alternative 4 is in the Exhibition Gully Avalanche Path. The southern portion of all three gondola alignments pass through a mapped PAHA. The Alpine Meadows mid-stations for Alternatives 3 and 4 are located within a mapped PAHA. The gondola alignment near the Alpine Meadows base terminal also passes through the path of a massive avalanche that occurred on the slopes west and north of the Alpine Meadows Lodge in 1982, which resulted in significant property damage and deaths.

4.16.1.2 REGULATORY SETTING

Federal

Federal Earthquake Hazards Reduction Act

In October 1977, the U.S. Congress passed the Earthquake Hazards Reduction Act to reduce the risks to life and property from future earthquakes in the United States. To accomplish this, the act established the National Earthquake Hazards Reduction Program (NEHRP). The mission of NEHRP includes improved understanding, characterization, and prediction of hazards and vulnerabilities; improved building codes and land use practices; risk reduction through post-earthquake investigations and education; development and improvement of design and construction techniques; improved mitigation capacity; and, accelerated application of research results. The NEHRPA designates the Federal Emergency Management Agency as the lead agency of the program and assigns several planning, coordinating, and reporting responsibilities. Other NEHRPA agencies include the National Institute of Standards and Technology, National Science Foundation,

Tahoe National Forest Land and Resource Management Plan and Sierra Nevada Forest Plan Amendment Record of Decision

The *Tahoe National Forest Land and Resource Management Plan* (LRMP) (U.S. Forest Service 1990) came into effect in 1990 and was amended by the Sierra Nevada Forest Plan Amendment Record of Decision (SNFPA) in 2004 (U.S. Forest Service 2004). The LRMP and SNFPA are collectively referred to as the Forest Plan. Forest-wide direction is presented in goals and objectives and in standards and guidelines (S&Gs) in the Forest Plan. Area-specific direction is detailed in the management direction guides for each of the 106 management areas of TNF. The following forest goals are applicable to this discussion of soils, geology, and seismicity:

- maintain or improve soil productivity and prevent excessive, cumulative watershed impacts, and
- conserve soil and water resources and prevent activities that will significantly or permanently impair the productivity of the land.

Forest Plan S&Gs are outlined to maintain effective soil cover. Soil is described as being in acceptable condition after land disturbance activity when

> the effective soil cover on an activity area is (1) the minimum amount shown in [Table 4.16-1], or (2) the minimum amount prescribed for a specific site by a qualified earth science specialist after on-site investigation.... Effective soil cover includes all materials that will dissipate the energy of falling raindrops. Included are plant litter and forest duff (which can be intact, displaced, or disturbed), woody material in contact with the soil, living vegetation, and rock fragments of a diameter of 0.5 to 3 inches.

The LRMP places emphasis on riparian and streamside guidelines and soil and water improvement projects to maintain and improve the watershed conditions. Soil resource management and monitoring are encouraged in forest practices to reduce and assess soil impacts, respectively.

As part of the analysis conducted for this Draft EIS/EIR, specific S&Gs identified in the Forest Plan related to soils, geology, and seismicity were applied and evaluated for consistency.

State

Seismic Hazards Mapping Act

The intention of the Seismic Hazards Mapping Act of 1990 (PRC Section 2690–2699.6) is to reduce damage resulting from earthquakes. While the Alquist-Priolo Act addresses surface fault rupture the Seismic Hazards Mapping Act addresses other earthquake-related hazards, including strong ground shaking, liquefaction, and seismically induced landslides. The act's provisions are similar in concept to those of the Alquist-Priolo Act: The state is charged with identifying and mapping areas at risk of strong ground shaking, liquefaction, landslides, and other corollary hazards, and cities and counties are required to regulate development within mapped Seismic Hazard Zones. Under the Seismic Hazards Mapping Act, permit review is the primary mechanism for local regulation of development. Specifically, cities and counties are prohibited from issuing development permits for projects in Seismic Hazard Zones until appropriate site- specific geologic or geotechnical investigations have been carried out and measures to reduce potential damage have been incorporated into the development plans.

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act of 1972 (PRC Section 2621–2630) intends to reduce the risk to life and property from surface fault rupture during earthquakes by regulating construction in active fault corridors and prohibiting the location of most types of structures intended for human occupancy across the traces of active faults. The act defines criteria for identifying active faults, giving legal support to terms such as active and inactive and establishes a process for reviewing building proposals in Earthquake Fault Zones. Because no designated Alquist-Priolo fault zones are located in the project area, this issue is not discussed further.

California Building Code

The California Building Code (CBC) (California Code of Regulations, Title 24) is based on the International Building Code (IBC). The IBC Seismic Zone Map of the United States designates Placer County, including the project area, within Seismic Hazard Zone III, which corresponds to an area that may experience damage because of earthquakes having moderate intensities of V or more on Modified Mercalli Scale, which corresponds to maximum momentum magnitudes of 4.9 or greater. The CBC has been modified for California conditions with more detailed and/or more stringent regulations. Specific minimum seismic safety and structural design requirements are set forth in Chapter 16 of the CBC. The CBC identifies seismic factors that must be considered in structural design. Chapter 18 of the CBC regulates the excavation of foundations and retaining walls, while Chapter 18A regulates construction on unstable soils, such as expansive soils and areas subject to liquefaction. Appendix J regulates grading activities, including drainage and erosion control.

Local

Placer County General Plan

The relevant policies of the *Placer County General Plan* (Placer County 2013) with respect to seismic and geologic hazards and avalanche hazards are listed below:

- **Policy 8.A.1.** The County shall require the preparation of a soils engineering and geologic-seismic analysis prior to permitting development in areas prone to geological or seismic hazards (i.e., groundshaking, landslides, liquefaction, critically expansive soils, and avalanche).

- **Policy 8.A.2.** The County shall require submission of a preliminary soils report, prepared by a registered civil engineer and based upon adequate test borings, for every major subdivision and for each individual lot where critically expansive soils have been identified or are expected to exist.

- **Policy 8.A.4.** The County shall ensure that areas of slope instability are adequately investigated and that any development in these areas incorporates appropriate design provisions to prevent landsliding.

- **Policy 8.A.5.** In landslide hazard areas, the County shall prohibit avoidable alteration of land in a manner that could increase the hazard, including concentration of water through drainage, irrigation, or septic systems; removal of vegetative cover; and steepening of slopes and undercutting the bases of slopes.
- **Policy 8.A.6.** The County shall require the preparation of drainage plans for development in hillside areas that direct runoff and drainage away from unstable slopes.
- **Policy 8.A.7.** In areas subject to severe groundshaking, the County shall require that new structures intended for human occupancy be designed and constructed to minimize risk to the safety of occupants.
- **Policy 8.A.9.** The County shall require that the location and/or design of any new buildings, facilities, or other development in areas subject to earthquake activity minimize exposure to danger from fault rupture or creep.
- **Policy 8.A.10.** The County shall require that new structures permitted in areas of high liquefaction potential be sited, designed, and constructed to minimize the dangers from damage due to earthquake-induced liquefaction.
- **Policy 8.A.11.** The County shall limit development in areas of steep or unstable slopes to minimize hazards caused by landslides or liquefaction.
- **Policies 8.A.12 and 8.H.3 [the same language is in each policy].** The County shall not issue permits for new development in potential avalanche hazard areas (PAHA) as designated in the Placer County Avalanche Management Ordinance unless project proponents can demonstrate that such development will be safe under anticipated snow loads and conditions of an avalanche.
- **Policy 8.H.2.** The County shall require new development in areas of avalanche hazard to be sited, designed, and constructed to minimize avalanche hazards.

Placer County Grading Ordinance

Grading is subject to the Placer County Code, Chapter 15, Article 15.48 (Grading, Erosion and Sediment Control), which addresses when a permit is required and when grading is exempt from permit requirements. The most common activities requiring a grading permit include fill or excavation greater than 250 cubic yards; cuts or fills exceeding 4 feet in depth; structural retaining walls exceeding 4 feet in total height, as measured from bottom of footing to the top of the wall and/or supporting a surcharge; soil or vegetation disturbances exceeding 10,000 square feet; grading within or adjacent to a drainage course or wetland; or grading within a floodplain.

Placer County Avalanche Management Ordinance

Article 12.40 of the Placer County Code addresses Avalanche Management Areas and establishes the Placer County Avalanche Management Ordinance. The article describes PAHAs as those areas where, after investigation and study, the county finds that an avalanche potential exists because of steepness of slope, exposure, snow pack composition, wind, temperature, rate of snowfall, and other interacting factors. PAHA zones are established to identify those areas with avalanche potential and include areas where the annual probability of avalanche occurrence is greater than 1 in 100 based on the results of approved studies, or where avalanche damage is documented.

Placer County limits construction in PAHAs and will not issue a building permit for construction in a PAHA without certifying that the structure will be safe under the anticipated snow loads and conditions of an avalanche.

Squaw Valley General Plan and Land Use Ordinance

The Squaw Valley General Plan and Land Use Ordinance (SVGPLUO) addresses risks from snow avalanche that could affect development and incorporates County policies related to seismic safety (Placer County 2006). When adopted in 1983, the SVGPLUO included designated geologic hazard zones), including:

- high hazard zones (subject to frequent and powerful avalanches) and
- potential hazard zones (a transition area).

In high hazard zones (terrain exposed to frequent and powerful avalanches), no buildings or winter parking facilities should be permitted. In potential hazard zones (a transition area), some structures may be designed to withstand the potential avalanche forces. Lodges, schools, residences, or any buildings that encourage a gathering of people should not be constructed in either of these areas. Summer-only recreation facilities could be considered.

The SVGPLUO also requires that tree removal within avalanche zones be carefully planned to avoid the creation of long continuous openings that could enhance avalanche movement. Further, site-specific study and review is necessary for any developments on sites in potential avalanche hazard areas to determine the most appropriate type of development, if any, and the most effective protective systems for the site.

Other, less serious, considerations of the snow environment in the SVGPLUO include design of structures to withstand snow loads, placement of facilities to avoid snow drifting problems and icing conditions, and provision of convenient snow clearing services.

Highly erosive soils and their vegetative cover should not be disturbed by construction activity. Extensive disruption of soils through development activities in both the uplands and lowlands of the valley have caused the degradation of the quality of water in Squaw Creek in the past.

Alpine Meadows General Plan

The Alpine Meadows General Plan was written in 1968 with the long-term objective of including the greatest attainable convenience, prosperity, beauty, health, safety, and decency for the present and future inhabitants of the area and the areas directly related to it. Geology and soils are not specifically addressed in the plan but generally contains the goal of creating a balanced selection of living environments and recreational outlets, sensitive to the terrain and undisturbed by trafficways, pollution, excessive slopes, scarring and other deleterious effects.

4.16.2 Analysis Methods

4.16.2.1 METHODS AND ASSUMPTIONS

Evaluation of geologic, soil, and seismicity impacts was based on a review of documents pertaining to the project study area, including the California Geological Survey, U.S. Geological Survey, and the NRCS 2007 Soil Conservation Survey; geotechnical investigations; the Initial Study prepared for Alternative 2; EIRs; background reports prepared for plans and projects in the vicinity; and other geologic literature. The information obtained from these sources was reviewed and summarized to understand existing conditions and to identify potential environmental effects, based on the thresholds of significance. In determining the level of significance, the analysis assumes that the proposed project would comply with relevant federal, state, and local laws, regulations, and ordinances.

As described in Section 2.2.6, “Resource Protection Measures,” the project incorporates a number of Resource Protection Measures (RPMs) designed to avoid and minimize environmental effects. These RPMs are considered part of the project by the Forest Service and will be conditions of approval of the Placer County Conditional Use Permit (CUP). The text of all RPMs is provided in Appendix B. The potential effects of implementing the action alternatives are analyzed as follows: The effect of the action alternatives was determined, relevant RPMs were applied, and the effectiveness of reducing adverse effects was determined. If additional measures were needed to further reduce effects, they were identified.

As it relates to CEQA, the significance of impacts is determined before RPMs are implemented. The analysis then determines whether the RPMs would reduce significant impacts to a less-than-significant level. If significant impacts would remain, mitigation measures are added, as feasible, to further reduce the significant impact. All RPMs, as well as additional mitigation measures, would be included in the Placer County mitigation monitoring and reporting program, and their implementation would be ensured by the CUP's conditions of approval. All RPMs are considered roughly proportional and have an essential nexus to the impacts they reduce.

