Section 3.1

Geology, Soils, and Seismicity

Introduction

This section analyzes the proposed program's potential effects related to geology, geologic hazards, including earthquake and landslide hazards. It also discusses the proposed program's potential effects on soil resources and hazardous materials. Related discussions regarding water quality are found in Section 3.2, *Hydrology and Water Quality*.

Methodology

Key sources of data used in the preparation of this section include the following.

- Regional geologic maps and fault maps prepared by the California Department of Conservation's California Geological Survey (formerly the Division of Mines and Geology) and U.S. Geological Survey (USGS).
- Soils information from the Soil Survey of Monterey County (Soil Conservation Service 1978) and the Natural Resource Conservation Service's *Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin* (Natural Resource Conservation Service 2006).
- *Uniform Building Code* (1997) and *Maps of Known Active Fault Near-Source Zones in California and Adjacent Portions of Nevada* (1998) from International Conference of Building Officials.
- California Geological Survey Special Publication 42: *Fault-Rupture Hazard Zones in California—Alquist-Priolo Earthquake Fault Zoning Act with Index to Earthquake Fault Zones Maps*.
- Preliminary geotechnical exploration for the proposed Rancho Canada Village development (ENGEO Incorporated 2004).
- Draft Environmental Impact Report for Carmel Valley Road Improvement Plan, Monterey County (1990).
- Monterey County Municipal Code (December 2005).

- General Plan for Monterey County, Greater Monterey Peninsula Area Plan, and Carmel Valley Master Plan.

Specific reference information is provided in the text. No additional fieldwork was performed for this program EIR.

Environmental Setting

The following sections describe the physiographic setting, geomorphology, and geology of the proposed program area, with an emphasis on Quaternary geology and geologic hazards.

Physiography

The proposed program area is located in the Carmel Valley, a broad alluvial low that drains westward via the Carmel River into the Pacific Ocean. The program area lies within the Coast Ranges Geomorphic Province. This province extends from the northern California border with Oregon south to the Transverse Ranges, and from the western continental borderland inland to the Great Valley (Norris and Webb 1990). The Coast Ranges are a discontinuous complex of mountain ranges and valleys, characterized by a series of northwest trending mountains and valleys (Norris and Webb 1990). The ranges and valleys lie subparallel to the San Andreas fault, which is to the east of the program area, extending more than 600 miles from Pt. Arena to the Gulf of California (California Geological Survey 2002). The peaks range from 2,000 to 4,000 elevation above sea level, with some peaks as high as 6,000 feet above sea level. The relief can be large; Cone Peak (near the program area) is 5,155 feet (1,572 meters) high but lies only 4 miles (6.5 kilometers) from the coast (Harden 1998, Norris and Webb 1990).

Slopes in the program area range from flat on the valley floor to steep on surrounding hillsides. North of Carmel Valley Road, slopes are steep with a gradient of 30% or more. South of Carmel Valley Road, slopes are less steep, 0–20% (Monterey County 1990).

Geologic Framework

The following paragraphs describe the geology of the proposed program area and vicinity, focusing on the Coast Ranges and the San Andreas fault/plate boundary system. Regional geomorphic features within the Carmel and Monterey areas are largely related to complex tectonics of the San Andreas fault zone.

The Coast Ranges geomorphic province (geographic extent described above in *Physiography*) is characterized by en echelon northwest-trending mountain ranges formed over the past 10 million years or less by active uplift related to

complex tectonics of the San Andreas fault/plate boundary system (e.g., Norris and Webb 1990, Buising and Walker 1995, Atwater and Stock 1998).

The Coast Range province is geologically complex and is characterized by extensive folding and faulting. The eastern rangefront along the Great Valley margin is defined by faults that have been interpreted as contractile features associated with shortening along an axis approximately normal to the rangefront (e.g., Wong et al. 1988, Sowers et al. 1992, Unruh et al. 1992; see also Jennings 1977 for regional mapping), but may also locally accommodate a right-lateral component of motion (e.g., Richesin 1996). The eastern border is characterized by strike-ridges and valleys in resistant Mesozoic units (California Geological Survey 2002). The western border of the Coast Ranges includes the Pacific coast. The coastline is uplifted, terraced, and wave-cut (California Geological Survey 2002).

Two primary basement terranes underlie the Coast Ranges: mélange of the Franciscan Complex and crystalline rocks of the Salinian Block. The Franciscan Complex lies to the east of the San Andreas fault on the North American tectonic plate. The Salinian Block is west of the San Andreas on the Pacific plate. The proposed program area is located on the Salinian Block.

The Salinian Block extends from the southern extremity of the Coast Ranges to the north of the Farallon Islands. It consists of Cretaceous granitoid basement—granodiorite, quartz monzonite, quartz diorite, and other plutonic units, along with associated contact metamorphic units—overlain by sedimentary rock and alluvial deposits (Norris and Webb 1990). The sedimentary units consist of a thick layer of Cretaceous and Tertiary sedimentary rocks, which are in turn overlain by late Pleistocene and/or Holocene alluvial deposits of poorly consolidated clay, silt, sand, and gravel (California Geological Survey 2002, ENGEO 2004). In the program area, the Carmel River Valley fill is made up of alluvium, and the surrounding mountains are principally of middle Miocene marine and non-marine sedimentary rock overlying and faulted against granitic rock (Jennings and Strand 1958).

Soils

Over 25 soil associations have been identified in the program area (Monterey County 1986). They have been mapped by the U.S. Department of Agriculture's Natural Resources Conservation Service (formerly the Soil Conservation Service), and are described in detail in the soil surveys for Monterey County. Additional information is available through the National Soil Survey Geographic (SSURGO) Database and State Soil Geographic (STATSGO) database (Natural Resources Conservation Service 2004b, Natural Resources Conservation Service 2004c).

Table 3.1-1 lists the soils found in the program area and rates their speed of runoff, erosion hazard, shrink-swell potential, and risk of corrosion.

