4.9 GEOLOGY, SOILS AND PALEONTOLOGY

This section describes the existing geologic and soil conditions at the project site and provides an analysis of the potential geologic hazards associated with development of the proposed project. In accordance with CEQA Guidelines Section 15125(a), the environmental baseline, as analyzed in this EIR, is the environmental setting as it existed at the time the Notice of Preparation was published, November 16, 2006. Therefore, the following discussion describes the site's geologic and soil conditions as they were on November 16, 2006. However, it should be noted that the Interstate 80/Sierra College Boulevard Interchange Improvement Project was initiated following release of the Notice of Preparation and extensive grading and excavation work has been initiated along the western and northern portions of the project site to accommodate the interchange project's lane construction and soil borrow requirements. These changes have altered the topographic character of the project site's northern and western boundaries.

4.9.1 EXISTING SETTING

GEOLOGY

Regional Geology

The City of Rocklin and the project site are located in the Great Valley geomorphic province of California. The Great Valley is an alluvial plain approximately 50 miles wide and 400 miles long that lies between the mountains and foothills of the Sierra Nevada to the east and the Coast Ranges to the west. Formation of the Great Valley Sequence began with marine sediments from the receding ocean and was followed more recently by river deposits (alluvial deposits) washing down from the Sierra Nevada, Klamath, Cascade, and Coast mountain ranges. As a result, the valley is underlain by an asymmetrical depression (formed by intersecting, downward sloping folds of bedrock) in which a set of rock formations composed of marine sandstone, shale or mudstone, and conglomerate have accumulated in a sequence of units (known as the Great Valley Sequence) for more than 100 million years.

Project Site Geology

The City of Rocklin is in the Loomis Basin, which is situated in the western foothills of the Sierra Nevada Range. The Sierra Nevada is a large fault block composed of granitic and metamorphic rocks tilted gently from the summit near Donner Lake to the west, where the block dips under sedimentary and alluvial units of the Sacramento Valley. Most of the surface of the Loomis Basin consists of granitic rocks. (City of Rocklin 2005.)

The project site is located within the U.S. Geological Survey (USGS) Rocklin 7.5-Minute Quadrangle. Site topography consists of gently sloping terrain. The project site has a local relief of 40 feet, and elevations range from approximately 320 to approximately 360 feet above mean sea level. The higher elevation areas occur on the northeast side of the property, and its surface overall slopes gently downward to the southwest (Wallace-Kuhl & Associates 2006). The California Geological Survey (formerly the California Department of Conservation, Division of Mines and Geology) Geologic Map of the Sacramento Quadrangle shows the project area to be underlain by Mesozoic granodiorite rocks, commonly referred to as the Rocklin and Penryn Plutons. The Rocklin and Penryn Plutons cover an area of approximately 150 square miles, extending from Folsom north to the Auburn area. These granitic rock units are a large-scale intrusive body that is part of a series of magmatic intrusions, which contributed in the formation of parts of the Sierra Nevada. The rock is typified as a light gray, coarse-grained igneous rock composed of minerals such as quartz, feldspar, hornblende, and biotite, and may contain xenoliths (an inclusion of pre-existing rock fragment within the magma) and quartz veins. This massive bedrock unit likely extends to depths of thousands of feet beneath the surface (Wallace-Kuhl & Associates 2006).

REGIONAL SEISMICITY AND FAULT ZONES

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

Surface Rupture

Surface rupture is an actual cracking or breaking of the ground along a fault during an earthquake. Structures built over an active fault can be torn apart if the ground ruptures. Surface rupture along faults is generally limited to a linear zone a few meters wide. The Alquist-Priolo Act (see the Regulatory Setting discussion below) was created to prohibit the location of structures designed for human occupancy across the traces of active faults, thereby reducing the loss of life and property from an earthquake. No Alquist-Priolo zones have been established in Placer County or adjacent to the project area (City of Rocklin 2005).