4.16.2.2 EFFECTS ANALYSIS AND SIGNIFICANCE CRITERIA

NEPA Indicators

An environmental document prepared to comply with NEPA must consider the context and intensity of the environmental effects that would be caused by or result from the action alternatives. Under NEPA, impacts should be addressed in proportion to their significance (40 CFR 1502.2[b]), meaning that severe impacts should be described in more detail than less consequential impacts. This is intended to help decision makers and the public focus on the project's key effects. The evaluation of effects considers the magnitude, duration, and significance of the changes. Changes that would improve the existing condition if they occur are noted and considered beneficial, and detrimental impacts are characterized as adverse. Where there would be no change, a "no effect" conclusion is used. The Forest Service has determined that the action alternatives could have an impact on soils, geology, and seismicity. The following analytical indicators are used to inform the Forest Service's determination of impacts:

- Identification and estimated quantification (acres) of temporary and permanent ground disturbance according to high/moderate/low erodibility soils classes, site geology and subsurface conditions, and slope stability concerns **(Impact 4.16-4)**
- Identification of seismicity and faulting concerns and the potential susceptibility of the proposed project to be impacted by or exacerbate these risks **(Section 4.16.2.3, "Issues Not Discussed Further")**
- Analysis of increased erosion hazard because of temporary and permanent ground disturbance **(Impact 4.16-4)**
- Inventory of erodible soils by soil map unit and field verification of these properties **(Impacts 4.16-3 and 4-16-4)**
- Identify best management practices (BMPs) to reduce soil erosion **(Impact 4.16-4)**

CEQA Criteria

Based on the Placer County CEQA checklist, Appendix G of the State CEQA Guidelines, and soils, geology, and seismicity policies and standards in the Placer County General Plan, implementing any of the alternatives would result in a significant impact related to soils, geology, and seismicity if it would:

- expose people or structures to unstable earth conditions or changes in geologic substructures **(Impact 4.16-1)**;
- result in significant disruptions, displacements, compaction, or overcrowding of the soil **(Section 4.16.2.3, "Issues Not Discussed Further")**;
- result in substantial change in topography or ground surface relief features **(Section 4.16.2.3, "Issues Not Discussed Further")**;
- result in the destruction, covering, or modification of any unique geologic or physical features **(Section 4.16.2.3, "Issues Not Discussed Further")**;
- result in any significant increase in wind or water erosion of soils, either on or off the site **(Impact 4.16-4)**;

- result in changes in deposition or erosion or changes in siltation which may modify the channel of a river, stream, or lake (Section 4.16.2.3, "Issues Not Discussed Further");
- result in exposure of people or property to geologic and geomorphological (i.e., avalanches) hazards such as earthquakes, landslides, mudslides, ground failure, or similar hazards (Impacts 4.16-1 and 4.16-2);
- be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse (Impact 4.16-3); or
- be located on expansive soil, as defined in Table 18 of the Uniform Building Code (1994, as updated), creating substantial risks to life or property (Impact 4.16-3).

4.16.2.3 ISSUES NOT DISCUSSED FURTHER

As discussed in the Initial Study prepared for the project (Appendix A), there are several resource areas that do not require further discussion. The project would not expose people or structures to potential adverse effect in the following resource areas:

Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault. Several unnamed fault traces are mapped in the project vicinity, and the exact location and nature of these faults has not been determined. However, the project area is not located within an Alquist-Priolo active fault zone. The gondola would be designed to withstand high winds and ice loads, and the flexibility inherent in the gondola line would readily tolerate horizontal and vertical displacements in excess of the magnitudes anticipated from a fault rupture (Holdrege & Kull 2015:14). In addition, the proposed project would not involve construction of habitable structures. Therefore, this impact is considered less than significant and will not be evaluated further in this Draft EIS/EIR.

Strong seismic ground shaking /Identification of seismicity and faulting concerns and the potential susceptibility of the proposed project to be impacted by or exacerbate these risks. As described above, several active and potentially active faults are located near the project area. Earthquakes associated with these faults may cause strong ground shaking in the project area. The extent of damage would depend on soil characteristics, groundwater depth, and duration and intensity of the earthquake. The majority of the project area is underlain by granite rock which has a low potential for strong ground shaking. In addition, the gondola would be designed flexibility that would readily tolerate ground shaking. The project design and construction would also conform to the standards contained within CBC Title 24, which identifies specific design requirements to reduce damage from strong seismic ground shaking, ground failure, landslides, soil erosion, and expansive soils. Therefore, this impact is considered less than significant and will not be evaluated further in this Draft EIS/EIR.

Seismic-related ground failure, including liquefaction. Liquefaction is the sudden temporary loss of strength in saturated, loose to medium dense, granular sediments subjected to ground shaking. Liquefaction can cause structure failure because of the reduction of foundation bearing strength. During a seismic event, the extent of damage from ground failure including liquefaction would depend on the soil characteristics, groundwater depth, and duration and intensity of the earthquake. The project site is primarily underlain by granite, with many locations having no overlying soil, and other areas having overlying soil of varying depth. The Preliminary Geotechnical Engineering and Geologic Review (Holdrege & Kull 2015:14) conducted for the project determined that the soils found within the project area have a low potential for liquefaction or lateral spreading because the project area is generally underlain by little to no soil overlying near surface rock. Although the Squaw Valley base terminal would be built in the current site of Cushing Pond, this is a constructed water body and the presence of the pond is not indicative of saturated soils. Project design and construction would conform to CBC Title 24, which identifies specific design requirements to further reduce damage from seismic-related ground failure, including liquefaction. Therefore, this impact is considered less than significant and will not be evaluated further in this Draft EIS/EIR.

Geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse/Result in significant disruptions, displacements, compaction, or overcrowding of the soil. As described above, significant adverse effects associated with landslide and liquefaction are considered unlikely. In addition, all new facilities would be designed to meet all applicable CBC engineering requirements to ensure that the facilities would not be affected by potential landslide, lateral spreading, subsidence, liquefaction, or collapse. The temporary access road associated with Alternative 2 will be constructed in compliance with the RPMs and BMPs and will be completely restored following construction activities. Therefore, this impact is considered less than significant and will not be evaluated further in this Draft EIS/EIR.

Expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994, as updated), creating substantial risks to life or property. Expansive soils are soils that are high in expansive clays or silts and that swell and shrink with wetting and drying, respectively. This shrinking and swelling can result in differential ground movement, which can cause damage to foundations. However, proper fill selection, moisture control, and compaction during construction can prevent these types of soils from causing significant damage.

The Preliminary Geotechnical Engineering and Geologic Review (Holdrege & Kull 2015:4) conducted for the project determined that the project area is generally underlain by little to no soil overlying near surface rock. Granitic rock is not considered an expansive soil. In addition, all construction and design would comply with the CBC, which has specific site development and construction standards by soil type to prevent expansive soil hazards. Therefore, this impact is considered less than significant and will not be evaluated further in this Draft EIS/EIR.

Result in changes in deposition or erosion or changes in siltation which may modify the channel of a river, stream, or lake. Erosion during construction of the base-to-base gondola is described in this section. Refer to Section 4.17, "Hydrology and Water Quality," for a discussion of erosion, sedimentation, and the loss of topsoil during project construction and operation including potential modification to rivers, streams, or lakes.

Soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water. The proposed project would not involve the use of septic tanks or alternative wastewater disposal systems that could be affected by poor soils. Therefore, no impact would occur related to the adequate support of such facilities.

Substantial change in topography or ground surface relief features. The proposed project would involve a change in topography at the Alpine Meadows base terminal to facilitate access to the terminal, but it would not be substantial. No other substantial changes in topography or ground surface relief are proposed.

Destruction, covering, or modification of any unique geologic or physical features. Although there would be blasting to construct the two mid-stations and some of the towers, it would not alter the character of granitic outcroppings or any unique geologic or physical feature.

4.16.3 Direct and Indirect Environmental Consequences

4.16.3.1 ALTERNATIVE 1 – NO ACTION ALTERNATIVE

Impact 4.16-1 (Alt. 1): Exposure of People and Structures to Mass Wasting Events

Alternative 1 – No Action Alternative would result in a continuation of existing conditions. There would be no new construction, and therefore it would not expose people or structures to mass wasting events. There would be **no effect** under NEPA.

Under Alternative 1 – No Action Alternative, the TNF and Placer County would not provide the necessary authorizations to allow construction of a gondola or Gazex avalanche control facilities. The outcome would be a continuation of existing conditions, with no new construction and no installation nor operation of new facilities. Therefore, there would be no change in exposure of people and structures to mass wasting events.

NEPA Effects Conclusion

With no new construction and no installation nor operation of new facilities, there would be **no effect** related to this issue.

CEQA Determination of Effects

With no new construction and no installation nor operation of new facilities, there would be **no effect** related to this issue.

Mitigation Measures

No mitigation measures are required.

Impact 4.16-2 (Alt. 1): Exposure of People and Structures to Avalanches

Alternative 1 – No Action Alternative would result in a continuation of existing conditions. There would be no new construction, and therefore no change in the exposure of people or structures to avalanches. There would be **no effect** under NEPA.

Under Alternative 1 – No Action Alternative, the TNF and Placer County would not provide the necessary authorizations to allow construction of a gondola or Gazex avalanche control facilities. The outcome would be a continuation of existing conditions, with no new construction and no installation nor operation of new facilities. Therefore, there would not be a change in exposure of people or structures to avalanches because there would be no change to existing conditions.

NEPA Effects Conclusion

With no new construction and no installation nor operation of new facilities, there would be **no effect** related to this issue.

CEQA Determination of Effects

With no new construction and no installation nor operation of new facilities, there would be **no effect** related to this issue.

Mitigation Measures

No mitigation measures are required.

Impact 4.16-3 (Alt. 1): Risks Associated with Soil Limitations

Alternative 1 – No Action Alternative would result in a continuation of existing conditions. There would be no new construction, and therefore no exposure of people or structures to risks associated with soil limitations. There would be **no effect** under NEPA.

Under Alternative 1 – No Action Alternative, the TNF and Placer County would not provide the necessary authorizations to allow construction of a gondola or Gazex avalanche control facilities. The outcome would be a continuation of existing conditions, with no new construction and no installation nor operation of new facilities. Therefore, there would be no new exposure of people or structures to risks associated with soil limitations.

<u>**NEPA Effects Conclusion**</u>
With no new construction and no installation nor operation of new facilities, there would be **no effect** related to this issue.

<u>**CEQA Determination of Effects**</u>
With no new construction and no installation nor operation of new facilities, there would be **no effect** related to this issue.

Mitigation Measures

No mitigation measures are required.

Impact 4.16-4 (Alt. 1): Excessive Erosion during Construction

Alternative 1 – No Action Alternative would result in a continuation of existing conditions. There would be no new construction, and therefore no excessive erosion or sedimentation. There would be **no effect** under NEPA.

Under Alternative 1 – No Action Alternative, the TNF and Placer County would not provide the necessary authorizations to allow construction of a gondola or Gazex avalanche control facilities. The outcome would be a continuation of existing conditions, with no new construction and no installation nor operation of new facilities. Therefore, there would be no potential for excessive erosion or sedimentation during construction because there would be no change to existing conditions.

<u>**NEPA Effects Conclusion**</u>
With no new construction and no installation nor operation of new facilities, there would be **no effect** related to this issue.

<u>**CEQA Determination of Effects**</u>
With no new construction and no installation nor operation of new facilities, there would be **no effect** related to this issue.

Mitigation Measures

No mitigation measures are required.

4.16.3.2 ALTERNATIVE 2

Impact 4.16-1 (Alt. 2): Exposure of People and Structures to Mass Wasting Events

Mass wasting events include landslides, debris flows, and rock fall. The steep terrain in the project area and areas of relatively unconsolidated geologic materials indicate that mass wasting events that might affect people and structures are possible. However, mass wasting events in the area are rare and the potential for mass wasting events to affect project facilities is low. Rock blasting would likely be required to construct components of Alternative 2, which has the potential to trigger mass wasting events. Under NEPA, and considering the NEPA indicators, absent RPMs and/or mitigation, direct and indirect effects related to mass wasting events would be **adverse** because of the potential for mass wasting to be triggered by rock blasting during construction of Alternative 2. RPM NOI-4 would mitigate this effect. Under CEQA, and using the CEQA criteria, effects related to mass wasting events would be **potentially significant** because construction of Alternative 2 would require rock blasting, which has the potential to trigger mass wasting events. RPM NOI-4 would reduce this effect, but not to a less-than-significant level. Under CEQA, this impact would remain **potentially significant.**

According to a geotechnical report prepared for the project, no historic landslides are located within the Alternative 2 gondola alignment and the potential for them to occur in the area is low because of the relatively competent nature of underlying and adjacent materials (Holdrege & Kull 2015:6).

A high energy debris flow occurred within the south fork of Squaw Creek during the 1997 New Year storm event. Although storms as large as the 1997 event are uncommon, there is the potential for similar debris flow events to occur in the project area from seismic activity or during large storm events. A debris flow path typically follows existing drainages. Infrastructure associated with Alternative 2 would not be constructed within drainages resulting in a low potential of exposure of people and structures because of debris flow.

Because of the relatively gentle topography at the end terminals, potential damage because of rock fall at the end terminals is low. The planned alignment, although generally near ridge tops, traverses across talus slopes that may be prone to rock fall. The volcanic rock is closely fractured into relatively small irregular shaped clasts that would have relatively low energy during rock fall. The granitic rock is strong competent rock and rock fall is an uncommon event (Holdrege & Kull 2015:6). Therefore, the potential damage to people or structures because of rock fall is low.

It is anticipated that rock blasting would be potentially required as part of construction of some of the towers as well as the Squaw Valley and Alpine Meadows mid-stations. The explosion associated with the rock blasting has the potential to trigger mass wasting events.

RPM NOI-4 requires the project applicant to submit a proof of contract with a state-licensed contractor if blasting is required for the installation of site improvements, comply with applicable County ordinances that relate to blasting, and use only state-licensed contractors to conduct these operations.

NEPA Effects Conclusion

Construction of Alternative 2 could expose people or structures to mass wasting events triggered by blasting. Under NEPA, and considering the NEPA indicators, absent RPMs and/or mitigation, direct and indirect effects related to mass wasting events and rockfall from Alternative 2 would be **adverse** These effects would be mitigated through implementation of RPM NOI-4 and Mitigation Measure 4.16-1 (Alt. 2).

CEQA Determination of Effects

According to a geotechnical report prepared for the project (Holdrege & Kull 2015), no historic landslides are located within the Alternative 2 gondola alignment and the potential for them to occur in the site area is low; however, rock blasting would likely be required and has the potential to trigger mass wasting events. Under CEQA, and using the CEQA criteria, effects related to mass wasting events would be **potentially significant** because construction of Alternative 2 could expose people or structures to mass wasting events due to rock blasting. RPM NOI-4 requires the project applicant to submit a proof of contract with a state-licensed contractor if blasting is required for the installation of site improvements, comply with applicable County ordinances that relate to blasting, and use only state-licensed contractors to conduct these operations. Implementation of this RPM would reduce this potentially significant impact, but not to a less-than-significant level because to prevent mass wasting events, a combination of geology and blasting knowledge is required, the latter of which may not be addressed in RPM NOI-4. Therefore, this impact would remain potentially significant.

