3.6 Geology and Soils

This section focuses on the potential for construction and operation of renewable energy projects proposed under the Program to result in soils- and geologic-related impacts and possible loss of access to mineral resources. Issues of liquefaction potential, landslide risk potential, erosion, soil suitability, and earthquake damage potential will be addressed.

3.6.1 PHYSICAL SETTING

GEOLOGY AND TOPOGRAPHY

San Luis Obispo County is located within the southern portion of the Coast Ranges Geomorphic Province (Coast Ranges), which encompasses northwest-trending mountain ranges and valleys that are roughly parallel to the Great Central Valley and Sierra Nevada range. To the east, the county is bordered by the Temblor Range. Other mountain ranges which traverse the county include the Santa Lucia Range, the Caliente Range, the La Panza Range, and the San Luis Range. The southwest portion of the county consists of the Carrizo Plain, which lies between the Temblor Range and the Caliente Range. The Sierra Madre Mountains border the southern portion of the county. Narrow valleys are interspersed between these mountain ranges. They include the Cholame Valley, Shandon Valley, Huasna Valley, Los Osos Valley, and Santa Maria Valley. The bedrock of the southern Coast Ranges consists of a complex mosaic of Mesozoic and Cenozoic rock bodies that existed in this area during the Jurrassic, Cretaceous, and early Tertiary periods (DeCourten 2010).

Soils

The Natural Resources Conservation Service has mapped over 423 individual soil types in San Luis Obispo County. These soil types are grouped into 144 soil series. Soil types and soil series reveal valuable information regarding soil characteristics that are important to keep in mind when siting renewable energy facilities. These characteristics include expansive soils, erosive soils, and soils corrosive to steel or concrete (SLO County 2013).

Expansive Soils

Expansive soils are characterized by their ability to undergo significant volume change based on variations in soil moisture content. Expansive soils are typically fine grained with a high percentage of clay, which is subject to expanding and contracting as soil moisture content fluctuates. Based on the degree of expansion and contraction, damage may occur to building foundations, concrete flatwork, and asphalt or concrete pavements.

Within the county, there are 134,221 acres of soil with a high shrink-swell potential, 721,063 acres with a moderate shrink-swell potential, and 1,171,627 acres with a low shrink-swell potential. Soils with a high shrink-swell potential are located primarily in the lower elevations of the county's coastal regions. Soils with a moderate shrink-swell potential are located primarily in the northern and mountainous coastal regions (SLO County 2013).

Soil Erosion

Soil erosion occurs when wind or water push fine-grained soil components out of place. Soil texture is the primary factor in determining a soil's erodibility. Soil texture types dominated by silt and very fine sand are the most highly erodible since soil particles are not bound together and are easily detached. Aggregated soils that are more closely bound together are less erodible since their particles can better resist action from wind and water. The quantity of soil lost by

water or wind erosion is influenced by a range of factors including soil texture, soil structure, vegetation cover, permeability, land use, topography, and climate.

There are 686,715 acres of soil in the county classified as having a high susceptibility to wind erosion (Wind Erodibility Groups 6–8). This acreage is located primarily in higher elevations in the eastern and western portions of the county, as well as in the county's central region. Approximately 682,677 acres of land have a moderate susceptibility to wind erosion (Wind Erodibility Groups 4, 4L, and 5). These lands are located primarily in the Santa Lucia Range, the Temblor Range, and the northern portion of the county (SLO County 2013).

Based on soil texture, 31,846 acres of land are deemed highly susceptible to water erosion and 1,182,082 acres of land are deemed moderately susceptible to water erosion. Soils highly susceptible to water erosion are located primarily in the lower elevations of the Carrizo Plain in the vicinity of Soda Lake. Soils with moderate susceptibility to water erosion are located along the slopes of the Temblor, Santa Lucia, Caliente, La Panza, and San Luis Mountain ranges (SLO County 2013).

Corrosive Soils

Based on its chemical composition, soil can be identified as corrosive to steel or concrete. Soil resistivity is the soil's ability to allow electrons to move through it. A low resistivity means a soil is a good conductor. A soil with resistivity less than 5,000 Ohm-centimeters is considered highly corrosive to ungalvanized steel, while soils with a resistivity between 5,000 to 10,000 Ohm-centimeters are considered mildly corrosive.

In San Luis Obispo County, 49,824 acres of soils are identified as highly corrosive to concrete and 561,832 acres of soils are identified as highly corrosive to steel. Soils identified as moderately corrosive to steel are located primarily in the county's eastern portion of the county. Soils identified as highly corrosive to steel are located primarily in the northern portion. In addition, 431,356 acres of soils are identified as moderately corrosive to concrete and 693,456 acres of soils are identified as moderately corrosive to steel. Soils identified as moderately corrosive to concrete are located primarily in the northwestern and southeastern portion of the county. Soils identified as highly corrosive to concrete are located primarily in the Soda Lake area (NRCS 2014; SLO County 2013).

Subsidence

Land subsidence normally results from fluid withdrawal occurring from groundwater pumping, oil extraction, or geothermal generation (Lofgren and Ireland 1973). Fluid removal can create subsurface voids that result in the sinking of the ground surface and loss of permeability in the soil. Subsidence resulting from shifting earth plates can also occur over large areas.

Faulting and Seismicity

Earthquakes are the result of an abrupt release of energy stored in the earth. This energy is generated from the forces that cause the continents to change their relative position on the earth's surface, a process called "continental drift." The earth's outer shell is composed of a number of relatively rigid plates that move slowly over the comparatively fluid molten layer below. The boundaries between plates are where the more active geologic processes take place. Earthquakes are an incidental product of these processes.

Active Faults

An "active" fault is one that shows displacement within the last 11,000 years and therefore is considered more likely to generate a future earthquake. The 1994 Alquist-Priolo Earthquake Fault Zoning Act requires the California State Geologist to establish regulatory zones (now known as Earthquake Fault Zones; prior to 1994, these zones were known as Special Studies Zones) around the surface traces of active faults that pose a risk of surface ground rupture and to issue appropriate maps in order to mitigate the hazard of surface faulting to structures for human occupancy.

According to the Geologic Map of California (CGS 2010a), the Fault Activity Map of California (CGS 2010b), and Fault Evaluation Report FER-200 (CGS 1989), two active fault zones traverse the county (and are within the four planning areas): the San Andreas Fault Zone and the Los Osos Fault Zone. The San Andreas Fault Zone spans approximately 54 miles of the southeastern portion of San Luis Obispo County, running along the western base of the Temblor Range through the Carrizo National Monument.

Other potentially active fault lines run roughly parallel on both the eastern and western sides of the San Andreas fault, the longest of which is approximately 24 miles (SLO County 2013). The Los Osos Fault Zone is a complex set of fault segments comprising the Edna, Huasana, and Oceanic fault zones that traverse the San Luis Obispo Planning Area. Both of these fault zones are Alquist-Priolo Fault Zones, meaning they pose a risk of surface ground rupture as evidenced by previous visible and documented surface fault ruptures along portions of the faults (CGS 1989).

Landslides

Landslides and slope instability can occur as a result of wet weather, weak soils, improper grading, improper drainage, steep slopes, adverse geologic structure, earthquakes, or a combination of these factors. Slope instability can occur in the form of creep slumps, large progressive translation or rotational failures, rockfall, debris flows, or erosion. Landsliding is a potential hazard in San Luis Obispo County due to topography that is dominated by mountain ranges interspersed with narrow valleys.