Seismic Ground Shaking

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

The foothills of the Sierra Nevada are characterized by relatively low risk of seismic activity. The principal fault zones nearest the project site are the Melones Fault Zone approximately 20 miles northeast and the Bear Mountain Fault Zone approximately 6.5 miles east, both of which are part of the Foothills Fault System. Data compiled between 1808 and 1987 show that only 15 earthquakes between a maximum moment magnitude (M) 3.0 and M 4.0 (on the Richter scale) were recorded along the Foothills Fault System between Mariposa and Oroville. The Richter scale is a logarithmic scale that expresses the magnitude of an earthquake in terms of the amount of energy generated, with 1.5 indicating the smallest earthquake that can be felt, 4.5 an earthquake causing slight damage, and 8.5 a very damaging earthquake. Four notable historical earthquakes have been reported in the northern Sierra Nevada. Three seem to have been associated with the northern portion of the Melones Fault Zone near Downieville approximately 55 miles to the northeast. The fourth was the M 5.7 Oroville earthquake of August 14, 1975, located about 50 miles north of the proposed project (City of Rocklin 2005).

Active Fault Zones in the Project Vicinity

Table 4.9-1 identifies active faults that may pose a potential geologic hazard to the project site. Active faults are those that show evidence of displacement during Holocene time (11,000 years ago to present). In addition, Table 4.9-1 identifies the approximate distance from the project site and the maximum moment magnitude.

The Modified Mercalli Scale, presented in Table 4.9-2, is a scale used to illustrate the effects of earthquake intensity. Table 4.9-3 shows the approximate relationships between earthquake magnitude (Richter scale) and intensity (Modified Mercalli Scale).

The California Geological Survey identifies low, medium, and high earthquake severity zones within California. Although the City of Rocklin lies in a low severity zone, the City could be subject to moderate to strong ground shaking from earthquake or fault zones located in the area near the boundary of the Sierra Nevada and the Sacramento Valley, and near the Coast Ranges and the San Francisco Bay Area (Table 4.9-1). The probable maximum intensity of an earthquake could be as high as VI to VII on the Modified Mercalli scale. Some structural damage could occur at that intensity.

Table 4.9-1 **Active Faults in the Project Vicinity**		
Fault	Approximate Distance (miles) from the Project Site	Maximum Moment Magnitude[1] (Richter Scale Magnitude)
Bear Mountain Fault	6.5	6.5
Melones Fault	20	6.5
Dunnigan Hills Fault	35	6.25 [2]
West Napa Fault	60	6.5
Concord-Green Valley Fault	60	6.9
Hayward Fault	85	7.1
Calaveras Fault	95	6.2 – 6.8
San Andreas Fault	105	7.8

Note:
1 The moment magnitude scale is used by seismologists to compare the energy released by earthquakes. Unlike other magnitude scales, it does not saturate at the upper end, meaning there is no particular value beyond which all earthquakes have about the same magnitude, which makes it a particularly valuable tool for assessing large earthquakes.
2 Wesnouski 1986
Sources: Probabilistic Seismic Hazard Assessment for the State of California (Petersen et al. 1996)

Table 4.9-2
Modified Mercalli Scale of Earthquake Intensity

Scale	Effects
I.	Not felt except by a very few under especially favorable conditions.
II.	Felt only by a few persons at rest, especially on upper floors of buildings.
III.	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV.	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V.	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI.	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII.	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII.	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX.	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X.	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
XI.	Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
XII.	Damage total. Lines of sight and level are distorted. Objects thrown into the air.

Source: U.S. Geological Survey 2005a

Table 4.9-3 Approximate Relationships between Earthquake Magnitude and Intensity		
Richter Scale Magnitude	Maximum Expected Intensity (Modified Mercalli Intensity Scale)	Distance Felt (Approx. Miles)
3.0 – 3.9	I – III	15
4.0 – 4.9	IV – V	30
5.0 – 5.9	VI – VIII	70
6.0 – 6.9	VII – VIII	125
7.0 – 7.9	IX – X	250
Source: OES 2005		