Mitigation Measures

All RPMs provided in Appendix B are adopted by Placer County as mitigation measures and are included in the Mitigation Monitoring and Reporting Program for the project. The adoption of RPM NOI-4 as a mitigation measure reduces this potentially significant impact, but not to a less-than-significant level because to prevent mass wasting events, a combination of geology and blasting knowledge is required, the latter of which may not be addressed in RPM NOI-4. Therefore, this impact would remain potentially significant.

Mitigation Measure 4.16-1 (Alt. 2): Develop and Implement a Rock Blasting Plan

To minimize the risk of mass wasting because of rock blasting during construction activities, a rock blasting plan shall be prepared by the contractor and submitted to the County at least 30 days prior to the blasting addressed in the plan. The blasting plan shall be site-specific, based on the locations of required blasting, and based on the results of a project-specific geotechnical investigation. The blasting plan shall include a description of the planned blasting methods, an inventory of receptors potentially affected by the planned blasting, calculations to determine the area affected by the planned blasting, and a description of measures that have been taken to minimize the risk of triggering mass wasting events by the blasting. The blasting plan shall meet criteria established in Chapter 3 (Control of Adverse Effects) in the Blasting Guidance Manual of the U.S. Department of Interior Office of Surface Mining Reclamation and Enforcement.

Significance after Mitigation

Implementation of Mitigation Measure 4.16-1 (Alt. 2) would reduce the risk of mass wasting because of rock blasting to a **less-than-significant** level because the rock blasting plan would evaluate site specific conditions and minimize the potential for the blast to cause mass wasting events.

Impact 4.16-2 (Alt. 2): Exposure of People and Structures to Avalanches

Implementation of Alternative 2 would include construction of gondola towers within areas currently designated as snow avalanche hazard zones (PAHAs). Project implementation would also increase the frequency and number of persons present in PAHAs. Alternative 2 includes the installation of eight Gazex exploders on the Alpine Meadows side of the alignment which would replace the artillery and hand shot (explosive) system that is currently used within the project area to control avalanche. This replacement will facilitate the triggering of smaller, less destructive avalanches which will reduce the risk posed by avalanches to people or structures by larger, more powerful avalanches. However, implementation of Alternative 2 would still increase the number and frequency of persons present in PAHAs. Under NEPA, and considering the NEPA indicators, absent RPMs and/or mitigation, direct and indirect effects related to avalanche hazards would be **adverse** because the project could increase the number of people and structures at risk in the event of an avalanche. There are no applicable RPMs that would mitigate this effect. Under CEQA, and using the CEQA criteria, effects related to avalanche hazards would be **potentially significant** because the project could increase the number of people and structures at risk in the event of an avalanche. There are no applicable RPMs that would reduce this impact.

Installation of the proposed gondola would necessitate changes to Alpine Meadows' current snow safety and avalanche hazard mitigation program. Currently, avalanche control in the area of Alpine Meadows where Alternative 2 is proposed is managed via remote artillery and hand shot (explosive) placements. There would be risk of direct artillery, indirect shrapnel, and impacts to the new gondola and towers if current management techniques continued. Thus, Alpine Meadows proposes to install, operate, and maintain up to eight Gazex exploders (seven on NFS lands) to perform avalanche control in the area known as *The Buttress* to replace the existing use of artillery in this area. The Gazex system will facilitate the triggering of smaller avalanches which are safer than large avalanches that expose more people and structures to avalanches.

The existing Squaw Valley Avalanche Mitigation Program that has maintained a high level of public safety would continue to operate for Alternative 2. The Program has been very effective in minimizing the avalanche risk to skiers and other members of the public. The avalanche plan used to control avalanche hazards in Squaw Valley would continue to be implemented under the Alternative 2.

Alternative 2 does cross several PAHAs including one on the Alpine Meadows side of the ridge, and the Powderhorn path on the Squaw Valley side. The Squaw Valley base terminal and both mid-stations are not located in a mapped PAHA. The Avalanche Mitigation Plan is intended to address the potential avalanche risks in outdoor public areas that are part of the project infrastructure.

Towers will be constructed in the PAHAs but will be constructed to withstand the design avalanche. All buildings must comply with the Placer County Code (Article 12.40, Avalanche Management Areas) specifications for ensuring that the building can withstand the design avalanche.

There are continuing conditions that are outside of the County's or the project applicant's control that affect future avalanche risk related to management of the mountain slopes. The active management of ski slopes and implementation of avalanche hazard mitigation contributes beneficial effects related to the magnitude and frequency of future avalanches, but it is possible that vegetation management and tree clearing could produce adverse effects, such as if trees clearing is initiated in identified avalanche runout zones. There are also uncertainties about future avalanche conditions, including runout distances. Other uncertainties include climate change effects that could lessen direct factors (e.g., snowfall) or, conversely, increase vulnerabilities (e.g., fire vegetation clearing).

NEPA Effects Conclusion

Alternative 2 would involve construction of gondola towers in PAHAs. Under NEPA, and considering the NEPA indicators, absent RPMs and/or mitigation, direct and indirect effects related to avalanche hazards from Alternative 2 would be **adverse** because the project could increase the number of people and structures at risk in the event of an avalanche. There are no applicable RPMs that would mitigate this effect. These effects would be mitigated, however, through implementation of Mitigation Measure 4.16-2 (Alt.2).

CEQA Determination of Effects

Implementation of Alternative 2 would include the construction of gondola towers within PAHAs. Alternative 2 would facilitate avalanche control practices on the Alpine Meadows side of the project by reducing reliance on the artillery and hand shot (explosive) system and implementing a Gazex exploder system. Under CEQA, and using the CEQA criteria, effects related to avalanche hazards would be **potentially significant** because implementation of Alternative 2 would still increase the number of persons and structures at risk in the event of an avalanche. There are no applicable RPMs that would reduce this impact. Therefore, this impact would remain potentially significant.

Mitigation Measure 4.16-2 (Alt. 2): Develop and Implement an Avalanche Hazard Mitigation Plan

Prior to issuance of permits, the project applicant shall provide the Forest Service and Placer County with a complete Avalanche Hazard Mitigation Plan for the project. The plan shall be subject to review and approval by the Forest Service and County, and permit approval will be conditioned based on ongoing implementation of the plan. The plan shall include, but shall not be limited to, the following elements:

- Prior to opening of the gondola, the project applicant shall develop avalanche notification protocols in consultation with the Squaw Valley Fire Department (SVFD), North Tahoe Fire Protection District (contracted through Alpine Springs County Water District), Squaw Valley, and Alpine Meadows operations. The protocols shall specify conditions that warrant consultation with these agencies regarding potential avalanche risks.
- If there is a substantial risk of avalanche, then the gondola and any public areas within the PAHA shall be closed to the public, and signs erected that explain that the closures are because of the avalanche risk. These areas shall be secured from entry until the risk of avalanche has abated.
- On-site structures: The Building Services Division shall review building permit applications for structures within or near moderate PAHAs to confirm that they incorporate the structural specifications to address avalanche risk.
- Up-slope conditions: Policy procedures and necessary agreements and permissions shall be included to ensure that operations on the ski terrain of Squaw Valley and Alpine Meadows continue to implement avalanche mitigation programs and that slope development and management avoids the creation of new long continuous openings that could increase the potential for avalanche

release and movement that could affect the gondola. No new large openings shall be created on slopes steeper than 30 degrees that could influence avalanche runouts leading to the gondola.

Significance after Mitigation

Implementation of Mitigation Measure 4.16-2 (Alt. 2) would provide a plan to operate Alternative 2 that minimizes avalanche risk; and would provide a more complete and comprehensive mitigation program to identify, inform, and instruct persons that would potentially be at additional risk because of the project. While these measures would not eliminate the risks of snow avalanche, these measures would lower the magnitude and probability of the impact to an acceptable level. This impact would therefore be reduced to a **less-than-significant** level.

Impact 4.16-3 (Alt. 2): Risks Associated with Soil Limitations

Implementation of Alternative 2 would include construction of structures in an area with subsurface materials subject to limitations that could produce instability, structural damage, or risks of injury to persons if not properly anticipated and addressed. While all towers and buildings would be constructed in accordance with seismic standards of the CBC, implementation of the project may include buildings on specific locations with varied soil conditions and a range of risks. Under NEPA, and considering the NEPA indicators, absent RPMs and/or mitigation, there would be **no effect** related to the depth to bedrock and expansion soil limitations, whereas effects related to erosion potential would be **adverse** during project construction and after remediation under episodic hydrological events. Implementation of RPMs SOILS-1, SOILS-7, SOILS-9, SOILS-11, and SOILS-12 would mitigate this effect. Under CEQA, and using the CEQA criteria, effects related to soil limitations would be potentially significant prior to the consideration of RPMs because project construction would occur in an area with subsurface materials subject to limitations that could produce instability, structural damage, or risks of injury to persons if not properly anticipated and addressed. RPMs SOILS-1, SOILS-7, SOILS-9, SOILS-11, and SOILS-12 would require the implementation of BMPS that reduce the risk of erosion. These measures include slope protection, locating roads, trails, or disturbed areas away from unstable slopes, cut/fill slope construction limitations, revegetation, and ground cover requirements. With implementation of these RPMs, this impact would be reduced to a **less-than-significant** level both during construction and after remediation under episodic hydrological events.

Soil limitation ratings are usually based on hazards, risks, or obstructions presented by the natural, undisturbed soil, and are presented in terms of severity from slight to severe. Common limitations for the soil types in the project area include erosion potential, depth to bedrock, and expansion. Risks associated with soil limitations exist in the short term, during construction, and in the long term.

There are several soil types mapped by NRCS on the Alternative 2 alignment. Field verification of soils took place through the preparation of the geotechnical report (Holdrege & Kull 2015). Soil throughout most of the central part of Alternative 2 is very thin and mapped as Rock outcrop, granitic (GRG), Rock outcrop, volcanic (VRG), and Ledford variant-Rock outcrop complex, 30- to 75-percent slopes (WRG). The Rock Outcrop soil units are described as unweathered bedrock with an average thickness of 0–4 inches. The Rock Outcrop units are not rated for erosion hazard because of the lack of soil on these geologic units. The Ledford variant-Rock outcrop complex (WRG) soil unit is typically underlain by bedrock at shallow depths (28 to 32 inches) but the off trail-off road, and trail erosion hazard is very severe. Though the erosion hazard is very severe, the depth to bedrock is shallow and therefore construction of isolated towers would not cause significant risk associated with erosion during construction or in the long term.

The Tallac Series soil units (TAE, TAF, TBF) are mapped in the area of the north and south end terminals and along the slopes immediately adjacent to the valley floor within Squaw Valley. The Tallac soil units generally forms on glacial moraines and have a moderate erosion hazard for both off trail off road and trail except where slopes exceed 30 percent and the erosion hazard is classified as severe, which could present a risk of erosion both during construction and in the long term.

The Tinker Series soil units (TIE, TIG) are mapped along the slopes above Alpine Meadows near the south segment of the gondola. This unit typically forms on glacial moraines. The erosion hazard associated with the soil is classified as moderate except where slopes exceed 30 percent and is classified as very severe. Though the erosion hazard is very severe, the depth to bedrock is shallow; therefore, construction of isolated towers would not cause significant risk associated with short-term or long-term erosion.

The erosion potential of soils within the project area range between 0.10 and 0.15 (NRCS 2014), which are low erodibility ratings. The erosion potential indicates the susceptibility of a soil to sheet and rill erosion by water. These low erodibility factors are because of the low runoff potential of the soil, even though these soils are composed of large particle sandy material that is easily detached from the substrate.

Depth to bedrock or duripan for soils underlying the project alternatives is generally between zero and 41 inches, depending on the soil type. Granitic outcroppings occur over the central portions of the Alternative 2 project site, near the Squaw Valley mid-station, where there is no soil cover for practical purposes.

The soils within the project area do not contain a significant amount of clay, and as a result have a low linear extensibility of approximately 1.5 percent.

In general, much of Alternative 2 is underlain by near-surface granitic and volcanic rock with thin soil cover that should provide suitable support for tower and terminal foundations (Holdrege & Kull 2015:16). The bottom terminals at each end appear to be underlain by alluvial fan and glacial till deposits that should also provide suitable support for planned structures on conventional shallow spread foundations. The Preliminary Geotechnical Engineering and Geologic Review (Holdrege & Kull 2015:14) conducted for the project determined that the soils found within the project area have a low potential for liquefaction or lateral spreading because the project area is generally underlain by little to no soil overlying near surface rock. Although the Squaw Valley base terminal would be built in the current site of Cushing Pond, this is a constructed water body and the presence of the pond is not indicative of saturated soils. As discussed in Section 4.17, “Hydrology and Water Quality,” the pond is currently drained by a 36-inch pipe that conveys water into Squaw Creek. As part of Alternative 2, a drainage plan would be developed for the area.

Project design and construction would conform to CBC Title 24, which identifies specific design requirements to further reduce damage from seismic-related ground failure, including soil limitations.

<u>NEPA Effects Conclusion</u>

Alternative 2 would involve construction in soils with limitations. Under NEPA, and considering the NEPA indicators, absent RPMs and/or mitigation, there would be **no effect** related to the depth to bedrock and expansion soil limitations. Alternative 2 would not directly increase the risks associated with these soil limitations. However, there could be an **adverse** effect because of the erosion potential soil limitation from the construction of Alternative 2 and in the long term. These effects would be mitigated through implementation of RPMs SOILS-1, SOILS-7, SOILS-9, SOILS-11, and SOILS-12.

