12 GEOLOGY, SEISMICITY, AND SOILS

12.1 ENVIRONMENTAL SETTING

This section describes the existing geologic and soil conditions in the region and at the project site and provides an analysis of the potential geologic hazards and soils impacts associated with project implementation.

12.1.1 GEOLOGY AND TOPOGRAPHY

REGIONAL

The project site is located in the northern portion of the Sierra Nevada geomorphic province of California, northwest of Lake Tahoe. The Sierra is a tilted fault block nearly 400 miles long. Its east face is a high, rugged multiple scarp, contrasting with the gentle western slope (about 2°) that disappears under sediments of the Great Valley. Deep river canyons are cut into the western slope. Their upper courses, especially in massive granites of the higher Sierra, are modified by glacial sculpturing, forming such scenic features as Yosemite Valley. The high crest culminates in Mt. Whitney in the south, with an elevation of 14,495 feet above sea level near the eastern scarp. The metamorphic bedrock contains gold-bearing veins in the northwest trending Mother Lode. The northern Sierra boundary is marked where bedrock disappears under the Cenozoic volcanic cover of the Cascade Range (California Geologic Survey 2002).

The regional terrain in the vicinity of the project is generally defined by gently sloping to moderately steep plateaus and mountain valleys (Martis Valley and Sierra Valley) with some steep mountainous areas (See Exhibit 7-2 in Chapter 7, Visual Resources). The plateaus, valleys, and mountains are dissected by streams in moderately steep-sided canyons, including the Truckee River Canyon (See Exhibit 7-3 in Chapter 7, Visual Resources). Elevation ranges from about 5,000 feet above mean sea level (msl) along the Truckee River up to over 9,000 feet above msl on Mount Lola, located 12 miles northwest of Truckee. The crest of the Sierra Nevada Mountain Range rises to the west of the Truckee River canyon with numerous peaks between 8,000 feet and 9,000 feet above msl, including Mt. Lincoln, Mount Andersen, and Tinker Knob.

PROJECT SITE

The project site is located within the U.S. Geological Survey (USGS) Truckee 7.5-Minute topographic quadrangle, within the Eastern Regional MRF and Transfer Station site. Elevation on the site ranges from approximately 6,290 to approximately 6,320 feet above sea level. The site generally slopes from northwest to southeast at between five and 25 percent grade and drains by natural overland flow and drainage swales that traverse the project site. To the southeast, the Truckee River and offsite residences located along the river are at an elevation approximately 375 feet below the project site.

Volcanic activity during the Tertiary age (and more recently) and several periods of glaciation have resulted in surface materials including volcanic and granitic boulders and cobbles in a silty to sandy matrix, as well as colluvium. Glacial moraines (glacially formed accumulation of unconsolidated glacial debris [soil and rock]) underlay much of the site and consist primarily of grey andesite porphyry, with some red andesite and some black basalt. Beneath the surface materials, tertiary volcanic flows and mudflow breccias (rock fragments bound together in natural cement) are present (Placer County 1994a).

12.1.2 SEISMICITY AND FAULT ZONES

Potential seismic hazards resulting from a nearby moderate to major earthquake can generally be classified as primary and secondary. The primary effect is fault ground rupture, also called surface rupture. Common secondary seismic hazards include ground shaking, liquefaction, and subsidence. Each of these potential hazards is discussed below.

SURFACE RUPTURE

Surface rupture is an actual cracking or breaking of the ground along a fault during an earthquake. Structures built over an active fault can be torn apart if the ground ruptures. Surface rupture along faults is generally limited to a linear zone a few meters wide. The Alquist-Priolo Act (see the Regulatory Setting discussion below) was created to prohibit the location of structures designed for human occupancy across the traces of active faults, thereby reducing the loss of life and property from an earthquake. No Alquist-Priolo zones have been established on or adjacent to the project area, or anywhere within Placer County (California Department of Conservation 2010).

SEISMIC GROUND SHAKING

Ground shaking, motion that occurs as a result of energy released during faulting, could potentially result in the damage or collapse of buildings and other structures, depending on the magnitude of the earthquake, the location of the epicenter, and the character and duration of the ground motion. Other important factors to be considered are the characteristics of the underlying soil and rock, the building materials used, and the workmanship of the structure.