Within the county, 619,010 acres of land have moderate potential for landsliding, located primarily in narrow valleys throughout the county. There are 989,641 acres of land with high potential for landsliding, which are located along the western face of the Temblor Range, the eastern and western slopes of the Caliente Range, and the eastern and western slopes of the Santa Lucia Range. In addition, 38,089 acres of land have a very high potential for landsliding, located primarily in the higher elevation areas of the Santa Lucia Range and the Temblor Range (SLO County 2013).

Liquefaction

Liquefaction is the sudden loss of soil strength due to a rapid increase in soil pore water pressures resulting from ground shaking during an earthquake. Seismic settlement is the reduction of volume in a saturated or unsaturated soil mass due to ground shaking during a seismic event. Within the county, there are approximately 42,984 acres of soils that are at high risk for liquefaction and 341,630 acres of soils that are at moderate risk for liquefaction. Moderate risk areas are located primarily in the narrow valleys throughout the county, while high risk areas are located primarily along the Coastal Zone (SLO County 2013).

Mineral Resources

Within San Luis Obispo County, combining designations EX and EX1 signify Energy and Extractive Resource Areas (EX) and Extractive Resource Areas (EX1), respectively. Energy and Extractive Resource Areas identify areas of the county where there are known mineral or petroleum resource as recognized by the state or areas where major public utility electric generation facilities are proposed (SLO County 2014a). Surface mines and/or oil fields have been developed within these areas.

The county has seven Energy and Extractive Resource Areas. They include Guadalupe Oil Fields, Huerhuero Creek, Lime Mountain Mine, Klau Mine, Diablo Canyon Nuclear Power Plant, Arroyo Grande (Price Canyon-Ormonde Road) Oilfield, and Standard Oil Company Tank Farm (SLO County 2013).

Extractive Resource Areas (EX1) identify areas of the county classified by the California Department of Conservation's Division of Mines and Geology as containing or being likely to contain significant mineral deposits. San Luis Obispo County has six such areas. These include two EX1 designations along the Salinas River in the central region of the county (SLO County 2014a). EX1 areas are also located near Alamo Creek and the Santa Maria River in the southern portion of the county. Other EX1 areas include La Panza Granitics and along the Navajo Creek in the central portion of the county (SLO County 2013).

CARRIZO PLANNING AREA

Geology and Topography

The Carrizo Planning Area is located in the southeastern portion of San Luis Obispo County. It is bordered by the Temblor Range on the east and the Caliente Range on the west, with the Carrizo Plain running through the majority of the central portion of the planning area. Other notable topographic features are Freeborn Mountain in the Caliente Range, at an elevation of 3,315 feet, and the Elkhorn and Panaroma hills, located near the Temblor Range (DeCourten 2010).

The predominant geologic units in the Carrizo Planning Area include undifferentiated alluvium, which underlies the majority of the Carrizo Plain. The Paso Robles Formation underlies much of the eastern portion of the planning area. The Vaqueros Formation and sandstone and clay shale conglomerates underlie much of the western portion of the planning area (SLO County 2013).

Soils

The predominant soil textures found in this planning area include limy upland, loamy bottomland, and loamy upland.

Expansive Soils

The Carrizo Planning Area has 14,057 acres of soils with a high shrink-swell potential, located primarily in the Carrizo Plain around Soda Lake. There are 107,271 acres of soil with a medium shrink-swell potential, located primarily in the northern and western portions of the planning area (SLO County 2013).

Soil Erosion

Within the Carrizo Planning Area, 70,446 acres of soils are classified as having a high susceptibility to wind erosion (Wind Erodibility Groups 6–8). These soils are located primarily in the higher elevations of both the Temblor and Caliente ranges. In the middle elevations of the Temblor and Caliente ranges are 296,105 acres of soils classified as having a moderate susceptibility for wind erosion (Wind Erodibility Groups 4, 4L, and 5).

Primarily in the Carrizo Plain, the planning area has 30,672 acres of soils classified as having a high potential for erosion from water. There are 340,216 acres of soils classified as having a moderate potential for erosion from water; these are located primarily along the slopes of the Temblor and Caliente ranges (SLO County 2013).

Corrosive Soils

Within the Carrizo Planning Area, 30,672 acres of soil are identified as being highly corrosive to concrete. These are located primarily in the Carrizo Plain area in the vicinity of Soda Lake, as well as in the southwestern portion of the planning area. Primarily in the medium elevations of the Temblor and Caliente ranges are 153,032 acres of soils identified as being moderately corrosive to concrete.

The planning area has 54,052 acres of soils identified as being highly corrosive to steel. These are located primarily in the Carrizo Plain area in the vicinity of Soda Lake, as well as scattered about the Temblor and Caliente Ranges. There are 305,984 acres of soils identified as being moderately corrosive to steel, located throughout the Temblor and Caliente ranges (NRCS 2014; SLO County 2013).

Subsidence

There are no groundwater basins within the Carrizo Planning Area with a certified level of severity. Therefore, there is no risk of land subsidence within the planning area.

Faulting and Seismicity

Active Faults

The Carrizo Planning Area contains several active faults. The highly seismogenic San Andreas fault runs parallel to the base of the Temblor Range along the eastern portion of the planning area. The Caliente Range in the western portion of the planning area includes potentially active faults (SLO County 2013).

Landslides

Within the Carrizo Planning Area, 1,781 acres of soils are identified as having a very high potential for landsliding, located primarily in the higher elevations of the Temblor Range. Primarily in the moderate elevations of the Temblor and Caliente Ranges are 113,825 acres of soils identified as having a high potential for landsliding. In addition, 94,951 acres of soils are identified as having a moderate potential for landsliding (SLO County 2013).

Liquefaction

The planning area has 145,599 acres of land identified as having a moderate potential for liquefaction, primarily located in the Carrizo Plain (SLO County 2013).

Mineral Resources

The Carrizo Planning Area has no Energy and Extractive Resource Areas (EX) or Extractive Resource Areas (EX1).

NORTH COUNTY PLANNING AREA

Geology and Topography

The North County Planning Area includes most of the northern half of San Luis Obispo County. The Santa Lucia Range traverses the majority of the western portion of the planning area. The Temblor Range extends a bit into the eastern portion of the planning area. The Cholame Hills and Cholame Valley make up the planning area's northeastern portion. Other notable topographic features include Machesna Mountain, with an elevation of 4,066 feet, and the Shandon and San Juan valleys (DeCourten 2010).

The predominant geologic units in the North County Planning Area include the Paso Robles Formation, which underlies most of the central eastern portion of the planning area including the Cholame Valley and Hills. Undifferentiated alluvium underlies most of the narrow valleys in the North County Planning Area. The south central portion of this planning area is underlain with granitic rocks (SLO County 2013).

Soils

The predominant soil textures found in this planning area include fine loamy, coarse loamy, loamy upland, and clayey.

Expansive Soils

In the planning area, 65,925 acres of soils have a high shrink-swell potential, located primarily in the northeastern portion of the planning area. Primarily in the northern and western portions of the planning area, 494,844 acres of soil have a medium shrink-swell potential (SLO County 2013).

Soil Erosion

In the North County Planning Area, 387,193 acres of soils, located in the middle elevations of mountain ranges found throughout the planning area, are classified as having a high susceptibility to wind erosion (Wind Erodibility Groups 6–8). There are 306,523 acres of soils classified as having a moderate susceptibility for wind erosion (Wind Erodibility Groups 4, 4L, and 5); these are located primarily in the northern and western portions of the planning area.

The planning area has 668,748 acres of soils classified as having a moderate potential for erosion from water, located primarily along the slopes of the middle elevations of mountain ranges found throughout the planning area (SLO County 2013).