<u>CEQA Determination of Effects</u>

Alternative 2 is underlain by near-surface granitic and volcanic rock with thin soil cover that should provide suitable support for tower and terminal foundations (Holdrege & Kull 2015). The bottom terminals at each end appear to be underlain by alluvial fan and glacial till deposits that should also provide suitable support for planned structures on conventional shallow spread foundations. The Preliminary Geotechnical Engineering and Geologic Review (Holdrege & Kull 2015:14) conducted for the project determined that the soils found within the project area have a low potential for soil limitations such as expansion because the project area is generally underlain by little to no soil overlying near surface rock. Under CEQA, and using the CEQA criteria, effects related to soil limitations would be potentially significant because project construction would occur in an area with subsurface materials subject to limitations that could produce instability, structural damage, or risks of injury to persons if not properly anticipated and addressed. RPMs SOILS-1, SOILS-7, SOILS-9, SOILS-11, and SOILS-12 would require the implementation of BMPS that reduce the risk of erosion. These measures include slope protection, locating roads, trails, or disturbed areas away from unstable slopes, cut/fill slope construction limitations, revegetation, and ground cover requirements. With implementation of these RPMs, this impact would be reduced to a **less-than-significant** level both during construction and in the long term.

Mitigation Measures

All RPMs provided in Appendix B are adopted by Placer County as mitigation measures and are included in the Mitigation Monitoring and Reporting Program for the project. The adoption of RPMs SOILS-1, SOILS-7, SOILS-9, SOILS-11, and SOILS-12 as mitigation measures reduces this potentially significant impact to a **less-than-significant** level.

Impact 4.16-4 (Alt. 2): Excessive Erosion during Construction

Depending on wind and rain conditions, grading activities associated with Alternative 2 could result in the potential for erosion of site soils during construction. During construction, graded, excavated, and stockpiled soil could be exposed to erosion via wind and water runoff, which could flow into and degrade nearby water bodies including Squaw and Bear Creek. Standard erosion control measures would be employed to prevent soil erosion, the overall construction disturbance area is relatively small, and portions of the construction would take place on exposed rock where there is no erosion potential. Under NEPA, and considering the NEPA indicators, absent RPMs and/or mitigation, direct and indirect effects related to soil erosion would be **adverse** because of the erosion potential from project construction and the steep topography in much of the project area. Implementation of RPMs SOILS-1 through SOILS-12 and MUL-3 would mitigate this effect. Under CEQA, and using the CEQA criteria, effects related to soil erosion would be potentially significant prior to the consideration of RPMs because of the erosion potential from project construction and the steep topography in much of the project area. RPMs SOILS-1 through SOILS-12 include best management practices to address any impacts from excessive erosion during construction of Alternative 2. These RPMs include implementation all practicable sediment and erosion control best management practices; maintenance of ground cover; revegetation after construction; implementation of a construction management plan; and adherence to all regulations from Forest Service Region 5, Lahontan Regional Water Quality Control Board, and Placer County. RPM MUL-3 requires Forest Service and County approval of a grading plan and layout prior to approval of the temporary access road alignment. With implementation of these RPMs, this impact would be reduced to a **less-than-significant** level.

During construction activities, disturbed, graded, excavated, and stockpiled soil could be exposed to erosion via wind and surface water runoff especially when construction occurs in soil susceptible to erosion. The risk of sedimentation and operation of Alternative 2 is discussed in Section 4.17, "Hydrology and Water Quality."

General construction activities that will take place to construct Alternative 2 would include grubbing/clearing of on-site vegetation, skidding of trees, excavation and relocation of soil on the site, backfilling and compaction of soils, and construction of proposed facilities. It is anticipated that helicopters and construction access roads would be used during construction to transport personnel and equipment to the project area during installation of lift infrastructure. Site soil would be moderately to highly susceptible to erosion, particularly on steep, unprotected slopes during construction (Holdrege & Kull 2015:22).

The applicant would be required to submit project grading/improvement plans to the County for review. Additionally, the applicant would be required to develop and implement a stormwater pollution prevention plan (SWPPP) as part of its National Pollution Discharge Elimination System permit for construction activities administered by the State Water Resources Control Board. The SWPPP would include a description of construction activities and would identify the BMPs that would be employed to prevent soil erosion that could contaminate nearby water resources. A monitoring program is required to ensure that BMPs are implemented according to the SWPPP and are effective at controlling discharges of stormwater-related pollutants.

Construction of Alternative 2 is estimated to result in the removal of 42 trees for installation of project facilities and as part of overstory vegetation removal to prevent trees from conflicting with gondola operations. Additionally, approximately 286 trees were identified with the canopy extending over project activity areas. These trees could be subject to removal if they conflict with project construction or operation. The timber removal/skidding activities in the project area could loosen and disturb soils; remove ground surface litter in some areas, exposing the soil surface and facilitating erosion; and compact soils such that runoff can no longer infiltrate or be filtered by the soil.

Overall, the base terminals and mid-stations would disturb approximately 5 acres. Tower footings would disturb a maximum of 0.5 acre (35 towers x 600 square feet maximum disturbance each, including temporary disturbance). A temporary construction access road would disturb 2.5 acres. In total, gondola construction would disturb up to approximately 7.95 acres. Table 4.16-1 describes disturbance by soil type, erosion hazard, and geologic unit.

Table 4.16-1 Alternative 2 Disturbance by Soil Type and Geologic Unit

Component	Number	Soil Type (grouped by NRCS erosion hazard)	Geologic Unit	Area Disturbed during Construction (acres)
Alpine Meadows base terminal	1	Moderate (100%) **TAE**, Tallac very gravelly sandy loam, 2–30% slopes	**Qti**, Quaternary till	1.9
Alpine Meadows mid-station	1	Not Rated (100%) **GRG**, rock outcrop, granitic	**KJgd**, Cretaceous/Jurassic granodiorite	0.5
Temporary construction access road (length not yet determined but assumed to be 7,100 feet)	1	Not Rated (80%) **GRG**, Rock outcrop, granitic Moderate (5%) **TIE**, Tinker-Rock outcrop, granitic-Cryumbrepts, wet complex, 2–30% slopes Very Severe (15%) (mostly on existing gravel road) **WRG**, Ledford variant-Rock outcrop complex, 30–75% slopes	**Qti**, Quaternary till; **KJgd**, Cretaceous/Jurassic granodiorite	2.5[a]
Towers	35	Not Rated (49.4% of alignment) **GRG**, Rock outcrop, granitic; **VRG**, Rock outcrop, volcanic Moderate (9.6% of alignment) **TAE**, Tallac very gravelly sandy loam, 2–30% slopes Severe (18. 7% of alignment) **TBF**, Tallac-Cryumbrepts, wet complex, 30–50% slopes **TAF**, Tallac very gravelly sandy loam, 30–50% slopes Very Severe (22.3% of alignment) **MIG3,** Meiss-Rock outcrop complex, 30–75% slopes, severely eroded; **TIG**, Tinker-Rock outcrop, granitic-Cryumbrepts, wet complex, 30–75% slopes; **WRG**, Ledford variant-Rock outcrop complex, 30–75% slopes	**Qf**, Holocene/Pleistocene alluvial fan deposits; **Qti**, Quaternary till; **Qt**, Holocene talus deposits; **Mvaf**, Miocene andesite and dacite flow; **Pia**, Pliocene andesite dike/intrusive; **Pib**, Pliocene basalt dike/intrusive; **KJgr**, Cretaceous/Jurassic granite and granodiorite; **KJgd,** Cretaceous/Jurassic granodiorite	0.5
Squaw Valley mid-station	1	Not Rated (100%) **GRG**, Rock outcrop, granitic	**Pib**, Pliocene basalt dike/intrusive	1.5
Squaw Valley base terminal	1	Moderate (100%) **TAE**, Tallac very gravelly sandy loam, 2–30% slopes	**Qf**, Holocene/Pleistocene alluvial fan deposits	1
Gazex exploder	8	Very Severe (100%) **TIG**, Tinker-Rock outcrop, granitic-Cryumbrepts, wet complex, 30–75% slopes; **WRG**, Ledford variant-Rock outcrop complex, 30–75% slopes	**KJgd**, Cretaceous/Jurassic granodiorite; **Qti** Quaternary till	0.05
Shelters	4	Very Severe (100%) **WRG**, Ledford variant-Rock outcrop complex, 30–75% slopes	**KJgd** Cretaceous/Jurassic granodiorite; **Qti** Quaternary till	0.002
TOTAL				7.95

Note: [a] 15 feet x 7,170 feet = 107,550 square feet, or approximately 2.5 acres.

Sources: NRCS 2014, Saucedo 2005; adapted by Ascent Environmental in 2018

Under Alternative 2, the Alpine Meadows base terminal is proposed southeast of the Alpine Meadows base lodge between the Roundhouse Express and Hot Wheels chairlifts and would disturb 1.9 acres. The base terminal would be built on an elevated foundation and no material would be excavated or removed to construct the terminal. Minimal soil disturbance would occur to construct the foundation footers. Additionally, 7,500 cubic yards of fill material would be added between the lodge and the lifts to reduce the slope in that area. This will have a minor change on the topography of the area. Fill material would be imported from off-site locations, and the area would be revegetated using appropriate Forest Service approved seed mixes and consistent with applicable RPMs provided in Appendix B.

The Alpine Meadows mid-station would be located about 650 feet north-northwest of *The Buttress* on NFS lands. This mid-station would be elevated above a granite outcropping, requiring minimal excavation and material export for the terminal and foundations. Some rock blasting may be required, and this material would be scattered on site. The overall disturbance area would be approximately 0.5 acre. Materials for this station would be transported to the site primarily via helicopter. Additionally, a temporary construction access route is proposed primarily on private lands but also on approximately 480 linear feet of NFS lands to access this mid-station during construction. The access road would be located primarily on bedrock and on an existing gravel road. It would be used in the winter months by snowmobiles and snow cats but would not be used in the snow-free months. The temporary construction access route is estimated to be 15 feet wide and approximately 7,100 feet long. It would be restored to its previous condition after construction is complete to the extent possible. Prior to approval of the temporary access road alignment, a grading plan and layout would need to be approved by Placer County and the Forest Service in accordance with RPM MUL-3.

The Squaw Valley mid-station would be located on private lands approximately 1,100 feet southwest of the KT-22 lift terminal. It is anticipated that grading, earth moving, and potentially rock blasting would be required as part of construction of the Squaw Valley mid-station. Overall ground disturbance for the Squaw Valley mid-station would be approximately 1.5 acres. The mid-station would be accessed via an existing road that extends from the Squaw Valley base area to the upper KT-22 terminal. No new access routes are proposed as part of the Squaw Valley side of the project.

The Squaw Valley base terminal would be located on private lands between the bottom terminals of the KT-22 and Squaw One express lifts adjacent to Cushing Pond. Overall ground disturbance for all elements of the Squaw Valley base terminal would be approximately 1 acre. This terminal would also include a deck connecting to the Olympic House and a cabin storage facility.

A total of 35 towers would be installed along the gondola alignment, with 25 on private land and 10 on NFS land. The exact locations and designs for each tower associated with Alternative 2 have not been determined. Helicopters would be used to set most towers. Access and construction methods for each tower would vary depending on site conditions and location. Disturbance for each tower would vary based on its location; towers accessible to an excavator could result in a total disturbance of 600 square feet (including spoil storage) if site conditions allow for a hole to be dug. For towers with more limited construction access, spider excavators could be used to dig a hole for the foundation resulting in approximately 300 square feet of disturbance (including spoil storage). Towers located on granite outcroppings could require some drilling/blasting, but would likely be secured directly to the rock, or anchored to concrete poured directly on the rock, and would not result in excavated ground disturbance. Approximately two towers are proposed on NFS lands and are proposed to be constructed with a spider excavator, which would walk up the proposed gondola alignment from the Alpine Meadows base area. The spider excavator path would need to be approved by Placer County and the Forest Service in accordance with RPM MUL-3 before use. Any disturbance would be restored to pre-project conditions to the extent possible. The anticipated disturbance area for all towers combined would not exceed 0.5 acre.

Eight Gazex exploders would be installed at Alpine Meadows (seven on NFS lands). Installation of the Gazex exploders would require two concrete footers for anchoring the upper would result in construction disturbance of 15 feet by 15 feet and the lower concrete footing disturbance would be feet by 7 feet. Operation of the Gazex exploders would require four shelters to house propane and oxygen tanks. Each shelter would require construction of a platform approximately 10 feet by 12 feet. Construction associated with the exploders and shelters would be principally by hand crews working in steep locations. No temporary or permanent access roads would be required. Materials would be flown in by helicopters. Unforeseen maintenance activities involving ground disturbance would require additional NEPA analysis.

Alternative 2 would result in disturbance of 7.95 acres during construction. Disturbance would take place primarily in soils with a Moderate or Not Rated Soil Erosion Hazard (NRCS 2014) (Table 4.16-2). The only temporary disturbance associated with Alternative 2 is the construction access road (2.6 acres), which would be recontoured and revegetated after construction.

Table 4.16-2 Alternative 2 Temporary and Permanent Disturbance by Soil Erosion Hazard

NRCS Erosion Hazard	Area Disturbed by Construction (Acres)	% of Total Disturbance
Not Rated	4.24 (2 temporary)	54
Moderate	3.07 (0.13 temporary)	39
Severe	0.09 (0 temporary)	1
Very Severe	0.54 (0.37 temporary)	6

Source: NRCS 2014; adapted by Ascent Environmental in 2018

NEPA Effects Conclusion

Alternative 2 would involve construction in potentially erodible soils. Under NEPA, and considering the NEPA indicators, absent RPMs and/or mitigation, direct and indirect effects related to excessive erosion during construction of Alternative 2 would be **adverse**. These effects would be mitigated through implementation of RPMs SOILS-1 through SOILS-12 and MUL-3.