Table 3.1-1. Characteristics of Soils in Carmel Valley

Soil Label	Description	Notes	Speed of Runoff	Erosion Hazard	Shrink-Swell Potential	Risk of Corrosion Uncoated Steel	Risk of Corrosion Concrete
AsB	Arroyo Seco gravelly sandy loam, 2 to 5 percent slopes.	This is a gently sloping soil on alluvial fans and plains. The available water capacity is 4 to 6 inches and is reduced by the coarse fragments in the soil.	slow	slight	low	moderate	low
Am	Arnold-San Andreas complex, 50 to 75 percent slopes.	This soil complex is on hills and escarpments. The soils have little vegetation and are eroded in places.	rapid to very rapid	high	low	moderate	moderate
AvB	Arroyo Seco sandy loam, 2 to 5 percent slopes.	This soil is gently sloping on alluvial fans. The surface layer contains approximately 20% angular gravel 2 to 5 millimeters in diameter. The substratum is sand or sandy loam.	slow	slight	low	moderate	low
CbB	Chualar loam, 2 to 5 percent slopes.	This is a gently sloping soil of fans and terraces.	slow	slight	low	low	low
CcG	Cieneba fine gravelly sandy loam, 30 to 75 percent slopes.	This is a steep and very steep soil on mountainsides that have mainly southern exposures. The elevation is 1,000 to 4,000 feet.	very rapid	very high	low	low	low
EbC	Elder very fine sandy loam, 2 to 9 percent slopes.	This is a gently sloping and moderately sloping, slightly hummocky soil that occupies small areas in narrow valleys. It formed on alluvial fans, terraces, and flood plains. Permeability is moderate. The available water capacity is about 6 to 11 inches.	slow	moderate	low	moderate	moderate
Ga	Gamboa-Sur complex, 50 to 100 percent slopes..	The Gamboa series consists of somewhat excessively drained soils on uplands. Available water capacity is 2 to 4 inches.	very rapid	very high	low	moderate	moderate

Table 3.1-1. Continued

Soil Label	Description	Notes	Speed of Runoff	Erosion Hazard	Shrink-Swell Potential	Risk of Corrosion Uncoated Steel	Risk of Corrosion Concrete
GkB	Gorgonio sandy loam, 0 to 5 percent slopes.	This is a level to gently sloping soil on valley floors.	slow	slight	low	moderate	moderate
JbG	Junipero sandy loam, 30 to 75 percent slopes.	This is a steep and very steep soil on mountains. Elevations are 200 to 5,000 feet.	rapid	high	low	high	high
Jc	Junipero-Sur complex, 50 to 85 percent slopes..	The is a very steep and extremely steep soil.	very rapid	very high	low	high	high
LeC	Lockwood loam, 2 to 9 percent slopes.	This is a gently sloping to moderately sloping soil on alluvial fans and terraces. The available water capacity is 8 to 10 inches.	medium	moderate	moderate	high	low
Pf	Pico fine sandy loam.	This is a nearly level soil on floodplains. If left exposed during periods of high winds, the soil is subject to some soil blowing.	slow	slight	low	high	low
PnC	Placentia sandy loam, 2 to 9 percent slopes.	This is a gently sloping and moderately sloping soil on old alluvial fans and terraces. The available water capacity is 2 to 5 inches.	slow or medium	slight or moderate	low	moderate	low
Pm	Pits and dumps.	Areas where soil and underlying rock have been removed, and where waste accumulates; examples are quarries and sand and gravel pits.	variable	high	no estimate	no estimate	no estimate
Ps	Pavements and fluvents, frequently flooded.	This mapping unit consists of undulating areas of stratified sandy, gravelly, and cobbly sediments on floodplains. These areas are subject to annual flooding, scouring, and deposition. Drainage is excessive, and permeability is very rapid.	slow or very slow	moderate	low	moderate	low
Rc	Rock outcrop-Xerorthents association.	This mapping unit consists of rock outcrop and very shallow soils on strongly sloping to extremely steep mountains. The content of gravel, cobblestones, and stones; and of silt and debris varies considerably.	rapid	very high	no estimate	no estimate	no estimate

Table 3.1-1. Continued

Soil Label	Description	Notes	Speed of Runoff	Erosion Hazard	Shrink-Swell Potential	Risk of Corrosion Uncoated Steel	Risk of Corrosion Concrete
ScE	San Andreas fine sandy loam, 15 to 30 percent slopes.	This is a moderately steep soil on lower hillsides. The available water capacity is 3.5 to 6.5 inches.	rapid	moderate	low	moderate	moderate
ScG	San Andreas fine sandy loam, 30 to 75 percent slopes.	This is a steep and very steep soil on low hills. The available water capacity is 2 to 6.5 inches.	rapid or very rapid	high	low	moderate	moderate
SfD	Santa Lucia shaly clay loam, 2 to 15 percent slopes.	This is an undulating to rolling soil on ridgetops and foot slopes or in narrow valleys. The available water capacity is 2 to 5.5 inches.	medium	moderate	low	high	high
SfE	Santa Lucia shaly clay loam, 15 to 30 percent slopes	This is a moderately steep soil on uplands. The available water capacity is 2 to 5.5 inches.	medium	moderate	low	high	high
SfF	Santa Lucia shaly clay loam, 30 to 50 percent slopes.	This is a steep soil on uplands. The available water capacity is 2 to 5.5 inches.	rapid	high	low	high	high
Sg	Santa Lucia-Reliz association, 30 to 75 percent slopes.	The steep and very steep soils in this association are on uplands. The available water capacity is 2 to 5.5 inches.	rapid or very rapid	very high	low	high	high
ShE	Santa Ynez fine sandy loam, 5 to 15 percent slopes, eroded.	This is a gently rolling to rolling soil on low hills and terraces. The available water capacity is 2.5 to 3.5 inches.	medium	moderate	low	moderate	low

Table 3.1-1. Continued

Soil Label	Description	Notes	Speed of Runoff	Erosion Hazard	Shrink-Swell Potential	Risk of Corrosion Uncoated Steel	Risk of Corrosion Concrete
SnD	Shedd silty clay loam, 15 to 30 percent slopes.	This is a rolling soil on hilltops and ridgetops. The available water capacity is 5.5 to 8.5 inches. The surface layer seals over and becomes puddle very easily.	medium	moderate	moderate	high	low
SpD	Snelling-Greenfield complex, 5 to 15 percent slopes.	The gently rolling to rolling soils in this complex are on fans and wind-modified terraces.	medium	moderate	low	low	low
TbB	Tujunga fine sand, 0 to 5 percent slopes.	This is a level and undulating soil on flood plains and alluvial fans, mainly in small, narrow areas along drainageways.	slow	slight (but some channel erosion occurs)	low	low	low
VaG	Vista coarse sandy loam, 30 to 70 percent slopes.	This is a steep to very steep soil on ridges, characterized by cobbles, stones, and rock outcrops at the surface. The water capacity is 2 to 5 iches.	rapid	high	low	moderate	moderate
Xc	Xerorthents, loamy, 9 to 50 percent slopes.	These well drained, moderately steep and steep soils are on bluffs and banks along major rivers, on escarpments of terraces, on fans or alluvial plains, and along drainageways. Slopes are commonly 15 to 50 percent, but are 9 percent along narrow escarpments that have only a few feet of relief. Permeability is moderately slow. The available water capacity is 6 to 9 inches.	variable	variable	moderate	high	
Xd	Xerorthents, dissected, 35 to 90 percent slopes..	These are steep to extremely steep soils on bluffs along major rivers, on steep escarpments of fans and terraces, and on the banks of deeply entrenched streams and gullies that have narrow bottoms. Slopes are typically 50 to 65 percent, but range from 35 to 90 percent.	rapid or very rapid	high or very high	no estimate	no estimate	

Source: *Soil Survey of Monterey County*, United States Department of Agriculture Soil Conservation Service, 1978.

