CHAPTER 10

SOILS, GEOLOGY, AND SEISMICITY

10.0 SOILS, GEOLOGY, AND SEISMICITY

10.1 ENVIRONMENTAL SETTING

This section presents an overview of the geologic, soils and seismic setting of the study area. Existing characteristics discussed include:

- topography;
- regional geology;
- local geology;
- mineral resources;
- seismicity; and
- soils.

The following sections present a brief overview of the regional setting, and a more detailed overview of the on-site characteristics listed above. The site conditions for the off-site infrastructure corridors are generally similar to the conditions found elsewhere on the project site. Deviations are noted where appropriate.

10.1.1 Topography

Regional Setting

The study area lies within the geomorphic province referred to as "Dissected Alluvial Plains" (USGS, 1985; Olmsted and Davis, 1961). This province is characterized by rolling and rounded knolls and ridges separated by intermittent streams. The entire region slopes gently westward toward the Sacramento River. Several streams, with moderate to narrow flood plains entrenched 10 to 15 feet below the surrounding topography, drain the area flowing east to west (Livingston, 1976).

Existing Site Conditions

The topography of the project site is dominated by a broad, northeast to southwest trending ridge known as Boulder Ridge. This ridge slopes gently to the southwest at a slope of approximately 100 feet per mile. Extending from the northern side of this main ridge are a series of nine, northwest trending ridges. Site elevations range from approximately 950 feet above mean sea level (msl) near the eastern site boundary to approximately 280 feet msl near the northwestern corner of the site.

Intermittent streams leading to Auburn Ravine drain the narrow valleys between the northwest trending ridges. The main northeast to southwest trending ridge is partially bisected by the upper end of the Clover Valley Creek drainage, which flows southwest into Clover Valley Reservoir, located just outside and south of the subject site. Clover Valley Creek continues southwest from the reservoir and re-enters the project site for approximately 4,000 feet before leaving the project site and turning southward to flow toward Dry Creek. The flow of Clover Valley Creek is seasonal above the Clover Valley Reservoir and perennial below the reservoir. The primary water source of Clover Valley Reservoir, and for maintaining the flow of Clover Valley Creek downstream from the reservoir, is Antelope Canal, which provides a supply of untreated water. Caperton Canal, which also delivers untreated water to rural residences and farms, is partially lined with concrete and crosses the project site from east to west to the north of the main ridge.

10.1.2 Geology

This section presents a summary of regional geologic history and local geology in the study area.

Regional Setting

The study area is located in the central portion of the Sacramento Valley. The Sacramento Valley extends from Redding in the north to the Sacramento-San Joaquin Delta Region in the south. At the latitude of the project site, the valley is approximately 48 miles wide. The Sacramento Valley is formed by the Great Valley geocline, which is a large, elongate, northwest-trending asymmetric structural trough. It is bordered by the Coast Ranges to the west, the Klamath Mountains and Cascade Range to the north, and the Sierra Nevada Mountains to the east. The trough continues southward from the Sacramento-San Joaquin Delta Region, where it is called the San Joaquin Valley. Both the Sacramento and San Joaquin valleys comprise the Great Valley geomorphic province of California (Hackel, 1966).

The structural trough has a long, stable eastern shelf which is supported by metamorphic and igneous rocks of the west-dipping Sierran slope. The basement rocks of the western edge of the structural trough are comprised of Jurassic metamorphic, ultramafic, and igneous rocks of the Franciscan formation (Hackel, 1966). The northwest-trending axis of the geocline is closer to the west side of the valley; therefore, the regional dip of the formations on the east side is less than that of the formations on the west side. This structural trough began receiving sediments in the Late Jurassic epoch (208-144 million years ago (Ma). It has been filled with sediments derived from both marine and continental sources. The thickness of the valley fill ranges from thin veneers along the valley edges to greater than 40,000 feet in the central portion of the valley. These sedimentary deposits range in age from Jurassic (190-135 Ma) to Holocene (0-0.01 Ma), with the older deposits (Jurassic to Eocene (57.8-36.6 Ma)) comprising the marine sequence and the younger deposits (Eocene to Holocene age) comprising the continental sequence. The marine deposits were formed in offshore shallow ocean shelf and basin environments. Continental sediments were derived mountain ranges surrounding the valley, and were deposited in lacustrine, fluvial, and alluvial environments (Norris & Webb, 1990).

The major sedimentary units in the study area are listed from youngest to oldest as follows:

- Quaternary Alluvium (Holocene, 0-0.01 Ma);
- Quaternary Basin deposits (Holocene, 0-0.01 Ma);
- Quaternary Modesto Formation, upper and lower members (Pleistocene, 0.01-1.5 Ma);
- Quaternary Riverbank Formation, upper and lower members (Pleistocene, 0.01-1.5 Ma);
- Tertiary-Quaternary Turlock Lake Formation, also known as Fair Oaks Formation (Plio-Pleistocene, 0.01-5.3 Ma);
- Tertiary Mehrten Formation (Miocene-Pliocene, 1.6-23.7 Ma); and
- Tertiary lone Formation (Eocene, 36.6-57.8 Ma).

Existing Site Conditions

Currently anticipated future activities at the project site would have the potential to affect or would be affected by only those geologic deposits which occur at or near the surface. For this reason, only those deposits which occur at or near the surface within the study area are described in this section. Geologic mapping and lithologic descriptions are summarized from preliminary geotechnical engineering reports prepared by Anderson Geotechnical Consultants (Anderson Geotechnical Consultants, 1989) and Wallace-Kuhl & Associates (Wallace-Kuhl & Associates, 1998).

Three distinct geologic units exist at the project site: the volcanic mudflow breccia of the Mehrten Formation, sandstone and cobble conglomerate of the Mehrten Formation, and granitic bedrock. Approximate boundaries of these units are shown on Figure 10-1. A geologic cross section is shown on Figure 10-2.

The caprock of Boulder Ridge consists of the Mehrten volcanic mudflow which was deposited when volcanic eruptions in the Sierra Nevada during the Pliocene (5 to 10 million years ago) resulted in volcanic mudflows. These mudflows flowed westerly through stream and river valleys. After the mudflows were deposited and before they had time to harden, the streams and rivers reworked the mudflows and deposited the material further downstream as sandstones and cobble conglomerates. These sedimentary deposits were then overlain by subsequent mudflows. The lava capped ridge at the site is the result of the last mudflow sequence deposited in the region. The elongate configuration of the lava capped ridge is due to the confining nature of the old river valley. As the mudflow hardened, it formed a resistant cap which protected the underlying softer rocks, such as the conglomerates and sandstones, from erosional processes. Ridges which once confined the mudflows were left unprotected from erosional processes and were subsequently eroded exposing the mudflows, sandstones, and conglomerates in their present form.

The Mehrten volcanic mudflow (shown as Tmv on Figure 10-1) is composed of angular fragments and blocks of black, gray and red, fine grained to porphrytic, andesitic rock which range in size from less than an inch to several feet in diameter. The rocks are contained in a cemented matrix composed of andesitic lapilli and light brown to gray ash and sand. The majority of this unit exists on top of the main ridge as caprock and dips gently to the southwest. Blocks of andesite are scattered over the ridge top and represent the residual products of weathering. Soil development on the mudflow tends to be very thin with typical soil thickness of less than six inches. Some areas underlain by the mudflow do not have any soil development. Due to its well cemented nature, the volcanic mudflow would be the most difficult material to excavate on the site (Anderson Geotechnical Consultants, 1989). Typically trenching or mass grading of this material requires specialized ripping equipment, and can result in fracturing and excavation of large blocks of material. This ripping can cause fractures in the rock that extend beyond the excavation site, that can affect the hydrology of surrounding areas by increasing the permeability of the surface. This can adversely effect vernal pools and other habitat, as discussed in Chapter 13.

The Mehrten conglomerate (Tmc on Figure 10-1) consists of rounded andesitic gravel and cobbles in a cemented matrix of andesitic sand and silt. Cemented layers of andesitic sandstone and thin layers of mudflow breccia are often interbedded within this unit. This unit is exposed on top and in the sides of the ridge at the site, and on the northwesterly trending ridges that finger off from the main ridge. Although large boulders or cemented blocks of conglomerate may be excavated during grading, the sandstone and conglomerate should be well-suited for use as fill material (Anderson Geotechnical Consultants, 1989).

The sandstones and conglomerates of the Mehrten Formation are underlain by granitic bedrock that is approximately 130 to 150 million years old (Mesozoic age). The bedrock is part of the Penryn Pluton and has been classified as quartz diorite. This Mesozoic quartz diorite (Mzd on Figure 10-1) is exposed as boulder outcrops throughout the lowlands of the property. The bedrock is differentially weathered and varies between slightly weathered, hard rock, and severely weathered rock which is similar to a partially cemented soil (decomposed granite). Where well weathered, the granitic bedrock would be excavatable and suitable as fill material (Anderson Geotechnical Consultants, 1989). This unit underlies the mid to lower ridge slopes and Clover Valley Creek below Clover Valley Reservoir. The Meadows area in the northwestern portion of the project site is also underlain by this unit.

10.1.3 Mineral Resources

Information on the mineral resource potential within the study area was obtained from the California Department of Conservation, Division of Mines and Geology (CDMG), Mineral Land Classification of Placer County (CDMG, 1995). In accordance with California's Surface Mining and Reclamation Act of 1975, this document classifies the land in Placer County according to "the presence, absence, or likely occurrence of significant mineral deposits in areas of the county subject to either urban expansion or other irreversible land uses incompatible with mining."

