4.5 GEOLOGY, SOILS, AND LAND CAPABILITY AND COVERAGE

This chapter discusses the regulatory guidance for earth resources and evaluates potential adverse environmental effects related to geology, soils, and land capability and coverage associated with implementation of the proposed project. Included in this analysis is a description of existing conditions, followed by a discussion of any changes in or to geologic conditions, relevant soil properties as they relate to geotechnical issues, and associated elements of land capability and coverage. Planning guidelines established by TRPA provide the regulatory framework that allow for the assessment of potential environmental effects to these resources. Existing conditions and potential environmental effects related to water quality resulting from soil erosion and other stormwater issues are addressed in Section 4.7, Hydrology and Water Quality.

The examination of geology, soils, and land capability and coverage is based on information from: (1) the review of academic research and available information published by local, state and federal agencies; (2) the Geotechnical Investigation Report (Kleinfelder 2005, Appendix O), Soils/Hydrologic Final Report (Kleinfelder 2006a), Geotechnical Investigation Update Letter (Kleinfelder 2006b), and the Site Investigation (Kleinfelder 2006c)[a]; and (3) the preliminary engineering drawings prepared for the proposed project and alternatives[b].

4.5.1 REGULATORY BACKGROUND

Regulations protecting the soil resources at the project site are enforced by TRPA, the Nevada Division of Environmental Protection (through water quality regulations), and Douglas County. Other regulations aid in the establishment of safe structures to ensure minimal, if any, impact on earth resources. The following discussion provides the framework for applicable earth resource requirements in the Lake Tahoe area of Douglas County.

FEDERAL EARTHQUAKE HAZARDS REDUCTION ACT

The U.S. Congress passed the Earthquake Hazards Reduction Act in 1997 to "reduce the risks to life and property from future earthquakes in the United States" through the establishment and maintenance of an effective earthquake hazards and reduction program. To accomplish this, the Act established the National Earthquake Hazards Reduction Program (NEHRP). This program was significantly amended in November 1990 by the National Earthquake Hazards Reduction Program Act (NEHRPA) by refining the description of the agency responsibilities, program goals, and objectives.

NEHRP's mission 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 it several planning, coordinating, and reporting responsibilities. Other NEHRPA agencies include the National Institute of Standards and Technology (NIST), the National Science Foundation (NSF), and the U.S. Geological Survey (USGS).

TAHOE REGIONAL PLANNING AGENCY LAND COVERAGE REGULATIONS

Soil conservation is essential for the maintenance of healthy plant communities, prevention of erosion, protection of water quality, maintenance of healthy stream systems, and protection of lake clarity. There are two major elements regarding soil conservation in the Lake Tahoe Basin: impervious land coverage and stream environment zones (SEZs). Impervious land coverage, such as asphalt, concrete, and roofs, prevents stormwater runoff from absorbing into the ground. When runoff bypasses this natural process, it is not filtered by the soil and does not contribute to local groundwater supplies. Excess runoff can overload stream channels with both sediments and

[a] These reports contain large pullout maps and other graphics and are available for review in the project file at TRPA.
[b] The full set of preliminary plans is available for review in the project file at TRPA.

higher water volumes, erode stream banks, and unnecessarily damage vegetation. Stream channel erosion transports nutrients and sediments to Lake Tahoe and contributes to the degradation of water clarity. SEZs are creeks, meadows, marshes, wetlands, and riparian areas that in low gradient systems slow runoff by dispersing it, allowing sediment to settle out and vegetation to take up nutrients. As stated in the project description, a small portion of Burke Creek crosses the parcel in two locations – the southeast corner and along a portion of the southern boundary line. A portion of Burke Creek is one component of the SEZ on the project parcel. The proposed voluntary land conveyance of 10.7 acres of the project site to a public entity for conservation of open space and public access would include the 2.4 acres of SEZ on the property (which contains the portions of Burke Creek inside the Sierra Colina SEZ) and the three proposed pedestrian/bike paths (linear public facilities [LPFs] 2, 4, and 5).

LAND CAPABILITY DISTRICTS

Since the late 1970s, regulatory agencies in the Lake Tahoe Basin, primarily TRPA, have used the land capability classification system known as the "Bailey System" (*Land-Capability Classification of the Lake Tahoe Basin, California-Nevada: A Guide to Planning* [Bailey 1974]) to determine the allowable amount of land coverage for a subject property. The Bailey System (named for the author, Robert G. Bailey) was developed as a planning tool to help prescribe land uses suitable within the Lake Tahoe Basin. The Bailey System, as utilized by TRPA, regulates the amount of impervious land coverage on all parcels and generally prohibits new land coverage in areas classified as SEZ.

Land capability is defined as "the level of use an area can tolerate without sustaining permanent (environmental) damage through erosion and other causes" (Bailey 1974). The Bailey system established a methodology for classifying the suitability of land for various types of uses in the Basin based on soil types and geomorphic setting (i.e., relief features of the earth that modify soil behavior). Classification of land in this manner recognized limitations on lands in the Basin, and this data is used to guide the types and intensities of uses on Basin lands while controlling erosion and maintaining ecological balances. The process to establish land capability classes included dividing and ranking the Basin into seven levels of land capability according to the frequency and magnitude of hazards that are present (i.e., floods, landslides, high water tables, poorly drained soils, fragile flora and fauna, and easily erodible soils). In the Bailey System, land tolerance is used as the principal measure of land capability. Table 4.5-1 shows the Bailey System land capability districts (LCDs), which range in value from 1 (lowest level of tolerance for use) to 7 (highest level of tolerance for use).

Table 4.5-1
Capability Districts for Lake Tahoe Basin Lands

Capability Levels	Tolerance for Use	Slope Percent	Relative Erosion Control	Runoff Potential	Disturbance Hazards
7	Most	0–5	Slight	Low to moderately low	Low-hazard lands
6		0–16		Low to moderately low	
5		0–16		Moderately high to high	
4		9–30	Moderate	Low to moderately low	
3		9–30	Moderate	Moderately high to high	Moderate-hazard lands
2		30–50	High	Low to moderately low	
1a	Least	30+	High	Moderately high to high	High-hazard lands
1b	(Poor Natural Drainage)				
1c	(Fragile Flora and Fauna)				

Source: TRPA 2000

LCDs were derived by analyzing the land capability according to frequency and magnitude of hazards that may be encountered and by considering the type and intensity of uses suitable for each unit (TRPA 2000). The integration of the LCDs and land use suitability resulted in limits on land-surface modifications for each unit. The limits are expressed as a percentage of each area that can be used for impervious coverage. Table 4.5-2 summarizes the characteristics and intensity of uses for the LCDs.

Table 4.5-2
Characteristics of Lands According to Capability Class and Suitable Uses Based on Relative Tolerance Levels

Capability Level (Class)	General Characteristics	Intensity of Uses
Low hazard lands – Classes 5–7	Gently sloping foothills and plains with deep soils. Surface erosion and drainage problems are generally minor to moderate.	Generally suited for various development activities and concentrated public occupancy. Access should be by high-standard roads and trails. May support most kinds of intensive or mass recreational uses. Facilities include campgrounds, recreational residences, hotels, and resorts or other commercial services where these uses would not destroy other values.
Moderate hazard lands – Classes 3 and 4	Moderately steep mountain slopes. These lands may provide visual backdrops for low hazard areas.	Recreation use may be varied and concentrated, including campgrounds, picnic areas, and winter sports sites. Access should be by low-standard roads and trails. Low-density housing may be permitted in some circumstances. Limited timber harvest may be appropriate.
High hazard lands – Class 2	Steep slopes and a fragile environment with unique plants and animals. High scenic value. Little or no soil mantle. Generally occurs in scattered areas at the base of steep slopes and along entrenched stream valleys.	Generally suited for limited recreation, restricted grazing, and selective timber harvest because of erosion hazard on slopes greater than 30%. These lands should generally remain in their natural condition. Access facilities should be restricted to foot and horse trails. Dispersed recreational uses could include hiking, backcountry camping, and fishing. These lands should not be managed for intensive commercial uses.
High hazard lands – Class 1	Mountaintops with little or no soil mantle, and very steep slopes with shallow soils. Subclasses (i.e., 1a, 1b, 1c) refer to marshes, stream channels, floodplains, meadows, and beaches.	Some of the uses specified under Class 2 apply to Class 1 as well. However, Class 1 areas are not suited for development, grazing, or forestry uses. Areas identified as Class 1 provide valuable wildlife habitat and are suited for low-intensity recreational uses. Protection of water supplies and watershed values is desirable.

Source: Data compiled by EDAW from Bailey 1974

Chapter 2 of the TRPA Code of Ordinances defines land coverage as a man-made structure, improvement or covering, that prevents normal precipitation from directly reaching the surface of the land underlying the structure, improvement, or covering. Examples include roofs, decks, patios, and surfaces paved with asphalt, concrete, or stone. Such structures are defined as "hard coverage." Compacted areas without structures are defined as "soft coverage." A structure, improvement, or covering is not considered to be land coverage if it permits at least 75% of normal precipitation to directly reach the ground and permits growth of vegetation described on TRPA's current approved species list. TRPA Code of Ordinances Chapter 20, Land Coverage Standards, applies the LCD to allowable land coverage. Table 4.5-3 presents the base percent coverage allowed for each land capability classification as set forth in Section 20.3.A.

The TRPA Code of Ordinances provides two methods for calculating allowable coverage[c]. The first, as described in Section 20.3.D (2)(a)(ii), is to calculate allowable coverage using the 1/5/20/25/30 method: based on 1% allowable percent coverage for low capability land classes 1b, 1a, 1c and 2, 5% land coverage for class 3 and 20%, 25%, and 30% allowable coverage for high capability land classes 4, 5, and 6, respectively. The second, as described in Section 20.3.D (2)(a)(iii), is to calculate allowable coverage based on the 1/5/20/20/20 method: based on 1% allowable coverage for low capability land 1b, 1a, 1c and 2, 5% land coverage for class 3 and 20%, 20%, and 20% allowable coverage for high capability classes 4, 5, and 6. Using the latter method, coverage may be relocated throughout the site, while the former method limits the land capability classes on the site to which certain of the coverage may be located.

Table 4.5-3
Tahoe Regional Planning Agency Base Land Coverage Requirements

Land Capability District	Base Coverage
6, 7	30%
5	25%
4	20%
3	5%
2	1%
1a, 1b, 1c	1%

Source: TRPA 1991.

BUILDING STANDARDS CODE

The International Code Council (ICC) is responsible for developing building codes that must be complied with when constructing residential or commercial buildings throughout the United States. Building codes developed by the ICC include the International Building Code (IBC), the Uniform Building Code (UBC), and International Residential Code (IRC), among others. Douglas County has adopted the standards set forth in the 2003 IBC and the 2003 IRC.