CEQA Determination of Effects

Under CEQA, and using the CEQA criteria, effects related to excessive erosion during construction of Alternative 2 would be potentially significant because even with strict adherence to BMPs identified in the SWPPP, there would still be some level of disturbance-related erosion during construction relative to existing conditions. RPMs SOILS-1 through SOILS-12 include best management practices to address any impacts from excessive erosion during construction of Alternative 2. These RPMs include implementation all practicable sediment and erosion control best management practices; maintenance of ground cover; revegetation after construction; implementation of a construction management plan; and adherence to all regulations from Forest Service Region 5, Lahontan Regional Water Quality Control Board, and Placer County. RPM MUL-3 requires Forest Service and County approval of a grading plan and layout prior to approval of the temporary access road alignment. With implementation of these RPMs, this impact would be reduced to a **less-than-significant** level.

Mitigation Measures

All RPMs provided in Appendix B are adopted by Placer County as mitigation measures and are included in the Mitigation Monitoring and Reporting Program for the project. The adoption of RPMs SOILS-1 through SOILS-12 and MUL-3 as mitigation measures reduces this potentially significant impact to a **less-than-significant** level.

4.16.3.3 ALTERNATIVE 3

Impact 4.16-1 (Alt. 3): Exposure of People and Structures to Mass Wasting Events

Mass wasting events include landslides, debris flows, and rock fall. The steep terrain in the project area and areas of relatively unconsolidated geologic materials indicate that mass wasting events that might affect people and structures are possible. However, mass wasting events in the area are rare and the potential for mass wasting events to affect project facilities is low. Rock blasting which have the potential to trigger mass wasting events would likely be required to construct components of Alternative 3. Under NEPA, and considering the NEPA indicators, absent RPMs and/or mitigation, direct and indirect effects related to mass wasting events would be **adverse** because of the potential for mass wasting to be triggered by rock blasting during construction of Alternative 3. RPM NOI-4 would mitigate this effect. Under CEQA, and using the CEQA criteria, effects related to mass wasting events would be **potentially significant** because construction of Alternative 3 would require rock blasting, which has the potential to trigger mass wasting events. RPM NOI-4 would reduce this effect, but not to a less-than-significant level. Under CEQA, this impact would remain **potentially significant.**

Impact 4.16-1 would be very similar between Alternative 3 and Alternative 2 because the proposed gondola has the same alignment from the Squaw Valley base terminal to the Squaw Valley mid-station. Alternative 3 then diverges from Alternative 2 to a more eastern alignment. Similar to Alternative 2, Alternative 3 is located in a steep, alpine, high-energy geologic environment that may be subject to landslides, debris flows, and rock fall. There is one small scar from a small landslide east of Alternative 3 (Holdrege & Kull 2013:6). The slide is located in volcanic soil, is only about 100 square feet in area, and is about 1 foot deep. It appears to be a small translational slide that was saturated and failing on the shallow rock surface. Small debris flows and flash floods have occurred in past history in the east and/or west gullies in the vicinity of the Alternative 3 alignment extending down to Alpine Meadows Road. However, because of the lack of or very thin soil at and above the site, debris flows cannot be very large. There is no significant source of material. Debris flows and flash floods at the site are confined to small channels and are not a significant hazard (Holdrege & Kull 2013).

It is anticipated that rock blasting would be potentially required as part of construction of some of the towers as well as the Squaw Valley and Alpine Meadows mid-stations. The explosion associated with the rock blasting has the potential to trigger mass wasting events.

<u>NEPA Effects Conclusion</u>

Construction of Alternative 3 could expose people and structures to mass wasting events triggered by blasting. Under NEPA, and considering the NEPA indicators, absent RPMs and/or mitigation, direct and indirect effects related to mass wasting events and rockfall from Alternative 3 would be **adverse.** These effects would be mitigated through implementation of RPM NOI-4 and implementation of Mitigation Measure 4.16-1 (Alt. 3).

<u>CEQA Determination of Effects</u>

Under Alternative 3, the potential for landslides, debris flow, and rock fall are low because of the relatively competent nature of underlying and adjacent materials (Holdrege & Kull 2015:6). Additionally, the potential for mass wasting events and rock fall are low because there is no significant source of material. Debris flows and flash floods at the site are confined to small channels and are not a significant hazard (Holdrege & Kull 2013:6). However, rock blasting would likely be required and has the potential to trigger mass wasting events. Under CEQA, and using the CEQA criteria, effects related to mass wasting events would be **potentially significant** because construction of Alternative 3 could expose people or structures to mass wasting events due to rock blasting. RPM NOI-4 requires the project applicant to submit a proof of contract with a state-licensed contractor if blasting is required for the installation of site improvements, comply with applicable County ordinances that relate to blasting, and use only state-licensed contractors to conduct these operations. Implementation of this RPM would reduce this potentially significant impact, but not to a less-than-significant level because to prevent mass wasting events, a combination of geology and blasting knowledge is required, the latter of which may not be addressed in RPM NOI-4. Therefore, this impact would remain potentially significant.

Mitigation Measures

All RPMs provided in Appendix B are adopted by Placer County as mitigation measures and are included in the Mitigation Monitoring and Reporting Program for the project. The adoption of RPM NOI-4 as a mitigation measure reduces this potentially significant impact, but not to a less-than-significant level because to prevent mass wasting events, a combination of geology and blasting knowledge is required, the latter of which may not be addressed in RPM NOI-4. Therefore, this impact would remain potentially significant.

Mitigation Measure 4.16-1 (Alt. 3): Develop and Implement a Rock Blasting Plan

Implement Mitigation Measure 4.16-1 (Alt. 2).

Significance after Mitigation

Implementation of Mitigation Measure 4.16-1 (Alt. 3) would reduce the risk of mass wasting because of rock blasting to a **less-than-significant** level because the rock blasting plan would evaluate site specific conditions and minimize the potential for the blast to cause mass wasting events.

Impact 4.16-2 (Alt. 3): Exposure of People and Structures to Avalanches

Implementation of Alternative 3 would include construction of the Alpine Meadows mid-station and gondola towers within areas currently designated as snow avalanche hazard zones (PAHAs). Project implementation would also increase the frequency and number of persons present in PAHAs. Alternative 3 includes the installation of eight Gazex exploders on the Alpine Meadows side of the alignment which would replace the artillery and hand shot (explosive) system that is currently used within the project area to control avalanche. This replacement will facilitate the triggering of smaller avalanches, less destructive avalanches which will reduce the risk posed by avalanches to people or structures by larger, more powerful avalanches. However, implementation of Alternative 3 would still increase the number and frequency of persons present in PAHAs. Under NEPA, and considering the NEPA indicators, absent RPMs and/or mitigation, direct and indirect effects related to avalanche hazards would be **adverse** because the project could increase the number of people and structures at risk in the event of an avalanche. There are no applicable RPMs that would mitigate this effect. Under CEQA, and using the CEQA criteria, effects related to avalanche hazards would be **potentially significant** because the project could increase the number of people and structures at risk in the event of an avalanche. There are no applicable RPMs that would reduce this impact.

Impact 4.16-2 would be very similar between Alternative 3 and Alternative 2 because the proposed gondola has the same alignment from the Squaw Valley base terminal to the Squaw Valley mid-station. Alternative 3 then diverges from Alternative 2 to a more eastern alignment. The proposed location for the Alpine Meadows mid-station is located in a mapped PAHA. Additionally, several of the towers between the Alpine Meadows mid-station and base terminal are also proposed in a mapped PAHA. The entire cliff band is considered a continuous potential avalanche starting zone where avalanches have been observed nearly every winter. There are several fall line profiles that suggest lines of typical flow for avalanche debris (Caldwell et al. 2009:19). There are numerous benches and rock outcrops along the entire length of the cliff band that act to hold, slow or divert debris flow, but these are not substantial enough to significantly anchor snow, or alter flow patterns for large destructive avalanche events. Any structures built within the study area be engineered and built to withstand design avalanche impact forces specific to the building sites. These forces should be calculated on a site-by-site basis by a qualified and reputable avalanche engineer familiar with or working closely with someone familiar with snow and avalanche conditions in the Alpine Meadows area (Caldwell et al. 2009:22).

NEPA Effects Conclusion

Alternative 3 would involve construction in a PAHA. Under NEPA, and considering the NEPA indicators, absent RPMs and/or mitigation, direct and indirect effects related to avalanche hazards from Alternative 3 would be **adverse** because the project could increase the number of people and structures at risk in the event of an avalanche. There are no applicable RPMs that would mitigate this effect. These effects would be mitigated, however, through implementation of Mitigation Measure 4.16-2 (Alt. 3).

CEQA Determination of Effects

Implementation of Alternative 3 would include the construction of the Alpine Meadows mid-station and gondola towers within PAHAs. Alternative 3 would facilitate avalanche control practices on the Alpine Meadows side of the project by reducing reliance on the artillery and hand shot (explosive) system and implementing a Gazex exploder system. Under CEQA, and using the CEQA criteria, effects related to avalanche hazards would be **potentially significant** because implementation of Alternative 3 would still increase the number of persons and structures at risk in the event of an avalanche. There are no applicable RPMs that would reduce this impact. Therefore, this impact would remain potentially significant.

Mitigation Measure 4.16-2 (Alt. 3): Develop and Implement an Avalanche Hazard Mitigation Plan

Implement Mitigation Measure 4.16-2 (Alt. 2).

Significance after Mitigation

Implementation of Mitigation Measure 4.16-2 (Alt. 3) would provide a plan to continue mountain operations that minimizes avalanche risk; and would provide a more complete and comprehensive mitigation program to identify, inform, and instruct persons that would potentially be at additional risk because of the project. While these measures would not eliminate the risks of snow avalanche, these measures would lower the magnitude and probability of the impact to an acceptable level. This impact would be reduced to a **less-than-significant** level.

Impact 4.16-3 (Alt. 3): Risks Associated with Soil Limitations

Implementation of Alternative 3 would include construction of structures in an area with subsurface materials subject to limitations that could produce instability, structural damage, or risks of injury to persons if not properly anticipated and addressed. While all towers and buildings would be constructed in accordance with seismic standards of the CBC, implementation of the project may include buildings on specific locations with varied soil conditions and a range of risks. Under NEPA, and considering the NEPA indicators, absent RPMs and/or mitigation, there would be **no effect** related to the depth to bedrock and expansion soil limitations, whereas effects related to erosion potential would be **adverse** during project construction and after remediation under episodic hydrological events. Implementation of RPMs SOILS-1, SOILS-7, SOILS-9, SOILS-11, and SOILS-12 would mitigate this effect. Under CEQA, and using the CEQA criteria, effects related to soil limitations would be potentially significant prior to the consideration of RPMs because project construction would occur in an area with subsurface materials subject to limitations that could produce instability, structural damage, or risks of injury to persons if not properly anticipated and addressed. RPMs SOILS-1, SOILS-7, SOILS-9, SOILS-11, and SOILS-12 would require the implementation of BMPS that reduce the risk of erosion. These measures include slope protection, locating roads, trails, or disturbed areas away from unstable slopes, cut/fill slope construction limitations, revegetation, and ground cover requirements. With implementation of these RPMs, this impact would be reduced to a **less-than-significant** level both during construction and after remediation under episodic hydrological events.

Impact 4.16-1 would be very similar between Alternative 3 and Alternative 2 because the proposed gondola has the same alignment from the Squaw Valley base terminal to the Squaw Valley mid-station. Alternative 3 then diverges from Alternative 2 to a more eastern alignment which crosses through two additional soil types: Tinker-Rock outcrop, granitic-Cryumbrepts, wet complex, 2- to 30-percent slopes (TIE) and Tallac-Cyrumbrepts, wet complex 2- to 30-percent slopes (TBF). The Alternative 3 alignment does not cross through the steeper versions of these soil types which are present in the Alternative 2 alignment (TIG and TBF). Because of the lesser slopes of these soil units, the erosion hazard associated with these soils is slightly less than the hazard in Alternative 2. Field verification of soil types took place during the preparation of the geotechnical report (Holdrege & Kull 2013, 2015).

Project design and construction would conform to CBC Title 24, which identifies specific design requirements to further reduce damage from seismic-related ground failure, including soil limitations.

NEPA Effects Conclusion

Alternative 3 would involve construction in soils with limitations. Under NEPA, and considering the NEPA indicators, absent RPMs and/or mitigation, there would be **no effect** related to the depth to bedrock and expansion soil limitations. Alternative 3 would not directly increase the risks associated with these soil limitations. However, there could be an **adverse** effect because of the erosion potential soil limitation from the construction of Alternative 3 and in the long term. These effects would be mitigated through implementation of RPMs SOILS-1, SOILS-7, SOILS-9, SOILS-11, and SOILS-12.

CEQA Determination of Effects

The preliminary Geotechnical Engineering and Geologic Review (Holdrege & Kull 2015:14) conducted for the project determined that the soils found within the project area have a low potential for soil limitations such as expansion because the project area is generally underlain by little to no soil overlying near surface rock. However, the erosion hazard associated with some of the deeper and steeper soils ranges from moderate to very severe within Alternative 3. Under CEQA, and using the CEQA criteria, effects related to soil limitations would be potentially significant because project construction would occur in an area with subsurface materials subject to limitations that could produce instability, structural damage, or risks of injury to persons if not properly anticipated and addressed. RPMs SOILS-1, SOILS-7, SOILS-9, SOILS-11, and SOILS-12 would require the implementation of BMPS that reduce the risk of erosion. These measures include slope protection, locating roads, trails, or disturbed areas away from unstable slopes, cut/fill slope construction limitations, revegetation, and ground cover requirements. With implementation of these RPMs, this impact would be reduced to a **less-than-significant** level both during construction and in the long term.