Regional Setting

This report classifies the land in the study area as Mineral Resource Zone I (MRZ-1), Mineral Resource Zone 2a (MRZ-2a), Mineral Resource Zone 3a (MRZ-3a), and Mineral Resource Zone 4 (MRZ-4). Mineral Resource Zones are defined as follows:

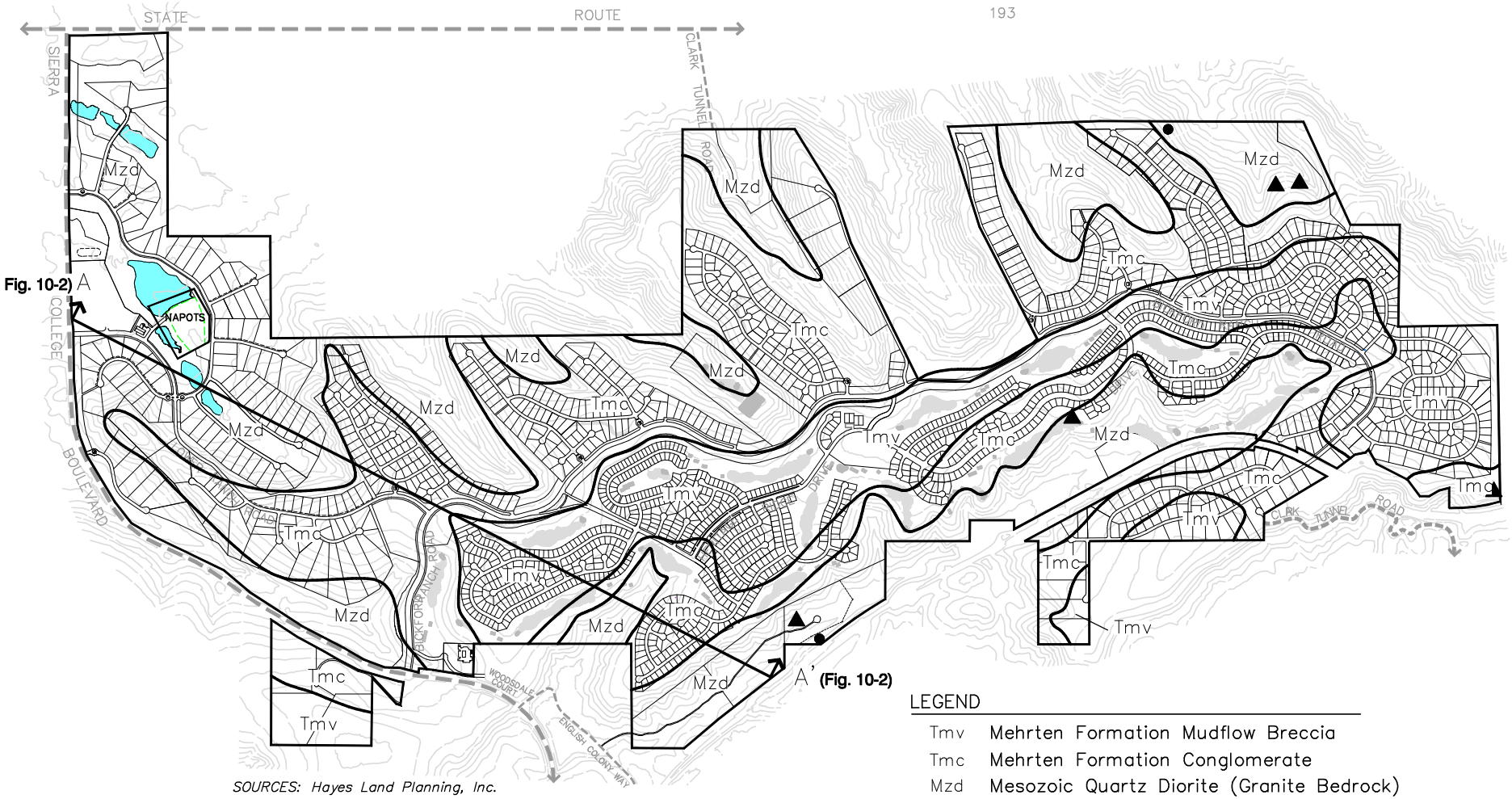
- MRZ-1 = Areas where available geologic information indicates there is little likelihood for the presence of significant mineral resources.
- MRZ-2a = Areas underlain by mineral deposits where geologic data indicate that significant measured or indicated resources are present.
- MRZ-3a = Areas containing known mineral occurrences of undetermined mineral resource significance.
- MRZ-4 = Areas of no known mineral occurrences where geologic information does not rule out either the presence or absence of significant mineral resources.

Mineral resource zones MRZ-2 and MRZ-3 within Placer County have been further subdivided to indicate the type of mineral deposit. Within the project site, the subdivision "p" exists, denoting placer gold deposits.

Existing Site Conditions

The portions of the project site underlain by granitic bedrock (Mzd on Figure 10-1) lie within a mineral resource zone classified as MRZ-1. Those areas underlain by Mehrten Formation (Tmv and Tmc on Figure 10-1) and which make up the main northeast to southwest trending ridge, and the finger ridges trending to the northwest, lie within a zone classified as MRZ-3a$^{(P)}$. This zone encompasses tertiary gravel deposits which have been previously mined or prospected for placer gold, but whose economic significance cannot be evaluated based on the available information. Regionally, this area includes several ridges capped by tertiary volcanic rocks of the Mehrten Formation that are known to, or most likely to, conceal older gold-bearing river channels (CDMG, 1995).

Seven locations described as "drifts, prospects, declined shafts, tailings dumps and prospects" are discussed in the Phase II Evaluation of Cultural Resources (Windmiller, et al., 1998a). The location coordinates of these mines and prospects were determined by Windmiller using global positioning satellite (GPS) equipment. These prospects and tunnels are located on the northern and southern slopes of the main northeast to southwest trending ridge, near the contact between the Mehrten conglomerate and the Mesozoic quartz diorite (Figure 10-1). The mining and prospecting activity was apparently associated with past placer mining of gold bearing gravels. The lack of any recorded mineral rights claims suggests that the mines and prospects were not successful (Windmiller, et al., 1998a). No known current mining activity exists on or in the vicinity of the proposed project.



SOURCES: Hayes Land Planning, Inc.
Wallace–Kuhl & Associates, 1998

LEGEND

Tmv	Mehrten Formation Mudflow Breccia
Tmc	Mehrten Formation Conglomerate
Mzd	Mesozoic Quartz Diorite (Granite Bedrock)
	Approximate Geologic Contact
▲	Mine Tunnel
●	Prospect
	Lake
	Golf Course
A A'	Cross Section Location

BICKFORD RANCH

0 1000 2000
SCALE IN FEET

LOCAL GEOLOGIC MAP

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FIGURE 10–1

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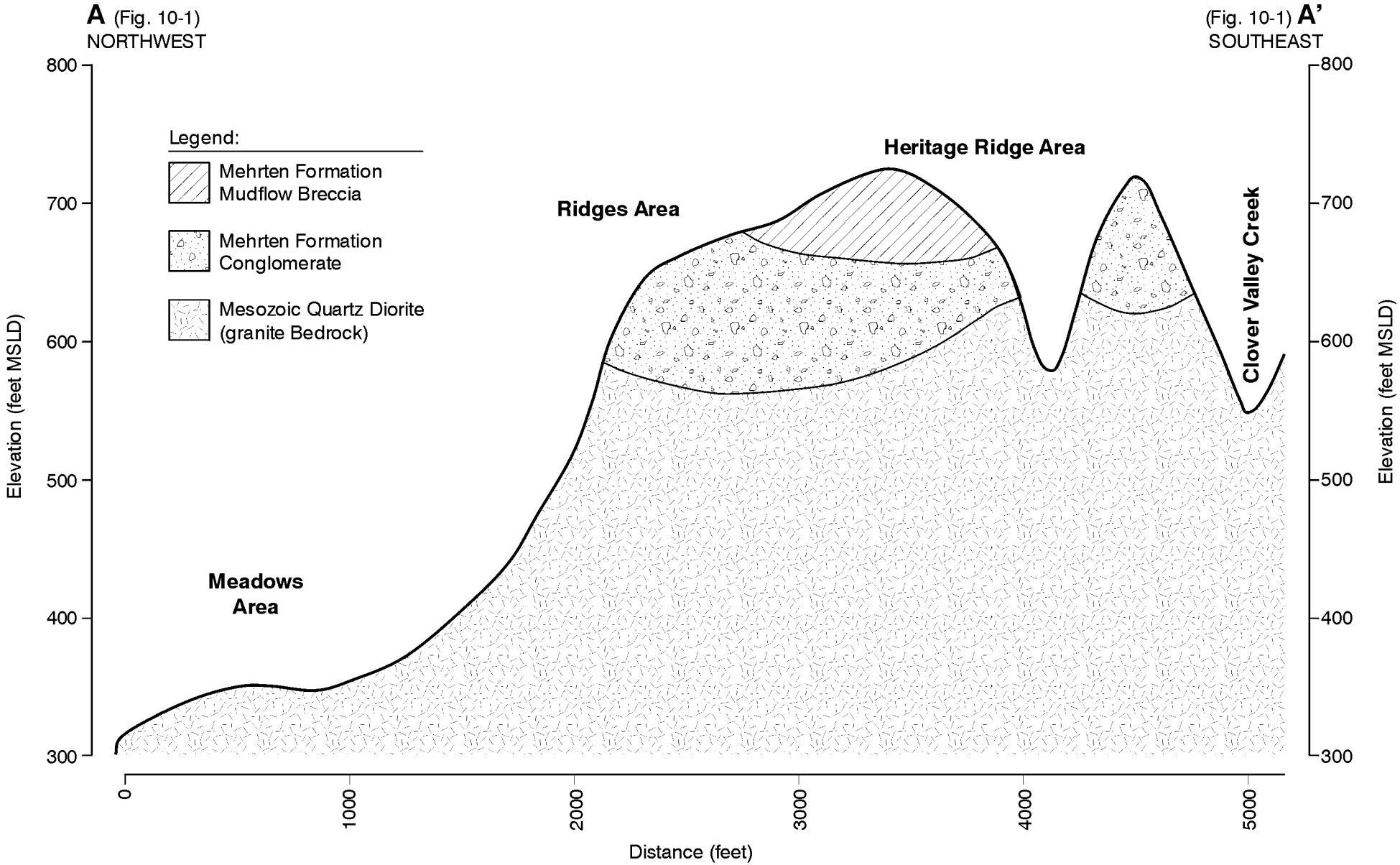

GEOLOGIC CROSS SECTION A-A'

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FIGURE 10-2

The abandoned mine located in the northeastern portion of the project site is described as the most developed of the seven mine and prospect locations on the project site, based on the information presented by Windmiller, et al. This abandoned mine was visited during the site reconnaissance on November 13, 1998, by a Dames & Moore representative accompanied by the Applicant's engineer, Mr. Jerry Anders. The location of this abandoned mine is below Caperton Canal, near the head of the easternmost of the canyons trending northwest from Boulder Ridge. Three tunnel openings, partially covered by fill material, were observed at this location but not entered. These openings are constructed in cemented Mehrten conglomerate without timbering or other support. There was no evidence of collapse of the tunnels, which widen to approximately 15 feet within the limit of visibility from the tunnel entrance. No drainage was observed from the tunnels, and there was no evidence of former drainage. A terrace, approximately 150 feet long and 50 feet wide and apparently composed of mine tailings, was observed in the canyon just below the tunnel entrance. No structures or other significant debris were noted, and it appeared that the past mining activity at the site had been limited. Mr. Anders said that he had been informed by the previous property owners that the mine was last worked in 1925, and production had been minimal. Mr. Anders also said that to his knowledge there had never been seepage from the mine, but that there was standing water within it, and that the tunnel was reported to extend for a few hundred feet. The remaining four locations shown as mine tunnels on Figure 10-1 are described by Windmiller, et al. as similar to the location visited but less extensive.