The California Geological Survey's Probabilistic Seismic Hazards Mapping Ground Motion Page (California Geological Survey 2005a) was consulted to estimate site-specific probabilistic ground acceleration for the project site. Peak horizontal ground acceleration (the level of ground shaking) with 10% probability of being exceeded in 50 years was calculated for firm rock, soft rock, and alluvium in percentage of gravity (g) (or percentage of the earth's normal gravitational strength). These calculations found that there is a 1-in-10 probability that an earthquake will occur within 50 years that would result in a peak horizontal ground acceleration exceeding 0.12g (California Geological Survey 2005a). By comparison, the California Geological Survey peak ground acceleration map for the state (California Geological Survey 2005b) shows corresponding peak horizontal ground acceleration in areas in the immediate vicinity of the San Andreas Fault to be approximately 0.8g, nearly seven times greater.

The California Building Standards Code specifies more stringent design guidelines where a project would be located adjacent to a Class "A" or "B" fault as designated by the California Probabilistic Seismic Hazard Maps. Faults with an "A" classification are capable of producing large-magnitude events (magnitude greater than 7.0), have a high rate of seismic activity (e.g., having slip rates greater than 5 millimeters per year), and have well constrained paleoseismic data (e.g., evidence of displacement within the last 700,000 years). Class "B" faults are those that lack paleoseismic data necessary to constrain the recurrence intervals of large-scale events. Faults with a "B" classification are capable of producing an event of magnitude 6.5 or greater. Based on these parameters, the Foothills Fault System would be considered a Class B fault (Wallace-Kuhl & Associates 2006).

Ground Failure/Liquefaction

Soil liquefaction occurs when ground shaking from an earthquake causes a sediment layer saturated with groundwater to lose strength and take on the characteristics of a fluid. Factors determining the liquefaction potential are soil type, the level and duration of seismic ground motions, the type and consistency of soils, and the depth to groundwater. Loose sands and peat deposits are susceptible to liquefaction, while clayey silts, silty clays, and clays deposited in freshwater environments are generally stable under the influence of seismic ground shaking.

Liquefaction poses a hazard to engineered structures. The loss of soil strength can result in bearing capacity insufficient to support foundation loads, increased lateral pressure on retaining or basement walls, and slope instability.

Based on soil borings taken by Wallace-Kuhl & Associates in 2005 and 2006, on-site soils consist of surface and near-surface silty fine sands within the upper two to three feet underlain by variably weathered granodioritic rock. In addition, regional groundwater levels are expected to be approximately 200 feet below existing site grades. Given the soil profile and regional groundwater table, the potential for liquefaction was determined to be low (Wallace-Kuhl & Associates 2006).

SUBSIDENCE AND EXPANSION

Land surface subsidence can be induced by both natural and human phenomena. Natural phenomena include: subsidence resulting from tectonic deformations and seismically induced settlements; soil subsidence from consolidation, hydrocompaction, or rapid sedimentation; subsidence from oxidation or dewatering of organic-rich soils; and subsidence related to subsurface cavities. Subsidence related to human activity includes subsurface fluid or sediment withdrawal. Pumping of water for residential, commercial, and agricultural uses from subsurface water tables causes more than 80 percent of the identified subsidence in the United States (Galloway et al. 1999). Lateral spreading is the horizontal movement or spreading of soil toward an open face, such as a streambank, the open side of fill embankments, or the sides of levees. The potential for failure from subsidence and lateral spreading is highest in areas where there is a high groundwater table, where there are relatively soft and recent alluvial deposits, and where creek banks are relatively high.

Expansive soils can shrink and swell with wetting and drying. Soils with high clay content tend to be the most affected. The shrink-swell potential of expansive soils can result in differential movement beneath foundations.

As discussed above, site soils consist of surface and near-surface silty fine sands within the upper two to three feet underlain by variably weathered granodioritic rock. These soils are considered to possess low subsidence and expansion potential (Wallace-Kuhl & Associates 2006).

SLOPE STABILITY

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

Surface and near-surface soils were determined to possess a low expansion potential. Based on the site’s relatively gently sloping topography and silty fine sand soils underlain by granodioritic rock, Wallace-Kuhl & Associates found no further investigation was required to evaluate seismically induced settlement or slope instability/failure.