NEVADA DIVISION OF ENVIRONMENTAL PROTECTION

The Bureau of Water Quality Planning (BWQP) is part of the Nevada Division of Environmental Protection (NDEP) and is responsible for several water quality protection functions in the state. These include collecting and analyzing water data, developing standards for surface waters, publishing informational reports, providing water quality education, and implementing programs to address surface water quality. The BWQP is also responsible for two certification programs. BWQP is divided into three branches: water quality standards, monitoring and nonpoint sources, and ground water protection.

DOUGLAS COUNTY MASTER PLAN

The Douglas County Master Plan, Conservation Element, contains the following goals and policies relevant to geology, soils, and seismicity in the project area.

[c] Either of these two methods was used as the basis for calculating allowable coverage for the different alternatives (and with different results). The method of calculation is driven by which one produces more allowable coverage for a particular project design, based on its distribution of coverage over the site and the location of the coverage in relation to each of the land capability districts on the parcel. The method used is clearly identified in the description of each alternative.

GOAL 4.01: To minimize danger and damage to County residents from natural hazards due to seismic activity, liquefaction, and other geologic hazards.

- **Policy 4.01.03:** Require site specific soils and geologic studies to assess natural and graded slope stability for development proposed in areas which may have moderate to high potential for landsliding, erosion, or other soil or geologic instability and require mitigation through setbacks, special foundation design, etc.

- **Policy 4.01.04:** Restrict location of utility lines within an appropriate distance from active fault traces. Utility lines crossing active fault traces should be specifically designed to withstand the expected movement. Utility lines would include electricity, water, gas, and sewer.

- **Policy 4.02.03:** Douglas County shall consider the use of clustering and other flexible design techniques for development of land in areas of moderate to steep slopes, in order to minimize the environmental, seismic, aesthetic, and service impacts of the development.

- **Policy 4.02.06:** Erosion control and slope stability measures shall be included within development guidelines and shall consider such things as lifecycle maintenance costs.

DOUGLAS COUNTY BUILDING AND DEVELOPMENT ORDINANCES

Douglas County Consolidated Development Code Title 20, Chapter 20.690, "Property Development Standards," contains provisions related to grading activities in hillside areas with slopes of 15% or greater and having a minimum vertical rise of at least 30 feet. Chapter 20.690, Section K(4) requires that a slope analysis and a grading plan, prepared by a Nevada registered professional engineer, be submitted to the Community Development Department for review and approval. The grading plan must include data on proposed slopes, drainage patterns, storm water detention, and cross-section exhibits showing preliminary cut-and-fill areas. An applicant must also submit an erosion control and re-vegetation plan prepared by a Nevada licensed landscape architect, registered forester, or civil engineer. Chapter 20.690, Section K(6) set forth Douglas County grading standards that apply in hillside areas.

4.5.2 AFFECTED ENVIRONMENT

GEOLOGY

The Lake Tahoe Basin is located in the northern Sierra Nevada, between the Sierra crest to the west and the Carson Range to the east. The Sierra Nevada is the most prominent mountain range in California, and in conjunction with the Central Basin, forms part of the Sierra Nevada microplate, an element of the broad Pacific–North American plate boundary (Argus and Gordon 1991). Before becoming part of the transform plate margin, the Sierra Nevada was the site of a Cenozoic volcanic arc, with related deposits draping over pre-Cenozoic metamorphic and plutonic rocks (Wakabayashi and Sawyer 2000). The general asymmetry of the Sierra Nevada reflects uplift and gentle westward tilting, evidenced by the mountain range sloping gently westward and abruptly eastward from its crest, to the west of the project site.

The Lake Tahoe Basin was formed over 2 million years ago by a combination of faulting and volcanism. As a result, the basin contains a combination of granitic, metamorphic, and volcanic rock. The predominant bedrock in the basin is Cretaceous granodiorite of the Sierra Nevada batholith. Cretaceous rock formed during the later period of the Mesozoic Era, characterized by the development of flowering plants and ending with the sudden extinction of the dinosaurs and many other forms of life. Pre-Cretaceous metamorphic rocks are found in localized areas.

Over the past 1.5 million years, the Lake Tahoe Region has been altered by glacial activity, and most of the landforms surrounding the lake are a result of glaciation. During glacial activities, valley glaciers dammed the

Truckee River Canyon, raising the water level of Lake Tahoe. Lacustrine sediments were deposited in the bays and canyons around the lake as a result of the rising lake levels. The faulting, folding, and in some cases overturning of rock formations that has taken place during various periods of geologic activity, in combination with erosion, deposition, and subsequent cementation of rock materials that occurred during relatively quiet periods, have left a complex arrangement of geologic rock types and structures in the area. However, the extraordinary clarity of Lake Tahoe is related to the prevalence of resistant granitic bedrock in the Lake Tahoe Basin and the unusually small drainage basin relative to the size of Lake Tahoe.

A review of the *Geologic Map of the Lake Tahoe Basin* (Saucedo 2005) indicates that the project site is located within an area of Kingsbury Grade/East Peak granodiorite of the Cretaceous-age (144 to 205 million years before present). The South Lake Tahoe Folio Geologic Map describes the materials as, "Granodiorite with abundant corestones surrounded by grus (disintegrated/decomposed crystalline rock)" (Bonham 1976).

Topography

Slope of the land is an important consideration in development planning. Slopes, in conjunction with soil types, geological and seismic hazards, and scenic vistas, are potential limitations to development. In terms of construction and service costs, land with 0 to 5% slope is generally most suitable for high density development. Typically, problems associated with development on slight slopes are minimal. Development on steep slopes, hillsides, and ridgelines have greater potential for erosion problems, have lower rates of re-vegetation, can degrade the aesthetic value of the natural environment and can also represent hazards to the land itself.

The project site is located on the South Lake Tahoe, California 7.5 minute USGS quadrangle map. The topography of the project site slopes toward the west (toward Rabe Meadow across U.S. 50), toward Burke Creek in the southeast portion of site, and toward Lake Village Drive in the northern portions of the project site. Elevations range from approximately 6,326 to 6,428 feet above mean sea level (msl), Site slopes typically range from 5% to 30%.

Seismicity

The potential for seismic activity at a given project site is most often related to the proximity of faults, which are fractures or zones of closely associated fractures along which rocks on one side have been displaced with respect to those on the other side. Most faults are the result of repeated displacement that may have taken place suddenly and/or by slow creep. The project site is located approximately 4,000 feet east of the southeastern shore of Lake Tahoe on a regionally significant down-faulted graben (i.e., trench-like geologic feature).

An unnamed fault mapped by Bonham et al. (1976) crosses the central portion of the project site. The fault cuts deposits of the Cretaceous age and is concealed beneath deposits of the Quaternary period. The fault is considered inactive.

The *Preliminary Map of Pleistocene to Holocene Faults in the Lake Tahoe Basin, California and Nevada* (Schweickert et al. 2000) shows that locally, several faults have been mapped near the project site, some of which are shown to cut Holocene or Pleistocene deposits and therefore may be active or potentially active. These include the Genoa Fault, Tahoe Valley Fault, and two unnamed faults. The Genoa Fault is located approximately 5 miles east of the project site and is estimated to be capable of generating an earthquake of moment magnitude 7.4 (dePolo 1997). The Tahoe Valley fault is located approximately 2.9 miles southwest of the project site. The two unnamed faults are located approximately 500 feet west and 1.1 miles southeast of the project site, respectively. Data pertaining to estimated moment magnitudes for these other faults are not available.

The North Tahoe Fault, located beneath the lake, is a northeast-southwest trending fault, approximately 7.0 miles long. It is estimated to be capable of generating an earthquake of magnitude 7.0; however, it has been inactive for at least 10,000 years (Jennings 1994). The northeast-southwest trending Incline Village fault zone appears to be

the landward extension of the submerged North Tahoe fault and also trends northeast towards the Truckee Meadows fault (TMF). All three of these faults may be part of a system of normal faults that rupture together.

The north-south trending West Tahoe-Dollar Point fault zone is another prominent normal slip fault zone in the Tahoe Basin. The West Tahoe fault is submerged from Emerald bay to McKinney Bay. The Dollar Point fault is the northern continuation of the West Tahoe fault northward from McKinney Bay. Both of these faults are likely to rupture together. (Ichinose, et al. 1999.)

According to the Earthquake Potential Map for Portions of Eastern California and Western Nevada, the Tahoe area is considered to have a relatively low potential for shaking caused by seismic-related activity (CGS 2005). However, the Nevada Seismological Laboratory catalog lists eight earthquakes with Richter magnitudes (M) of 4.2 or greater that have occurred since 1950 within approximately 18 miles of the center of Lake Tahoe (Smith et al. 2004). These include M 4.5 earthquake approximately (at Tahoe Vista, approximately 40 miles northwest of the project site) on June 3, 2004. The 2004 event has been attributed to an increase in upper crustal seismicity following a deep dike swarm of 1,611 earthquakes in the Tahoe Vista area at the site of a deep magma injection event beneath Lake Tahoe (Smith et al. 2004). Recent seismic research in the Lake Tahoe Basin suggests that the potential for strong seismic shaking in the area may be greater than had been previously thought.

SOILS

Soils are a critical element in land-use planning and environmental analyses in the Lake Tahoe Region, because the TRPA Land Capability Districts are determined based on soil types. A soil survey conducted by a Certified Soil Scientist identified eight different soil types on the project site. The following descriptions are qualitative summaries of these soils, based on the Soil Survey for the Lake Tahoe Basin Area (NRCS 1974):

- Elmira loamy coarse sand, wet variant (Ev);
- Elmira gravelly loamy coarse sand, 0 to 9% slopes (EbC);
- Elmira gravelly loamy coarse sand, 9 to 30% slopes (EbE);
- Cagwin-Rock outcrop, 5 to 15% slopes (CaD);
- Cagwin-Rock outcrop, 15 to 30% slopes (CaE);
- Cagwin-Rock outcrop, 30 to 50% slopes (CaF);
- Jabu coarse sandy loam, 0 to 9% slopes (JaC); and
- Rock outcrop and Rubble land (Rx).

Elmira loamy coarse sand, wet variant— this soil formed in sandy alluvium from mixed sources but dominantly from granitic sources. This soil is found in the drainage ways of glacial outwash fans. The surface and subsurface layers consist of loamy coarse sand to a depth of approximately 44 inches, which overlie stratified alluvium. This soil is subject to flooding, is naturally poorly drained, has a very slow or slow runoff, and a moderately rapid permeability above the substratum and slow in the substratum.

Cagwin-Rock outcrop— these are hilly soil complexes on granitic uplands. With increasing slope, there is more rock outcrop and less soil. The Cagwin soil series consists of loamy coarse sand underlain by coarse sand, which overlies weathered granitic rock. During dry periods (summer months) the surface layer of Cagwin soil may not absorb water readily. If the surface is bare of vegetation, runoff is typically rapid and the erosion hazard is moderate. Rock outcrop has a very rapid runoff, but the erosion hazard is slight.