Geologic Hazards

Primary Seismic Hazards—Surface Fault Rupture and Groundshaking

Surface Fault Rupture

The program area is not within any Earthquake Fault Zone designated by the State of California under the Alquist-Priolo Earthquake Fault Zoning Act (California Division of Mines and Geology 2000) (see discussion below under *State Regulations and Policies*). The risk of surface fault rupture in the program area is thus considered minimal.

Groundshaking

Earthquakes on any of the region's principal active faults could cause groundshaking during the lifespan of the proposed program. The Uniform Building Code (UBC) defines active faults as faults "that have evidence of Holocene displacement (last 11,000 years), are exposed at the ground surface, [and] have reported slip rates greater than about 0.1 mm per year" (International Conference of Building Officials 1998). The state of California defines an active fault as a fault "that has had surface displacement during Holocene time (last 11,000 years)" (Hart and Bryant 1997). The intensity of ground shaking at any given location is a function of earthquake magnitude, distance from the earthquake epicenter, and the nature of the substrate.

Numerous active faults have been mapped in the vicinity of the program area. Note that many faults that have not yet been classified as "active" by the Alquist-Priolo Act are considered active by geologists because of the lengthy process for adding new faults to the list of active faults (Monterey County 1984). The UBC has identified the following faults[1] near the program area as type "B" faults, or faults which have an intermediate but substantial maximum moment magnitude and slip rate (International Conference of Building Officials 1998, California Geological Survey 1998, ENGEO Incorporated 2004, International Conference of Building Officials 1998, Monterey County 1990).[2]

- Monterey Bay–Tularcitos fault, which runs through Carmel Valley.
- Rinconada fault, around 6 miles (10 kilometers) north of Carmel Valley.
- San Gregorio fault (Sur region)[3], approximately 10 miles (16 kilometers) south of Carmel Valley.

[1] Faults classified by the UBC are considered in assessments of near-source factors for development sites because of their potential to generate groundshaking affecting the program area.
[2] UBC Type A faults are those which are "capable of producing large magnitude events and that have a high rate of seismic activity," and "C" faults are those which are "not capable of producing large magnitude events and that have a relatively low rate of seismic activity" (International Conference of Building Officials 1997). Type B faults are all faults other than type A or C faults.
[3] The segment of the San Gregorio fault that is present near Carmel Valley is a type B fault. Farther north, the San Gregorio fault is a type A fault.

The San Andreas fault should also be considered in assessing the potential for groundshaking effects (California Geological Survey 1998, ENGEO Incorporated 2004, Monterey County 1990). An earthquake of moderate magnitude or greater on other, more distant faults in the San Francisco Bay region could also cause groundshaking (ENGEO Incorporated 2004).

Figure 3.1-1 shows the location of the faults in the region that could affect Carmel Valley (Monterey County 1984), and Table 3.1-2 summarizes current information on earthquake recurrence intervals and maximum credible earthquakes for this area.

Table 3.1-2. Maximum Credible Earthquake and Recurrence Interval for Principal Active Faults in the Program Area

Fault	Magnitude of Maximum Credible Earthquake	Approximate Recurrence Interval
Program area faults		
Monterey Bay–Tularcitos	7.1[a]	2,600 years[a]
Rinconada	6.5–7.0[b]	N/A
San Gregorio (Sur region)	6.7[e]	N/A
Regional faults		
San Andreas	7.0–7.9[c]	210–400[c]
San Gregorio	7.0[c]	1,500 years[e]
Hayward	Entire fault: 7.1[c] Southern segment: 6.5[c]–6.9[e]	Entire fault: 330 years[c] Southern segment: 161[e]–167[d] years
Calaveras (southern)	6.2[c]	75 years[e]
Greenville	6.9[c]	Southern segment: 623 years[e] Northern segment: 644 years[e]

Note: See Figure 3.1 for fault locations.

Sources: [a] Santa Clara Valley Transportation Authority 2004, [b] City of El Paso de Robles 2003, [c] International Conference of Building Officials 1997, [d] Anderson et al. 1982, [e] U.S. Geological Survey Working Group on California Earthquake Probabilities 2003.

Secondary Seismic Hazards—Liquefaction and Ground Failure

Secondary seismic hazard refers to liquefaction and related types of ground failure, as well as seismically induced landsliding (see *Landslide and Other Slope Stability Hazards* below).

Liquefaction is a process by which soils and sediments lose shear strength and fail during episodes of intense seismic ground shaking. The susceptibility of a given soil or sediment to liquefaction is primarily a function of local groundwater

conditions and soil and sediment properties such as particle size distribution and bulk density. Water-saturated fine sands and silts located within 50 feet of the surface are typically considered to be the most susceptible to liquefaction. Unsaturated, well-consolidated soils and sediments that consist of coarser or finer materials are generally less susceptible to liquefaction. The potential for liquefaction to occur in a given area is a function of a soils susceptibility to liquefaction and groundshaking potential (i.e., proximity to active faults).

As discussed in *Regulatory Setting* below, the State of California maps areas subject to secondary seismic hazards pursuant to the Seismic Hazards Mapping Act of 1990. To date, this effort has focused on areas such as the Los Angeles Basin–Orange County region and the San Francisco Bay region, where dense populations are concentrated along active faults; seismic hazards maps have not been issued for the program area (California Geological Survey 2006). However, site-specific studies suggest that some risk exists for liquefaction in the program area. Maps showing liquefaction potential of soils in the region (Dupré 1990) indicate that younger flood plain deposits which are common in the program area have a "high" potential for liquefaction and older flood plain deposits have a "moderate" potential for liquefaction (ENGEO Incorporated 2004).

Liquefaction can cause other types of ground failures such as disruption, sand boils, and ground settlement (ENGEO Incorporated 2004). Disruption and sand boils occur when liquefied soils vent through the ground surface. The presence of a nonliquefiable surface layer can prevent this venting, if it is sufficiently thick. The program area includes sites that could be susceptible to disruption and sand boils because liquefiable soils are covered by nonliquefiable surface materials that are too thin to prevent liquefied materials from venting (ENGEO Incorporated 2004).

In addition to liquefaction hazards, densification of sandy soils above and below groundwater levels could result in ground settlement in some sites in the program area during an earthquake. Since some of the surface materials have densities ranging from loose to medium and are potentially liquefiable, it is estimated that up to 4 inches of settlement may occur as a result of densification in some parts of the program area (ENGEO Incorporated 2004).

Landslide and Other Slope Stability Hazards

As stated above, the State of California has not yet issued seismic hazard maps for the Monterey 7.5′ quadrangle (see California Geological Survey 2006). However, landslides are common in Carmel Valley (Monterey County 1990). The combination of steep slopes, unstable substrate materials such as Monterey shale and old landslide deposits, seismic activity, and saturation during the rainy season combine to create substantial landslide risk (Monterey County 1990).