Mitigation Measures

All RPMs provided in Appendix B are adopted by Placer County as mitigation measures and are included in the Mitigation Monitoring and Reporting Program for the project. The adoption of RPMs SOILS-1, SOILS-7, SOILS-9, SOILS-11, and SOILS-12 as mitigation measures reduces this potentially significant impact to a **less-than-significant** level.

Impact 4.16-4 (Alt. 3): Excessive Erosion during Construction

Depending on wind and rain conditions, grading activities associated with Alternative 3 could result in the potential for erosion of site soils during construction. During construction, graded, excavated, and stockpiled soil could be exposed to erosion via wind and water runoff, which could flow into and degrade nearby water bodies including Squaw and Bear Creek. Standard erosion control measures would be employed to prevent soil erosion, the overall construction disturbance area is relatively small, and portions of the construction would take place on exposed rock where there is no erosion potential. Under NEPA, and considering the NEPA indicators, absent RPMs and/or mitigation, direct and indirect effects related to soil erosion would be **adverse** because of the erosion potential from project construction and the steep topography in much of the project area. Implementation of RPMs SOILS-1 through SOILS-12 and MUL-3 would mitigate this effect. Under CEQA, and using the CEQA criteria, effects related to soil erosion would be potentially significant prior to the consideration of RPMs because of the erosion potential from project construction and the steep topography in much of the project area. RPMs SOILS-1 through SOILS-12 include best management practices to address any impacts from excessive erosion during construction of Alternative 3. These RPMs include implementation all practicable sediment and erosion control best management practices; maintenance of ground cover; revegetation after construction; implementation of a construction management plan; and adherence to all regulations from Forest Service Region 5, Lahontan Regional Water Quality Control Board, and Placer County. RPM MUL-3 requires Forest Service and County approval of a grading plan and layout prior to approval of the temporary access road alignment. With implementation of these RPMs, this impact would be reduced to a **less-than-significant** level.

Impact 4.16-4 would be very similar between Alternative 3 and Alternative 2 because the proposed gondola has the same alignment from the Squaw Valley base terminal to the Squaw Valley mid-station. Alternative 3 then diverges from Alternative 2 to a more eastern alignment. Under Alternative 3, the Alpine Meadows mid-station would be in a different location, on private lands approximately 900 feet north of the Alpine

Meadows SUP boundary. The Alpine Meadows mid-station design and disturbance would be similar to the mid-stations described for Alternative 3. Under Alternative 3, the fill required for the grading proposed at the Alpine Meadows base area would be generated from the Alpine Meadows mid-station site. Construction access to this site would not require any new temporary or permanent roads.

The Squaw Valley mid-station would be in the same location as described for Alternative 2, but the angle of the terminal would be slightly different. The mid-station design and access would be similar to the Squaw Valley mid-station included in Alternative 2. The same Gazex and shelter system would be installed under Alternative 3.

Construction of Alternative 3 is estimated to result in the removal of 104 trees for installation of project facilities and as part of overstory vegetation removal to prevent trees from conflicting with gondola operations—more than twice the number of trees that would be removed under Alternative 2. Additionally, approximately 133 trees were identified with the canopy extending over project activity areas. These trees, approximately half the number identified for Alternative 2, could be subject to removal if they conflict with project construction or operation. The timber removal/skidding activities in the project area could loosen and disturb soils; remove ground surface litter in some areas, exposing the soil surface and facilitating erosion; and compact soils such that runoff can no longer infiltrate or be filtered by the soil.

Table 4.16-3 represents the disturbance by soil type and geologic unit associated with Alternative 3. There would be no temporary disturbance for this alternative, compared to Alternative 2, which would involve temporary disturbance to construct a temporary construction access road.

Table 4.16-3 Alternative 3 Disturbance by Soil Type and Geologic Unit

Component	Number	Soil Type (Grouped by NRCS erosion hazard)	Geologic Unit	Area Disturbed during Construction (acres)
Alpine Meadows base terminal	1	Moderate (100%) **TAE**, Tallac very gravelly sandy loam, 2–30% slopes	**Qti**, Quaternary till	1.9
Alpine Meadows mid-station	1	Moderate (50%) **TIE**, Tinker-Rock outcrop, granitic-Cryumbrepts, wet complex, 2–30% slopes Very Severe (50%) **WRG**, Ledford variant-Rock outcrop complex, 30–75% slopes	**KJgd**, Cretaceous/Jurassic granodiorite	0.5
Towers	35	Not Rated (26% of alignment) **GRG**, Rock outcrop, granitic; **VRG**, Rock outcrop, volcanic Moderate (44% of alignment) **TAE**, Tallac very gravelly sandy loam, 2–30% slopes; **TBE**, Tallac-Cryumbrepts, wet complex, 2–30% slopes; **TIE**, Tinker-Rock outcrop, granitic-Cryumbrepts, wet complex, 2–30% slopes Severe (16% of alignment) **TAF**, Tallac very gravelly sandy loam, 30–50% slopes Very Severe (14% of alignment) **WRG**, Ledford variant-Rock outcrop complex, 30–75% slopes	**Qf**, Holocene/Pleistocene alluvial fan deposits; **Qti**, Quaternary till; **Qt**, Holocene talus deposits; **Mvaf**, Miocene andesite and dacite flow; **Pia**, Pliocene andesite dike/intrusive; **Pib**, Pliocene basalt dike/intrusive; **KJgr**, Cretaceous/Jurassic granite and granodiorite; **KJgd** Cretaceous/Jurassic granodiorite	0.5
Squaw Valley mid-station	1	Not Rated (100%) **GRG**, Rock outcrop, granitic	**Pib**, Pliocene basalt dike/intrusive	1.5
Squaw Valley base terminal	1	Moderate (100%) **TAE**, Tallac very gravelly sandy loam, 2–30% slopes	**Qf**, Holocene/Pleistocene alluvial fan deposits	1
Gazex exploder	8	Very Severe (100%)	**KJgd**, Cretaceous/Jurassic granodiorite; **Qti** Quaternary till	0.05

Table 4.16-3 Alternative 3 Disturbance by Soil Type and Geologic Unit

Component	Number	Soil Type (Grouped by NRCS erosion hazard)	Geologic Unit	Area Disturbed during Construction (acres)
		TIG, Tinker-Rock outcrop, granitic-Cryumbrepts, wet complex, 30–75% slopes; **WRG**, Ledford variant-Rock outcrop complex, 30–75% slopes		
Shelters	4	Very Severe (100%) **WRG**, Ledford variant-Rock outcrop complex, 30–75% slopes	**KJgd** Cretaceous/Jurassic granodiorite; **Qti** Quaternary till	0.002
TOTAL				5.4

Sources: NRCS 2014, Saucedo 2005; adapted by Ascent Environmental in 2018

Alternative 3 would result in less overall disturbance than Alternative 2 (which would disturb 7.95 acres; see Table 4.16-1) because no temporary construction access road would need to be constructed. Alternative 3 disturbs less area with a moderate or severe or very severe erosion hazard rating than Alternative 2 (Table 4.16-4).

Table 4.16-4 Alternative 3 Permanent Disturbance by Soil Erosion Hazard

NRCS Erosion Hazard	Area Disturbed by Construction (Acres)	% of Total Disturbance
Not Rated	1.63	30
Moderate	3.37	62
Severe	0.08	1
Very Severe	0.37	7

Source: NRCS 2014; adapted by Ascent Environmental in 2018

NEPA Effects Conclusion

Under NEPA, and considering the NEPA indicators, absent RPMs and/or mitigation, direct and indirect effects related to excessive erosion during construction of Alternative 3 would be **adverse** because Alternative 3 would involve construction in potentially erodible soils. These effects would be mitigated through implementation of RPMs SOILS-1 through SOILS-12 and MUL-3.

CEQA Determination of Effects

Under CEQA, and using the CEQA criteria, effects related to excessive erosion during construction of Alternative 2 would be potentially significant because even with strict adherence to BMPs identified in the SWPPP, there would still be some level of disturbance-related erosion during construction relative to existing conditions. RPMs SOILS-1 through SOILS-12 include best management practices to address any impacts from excessive erosion during construction of Alternative 3. These RPMs include implementation all practicable sediment and erosion control best management practices; maintenance of ground cover; revegetation after construction; implementation of a construction management plan; and adherence to all regulations from Forest Service Region 5, Lahontan Regional Water Quality Control Board, and Placer County. RPM MUL-3 requires Forest Service and County approval of a grading plan and layout prior to approval of the temporary access road alignment. With implementation of these RPMs, this impact would be reduced to a **less-than-significant** level.

Mitigation Measures

All RPMs provided in Appendix B are adopted by Placer County as mitigation measures and are included in the Mitigation Monitoring and Reporting Program for the project. The adoption of RPMs

SOILS-1 through SOILS-12 and MUL-3 as mitigation measures reduces this potentially significant impact to a **less-than-significant** level.

4.16.3.4 ALTERNATIVE 4

Impact 4.16-1 (Alt. 4): Exposure of People and Structures to Mass Wasting Events

Mass wasting events include landslides, debris flows, and rock fall. The steep terrain in the project area and areas of relatively unconsolidated geologic materials indicate that mass wasting events that might affect people and structures are possible. However, mass wasting events in the area are rate and the potential for mass wasting events to affect project facilities is low. Rock blasting will likely be required to construct components of Alternative 4, which has the potential to trigger mass wasting events. Under NEPA, and considering the NEPA indicators, absent RPMs and/or mitigation, direct and indirect effects related to mass wasting events would be **adverse** because of the potential for mass wasting to be triggered by rock blasting during construction of Alternative 4. RPM NOI-4 would mitigate this effect. Under CEQA, and using the CEQA criteria, effects related to mass wasting events would be **potentially significant** because construction of Alternative 4 would require rock blasting, which has the potential to trigger mass wasting events. RPM NOI-4 would reduce this effect, but not to a less-than-significant level. Under CEQA, this impact would remain **potentially significant.**

Impact 4.16-1 would be very similar between Alternative 4 and Alternative 3 because of the similar alignment in the southern portion and parallel alignment of the gondola in the northern portion. The potential for landslides, debris flow, and rock fall are low because of the relatively competent nature of underlying and adjacent materials in the northern portion of Alternative 4 (Holdrege & Kull 2015:6). Additionally, the impacts of landslides, debris flow, and rock fall are low because there is no significant source of material in the southern portion of Alternative 4. Debris flows and flash floods at the site are confined to small channels and are not a significant hazard (Holdrege & Kull 2013:6). However, it is anticipated that rock blasting would be potentially required as part of construction of some of the towers as well as the Squaw Valley and Alpine Meadows mid-stations. The explosion associated with the rock blasting has the potential to trigger mass wasting events.

<u>**NEPA Effects Conclusion**</u>

Construction of Alternative 4 could expose people and structures to mass wasting events triggered by blasting. Under NEPA, and considering the NEPA indicators, absent RPMs and/or mitigation, direct and indirect effects related to mass wasting events and rockfall from Alternative 4 would be **adverse**. These effects would be mitigated through implementation of RPM NOI-4 and Mitigation Measure 4.16-1 (Alt. 4).

<u>**CEQA Determination of Effects**</u>

According to a geotechnical report prepared for the project (Holdrege & Kull 2015), no historic landslides are located within the proposed gondola alignment and the potential for them to occur in the site area is low; however, rock blasting would likely be required and has the potential to trigger mass wasting events. Under CEQA, and using the CEQA criteria, effects related to mass wasting events would be **potentially significant** because construction of Alternative 4 could expose people or structures to mass wasting events due to rock blasting. RPM NOI-4 requires the project applicant to submit a proof of contract with a state-licensed contractor if blasting is required for the installation of site improvements, comply with applicable County ordinances that relate to blasting, and use only state-licensed contractors to conduct these operations. Implementation of this RPM would reduce this potentially significant impact, but not to a less-than-significant level because to prevent mass wasting events, a combination of geology and blasting knowledge is required, the latter of which may not be addressed in RPM NOI-4. Therefore, this impact would remain potentially significant.

Mitigation Measures

All RPMs provided in Appendix B are adopted by Placer County as mitigation measures and are included in the Mitigation Monitoring and Reporting Program for the project. The adoption of RPM NOI-

4 as a mitigation measure reduces this potentially significant impact, but not to a less-than-significant level because to prevent mass wasting events, a combination of geology and blasting knowledge is required, the latter of which may not be addressed in RPM NOI-4. Therefore, this impact would remain potentially significant.

Mitigation Measure 4.16-1 (Alt. 4): Develop and Implement a Rock Blasting Plan

Implement Mitigation Measure 4.16-1 (Alt. 2).

Significance after Mitigation

Implementation of Mitigation Measure 4.16-1 (Alt. 4) would reduce the risk of mass wasting because of rock blasting to a **less-than-significant** level because the rock blasting plan would evaluate site specific conditions and minimize the potential for the blast to cause mass wasting events.

Impact 4.16-2 (Alt. 4): Exposure of People and Structures to Avalanches

Implementation of Alternative 4 would include construction of the Alpine Meadows mid-station and gondola towers within areas currently designated as snow avalanche hazard zones (PAHAs). Project implementation would also increase the frequency and number of persons present in PAHAs. Alternative 4 includes the installation of eight Gazex exploders on the Alpine Meadows side of the alignment which would replace the artillery and hand shot (explosive) system that is currently used within the project area to control avalanche. This replacement will facilitate the triggering of smaller avalanches, less destructive avalanches which will reduce the risk posed by avalanches to people or structures by larger, more powerful avalanches. However, implementation of Alternative 4 would still increase the number and frequency of persons present in PAHAs. Under NEPA, and considering the NEPA indicators, absent RPMs and/or mitigation, direct and indirect effects related to avalanche hazards would be **adverse** because the project could increase the number of people and structures at risk in the event of an avalanche. There are no applicable RPMs that would mitigate this effect. Under CEQA, and using the CEQA criteria, effects related to avalanche hazards would be **potentially significant** because the project could increase the number of people and structures at risk in the event of an avalanche. There are no applicable RPMs that would reduce this impact.