Jabu coarse sandy loam—this soil is typically found on glacial outwash terraces and derived from granitic alluvium. The soil profile consists of a surface layer of coarse sandy loam underlain by gravelly coarse sandy loam, which overlies highly weathered compacted till or lake sediments. The soil is well drained, surface runoff is slow, and the erosion hazard is slight.

Rock outcrop and rubble land—rock outcrop consists of areas of rock that have been left bare by the movement of glaciers or colluvial soil material. Where there is little or no soil material present, runoff is rapid, but the erosion hazard is slight. Rubble land consists of stones that have accumulated at the foot of a slope as a result of gravitational forces, and is typically more than 90% stones and boulders. Rubble land is excessively drained, runoff is slow (when vegetated or deep), and the erosion hazard is slight.

Subsurface Conditions

In October 2006, Kleinfelder excavated 34 test pits to depths of up to 12 feet below ground surface at the areas proposed for infiltration/snow storage, underground utilities, building foundation walls, and retaining walls (Kleinfelder 2006c). At all test pit (TP) locations, subsurface conditions consisted of silty sand, underlain by grus (disintegrated/decomposed granitite) and/or granodiorite bedrock with variable degrees of weathering. No groundwater was encountered up to the maximum depth of 12 feet bgs (Kleinfelder 2006c).

LAND CAPABILITY

The land capability districts (including the delineation of the SEZ and applicable SEZ setbacks) on the project site were verified by TRPA staff and approved by the TRPA Governing Board as part of a Land Capability Challenge in May 1998 (TRPA 1998 [Appendix C[d]].) Table 4.5-4 shows the distribution of land area by land class on the site, with and without the proposed 60-foot Douglas County right-of-way that is the portion of Lake Village/Echo Drive (LPF 1) that runs through the project site. Per TRPA Code of Ordinances 20.3.D (1) (b), land beneath LPFs is not included in the calculation of the project area. Therefore, the area of land beneath an existing LPF (such as Lake Village Drive) is subtracted from the gross land area of the parcel before calculating the amount of allowable land coverage[e].

Table 4.5-4
Existing Land Area and Land Capability Calculations for Project Site (square feet)

Land Class	Gross area per land class	Less Lake Village proposed 60 foot wide right-of-way	Net area per land class after subtraction of 60-foot right-of-way	TRPA allowable coverage	TRPA verified existing coverage	TRPA project coverage allowed on site
1b	106,259.77	--	106,259.77	1,063	1,900	1,900
1a	91,184.92	10,809	80,375.92	804	--	804
1c	10,282.79	--	10,282.79	103	--	103
2	97,880.29	8,516	89,364.29	894	500	894
3	--	--	--	--	--	--
4	374,099.26	9,610	364,489.26	72,898	3,500	72,898
5	97,223.55	20,825	76,398.65	19,100	200	19,100
6	7,292.00	--	7,292.00	2,188	--	2,188
7	--	--	--	--	--	--
Totals	784,223	49,760	734,463	97,048	6,100	97,885
	18.00 acres	1.14 acres	16.86 acres			

Source: Calculations for allowable land coverage (Application for Right of Way Reduction: Sheets C1.0 (Proposed 60 foot wide Lake Village Drive Right of Way), Shinault 2006; using TRPA Code Section 20.3.D (2)(a)(ii) to calculate allowable coverage.

[d] TRPA's Land Capability Map is included as Appendix C in this EIS. A full-size copy is available for review in the project application file at TRPA.

[e] Information regarding land coverage regulations pertaining to linear public facilities (LPFs) such as roadways and bicycle paths is included under Regulatory Background in Section 4.8, Land Use, in this document.

4.5.3 ENVIRONMENTAL CONSEQUENCES AND RECOMMENDED MITIGATION MEASURES

TRPA CRITERIA OF SIGNIFICANCE

The TRPA Land Classification System (Tables 4.5-1 through 4.5-3) is used to analyze potential impacts to sensitive slope, soils, and drainage conditions. Significance criteria used in the analysis of land coverage relate directly to the TRPA Land Classification system and coverage requirements.

Based on TRPA's Initial Environmental Checklist, the proposed project would result in a significant impact to geology and soils if it would:

- result in a change in the topographic features of the site inconsistent with the natural surrounding conditions;
- change the undisturbed soil or native geologic substructures or grading in excess of 5 feet; unless TRPA makes the findings set forth in Code Section 64.7.B, in which case such grading is permissible;
- continue or increase wind or water erosion of soils;
- result in changes in siltation, deposition, or erosion that could modify the channel of a river or stream or the bed of a lake;
- result in unstable soil conditions; or
- expose people or property to geologic hazards such as earthquakes, landslides, avalanches, or similar hazards.

Geologic hazards, as defined in this section, relate to seismic activity and may include surface fault rupture, strong seismic ground shaking, liquefaction, subsidence, landslides, tsunami, and seiche potential. Non-seismic geologic hazards are discussed with regard to potential impacts on the alteration of the land surface (naturally or through human actions), including grading, deposition or erosion, landslides, avalanches, or any effects that are because of or that may alter soil properties or geotechnical issues. Although landslides, mudslides, avalanches, and other geomorphological events can be triggered by seismic activity, it is not necessarily a prerequisite, and these actions can be triggered by other events. Therefore, they are addressed separately unless site-specific conditions warrant otherwise.

IMPACT ANALYSIS

Alternative 1 – Proposed Project

IMPACT 4.5.1-1 Land Coverage. *There is adequate allowable land coverage available on the project site for construction of the residential development and common areas; however, there is not adequate allowable land coverage available on the project site to construct the new LPFs proposed under Alternative 1. Approximately 26,889 square feet of coverage would need to be transferred to the site for the proposed LPFs. Because the coverage required for the LPFs would be transferred in accordance with Section 20.3 B(4) and 20.4 of TRPA Code of Ordinances, and because Alternative 1 would not exceed the coverage allowed on site per the TRPA land classification system and coverage requirements, this would be a* ***less-than-significant*** *impact.*

Alternative 1 (including proposed new LPFs 2-5) would result in approximately 116,964 square feet of coverage on the project site (85,307 square feet of coverage for the proposed buildings, driveways and walkways and 31,657 square feet of coverage for proposed LPFs 2-5, excluding the 1.5 to 1 ratio for coverage within an SEZ mitigation requirement (see Tables 2-2 and 2-3)). The proposed project coverage of 85,307 square feet (not including the LPFs) is approximately 2,264 square feet less than the 87,571 square feet of coverage allowed for

the site (See Tables 2-3 and 2-4 in Chapter 2, Project Description). Therefore, adequate coverage is available for construction of the residential development and common areas. Excess coverage would be banked by the project applicant. Table 2-3 of Chapter 2, Project Description, shows the coverage by land class required for Alternative 1 and Table 2-2 shows the existing and proposed coverage and land capability calculations for the existing LPF (Lake Village Drive, LPF 1) and the 4 new LPFs (LPFs 2 - 5).

Per TRPA Code of Ordinances 20.3.D (1)(b), land beneath LPFs is not included in either the project area or the calculation of base allowable coverage for a project. The five LPFs (the existing LPF 1 (Lake Village Drive right of way) and proposed LPFs 2-5) would result in a combined total of approximately 81,417 square feet of land area and 59,202 square feet of coverage. (This calculation includes the 60-foot Lake Village Drive right-of-way easement.) Of this 59,202 square feet of coverage, approximately 31,657 square feet would be new coverage resulting from the 4 new LPFs, and 27,545 square feet would be existing coverage on Lake Village Drive (LPF 1). No additional coverage would be required for Lake Village Drive (LPF 1) because it is an existing LPF.

However, while the land beneath the LPFs does not contribute to the total land area of the project area for purposes of calculating base allowable coverage for the proposed project or to the proposed coverage for the project, the 26,889 square feet of coverage required for the LPFs (including the 1.5 to 1 SEZ coverage mitigation requirement) beyond the 6,055 square feet of base allowable coverage attributable to the land area beneath the LPFs must be transferred to those areas under LPFs 2-5 in accordance with the provisions of Chapter 20 of the TRPA Code of Ordinances (see Tables 2-3 and 2-4 below).

Based on these calculations, there is not adequate allowable land coverage available on the project site to construct the 4 new LPFs proposed under Alternative 1. The proposed project must, therefore, obtain the appropriate land coverage transfers for their construction pursuant to Chapter 20 of the TRPA Code of Ordinances. Table 2-3 in Chapter 2, Project Description, shows the base allowable coverage (approximately 6,055 square feet) for these LPFs, and the coverage from low and high LCDs that would need to be transferred to the parcel to provide the necessary coverage needed for the 4 proposed LPFs. The applicant has submitted a separate application to TRPA requesting approval of the LPFs, which will include a requirement that the necessary land coverage required for the LPFs beyond the base allowable coverage attributable to the land area beneath the LPFs be transferred to the LPFs. Approximately 26,889 square feet of coverage (22,494 square feet of high capability land coverage and 4,395 square feet of low capability land coverage) would need to be transferred to the parcel for the proposed 4 new LPFs. (This coverage transfer total includes the 1.5 to 1.0 low capability land transfer mitigation requirement applicable under Chapter 20 of the TRPA Code of Ordinances.) This request for land coverage transfer is allowed per TRPA Section 20.3 B(4) and 20.4 of TRPA Code of Ordinances.

Because the coverage required for the LPFs would be transferred in accordance with the TRPA Code of Ordinances, and because Alternative 1 would not exceed the coverage allowed on site per the TRPA land classification system and coverage requirements, this would be a **less-than-significant** impact.

Mitigation Measures

No mitigation is required.

IMPACT 4.5.1-2 Site Topography, Grading, and Soil Erosion. *Implementation of Alternative 1 would change the site topography, could expose soils and a SEZ to adverse effects from erosion during construction activities, and would result in grading in excess of 5 feet, requiring findings pursuant to Code Section 64.7.B. This impact would be potentially significant.*

The proposed buildings would generally follow the natural contours of the site and would not change the topographic features such that it would be inconsistent with the natural surrounding conditions. However, proposed development would require construction of level areas for building and roadway foundations, which would involve cut and fill. As discussed in Chapter 2 (Building Design), the project site is undulating and

generally slopes downward approximately 100 vertical feet from east to west. As a result, approximately one-third of the buildings would be upslope of the access roadway and "cut" into the hill, and approximately two-thirds of the buildings would be down slope of the roadway with the rear of the home "suspended" over the down-sloping surface (See example for buildings 19 and 20, Exhibit 2-16 (Shinault 2006)). For the former condition (Building #20, for example), the site plan calls for excavation and one or more retaining walls at the rear of the building to produce a level, walkable exterior area and to allow for natural light and air to reach the lower floor. For the latter condition (Building #19, for example), the site plan calls for fill and a retaining wall at the rear of the building to produce a level, walkable exterior area.