Corrosive Soils

In the North County Planning Area, 18,080 acres of soil, located primarily in the Santa Lucia Range, are identified as being highly corrosive to concrete. There are 185,730 acres of soils identified as being moderately corrosive to concrete; these are located primarily in the northeastern and central portions of the planning area.

Throughout the northern and western portions of the planning area are 404,671 acres of soils identified as being highly corrosive to steel. Located throughout eastern, central, and far western portions are 263,471 acres of soils identified as being moderately corrosive to steel (NRCS 2014; SLO County 2013).

Subsidence

The County Board of Supervisors has certified LOS III status for the Paso Robles Groundwater Basin. Due to the high levels of water table drawdown that have occurred in this basin, land subsidence is a possible risk for the 409,600 acres, or 640 square miles, of land overlying this groundwater subbasin. Studies done in the area reveal that a location 3 miles northeast of Paso Robles has shown a downward displacement from 0.6 to 2.1 inches (SLO County 2011).

Faulting and Seismicity

Active Faults

Approximately 15 miles of active fault lines traverse the western portion of the North County Planning Area. These fault lines run parallel to the Temblor Range (SLO County 2013).

Landslides

In the North County Planning Area, 14,417 acres of soils are identified as having a very high potential for landsliding, located primarily in the western portion. A high potential for landsliding has been identified for 437,640 acres of soils on lands located throughout the majority of the planning area, primarily in the west central and southern regions. In addition, 422,885 acres of soils have a moderate potential for landsliding (SLO County 2013).

Liquefaction

There are 9,286 acres of land identified as having a high potential for liquefaction and 100,144 acres of soils with a moderate potential. These lands are located primarily in the riverine valleys of the North County Planning Area (SLO County 2013).

Mineral Resources

Of the seven Energy and Extractive Resource Areas (EX) in San Luis Obispo County, four are located in the North County Planning Area. These include Huerhuero Creek in the central portion; Lime Mountain Mine and Klau Mine, both in the western portion; and the Standard Oil Company Tank Farm in the southern portion of the planning area.

Of the six Extractive Resource Areas (EX1) in the county, four are located in this planning area: La Panza Granitics, an area along the Navajo Creek, and two areas designated along the Salinas River (SLO County 2014a).

SAN LUIS OBISPO PLANNING AREA

Geology and Topography

The San Luis Obispo Planning Area is located in the central western portion of the county, inland from the Coastal Zone. The Santa Lucia Range abuts the northeastern border of the planning area. The Trish Hills traverse most of the southern portion of the planning area, with the Los Osos Valley running through the central region of the planning area (DeCourten 2010).

The predominant geologic units in the San Luis Obispo Planning Area include the Franciscan mélange, which underlies most of the northeastern portion. The Miguelito Member of the Pismo Formation underlies most of the southwestern portion of this planning area. Undifferentiated alluvium underlies much of the south central portion.

Soils

The predominant soil textures found in this planning area include shallow gravelly fine loamy, loamy claypan, and clayey (SLO County 2013).

Expansive Soils

The planning area has 18,409 acres of soils with a high shrink-swell potential and 44,082 acres of soils with a medium shrink-swell potential (SLO County 2013).

Soil Erosion

In the San Luis Obispo Planning Area, 69,074 acres of soils are classified as having a high susceptibility to wind erosion (Wind Erodibility Groups 6–8); these are located throughout the planning area, primarily in the higher elevations of the Santa Lucia Range and the Trish Hills. In the middle elevations of the Santa Lucia Range and the Trish Hills are 28,942 acres of soils classified as having a moderate susceptibility for wind erosion (Wind Erodibility Groups 4, 4L, and 5).

The planning area has 45,607 acres of soils classified as having a moderate potential for erosion from water, located throughout the planning area (SLO County 2013).

Corrosive Soils

Scattered throughout the planning area are 7,575 acres of soils identified as being moderately corrosive to concrete, while 20,422 acres of soils have been identified as being highly corrosive and 44,922 acres of soils identified as being moderately corrosive to steel.

Subsidence

The County Board of Supervisors has certified LOS III status for the Los Osos Groundwater Basin. Due to the high levels of water table drawdown that have occurred in this basin, land subsidence is a possible risk for the 6,990 acres of land overlying this groundwater basin.

Faulting and Seismicity

Active Faults

As previously discussed, the Los Osos Fault Zone, an Alquist-Priolo Fault Zone, traverses the San Luis Obispo Planning Area.

Landslides

In the San Luis Obispo Planning Area, 3,894 acres of soils are identified as having a very high potential for landsliding, located primarily in the northern and southern fringes of the planning area. There are 49,923 acres of soils identified as having a high potential for landsliding. These lands make up the bulk of the San Luis Obispo Planning Area and are located primarily in the central region. In addition, 14,498 acres of soils with a moderate potential for landsliding are located in the southern portion of the planning area (SLO County 2013).

Liquefaction

In this planning area, 627 acres of soils are identified as having a high potential for liquefaction and 12,475 acres of soils with moderate potential (SLO County 2013).

Mineral Resources

A portion of the Diablo Canyon Nuclear Power Plant is located in the Energy and Extractive Resource Area in the San Luis Obispo Planning Area. The planning area has no Extractive Resource Areas (EX1).

SOUTH COUNTY PLANNING AREA

Geology and Topography

The South County Planning Area generally consists of the land south and east of the city of San Luis Obispo to the Santa Barbara county line, between the Coastal Zone and the Carrizo Plain. The Caliente Range traverses most of the eastern half of this planning area. The topography toward the western part of the planning area includes Huasna Valley, Nipomo Valley and Mesa, Lopez Canyon, Newsom Ridge, and Temettate Ridge.

The predominant geologic units in the South County Planning Area include a sandstone and clay shale conglomerate, which underlies much of the north central portion. Undifferentiated alluvium underlies much of the southern and southwestern portions of the South County Planning Area. The Monterey Formation underlies the central western portions of the planning area, while the Atascadero Formation underlies the south central portion.

Soils

The predominant soil textures found in this planning area include sandy, shallow gravelly fine loamy, north slope gravelly fine loamy, and clayey (SLO County 2013).

Expansive Soils

The planning area has 24,547 acres of soils with a high shrink-swell potential, located primarily in the valley floors in the western portion of the planning area. There are 92,995 acres of soil with a medium shrink-swell potential, located primarily in the planning area's western portions (SLO County 2013).

Soil Erosion

In the South County Planning Area, 269,095 acres of soils classified as having a high susceptibility to wind erosion (Wind Erodibility Groups 6–8), located primarily on valley slopes in the western portion of the planning area. There are 95,414 acres of soils classified as having a moderate susceptibility for wind erosion (Wind Erodibility Groups 4, 4L, and 5), located in the middle elevations of the Caliente Range in the eastern portion and the middle elevations of valley slopes in the southwestern portion of the planning area.

In the higher elevations of the Caliente Range in the southeastern portion of the planning area are 7,528 acres of soils classified as having a high potential for erosion from water. Primarily in the middle elevations of the Caliente Range and along the valley slopes, 267,556 acres of soils in the planning area have been classified as having a moderate potential for erosion from water (SLO County 2013).

Corrosive Soils

In the South County Planning Area, 7,425 acres of soils are identified as being highly corrosive to concrete, located in the southeastern portion of the planning area in the Caliente Range. There are 87,718 acres of soils identified as being moderately corrosive to concrete, located primarily in the valley floor areas of the western portion.

There are 60,004 acres of soils identified as being highly corrosive to steel, located primarily in the valley floor areas of the western portion of the planning area, with 122,512 acres of soils identified as being moderately corrosive to steel located throughout (NRCS 2014; SLO County 2013).

Subsidence

There are no groundwater basins in the South County Planning Area with a Certified Level of Severity. Therefore, there is no risk of land subsidence within the planning area.