Seismic activity has occurred in the area surrounding the project site in recent history, including a magnitude 6+ earthquake in 1966, a magnitude 3.6 earthquake in 1998, and a magnitude 4.5 earthquake in 2004 (Town of Truckee 2006). Faults within five miles of the project site include the West Tahoe-Dollar Point fault zone to the east, the Tahoe-Sierra frontal fault zone to the south, the Dog Valley fault zone to the north, and several unnamed faults south and east of the Town of Truckee (U.S. Geological Survey 2011).

In 1996, the California Geological Survey released a probabilistic seismic hazard assessment to aid in the assessment of seismic ground-shaking hazards in California (Peterson et al. 1996). The report contains a probabilistic seismic hazard map that depicts the peak ground acceleration (Pga) values exceeded in a given region of California at a 10 percent probability in 50 years (i.e., 0.2 percent probability in 1 year). The peak horizontal ground acceleration values depicted on the map represent probabilistic estimates of the ground-shaking intensity likely to occur in a given area as a result of characteristic earthquake events on active faults, and can be used to assess the relative seismic ground-shaking hazard for a given region. Pga values range from a low of <0.1g to a high of >0.8g (g = acceleration due to gravity). For the region in which the project is located, Pga values are shown to be between 0.2g and 0.3g (Peterson et al. 1996).

The California Geological Survey provides precise Pga values based on project area longitude and latitude through an online Probabilistic Seismic Hazards Mapping Ground Motion website. Based on this mapping tool, the approximate Pga values for the project area are 0.26g for firm rock, 0.28g for soft rock, and 0.32g for alluvium (California Geological Survey 2012).

LIQUEFACTION AND GROUND FAILURE

Soil liquefaction occurs when ground shaking from an earthquake causes a sediment layer saturated with groundwater to lose strength and take on the characteristics of a fluid. Liquefaction poses a hazard to engineered structures. The loss of soil strength can result in bearing capacity insufficient to support foundation

loads, increased lateral pressure on retaining or basement walls, and slope instability. Factors determining the liquefaction potential are soil type, the level and duration of seismic ground motions, the type and consistency of soils, and the depth to groundwater. Loose sands and peat deposits are susceptible to liquefaction, while clayey silts, silty clays, and clays deposited in freshwater environments are generally stable under the influence of seismic ground shaking.

According to previous soil sampling on the project site, soil characteristics of the site include a matrix of clay, silt and sand, varying in proportions (Placer County 1994a). The soil matrix includes sand layers that may provide potential avenues for groundwater movement, and potential liquefaction during a seismic event.

12.1.3 SUBSIDENCE AND EXPANSION

Land surface subsidence can be induced by both natural and human phenomena. Natural phenomena include: subsidence resulting from tectonic deformations and seismically induced settlements; soil subsidence from consolidation, hydrocompaction, or rapid sedimentation; subsidence from oxidation or dewatering of organic-rich soils; and subsidence related to subsurface cavities. Subsidence related to human activity includes subsurface fluid or sediment withdrawal. Lateral spreading (expansion) is the horizontal movement or spreading of soil toward an open face, such as a streambank, the open side of fill embankments, or the sides of levees. 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.

Expansive soils can undergo substantial volume changes (shrink and swell) with changes in moisture content (wetting and drying). Soils with high clay content tend to be the most affected. The shrink-swell potential of expansive soils can result in differential movement beneath foundations. Geotechnical reports for other projects within the Eastern Regional MRF and Transfer Station site have indicated the potential of soils with expansive characteristics on adjacent portions of the property (Eiri pers. comm., 2012). A site-specific geotechnical report has not yet been prepared to determine the presence or absence of expansive soils on the project site.

12.1.4 SLOPE STABILITY

A landslide is the downhill movement of masses of earth material under the force of gravity. The factors contributing to landslide potential are steep slopes, unstable terrain, and proximity to earthquake faults. This process typically involves the surface soil and an upper portion of the underlying bedrock. Expansive soil on slopes tends to shrink and swell in response to moisture content changes. During this shrinking and swelling process, gravity tends to work the soil downslope. Movement may be very rapid, or so slow that a change of position can be noted only over a period of weeks or years (creep). The size of a landslide can range from several square feet to several square miles.

As noted previously, the project area is located on a sloped site. The site generally slopes from northwest to southeast at between 5 and 25 percent grade.

12.1.5 AVALANCHE

Avalanches occur when loading of new snow increases stress at a rate faster than strength develops in the snowpack, and the slope fails. Critical stresses develop more quickly on steeper slopes and where deposition of wind-transported snow is common. The combination of steep slopes, abundant snow, weather, snowpack, and an impetus to cause movement creates avalanches. Avalanche hazards exist in eastern Placer County where combinations of the above criteria occur (Placer County 2010).