Development of Alternative 1 and its associated infrastructure would generate approximately 2,974 cubic yards (CY) of cut material, of which approximately 640 CY would be used for on-site fill material, including roads. Thus, approximately 2,334 CY of material would need to be transported off-site over the construction period for the project. (This is a rough estimate based on the preliminary grading plan [Shinault 2006].) No imported fill material would be required, as all fill areas on the project site would use material from the cut areas.

A typical tractor trailer used for transporting fill material has a capacity of 20 CY; therefore, if 2,334 CY of net cut must be transported off-site, approximately between 117 and 146 total trips (when including a potential 25% volume increase due to the loose state of soils to be transported) would be required during project build-out over the proposed 3-year construction period. It is reasonable to expect that other projects in the Lake Tahoe area would require fill, but it is not possible at this time to know with any degree of certainty what other projects would be approved and scheduled for construction that would be consistent with the timeframe for excavation of Alternative 1. It would be the ultimate responsibility of the excavation contractor hired to provide earthwork services to determine the method and location of disposal or temporary storage of the excess cut from the project site. However, the project applicant anticipates that the export fill would be transported to a TRPA-approved facility.

Project implementation would require grading activities on approximately one-third (6 acres) of the 18-acre project site, including cut and fill, trenching, excavation for roadways, underground utilities and building foundations, pipe installation, and revegetation. A limited number of excavations for the installation of underground utilities and retaining structures are anticipated to extend deeper than 5 feet below existing grade. The pertinent retaining walls and maximum freestanding wall heights are provided in Table 3 of the *Soils/Hydrologic Final Report* (Kleinfelder 2006a).

Construction activities would result in the temporary disturbance of soil and would expose disturbed areas to winter storm events. Rain of sufficient intensity and duration could dislodge soil particles, generate runoff, and cause localized erosion. Soil disturbance during the summer months could result in loss of topsoil because of wind erosion or thundershower events. The project site contains a 2.4-acre SEZ, and a portion of the site topography slopes toward the SEZ. Therefore, a potentially significant impact from soil erosion, including sediment transport that could modify the creek channel, could result from construction activities associated with the project.

As noted in the *Geotechnical Investigation Report* (Kleinfelder 2005), *Soils/Hydrologic Final Report* (Kleinfelder 2006a), *Geotechnical Investigation Update Letter* (Kleinfelder 2006b) (all contained in Appendix O), and the *Site Investigation* (Kleinfelder 2006c), there were no severe soil constraints that would preclude grading and construction activities. No free water was encountered in the test pits excavated to maximum depths of 12 feet bgs. The Kleinfelder reports and Improvement Plans prepared for Alternative 1 address very specific requirements that consider the full range of non-seismic geologic hazards related to soil properties. As discussed in detail in Section 4.7, Hydrology and Water Quality, TRPA Ordinance prohibits excavation deeper than 5 feet because of the potential for groundwater interception or interference, except under certain defined and permitted conditions (see Code Section 64.7.B and Section 4.7 for the list of conditions that allow exceptions). Based on information

provided in the *Soils/Hydrologic Final Report* (Kleinfelder 2006a), it is likely that project activities would meet the necessary conditions to receive an approved exemption (to allow excavation beyond 5 feet bgs) from TRPA[f].

Because implementation of Alternative 1 could result in increased soil erosion that could adversely affect an SEZ, and would change the undisturbed soil and require grading in excess of 5 feet, this impact is considered **potentially significant**.

Mitigation Measure 4.5.1-2A. Implement Geotechnical Engineering Recommendations and Comply with all TRPA Codes and Douglas County Regulations. The project applicant shall implement the following:

- Submit to TRPA and Douglas County for review and approval, a final geotechnical engineering report produced by a Registered Civil Engineer or Geotechnical Engineer. The report shall address and make final recommendations on the following: (1) road, pavement, and parking area design; (2) structural foundations, including retaining wall design (if applicable); (3) grading practices; (4) erosion/winterization; (5) special problems discovered on-site (i.e., groundwater, expansive/unstable soils, evidence of previous mining activity); and (6) slope stability. All feasible recommendations made by the engineer shall be implemented by the project applicant. It is the responsibility of the project applicant to provide for engineering inspection and certification that earthwork has been performed in conformity with recommendations contained in the report.

- The applicant shall obtain all necessary TRPA permits and approvals and shall follow all required TRPA codes and procedures with respect to grading and excavation, including but not limited to the following:

  - the applicant shall comply with the requirements of Chapter 64 of the TRPA Code, including grading requirements, and the requirement that proper erosion control measures shall be applied where soil stockpiling or borrow areas are to remain for more than one construction season;

  - the applicant shall comply with the pre-construction requirements of Chapters 61 and 62 of the TRPA Code;

  - the applicant shall comply with the revegetation requirements of Chapter 20 and 77 of the TRPA Code; and

  - the applicant shall submit a winterization plan to TRPA that shall comply with the requirements of Chapter 64, 25 and 81 of the TRPA Code.

- The applicant shall obtain all necessary Douglas County permits and approvals (including grading permits) and shall follow all required County laws and procedures with respect to the proposed project, and in accordance the Improvement Plans, which shall:

  - list specific conditions for the project;

  - demonstrate that the work shall conform to provisions of the County Grading Ordinance in effect at the time of submittal; and

  - provide erosion control measures where roadside drainage is off the pavement.

- All earthwork shall be monitored by a geotechnical engineer tasked with the responsibility of providing oversight during all excavation activities, placement of fill, and disposal of materials removed from and deposited on the project site.

[f] TRPA previously approved excavation depths not-to-exceed 15 feet for this site. See Approval of Excavation Depths for Proposed Project and Waiver of Subsurface Investigation Requirement letter (TRPA 1998).

Mitigation Measure 4.5.1-2B. Implement Best Management Practices Required as Part of Mitigation Measure 4.7.1-1A. The permanent best management practices (BMP) plan to be developed and implemented as part of Mitigation Measure 4.7.1-1A (see Section 4.7, Hydrology and Water Quality) shall specifically include BMPs to prevent sediment transport off-site or into Burke Creek and the associated Sierra Colina SEZ. These provisions may include, but may not be limited to, those described in Chapter 2, Project Description, Section 2.4.2 Best Management Practices.

Implementation of Mitigation Measures 4.5.1-2A and 4.5.1-2B would reduce the potential impacts from grading and soil erosion and under Alternative 1 to a **less-than-significant** level because grading and improvement plans would conform to TRPA and County requirements, under which (i) they would be approved by County/TRPA staff prior to implementation, (ii) a grading permit would be obtained, (iii) temporary BMPs specifically designed to reduce erosion during construction would be implemented, (iv) earthwork would be monitored by a geotechnical engineer, and (iv) excess excavated materials not needed for fill would be exported off-site to a TRPA-approved fill location.

IMPACT 4.5.1-3 Seismic Hazards. *Because the fault that underlies the project site is not considered active, the hazard from surface fault rupture is considered negligible. Several active or potentially active faults are located in the Lake Tahoe area that could subject the site to strong seismic ground shaking. Because the Alternative 1 project components would be designed and constructed in accordance with the current design requirements of the IBC, there would be no substantial increased risk of injury or property damage from strong ground shaking or earthquake-induced liquefaction or landslides caused by unstable soils. Since the project site is approximately 100 feet above lake level, adverse affects from a tsunami or seiche are not likely to occur. This would be a* ***less-than-significant*** *impact.*

Although an unnamed fault has been mapped underneath the central portion of the project site (Bonham et al. 1976, cited in Kleinfelder 2006a), the fault has not been active in over 1.5 million years and is therefore considered inactive. It is unlikely that surface fault rupture would occur along an inactive fault.

The most current interpretations and mapping of potentially active faults near the project site indicate local faults that cut Pleistocene or Holocene (recent) deposits (Schweickert et al. 2000). These include the Genoa Fault, Tahoe Valley Fault, and two unnamed faults. The Genoa Fault is located approximately 5 miles east of the project site, and is capable of generating an earthquake of moment magnitude 7.4.

The Tahoe Valley fault is located approximately 2.9 miles southwest of the project site. The two unnamed faults are located approximately 500 feet west and 1.1 miles southeast of the project site, respectively. Other fault zones in the Basin, including the North Tahoe and West Tahoe-Dollar Point, also may pose a hazard for strong seismic ground shaking at the project site. However, the project components would be designed and constructed in accordance with current IBC design requirements for seismicity, and seismic design recommendations contained in Kleinfelder's geotechnical report (Kleinfelder 2005). Construction in accordance with the IBC is designed to reduce the risk of injury or property damage from strong ground shaking.

Other potential seismic hazards include tsunami or seiche. A tsunami is a series of waves that may result from a major seismic event that involves the displacement of a large volume of water and can occur in any large body of water. A seiche is a periodic oscillation of an enclosed or restricted water body, typically a lake or reservoir, produced by seismic shaking or massive landslide (above ground or underwater). A sieche results in a potentially damaging wave, similar to a tsunami, which may result from seismic activity near a large lake. A seiche may occur in (wave) periods that differ from a tsunami. But should the period of wave propagation occur simultaneously with a tsunami, it could result in cumulative seismic-related wave effects. Ichinose et al. (1999) show through simulations modeling wave propagation for various earthquake scenarios that if a large earthquake were to occur (approximately magnitude 7.0), a potential exists for both tsunami and seiche-related waves up to 30 feet to occur along the shore of Lake Tahoe.

Although wave run-up heights using nonlinear equations, bottom friction, and topography have not been determined at this time, and therefore maps do not exist that indicate a minimum level of high ground or safety, the average surface elevation of Lake Tahoe is 6,225 ft above msl (USGS 2005), and the lowest elevation on the project site is approximately 6,326 ft above msl. Considering the project site is approximately 100 feet above lake level, adverse affects from a tsunami or seiche are not likely to occur.

Although the potential for seismic hazards exist in the Lake Tahoe area and throughout California in general, current building codes substantially reduce the costs of damage and are intended to prevent widespread loss of life by keeping buildings from collapsing and the project site is located at a high enough elevation relative to the lake level such that seiche or tsunami waves would not result in site damage. Furthermore, because the fault that underlies the project site is not considered active, the hazard from surface fault rupture is considered negligible.

Per the discussion above, impacts related to seismic hazards at the project site for Alternative 1 would be **less than significant**.

Mitigation Measures

No mitigation is required.

IMPACT 4.5.1-4 Geologic Hazards Related to Landslides, Expansive Soils, and Corrosive Soils. *The project site is not located on or adjacent to any known non-seismic geologic hazards, such as landslides, mudslides, sinkholes, or lava flows. Project site soils have a low shrink-swell potential, and a negligible corrosion potential. This would be a* ***less-than-significant*** *impact.*

Alternative 1 would be constructed in soil types composed of silty sands and weathered granite, which have an extremely low shrink/swell potential. No previous landslides have been mapped at the project site, and the site topography includes a moderate elevation change of 100 feet over a distance of approximately 1,000 feet, with slopes that range from 5 to 30%. Kleinfelder's investigation concluded that the risk of pipeline corrosivity from on-site soils is negligible (Kleinfelder 2005). Therefore, this impact would be **less than significant**.