SOILS

Subsurface test borings at the project site indicated the surface and near-surface residual soils consist of dark brown and brown, silty fine sands within the upper two or three feet, underlain by variably weathered granodioritic rock to the maximum depth explored of 18 feet below existing surface grade. Perched water was encountered in several borings initially at depths ranging from 3 to 14 feet below existing grades. Perched water levels were observed to rise up to 4.5 feet above initial measurements. The test borings were allowed to remain open for at least 24 hours to allow seepage water levels to reach static equilibrium at depths ranging from 1.5 to 12 feet below existing grades. The perched water was determined to be a result of the relatively impervious granodiorite rock below the surface soil, which prohibits the vertical percolation and traps surface water within the upper soils. The presence of perched water tables can require the implementation of dewatering activities (i.e., pumping) during construction if the water is exposed during site excavation.

Review of the 1980 U.S. Department of Agriculture Soil Conservation Service (SCS) *Soil Survey of Placer County, California, Western Part, Sheet No. 14 (Rocklin Quadrangle)* (1980) indicates two soil types cross the project site:

- **Andregg coarse sandy loam, 2-9% slopes.** This soil occurs at elevations of 200 to 1,000 feet above sea level. It is moderately deep, gently rolling, and well drained. Andregg coarse sandy loam typically consists of grayish brown to very pale brown coarse sandy loam to a depth of 2.5 feet underlain by weathered granitic bedrock. Permeability is moderately rapid and surface runoff is medium with a moderate erosion hazard.

- **Xerothents.** This soil typically consists of mechanically removed and mixed soil material in which horizons are no longer discernable. Most of this material is within the Interstate 80 right-of-way.

These soils are shown on Exhibit 4.9-1. These soil types were found to be generally consistent with the subsurface soil conditions identified during test borings.

PALEONTOLOGY

Fossil remains of prehistoric plant and animal life could be found in the sedimentary rocks and volcanic rock sedimentary materials that are present throughout Placer County. Sediments associated with the Mehrten Formation in the Roseville area have been found to contain fossils of terrestrial vertebrates. Fossilized animal remains also may be present in caves associated with the limestone geology that can be found in the central part of the Sierra Nevada foothills. No inventory or other information source exists that characterizes the extent, sensitivity, or significance of paleontological resources in Placer County.

The proposed project site is located in the Rocklin and Penryn Pluton, which consists of Mesozoic-age (approximately 206 million to 70 million years ago) rocks (Wagner et al. 1987). Plutonic rocks crystallized at great depths beneath the earth's surface from many different batches of magma. At the project site, the plutonic rocks are composed of diorite. Because of the geologic processes involved as these rocks were formed (high temperature and pressure at great depth), they do not contain fossils. Based on the lack of fossils within the rocks on the project site, there is no potential for fossils to be discovered during site excavations and this subject will not be discussed further in this document.

MINERAL RESOURCES

Mineral extraction in the City of Rocklin includes granite and gravel operations. The granite found in Rocklin is optimal because it is even-textured, very hard, available in large blocks and takes a high polish. One commercial business, Big Gun Quarry, extracts granite from Rocklin at this time (City of Rocklin 2005).

The project site is not located within or near any active mining operation. The California Geological Survey has designated Mineral Resource Zones (MRZ) in portions of the State that are considered to have potentially significant mineral deposits. The project site is not within a State-designated MRZ.