Faulting and Seismicity

Active Faults

The planning area has approximately 1.5 miles of active fault lines and 111 miles of potentially active fault lines. Both active and potentially active fault lines are located in the Caliente Range in the southeastern portion of the planning area (SLO County 2013).

Landslides

In this planning area, 10,236 acres of land are identified as having a very high potential for landsliding, located primarily in the higher elevations of the Caliente Range, which traverses the majority of the planning area. A high potential for landsliding has been identified for 289,508 acres of land, located primarily in the moderate elevations of the Caliente Range. In addition,

78,122 acres of land have been identified as having a moderate potential for landsliding (SLO County 2013).

Liquefaction

The planning area has 142,845 acres of land identified as having a high potential for liquefaction and 59,522 acres of land with a moderate potential (SLO County 2013).

Mineral Resources

Of the seven Energy and Extractive Resource Areas (EX) in San Luis Obispo County, one is located in the South County Planning Area: the Price Canyon-Ormande Road Oilfield in the planning area's western portion.

Of the six Extractive Resource Areas (EX1) in the county, two are located in the planning area; these include areas along Alamo Creek and the Santa Maria River.

3.6.2 REGULATORY SETTING

STATE

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act aims to mitigate the hazard of surface faulting to structures for human occupancy. Its main purpose is to prevent the construction of buildings used for human occupancy on the surface of active faults. The act only addresses the hazard of surface fault rupture and is not directed toward other earthquake hazards. The Seismic Hazards Mapping Act (discussed below) addresses non-surface fault rupture earthquake hazards, including liquefaction and seismically induced landslides.

The law 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 and controlling new or renewed construction. The law requires that before a project can be permitted, cities and counties must require a geologic investigation to demonstrate that proposed buildings will not be constructed across active faults. An evaluation and written report of a specific site must be prepared by a licensed geologist. If an active fault is found, a structure for human occupancy cannot be placed over the trace of the fault and must be set back from the fault, generally 50 feet (DOC 2009a).

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act of 1990 (Public Resources Code, Chapter 7.8, Sections 2690–2699.6), passed by the Legislature following the 1989 Loma Prieta earthquake, directs the Department of Conservation, California Geological Survey to identify and map areas prone to liquefaction, earthquake-induced landslides, and amplified ground shaking. The purpose of the act is to minimize loss of life and property through the identification, evaluation, and mitigation of seismic hazards.

Staff geologists at the California Geological Survey (CGS), in the Seismic Hazard Zonation Program, gather existing geological, geophysical, and geotechnical data from numerous sources to produce the Seismic Hazard Zone Maps. They integrate and interpret this data

regionally in order to evaluate the severity of the seismic hazards and designate as Zones of Required Investigation those areas prone to liquefaction and earthquake-induced landslides. Cities and counties are then required to use the Seismic Hazard Zone Maps in their land use planning and building permit processes. The Seismic Hazards Mapping Act requires that site-specific geotechnical investigations be conducted within the Zones of Required Investigation to identify and evaluate seismic hazards and formulate mitigation measures prior to permitting most developments designed for human occupancy (DOC 2009b).

California Building Code

California's building codes provide uniform requirements for buildings throughout the state. These requirements are contained in Title 24 of the California Code of Regulations (CCR). The CCR is divided into 28 separate titles based on subject matter or state agency authority. Title 24 is the twenty-fourth title within the CCR and is reserved for state regulations that govern the design and construction of buildings, associated facilities, and equipment. These regulations are also known as the state's "building standards." Title 24 applies to all building occupancies and related features and equipment throughout the state. It contains requirements for a building's structural, mechanical, electrical, and plumbing systems, in addition to measures for energy conservation, sustainable construction, maintenance, fire and life safety, and accessibility. A common misunderstanding is that Title 24 relates only to energy conservation. In fact, it covers a much wider range of requirements for buildings. Specific areas within Title 24 identify certain requirements for solar photovoltaic (PV) installations such as the California Electrical Code, the California Building Code, and the California Residential Code (which applies to residential buildings of one or two units).

Title 24, Part 2, is a portion of the California Building Code. The purpose of the CBC is to provide minimum standards to safeguard life or limb, health, property, and public welfare by regulating and controlling the design, construction, quality of materials, use and occupancy, location, and maintenance of all building and structures within its jurisdiction. The provisions of the CBC apply to the construction, alteration, movement, enlargement, replacement, repair, equipment, use and occupancy, location, maintenance, removal, and demolition of every building or structure or any appurtenances connected or attached to such buildings or structures throughout California (California Building Standards Commission 2014).

Published by the International Conference of Building Officials, the International Building Code is a widely adopted model building code in the United States. The CBC incorporates by reference the International Building Code with necessary California amendments. These amendments include significant building design criteria that have been tailored for California earthquake conditions. Design criteria for seismic loading and other geologic hazards are included in the design standards in the CBC. The CBC provides design criteria for geologically induced loading that govern sizing of structural members and provides calculation methods to assist in the design process.

LOCAL

San Luis Obispo County General Plan – Conservation and Open Space Element

The Conservation and Open Space Element (COSE) of the County's General Plan (adopted in 2010) contains policies intended to protect the county's mineral and soil resources.,COSE Goal MN 2 requires that significant mineral resources "be protected from land uses that threaten their availability for future mining," while other goals recognize the importance of balancing mineral resource extraction with other land uses and community goals. Goals specific to soil resources

describe the need to protect soil resources and the benefits achieved from soil conservation. COSE policies include surveys and monitoring of mineral and soil resources, and ensuring that access to important mineral and soil resources is preserved.

San Luis Obispo County General Plan – Agriculture Element

The General Plan Agriculture Element (revised in 2010) contains policies to protect soil resources of agricultural importance, observing that fertile soils are one of the "essential ingredients for...the unique, diverse, and valuable agricultural resources to be found in San Luis Obispo County" and declaring that "soil characteristics are critical for agriculture." Although many policies related to soil resources are included in the Conservation and Open Space Element, the Agriculture Element includes measures encouraging the county's landowners to adopt soil conservation and erosion reduction practices.

San Luis Obispo County General Plan – Land Use and Circulation Element

The Land Use and Circulation Element (LUCE) is a comprehensive land use document divided into four parts: Part I (Framework for Planning); Part II (The Area Plans); Part III (The Community/Village Plans); and Part IV(The Official Maps). Part I of the Land Use Element, Framework for Planning, contains policies and procedures that apply to the unincorporated area outside the coastal zone, defining how the LUE is used together with the Land Use Ordinance and other adopted plans. Parts II and III of the LUCE address planning areas and sub-areas in the overall county.

These area or community/village plans are adopted as part of the LUCE, while standards are adopted as part of the applicable Land Use Ordinance for that area (Title 22). Area and community/village plans in the LUCE include detailed descriptions of the County's planning areas, specific programs, and associated planning area standards intended to address local planning issues. The area plans also provide maps showing detailed overlays of environmental concern, called combining designations. This overlay distinction requires special design and/or development considerations to provide more detailed review when necessary for environmental issues such as sensitive habitats or geologic hazards. Part IV separates the planning area into land use categories, which define regulations for land uses, density and intensity of use.