Although avalanches have occurred on slopes of many angles, they most often occur on slopes ranging between 30 degrees and 45 degrees. Therefore ski resorts, residences, roads, businesses, and other structures and activities in these areas are vulnerable. Moderate hazard zones are usually on shallow slopes and located immediately downhill of high zones. These high and moderate zones are located near the Nevada County line, south of Donner Lake and Lake Van Norden, east of Tahoe City, near Twin Peaks and McKinney Bay, and in areas near Squaw Valley, Alpine Meadows, and Sugar Bowl (Placer County 2010).

Areas of particular concern for avalanche hazards include: Alpine Meadows, Bear Creek drainage; West shore of Donner Lake; Donner Summit/Norden Area; West shore of Lake Tahoe (Homewood & Ward Creek tract); Serene Lakes, Onion Creek drainage; Squaw Valley; Sugar Bowl Ski Resort and Onion Creek; Truckee River Corridor/Highway 89 Corridor; and Northstar Ski Resort (Placer County 2010).

12.1.6 SOILS

According to the USDA Soil Conservation Survey, the types of soils found onsite are primarily Lorack variant gravelly loam, with smaller areas of Jorge-Rubble land complex and Waca-Meiss complex Survey (United States Department of Agriculture Natural Resources Conservation Service 2012). Characteristics of these soils typically include a near surface layer of silty sand underlain by clayey sand with gravel and cobbles. Soils are moderately well-drained and generally have a moderate to low corrosion potential when in contact with buried metal (Eiri pers. comm., 2012). The USDA Soil Conservation Survey also indicates that these types of soils have a low to moderate erosion hazard.

12.1.7 MINERAL RESOURCES

Mineral resources including sand, gravel, clay, stone, and gold, are found throughout Placer County. Although current gold mining is minimal compared to historic mining activity, some operations continue to produce. Sand and gravel are the primary mineral resources currently being extracted for construction activities (Placer County 1994b). Figures 9-9 and 9-10 of the Placer County General Plan Background Report identify the existing mineral extraction sites and potential mineral resources sites in Placer County. The project site is not identified on these figures as a mineral extraction site or potential mineral resource site (Placer County 1994b).

12.2 REGULATORY SETTING

12.2.1 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 (FEMA) 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, and USGS.

12.2.2 STATE

CALIFORNIA BUILDING CODE

The State of California provides minimum standards for building design through the California Building Standards Code (California Code of Regulations, Title 24). The current 2010 California Building Code (CBC) is based on the 2009 International Building Code (IBC). The CBC has been modified for California conditions with more detailed and/or more stringent regulations.

The State earthquake protection law (California Health and Safety Code Section 19100 et seq.) requires that 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. 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.

ALQUIST-PRIOLO EARTHQUAKE FAULT ZONING ACT

The Alquist-Priolo Act (Public Resources Code Sections 2621–2630) was passed in 1972 to mitigate the hazard of surface faulting to structures designed for human occupancy. The main purpose of the law is to prevent the construction of buildings used for human occupancy on the surface trace of active faults. The law addresses only the hazard of surface fault rupture and is not directed toward other earthquake hazards. The Alquist-Priolo Act requires the State Geologist to establish regulatory zones known as "Earthquake Fault Zones" around the surface traces of active faults and to issue appropriate maps. The maps are distributed to all affected cities, counties, and State agencies for their use in planning efforts. Before a project can be permitted in a designated Alquist-Priolo Earthquake Fault Zone, cities and counties must require a geologic investigation to demonstrate that proposed buildings would not be constructed across active faults.

SEISMIC HAZARDS MAPPING ACT

The Seismic Hazards Mapping Act of 1990 (Public Resources Code Sections 2690–2699.6), addresses earthquake hazards from non-surface fault rupture, including liquefaction and seismically induced landslides. The act established a mapping program for areas that have the potential for liquefaction, landslide, strong ground shaking, or other earthquake and geologic hazards. The Act also specifies that the lead agency for a project may withhold development permits until geologic or soils investigations are conducted for specific sites and mitigation measures are incorporated into plans to reduce hazards associated with seismicity and unstable soils.

12.2.3 LOCAL

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 the following: Fill or excavation greater than 250 cubic yards, cuts or fills exceeding four feet in depth, structural retaining walls exceeding four 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.