Other Hazards (Relating to Hazardous Materials)

Hazardous materials and hazardous wastes are defined in the CCR Title 22, Sections 66260 through 66261.10. As defined in Title 22, hazardous materials are grouped into four general categories:

- toxic (causes human health effects);
- ignitable (has the ability to burn);
- corrosive (causes severe burns or damages materials); or
- reactive (causes explosions or generates toxic gasses).

Hazardous materials are generally considered to be substances with certain chemical or physical properties that may pose a substantial present or future hazard to human health or the environment when improperly handled, stored, disposed, or otherwise managed. In general, discarded, abandoned, or inherently waste-like hazardous materials are referred to as hazardous wastes A hazardous material or waste can be present in liquid, semi-solid, solid, or gaseous form.

This section describes general environmental conditions in terms of potential sources of hazardous materials in soil or groundwater in the program area. The discussion of environmental conditions is primarily based on a review of the U.S. Environmental Protection Agency's (EPA) on-line environmental database of EPA-regulated hazardous waste sites.

There are four EPA-regulated handlers of hazardous waste in Carmel Valley:

- Pacific Bell, 6 Carmel Valley Road, Carmel Valley CA.
- American Telephone and Telegraph, 3 miles NNW of Carmel Valley CA.
- Kim Carmel Valley Cleaners, 19 E Carmel Valley Road, Carmel Valley CA.
- UC Berkeley Hastings Reserve, 38601 E Carmel Valley Road, Carmel Valley CA.

None of these facilities has been reported for violations associated with toxic releases to land, water or air, and none of them has an active or archived hazardous waste clean-up report according to EPA's databases (U.S. Environmental Protection Agency 2006). These facilities are not expected to be significant hazardous waste generators.

In addition to these known, or recorded sites, potential for unknown or unrecorded hazardous waste sites associated with historical agricultural land uses, underground storage tanks and other past waste generating land uses exists within the program area.

Regulatory Setting

Federal Regulations

Clean Water Act Section 402[p]

Amendments to the federal Clean Water Act (CWA) in 1987 added Section 402[p], which created a framework for regulating municipal and industrial storm water discharges under the National Pollutant Discharge Elimination System (NPDES) program. In California, the State Water Resources Control Board is responsible for implementing the NPDES program; pursuant to the state's Porter-Cologne Water Quality Control Act (Porter Cologne Act) (see discussion in Section 3.2), it delegates implementation responsibility to the state's nine Regional Water Quality Control Boards.

Under the NPDES Phase II Rule, any construction project disturbing 1 acre or more must obtain coverage under the state's General Permit for Storm Water Discharges Associated with Construction Activity. The purpose of the Phase II rule is to avoid or mitigate the effects of construction activities, including earthwork, on surface waters. To this end, General Construction Permit applicants are required to file a Notice of Intent to Discharge Storm Water with the Regional Water Quality Control Board (RWQCB) that has jurisdiction over the construction area, and to prepare a stormwater pollution prevention plan (SWPPP) stipulating best management practices (BMPs) that will be in place to avoid adverse effects on water quality.

Additional information on other aspects of the CWA is provided in Section 3.2, *Hydrology and Water Quality*.

Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act (RCRA) enables the EPA to administer a regulatory program that extends from the manufacture of hazardous materials to their disposal, thereby regulating the generation, transport, treatment, storage, and disposal of hazardous waste at all facilities and sites in the nation.

Comprehensive Environmental Response, Compensation, and Liability Act, and Superfund Amendment and Reauthorization Act Title III

The Comprehensive Environmental Response, Compensation, and Liability Act, also known as Superfund, was passed to facilitate the cleanup of the nation's toxic waste sites. In 1986, Superfund was amended by the Superfund Amendment and Reauthorization Act Title III (community right-to-know laws), also called the Emergency Planning and Community Right-to-Know Act, which

states that past and present owners of land contaminated with hazardous substances can be held liable for the entire cost of the cleanup even if the material was dumped illegally when the property was under different ownership. These regulations also establish reporting requirements that provide the public with important information on hazardous chemicals in their communities to enhance community awareness of chemical hazards and facilitate development of state and local emergency response plans.

State Regulations and Policies

Alquist-Priolo Earthquake Fault Zoning Act

California's Alquist-Priolo Earthquake Fault Zoning Act (Alquist-Priolo Act) (PRC Sec. 2621 *et seq*.), originally enacted in 1972 as the Alquist-Priolo Special Studies Zones Act and renamed in 1994, is intended to reduce the risk to life and property from surface fault rupture during earthquakes. The Alquist-Priolo Act prohibits the location of most types of structures intended for human occupancy[4] across the traces of active faults and strictly regulates construction in the corridors along active faults (*earthquake fault zones*). It also defines criteria for identifying active faults, giving legal weight to terms such as *active*, and establishes a process for reviewing building proposals in and adjacent to Earthquake Fault Zones.

Under the Alquist-Priolo Act, faults are zoned and construction along or across them is strictly regulated if they are "sufficiently active" and "well-defined." A fault is considered *sufficiently active* if one or more of its segments or strands shows evidence of surface displacement during Holocene time (defined for purposes of the Act as referring to approximately the last 11,000 years). A fault is considered *well defined* if its trace can be clearly identified by a trained geologist at the ground surface or in the shallow subsurface, using standard professional techniques, criteria, and judgment (Hart and Bryant 1997).

Seismic Hazards Mapping Act

Like the Alquist-Priolo Act, the Seismic Hazards Mapping Act of 1990 (PRC Sections 2690–2699.6) is intended to reduce damage resulting from earthquakes. While the Alquist-Priolo Act addresses surface fault rupture, the Seismic Hazards Mapping Act addresses other earthquake-related hazards, including strong groundshaking, liquefaction[5], and seismically induced landslides. Its provisions are similar in concept to those of the Alquist-Priolo Act: the state is charged with

[4] With reference to the Alquist-Priolo Act, a *structure for human occupancy* is defined as one "used or intended for supporting or sheltering any use or occupancy, which is expected to have a human occupancy rate of more than 2,000 person-hours per year" (California Code of Regulations, Title 14, Div. 2, Section 3601[e]).

[5] *Liquefaction* is a phenomenon in which the strength and stiffness of a soil are reduced by earthquake shaking or other rapidly applied loading. Liquefaction and related types of ground failure are of greatest concern in areas where well-sorted sandy unconsolidated sediments are present in the subsurface and the water table is comparatively shallow.

identifying and mapping areas at risk of strong groundshaking, liquefaction, landslides, and other corollary hazards, and cities and counties are required to regulate development within mapped Seismic Hazard Zones.

Under the Seismic Hazards Mapping Act, permit review is the primary mechanism for local regulation of development. Specifically, cities and counties are prohibited from issuing development permits for sites within Seismic Hazard Zones until appropriate site-specific geologic and/or geotechnical investigations have been carried out and measures to reduce potential damage have been incorporated into the development plans.