Impact 4.16-2 is similar between Alternative 4 and Alternative 2 because of the similar alignment in the southern portion and parallel alignment in the northern portion of the gondola. In Alternative 4, the Squaw Valley base terminal is located further east than any other alternative, between the Funitel and Red Dog chairlift. It is located outside of a mapped PAHA, but the area is commonly blocked off if there is a potential avalanche danger. The Alpine Meadows mid-station is located slightly west of the location for Alternative 3 but is still located within a PAHA.

NEPA Effects Conclusion

Alternative 4 would involve construction in a PAHA. Under NEPA, and considering the NEPA indicators, absent RPMs and/or mitigation, direct and indirect effects related to avalanche hazards from Alternative 4 would be **adverse** because the project could increase the number of people and structures at risk in the event of an avalanche. There are no applicable RPMs that would mitigate this effect. These effects would be mitigated, however, through implementation of Mitigation Measure 4.16-2 (Alt. 4).

CEQA Determination of Effects

Implementation of the Alternative 4 would include the construction of the Alpine Meadows mid-station and gondola towers within PAHAs. Alternative 4 would facilitate avalanche control practices on the Alpine Meadows side of the project by reducing reliance on the artillery and hand shot (explosive) system and implementing a Gazex exploder system. Under CEQA, and using the CEQA criteria, effects related to avalanche hazards would be **potentially significant** because implementation of Alternative 4 would still increase the number of persons and structures at risk in the event of an avalanche. There are no applicable RPMs that would reduce this impact. Therefore, this impact would remain potentially significant.

Mitigation Measure 4.16-2 (Alt. 4): Develop and Implement an Avalanche Hazard Mitigation Plan

Implement Mitigation Measure 4.16-2 (Alt. 2).

Significance after Mitigation

Implementation of Mitigation Measure 4.16-2 (Alt. 4) would provide a plan to operate Alternative 4 that minimizes avalanche risk; and would provide a more complete and comprehensive mitigation program to identify, inform, and instruct persons that would potentially be at additional risk because of the project. While these measures would not eliminate the risks because of snow avalanche, these measures would lower the magnitude and probability of the impact to an acceptable level. This impact would therefore be reduced to a **less-than-significant** level.

Impact 4.16-3 (Alt. 4): Risks Associated with Soil Limitations

Implementation of Alternative 4 would include construction of structures in an area with subsurface materials subject to limitations that could produce instability, structural damage, or risks of injury to persons if not properly anticipated and addressed. While all towers and buildings would be constructed in accordance with seismic standards of the CBC, implementation of the project may include buildings on specific locations with varied soil conditions and a range of risks. Under NEPA, and considering the NEPA indicators, absent RPMs and/or mitigation, direct and indirect effects related to the depth to bedrock and expansion soil limitations would have **no effect** whereas effects related to erosion potential would be **adverse** during project construction and after remediation under episodic hydrological events. Implementation of RPMs SOILS-1, SOILS-7, SOILS-9, SOILS-11, and SOILS-12 would mitigate this effect. Under CEQA, and using the CEQA criteria, effects related to soil limitations would be potentially significant prior to the consideration of RPMs because project construction would occur in an area with subsurface materials subject to limitations that could produce instability, structural damage, or risks of injury to persons if not properly anticipated and addressed. RPMs SOILS-1, SOILS-7, SOILS-9, SOILS-11, and SOILS-12 would require the implementation of BMPS that reduce the risk of erosion. These measures include slope protection, locating roads, trails, or disturbed areas away from unstable slopes, cut/fill slope construction limitations, revegetation, and ground cover requirements. With implementation of these RPMs, this impact would be reduced to a **less-than-significant** level both during construction and after remediation under episodic hydrological events.

Impact 4.16-1 would be very similar between Alternative 4 and Alternative 2 because most of the affected soils are the same units. Alternative 4 crosses two soil types that are also present in the Alternative 2 alignment: Meiss-Rock outcrop complex, 30- to 75-percent slopes, severely eroded (MIG3) and Tinker-Rock outcrop, granitic-Cryumbrepts, wet complex, 30- to 75-percent slopes (TIG). Both of these soils have a severe erosion hazard, which makes the erosion risk based on soil limitation for Alternative 4 similar to the risk for Alternative 2. Alternative 4 does not cross the Tallac very gravelly sandy loam, 30- to 50-percent slopes that is present in Alternative 2 and also has a severe erosion hazard. Field verification of soil types took place during the preparation of the geotechnical report (Holdrege & Kull 2013, 2015).

Project design and construction would conform to CBC Title 24, which identifies specific design requirements to further reduce damage from seismic-related ground failure, including soil limitations.

NEPA Effects Conclusion

Alternative 4 would involve construction in soils with limitations. Under NEPA, and considering the NEPA indicators, absent RPMs and/or mitigation, direct and indirect effects related to the depth to bedrock and expansion soil limitations would have **no effect**. Alternative 4 would not directly increase the risks associated with these soil limitations. However, there could be an **adverse** effect because of the erosion potential soil limitation from the construction of Alternative 4 and in the long term. These effects would be **mitigated** through implementation of RPMs SOILS-1, SOILS-7, SOILS-9, SOILS-11, and SOILS-12.

<u>CEQA Determination of Effects</u>

The Preliminary Geotechnical Engineering and Geologic Review (Holdrege & Kull 2015:14) conducted for the project determined that the soils found within the project area have a low potential for soil limitations such as expansion because the project area is generally underlain by little to no soil overlying near surface rock. However, the erosion hazard associated with some of the deeper and steeper soils ranges from moderate to severe within Alternative 4. Under CEQA, and using the CEQA criteria, effects related to soil limitations would be potentially significant because project construction would occur in an area with subsurface materials subject to limitations that could produce instability, structural damage, or risks of injury to persons if not properly anticipated and addressed. RPMs SOILS-1, SOILS-7, SOILS-9, SOILS-11, and SOILS-12 would require the implementation of BMPS that reduce the risk of erosion. These measures include slope protection, locating roads, trails, or disturbed areas away from unstable slopes, cut/fill slope construction limitations, revegetation, and ground cover requirements. With implementation of these RPMs, this impact would be reduced to a **less-than-significant** level both during construction and in the long-term.

Mitigation Measures

All RPMs provided in Appendix B are adopted by Placer County as mitigation measures and are included in the Mitigation Monitoring and Reporting Program for the project. The adoption of RPMs SOILS-1, SOILS-7, SOILS-9, SOILS-11, and SOILS-12 as mitigation measures reduces this potentially significant impact to a **less-than-significant** level.

Impact 4.16-4 (Alt. 4): Excessive Erosion during Construction

Depending on wind and rain conditions, grading activities associated with Alternative 4 could result in the potential for erosion of site soils during construction. During construction graded, excavated, and stockpiled soil could be exposed to erosion via wind and water runoff which could flow into and degrade nearby water bodies including Squaw and Bear Creek. Standard erosion control measures would be employed to prevent soil erosion, the overall construction disturbance area is relatively small, and portions of the construction would take place on exposed rock where there is no erosion potential. Under NEPA, and considering the NEPA indicators, absent RPMs and/or mitigation, direct and indirect effects related to soil erosion would be **adverse** because of the erosion potential from project construction and the steep topography in much of the project area. Implementation of RPMs SOILS-1 through SOILS-12 and MUL-3 would mitigate this effect. Under CEQA, and using the CEQA criteria, effects related to soil erosion would be potentially significant prior to the consideration of RPMs because of the erosion potential from project construction and the steep topography in much of the project area. RPMs SOILS-1 through SOILS-12 include best management practices to address any impacts from excessive erosion during construction of Alternative 4. These RPMs include implementation all practicable sediment and erosion control best management practices; maintenance of ground cover; revegetation after construction; implementation of a construction management plan; and adherence to all regulations from Forest Service Region 5, Lahontan Regional Water Quality Control Board, and Placer County. RPM MUL-3 requires Forest Service and County approval of a grading plan and layout prior to approval of the temporary access road alignment. With implementation of these RPMs, this impact would be reduced to a **less-than-significant** level.

Under Alternative 4, the Squaw Valley base terminal, the Squaw Valley mid-station, and the Alpine Meadows mid-stations would be in different locations than any of the other alternatives. The base terminal at Alpine Meadows would be in the same location as described for the other alternatives. The Alpine Meadows mid-station design and disturbance would be similar to the mid-stations described for Alternative 2. Construction of this mid-station would require approximately 25,000 cubic yards of excavation, of which approximately 5,000 cubic yards would remain onsite. Access to this site would require a new permanent road. The Squaw Valley mid-station would be located on the Olympic Ridge, east of the top terminal of the existing Olympic Lady lift. Under Alternative 4, the Squaw Valley mid-station would be located slightly to the east of the Squaw Valley mid-station location proposed for Alternatives 2 and 3. The mid-station design and access would be similar to the Squaw Valley mid-station included in Alternative 2. The alignment of the existing Red Dog lift may need to be altered to accommodate the gondola. Under Alternative 4, fill required for the grading proposed at the Alpine Meadows base area would be generated from the Alpine Meadows mid-station site.

The same Gazex avalanche mitigation system described above is also proposed as part of Alternative 4. Although avalanche mitigation would not be affected by the modified location of the gondola under this alternative, Alpine Meadows nonetheless proposes to replace the existing artillery and hand-charge based system with the more efficient Gazex system.

Construction of Alternative 4 is estimated to result in the removal of 38 trees for installation of project facilities and as part of overstory vegetation removal to prevent trees from conflicting with gondola operations—the least amount identified for any of the action alternatives. Additionally, approximately 176 trees were identified with the canopy extending over project activity areas. These trees, substantially fewer than under Alternative 2 and somewhat greater than under Alternative 3, could be subject to removal if they conflict with project construction or operation. The timber removal/skidding activities in the project area could loosen and disturb soils; remove ground surface litter in some areas, exposing the soil surface and facilitating erosion; and compact soils such that runoff can no longer infiltrate or be filtered by the soil.

Table 4.16-5 represents the disturbance by soil type and geologic unit associated with Alternative 4.

Table 4.16-5 Alternative 4 Disturbance by Soil Type and Geologic Unit

Component	Number	Soil Type (grouped by NRCS erosion hazard)	Geologic Unit	Area Disturbed during Construction (acres)
Alpine Meadows base terminal	1	Moderate (100%) **TAE**, Tallac very gravelly sandy loam, 2–30% slopes	**Qti**, Quaternary till	1.9
Alpine Meadows mid-station	1	Moderate (100%) **TIE**, Tinker-Rock outcrop, granitic-Cryumbrepts, wet complex, 2–30% slopes	**KJgd**, Cretaceous/Jurassic granodiorite	0.5
Towers	35	Not Rated (20%) **GRG**, Rock outcrop, granitic **VRG**, Rock outcrop, volcanic Moderate (32%) **TAE**, Tallac very gravelly sandy loam, 2–30% slopes; **TBE**, Tallac-Cryumbrepts, wet complex, 2–30% slopes; **TIE**, Tinker-Rock outcrop, granitic-Cryumbrepts, wet complex, 2–30% slopes Severe (20%) **TBF**, Tallac-Cryumbrepts, wet complex, 30–50% slopes Very Severe (28%) **TIG**, Tinker-Rock outcrop, granitic-Cryumbrepts, wet complex, 30–75% slopes; **WRG**, Ledford variant-Rock outcrop complex, 30–75% slopes; **MIG3**, Meiss-Rock outcrop complex, 30–75% slopes, severely eroded	**Qf**, Holocene/Pleistocene alluvial fan deposits; **Qti**, Quaternary till; Qt, Holocene talus deposits; **Pia**, Pliocene andesite dike/intrusive; **KJgr**, Cretaceous/Jurassic granite and granodiorite; **Pib**, Pliocene basalt dike/intrusive; **KJgd**, Cretaceous/Jurassic granodiorite	0.5
Squaw Valley mid-station	1	Not Rated (50%) **VRG**, Rock outcrop, volcanic Very Severe (50%) **MIG3**, Meiss-Rock outcrop complex, 30–75% slopes, severely eroded	**Pia**, Pliocene andesite dike/intrusive	1.5
Squaw Valley base terminal	1	Moderate (100%) **TAE**, Tallac very gravelly sandy loam, 2–30% slopes	**Qf**, Holocene/Pleistocene alluvial fan deposits	1
Gazex exploder	8	Very Severe (100%) **TIG**, Tinker-Rock outcrop, granitic-Cryumbrepts, wet complex, 30–75% slopes; **WRG**, Ledford variant-Rock outcrop complex, 30–75% slopes	**KJgd**, Cretaceous/Jurassic granodiorite; **Qti,** Quaternary till	0.05
Shelters	4	Very Severe (100%) **WRG**, Ledford variant-Rock outcrop complex, 30–75% slopes	**KJgd,** Cretaceous/Jurassic granodiorite; **Qti,** Quaternary till	0.002
TOTAL				5.4

Sources: NRCS 2014, Saucedo 2005; adapted by Ascent Environmental in 2018

There would be no temporary disturbance associated with Alternative 4 compared to Alternative 2 because no temporary access road would be constructed. Alternative 4 has a lower overall disturbance area than Alternative 2 (which would disturb 7.95 acres; see Table 4.16-1) and the same disturbance area as Alternative 2 (which would disturb 5.4 acres; see Table 4.16-3). Alternative 4 has a slightly higher impact in soils with a severe or very severe erosion hazard than Alternatives 2 and 3 (Table 4.16-6).