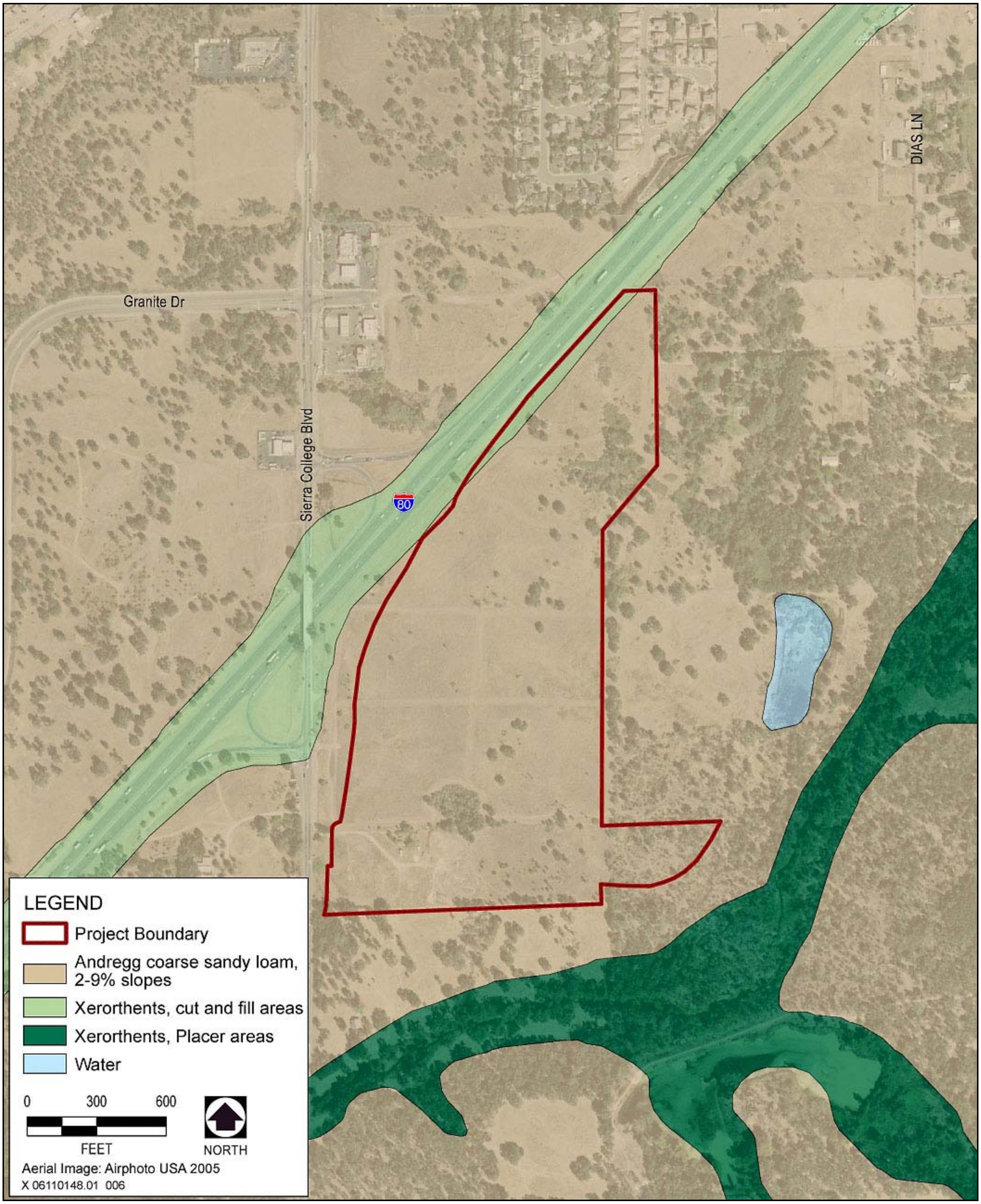
4.9.2 REGULATORY SETTING

FEDERAL

Earthquake Hazards Reduction Act

In October 1977, the U.S. Congress passed the Earthquake Hazards Reduction Act to reduce the risks to life and property from future earthquakes in the United States. To accomplish this, the act established the National Earthquake Hazards Reduction Program (NEHRP). This program was significantly amended in November 1990 by the NEHRPA by refining the description of agency responsibilities, program goals, and objectives.