Mitigation Measures

No mitigation is required.

IMPACT 4.5.1-5 Geologic Hazards Related to Seasonal Subsurface Water Flows due to Surface Infiltration. *Excavation to a maximum depth of 12 feet bgs is not expected to encounter groundwater, but seasonal subsurface flows due to surface infiltration could adversely affect some of the building foundations at the project site. The effects of these flows would be limited to buildings within areas of cut, particularly where the building foundations are constructed at or near an interface of soil and hard rock. This would be a* ***potentially significant*** *impact.*

According to the results from text pits excavated by Kleinfelder (2006a, b, and c), groundwater was not encountered in any test pit to a maximum of 12 feet bgs. However, infiltrated seasonal runoff and snowmelt can be expected to flow underneath the project site along the soil/bedrock interface, which may create or increase shallow seasonal groundwater conditions. Without proper design techniques, such as installation of French drains, this could result in adverse impacts to building foundations constructed at or near the interface of soil and rock. Of the proposed 29 buildings to be constructed, 5 would be constructed in areas of deep cuts (greater than 8 feet below the ground surface) where seasonal flows along the soil/bedrock interface could occur. Therefore, this impact is considered **potentially significant**.

Mitigation Measure 4.5.1-5. Divert Seasonal Flows Away from Building Foundations. The project applicant shall either install French drains as recommended in the Kleinfelder (2005) *Geotechnical Investigation Report*, or take

such other actions as recommended by the geotechnical engineer for the project (as approved by TRPA) that would serve to divert seasonal flows caused by surface infiltration away from building foundations. The specifications for the diversion structure(s) shall be shown on project construction drawings.

Implementation of Mitigation Measure 4.5.1-5 would reduce the potential impacts from seasonal flows to a **less-than-significant** level because French drains, or another methodology recommended by the project geotechnical engineer (and approved by TRPA), would be installed to channel seasonal water flows away from building foundations.

IMPACT 4.5.1-6 Geologic Hazards Related to Construction in Bedrock and Rock Outcrops. *Most of the rocks visible at the project site are boulders surrounded by grus (disintegrated/decomposed granitite) and are not rock outcrops; however, a few buildings are proposed in areas that contain rock outcrops/bedrock where construction is not practical. This would be a* ***significant*** *impact to a limited number of buildings.*

Construction activities would include site preparation (e.g., excavation, grading, vegetation removal, and clearing), cut and fill, trenching, laying of concrete foundations, paving, frame erection, equipment installation, finishing, and cleanup. Foundations for the proposed buildings would be spread footings and no pile driving is anticipated. However, where boulders conflict with final grading or foundation and utility excavations, cushion blasting and/or pre-shear blasting could be used to trim/smooth wall boulders to minimize ground disturbance and/or open confined excavations.

The EIS documentation submitted to TRPA includes a Summary of Sierra Colina EIS Technical Reports and Documents for Analysis. Included in this summary of exhibits is a list of project designs with conceptual drawings that were considered but rejected for a variety of reasons. Several of the potential designs were rejected due to the need to meet scenic quality objectives and a prohibition on development within 200 feet of U.S. Highway 50. Some designs were rejected due to land coverage constraints. Additional site constraints include a requirement to avoid access to the property from U.S. Highway 50 and prohibition on new development within low land capability classes and stream environment zones. A design that fully maximizes retention of all natural site features could result in a proposal that exceeds the base allowable land coverage, encroaches onto sensitive stream environment zone, and includes development within a required scenic buffer. Alternative 1 includes a compact design that avoids development within the scenic setback, sensitive stream environment zone, and maintains consistency with maximum land coverage requirements. To the extent feasible, rock outcrops and other natural site features are proposed to be retained.

Kleinfelder conducted seismic refraction surveys, velocity-depth profiles, and excavated test pits, which determined that in most cases, there was no evidence that surface boulders at the project site were structurally attached to rock of similar strength or weathering (Kleinfelder 2006c). Most of the rocks visible at the project site are boulders surrounded by grus (disintegrated/decomposed granitite) and are not rock outcrops. However, the *Site Investigation* identifies five different areas where rock outcrops present conflicts with proposed construction of structures, or where the terrain and soil composition (bedrock) would make proposed construction infeasible (Kleinfelder 2006c).

Because five proposed building foundations partially conflict with areas of rock outcrop/bedrock where construction would not be feasible, this impact is considered **significant**.

Mitigation Measure 4.5.1-6. Relocate Buildings as Recommended in the Site Investigation. Site plan C1.0 (Shinault 2006) shall be revised to reflect recommendations in the Kleinfelder (2006c) *Site Investigation*. Recommendations include building relocation to remove conflict with rock outcrops and bedrock to the maximum extent practicable.

Implementation of Mitigation Measure 4.5.1-6 would reduce the potential conflicts with rock outcrops/bedrock under Alternative 1 to a **less-than-significant** level since the affected five buildings would be repositioned and/or relocated so as to avoid the identified rock outcrops/bedrock (as determined by the geotechnical engineer).

Alternative 2 – Grand Private Estate

IMPACT 4.5.2-1 Land Coverage. *The calculated allowable land coverage available on the project site under Alternative 2 is 97,885 square feet. The amount of available land coverage is greater than the total required for implementation of Alternative 2. This impact would be* ***less than significant****.*

Alternative 2 would result in approximately 97,285 square feet of coverage on the project site. This is approximately 600 square feet less than the 97,885 square feet of coverage available on the site (using the TRPA approved 60-foot Lake Village Drive right-of-way on the applicant's parcel and using Code Section 20.3.D (2)(a)(ii) to calculate coverage (i.e., 1/20/25/30%)). This excess coverage would be banked by the project applicant. Table 4.5-5 shows the coverage required for and land classes upon which Alternative 2 would be constructed. There are no new LPFs proposed under Alternative 2.

Table 4.5-5
Alternative 2 – Land Coverage and Land Capability Calculations for Proposed Development (square feet)

Land Class	Gross Area per Land Class	Lake Village approved 60 foot wide right-of-way	Net area per land class after subtraction of approved Lake Village Drive 60 foot wide right–of-way	Calculated Allowable Coverage[1]	Existing	Allowable Coverage for Alternative 2[2]	Coverage Required for Alternative 2
1b	106,259.77	--	106,259.77	1,063	1,900	1,900	1,554
1a	91,184.92	10,809	80,375.92	804	--	804	-
1c	10,282.79	--	10,282.79	103	--	103	-
2	97,880.29	8,516	89,364.29	894	500	894	139
3	--	--		-	--	-	-
4	374,099.26	9,610	364,489.26	72,898	3,500	72,898	77,361
5	97,223.65	20,825	76,398.65	19,100	200	19,100	18,231
6	7,292	--	7,292.00	2,188	--	2,188	1,554
7	--	--	--		--	--	--
Totals	784,222.68	49,760	734,462.68	97,048	6,100	97,885	97,285

[1] Based on 20/25/30% allowable coverage per high capability land class (4, 5, 6 & 7) and 1 or 5% allowable coverage per low capability land class (1b, 1a, 1c, 2 & 3) per Code Section 20.3D (2)(a)(ii).
[2] Equals the calculated allowable coverage plus the amount of existing coverage, if any, that is greater than the calculated allowable coverage.
Source: Alternative 2 – Proposed Site Plans (Sheets C1.0), Shinault 2006.

Because Alternative 2 would not exceed the coverage allowed on site per the TRPA land classification system and coverage requirements, this would be a **less-than-significant** impact.

Mitigation Measures

No mitigation is required.

IMPACT 4.5.2-2 Site Topography, Grading, and Soil Erosion. *This impact is the same as Impact 4.5.1-2 for Alternative 1. Implementation of Alternative 2 would change the site topography, could expose soils and a SEZ to adverse effects from erosion during construction activities, and would result in grading in excess of 5 feet, requiring findings pursuant to Code Section 64.7.B. This would be a* ***potentially significant*** *impact.*

This impact would be essentially the same as Impact 4.5.1-2 described above for Alternative 1. See full discussion above.

As with Alternative 1, Alternative 2 would require construction of level areas for building and roadway foundations, which would involve cut and fill. Development of Alternative 2 and its associated infrastructure would involve 2,753 CY of cut and 2,481 CY of fill. Thus, approximately 272 CY of material would need to be transported off-site over the life of the construction period for the project (Shinault 2007a). Alternative 2 would result in approximately between 14 and 17 total truck trips (when including a potential 25% increase in volume due to the loose state of soils to be transported) to transport this material off-site. No imported fill material would be required, as all fill areas on the project site would use material from the cut areas.

As with Alternative 1, construction activities associated with implementation of Alternative 2, including grading efforts, would result in a potentially significant impact from soil erosion, including sediment transport that could modify the Burke Creek channel.

As discussed in detail in Section 4.7, Hydrology and Water Quality, TRPA Code Section 64.7.B prohibits excavation deeper than 5 feet because of the potential for groundwater interception or interference, except under certain defined and permitted conditions (see Section 4.7, Hydrology and Water Quality, for the list of conditions that allow exceptions). Based on information provided in the *Soils/Hydrologic Final Report* (Kleinfelder 2006a), it is likely that project activities would meet the necessary conditions to receive an approved exemption (to allow excavation beyond 5 feet bgs) from TRPA. Because implementation of Alternative 2 could result in increased soil erosion that could adversely affect an SEZ, and would change the undisturbed soil and require grading in excess of 5 feet, this impact is considered **potentially significant**.

Mitigation Measure 4.5.2-2A. Implement Geotechnical Engineering Recommendations and Comply with all TRPA Codes and Douglas County Regulations. See Mitigation Measure 4.5.1-2A described above for Alternative 1. The same mitigation measure would apply.

Mitigation Measure 4.5.2-2B. Implement Best Management Practices Required as Part of Mitigation Measure 4.7.1-1A. See Mitigation Measure 4.5.1-2B described above for Alternative 1. The same mitigation measure would apply.

Implementation of Mitigation Measures 4.5.2-2A and 4.5.2-2B would reduce the potential impacts from grading and soil erosion and under Alternative 2 to a **less-than-significant** level because grading and improvement plans would conform to TRPA and County requirements, under which requirements (i) they would be approved by County/TRPA staff prior to implementation, (ii) a grading permit would be obtained, (iii) temporary BMPs specifically designed to reduce erosion during construction would be implemented, (iv) earthwork would be monitored by a geotechnical engineer, and (iv) excess excavated materials not needed for fill would be exported off-site to a TRPA-approved fill location.