Project Name/Document Type 12-5

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 potential avalanche hazard areas (PAHA) 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 based on approved studies that designate a minimum probability of occurrence greater than one in 100 per year, or where avalanche damage is documented.

PLACER COUNTY GENERAL PLAN

The relevant policies of the General Plan with respect to seismic and geologic hazards are listed below. Refer to Table 4-1 in Chapter 4, Land Use for analysis of the project's consistency with relevant General Plan policies (Placer County 1994c: Section 8, Health and Safety; p 128 and 136).

- 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.3. The County shall prohibit the placement of habitable structures or individual sewage disposal systems on or in critically expansive soils unless suitable mitigation measures are incorporated to prevent the potential risks of these conditions.
- 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.
- Policy 8.A.12. 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.

12.3 IMPACTS

12.3.1 SIGNIFICANCE CRITERIA

Pursuant to Placer County's Environmental Questionnaire, and CEQA Guidelines Appendix G, an adverse geology, seismic, or mineral resources impact is considered significant if implementation of the project would do any of the following:

- Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
 - Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault;
 - Strong seismic ground shaking;
 - Seismic-related ground failure, including liquefaction; or
 - Landslides.
- Result in substantial soil erosion or the loss of topsoil.
- 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 offsite landslide, lateral spreading, subsidence, liquefaction or collapse.
- Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property.
- Have 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.
- Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state.
- A Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan.

12.3.2 METHODS AND ASSUMPTIONS

Evaluation of potential geologic and soil impacts was based on a review of documents pertaining to the project site, including the USDA Soil Conservation Survey; input received from Placer County staff; environmental impact reports and background reports prepared for plans and projects in the vicinity, and published and unpublished geologic literature. The information obtained from these sources was reviewed and summarized to establish existing conditions and to identify potential environmental effects, based on the thresholds of significance presented in this chapter. In determining the level of significance, the analysis assumes that the proposed project would comply with relevant federal, State, and local ordinances and regulations, as well as the County General Plan objectives and policies presented in this chapter.

12.3.3 ISSUES OR POTENTIAL IMPACTS NOT DISCUSSED FURTHER

The project does not propose the use of septic tanks or alternative waste water disposal systems; a wastewater collection system, which would be extended to the project site, currently serves existing uses on the adjacent Eastern Regional MRF and Transfer Station and TART facilities. As described above, the project site is not identified as a mineral extraction site or potential mineral resource site. These issues are not discussed further in the EIR.

Project Name/Document Type 12-7

Construction-related and post-construction period erosion and sedimentation impacts are addressed in Chapter 13, Hydrology and Water Quality. Therefore this issue is not addressed further in this chapter.

12.3.4 IMPACT ANALYSIS

Impact 12-1

Seismic Hazard Impacts. Previous soil sampling on the adjacent Eastern Regional MRF and Transfer Station site indicated the potential for liquefaction. A site-specific geotechnical study has not been prepared for the project. Because soils near the project site exhibit liquefaction properties, it is possible that similar soils exist on the project site. Therefore, this impact is considered **potentially significant**.

Construction period seismic hazard risk would result from fault rupture that would cause ground displacement or collapse or groundshaking that would collapse partially constructed buildings. As described above in the Environmental Setting section of this chapter, the project site is located in a seismically active region; however, no Alquist-Priolo zones have been established on or adjacent to the project area. Therefore, the potential for fault rupture on the project site is considered low. Peak ground acceleration values for the project area are also considered low (0.26g for firm rock, 0.28g for soft rock, and 0.32g for alluvium). Risks to people and structures from seismic hazards during construction are considered less than significant.

Risks to people can also result from failure to design and construct facilities to withstand seismic activity. According to previous soil sampling in the area adjacent to the project site, the soil matrix in the project area includes sand layers that may provide potential avenues for groundwater movement and potential liquefaction during a seismic event. All projects within the County are required to be designed in accordance with seismic standards of the CBC, which includes regulation of construction on unstable soils, such as areas subject to liquefaction. Foundation design and engineering would be based on site-specific conditions. However, a geotechnical study has not been prepared for the project site and the presence of unstable soil conditions on the site, including the potential for liquefaction has not been determined. Because soils near the project site exhibit liquefaction properties, it is possible that similar soils exist on the project site. Therefore, this impact is considered **potentially significant**.