The remaining portions of the project site and study area are classified as MRZ-4, or mineral areas with no known mineral occurrences. No other valuable deposits of mineral commodities are known to exist in the site vicinity or underlying the project site.

Information on the oil and natural gas resource potential within the study area was obtained from the *Munger Map Book of California-Alaska Oil and Gas Fields* (Munger, 1995) and the book of *California Oil & Gas Fields, Northern California* (California Division of Oil and Gas, 1982). According to the *Munger Map Book* and the book of *California Oil & Gas Fields*, no oil or natural gas fields are known to exist in the vicinity or underlying the project site.

10.1.4 Seismicity

Regional Setting

The project site is located along the eastern edge of the Central Valley of California in a relatively seismically quiescent area between two areas of documented tectonic activity. The Coast Ranges to the west contain many active faults which are associated with the northwest trending San Andreas Fault system, such as the Hayward and Calaveras faults (Jennings, 1994). The Coast Ranges-Sierran Block boundary zone, which follows the physiographic boundary between the Coast Ranges and Great Valley, contains potentially active "blind" thrust faults such as the Midland Fault (Unruh and Moores, 1992). Based on the size of historical events and on the inferred segmentation of the boundary zone, these "blind" thrust faults are capable of producing moderate to large earthquakes. To the east, there are active faults such as the Cleveland Hills Fault and the Carson Valley Fault, as well as older faults (pre-Holocene in age, or greater than 11,000 years before present) associated with the faults of the Foothill Fault System in the Sierra Nevada foothills, such as the Bear Mountain and Melones fault zones (Figure 10-3). In addition, the eastern range of the Sierra Nevada is bounded by a series of active faults associated with the Sierra Nevada Frontal Fault System, such as the Genoa Fault.

Other nearby faults, including the Willows Fault and Stockton Fault, are considered to be inactive faults with displacements occurring greater than two million years before the present (Jennings, 1994; Harwood and Helley, 1987).

There are three known inactive faults located in the vicinity of Roseville to the south: the Volcano Hill Fault, the Linda Creek Fault, and one unnamed fault. The Volcano Hill Fault is located northwest of Volcano Hill and trends northwest for approximately one mile starting just east of the Roseville city limits. The Linda Creek Fault is suspected to extend along a portion of Linda Creek through Roseville and a portion of Sacramento County. The existence of this fault is disputed due to a lack of recorded activity (City of Roseville, 1992). However, it is reported that terrace deposits have been cut by the fault, suggesting that fault activity may have occurred during the last 100,000 years (Livingston, 1976). The unnamed fault trends in an east-west direction between Folsom Lake and the City of Rocklin. Portions of this unnamed fault alignment are reported to be concealed and possibly connected to the Bear Mountain Fault near Folsom Lake (City of Roseville, 1992).

The most recent seismic event recorded in the south Placer area occurred in 1908 on a north-south trending fault between Folsom and Auburn and on an east-west trending fault between Placerville and Roseville. This event measured at least 4.0 on the Richter Scale; however, no significant seismic event has been recorded in the Roseville area since that time (City of Roseville, 1992).

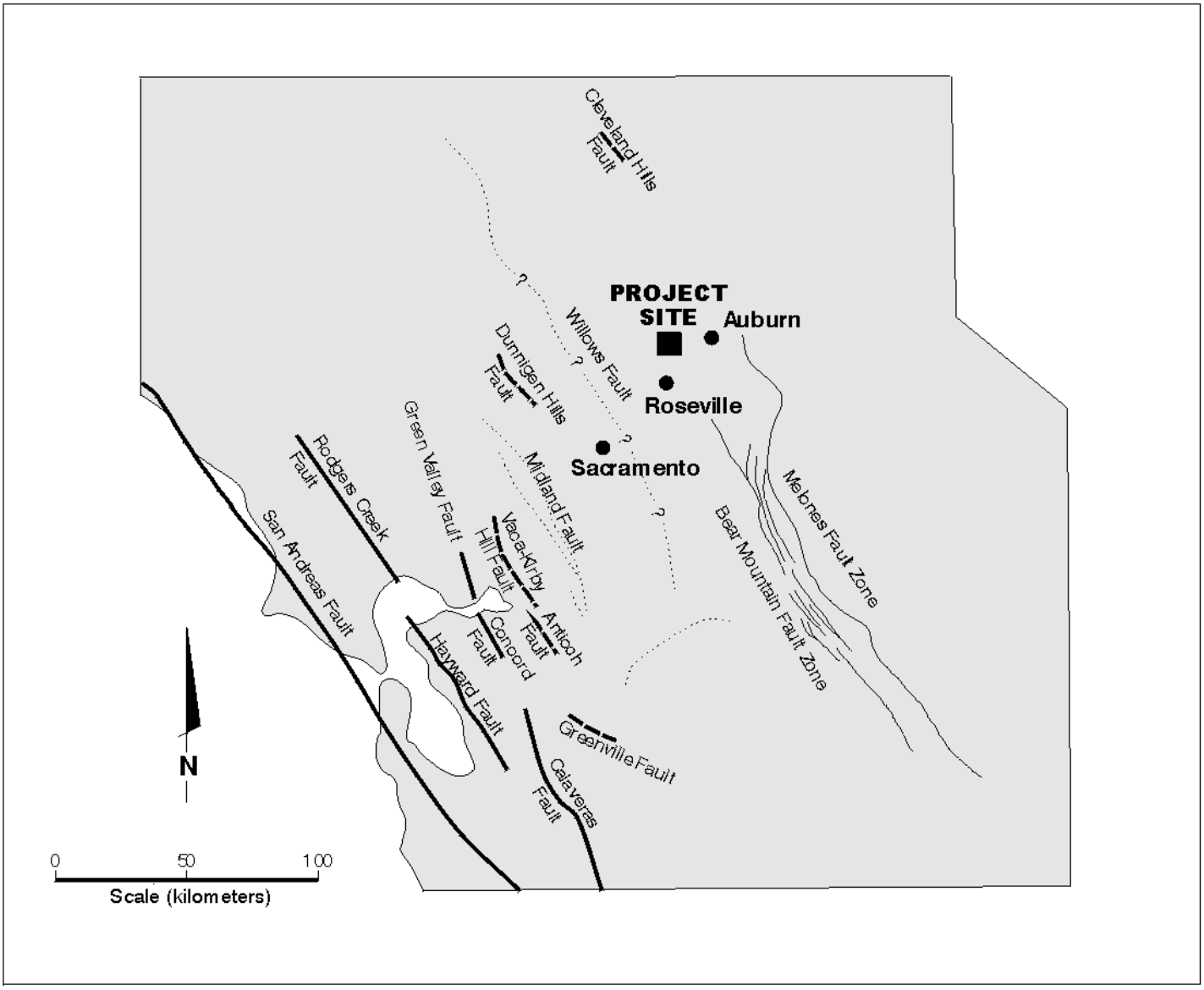
The CDMG has classified the south Placer area a low severity earthquake zone (City of Roseville, 1992). The maximum expected intensity in a zone of this classification would range between VI and VII on the Modified Mercalli Scale. Events of this intensity level would include cracks in weak masonry and chimneys, shaking or rustling of trees and bushes, furniture movement, and breaking of glassware.

The fault zones within 100 kilometers (km) of the study area that are currently zoned as active by the CDMG under the Alquist-Priolo Special Studies Zone Act (Hart, 1992) are listed on Table 10-1. The active San Andreas Fault and Genoa Fault Zones are also listed for comparative purposes. Significant faults (those showing Late Quaternary displacement) within 100 km of the study area not currently zoned active by the CDMG are listed in Table 10-2.

Table 10-1
Active Faults Zoned by California Division of Mines and Geology Within 60 Miles (100 Kilometers) of the Project Site

Fault Name	Distance to Site (kilometers)	Maximum Credible Earthquake Magnitude (MCE)
Cleveland Hill Fault	73	6.5
Green Valley Fault	115	6.5
Antioch Fault	124	6.5
Huntington Creek Fault	115	6.0-6.5
San Andreas Fault	171	8.3
Genoa Fault	119	7.5

Source: Hart, 1992; Jennings, 1994



Source: Jennings, 1975;Harwood & Helley, 1987.

KEY

Quaternary or Younger Fault

Pre-Quaternary Fault; Queried Where Inferred, Dotted Where Concealed

REGIONAL FAULT LOCATION MAP

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FIGURE 10-3

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Table 10-2
Other Faults Not Zoned Active in the Vicinity of the Project Site[1]

Fault Name	Distance to Site (kilometers)	Maximum Credible Earthquake Magnitude
Dunnigan Hills Fault	59	6.5
Spenceville Fault	14	6.0-6.5
Swain Ravine Fault	42	6.0-6.5
Bear Mountain Fault Zone	49	6.5
Dewitt Fault	30	6.0-6.5
Melones Fault Zone	98	6.0-6.5
Vaca-Kirby Hills Faults	95	6.5
Cordelia Fault	102	6.0-6.5
West Napa Fault	116	6.0-6.5
Soda Creek Fault	109	6.0-6.5

Note:
[1] Available data are insufficient for the California Division of Mines and Geology to determine whether the faults have been active in the last 11,000 years.
Source: Hart, 1992; Jennings, 1994

Existing Site Conditions

There are no known active faults zoned beneath or near the study area and no active fault trace is known to pass beneath the study area. The active zoned fault nearest to the study area is the Cleveland Hills Fault, approximately 66 kilometers north, and the source of a magnitude 5.7 earthquake in 1975. In addition, recent studies (PG&E, 1992) indicate that there may be active faults, similar to the Cleveland Hills Fault, located within the Bear Mountains and Melones fault zones.