State Hazardous Waste Management Regulations

California hazardous waste management regulations are equal to or more stringent than federal regulations. The EPA has granted the State primary oversight responsibility to administer and enforce hazardous waste management programs. State regulations require planning and management to ensure that hazardous wastes are handled, stored, and disposed of properly to reduce risks to human health and the environment. Key state laws pertaining to hazardous wastes include the following.

- Hazardous Materials Release Response Plans and Inventory Act of 1985 (Business Plan Act).
- Hazardous Waste Control Act.
- Emergency Services Act.
- California Occupational Safety and Health Administration Standards.
- Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65), which requires labeling of substances known or suspected by the state to cause cancer.
- California Government Code Section 65962.5, which requires the Office of Permit Assistance to compile a list of possible contaminated sites in the state.
- In addition to regulating the management of hazardous wastes, state law also governs the prevention and suppression of wildfires in state responsibility areas (SRAs), which are primarily the responsibility of state fire protection agencies operating under the Department of Forestry, and SRA areas that have been reclassified so as to become the responsibility of local jurisdictions. Key state laws pertaining to wildfires include the PRC definition of State Responsibility Areas (PRC Section 4125 et seq.) and Defensible Space requirements (PRC Section 4290).

Local Regulations

Many cities and counties include geologic hazards as a factor in their land use planning, with the result that their general plans, local code, zoning ordinances, and building and earthwork standards reflect policies specifically aimed at reducing risk to life and property as a result of seismic and other types of geologic hazards. Monterey County has developed such methods specifically to address reduction of geologic hazards.

In California, earthwork and construction activities are regulated at the local jurisdiction level through a multi-stage permitting process—grading permits are required for most types of earthwork, and additional permits are typically needed for various types of construction. The purpose of local jurisdiction permit review is to ensure that proposed earthwork will meet the jurisdiction's adopted codes and standards. Most jurisdictions in California have adopted either the UBC or the California Building Code (CBC) as a minimum standard. The UBC was specifically developed to foster consistency in building laws across the nation by offering local jurisdictions, agencies, and organizations adequate minimum standards to guide local regulation of design and construction. The CBC expands on the UBC by providing more stringent standards addressing reduction of earthquake risk to structures in this seismically active state; however, many jurisdictions have evaluated the UBC as providing adequate protection. Monterey County Building Code is based on the CBC (2001 edition) (LexisNexis 2006).[6]

Portions of the CBC incorporated by Monterey County into Monterey County Building Code that are particularly relevant to geology and geologic hazards include Chapter 16 Division IV (*Structural Design Requirements—Earthquake Design*) and Chapter 18 (*Foundations and Retaining Walls*).

Depending on the extent, nature, and location of proposed earthwork and construction, the local jurisdiction permit process may require preparation of a site-specific geotechnical investigation, sometimes called a soils report. In some cases, this is required by state regulations (see discussion of Alquist-Priolo and Seismic Hazards Mapping Acts above). It may also be required by the UBC or CBC. The purpose of a site-specific geotechnical investigation is to provide a geologic basis for the development of appropriate project design. Geotechnical investigations typically assess bedrock and Quaternary geology, geologic structure, soils, and previous history of excavation and fill placement; as appropriate, they may also include information specifically addressing the

[6] Title 18 Buildings and Construction, Chapter 18.08 Monterey County Building Code, 18.08.010 Building Code adopted:

> "The California Building Code, 2001 Edition, Volumes 1 and 2 (based upon the 1997 Uniform Building Code), copyrighted by the California Building Standards Commission and the International Conference of Building Officials, including the Chapters 12, 15, 23, and 31 of the Appendix, Division III of Chapter 34 of the Appendix, and the Appendix Chapter provisions mandated by the State of California Building Standards Codes, copies of which are on file as required by law, is adopted and incorporated into this Code by reference, with the modifications set forth in this Chapter. The above referenced California Building Code, as amended by this Chapter, shall be known as the Monterey County Building Code. (Ord. 4189, 2003; Ord. 3946, 1997.)

stipulations of the Alquist-Priolo Act, the Seismic Hazards Mapping Act, and/or local regulations.

Monterey County General Plan

Policy 3.1.1. Erosion control procedures shall be established and enforced for all private and public construction and grading projects.

Policy 3.2.2. Lands having a prevailing slope above 30% shall require adequate special erosion control and construction techniques.

Policy 15.1.4. All new development and land divisions in designated high hazard zones shall provide a preliminary seismic and geologic hazard report which addresses the potential for surface ruptures, ground shaking, liquefaction, and landsliding before the application is considered complete. This report shall be completed by a registered geologist and conform to the standards of a preliminary report adopted by the County.

Policy 15.1.6. Prior to the construction of a new public facility or critical structure within a high hazard zone, the County shall require a full geological investigation by a registered geologist.

Policy 15.1.7. Prior to the issuance of a building or grading permit, the County shall require liquefaction investigations for proposed critical use structures and multi-family dwellings over four units when located in areas of moderate or high hazard for liquefaction or subject to the following conditions:

- location in primary floodways; and
- groundwater levels less than 20 feet, as measured in spring and fall.

Policy 15.1.8. The County should require a soils report on all building permits and grading permits within areas of known slope instability or where significant potential hazard has been identified.

Policy 15.1.11. For high hazard areas, the County should condition development permits based on the recommendations of a detailed geological investigation and soils report.

Policy 15.1.12. The County shall require grading permits to have an approved site plan which minimizes grading and conforms to the recommendations of a detailed soils or geology investigation where required.

Policy 15.1.15. Side castings from the grading of roads and building pads shall be removed from the site unless they can be distributed on the site so as not to change the natural landform. An exception to this policy will be made for those cases where changes in the natural landform are required as a condition of development approval.

Policy 15.2.2. The County should encourage the State Department of Transportation (Caltrans) to review its facilities and roadways within the County to assess potential impact of seismic hazards; comments should be forwarded to the County.

Policy 18.1.1. The County shall establish land use controls to reduce undesirable effects of hazardous chemicals.

Greater Monterey Peninsula Area Plan

Policy 3.1.1. Erosion control procedures shall be established and enforced for all private and public land clearing projects.

Policy 15.1.1.1. The Greater Monterey Peninsula Seismic Hazards Map and Landslide and Erosion Susceptibility Map shall be used to delineate high hazard areas addressed by the countywide General Plan and this area plan. Hazard categories IV, V, and VI from these maps shall be considered to be "high hazard" areas for the purpose of applying General Plan and/or area plan policies in the Greater Monterey Peninsula Planning Area. These maps may be revised as new, accepted investigations dictate.

Policy 15.1.11.1. For high hazard areas, the County shall require, as a condition of development approval, a detailed geological investigation and soils report and shall further require, as a condition of approval, that the recommendations of that report be followed.

Policy 18.1.2. The County shall establish land use controls and other regulations to reduce undesirable effects of hazardous materials.