Additionally, the LUCE provides policies for land use and transportation. The County's Strategic Growth Principles in the LUCE guide all countywide development, including Principle #3 to "foster distinctive, attractive communities with a strong sense of place." Policies and strategies in the LUCE apply countywide and by planning area. Policies and strategies seek to maintain distinct urban boundaries and protect attractive rural landscapes. The LUCE also uses combining designations to identify areas with characteristics that are either of public value or are hazardous to the public. The special location, terrain, man-made features, plants, or animals of these areas create a need for more careful project review to protect those characteristics or to protect public health, safety, and welfare. Combining designations are established to achieve the following (the following is not an all-inclusive list and only shows goals pertinent to geology and soils):

1) To reduce risks to life and property through proper location and design of structures within areas subject to man-made or natural hazards, such as airports; flooding; or geologic hazards, including active faulting, landsliding, or liquefaction.

2) To inform developers, owners, and prospective buyers of property about potential flood or geologic hazards, supporting reduction of future demands for publicly funded flood control, landslide stabilization, and emergency aid.

3) To enhance property values and increase economic benefits to the county by promoting the tourist trade and interest in the historic, scenic, and environmental amenities of the county.

4) To recognize the importance of continuing availability of mineral and energy resources by avoiding land use decisions which may inhibit the continuing viability of energy and extractive operations and result in unnecessary or premature termination of the use of such resources.

In the county, Geologic Study Areas (GSA) are applied to areas identified in the Alquist-Priolo Geologic Hazard Zones Act as "Special Study Zone" (Public Resources Code Section 2622); to areas within urban and village reserve lines subject to "moderately high to high" landslide risk or liquefaction potential (as identified by the Safety Element of the County of San Luis Obispo General Plan); and to lands outside urban reserve lines subject to high landslide risk potential (also according to the Safety Element). Further, one of the purposes of this element is to implement the sections of the California Public Resources Code (Chapter 7.5, Division 2, also known as the Alquist-Priolo Geologic Hazard Zones Act). As such, it is County policy that the Alquist-Priolo Geologic Hazard Zone Act, the policies and criteria established and adopted by the State Mining and Geology Board, and the Special Studies Zones maps of the State Geologist that affect the county are encompassed in the LUCE.

San Luis Obispo County Land Use Ordinance – Title 22

The Land Use Ordinance (LUO) contains standards for parcels containing important mineral or soil resources. These include ensuring that access to important mineral resources is preserved and that the loss of soil resources is kept to a minimum.

LUO – Energy and Extractive Resource Area (EX) and Extractive Resource Area (EX1) Combining Designation

The LUO delineates several combining designations that are applied throughout the county, including the Energy and Extractive Resource Area (EX) and Extractive Resource Area (EX1) combining designations. The EX Combining Designation, as described in Title 22, Section 22.14.040, is intended for areas with existing or proposed mineral extraction, petroleum exaction, or major public electric generation facilities, or for areas that the state designates as a mineral resource area of state or regional importance. The EX1 Combining Designation, as described in Title 22, Section 22.14.050, is intended for areas that the state designates as containing or highly likely to contain significant mineral deposits. Standards for both combining designations describe the permitting process for resource extraction and electric-generating facilities (electric-generating facilities are subject to the standards of Title 22, Section 22.32) and apply additional permitting and reporting requirements for all other uses.

LUO – Geologic Study Area (GSA)

The LUO includes the Geologic Study Area (GSA) Combining Designation, as described in Title 22, Section 22.14.070, which is applied to areas where geologic and soil conditions may pose a hazard to life and property. Areas under the GSA Combining Designation are subject to increased risk from seismic activity, landslides, and/or liquefaction. The combining designation

requires a geology and soils report for most land use permit applications and applies additional standards for grading and building siting.

LUO – Sensitive Resource Area (SRA)

The LUO includes the Sensitive Resource Area (SRA) Combining Designation, described in Title 22, Section 22.14.100, which applies to areas "with special environmental qualities, or areas containing unique or endangered vegetation or habitat resources." The standards in the SRA Combining Designation include requirements to prevent loss of soil resources through runoff, to minimize the clearing of topsoil, and to avoid disrupting prominent geological features. Additional standards in the SRA Combining Designation limit surface mining activities.

For an additional discussion of the SRA Combining Designation as it relates to other issues, see Section 3.4, Biological Resources, of this EIR.

LUO – Grading Permit Requirements

Title 22, Section 22.52.050 establishes the requirement for grading permits in the county. Unless exempt under Title 22, Sections 22.52.070 and 22.52.080, grading permits are required for (1) projects moving more than 50 cubic yards of earthwork, (2) activities within a watercourse that involves the movement of more than 20 cubic yards of earthwork, or (3) removal of more than 1 acre of vegetation. Projects that are otherwise exempt from grading permit requirements may also be required to comply with some sections of the Grading and Drainage chapter of the LUO (Title 22, Chapter 22.52).

An additional discussion of grading permit standards is located in Section 3.11, Water Resources, of this EIR.

LUO – Planning and Community Area Standards

Within the LUO, Article 9 of Title 22 and other community planning documents require that some types of land use applications or activities in designated areas meet standards to protect geologic and soil resources and to minimize the reduce the risk posed by geologic hazards , in addition to the general countywide standards discussed above. These standards may include more extensive permitting requirements, geologic and soil surveys, or other protective measures.

LUO – Development Standards and General Requirements

Section 22.32.030.D requires that areas cleared of vegetation and topsoil during construction be restored (regraded, covered with topsoil, and replanted) once those disturbed areas are no longer required for operation.

Summary of Local Regulations and Policies

Table 3.6-1 summarizes regulations and policies from the documents described above, including requirements to minimize loss of soil, preserve access to mineral resources, and reduce the threat posed by geological hazards in high-risk areas. Information is organized by planning area. The table also identifies where policies or standards only apply to subareas or land use designations.

A number of standards that indirectly relate to geology and soils, including additional standards for grading, erosion, and runoff, are located other sections of this EIR, including Water Resources, Biological Resources, Hazards and Hazardous Materials, and Agricultural Resources.

TABLE 3.6-1
LOCAL POLICIES AND REGULATIONS FOR GEOLOGY AND SOILS

Applicable Code Section	Summary
Countywide	
Title 22, Section 22.14.040.B.1.c	Proposed uses in the EX Combining Designation not directly related to energy or extraction operations require a Minor Use Permit or Conditional Use Permit.
Title 22, Section 22.14.040.B.2.c	Permit applications in the EX Combining Designation for uses other than resource extraction or electricity generation must include an mineral resource report.
Title 22, Section 22.14.040.B.3	Permit applications in the EX Combining Designation for uses other than resource extraction or electricity generation may not adversely affect the continued operation or expansion of energy or extraction uses.
Title 22, Section 22.14.050.B.2	Permit applications in the EX1 Combining Designation for uses other than resource extraction may not adversely affect the continued operation or expansion of extraction uses.
Title 22, Section 22.14.070.B	Land use permit applications in the GSA Combining Designation must submit a geologic and soils report, with the exception of some residential and agricultural activities, and small-scale remodels and additions.
Title 22, Section 22.14.070.E	With some exceptions, all grading in the GSA Combining Designation must be engineered grading and no structure intended for human occupancy may be located within 50 feet of an active fault trace in an Earthquake Fault Zone.
Title 22, Section 22.14.100.C.5	Projects subject to the standards of the SRA Combining Designation must minimize topsoil clearing and must prevent the loss of soil resources through runoff.
Title 22, Section 22.14.100.D.1	No surface mining is permitted in the SRA Combining Designation, except in areas also designated as the EX Combining Designation (see Title 22, Section 22.14.050).
Title 22, Section 22.14.100.D.4	Projects subject to the standards of the SRA Combining Designation must preserve prominent geological features.
Conservation and Open Space Element, Implementation Strategy MN 2.4.1	Projects in the EX and EX1 combining designations, other than mineral extraction projects, must prepare a mineral resource report and show that they will not adversely affect the operation or expansion of an existing extraction use.
Conservation and Open Space Element, Implementation Strategy SL 1.2.1	Discretionary projects near blueline streams, or in areas of moderate or greater erosion potential, must maintain natural vegetation and topography to the greatest extent feasible.
Conservation and Open Space Element, Implementation Strategy SL 1.2.2	Discretionary projects must restore degraded and eroded areas with native vegetation and other soil conservation techniques to the extent feasible.
Conservation and Open Space Element, Policy MN 2.1	Protect significant mineral and aggregate resources from incompatibles uses, so that the resources may be available for future use.
Conservation and Open Space Element, Policy MN 2.2	Protect existing mineral resource extraction activities from incompatible uses, land use category changes, and land divisions that could affect extraction.