The Maximum Credible Earthquake (MCE) postulated for each of the known active faults within approximately 100 kilometers of the study area is also listed in Tables 10-1 and 10-2. MCE magnitudes were empirically derived for each fault based on a combination of parameters known for each fault, including the potential fault rupture length, and regional seismic data (Slemmons, 1982).

It is not anticipated that any provisions will be required to comply with the Alquist-Priolo Special Studies Zones Act of 1972, since the project site is not located in an area that is classified as a “Special Studies Zone” under this Act.

10.1.5 Soils

Soil type is one criterion used to evaluate potential impacts of development. Soils are typically considered for their resource value in agricultural production or for their potential development characteristics or constraints. For potential development, some soils are susceptible to erosion and/or liquefaction while others are more suitable for compaction for construction.

Regional Setting

The *Soil Survey of Placer County, Western Part* (USDA, 1980) shows ten soil types occurring in the region of the project site (Figure 10-4). The soils occurring in this area are classified as either those which form on terraces, such as Cometa Complexes, or those which form in foothill areas, such as the Exchequer Complex. Terrace soils are generally well drained, moderately deep to deep over a clay pan, and have a sandy loam or loam subsurface layer and a dense clay subsoil. Soils forming on the foothills are somewhat excessively drained to well drained gravely coarse sandy loams to silt loams.

Existing Site Conditions

The "Soil Survey of Placer County California, Western Part" (USDA, 1980) shows 13 soil types occurring within the boundaries of the project site (Figure 10-4). The primary soils located at the project site belong to two complexes of related series, Andregg and Caperton loams, and Exchequer and Inks Loams. The Andregg and Caperton loams are underlain by weathered granitic bedrock at depths of 8 to 40 inches. The Exchequer and Inks loams are typically found on the tops and sides of volcanic tabular ridges and are underlain by hard andesitic breccia at depths ranging from 11 to 18 inches.

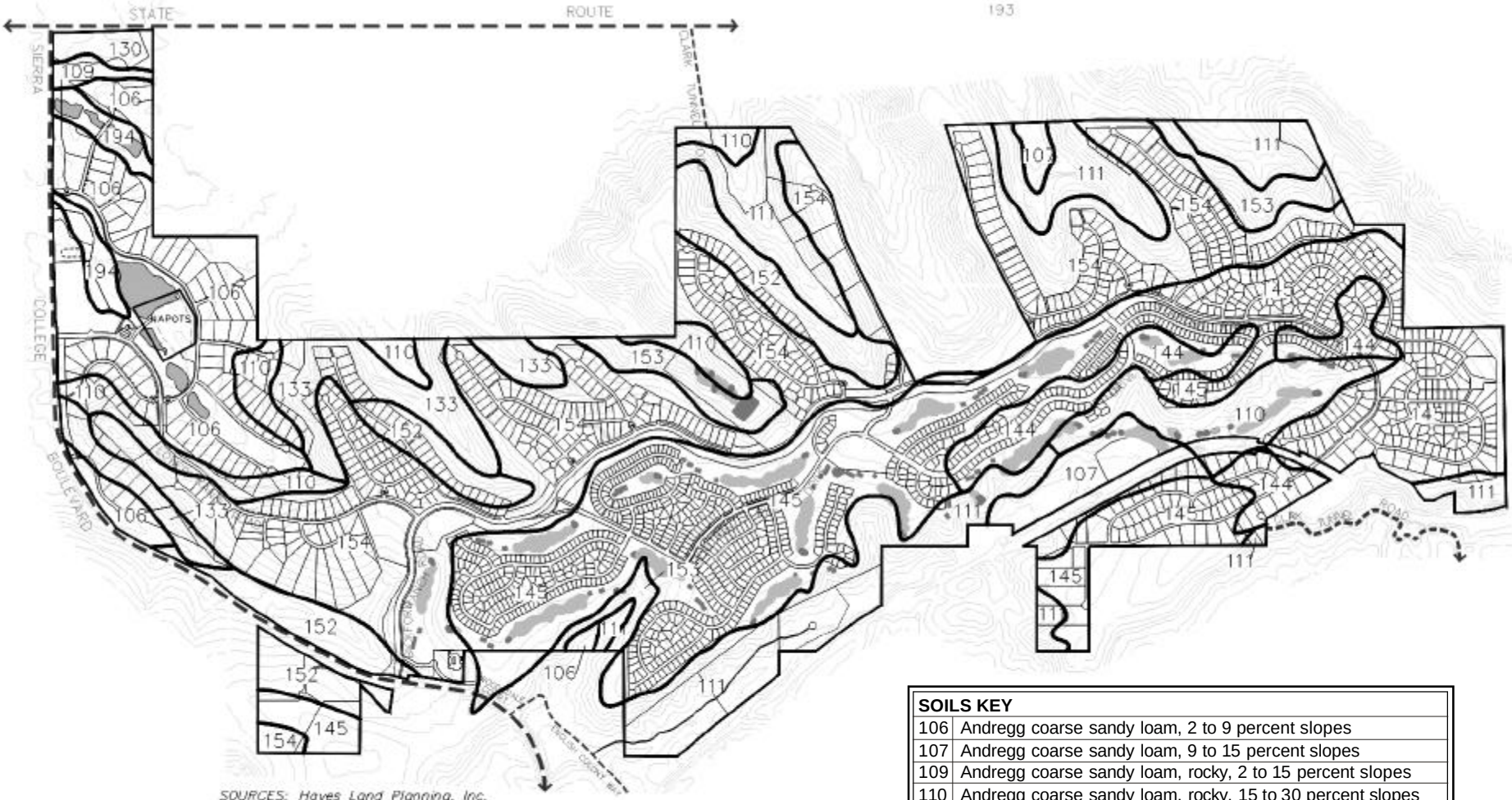
The soil types (units) occurring within the project site are shown on Figure 10-4. These soils are described below. The numeral preceding the soil name keys to the map on Figure 10-4.

106-Andregg coarse sandy loam, 2 to 9 percent slopes; 107-Andregg coarse sandy loam, 9 to 15 percent slopes; 109-Andregg coarse sandy loam, rocky, 2 to 15 percent slopes; 110-Andregg coarse sandy loam, rocky, 15 to 30 percent slopes; and 111-Andregg coarse sandy loam, rocky, 30 to 50 percent slopes: These soils are described together, as their characteristics are similar. These are moderately deep, rolling, well drained soils underlain by weathered granitic bedrock. They are formed on low hills in the Loomis Basin at elevations of 200 to 1,000 feet msl. Typically, the surface layer of the Andregg soil is grayish brown coarse sandy loam about 15 inches thick. The subsoil is pale brown and very pale brown coarse sandy loam. At a depth of 29 inches is highly weathered granitic rock. Permeability is moderately rapid. Surface runoff is medium and the hazard of erosion is moderate for slopes up to 15 percent. On slopes of greater than 15 percent surface runoff is medium to rapid and the hazard of erosion is high. The major limitations to urban use are the depth to bedrock, and in the case of those with greater than 15 percent slope, the slope. Septic tank absorption fields may not function properly because the depth to bedrock is generally less than 40 inches, and because of the slope in the steeper soils.

Special care is needed for use of the soils with slopes greater than 15 percent as sites of rural subdivisions. Care must be used in locating roads to minimize the depths of cuts and fills. Cuts and fills greater than 6 feet make access to building sites a problem. Because of the erodibility of this soil and its parent material, all cut and fill slopes made in this material should be on at least a 2 to 1 slope.

Capability classes indicate in a general way the suitability of soils for most kinds of field crops. Capability classes for these soils range from III to IV for slopes up to 15 percent. These soils have severe to very severe limitations that reduce the choice of plants, due to the erosion potential. At slopes of greater than 15 percent, these soils have capability classes of VI and VII. These soils have severe to very severe limitations that make them unsuitable for cultivation because they are shallow, droughty, or stony.

130 Caperton-Andregg coarse sandy loams: These undulating to rolling soils are on the granitic foothills in the Folsom Lake-Loomis Basin area at elevations of 200 to 1,000 feet msl. The unit is about 50 percent Caperton soil and 30 percent Andregg soil. The Caperton soil is on rounded knolls and the Andregg soil is on lower slopes.



SOURCES: Hayes Land Planning, Inc.

Soil Survey of Placer County California, Western Part United States Department of Agriculture Soil Conservation Service in Cooperation with University of California Agriculture Experiment Station

SOILS KEY	
106	Andregg coarse sandy loam, 2 to 9 percent slopes
107	Andregg coarse sandy loam, 9 to 15 percent slopes
109	Andregg coarse sandy loam, rocky, 2 to 15 percent slopes
110	Andregg coarse sandy loam, rocky, 15 to 30 percent slopes
111	Andregg coarse sandy loam, rocky, 30 to 50 percent slopes
130	Caperton-Andregg coarse sandy loams
133	Caperton-Rock outcrop complex, 30 to 50 percent slopes
144	Exchequer very stony loam, 2 to 15 percent slopes
145	Exchequer-Rock outcrop complex, 2 to 30 percent slopes
152	Inks cobbly loam, 2 to 30 percent slopes
153	Inks cobbly loam, 30 to 50 percent slopes
154	Inks-Exchequer complex, 2 to 25 percent slopes
194	Xerofluvents, frequently flooded

BICKFORD RANCH

0 1000 2000

SCALE IN FEET

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SOILS MAP

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FIGURE 10-4

The Caperton is a shallow, somewhat excessively drained soil formed over weathered granitic bedrock. Typically the surface layer is grayish brown and brown coarse sandy loam about 12 inches thick. The next six inches is a pale brown gravelly coarse sandy loam, overlying weathered granitic bedrock at a depth of 18 inches. Permeability is moderately rapid and surface runoff is medium. The hazard of erosion is moderate.

The Andregg is a moderately deep, well drained soil also formed over weathered granitic bedrock. The surface layer typically is grayish brown coarse sandy loam about 15 inches thick. The subsoil is pale brown and very pale brown coarse sandy loam, overlying weathered granitic bedrock at a depth of 29 inches. Permeability is moderately rapid. Surface runoff is medium, and the hazard of erosion is moderate.