Policy 18.1.3. The Board of Supervisors shall direct the County Health Department to inventory all abandoned dump and landfill sites in the Planning Area. The Health Department shall report the results of its inventory to the Board of Supervisors and shall recommend criteria for determining the magnitude of possible health hazard present at each site, a procedure for determining which abandoned sites should be tested, and criteria which must be met as a condition of development approval on or adjacent to abandoned sites. The Health Department report shall also contain recommendations regarding payment for required testing.

Carmel Valley Master Plan

Policy 3.1.1.1 (CV) A soils report in accordance with the Monterey County Grading and Erosion Control ordinances shall be required for all changes in land use which require a discretionary approval in high or extreme erosion hazard areas as designated by the Soil Conservation Service manual "Soil Surveys of Monterey County". This report shall include a discussion of existing or possible future deposition of upslope materials or downslope slippage for each site.

Policy 3.1.1.2 (CV) As part of the building permit process, the erosion control plan shall include these elements:

- Provision for keeping all sediment on-site.

- Provision for slow release of runoff water so that runoff rates after development do not exceed rates prevailing before development.
- Revegetation measures that provide both temporary and permanent cover.
- Map showing drainage for the site, including that coming onto and flowing off the property.

Storm drainage facilities shall be designed to accommodate runoff from 10-year or 100-year storms as recommended by the Monterey County Flood Control and Water Conservation District.

Policy 3.1.1.3 (CV) All exposed areas within development projects subject to erosion and not involved in construction operations shall be protected by mulching or other means during the rainy season (October 15 - April 15).

Policy 3.1.4 (CV) Grading shall be minimized through the use of step and pole foundations, where appropriate.

Policy 3.1.5 (CV) The amount of land cleared at any one time shall be limited to the area that can be developed during one construction season. This prevents unnecessary exposure of large areas of soil during the rainy season.

Policy 3.1.6 (CV) Site control shall be established throughout the Master Plan area, including lots of record and utilities extensions, in order to minimize erosion and/or modification of landforms.

Policy 3.1.7 (CV) The combination of generally steep slopes and often thin and erosive soils will present a definite potential for erosion and siltation which may have adverse effects both on and off- site. Development shall therefore be carefully located and designed with this hazard in mind.

Policy 3.1.8 (CV) The native vegetative cover must be maintained on areas prone to rapid runoff as defined in the Soil Survey of Monterey County. These include the following soils:

a. Santa Lucia shaly clay loam, 30-50% slope

b. Santa Lucia-Reliz Association, 30-75% slope

c. Cieneba fine gravelly sandy loam, 30-70% slope

d. San Andreas fine sandy loam, 30-75% slope

e. Sheridan coarse sandy loam, 30-75% slope

f. Junipero-Sur complex, 50-85% slope (Jc)

Policy 3.1.9 (CV) A condition of approval requiring on-going maintenance of erosion control measures identified in the erosion control plan shall be attached to all permits allowing development in areas prone to slope failure, including, but not limited to, the following:

- all development in areas classified as highly susceptible to slope failure;
- all development on sites with slopes of greater than 20%; and

- where roadways are cut across slopes greater than 30%, or across slopes with thin and highly erosive soils.

Policy 3.1.10 (CV) In addition to required on-site improvements for development projects, the County shall impose a fee to help finance the improvement and maintenance of drainage facilities as identified in the Master Drainage Plan for Carmel Valley.

Policy 3.1.11 (CV) Development of on-site stormwater retention and infiltration basins is encouraged in groundwater recharge areas subject to approval by the Monterey Peninsula Water Management District, the County Health Department, the County Flood Control and Water Conservation District and the County Surveyor.

Policy 3.1.12 (CV) A comprehensive drainage maintenance program should be established by the formation of either sub-basins or valley-wide watershed zones through the cooperation of the County Department of Public Works, the Monterey County Flood Control and Water Conservation District and the Monterey Peninsula Water Management District.

Policy 3.1.14 (CV) Containment structures or other measures shall be required to control the runoff of pollutants for major commercial areas or other sites where chemical storage or accidental chemical spillage is possible.

Policy 3.1.15 (CV) An erosion control plan shall be required for all discretionary development permits and all submittals for areas identified as having a high or extreme erosion hazard prior to accepting such applications as complete.

Policy 3.2.3.1 (CV) Due to the highly erosive qualities of local soils and the fragileness of the native vegetation, livestock (i.e., horses, cattle, goats, etc.) shall not be permitted in proposed developments unless a livestock management plan is first approved.

Policy 4.2.4 (CV) Development adjacent to agricultural lands shall be planned to minimize adverse effects on the productivity of the agricultural soils.

Policy 17.4.15. In high and very high fire hazard areas, as defined by the California Department of Forestry and shown on California Department of Forestry Fire Hazard Maps, roof construction (except partial repairs) of fire retardant materials, such as tile, asphalt or asbestos combination, or equivalent, shall be required as per Section 3203 (e) (excluding 11) of the Uniform Building Code, or as approved by the fire district. Exterior walls constructed of fire resistant materials are recommended but not required. Vegetation removal will not be allowed as a means of removing high or very high fire hazard designation from an entire parcel.

Policy 17.4.16. Where feasible, proposed trail easements in high and extreme fire hazard areas shall be designed to provide effective firebreak zones and shall be designed for access to Laureles Grade, Tierra Grande, and other roads for emergency vehicle access.

Criteria for Determining Significance

In accordance with State CEQA Guidelines, applicable federal and state regulations, and local plans and policies, the proposed program would be considered to result in a significant impact if it would:

A. Seismic Hazards

Expose people or structures to potential substantial adverse effects resulting from the rupture of a known earthquake fault, seismic ground shaking, landslides, or seismic-related ground-failure, including liquefaction, and that cannot be mitigated through the use of standard engineering design techniques.

B. Landslides and Slope Stability

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 an onsite or offsite landslide or slope failure.

Be located on an existing slope with a gradient greater than 30 percent.

C. Erosion

Result in substantial soil erosion or the loss of topsoil and subsequent sedimentation into local drainage facilities and water bodies.

D. Soil Constraints

Be located on an expansive soil, as defined by the CBC (1997) or be subject or to other soil constraints that might result in deformation of foundations or damage to structures, creating substantial risks to life or property.

E. Hazardous Materials

Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater.

Create a significant hazard to the public or the environment through the release of hazardous materials into the environment.

Impacts and Mitigation Measures

A. Seismic Hazards

Impact GEO-1: Expose People or Structures to Risk of Rupture of a Known Earthquake Fault (Less Than Significant)

No earthquake fault zone as designated under the Alquist-Priolo Earthquake Fault Zoning Act traverses the project area. The risk of surface fault rupture is **less than significant**. No mitigation is required.