Applicable Code Section	Summary
Conservation and Open Space Element, Policy MN 2.4	Projects requiring a discretionary land use permit may not adversely affect the operation or expansion of an existing extraction use.
Conservation and Open Space Element, Policy SL 1.2	Development or any soil-disturbing activities on steep slopes and ridgelines must implement erosion and sediment control practices.
Conservation and Open Space Element, Policy SL 1.3	Minimize erosion from new development by avoiding steep slopes and limiting site disturbance.
Conservation and Open Space Element, Policy SL 3.1	Conserve soils designated as Important Agricultural Soils.
Carrizo Planning Area	
No additional policies or code specific to the Carrizo Planning Area.	
North County Planning Area	
Title 22, Section 22.94.070.D.2	New roads in the Nacimiento Sub-Area, as part of a project involving new land divisions or requiring a Conditional Use Permit, shall be constructed to minimize erosion.
Title 22, Section 22.94.080.E-F	New development in the Salinas River Sub-Area shall be sited to minimize the loss of prime soils or other soils of agricultural value.
Title 22, Section22.94.074.D.2.b	For certain new land divisions in the Residential Rural land use designation of the Nacimiento Sub-Area, buildings shall be located on soils best suited for septic systems.
San Luis Obispo Planning Area	
Title 22, Section 22.96.040.D	New development in the San Luis Obispo Sub-Area shall be sited to minimize the loss of prime soils and other soils classified as highly productive.
South County Planning Area	
Title 22, Section 22.98.020.E.1.f	All grading activities or site disturbances below the rim of Black Lake Canyon outside of the designated Sensitive Resource Area shall require a grading permit; the permit application shall include a comprehensive erosion and sedimentation control program.
Title 22, Section 22.98.070.B.2-3	All projects on the edge of Nipomo Mesa in the South County Sub-Area shall avoid grading on slopes steeper than 15% and shall address erosion concerns in all Minor Use Permit, Conditional Use Permit, and land division applications. Septic systems within 150 feet of steep bluff slopes shall meet additional design standards.

3.6.3 IMPACTS AND MITIGATION MEASURES

THRESHOLDS OF SIGNIFICANCE

The proposed Program would result in potentially significant impacts if development would result in substantial adverse physical impacts associated with any of the following conditions:

1) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving rupture of a known earthquake fault (as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map), strong seismic ground shaking, seismic-related ground failure, including liquefaction, or landslides or 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 landslide, lateral spreading, subsidence, liquefaction, or collapse.

2) Result in substantial soil erosion or the loss of topsoil.

3) Be located on expansive soil, creating substantial risks to life or property.

4) Be inconsistent with the goals and policies of the County's Safety Element relating to geologic and seismic hazards.

5) Preclude the future extraction of valuable mineral resources.

PROJECT IMPACTS AND MITIGATION MEASURES

Expose People or Structures to Potential Substantial Adverse Effects, Including the Risk of Loss, Injury, or Death Involving Rupture of a Known Earthquake Fault (as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map), Strong Seismic Ground Shaking, Seismic-Related Ground Failure, Including Liquefaction, or Landslides or 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 Landslide, Lateral Spreading, Subsidence, Liquefaction, or Collapse (Threshold 1)

Impact 3-6-1 – Solar Implementation of the proposed Program could result in the exposure of people, structures, and infrastructure to seismic hazards. This impact is considered **less than significant (Class III)**.

Central California, including San Luis Obispo County, is subject to the effects of seismic activity due to the active faults that traverse the county. As discussed in the Existing Setting subsection above, two Alquist-Priolo Special Earthquake Study Zone Faults traverse the county—the San Andreas and the Los Osos fault zones. Because these two fault zones are Alquist-Priolo faults, there is a potential for surface ground rupture during a seismic event along these segments.

Development of solar electric facility (SEF) projects could result in structures being placed and maintained within an Earthquake Fault Zone. However, these structures would not be designed for human occupancy and would not place people at risk of surface rupture or other seismic hazards. In the event that solar panels and associated infrastructure are placed within an Earthquake Fault Zone, GSA performance standards would apply and a geology and soils report would be required. Structures would be designed, engineered, and installed to avoid or withstand surface rupture or other seismic hazards. Additionally, it should be noted that the RESP would not negate or supersede the requirements of the Alquist-Priolo Earthquake Fault Zoning Act.

Development of SEFs in the county, whether roof- or ground-mounted, would be designed in accordance with CBC requirements that address structural seismic safety. All new development would be required to comply with the CBC, which includes design criteria for seismic loading and other geologic hazards, including design criteria for geologically induced loading that govern sizing of structural members and provide calculation methods to assist in the design process and mounting and installation requirements for rooftop solar panels specific to roof types. Thus, while shaking impacts would be potentially damaging, they would also tend to be reduced in their structural effects due to CBC criteria that recognize this potential. The CBC includes provisions for

buildings to structurally survive an earthquake without collapsing and includes measures such as anchoring to the foundation and structural frame design.

Conformance with GSA performance standards, including engineered grading plan requirements where applicable, would reduce impacts related to unstable earth conditions to **less than significant (Class III)**.

Impact 3-6-1 – Wind Implementation of the proposed Program could result in the exposure of people, structures, and infrastructure to seismic hazards. This is a **less than significant (Class III)** impact.

Construction and operation of wind energy conversion system (WECS) projects would not place structures within an Alquist-Priolo Earthquake Fault Zone, would not produce unstable earth conditions, and would not expose people or structures to unstable earth conditions. Only Tier 1 WECS, which would be mounted on a rooftop or existing structure, would be streamlined under this Program. No soil disturbance or excavation would occur, and the WECS would be mounted on structures that were sited and constructed in conformance with the California Building Code.

In the event that WECs projects and associated infrastructure are proposed within an Earthquake Fault Zone, GSA performance standards would apply and a geology and soils report would be required. Structures would be designed, engineered, and installed to avoid or withstand surface rupture or other seismic hazards. Additionally, it should be noted that the proposed Program would not negate or supersede the requirements of the Alquist-Priolo Earthquake Fault Zoning Act.

Development of WECs in the county, whether roof- or ground-mounted, would be designed in accordance with CBC requirements that address structural seismic safety. All new development would be required to comply with the CBC, which includes design criteria for seismic loading and other geologic hazards. As such, the impact would be **less than significant (Class III).**

Impact 3-6-1 – Policy Changes Implementation of the proposed Program could result in the exposure of people, structures, and infrastructure to seismic hazards. This impact is considered **less than significant (Class III)**.

The proposed RE Combining Designation overlaps large portions of the GSA Combining Designation in the county. The GSA Combining Designation indicates areas subject to increased risk from seismic activity, landslides, and/or liquefaction. However, for areas where the proposed RE Combining Designation overlaps with a GSA, all performance standards for that GSA would continue to apply under the proposed Program. Specifically, streamlined Tier 2 and Tier 3 SEF projects would be subject to engineered grading plan requirements to reduce risks to structures, life, and property from unstable/hazardous earth conditions.