IMPACT 4.5.2-3 Seismic Hazards. *This impact is the same as Impact 4.5.1-3 for Alternative 1. Because the fault that underlies the project site is not considered active, the hazard from surface fault rupture is considered negligible. Alternative 2 project components would be designed and constructed in accordance with the current design requirements of IBC. Therefore there would be no substantial increased risk of injury or property damage from strong ground shaking or earthquake-induced liquefaction or landslides caused by unstable soils. Due to the location and elevation above lake level of the project site, adverse affects from a tsunami or seiche are not likely to occur. This would be a* ***less-than-significant*** *impact.*

This impact is the same as Impact 4.5.1-3 described above for Alternative 1. See full discussion above.

The fault that underlies the project site is not considered active, therefore the hazard from surface fault rupture is considered negligible. Several active or potentially active faults are located in the Lake Tahoe area that could subject the site to strong seismic ground shaking or massive landslide (above ground or underwater). Because the Alternative 2 project components would be designed and constructed in accordance with the current design requirements of IBC, there would be no substantial increased risk of injury or property damage from strong ground shaking or earthquake-induced liquefaction or landslides caused by unstable soils. Since the project site is approximately 100 feet above lake level, adverse affects from a tsunami or seiche are not likely to occur.

Impacts related to seismic hazards at the project site for Alternative 2 would be **less than significant**.

Mitigation Measures

No mitigation is required.

IMPACT 4.5.2-4 Geologic Hazards Related to Related to Landslides, Expansive Soils, and Corrosive Soils. *This impact is the same as Impact 4.5.1-4 for Alternative 1.The project site is not located on or adjacent to any known non-seismic geologic hazards, such as landslides, mudslides, sinkholes, or lava flows. Project site soils have a low shrink-swell potential, and a negligible corrosion potential. This would be a* ***less-than-significant*** *impact.*

This impact is the same as Impact 4.5.1-4 described above for Alternative 1. See full discussion above.

Alternative 2 would be constructed in soil types composed of silty sands and weathered granite, which have an extremely low shrink/swell potential. No previous landslides have been mapped at the project site, and the site topography includes a moderate elevation change of 100 feet over a distance of approximately 1,000 feet, with slopes that range from 5 to 30%. Kleinfelder's investigation concluded that the risk of pipeline corrosivity from on-site soils is negligible (Kleinfelder 2005). Therefore, this impact would be **less than significant**.

Mitigation Measures

No mitigation is required.

IMPACT 4.5.2-5 Geologic Hazards Related to Seasonal Subsurface Water Flows due to Surface Infiltration. *This impact is the same as Impact 4.5.1- 5 for Alternative 1. Excavation to a maximum depth of 12 feet bgs did not encounter groundwater, but seasonal subsurface flows could adversely affect some of the building foundations at the project site. This would be a* ***potentially significant*** *impact.*

This impact is the same as Impact 4.5.1-5 described above for Alternative 1. See full discussion above.

Infiltrated seasonal runoff and snowmelt can be expected to flow underneath the project site along the soil/bedrock interface, which may create shallow seasonal groundwater conditions that could result in adverse impacts to building foundations. Therefore, this impact is considered **potentially significant**.

Mitigation Measure 4.5.2-5. Divert Seasonal Flows Away from Building Foundations. See Mitigation Measure 4.5.1-5 described above for Alternative 1. The same mitigation measure would apply.

Implementation of Mitigation Measure 4.5.2-5 would reduce the potential impacts from seasonal flows under Alternative 2 to a **less-than-significant** level because French drains, or another methodology recommended by the project geotechnical engineer (and approved by TRPA), would be installed to channel seasonal water flows away from building foundations.

IMPACT 4.5.2-6 Geologic Hazards Related to Construction in Bedrock and Rock Outcrops. *This impact is the same as Impact 4.5.1-6 for Alternative 1. Most of the rocks visible at the project site are boulders surrounded by grus (disintegrated/decomposed granitite) and are not rock outcrops; however, structures are proposed in areas that contain rock outcrops/bedrock where construction is not practical. This would be a* ***significant*** *impact to a limited number of buildings.*

This impact is the same as Impact 4.5.1-6 described above for Alternative 1. See full discussion above.

Kleinfelder conducted seismic refraction surveys, velocity-depth profiles, and excavated test pits, which determined that in most cases, there was no evidence that surface boulders at the project site were structurally attached to rock of similar strength or weathering (Kleinfelder 2006c). Most of the rocks visible at the project site are boulders surrounded by *grus (*disintegrated/decomposed granitite) and are not rock outcrops. However, the *Site Investigation* identifies five different areas where rock outcrops present conflicts with proposed construction of structures, or where the terrain and soil composition (bedrock) would make proposed construction infeasible (Kleinfelder 2006c). This impact is considered **significant**.

Mitigation Measure 4.5.2-6. Relocate Buildings as Recommended in a Supplemental Site Investigation. If an alternative site plan is implemented, prior to issuance of building permits, the project applicant shall conduct a supplemental site investigation specifically related to the location of building proposed for Alternative 2 and shall reposition and/or relocate all buildings in order to remove the conflicts with rock outcrops as identified in the Kleinfelder (2006c) Site Investigation with respect to the identification of where conflicts would occur with rock outcrops or bedrock under site plan C1.0 (Shinault 2006) These changes shall be reflected on revised site plans to be submitted and approved by TRPA.

Implementation of Mitigation Measure 4.5.2-6 would reduce the potential conflicts with rock outcrops/bedrock under Alternative 1 to a **less-than-significant** level since the affected buildings would be repositioned and/or relocated so as to avoid the identified rock outcrops/bedrock (as determined by the geotechnical engineer).

Alternative 3 – Reduced Density Alternative

IMPACT 4.5.3-1 Land Coverage. *There is adequate allowable land coverage available on the project site for construction of the residential development and common areas; however, there is not adequate allowable land coverage available on the project site to construct the new LPFs proposed under Alternative 3. Land coverage would need to be transferred to the site for the proposed LPFs. Because the coverage required for the LPFs would be transferred in accordance with Section 20.3 B(4) and 20.4 of TRPA Code of Ordinances, and because Alternative 3 would not exceed the coverage allowed on site per the TRPA land classification system and coverage requirements, this would be a* ***less-than-significant*** *impact.*

Alternative 3 (including proposed new LPFs 2-5) would result in approximately 97,944 square feet of coverage on the project site (73,254 square feet of coverage for the proposed buildings, driveways, and walkways and 24,679

square feet of coverage for proposed LPFs 2-5, excluding the 1.5 to 1 ratio for coverage within an SEZ mitigation requirement (Table 4.5-6). The proposed project coverage of 73,254 square feet (not including the LPFs) is approximately 15,347 square feet less than the 88,601 square feet of coverage available on the site. Therefore, there is adequate allowable land coverage on the project site for construction of the residential development and common areas. Excess coverage would be banked by the project applicant. Table 4.5-6 shows the coverage required for and land classes upon which Alternative 3 would be constructed.

Table 4.5-6
Alternative 3 - Land Coverage and Land Capability Calculations for Proposed Development (sq ft)

Land Class	Gross Area per Land Class	Total Area Required for LPFs	Land Area Available Less LPFs	Calculated Allowable Coverage[1]	Existing Coverage	Allowable Coverage for Alternative 3[2]	Coverage Required for Alternative 3
1b	106,259.77	1,004	105,255.77	1,053	1,900	1,900	—
1a	91,184.92	10,809	80,375.92	804	—	804	159
1c	10,282.79	-	10,282.79	103	—	103	—
2	97,880.29	8,516	89,364.29	894	500	894	93
3	—	—	—	—	—	—	—
4	374,099.26	26,928	347,171.26	69,434	3,500	69,434	45,102
5	97,223.65	27,182	70,041.65	14,008	200	14,008	27,900
6	7,292	—	7,292.00	1,458	—	1,458	—
7	—	—	—	—	—	—	—
Totals	784,222.68	74,439	709,784	87,754	6,100	88,601	73,254

[1] Based on 20% allowable coverage per high capability land class (4, 5, 6 & 7) and 1 or 5% allowable coverage per low capability land class (1b, 1a, 1c, 2 & 3).

[2] Equals the calculated allowable coverage plus the amount of existing coverage, if any, that is greater than the calculated allowable coverage.

Source: Alternative 3 – Proposed Site Plans (Sheets C1.0), Shinault 2006.

Per TRPA Code of Ordinances 20.3.D (1)(b), land beneath LPFs is not included in either the project area or the calculation of base allowable coverage for a project. The five LPFs under Alternative 3 (the existing LPF 1 (Lake Village Drive right of way) and proposed LPFs 2-5) would result in a combined total of approximately 74,439 square feet of land area and 52,224 square feet of coverage. (This calculation includes the 60-foot Lake Village Drive right-of-way easement.) Of this 59,202 square feet of coverage, approximately 24,679 square feet would be coverage resulting from the new LPFs (LPFs 2 - 5) proposed for Alternative 3 (all of which would be new coverage), and 27,545 square feet would be existing coverage on Lake Village Drive (LPF 1). No additional coverage would be required for Lake Village Drive (LPF 1) because it is an existing LPF[g]

The land coverage and land capability calculations for the LPFs proposed under Alternative 3 would be similar to those proposed under Alternative 1. The main difference in LPF coverage needs between Alternatives 1 and 3 is that less coverage would need to be transferred to the project site under Alternative 3, as the shared access driveway under Alternative 3 occupies approximately 6,978 fewer square feet, than the shared access driveway under Alternative 1, but covers similar LCDs.

[g] This excludes off-site coverage needed to connect Lake Village Drive in LPF 1 to LPF 3 (access roadway) at the two proposed entrances to the project.

Because the coverage required for the LPFs would be transferred in accordance with Chapter 20 of the TRPA Code of Ordinances, and because Alternative 3 would not exceed the coverage allowed on site per the TRPA land classification system and coverage requirements, this would be a **less-than-significant** impact.

Mitigation Measures

No mitigation is required.

IMPACT 4.5.3-2 **Site Topography, Grading, and Soil Erosion.** *This impact is the same as Impact 4.5.1-2 for Alternative 1. Implementation of Alternative 3 would change the site topography, could expose soils and a SEZ to adverse effects from erosion during construction activities, and would result in grading in excess of 5 feet, requiring findings pursuant to Code Section 64.7.B. This would be a* ***potentially significant*** *impact.*

This impact would be essentially the same as Impact 4.5.1-2 described above for Alternative 1. See full discussion above.

As with Alternative 1, Alternative 3 would require construction of level areas for building and roadway foundations, which would involve areas of cut and fill. Development of Alternative 3 and its associated infrastructure would involve 2,026 CY of cut and 1,741 CY of fill. Thus, approximately 285 CY of material would need to be transported off-site over the construction period (Shinault 2007a). Alternative 3 would result in approximately between 15 and 18 total truck trips (when including a potential 25% increase in volume due to the loose state of soils to be transported) to transport this material off-site. No imported fill material would be required, as all fill areas on the project site would use material from the cut areas.