The mission of NEHRP includes improved understanding, characterization, and prediction of hazards and vulnerabilities; improved building codes and land use practices; risk reduction through post-earthquake investigations and education; development and improvement of design and construction techniques; improved



Soils Types **Exhibit 4.9-1**

mitigation capacity; and, accelerated application of research results. The NEHRPA designates the Federal Emergency Management Agency (FEMA) as the lead agency of the program and assigns several planning, coordinating, and reporting responsibilities. Other NEHRPA agencies include the National Institute of Standards and Technology, National Science Foundation, and USGS.

STATE

Alquist-Priolo Earthquake Fault Zoning Act

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

Seismic Hazards Mapping Act

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

National Pollutant Discharge Elimination System Permit

In California, the State Water Resources Control Board (SWRCB) administers regulations promulgated by the U.S. Environmental Protection Agency (55 Code of Federal Regulations [CFR] 47990) requiring the permitting of stormwater-generated pollution under the National Pollutant Discharge Elimination System (NPDES). In turn, the SWRCB’s jurisdiction is administered through nine regional water quality control boards. Under these federal regulations, an operator must obtain a General Permit through the NPDES Stormwater Program for all construction activities with ground disturbance of one acre or more. The General Permit requires the implementation of best management practices (BMPs) to reduce sedimentation into surface waters and control erosion. One element of compliance with the NPDES permit is preparation of a Storm Water Pollution Prevention Plan (SWPPP) that addresses control of water pollution, including sediment, in runoff during construction. (See Section 4.10, Hydrology and Water Quality, for more information about the NPDES and SWPPPs.)

California Building Standards Code

The State of California provides minimum standard for building design through the California Building Standards Code (California Code of Regulations, Title 24). Where no other building codes apply, Chapter 29 regulates excavation, foundations, and retaining walls. The California Building Standards Code (CBC) applies to building design and construction in the state and is based on the federal Uniform Building Code (UBC) used widely throughout the country (generally adopted on a state-by-state or district-by-district basis). The CBC has been modified for California conditions with more detailed and/or more stringent regulations.

The State earthquake protection law (California Health and Safety Code Section 19100 et seq.) requires that structures be designed to resist stresses produced by lateral forces caused by wind and earthquakes. Specific minimum seismic safety and structural design requirements are set forth in Chapter 16 of the CBC. The CBC identifies seismic factors that must be considered in structural design.

Chapter 18 of the CBC regulates the excavation of foundations and retaining walls, and Appendix Chapter A33 regulates grading activities, including drainage and erosion control and construction on unstable soils, such as expansive soils and areas subject to liquefaction.

LOCAL

City of Rocklin General Plan

The following goal and policies from the Community Safety Element of the City General Plan (1991) are applicable to the proposed project:

Goal: To minimize the danger of natural and man-made hazards and to protect residents and visitors from the dangers of earthquake, fire, flood, and other natural disasters, and manmade dangers.

- **Policy 1:** To require engineering analysis of new development proposals in areas with possible soil instability, flooding, earthquake faults, or other hazards, and to prohibit development in high danger areas.

- **Policy 11:** To limit development in areas with severe slopes.

Rocklin Municipal Code Title 15, Buildings and Construction

Chapter 15.28, Grading and Erosion and Sedimentation Control, of the Rocklin Municipal Code regulates grading on all property within the City of Rocklin to safeguard life, limb, health, property and public welfare; to avoid pollution of watercourses with nutrients, sediments, or other earthen materials generated or caused by surface runoff on or across the permit area; to comply with the City's National Pollution Discharge Elimination System permit issued by the California Regional Water Quality Control Board; and, to ensure that the intended use of a graded site is consistent with the City of Rocklin General Plan, provisions of the California Building Standards Code as adopted by the City relating to grading activities, City of Rocklin improvement standards, any applicable specific plans or other land use entitlements.

In addition, this chapter establishes rules and regulations to control grading and erosion control activities, including fills and embankments; establishes the administrative procedure for issuance of permits; and, provides for approval of plans and inspection of grading construction and erosion control plans for all graded sites.