The Program would not negate or supersede the requirements of the Alquist-Priolo Earthquake Fault Zoning Act. No structures designed for human occupancy would be placed within a California Geological Survey Earthquake Fault Zone. For areas where the RE Combining Designation overlaps with a GSA, all performance standards for that GSA would continue to apply under the proposed Program. The proposed Program would not result in any policy changes that would increase the likelihood of a structure being placed within an Earthquake Fault Zone, nor would the proposed Program change any of the existing requirements for an unoccupied structure that is placed within an Earthquake Fault Zone.

Similarly, requirements of the California Building Code would continue to apply to all projects proposed under the Program throughout the county. Additionally, the Program does not pertain to the development of structures designed for human occupancy. Therefore, impacts related to unstable earth conditions would be **less than significant (Class III)**.

Result in Substantial Soil Erosion or the Loss of Topsoil (Threshold 2)

Impact 3-6-2 – Solar

Implementation of the proposed Program could result in increased soil erosion or reduce the stability of soils within the project area. This impact is considered **less than significant (Class III)**.

Construction activities for SEFs could include soil disturbance, grading, site leveling, filling of depressions and downslope areas, and excavation of foundations for solar panel support structures, gen-tie lines, telecommunication equipment and structures, switchgear buildings or structures, and security fencing. These construction activities could lead to topographic changes within the project area. These topographic modifications, if improperly designed, could lead to soil erosion, loss of topsoil, and/or unstable soil conditions.

However, all SEFs disturbing more than 50 cubic yards of material or removing more than 1 acre of vegetation would be subject to the County's grading permit requirements (Chapter 22.52 of the County Code), which establish standards to minimize erosion and sedimentation, reduce the harmful effects of stormwater runoff, and otherwise protect the natural environment. Grading permit requirements include submittal of a grading plan and erosion and sedimentation control plan (Section 22.52.120), including protective measures to be taken during construction, such as hydro-mulching, berms (temporary or permanent), interceptor ditches, subsurface drains, terraces, and sediment traps in order to prevent erosion of the cut faces of excavations or of the sloping surfaces of fills. If necessary, a civil engineering report, soil engineering report, and/or engineering geology report could also be required.

In addition, COSE Policies SL 1.2 and SL 1.3 recommend that erosion and sediment control practices are implemented on steep slopes, natural vegetation and topography are retained to the maximum extent feasible in areas designated with at least moderate erosion potential, degraded and eroded areas are restored where feasible by replanting with native vegetation, grading and site disturbance is avoided on slopes over 30 percent, and projects are designed to minimize runoff. Additionally, the retention of natural drainage systems is encouraged. Further, under the proposed Program, sites graded and cleared of natural vegetation and topsoil during construction are required to be restored (regraded, covered with topsoil, and replanted) once those disturbed areas are no longer required for operation (LUO Section 22.32.040.A.3). Soil removed during construction must be stored for later use.

Adherence to the County Land Use Ordinance, COSE Policies SL 1.2 and SL 1.3, and proposed LUO Section 22.32.040.A.3 would reduce impacts to **less than significant (Class III)**.

Impact 3-6-2 – Wind

Implementation of the proposed Program could result in increased soil erosion or reduce the stability of soils within the project area. This impact is considered **less than significant (Class III)**.

Construction and operation of WECS would not increase soil erosion or lead to unstable soils. Only Tier 1 WECS, which would be mounted on a rooftop or existing structure, would be

streamlined under this program. No grading, excavation, or filling would occur.. Impacts would be **less than significant (Class III)**.

Impact 3-6-2 – Policy Changes Implementation of the proposed Program could result in changes to countywide policies that could indirectly result in increased soil erosion or reduce the stability of soils within the project area. This impact is considered **less than significant (Class III)**.

For areas where the RE Combining Designation overlaps with a GSA, all performance standards for the Geologic Study Area would continue to apply under the proposed Program. Similarly, requirements of the California Building Code would continue to apply to all projects streamlined under the proposed Program. Additionally, the proposed Program does not negate or conflict with any County General Plan COSE soil conservation requirements to preserve and protect soil resources from degradation or loss by wind and water erosion (SLO County 2010b). COSE Policy SL 1.2 requires erosion and sedimentation control practices during development or other soil-disturbing activities on steep slopes and ridgelines, while Policy SL 1.3 requires that grading and site disturbance on slopes greater than 30 percent be avoided. Therefore, compliance with General Plan COSE policies and adherence to CBC requirements and the requirements in the Land Use Ordinance for GSA would reduce effects associated with the implementation of the proposed Program and would not result in increased soil erosion or unstable soils. The impact would be **less than significant (Class III).**

Be Located on Expansive Soil, Creating Substantial Risks to Life or Property (Threshold 3)

Impact 3-6-3 – Solar Implementation of the proposed Program could result in structures being sited on expansive soils. This impact is considered **less than significant (Class III)**.

Expansive soils are typically fine grained with a high percentage of clay that is subject to expanding and contracting as soil moisture content fluctuates. Based on the degree of expansion and contraction, damage may occur to building foundations, concrete flatwork, and asphalt or concrete pavements. The county has 134,221 acres of soil with a high shrink-swell potential, located primarily in the lower elevations of the coastal regions of the county. The North County Planning Area has the highest number of acres with high shrink-swell potential, with approximately 66,000 acres of these soils. The South County Planning Area contains approximately 26,000 acres of soils with high shrink-swell potential, followed by the San Luis Obispo Planning Area with approximately 18,000 acres. The Carrizo Planning Area has the lowest number of acres with expansive soils with a high shrink-swell potential, approximately 14,000 acres.

Construction and operation of ground-mounted SEFs could result in structures being placed and maintained on expansive soils. These structures would not be designed for human occupancy and would not place people at risk of geologic hazards. Under the RESP, requirements of the California Building Code would continue to apply to all streamlined projects, and structures located on expansive soils would be designed and engineered to withstand the shrink-swell forces of expansive soils (SLO County 2013). Although Tier 3 SEFs would include a greater number of structures than Tier 1 and Tier 2 SEFs, the risk of exposure to geologic hazards would be the similar and would remain less than significant.. Conformance with California Building Code requirements, which would apply to all streamlined SEFs, would reduce the risk of exposure to geologic hazards (including expansive soils) to **less than significant (Class III)**.

Impact 3-6-3 – Wind Implementation of the proposed Program could result in structures being sited on expansive soils. This impact is considered **less than significant (Class III)**.

Construction and operation of WECS would not place structures on expansive soils. Only Tier 1 WECS, which would be mounted on a rooftop or existing structure, would be streamlined under this program. Therefore, WECS would not be placed on expansive soils, and no impacts under this threshold would occur as a result of streamlined WECS. This impact is **less than significant (Class III)**.

Impact 3-6-3 – Policy Changes Implementation of the proposed Program could result in changes to countywide policies that could indirectly result in placement of structures on expansive soils. This impact is considered **less than significant (Class III)**.

The Program would not negate or supersede the requirements of the California Building Code. No structures designed for human occupancy would be constructed under the proposed Program. The proposed Program would not result in any policy changes that would increase the likelihood of a structure being placed on expansive soils, nor would the proposed Program change any of the existing requirements for an unoccupied structure that is placed on expansive soils. Therefore, this impact is **less than significant (Class III)**.

Be Inconsistent with the Goals and Policies of the County's Safety Element Relating to Geologic and Seismic Hazards (Threshold 4)

The County's Safety Element contains goals and policies to avoid loss of life or damage to structures resulting from fault rupture hazards, ground shaking hazards, liquefaction and seismic settlement, and slope instability and landslides. The intensity and location of these hazards is discussed above under Threshold 1. Also, as discussed above, GSA performance standards and the requirements of the Alquist-Priolo Earthquake Fault Zoning Act and the California Building Code would minimize exposure to geologic and seismic hazards.