The major limitations to urban use of these soils is depth to bedrock. Septic tank absorption fields may not function properly because the depth to rock generally ranges from 8 to 40 inches.

This soil has a capability class designation of IVe-4(18) indicating that it has very severe limitations that reduces the choice of plants due to low available water capacity.

133-Caperton-Rock outcrop complex, 30 to 50 percent slopes: This is a combination primarily of about 70 percent steep Caperton soil and 15 percent granitic outcrop. It is found on granitic side slopes of volcanic ridges in the Loomis Basin at elevations of 300 to 1,000 feet msl.

The Caperton soil is a somewhat excessively drained, shallow soil formed over weathered granitic bedrock. Typically the surface layer is grayish brown and brown gravelly coarse sandy loam about 12 inches thick. The next 6 inches is pale brown gravelly coarse sandy loam overlying weathered granitic bedrock at a depth of 18 inches. Permeability is moderately rapid. Surface runoff is rapid and the hazard of erosion is high.

The steepness of slope, erosion hazard, and the rock outcrop are the major limitations to planning home and road construction. The capability classification of VIIs(18) indicates that this soil has very severe limitations making it unsuitable for cultivation because it is shallow, droughty, or stony.

144-Exchequer very stony loam, 2 to 15 percent slopes: This is a shallow, somewhat excessively drained very stony soil underlain by hard andesitic breccia. It is formed on long, road volcanic ridges at elevations of 100 to 2,000 feet msl. Typically, the soil is brown very stony loam and cobbly loam. At a depth of about 11 inches is hard andesitic breccia. Permeability is moderate. Surface runoff is medium. The hazard of erosion is slight to moderate. After intense rainstorms, this soil is saturated with water and water flows across the surface for a short time.

Stones and the depth to hard rock are the major limitations to be considered in planning road construction. Septic tank absorption fields may not function properly because the depth to hard rock is less than 20 inches. The capability classification of VIIs(18) indicates that this soil has very severe limitations making it unsuitable for cultivation because it is shallow, droughty, or stony.

145-Exchequer-Rock outcrop complex, 2 to 30 percent slopes: This unit is on long, broad volcanic ridges and their side slopes. It consists of about 60 percent Exchequer soil and 15 percent andesitic breccia (lava cap). The Exchequer is a shallow, somewhat excessively drained very stony soil formed in residuum from hard andesitic breccia. Permeability is moderate. Surface runoff is medium to rapid, and the hazard of erosion is slight to high. After intense rainstorms, this soil is saturated and water flows across the surface for a short time.

Steepness of slope, the rock outcrop, and the shallowness over hard rock are the major limitations to be considered in planning road construction. Septic tank absorption fields should not be planned on this unit because the soil material is not deep enough to install leach fields.

The capability classification of VIIs(18) indicates that this soil has very severe limitations making it unsuitable for cultivation because it is shallow, droughty, or stony.

152-Inks cobbly loam, 2 to 30 percent slopes and 153-Inks cobbly loam, 30 to 50 percent slopes: This is a shallow, well drained cobbly soil underlain by andesitic conglomerate. It is formed in residuum on long broad volcanic ridges and side slopes at elevations of 200 to 1,200 feet msl.

Typically, the surface layer is yellowish brown cobbly loam about five inches thick. The subsoil is brown very cobbly clay loam. At a depth of about 18 inches it is underlain by andesitic conglomerate. Permeability is moderate. The hazard of erosion is slight to high on 2 to 30 percent slopes, and high on 30 to 50 percent slopes.

Some rural housing has been developed on this soil. The major limitations to rural development are the slope and depth to rock. Septic tank absorption fields may not function properly because of the slope and the depth to rock, which is generally less than 20 inches.

The capability classification of IVe-8(18) for the 2 to 30 percent slopes indicates severe limitations limiting the choice of plants due to the shallow bedrock. The capability classification for these soils at 30 to 50 percent slopes is VIe-(18). This indicates severe limitations making it generally unsuitable for cultivation because of the potential for erosion.

154-Inks-Exchequer complex, 2 to 25 percent slopes: This unit is found on long, broad volcanic ridges and side slopes at elevations of 200 to 1,200 feet msl. It is about 40 percent Inks soil and 30 percent Exchequer soil. The soil pattern generally follows the pattern of oak trees. The Inks soil supports a denser stand of oak trees than does the Exchequer soil.

The Inks is a shallow, well drained cobbly soil formed in residuum from andesitic conglomerate. Typically, the surface layer is yellowish brown, cobbly loam about five inches thick. The subsoil is brown very cobbly clay loam. At a depth of 18 inches is andesitic conglomerate. In a few places, the surface layer is gravelly loam. Permeability is moderate. The surface runoff is medium. The hazard of erosion is slight or moderate. After intense rainstorms, this soil is saturated and water flows across the surface.

The Exchequer is a shallow somewhat excessively drained very stony soil that formed in residuum from hard andesitic breccia. Typically the soil is brown very stony loam and cobbly loam. At a depth of 11 inches is hard andesitic breccia. Permeability is moderate. The hazard of erosion is slight or moderate After intense rainstorms, this soil is saturated and water flows across the surface.

Some rural housing has been developed on this unit. The major limitations to rural development are the slope and the depth to rock. Septic tank absorption fields may not function properly because of the slope and the depth to rock, which is generally less than 20 inches.

The capability classification of this soil is VIs(18), which indicates that this soil has severe limitations making it unsuitable for cultivation because it is shallow, droughty, or stony.

194-Xerofluvents, frequently flooded: This soil type is mapped within two tributary stream channels within the northwestern corner of the project site which drain to Auburn Ravine. The soil type consists of

narrow stringers of somewhat poorly drained recent alluvium adjacent to stream channels. These soils are variably colored, stratified gravelly sandy loams, gravely loams, and gravelly clay loams that generally grade to sand and gravel with increasing depth. The depth to underlying restrictive material is greater than 36 inches. Surface runoff is slow.

These soils have a capability unit classification of IVw-2 which indicates there are severe limitations that reduce the choice of crops, or that require very careful management of crops, due to poor drainage or flooding. The risk of corrosion for uncoated steel is high and that for concrete is low. The hazard of erosion is high. Areas are subject to frequent flooding and channelization. These soils are not suited for urban use due to the flood hazard.

Liquefaction

Soil liquefaction is a process by which the shear strength of granular saturated soils is reduced due to an increase in pore pressure during human-induced events or seismic shaking. Requisite conditions for liquefaction to occur include saturated granular soils with a loose-packed grain structure capable of progressive rearrangement of grains during repeated cycles of seismic loading. Soils at the project site are not considered to be prone to liquefaction.

Soil Erosion

The erosion hazard of site soils as delineated by the USDA (USDA, 1980) is largely related to topographic slope. With few exceptions, such as the Xerofluvents, frequently flooded (194) in the Meadows area in the northwestern portion of the site, all soils rated by the USDA as having a high erosion hazard lie on slopes of 30 percent or greater.

Soils throughout most of the project site have a low to moderate erosion hazard, and are not expected to be subject to erosion problems. Soils occupying approximately one quarter of the project site have a high erosion hazard (Figure 10-5). These soils include the Andregg coarse sandy loam, 15 to 30 percent slopes (110), Andregg coarse sandy loam, 30 to 50 percent slopes (111), Caperton-Rock outcrop complex, 30 to 50 percent slopes (13), Inks cobbly loam, 30 to 50 percent slopes (153), and Xerofluvents, frequently flooded (194). These soils are located on the steep side slopes of the northwest trending ridges, along the tributary to Auburn Ravine which crosses the northwest corner of the project site, and on the southern slopes of the main ridge. Development is proposed for a limited area of these high erosion hazard soils, as shown in Figure 10-5.

10.2 REGULATORY SETTING

The Placer County Planning and Public Works Departments have policies and guidelines concerning grading, erosion control, stormwater design, inspection, and permitting. In addition, permits related to soils and geology that may be required for the proposed project include:

- U.S. Army Corps of Engineers Nationwide Permit 12, for utility line backfill and bedding;
- California Department of Fish and Game Streambed Alteration Agreement;
- Regional Water Quality Control Board General Construction Activity Permit;
- Drilling permits for geotechnical borings from the Placer County Department of Environmental Health; and
- Construction permits from the Placer County Building Departments.

Placer County's General Plan contains policies governing development within Placer County. The policies relating to soils, geology, and seismicity are identified in the General Plan Consistency discussion in Section 10.3.

10.3 IMPACTS

This section identifies and discusses the environmental impacts resulting from the proposed project, and suggests mitigation measures to reduce the level of impact. A detailed discussion of mitigation measures is included in Section 10.4.