Impact GEO-2: Expose People or Structures to Risk of Seismic Groundshaking (Less Than Significant With Mitigation)

Because the proposed roadway improvements are located within a seismically active area, in close proximity to several major active faults, the area is likely to experience strong groundshaking during the lifespan of the proposed program. This groundshaking could cause substantial damage to improperly designed and constructed roadway improvements and result in injury to people. This is considered a potentially significant impact. Implementation of **Mitigation Measure GEO-2.1** would reduce this impact to a **less-than-significant** level.

> **Mitigation Measure GEO-2.1: Conduct Project-Level Geotechnical Investigations and Design all Project Facilities to Avoid or Minimize Groundshaking-Related Impacts**
> The County should conduct site-specific fault investigations during the preliminary and/or final design stage of all proposed roadway and intersection improvements. If it is determined at the project-level that groundshaking or seismically induced land failure poses a substantial threat to any of the proposed improvements, the affected improvements would be designed to avoid or minimize the potential for damage resulting from groundshaking or seismically induced land failure. The exact measures that would be used to avoid or minimize damage resulting from groundshaking are not currently known, but could include reinforcing project-related structures or relocating certain project facilities to avoid active fault traces.

Impact GEO-3: Expose People or Structures to Risk of Earthquake-Induced Liquefaction (Less Than Significant With Mitigation)

Much of Carmel Valley is located on Holocene deposits (Clark et al. 1997), which are susceptible to liquefaction (Monterey County 1984). Some of the proposed roadway improvements may be located on these deposits. Liquefaction

induced by an earthquake on any of the active and potentially active faults in the region could cause substantial damage to improperly designed and constructed roadway facilities and result in injury to people using these facilities. This is considered a potentially significant impact. Implementation of **Mitigation Measure GEO-3.1** would reduce this impact to a **less-than-significant** level.

Mitigation Measure GEO-3.1: Conduct Site-Specific Geotechnical Investigations for Liquefaction and Implement Appropriate, Proven Geotechnical Methods

The County will conduct site-specific geotechnical investigations before or during the preliminary and/or final design stages of the proposed traffic improvements to identify and characterize areas that may be susceptible to liquefaction. These site-specific investigations may range from limited screening investigations to identify obvious liquefaction hazards, to very detailed subsurface investigations. The findings of these site-specific investigations will serve as the basis for the final design of the proposed improvements and ensure that appropriate geotechnical methods are used to avoid or minimize the potential for liquefaction to damage project-related facilities. The exact measures that would be used to reduce the liquefaction hazard are not currently known, but the measures may include standard practices such as the following:

- removal or treatment of potentially liquefiable soils and sediments,
- construction of edge containment structures (e.g., berms, dikes, retaining structure, compacted soil zones),
- installation of drainage structures to lower the groundwater table,
- in-situ ground densification, and
- other types of ground improvement (California Division of Mines and Geology 1997).

B. Landslides and Slope Stability

Impact GEO-4: Expose People or Structures to Risk of Landslide or Slope Failure (Less Than Significant With Mitigation)

California's Seismic Hazards Mapping Program, which maps areas susceptible to risks as defined by the Seismic Hazards Mapping Act, has not yet mapped the program area and thus does not provide guidance at this time for secondary seismic hazards in this area (California Geological Survey 2006). However, Monterey County has identified Carmel Valley and the surrounding hillsides as being highly susceptible to landslide, erosion, and slope failure (Monterey County 1984). Construction of the proposed roadway improvements, as well as the post-construction phase, could induce onsite or offsite slope failures. In addition, slope failures caused by earthquakes, high rainfall, project activities, or other means could cause substantial damage to improperly designed and

constructed roadway facilities, and could result in injuries to people using these facilities. This is considered a potentially significant impact. Implementation of **Mitigation Measure GEO-4.1** would reduce this impact to a **less-than-significant** level.

> **Mitigation Measure GEO-4.1: Conduct Site-Specific Geotechnical Investigations for Slope Stability and Implement Appropriate, Proven Geotechnical Methods**
> The County will conduct site-specific geotechnical investigations before or during the preliminary and/or final design stages of the proposed traffic improvements to identify and characterize potential slope failure hazards. These site-specific investigations may range from limited screening investigations to identify obvious slope failure hazards, to very detailed subsurface investigations. The findings of these investigations will serve as the basis for the final design of the proposed improvements and ensure that appropriate geotechnical methods are used to avoid or minimize the potential for slope failures and associated damage. The exact methods that will be used to address potential slope failure hazards are not currently known, but will likely involve avoiding the failure hazard by relocating the project in question, protecting susceptible areas from the failure by constructing protective structures, and reducing the hazard to an acceptable level by stabilizing unstable slopes (California Division of Mines and Geology 1997).

Impact GEO-5: Destabilize Steep Slopes (Less Than Significant with Mitigation)

Some of the roadway improvements under the proposed program could be constructed on existing slopes with a gradient greater than 30 percent. Grading could destabilize existing slopes and create unstable manufactured (cut-and-fill slopes) slopes. Resulting slope failures (e.g., landslides and debris flows) could cause damage to existing structures and existing and newly constructed roadways, and thus expose people to a resultant risk. Potential impacts resulting from construction on steep slopes and manufacture of steep slopes are considered significant. Implementation of **Mitigation Measure GEO-5.1** would reduce this impact to a **less-than-significant** level.

> **Mitigation Measure GEO-5.1: Implement Recommended Design Criteria of the Geotechnical Investigation Wherever Steep Slopes Would Be Graded or Manufactured**
> The County shall implement the recommended design criteria of the geotechnical investigation during the final design and construction of the proposed improvements. All design criteria shall be in conformance with the standards of the California Building Code and all other applicable County and local building code standards. If seepage or groundwater is observed within cut or fill slopes, additional measures will be necessary.

C. Erosion

Impact GEO-6: Cause Soil Erosion or Loss of Topsoil and Subsequent Sedimentation (Less Than Significant With Mitigation)

Nearly all of the proposed roadway improvements would involve some land clearing, grading, and other ground-disturbing activities that could temporarily increase soil erosion rates during and shortly after project construction. Although the soils in the lowlands of Carmel Valley, because of slope and composition, are fairly resistant to erosion, construction-related erosion could result in the loss of a substantial amount of nonrenewable topsoil and could adversely affect water quality in nearby surface waters (see detailed discussion in Section 3.2, *Hydrology and Water Quality*). Further, there are soils on the slopes along Laureles Grade that are highly susceptible to erosion. This is considered a potentially significant impact. Implementation of **Mitigation Measure GEO-6.1** would reduce this impact to a **less-than-significant** level.