Table 4.16-6 Alternative 4 Permanent Disturbance by Soil Hazard Rating

NRCS Erosion Hazard	Area Disturbed by Construction (Acres)	% of Total Disturbance
Not Rated	0.85	16
Moderate	3.56	65
Severe	0.1	2
Very Severe	0.94	17

Source: NRCS 2014; adapted by Ascent Environmental in 2018

NEPA Effects Conclusion

Alternative 4 would involve construction in potentially erodible soils. Under NEPA, and considering the NEPA indicators, absent RPMs and/or mitigation, direct and indirect effects related to excessive erosion during construction of Alternative 4 would be **adverse** because Alternative 4 would involve construction in potentially erodible soils. These effects would be mitigated through implementation of RPMs SOILS-1 through SOILS-12 and MUL-3.

CEQA Determination of Effects

Under CEQA, and using the CEQA criteria, effects related to excessive erosion during construction of Alternative 4 would be potentially significant because even with strict adherence to BMPs identified in the SWPPP, there would still be some level of disturbance-related erosion during construction relative to existing conditions. RPMs SOILS-1 through SOILS-12 include best management practices to address any impacts from excessive erosion during construction of Alternative 4. These RPMs include implementation all practicable sediment and erosion control best management practices; maintenance of ground cover; revegetation after construction; implementation of a construction management plan; and adherence to all regulations from Forest Service Region 5, Lahontan Regional Water Quality Control Board, and Placer County. RPM MUL-3 requires Forest Service and County approval of a grading plan and layout prior to approval of the temporary access road alignment. With implementation of these RPMs, this impact would be reduced to a **less-than-significant** level.

Mitigation Measures

All RPMs provided in Appendix B are adopted by Placer County as mitigation measures and are included in the Mitigation Monitoring and Reporting Program for the project. The adoption of RPMs SOILS-1 through SOILS-12 and MUL-3 as mitigation measures reduces this potentially significant impact to a **less-than-significant** level.

4.16.3.5 SUMMARY OF DIRECT AND INDIRECT EFFECTS

Table 4.16-7 provides a summary of the effects determinations for the direct and indirect effects evaluated above for each alternative.

For Alternative 1, the No Action Alternative, there would be no effect for all NEPA indicators and CEQA criteria evaluated.

Addressing the action alternatives, for Impact 4.16-1, NEPA effects are adverse and CEQA impacts are potentially significant for all three action alternatives. However, with implementation of RPM NOI-4 and Mitigation Measure 4.16-1, effects under NEPA would be mitigated, and impacts under CEQA would be reduced to a less-than-significant level for all action alternatives. There is no meaningful difference in effects across the three action alternatives.

For Impact 4.16-2, NEPA effects are adverse and CEQA impacts are potentially significant for all three action alternatives. However, with implementation of Mitigation Measure 4.16-2, effects under NEPA would be mitigated, and impacts under CEQA would be reduced to a less-than-significant level for all action alternatives. Alternative 2 would include construction of gondola towers within areas currently designated as snow avalanche hazard zones (PAHAs). In addition to the gondola towers, under Alternatives 3 and 4, the Alpine Meadows mid-station would also be constructed within a mapped PAHA. Under Alternative 4, the Squaw Valley mid-station would be located outside of a mapped PAHA.

For Impact 4.16-3, NEPA effects are adverse and CEQA impacts are potentially significant for all three action alternatives. However, with implementation of RPMs, effects under NEPA would be mitigated, and impacts under CEQA would be reduced to a less-than-significant level for all action alternatives. Alterative 4 proposes more ground disturbance in very severe erosion hazard soils than Alternatives 2 and 3.

For Impact 4.16-4, NEPA effects are adverse and CEQA impacts are potentially significant for all three action alternatives. However, with implementation of RPMs, effects under NEPA would be mitigated, and impacts under CEQA would be reduced to a less-than-significant level for all action alternatives. Alternative 2 proposes the most ground disturbance (up to 7.95 acres compared with 5.4 acres under both Alternatives 3 and 4), which could result in erosion during construction. Alternative 4 proposes the most ground disturbance in soils with very severe erosion hazard soils compared with Alternatives 2 and 3.

Table 4.16-7 Summary of Direct and Indirect Effects

Impact	Applicable Analytical Indicators and Significance Criteria	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Impact 4.16-1: Exposure of People and Structures to Mass Wasting Events	Expose people or structures to unstable earth conditions or change in geologic substructures	No effect	Adverse under NEPA; less than significant with mitigation under CEQA	Adverse under NEPA; less than significant with mitigation under CEQA Similar to Alternative 2	Adverse under NEPA; less than significant with mitigation under CEQA Similar to Alternatives 2 and 3
	Result in exposure of people or property to geologic and geomorphological (i.e., avalanches) hazards such as earthquakes, landslides, mudslides, ground failure, or similar hazards	No effect	Adverse under NEPA; less than significant with mitigation under CEQA	Adverse under NEPA; less than significant with mitigation under CEQA Similar to Alternative 2	Adverse under NEPA; less than significant with mitigation under CEQA Similar to Alternatives 2 and 3
Impact 4.16-2: Exposure of People and Structures to Avalanches	Result in exposure of people or property to geologic and geomorphological (i.e., avalanches) hazards such as earthquakes, landslides, mudslides, ground failure, or similar hazards	No effect	Adverse under NEPA; less than significant with mitigation under CEQA	Adverse under NEPA; less than significant with mitigation under CEQA Similar to Alternative 2	Adverse under NEPA; less than significant with mitigation under CEQA Similar to Alternatives 2 and 3
Impact 4.16-3: Risks Associated with Soil Limitations	Inventory of erodible soils by soil map unit and field verification of these properties	No effect	Adverse under NEPA; less than significant under CEQA	Adverse under NEPA; less than significant under CEQA Similar to Alternative 2	Adverse under NEPA; less than significant under CEQA Similar to Alternatives 2 and 3
	Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse	No effect	Adverse under NEPA; less than significant under CEQA	Adverse under NEPA; less than significant under CEQA Similar to Alternative 2	Adverse under NEPA; less than significant under CEQA Similar to Alternatives 2 and 3

Table 4.16-7 Summary of Direct and Indirect Effects

Impact	Applicable Analytical Indicators and Significance Criteria	Alt. 1	Alt. 2	Alt. 3	Alt. 4
	Be located on expansive soil, as defined in Table 18 of the Uniform Building Code (1994, as updated), creating substantial risks to life or property	No effect	Adverse under NEPA; less than significant under CEQA	Adverse under NEPA; less than significant under CEQA Similar to Alternative 2	Adverse under NEPA; less than significant under CEQA Similar to Alternatives 2 and 3
Impact 4.16-4: Excessive Erosion during Construction	Identification and estimated quantification (acres) of temporary and permanent ground disturbance according to high/moderate/low erodibility soils classes, site geology and subsurface conditions, and slope stability concerns	No effect	Adverse under NEPA; less than significant under CEQA	Adverse under NEPA; less than significant under CEQA Less ground disturbance than under Alternative 2	Adverse under NEPA; less than significant under CEQA Similar to Alternatives 2 and 3
	Analysis of increased erosion hazard because of temporary and permanent ground disturbance	No effect	Adverse under NEPA; less than significant under CEQA	Adverse under NEPA; less than significant under CEQA Less ground disturbance than under Alternative 2	Adverse under NEPA; less than significant under CEQA Similar to Alternatives 2 and 3
	Inventory of erodible soils by soil map unit and field verification of these properties	No effect	Adverse under NEPA; less than significant under CEQA	Adverse under NEPA; less than significant under CEQA Less ground disturbance than under Alternative 2	Adverse under NEPA; less than significant under CEQA Similar to Alternatives 3 and 4.
	Identify best management practices (BMPs) to reduce soil erosion	No effect	Adverse under NEPA; less than significant under CEQA	Adverse under NEPA; less than significant under CEQA Less ground disturbance than under Alternative 2	Adverse under NEPA; less than significant under CEQA Similar to Alternatives 2 and 3
	Result in any significant increase in wind or water erosion of soils, either on or off the site	No effect	Adverse under NEPA; less than significant under CEQA	Adverse under NEPA: less than significant under CEQA Less ground disturbance than under Alternative 2	Adverse under NEPA; less than significant under CEQA Similar to Alternatives 2 and 3

4.16.4 Cumulative Effects

4.16.4.1 METHODS AND APPROACH

The list of past, present, and reasonably foreseeable future projects considered in this cumulative analysis is provided in Chapter 3 of this Draft EIS/EIR. The geographic scope for analyzing cumulative effects for soils, geology, and seismicity is the immediate project vicinity.

Any present or reasonably foreseeable future projects in the immediate project vicinity have the potential to create impacts to soils, geology, and seismicity. Potential impacts associated with these projects include significant increases in exposure of people or structures to mass wasting, avalanche, soil limitations, and/or cause excessive erosion during construction. The following is a list of present and reasonably foreseeable future projects that could affect soils, geology, and seismicity in the immediate project vicinity.

Project	Potential Impacts
Alpine Meadows Master Development Plan	Increased exposure to mass wasting, avalanche, soil limitations, and/or excessive erosion during construction.
Squaw Valley Red Dog Lift Replacement	Increased exposure to mass wasting, avalanche, soil limitations, and/or excessive erosion during construction.
Alpine Meadows Hot Wheels Lift Replacement	Increased exposure to mass wasting, avalanche, soil limitations, and/or excessive erosion during construction.
White Wolf development	Increased exposure to mass wasting, avalanche, soil limitations, and/or excessive erosion during construction.
General development in Olympic Valley	Increased exposure to mass wasting, avalanche, soil limitations, and/or excessive erosion during construction.
General development in Alpine Meadows	Increased exposure to mass wasting, avalanche, soil limitations, and/or excessive erosion during construction.
Alpine Sierra subdivision	Increased exposure to mass wasting, avalanche, soil limitations, and/or excessive erosion during construction.
Tahoe National Forest Land and Resource Management Plan	Regulatory changes
Sierra Nevada Forest Plan Amendment	Regulatory changes

4.16.4.2 CUMULATIVE IMPACTS

Alternative 1 – No Action Alternative

Alternative 1 – No Action Alternative would result in a continuation of existing conditions. There would be no direct and indirect impacts and thus by definition no cumulative impacts to soils, geology, or seismicity.

Alternative 2

Geotechnical and seismic impacts tend to be site-specific rather than cumulative in nature. For example, seismic events may affect a project-related structure, but the construction of the project components (towers, terminals, Gazex exploders and shelters) would not cause any adjacent parcels to become more or less susceptible to seismic events. The related future projects listed in Table 3-3 as well as Alternative 2 would be required to be designed and constructed in accordance with the State earthquake protection law (California Health and Safety Code Section 19100 et seq.), which requires that all new structures be designed to resist stresses produced by lateral forces caused by wind and earthquakes. Specific minimum seismic safety and structural design requirements are set forth in Chapter 16 of the CBC. Therefore, Alternative 2 would not have a considerable contribution to an overall adverse cumulative effect related to seismicity.

The Squaw Valley and Alpine Meadows area has steep slopes that are vulnerable to mass wasting and avalanche. Construction of the proposed gondola associated with Alternative 2 has the potential to result in adverse effects on structures and human life as a result of mass wasting and avalanche both of which are primarily local, site-specific impacts. Alternative 2 would not significantly alter topography which could increase the risk of mass wasting or avalanche and would not cause any adjacent parcels or projects to be more vulnerable to these events. Therefore, Alternative 2 would not have a considerable contribution to an overall adverse cumulative effect related to mass wasting or avalanche.

The Squaw Valley and Alpine Meadows area is also vulnerable to soil limitations such as depth to bedrock, expansion, and erosion potential. Much of the project area for Alternative 2 is generally underlain by little to no soil overlying near surface rock and soils within the project area do not contain a significant amount of clay, and as a result have a low linear extensibility. Thus Alternative 2 would not result in a cumulative effect to soil limitations regarding depth to bedrock or soil expansion. Related future projects listed in Table 3-3 as well as Alternative 2 would be required to minimize soil erosion effects by limiting surface disturbance to the grading seasons prescribed by Placer County and the Lahontan Regional Water Quality Control Board; include project design features or mitigation measures; comply with regulatory permitting requirements and conditions; develop a SWPPP; and implement BMPs that are expected to offset each project's short-term (construction) and long-term (operational) effects such as exposed soils, unstable earthworks, or groundwater interference. Specifically, Alternative 2 would include implementation of Mitigation Measures 4.16-1 and 4.16-2. Therefore, Alternative 2 would not have a considerable contribution to an overall adverse cumulative effect related to grading and soil erosion that could not be addressed by BMPs and standard engineering practices.

Alternatives 3 and 4

Cumulative impacts resulting from Alternatives 3 and 4 would be very similar to those discussed above for Alternative 2. For example, exposure of people and structures to mass wasting events and avalanches would be similar across the action alternatives. There would be a difference among the action alternatives in terms of risks associated with soil limitations because of the number of structures proposed within areas currently designated as snow avalanche hazard zones (PAHAs); Alternative 3 proposes the most structures in these areas, followed by Alternative 4 and then Alternative 2. Another difference is regarding excessive erosion during construction; Alternative 2 proposes the most ground disturbance (up to 7.95 acres compared with 5.4 acres under both Alternatives 3 and 4), which could result in erosion during construction. Alternative 4 proposes the most ground disturbance in soils with very severe erosion hazard soils compared with Alternatives 2 and 3.