4.9.3 IMPACTS AND MITIGATION MEASURES

METHOD OF ANALYSIS

Evaluation of potential geologic and soil impacts was based on a review of documents pertaining to the project site, including the City General Plan, the U.S. Department of Agriculture SCS *Soil Survey of Placer County, California, Western Part, Sheet No. 14 (Rocklin Quadrangle)* geologic maps (1980); the geotechnical investigation performed by Wallace-Kuhl & Associates (2006); and published and unpublished geologic literature. The information obtained from these sources was reviewed and summarized to establish existing conditions and to identify potential environmental effects, based on the standards of significance presented in this section. In determining the level of significance, the analysis assumes that the proposed project would comply with relevant federal, State, and local ordinances and regulations, as well as the City General Plan policies presented in this section.

THRESHOLDS OF SIGNIFICANCE

An impact is considered significant, as defined by the State CEQA Guidelines (Appendix G), if the proposed project would:

- expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
  - the rupture of a known earthquake fault as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known active fault;
  - strong seismic ground shaking;
  - seismic-related ground failure, including liquefaction; or
  - landslides;
- result in substantial soil erosion or the loss of topsoil;
- be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on or off-site landsliding, lateral spreading, subsidence, liquefaction, or collapse;
- be located on expansive soil, as defined in Table 18-1-B of the UBC, creating substantial risks to life or property; or
- cause the disturbance or destruction of a unique paleontological resource or site or unique geologic feature.

IMPACTS AND MITIGATION MEASURES

IMPACT 4.9-1 **Risks to People and Structures from Seismic Hazards.** *The project site is not located within an earthquake fault zone as designated by the Alquist-Priolo Earthquake Fault Zone Act and no known faults are located on the project site. Based on the site topography, soil profiles, and the groundwater table, the potential for soil expansion, slope instability/failure, and liquefaction was determined to be low. However, ground shaking, as a result of seismic activity from nearby or distant earthquake faults, could cause seismic-related ground failure. Thus, development of the project site for commercial uses has the potential to expose people to adverse effects from seismic hazards, including strong seismic ground shaking. This impact would be* ***significant****.*

The project site is not located within an earthquake fault zone as designated by the Alquist-Priolo Earthquake Fault Zone Act (City of Rocklin 2005). The principal fault zones nearest the project site are the Melones Fault Zone and the Bear Mountain Fault Zone, both of which are part of the Foothills Fault System. Both faults are estimated to have a maximum credible earthquake of 6.25 on the Richter scale. The term “maximum credible earthquake” is defined as the largest earthquake that is likely to be generated along an active fault zone. Because no known faults are located on the project site, the potential for surface rupture (cracking or breaking of the ground during an earthquake) would be less than significant.

Based on soil borings taken by Wallace-Kuhl & Associates in 2005 and 2006, site soils consist of surface and near-surface silty fine sands within the upper two to three feet underlain by variably weathered granodioritic rock. These soils are generally considered to possess low expansion potential. Based on the site topography and soil profiles, Wallace-Kuhl & Associates found no further investigation was required to evaluate seismically induced settlement or slope instability/failure. In addition, regional groundwater levels are expected to be approximately

200 feet below existing site grades. Given the soil profile and regional groundwater table, the potential for liquefaction was determined to be low.

The project site is classified as being within Seismic Zone 3 in the 1997 edition of the UBC; as such, the level of anticipated ground shaking is lower than in many areas within the state of California. The California Geological Survey's Probabilistic Seismic Hazards Mapping Ground Motion Page (California Geological Survey 2005a) was consulted to estimate site-specific probabilistic ground acceleration for the project site. The calculations found that there is a 1-in-10 probability that alluvium on the project site will have a peak horizontal ground acceleration (level of ground shaking) exceeding 0.012g within 50 years (California Geological Survey 2005a).

The California Building Standards Code specifies more stringent design guidelines where a project would be located adjacent to a Class "A" or "B" fault as designated by the California Probabilistic Seismic Hazard Maps. The Foothills Fault System would be considered a Class B fault.