Impact 12-2

Impacts Associated with Landslide, Lateral Spreading, Subsidence, or Collapse. Because the site is sloping and grading would involve cut and fill, there is a potential for grading activities to create slope instability. A site-specific geotechnical study and the final grading plan have not been prepared for the project; therefore, the potential exists for unstable slopes or other soil hazards to occur. This is considered a **potentially significant** impact.

The site generally slopes from northwest to southeast at between 5 and 25 percent grade. The site earthwork is expected to total 12,000 cubic yards of export, with approximately 30,000 cubic yards of cut and 18,000 cubic yards of fill. Because the site is sloping and grading will involve cut and fill, there is a potential for grading activities to create slope instability if not properly designed. A site-specific geotechnical study and the final grading plan have not been prepared for the project; therefore, the potential exists for unstable slopes or other soil hazards to occur. Impacts associated with landslides, lateral spreading, subsidence, or collapse would be considered **potentially significant**.

Impact 12-3

Risks to People and Structures from Seismic Hazards. Foundations and structures of the biomass facility would be designed based on site-specific conditions in accordance with seismic standards of the CBC, which includes specific minimum seismic safety and structural design requirements. This impact is considered **less than significant**.

The project site is located in a seismically active region. However, no Alquist-Priolo zones have been established on or adjacent to the project area and peak ground acceleration values for the project area are low (refer to Environmental Setting, above). The State earthquake protection law (California Health and Safety Code Section 19100 et seq.) requires that 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. The CBC identifies seismic factors that must be considered in structural design and all structures built within Placer County must adhere to CBC design standards for the area. Therefore, the risk to people and structures from seismic hazards would be minimized through proper design standards. This impact is considered less than significant.

Impact 12-4

Risks to People and Structures from Avalanche Hazards. Slopes to the immediate west of the project site are between 14 and 20 percent. The project site is not located in a Potential Avalanche Hazard Area, as defined by Placer County, and the avalanche hazard is identified as low for the project site. This impact is considered **less than significant**.

Avalanches most often occur on slopes ranging between 30 to 45 degrees. According to the Placer County Local Hazard Mitigation Plan (2010) high and moderate hazard avalanche zones are located near the Nevada County line, south of Donner Lake and Lake Van Norden, east of Tahoe City, near Twin Peaks and McKinney Bay, and in areas near Squaw Valley, Alpine Meadows, and Sugar Bowl, including the Truckee River Corridor/Highway 89 Corridor. The project site sits on a sloping bench above the Truckee River Canyon. Slopes above the project site, located on the adjacent ridges to the west, are approximately 570 feet higher than the project site. The top of the ridge is over 0.5 mile west of the site, and the slope from the top of the ridge and the project site varies between 14 and 20 percent. The project site is not located in a Potential Avalanche Hazard Area, as defined by Placer County (Haas pers. com. 2012). Therefore avalanche hazard at the project site is considered to be low. This impact would be **less than significant.**

12.4 MITIGATION MEASURES

Mitigation Measure 12-1

The Improvement Plan submittal shall include a geotechnical engineering report produced by a California Registered Civil Engineer or Geotechnical Engineer. The report shall address and make recommendations on the following:

- A) Road, pavement, and parking area design;
- B) Structural foundations, including retaining wall design (if applicable);
- C) Grading practices;
- D) Erosion/winterization;
- E) Special problems discovered on-site, (i.e., groundwater, expansive/unstable soils, etc.); and
- F) Slope stability.

Client

Project Name/Document Type 12-9

If the soils report indicates the presence of critically expansive or other soils problems that, if not corrected, could lead to structural defects, a certification of completion of the requirements of the soils report shall be required prior to approval of the Improvement Plans. It is the responsibility of the Applicant to provide for engineering inspection and certification that earthwork has been performed in conformity with recommendations contained in the report.

Level of Significance After Mitigation

Implementation of these mitigation measures would reduce significant impacts associated with seismic hazards and slope instability to a **less-than-significant** level by requiring that grading and construction follows recommendations of a site-specific geotechnical report and that earthwork is monitored by a geotechnical engineer.

Mitigation Measure 12-2

The Applicant shall implement Mitigation Measure 12-1.

Level of Significance After Mitigation

Implementation of these mitigation measures would reduce significant impacts associated with seismic hazards and slope instability to a **less-than-significant** level by requiring that grading and construction follows recommendations of a site-specific geotechnical report and that earthwork is monitored by a geotechnical engineer.