As with Alternative 1, construction activities associated with implementation of Alternative 3, including grading, could result in a potentially significant impact from soil erosion, including sediment transport that could modify the creek channel, could result from construction activities associated with the project.

As discussed in detail in Section 4.7, Hydrology and Water Quality, TRPA Ordinances prohibits excavation deeper than 5 feet because of the potential for groundwater interception or interference, except under certain defined and permitted conditions (see Section 4.7, Hydrology and Water Quality, for the list of conditions that allow exceptions). Based on information provided in the *Soils/Hydrologic Final Report* (Kleinfelder, 2006a), it is likely that project activities would meet the necessary conditions to receive an approved exemption (to allow excavation beyond 5 feet bgs) from TRPA. Because implementation of Alternative 3 could result in increased soil erosion that could adversely affect an SEZ, and would change the undisturbed soil and require grading in excess of 5 feet, this impact is considered **potentially significant**.

Mitigation Measure 4.5.3-2A. Implement Geotechnical Engineering Recommendations and Comply with all TRPA Codes and Douglas County Regulations. See Mitigation Measure 4.5.1-2A described above for Alternative 1. The same mitigation measure would apply.

Mitigation Measure 4.5.3-2B. Implement Best Management Practices Required as Part of Mitigation Measure 4.5.1-2B. See Mitigation Measure 4.5.1-2B described above for Alternative 1. The same mitigation measure would apply.

Implementation of Mitigation Measures 4.5.3-2A and 4.5.3-2B would reduce the potential impacts from grading and soil erosion under Alternative 3 to a **less-than-significant** level because grading and improvement plans would conform to TRPA and County requirements, under which requirements (i) they would be approved by County/TRPA staff prior to implementation, (ii) a grading permit would be obtained, (iii) temporary BMPs specifically designed to reduce erosion (and sedimentation) during construction would be implemented, (iv) earthwork would be monitored by a geotechnical engineer, and (iv) excess excavated materials not needed for fill would be exported off-site to a TRPA-approved fill location.

IMPACT 4.5.3-3 Seismic Hazards. *This impact is the same as Impact 4.5.1-3 for Alternative 1. Because the fault that underlies the project site is not considered active, the hazard from surface fault rupture is considered negligible. Alternative 3 project components would be designed and constructed in accordance with the current design requirements of the IBC, therefore there would be no substantial increased risk of injury or property damage from strong ground shaking or earthquake-induced liquefaction or landslides caused by unstable soils. Due to the location and elevation above lake level of the project site, adverse affects from a tsunami or seiche are not likely to occur. This would be a* ***less-than-significant*** *impact.*

This impact is the same as Impact 4.5.1-3 described above for Alternative 1. See full discussion above.

The fault that underlies the project site is not considered active, therefore the hazard from surface fault rupture is considered negligible. Several active or potentially active faults are located in the Lake Tahoe area that could subject the site to strong seismic ground shaking or massive landslide (above ground or underwater). Because the Alternative 3 project components would be designed and constructed in accordance with the current design requirements of IBC, there would be no substantial increased risk of injury or property damage from strong ground shaking or earthquake-induced liquefaction or landslides caused by unstable soils. Since the project site is approximately 100 feet above lake level, adverse affects from a tsunami or seiche are not likely to occur.

Impacts related to seismic hazards at the project site for Alternative 3 would be **less than significant**.

Mitigation Measures

No mitigation is required.

IMPACT 4.5.3-4 Geologic Hazards Related to Related to Landslides, Expansive Soils, and Corrosive Soils. *This impact is the same as Impact 4.5.1-4 for Alternative 1. The project site is not located on or adjacent to any known non-seismic geologic hazards, such as landslides, mudslides, sinkholes, or lava flows. Project site soils have a low shrink-swell potential, and a negligible corrosion potential. This would be a* ***less-than-significant*** *impact.*

This impact is the same as Impact 4.5.1-4 described above for Alternative 1. See full discussion above.

Alternative 3 would be constructed in soil types composed of silty sands and weathered granite, which have an extremely low shrink/swell potential. No previous landslides have been mapped at the project site, and the site topography includes a moderate elevation change of 100 feet over a distance of approximately 1,000 feet, with slopes that range from 5 to 30%. Kleinfelder's investigation concluded that the risk of pipeline corrosivity from on-site soils is negligible (Kleinfelder 2005). Therefore, this impact would be **less than significant**.

Mitigation Measures

No mitigation is required.

IMPACT 4.5.3-5 Geologic Hazards Related to Seasonal Subsurface Flow Due to Surface Infiltration. *This impact is the same as Impact 4.5.1-5 described above for Alternative 1.Excavation to a maximum depth of 12 feet bgs did not encounter groundwater, but seasonal subsurface flow could adversely affect some of the building foundations at the project site. This would be a* ***potentially significant*** *impact.*

This impact is the same as Impact 4.5.1-5 described above for Alternative 1. See full discussion above.

Infiltrated seasonal runoff and snowmelt can be expected to flow underneath the project site along the soil/bedrock interface, which may create shallow seasonal groundwater conditions that could result in adverse impacts to building foundations. Therefore, this impact is considered **potentially significant**.

Mitigation Measure 4.5.3-5. Divert Seasonal Flows Away from Building Foundations. See Mitigation Measure 4.5.1-2A described above for Alternative 1. The same mitigation measure would apply.

Implementation of Mitigation Measure 4.5.3-5 would reduce the potential impacts from seasonal flows under Alternative 1 to a **less-than-significant** level because French drains, or another methodology recommend by the project geotechnical engineer (and approved by TRPA), would be installed to channel seasonal water flows away from building foundations.

IMPACT 4.5.3-6 Geologic Hazards Related to Construction in Bedrock and Rock Outcrops. *This impact is the same as Impact 4.5.1 6 for Alternative 1. Most of the rocks visible at the project site are boulders surrounded by grus (disintegrated/decomposed granitite) and are not rock outcrops; however, structures are proposed in areas that contain rock outcrops/bedrock where construction is not practical. This would be a* ***significant*** *impact to a limited number of buildings.*

This impact is the same as Impact 4.5.1-6 described above for Alternative 1. See full discussion above.

Construction activities would include site preparation (e.g., excavation, grading, vegetation removal, and clearing), cut and fill, trenching, laying of concrete foundations, paving, frame erection, equipment installation, finishing, and cleanup. Foundations for the proposed buildings would be spread footings and no pile driving is anticipated. However, where boulders conflict with final grading or foundation and utility excavations, cushion blasting and/or pre-shear blasting could be used to trim/smooth wall boulders to minimize ground disturbance and/or open confined excavations.

Kleinfelder conducted seismic refraction surveys, velocity-depth profiles, and excavated test pits, which determined that in most cases, there was no evidence that surface boulders at the project site were structurally attached to rock of similar strength or weathering (Kleinfelder 2006c). Most of the rocks visible at the project site are boulders surrounded by *grus (*disintegrated/decomposed granitite) and are not rock outcrops. However, the *Site Investigation* identified different areas in analyzing the site plan for Alternative 1 where rock outcrops present conflicts with proposed construction of structures, or where the terrain and soil composition (bedrock) would make proposed construction infeasible (Kleinfelder 2006c). The Site Investigation did not analyze the site plan for the proposed Alternative 3, although it is identical to the Alternative 1 site plan east of the north south power lines on the parcel and therefore there would be the same conflicts for Alternative 3 noted for that area of the site for Alternative 1. This impact is considered **significant**.

Mitigation Measure 4.5.3-6. Relocate Buildings as Recommended in a Supplemental Site Investigation. See Mitigation Measure 4.5.2-6 described above for Alternative 2. The same mitigation measure would apply.

Implementation of Mitigation Measure 4.5.3-6 would reduce the potential conflicts with rock outcrops/bedrock under Alternative 3 to a **less-than-significant** level since the affected buildings would be repositioned and/or relocated so as to avoid the identified rock outcrops/bedrock (as determined by the geotechnical engineer).

Alternative 4 – Increased Density Alternative

IMPACT 4.5.4-1 Land Coverage. *There is adequate allowable land coverage available on the project site for construction of the residential development and common areas; however, there is not adequate allowable land coverage available on the project site to construct the new LPFs proposed under Alternative 4. Land coverage would need to be transferred to the site for the proposed LPFs. Because the coverage required for the LPFs would be transferred in accordance with Section 20.3 B(4) and 20.4 of TRPA Code of Ordinances, and because Alternative 4 would not exceed the coverage allowed on site per the TRPA land classification system and coverage requirements, this would be a* ***less-than-significant*** *impact.*

Alternative 4 (including proposed new LPFs 2-5) would result in approximately 105,480 square feet of coverage on the project site (81,561 square feet of coverage for the proposed buildings, driveways and walkways and 23,919 square feet of coverage for proposed LPFs 2-5, excluding the 1.5 to 1 ratio for coverage within an SEZ mitigation requirement. The proposed project coverage of 81,561 square feet (not including the LPFs) is approximately 7,192 square feet less than the 88,753 square feet of coverage available on the site. Therefore, there is adequate allowable land coverage on the project site for construction of the residential development and common areas. Excess coverage would be banked by the project applicant. Table 4.5-7 shows the coverage required for and land classes upon which Alternative 4 would be constructed.

Table 4.5-7
Alternative 4 – Land Coverage and Land Capability Calculations for Proposed Development (sq ft)

Land Class	Gross Area per Land Class	Total Area Required for LPFs	Land Area Available (Less LPFs	Calculated Allowable Coverage[1]	Existing	Allowable Coverage for Alternative 4[2]	Coverage Required for Alternative 4
1b	106,259.77	1,004.00	105,255.77	1,053	1,900	1,900	—
1a	91,184.92	10,809.00	80,375.92	804	—	804	260
1c	10,282.79	—	10,282.79	103	—	103	—
2	97,880.29	8,516.00	89,364.29	894	500	894	1,775
3	—	—	—	—	—	—	—
4	374,099.26	26,935.00	347,164.26	69,433	3,500	69,433	51,500
5	97,223.65	26,415.00	70,808.65	14,162	200	14,162	28,026
6	7,292	—	7,292.00	1,458	—	1,458	—
7	—	—	—	—	—	—	—
Totals	784,222.68	73,679.00	710,544	87,906	6,100	88,753	81,561
	18.00	1.69	16.31	2.02	0.14	2.04	1.87

[1] Based on 20% allowable coverage per high capability land class (4, 5, 6 & 7) and 5% allowable coverage per low capability land class (1b, 1a, 1c, 2 & 3).
[2] Equals the calculated allowable coverage plus the amount of existing coverage, if any, that is greater than the calculated allowable coverage.
Source: Alternative 4 – Proposed Site Plans (Sheets C1.0), Shinault 2006.