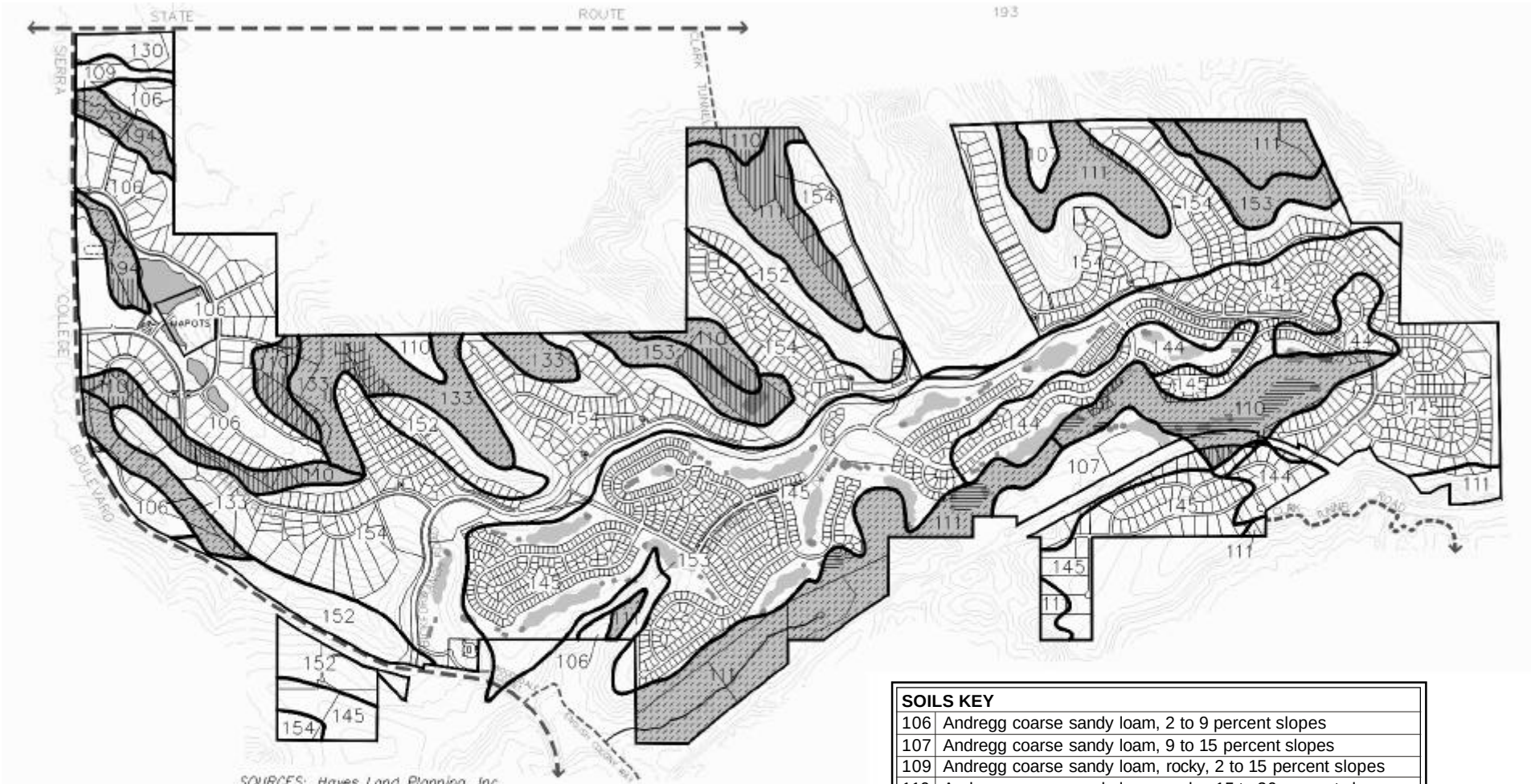
Potential significant impacts associated with soils, geology, and seismicity have been evaluate using the following criteria:

- Substantial alteration of existing topographic features of the project site;
- Constraint to potential mineral extraction activities;
- Potential constraints to development as a result of seismic hazards within the study area;
- Increased erosion during construction activities and following completion of the proposed project;
- Potential constraint to development as a result of soils and geologic conditions in the area of the proposed project; or
- Level of conflict with General Plan goals and policies related to development on slopes.

10.3.1 Topography

IMPACT G-1:	Topographic alteration resulting from earth grading
SIGNIFICANCE:	Potentially Significant
MITIGATION	
Proposed:	Mitigation Measures G-A (Comply with Placer County ordinances for all grading, drainage and construction of improvements); G-B (Prepare and implement a grading and erosion control plan); V-B (Implement sensitive grading techniques to blend with natural setting); and V-C (Minimize grading within Meadows and Ridges developments)
Recommended:	None
RESIDUAL IMPACT:	Less Than Significant

The site design utilizes and incorporates site topography into the alignment of streets, layout of residential lots and the locating of the site's recreational facilities. Site topography will be altered by grading for building pads, golf course and other recreational facilities, roads, lake, and service facilities. A total of approximately 3.8 million cubic yards of earth would be moved, which could result in potentially significant topographic alterations. The bulk of the grading would consist of construction of building pads in the Heritage Ridge residential area (1.3 million cubic yards), roads (1.2 million cubic yards) and the lakes (600,000 cubic yards). Following General Grading Concepts including in the Bickford Ranch Development Standards, adhering to Placer County ordinances for grading, drainage and construction, and implementation of a grading and erosion control plan would reduce the effects of topographic alteration to a less than significant level.



SOURCES: Hayes Land Planning, Inc.
Soil Survey of Placer County California, Western Part United States Department of Agriculture Soil Conservation Service in Cooperation with University of California Agriculture Experiment Station

SOILS KEY	
106	Andregg coarse sandy loam, 2 to 9 percent slopes
107	Andregg coarse sandy loam, 9 to 15 percent slopes
109	Andregg coarse sandy loam, rocky, 2 to 15 percent slopes
110	Andregg coarse sandy loam, rocky, 15 to 30 percent slopes
111	Andregg coarse sandy loam, rocky, 30 to 50 percent slopes
130	Caperton-Andregg coarse sandy loams
133	Caperton-Rock outcrop complex, 30 to 50 percent slopes
144	Exchequer very stony loam, 2 to 15 percent slopes
145	Exchequer-Rock outcrop complex, 2 to 30 percent slopes
152	Inks cobbly loam, 2 to 30 percent slopes
153	Inks cobbly loam, 30 to 50 percent slopes
154	Inks-Exchequer complex, 2 to 25 percent slopes
194	Xerofluvents, frequently flooded

LEGEND

- Erosion Hazard High, Undeveloped Area
- Erosion Hazard High, Developed Area
- Erosion Hazard High, Golf Course
- Lakes
- Golf Course

990605D 6/4/99

BICKFORD RANCH

0 1000 2000
SCALE IN FEET

SOILS EROSION HAZARD MAP

1999
Job No. 21305-002-038

Bickford Ranch Specific Plan EIR
Placer County, California

DAMES & MOORE
A DAMES & MOORE GROUP COMPANY

FIGURE 10-5

IMPACT G-2:	Development constraints due to difficult excavation conditions
SIGNIFICANCE:	Potentially Significant
MITIGATION	
Proposed:	Mitigation Measure G-C (Comply with the conclusions of a site-specific geotechnical investigation)
Recommended:	None
RESIDUAL IMPACT:	Less Than Significant

According to the preliminary geotechnical report prepared for the proposed project (Anderson Geotechnical Consultants, 1996), the Mehrten mudflow breccia will be a difficult material to excavate. Use of a large tractor equivalent in size to a Caterpillar D10 equipped with a single tooth ripper is recommended. Depth of penetration into the cemented mudflow breccia with a standard size backhoe would likely be limited to less than one foot. Pre-ripping of utility trenches can create pieces of mudflow breccia which may be too large to be suitable as trench backfill material without additional processing. According to the preliminary geotechnical report, this type of rock tends to absorb energy produced by blasting, resulting in little energy available for fracturing. While excavation of this material will be difficult, appropriate selection of equipment and methods can reduce this impact to less than significant.

10.3.2 Mineral Resources

IMPACT G-3:	Mineral resources rendered inaccessible
SIGNIFICANCE:	Less Than Significant
MITIGATION:	None Warranted

The portions of the project site made up of the two main northeast to southwest trending ridges, and the finger ridges trending to the northwest, lie within a zone classified by the CDMG as MRZ-3a$^{(P).}$ This zone encompasses Tertiary gravel deposits which have been previously mined or prospected for placer gold, but whose economic significance cannot be evaluated based on the available information. Regionally, this area includes several ridges capped by tertiary volcanic rocks of the Mehrten Formation that are known to, or most likely to, conceal older gold-bearing river channels.

Several mine tunnels or prospects have been identified within the project site located in the Tertiary gravels of the Mehrten conglomerate. According to previous site owners, this mining or prospecting activity ceased in about 1925. The CDMG has no record of productive mines on the project site. Based on the number of prospects, it would appear that the potentially gold-bearing rocks on the project site have been reasonably explored. Therefore, the potential that possible mineral resources on the proposed project site will be rendered inaccessible is less than significant.

10.3.3 Seismicity

IMPACT G-4:	Potential for seismic activity
SIGNIFICANCE:	Less Than Significant
MITIGATION:	None Warranted

As discussed in Section 10.1.4, the zoned active fault closest to the project site is located 73 kilometers to the north. No active fault traces are found beneath the study area of the project site. Therefore, the probability of surface ground rupture is negligible, and the possibility of strong ground motion is low. In addition, the proposed project would not impose surface loading which would induce seismic activity. Therefore, impacts associated with the potential for seismic activity would be less than significant.

10.3.4 Soils

IMPACT G-5:	Potential for increased erosion during and after construction
SIGNIFICANCE:	Potentially Significant
MITIGATION	
Proposed:	Mitigation Measures G-A (Comply with Placer County ordinances for all grading, drainage, and construction of improvements); G-B (Prepare and implement a grading and erosion control plan); G-C (Comply with the conclusions of a site-specific geotechnical investigation); and A-A (Provide dust controls)
Recommended:	Mitigation Measure G-D (Implement appropriate trail design, construction, and maintenance standards to minimize erosion)
RESIDUAL SIGNIFICANCE:	Less Than Significant

Clearing, grading and excavation activities would remove vegetative cover from the soils and would expose soils to the effects of wind, rain, and surface flow as a result of construction. The potential for erosion would be increased in all areas of the site affected by construction activities. The potential for erosion would be further increased where construction activities occur in areas with soils classified as having a high erosion potential, areas with steep slopes, and areas in which steep cut/fill slopes would be created.

Summer construction activities would increase soil exposure to wind erosion and winter construction would increase soil exposure to water erosion, both representing potentially significant impacts. In addition, construction activities in creek channels would remove the vegetative cover and expose both the creek bed and banks to increased erosion. Once the construction project is complete, increased potential for erosion would exist in all areas which have not been properly revegetated, or on and in the vicinity of wilderness trails not properly constructed or maintained.