Mitigation Measure GEO-6.1: Prepare and Implement an Erosion and Sediment Control Plan, Storm Water Pollution Prevention Plan, or Water Pollution Control Plan at the Project Level

The County should prepare and implement an erosion and sediment control plan (ESCP), SWPPP, or Water Pollution Control Plan (WPCP) for each proposed improvement project as needed. Each of these documents would contain details and specifications for a variety of standard BMPs, such as those recommended by the California Department of Transportation (Caltrans) (Camp Dresser & Mckee 2000), that would be implemented to control erosion, stormwater runoff, sediment, and other construction-related pollutants during project construction. The ESCP would remain in effect until all areas disturbed during construction are permanently stabilized. The specific BMPs that would be incorporated into the ESCP would be determined during the final design phase of the selected alternative. They would likely include, but not be limited to, one or more of the following:

- **Time and sequence construction activities to minimize ground disturbance:** The County may develop a construction schedule prior to the commencement of construction to help avoid or minimize ground disturbing activities during the rainy season (October 15–April 15), sequence construction activities in a manner that would minimize the amount of ground disturbed at any given time, and allow for the timely and proper implementation of appropriate erosion and sediment control BMPs.
- **Stage construction equipment and materials away from surface water.** All equipment and construction materials may be staged away from existing stream channels and other surface water bodies.

To the extent possible, equipment and materials would be staged in areas that have already been disturbed.

- **Minimize ground disturbance and preserve existing vegetation.** The County may minimize ground disturbance and the destruction of existing vegetation during project construction. This would be accomplished in part through the establishment of designated equipment staging areas, ingress and egress corridors, and equipment exclusion zones before the any land clearing, grubbing, or grading operations begin.
- **Apply mulch and seed:** The County may apply mulch and seed mixtures hydraulically or using other appropriate methods to all graded and otherwise disturbed areas to reestablish vegetative ground cover and stabilize all graded and otherwise disturbed surfaces once construction is complete. Mulch and seed may also be applied to temporarily stabilize areas that would need to be re-disturbed after an extended period of inactivity. Hydraulic mulch and seed application may be used in conjunction with other erosion and sediment control BMPs and supplemented with the planting of native or ornamental trees and shrubs.
- **Install erosion control blankets:** The County may install erosion control blankets or other suitable materials to protect graded and otherwise disturbed surfaces from raindrop impact and wind erosion. Erosion control blankets are particularly well suited and appropriate for areas where slope gradients are steep, the hazard of erosion is high, or vegetation is likely to reestablish slowly because of harsh post-construction soil conditions.
- **Intercept and divert stormwater run-on:** If appropriate, the County may construct temporary earthen dikes, lined drainage swales, or slope drains to intercept and divert stormwater run-on away from areas with high erosion hazard (e.g., steep fill slopes) and toward stable outlets and watercourses. It may be necessary to use other erosion control methods, such as check dams or energy dissipater structures, to prevent the scouring and erosion of newly graded diversion structures.
- **Install silt fences or fiber rolls:** The County may install silt fences or fiber rolls in the construction area to slow and filter sediment from construction area runoff.
- **Install storm drain inlet protection:** The County may install filter fabric fence, drop inlet sediment traps, sandbag barriers, or other similar devices at storm drain inlets to detain and filter sediment-laden runoff from the construction area before it is discharged into drainage systems or natural watercourses.
- **Stabilize grading spoils:** Grading spoils generated during the construction may be temporarily stockpiled in stable areas located away from stream channels and other surface water bodies. Silt fences and fiber rolls may be installed around the base of the

temporary stockpiles to intercept runoff and sediment draining from the stockpiles. If necessary, temporary stockpiles may also be covered with an appropriate geotextile to provide protection from wind and water erosion.

D. Soil Constraints

Impact GEO-7: Expose People or Structures to Risks Resulting from Expansive Soils and Sediments (Less Than Significant)

The soil survey of Monterey County indicates that no soils with a shrink-swell potential (i.e., potentially expansive soils) greater than "moderate" occur in the program area. For this reason, the risk of adverse effects resulting from expansive soils is considered a **less-than-significant** impact. No mitigation is necessary.

Impact GEO-8: Expose People or Structures to Risks Resulting from Land Subsidence or Settlement (Less Than Significant With Mitigation)

Some of the proposed roadway improvements could be located on unconsolidated Holocene deposits (Clark et al. 1997) which could be susceptible to uneven settlement, which could cause substantial damage to improperly designed and constructed project facilities and result in injury to people using these facilities. This is considered a potentially significant impact. Implementation of **Mitigation Measure GEO-8.1** would reduce this impact to a **less-than-significant** level.

Mitigation Measure GEO-8.1: Conduct Site-Specific Geotechnical Investigations for Settlement and Subsidence and Implement Appropriate, Proven Geotechnical Methods

The County will conduct site-specific geotechnical investigations before or during the preliminary and/or final design stages of all proposed improvements to identify areas with the potential for settlement and subsidence. The findings of these investigations will serve as the basis for the final design and ensure that appropriate, proven geotechnical methods are used to avoid or minimize the potential for settlement and subsidence to damage project-related facilities. The exact methods that will be used to address potential land subsidence and settlement issues are not currently known, but will likely involve improvement of the ground conditions by removing or replacing problematic soils and sediments.

E. Hazardous Materials

Impact GEO-9: Expose People to Untreated Human Waste (No Impact)

The roadway improvements under the proposed program would not require new septic facilities or sewer lines. Therefore, there is **no impact**.

Impact GEO-10: Expose People or the Environment to Hazardous Waste Contamination (Less Than Significant With Mitigation)

None of the four facilities that handle hazardous waste in Carmel Valley has been cited for a violation of regulations or for release of hazardous waste into land, water or the air. Some of the proposed roadway improvements may be located adjacent to or near one of these four facilities, and construction activity could encroach on the operations of these facilities, thus potentially exposing people and the environment to hazardous waste contamination. In addition to the known hazardous waste handling facilities, there could be other, unknown and/or unrecorded hazardous waste sites within the program area that could be encountered during ground-disturbing activities associated with project construction. If construction activities disturbed any unknown hazardous waste sites, people and the environment could potentially be exposed to hazardous waste contamination. This impact is considered potentially significant. Implementation of **Mitigation Measures GEO-10.1 and GEO-10.2** would reduce this impact to a **less-than-significant** level.

Mitigation Measure GEO-10.1: Perform a Phase 1 Preliminary Environmental Site Assessment Before Beginning Construction Activities

Before beginning construction activities, the County will retain a qualified hazardous materials compliance engineer to perform a Phase 1 Environmental Site Assessment for specific project site(s) to identify locations of potential hazardous wastes sites within the specific project area. In addition to identification of potentially hazardous waste sites, the Phase I (Environmental Site Assessment) will propose recommendations on further study of potential contaminated sites, and/or further procedures to implement in order to comply with all applicable, federal, state, and local hazardous waste handling regulations.

Mitigation Measure GEO-10.2: Coordinate Construction Activities with Health Department and Waste Handler

If construction activities could encroach on a site where hazardous materials are present, as identified either by the EPA or by the Phase 1 Environmental Site Assessment, the County will coordinate with appropriate State agencies, Monterey County Health Department and with the waste handler, if applicable, prior to commencement of any construction activities to determine proper steps in handling any

encounters with contaminants, training construction personnel and all other procedures for the proper handling of hazardous wastes.