Per TRPA Code of Ordinances 20.3.D (1)(b), land beneath LPFs is not included in either the project area or the calculation of base allowable coverage for a project. The five LPFs under Alternative 4 (the existing LPF 1 (Lake Village Drive right of way) and proposed LPFs 2-5) would result in a combined total of approximately 73,679 square feet of land area and 51,464 square feet of coverage (This calculation includes the proposed 60-foot Lake Village Drive right-of-way easement.). Of this 51,464 square feet of coverage, approximately 23,919 square feet of coverage would comprise the new LPFs (LPFs 2-5) proposed for Alternative 4 (all of which would be new

coverage), and 27,545 square feet would be existing coverage on Lake Village Drive (LPF 1). No additional coverage would be required for Lake Village Drive (LPF 1) because it is an existing LPF[h]

The land coverage and land capability calculations for the LPFs proposed under Alternative 4 would be similar to those proposed under Alternative 1. The main difference in LPF coverage needs between Alternatives 1 and 4 is that less coverage would need to be transferred to the project site under Alternative 4, as the shared access driveway under Alternative 4 occupies approximately 7,738 fewer square feet, than the shared access driveway under Alternative 1, but covers similar LCDs.

Because the coverage required for the LPFs would be transferred in accordance with the TRPA Code of Ordinances, and because Alternative 4 would not exceed the coverage allowed on site per the TRPA land classification system and coverage requirements, this would be a **less-than-significant** impact.

Mitigation Measures

No mitigation is required.

IMPACT 4.5.4-2 **Site Topography, Grading, and Soil Erosion. This impact is the same as Impact 4.5.1-2 for Alternative 1.** *This impact would be essentially the same as Impact 4.5.1-2 for Alternative 1. Implementation of Alternative 4 would change the site topography, could expose soils and a SEZ to adverse effects from erosion during construction activities, and would result in grading in excess of 5 feet, requiring findings pursuant to Code Section 64.7.B. This would be a* ***potentially significant*** *impact.*

This impact would be essentially the same as Impact 4.5.1-2 described above for Alternative 1. See full discussion above.

As with Alternative 1, Alternative 4 would require construction of level areas for building and roadway foundations, which would involve areas of cut and fill. Development of Alternative 4 and its associated infrastructure would involve 2,758 CY of cut and 1,598 CY of fill. Thus, approximately 1,160 CY of material would need to be transported off-site over the life of the construction period for the project (Shinault 2007a). Alternative 4 would result in approximately between 58 and 73 total truck trips (when including a potential 25% increase in volume due to the loose state of soils to be transported) to transport this material off-site during the construction period. No imported fill material would be required, as all fill areas on the project site would use material from the cut areas.

As with Alternative 1, construction activities associated with implementation of Alternative 4, including grading, would result in a potentially significant impact from soil erosion, including sediment transport that could modify the creek channel, could result from construction activities associated with the project.

As discussed in detail in Section 4.7, Hydrology and Water Quality, TRPA Ordinances prohibits excavation deeper than 5 feet because of the potential for groundwater interception or interference, except under certain defined and permitted conditions (see Section 4.7, Hydrology and Water Quality, for the list of conditions that allow exceptions). Based on information provided in the *Soils/Hydrologic Final Report*, it is likely that project activities would meet the necessary conditions to receive an approved exemption (to allow excavation beyond 5 feet bgs) from TRPA.

Because implementation of Alternative 4 could result in increased soil erosion that could adversely affect an SEZ, and would change the undisturbed soil and require grading in excess of 5 feet, this impact is considered **potentially significant**.

[h] This excludes off-site coverage needed to connect Lake Village Drive in LPF 1 to LPF 3 (access roadway) at the two proposed entrances to the project.

Mitigation Measure 4.5.4-2A. Implement Geotechnical Engineering Recommendations and Comply with all TRPA Codes and Douglas County Regulations. See Mitigation Measure 4.5.1-2A described above for Alternative 1. The same mitigation measure would apply.

Mitigation Measure 4.5.4-2B. Implement Best Management Practices Required as Part of Mitigation Measure 4.7.1-2A. See Mitigation Measure 4.5.1-2B described above for Alternative 1. The same mitigation measure would apply.

Implementation of Mitigation Measures 4.5.4-2A and 4.5.4-2B would reduce the potential impacts from grading and soil erosion and under Alternative 4 to a **less-than-significant** level because grading and improvement plans would conform to TRPA and County requirements, under which requirements (i) they would be approved by County/TRPA staff prior to implementation, (ii) a grading permit would be obtained, (iii) temporary BMPs specifically designed to reduce erosion during construction would be implemented, (iv) earthwork would be monitored by a geotechnical engineer, and (iv) excess excavated materials not needed for fill would be exported off-site to a TRPA-approved fill location..

IMPACT 4.5.4-3 Seismic Hazards. *This impact is the same as Impact 4.5.1-2 for Alternative 1. Because the fault that underlies the project site is not considered active, the hazard from surface fault rupture is considered negligible. Alternative 4 project components would be designed and constructed in accordance with the current design requirements of the IBC, therefore there would be no substantial increased risk of injury or property damage from strong ground shaking or earthquake-induced liquefaction or landslides caused by unstable soils. Due to the location and elevation above lake level of the project site, adverse affects from a tsunami or seiche are not likely to occur. This would be a* ***less-than-significant*** *impact.*

This impact is the same as Impact 4.5.1-3 for Alternative 1. See full discussion above.

The fault that underlies the project site is not considered active, therefore the hazard from surface fault rupture is considered negligible. Several active or potentially active faults are located in the Lake Tahoe area that could subject the site to strong seismic ground shaking or massive landslide (above ground or underwater). Because the Alternative 4 project components would be designed and constructed in accordance with the current design requirements of IBC Seismic Zone 3, there would be no substantial increased risk of injury or property damage from strong ground shaking or earthquake-induced liquefaction or landslides caused by unstable soils. Since the project site is approximately 100 feet above lake level, adverse affects from a tsunami or seiche are not likely to occur.

Impacts related to seismic hazards at the project site for Alternative 4 would be **less than significant**.

Mitigation Measures

No mitigation is required.

IMPACT 4.5.4-4 Geologic Hazards Related to Related to Landslides, Expansive Soils, and Corrosive Soils. *This impact is the same as Impact 4.5.1-4 for Alternative 1. The project site is not located on or adjacent to any known non-seismic geologic hazards, such as landslides, mudslides, sinkholes, or lava flows. Project site soils have a low shrink-swell potential, and a negligible corrosion potential. This would be a* ***less-than-significant*** *impact.*

This impact is the same as Impact 4.5.1-4 for Alternative 1. See full discussion above.

Alternative 4 would be constructed in soil types composed of silty sands and weathered granite, which have an extremely low shrink/swell potential. No previous landslides have been mapped at the project site, and the site topography includes a moderate elevation change of 100 feet over a distance of approximately 1,000 feet, with

slopes that range from 5 to 30%. Kleinfelder's investigation concluded that the risk of pipeline corrosivity from on-site soils is negligible (Kleinfelder 2005). Therefore, this impact would be **less than significant**.

Mitigation Measures

No mitigation is required.

IMPACT 4.5.4-5 Geologic Hazards Related to Seasonal Subsurface Water Flows due to Surface Infiltration. *This impact is the same as Impact 4.5.1-5 for Alternative 1. Excavation to a maximum depth of 12 feet bgs did not encounter groundwater, but seasonal surface flows could adversely affect some of the building foundations at the project site. This would be a* ***potentially significant*** *impact.*

This impact is the same as Impact 4.5.1-5 described above for Alternative 1. See full discussion above.

Infiltrated seasonal runoff and snowmelt can be expected to flow underneath the project site along the soil/bedrock interface, which may create shallow seasonal groundwater conditions that could result in adverse impacts to building foundations. Therefore, this impact is considered **potentially significant**.

Mitigation Measure 4.5.4-5. Divert Seasonal Flows Away from Building Foundations. See Mitigation Measure 4.5.1-2A described above for Alternative 1. The same mitigation measure would apply.

Implementation of Mitigation Measure 4.5.4-5 would reduce the potential impacts from seasonal flows under Alternative 1 to a **less-than-significant** level because French drains, or another methodology recommend by the project geotechnical engineer (and approved by TRPA), would be installed to channel seasonal water flows away from building foundations.

IMPACT 4.5.4-6 Geologic Hazards Related to Construction in Bedrock and Rock Outcrops. *This impact is the same as Impact 4.5.1 6 described above for Alternative 1. Most of the rocks visible at the project site are boulders surrounded by grus (disintegrated/decomposed granitite) and are not rock outcrops; however, structures are proposed in areas that contain rock outcrops/bedrock where construction is not practical. This would be a* ***significant*** *impact to a limited number of buildings.*

This impact is the same as Impact 4.5.1-6 described above for Alternative 1. See full discussion above.

Construction activities would include site preparation (e.g., excavation, grading, vegetation removal, and clearing), cut and fill, trenching, laying of concrete foundations, paving, frame erection, equipment installation, finishing, and cleanup. Foundations for the proposed buildings would be spread footings and no pile driving is anticipated. However, where boulders conflict with final grading or foundation and utility excavations, cushion blasting and/or pre-shear blasting could be used to trim/smooth wall boulders to minimize ground disturbance and/or open confined excavations.

Kleinfelder conducted seismic refraction surveys, velocity-depth profiles, and excavated test pits, which determined that in most cases, there was no evidence that surface boulders at the project site were structurally attached to rock of similar strength or weathering (Kleinfelder 2006c). Most of the rocks visible at the project site are boulders surrounded by *grus (*disintegrated/decomposed granitite) and are not rock outcrops. However, the *Site Investigation* identified different areas in analyzing the site plan for Alternative 1 where rock outcrops present conflicts with proposed construction of structures, or where the terrain and soil composition (bedrock) would make proposed construction infeasible without extreme measures such as blasting (Kleinfelder 2006c). The Site Investigation did not analyze the site plan for the proposed Alternative 4, although it is identical to the Alternative 1 site plan east of the north south power lines on the parcel and therefore there would be the same conflicts for Alternative 4 noted for that area of the site for Alternative 1. This impact is considered **significant**.

Mitigation Measure 4.5.4-6. Relocate Buildings as Recommended in a Supplemental Site Investigation. See Mitigation Measure 4.5.2-6 described above for Alternative 2. The same mitigation measure would apply.

Implementation of Mitigation Measure 4.5.4-6 would reduce the potential conflicts with rock outcrops/bedrock under Alternative 4 to a **less-than-significant** level since the affected buildings would be repositioned and/or relocated so as to avoid the identified rock outcrops/bedrock (as determined by the geotechnical engineer).

Alternative 5 – No Project Alternative

Under Alternative 5, there would be no changes to existing conditions on the project site. With no ground-disturbing activities occurring under this alternative and no buildings being constructed, there would be **no impacts** related to geology and soils.

Mitigation Measures

No mitigation is required.