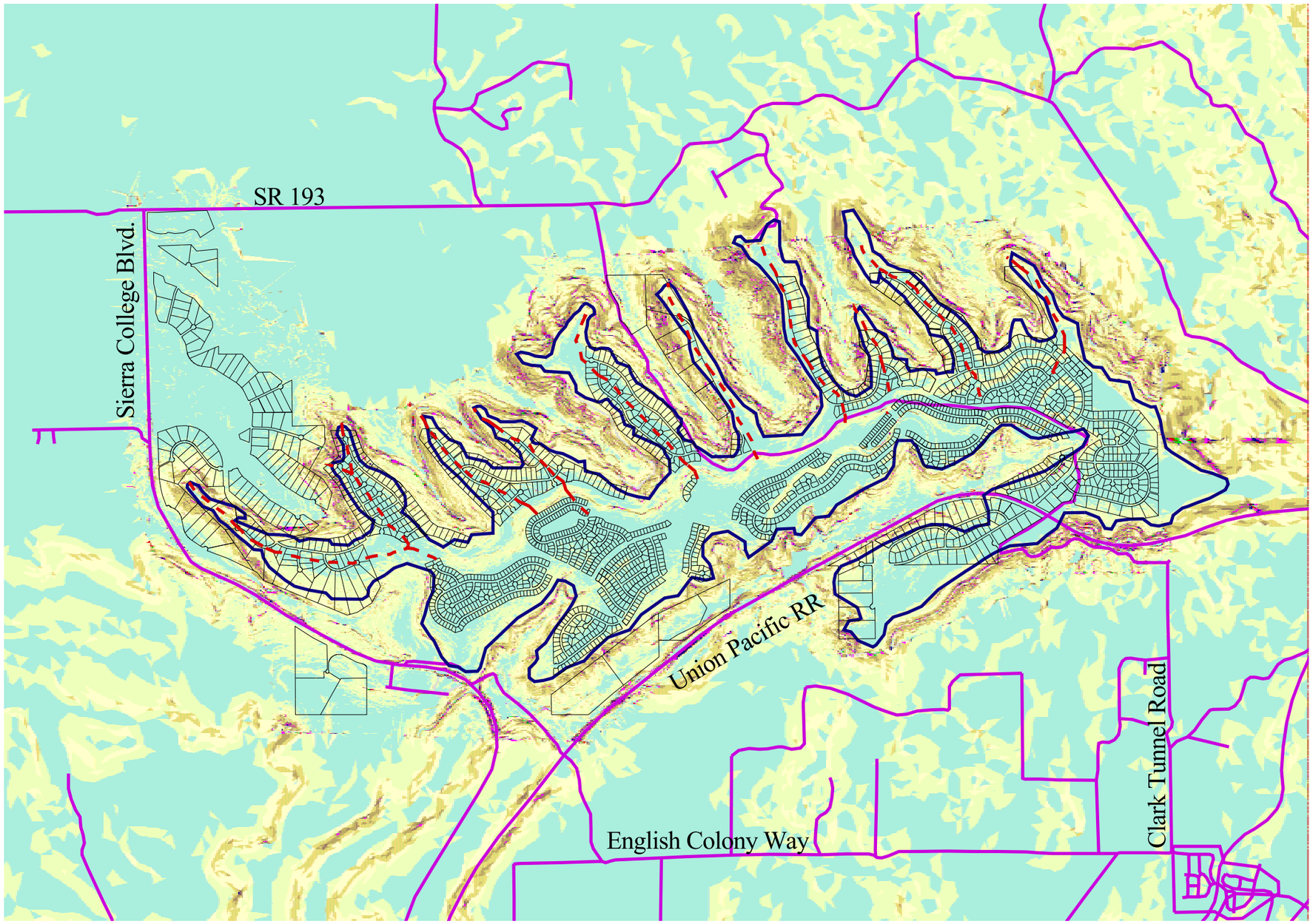
In addition to the potential for increased erosion caused by construction activities, natural soil erosion hazards exist within the boundaries of the proposed project site. Figure 10-5 presents a comparison of the areas of the proposed project site to be developed to those having soils classified as having a high erosion hazard (based on the *Soil Survey of Placer County, Western Part*, USDA, 1980). As illustrated in Figure 10-5, most of the areas of the proposed project site with soils classified as having a high erosion hazard would be retained as open space, or make up portions of rural estate lots of 3.5 to 10 acres in size. A slope map, indicating the slopes within the proposed project boundaries, is shown on Figure 10-6.

Construction of specific project features with the potential to produce and/or enhance potential erosion occur primarily from development of the three residential communities: the Meadows, the Ridges, and Heritage Ridge, wilderness trails, and off-site facilities associated with the proposed project. Grading and excavation activities associated with each of these areas are briefly summarized below.

Meadows

Lot grading guidelines proposed by the Applicant in the Bickford Ranch Specific Plan and the Bickford Ranch Development Standards call for development of the majority of the lots in the Meadows residential area with minimal grading by designing dwellings with raised, stepped or pier and grade foundations to utilize existing contours of the land. The remaining lots would utilize building foundation pads, where cut and fill slopes would not exceed 5 feet in height and excessive amounts of trees would not be impacted. The fire station site is also located in the Meadows area at the southeastern corner of Bickford Ranch Park and Lower Ranch Road. Slopes, on most lots in the Meadows area would be gentle, but some

Study Area Slope Map



BICKFORD RANCH

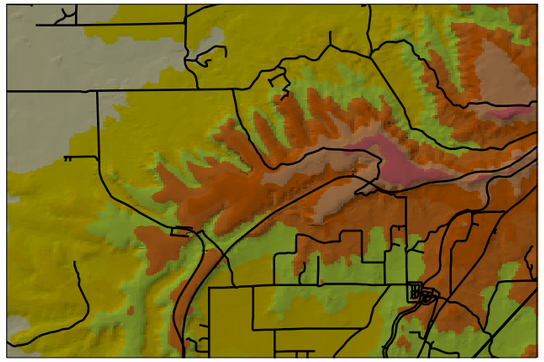
Legend

- Ridgelines
- Ridge Edge
- Lot Boundaries
- Existing Roads

Percent Slope

- 0 - 10
- 10 - 20
- 20 - 30
- 30 - 40
- 40 - 50
- 50 -60
- 60 - 70
- 70 - 80
- 80 - 90
- 90 - 100
- > 100

Regional Elevation Range Key



0 0.4 0.8 1.2 1.6 2 2.4 2.8 Miles

N W E S

STUDY AREA SLOPE MAP

1999
Job No. 21305-002-038

Bickford Ranch Specific Plan EIR
Placer County, California

DAMES & MOORE

FIGURE 10-6

are steep. If the Applicant's guidelines are not followed by individual lot owners, erosion impacts could occur.

Eight lakes are to be constructed within the Meadows residential area, with the excavated material to be used for fill elsewhere in the project. Two of these lakes are located within soils identified by the USDA as having a high erosion hazard. Construction activities in these soils have the potential to cause increased erosion. Use of these soils as fill would have the potential to cause excess seepage and/or washout of any retaining structures or fill slopes constructed of these soil materials.

Ridges

No building foundation pad construction is proposed by the Applicant within the Ridges area of the proposed project site, with the exception of some lots in areas R-14 and R-16 on the north and south slopes of Boulder Ridge. Steep fill slopes created by these pads would increase the potential for erosion. Unsuitable construction by owners of the lots not developed by the Applicant could potentially result in increased erosion.

Erosion-related impacts can be mitigated to less than significant levels through preparation and implementation of a project specific geotechnical report, preparation and implementation of a dust control plan, preparation and implementation of a grading and erosion control plan, compliance with the Placer County Grading Ordinance and preparation and implementation of appropriate CC&Rs.

Heritage Ridge

The majority of site clearing and grading in the Heritage Ridge area is planned for Boulder Ridge and its southern slopes. Grading in these areas would occur for the development of residential lots, the golf course, the Village Commercial site, and a water storage tank site. In addition, grading activities associated with construction of Bickford Ranch Road and other roads in the Heritage Ridge area would account for a significant proportion of the overall grading estimate for project roads. Potentially significant slope cuts would occur on Bickford Ranch Road at the intersection with Sierra College Boulevard, and along the north side of Boulder Ridge, increasing the potential for erosion. Clark Tunnel Road crosses the upper, intermittent portion of Clover Valley Creek within the eastern portion of the Heritage Ridge residential area. Grading and excavation activities associated with construction of this crossing could expose both the creek bed and banks to potential increased erosion. Steep fill slopes could potentially result where building pads would be constructed on Heritage Ridge lots on the south side of Boulder Ridge where slopes exceed 10 percent. These lots would be located in sections H-21, H-24, H-25, H-26, H-29, H-30 and H-34. Steep fill slopes created by these pads would increase the potential for erosion.

Off-Site Facilities

Wilderness trails planned for the north side of Boulder Ridge would be located on soils identified by the USDA as having a high erosion hazard Trail construction activities in these soils have the potential to cause increased erosion, as would improper trail design and inadequate maintenance The potential for additional soil erosion during and following trail construction would be reduced to less than significant through implementation of Mitigation Measure G-D.

The impact due to potential increased soil erosion during and after construction related to the off-site facilities is considered to be less than significant. These off-site facilities include a water supply line connecting to an existing main south of the property, and a sewer connection to the City of Lincoln Wastewater Treatment Facility.

The proposed alignment for a 16-inch water supply line to connect to an existing 30-inch line on Swetzer Road to the south of the proposed project is on existing street right-of-way, with the exception of an easement across private property between Plum Tree Lane and the Union Pacific Railroad right-of-way. The alignment of this easement lies within an existing private residential access road, where the impact of increased erosion due to trenching is considered to be less than significant. Impact analysis and acceptance of mitigation has been completed for the area through which the off-site sewer improvements would be constructed, through Caltrans' SR 193 improvement project (scheduled for 1999), and the Twelve Bridges Specific Plan EIR and Subsequent EIR (EIP Associates, 1993 and 1997). The analysis and mitigation in these documents are assumed to be adequate, and no further impact analysis for this part of the project is included in this impact section. The proposed alignment of an off-site sewer line from SR 193 to the City of Lincoln Wastewater Treatment Facility follows existing or proposed roadways, and the potential for increased erosion is considered to be less than significant.

■

IMPACT G-6:	Differential settlement of soils under proposed structures
SIGNIFICANCE:	Potentially Significant
MITIGATION	
Proposed:	Mitigation Measures G-A (Comply with Placer County ordinances for all grading, drainage and construction of improvements); G-B (Prepare and implement a grading and erosion control plan); and G-C (Comply with the conclusions of a site-specific geotechnical investigation)
Recommended:	None
RESIDUAL SIGNIFICANCE:	Less Than Significant

Differential settlement can occur in areas where shallow groundwater and/or poorly consolidated to unconsolidated soils exist. Differential settlement can also occur in areas where building pads have been constructed over areas with differential fill depths and/or where building pads have been prepared over the transition between a cut and a fill slope Settlement or collapse due to construction in the immediate vicinity of mine tunnels is a potentially significant impact. If construction activities encroach within 200 feet of a mine tunnel, a specific geotechnical evaluation shall be prepared. At locations more distant from tunnel openings settlement is unlikely due to the limited extent of the workings, the competence of the rock material within which the tunnels are constructed, and the steep topography in the vicinity of the tunnels which would place them at considerable depth. Following the recommendations of that specific geotechnical evaluation, along with careful grading plan design, grading implementation, and fill compaction, the effects of differential settlement would be reduced to a less than significant level.