Impact 3-6-4 – Solar Implementation of the proposed Program could result in actions or projects that are inconsistent with the County's Safety Element relating to geologic and seismic hazards. This impact is considered **less than significant (Class III)**.

As discussed above under Threshold 1, construction and operation of SEFs would not produce unstable earth conditions. Conformance with GSA performances, which would apply to all streamlined SEFs within a Geologic Study Area, would reduce the risk of exposure to unstable earth conditions to less than significant. In the event solar panels and associated infrastructure are placed within an Earthquake Fault Zone, GSA performance standards would apply and engineered grading would be required. Structures would be designed, engineered, and installed to avoid or withstand surface rupture or other seismic hazards. Although Tier 3 SEFs would include a greater number of structures than Tier 1 and Tier 2 SEFs, the risk of exposure to unstable earth conditions or surface rupture and other seismic hazards would be the similar and would remain **less than significant (Class III)**.

Impact 3-6-4 – Wind Implementation of the proposed Program could result in actions or projects that are inconsistent with the County's Safety Element relating to geologic and seismic hazards. This impact is considered **less than significant (Class III)**.

Construction and operation of WECS would not produce unstable earth conditions and would not expose people or structures to unstable earth conditions. Construction and operation of WECS would not place structures built for human occupancy within an Earthquake Fault Zone. Only Tier 1 WECS, which would be mounted on a rooftop or existing structure, would be streamlined under this program. No soil disturbance or excavation would occur, and the WECS would be mounted on structures that were sited and constructed in conformance with the California Building Code. Exposure to unstable earth conditions or surface rupture would not occur within any of the planning areas, and this impact is considered **less than significant (Class III)**.

Impact 3-6-4 – Policy Changes Changes to countywide policies resulting from implementation of the proposed Program could result in actions or projects that are inconsistent with the County's Safety Element relating to geologic and seismic hazards. This impact is considered **less than significant (Class III)**.

For areas where the RE Combining Designation overlaps with a GSA, all performance standards for that Geologic Study Area would continue to apply under the proposed Program. Similarly, requirements of the Alquist-Priolo Fault Zoning Act and the California Building Code would continue to apply to all projects streamlined under the proposed Program. Additionally, the proposed Program does not pertain to the development of structures designed for human occupancy. Therefore, implementation of the proposed Program would not result in actions or projects that are inconsistent with the County's Safety Element relating to geologic and seismic hazards. This impact is considered **less than significant (Class III)**.

Preclude the Future Extraction of Valuable Mineral Resources (Threshold 5)

Construction and operation of either solar or wind energy projects would not interfere with mineral resource extraction. The highest concentration of valuable mineral resources is found in the North County Planning Area and the San Luis Obispo Planning Area. For areas where the RE Combining Designation overlaps with an Energy and Extractive Resource Area (EX) or an Extractive Resource Area (EX1) combining designation, all standards for the EX and EX1 areas would continue to apply under the proposed Program. These standards include, but are not limited to, the requirement that land uses other than resource extraction may not adversely affect the continued operation or expansion of extraction uses.

In addition, Implementation Strategy MN 2.4.1 under General Plan COSE Policy MN 2.4 requires that projects in the EX and EX1 combining designations, other than mineral extraction projects, prepare a mineral resource report and show that they will not adversely affect the operation or expansion of an existing extraction use and that significant mineral and aggregate resources are protected from incompatibles uses, so that the resources may be available for future use.

Impact 3-6-5 – Solar Implementation of the proposed Program could result in the preclusion of the future extraction of valuable mineral resources. This impact is considered **less than significant (Class III)**.

Although SEFs could occupy up to 160 acres, they would be subject to the LUO requirements of the EX and EX1 combining designations. These requirements would ensure that SEFs are not sited in locations that are reserved or zoned for present or future mineral resource extraction. Therefore, SEFs would not preclude the future extraction of valuable mineral resources. **Less than significant (Class III)** impacts would occur under this threshold as a result of streamlined SEFs.

Impact 3-6-5 – Wind Implementation of the proposed Program could result in preclusion of the future extraction of valuable mineral resources. This impact is considered **less than significant (Class III)**.

Construction and operation of WECS would not place structures on mineral resource extraction lands. Only Tier 1 WECS, which would be mounted on a rooftop or existing structure, would be streamlined under this program. Therefore, WECS would not preclude the future extraction of valuable mineral resources. **Less than significant (Class III)** impacts under this threshold would occur as a result of streamlined WECS.

Impact 3-6-5 – Policy Changes Changes to countywide policies resulting from implementation of the proposed Program could result in preclusion of the future extraction of valuable mineral resources. This impact is considered **less than significant (Class III)**.

The RESP would not negate or supersede the performance standards of the EX or EX1 combining designations. No structures would be sited on lands reserved or zoned for mineral resource extraction under the proposed Program. The proposed Program would not result in any policy changes that would preclude the future extraction of valuable mineral resources. Therefore this impact is **less than significant (Class III).**

CUMULATIVE IMPACTS

Exposure of people or structures to geologic and seismic hazards, and adverse impacts to soil and mineral resources, are issues that need consideration for any construction project. Countywide conditions, programs, and projections, when considered together with the proposed Program, would not result in a cumulative impact due to continued compliance with the requirements of existing laws and regulations, such as the Alquist-Priolo Fault Zoning Act, the California Building Code, and the General Plan policies discussed in Thresholds 1 through 5.

REFERENCES

California Building Standards Commission. 2014. California Building Standards Code (Title 24, California Code of Regulations, 2013 Triennial Edition). http://www.bsc.ca.gov/codes.aspx.

CGS (California Geological Survey). 1989. *Fault Evaluation Report FER-200.*

———. 2010a. Geologic Map of California.

———. 2010b. Fault Activity Map of California.

DeCourten, Frank. 2010. *Geology of Southern California.* Accessed May 1, 2014. http://www.grossmont.edu/garyjacobson/Naural%20History%20150/Geology%20of%20Southern%20California.pdf.

DOC (California Department of Conservation). 2009a. Alquist-Priolo Earthquake Fault Zoning Act. http://www.conservation.ca.gov/cgs/rghm/ap/Pages/index.aspx.

———. 2009b. Seismic Hazards Mapping Act. http://www.conservation.ca.gov/cgs/shzp/Pages/SHMPAct.aspx

Lofgren, B. E., and R. L. Ireland. 1973. *Preliminary Investigation of Land Subsidence in the Sacramento Valley, California.* USGS Open-File Report. Accessed May 1, 2014. http://pubs.usgs.gov/of/1974/1064/report.pdf.

NRCS (Natural Resources Conservation Service). 2014. Web Soil Survey. Accessed May 1. http://websoilsurvey.nrcs.usda.gov/app/.

SLO County (County of San Luis Obispo). 2010a. *County of San Luis Obispo General Plan, Agriculture Element.*

———. 2010b. *County of San Luis Obispo General Plan, Conservation and Open Space Element.*

———. 2011. *Paso Robles Groundwater Basin Management Plan.* Accessed May, 6, 2014. http://www.slocounty.ca.gov/Assets/PL/PR+Groundwater/gwp.pdf.

———. 2013. GIS Data for Soils, Geologic Units, Active Faults, and Mineral Resource Areas.

———. 2014a. *County of San Luis Obispo General Plan, Land Use and Circulation Element.*

———. 2014b. Title 22, Land Use Ordinance.