As required by current City of Rocklin construction standards as well as standard engineering practices, project facilities would be designed in accordance with seismic standards of the UBC for structures located within Seismic Zone 3. These construction standards would minimize the effects of seismic ground shaking on developed structures. However, strong ground shaking may still occur at the site as a result of large, distant earthquakes. The California Geological Survey indicates that the project area is located in a low severity zone. The probable maximum intensity of an earthquake could be as high as VI to VII on the Modified Mercalli scale. Earthquakes in this range could cause general alarm and moderate damage. Thus, development of the project site has the potential to expose people to substantial adverse effects from seismic hazards, including strong seismic ground shaking. This impact would be **significant**.

Mitigation Measure 4.9-1 Risks to People and Structures from Seismic Hazards

a. Before issuance of a grading permit, the project design plans and specifications, including grading and foundation plans, shall be reviewed by a licensed geotechnical engineer, to ensure that the recommendations in the geotechnical report have been appropriately integrated and comply with Rocklin Municipal Code Chapter 15.28, Grading and Erosion and Sedimentation Control. This review shall also assess the extent to which the recommendations in the geotechnical report are appropriate and sufficient for construction of the buildings described in the final project design plans.

b. During project design and construction, all recommendations outlined in the geotechnical report for the project (Wallace Kuhl & Associates 2006) shall be implemented, at the direction of the City engineer, to prevent significant impacts associated with seismic activity. These recommendations specifically identify actions to be taken related to: site clearing, site preparation and engineered fill construction, final subgrade preparation, trench backfilling, foundation design, interior floor slab support and moisture penetration resistance, exterior flatwork, retaining wall design, light pole and entry sign foundations, erosion and slope winterization, surface drainage, pavement design, and geotechnical engineering observation and testing during earthwork. As identified in these recommendations, a geotechnical engineer shall be present on-site during appropriate earthmoving and construction activities to ensure that requirements outlined in the geotechnical report are adhered to for proper fill and compaction of soils.

c. Should the construction schedule require continued work during the wet weather months (e.g., October through April), the project applicant shall consult with a licensed civil engineer and implement any additional recommendations provided, as conditions warrant. These recommendations would include but not be limited to (1) implementing aeration, to allow site soils to reach a proper moisture content to attain the specified degree of compaction to be achieved; and (2) implementing aeration or lime treatment, to allow any low-permeability surface clay soils intended for use as engineered fill to reach a moisture content that would permit the specified degree of compaction to be achieved (Wallace Kuhl & Associates 2006).

Level of Significance After Mitigation

Implementation of the identified mitigation measures would reduce potentially significant impacts under the proposed project associated with seismic hazards to a less-than-significant level.

IMPACT 4.9-2 — Construction-Related Erosion Hazards. *Excavation and grading of soil could result in localized erosion during project construction. This would be a* ***significant*** *impact.*

Project construction activities would involve excavation and grading of soil and would remove all vegetative cover on-site thereby exposing on-site soils to wind and water erosion. The erosion potential of the soils on the site is considered moderate. Although excavation activities, grading, and construction would be conducted according to standard construction practices and building codes, construction activities associated with project site development have the potential to create substantial localized erosion during wind and rain events. Therefore, this impact would be considered **significant**.

Mitigation Measure 4.9-2 Construction-Related Erosion Hazards

a. A grading and erosion control plan shall be prepared by a California Registered Civil Engineer retained by the applicant(s) and submitted to the City of Rocklin for approval prior to issuance of grading permits. The plan shall comply with the City of Rocklin Grading and Erosion and Sedimentation Control (Municipal Code Title 15, Chapter 15.28), the erosion control recommendations in the project's geotechnical report (Wallace Kuhl & Associates 2006), and the California Building Standards Code grading requirements. The plan shall include the site-specific grading proposed for the new development. All grading shall be balanced on the site, where feasible.

b. To ensure grading activities do not directly or indirectly discharge sediments into surface waters as a result of construction activities, the project applicant shall develop a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP shall identify Best Management Practices that would be used to protect stormwater runoff and minimize erosion during construction.

Level of Significance After Mitigation

Implementation of these mitigation measures would reduce significant impacts associated with construction-related erosion hazards to a less-than-significant level.