■

IMPACT G-7:	Foundation instability
SIGNIFICANCE:	Potentially Significant
MITIGATION	
Proposed:	Mitigation Measure G-C (Comply with the conclusions of a site-specific geotechnical investigation)
Recommended:	None
RESIDUAL SIGNIFICANCE:	Less Than Significant

Foundation instability can result from landslides, unstable cut and fill slopes, collapsible and expansive soils, and long-term exposure to corrosive soils. This would be considered a potentially significant

impact. Specific geotechnical evaluation performed after final plans have been developed for the proposed project, and fill control and proper design of cut and/or fill slopes, would reduce the possibility of foundation instability to a level that is less than significant.

■

IMPACT G-8:	Slope instability
SIGNIFICANCE:	Potentially Significant
MITIGATION	
Proposed:	Mitigation Measures G-B (Prepare and submit a grading and erosion control plan); and G-C (Comply with the conclusions of a site-specific geotechnical investigation)
Recommended:	None
RESIDUAL SIGNIFICANCE:	Less Than Significant

Improper design of engineered slopes, resulting in over-steepening of slopes and/or removing the lateral support for slopes would create the potential for slope instability and landsliding. This would be considered a potentially significant impact. Specific geotechnical evaluation of engineered slopes within the project site would mitigate the impact to a level that is less than significant.

■

IMPACT G-9:	Limited effectiveness of septic tank leach fields due to soil conditions
SIGNIFICANCE:	Potentially Significant
MITIGATION	
Proposed:	Mitigation Measure H-J (Implement Placer County policies and ordinances related to permitting, design, construction and maintenance of septic systems);
Recommended:	None
RESIDUAL SIGNIFICANCE:	Less Than Significant

Approximately 18 large lots would be serviced by septic systems. Septic tank leach fields potentially may not function properly at some of these locations due to limiting soil conditions. Soil conditions should be evaluated individually for each location. Implementation of Placer County policies and ordinances relating to permitting, design, construction and maintenance of septic systems for each affected parcel within the project site would mitigate the potential impact to a level that is less than significant.

10.3.5 General Plan Consistency

The Placer County General Plan policies addressing soils, geology, and seismicity are identified below, and a determination of the proposed project's consistency is made. The proposed project is consistent with Placer County's soils, geology, and seismicity policies.

8.A.5 In landslide hazard areas, the County shall prohibit avoidable alteration of land in a manner that could increase the hazard, including construction of water through drainage, irrigation, or septic systems; removal of vegetative cover; and steepening of slopes and undercutting the bases of slopes.

Consistent.
The project Applicant will comply with the conclusions of a site-specific geotechnical

investigation and the provisions of the Placer County Grading Ordinance for all grading, drainage and improvements construction. A grading and erosion control plan will be prepared and implemented.

8.A.6 The County shall require the preparation of drainage plans for development in hillside areas that direct runoff and drainage away from unstable slopes.

Consistent.
Drainage plans will be prepared for the entire Specific Plan area.

8.A.11 The County shall limit development in areas of steep or unstable slopes to minimize hazards caused by landslides or liquefaction.

Consistent.
Site-specific geotechnical investigation and grading and erosion control plans will minimize hazards caused by landsliding. The proposed project is not in an area susceptible to liquefaction.

10.4 MITIGATION MEASURES

Mitigation Measure G-A: Comply with Placer County ordinances for all grading, drainage and construction of improvements

Mitigation Measure G-A applies to Impacts G-1, G-5, G-6, B-8, B-9, B-10, and B-13.

The Applicant proposes that all grading, drainage and construction of improvements will be in accordance with the Placer County Grading Ordinance, Chapter 29, Sections 29.1 through 29.10 of the Ordinance Code of Placer County. Specific sections applicable to this project include, but are not limited to:

- Sections 29.510 and 29.520 covering the content of preliminary and final grading plans to be submitted to the County for review and determination of grading permit requirements.
- Section 29.550 regarding implementation of erosion and sediment control plans to take into consideration time of year in terms of potential for rainfall and heavy storms.
- Sections 29.610, 29.615, 29.620, 29.625 and 29.630 regarding geotechnical, geologic and final reporting requirements.
- Section 29.780 regarding submission of erosion and sediment control plans for timely implementation of measures to prevent increased discharge of sediment during all stages of construction and effective revegetation to stabilize disturbed areas.

Plans required under this ordinance will be submitted to and approved by the County prior to commencement of construction activities. These measures would reduce the impacts of these activities to less than significant.

Mitigation Measure G-B: Prepare and implement a grading and erosion control plan

Mitigation Measure G-B applies to Impacts G-1, G-5, G-6, G-8, A-1, H-3, H-5, B-8, B-9, B-10, B-13, V-1, and V-2.

The Applicant proposes to prepare a Master Grading Plan as required by the County's Grading Ordinance (Chapter 29, Placer County Code) for Department of Public Works review and approval. The Master Grading Plans will show all proposed grading, drainage improvement, vegetation and tree removal. Revegetation of disturbed areas and vegetation maintenance will be provided for in the Master Grading Plan. The Master Grading Plan should include:

- General grading concepts, including reduction of impacts on sensitive habitat and open space, maintenance of natural character and aesthetic values, incorporation of existing drainageways and landforms, minimal disturbance of vegetation, including oak trees and soil stabilization.

- General guidelines for grading of hillside lots, including placement of retaining walls, consistency with geotechnical recommendations, consistency of lot drainage with the Master Drainage Plan and construction of unobtrusive interceptor ditches where necessary to reduce erosion potential.

- Specific grading guidelines for Meadows, Ridges and Heritage Ridge portions of the project.

- Guidelines for developing grading transitions, including terraces where necessary for stability and access to sloped areas.

An erosion control plan will be provided with the Master Grading Plan. The erosion control plan will contain Best Management Practices including:

- Timing of grading activities to minimize soil exposure during the wet season. By October, all areas that have been graded and that will remain undeveloped during the rainy season will be revegetated with compatible native vegetation and secured from the possibility of erosion.

Employment of measures during construction to prevent eroded soil from entering site drainageways, including: placement of hay bales or other acceptable materials such as sediment barriers, the installation of temporary earth berms and/or sediment traps, use of fabric silt fences, spreading hay or straw on exposed areas, development of temporary settling areas and use of other means for slowing runoff and reducing sediment loads.

Mitigation Measure G-C: Comply with the conclusions of a site-specific geotechnical investigation

Mitigation Measure G-C applies to Impacts G-2, G-5, G-6, G-7 and G-8.

The Applicant proposes that, prior to the commencement of any earthwork on the project site or study area infrastructure improvement corridor, a full-scale, detailed geotechnical investigation will be completed. A specific geotechnical evaluation performed after specific plans have been developed for the proposed project will include:

- Soil borings;
- Laboratory testing; and
- Grading and design recommendations.

The grading and design recommendations will, at a minimum, address the following issues:

- Fill control plan;
- Expansive soils;
- Differential settlement;
- Slope instability;

- Foundation instability;
- Stream bank protection;
- Evaluation of inactive mine sites and tunnels; and
- Other significant geological characteristics pertinent to proper development of the project site and off-site infrastructure improvement corridor.

The geotechnical investigation will consist of soil borings to collect samples and laboratory testing to determine the appropriate design parameters for use in determination of the structural fill, roadbed fill, and landscaping fill requirements, along with the fill placement requirements. The various soils will also be tested for corrosivity, to allow for proper foundation design.

Design of engineered fills will require that the geotechnical investigation assess the structural properties of each of the different soils types throughout the project site. Such an investigation will address specific areas of the project site to be developed in order to account for the various structures and roadways proposed for that particular area.

The geotechnical investigation will provide recommendations for monitoring of grading and fill placement and compaction testing to be performed to ensure proper placement of all fill types (structural, non-structural, and roadbed).

In addition to the measures mentioned above, soils will be tested for their shrink-swell potential. Soils with low strength and/or high shrink-swell potential will be controlled by over-excavation, or covering these soils with a sufficient amount of granular soils (as determined by the geotechnical investigation). Potentially expansive soils will only be placed in areas determined not to consist of structural fill.

In addition to evaluation for engineered fills, specific geotechnical evaluation of engineered slopes will also be included in the geotechnical evaluation. All proposed cut and/or fill slopes will be evaluated for proper design in order to reduce the hazard of over-steepening and/or removing of their lateral support, both of which could lead to slope instability, structural failure, and landsliding. If necessary, slopes will be designed with additional lateral support, such as buttressing, and fill slopes will be properly keyed into competent formational materials. Slopes (banks) along the creek channels will be designed with proper slope protection to prevent soil erosion and channel-bank undercutting.

The geotechnical evaluation will include specific recommendations for inactive mine sites where potential collapse of tunnels, shafts, or air shafts could effect the stability of improvements or otherwise create a safety hazard.

These measures would reduce the impacts for differential settlement, foundation instability, expansive soils, and slope instability to levels which are less than significant.

Mitigation Measure G-D: Implement appropriate trail design, construction and maintenance standards to minimize erosion

Mitigation Measure G-D applies to Impact G-5.

Wilderness trails will be constructed and maintained based on appropriate and standard trail construction guidelines, such as U.S. Forest Service Trail Handbook 2309.18 (USFS, 1991). Soil type and trail grade should be considered with reference to cross drain frequency, and grades should be minimized on highly erosive soil types. Since cross drains are maintenance intensive, particularly under equestrian use, trails should be designed to eliminate them where possible by rolling the grades, i.e., providing dips on graded sections to eliminate long sloped trail sections. Design, construction and maintenance of wilderness trails

based on standardized trail construction guidelines would reduce the potential impact of erosion to less than significant.

Other Mitigation Measures: Mitigation Measure A-A, Provide dust controls, is discussed in Chapter 8. Mitigation Measure H-J, Implement Placer County policies and ordinances related to permitting, design, construction, and maintenance of septic systems, is discussed in Chapter 12. Mitigation Measures V-B, Implement sensitive grading techniques to blend with natural setting, and V-C, minimize grading within Meadows and Ridges developments, are discussed in Chapter 15.