3.5 Geologic and Mineral Resources

This section addresses the potential impacts to geology, soils, and seismicity associated with implementation of the proposed program. This section provides a description of the regional geology, a summary of the regulations related to geologic and seismic hazards, and an evaluation of the potential impacts that may result from implementing the proposed program and identifies mitigation measures to minimize potential effects. This section also evaluates whether the proposed program would result in a loss of available mineral resources.

3.5.1 Environmental Setting

Regional

The project area is located in the center portion of the Transverse Ranges Geomorphic Province (California Geological Survey [CGS], 2002b). California's geomorphic provinces are naturally defined geologic regions that display a distinct landscape or landforms with unique, defining features based on geology, faults, topographic relief, and climate. This province consists of an east-west trending series of steep mountain ranges and valleys that deviate from the normal northwest trend of other Coastal California geomorphic provinces due to intense north-south compression squeezing the ranges within this province. The east-west structure of the Transverse Ranges is oblique to the normal northwest trend of coastal California, hence the name "Transverse." The province extends offshore to include San Miguel, Santa Rosa, and Santa Cruz islands. The eastern extension, the San Bernardino Mountains, has been displaced to the south along the San Andreas Fault. As a result, this is one of the most rapidly rising regions on earth and it is seismically active. Cenozoic petroleum-rich sedimentary rocks have been folded and faulted, making this an important oil-producing area in the United States. The Los Angeles Basin is in the southern part of the province and separates the Transverse Ranges Province from the Peninsular Ranges Provinces to the south.

Project Area

Topography

The project area is bounded on the northwest by the Santa Monica Mountains, on the northeast by the San Gabriel Mountains, on the southeast by the Orange County coastal plain, and on the west and southwest by the Pacific Ocean. The project area largely consists of the watersheds for the Los Angeles, Santa Clara, San Gabriel Rivers, Santa Monica Bay, and the Dominguez Channel, and includes the Los Angeles Basin and the San Fernando and Santa Clarita Valleys. Topography varies regionally from sea level at the coast to several thousand feet in the surrounding mountains.

Geology

The project area geology consists of Tertiary and older (1.6 million years and older) bedrock mountain ranges and hills surrounding and separating Quaternary and younger (1.6 million years and younger) sediment-filled basins and valleys, as shown in **Figure 3.5-1**, Regional Geology (U.S. Geological Survey [USGS], 1990). To the northwest of the project area, the Santa Monica Mountains have a granitic and metamorphic core covered with marine sedimentary sandstone, shale, and conglomerate rocks. To the northeast of the project area, the San Gabriel Mountains consist mostly of granitic rocks with some metamorphic gneiss and schist rocks. Several lower hills separate the Los Angeles Basin and the San Fernando and Santa Clara Valleys. Marine sediments and erosion of the surrounding mountain ranges and hills within the project area have filled the intervening basins and valleys with thick deposits of sediments. The recent surface sediments are mostly sand and silt. Much of the basin and valley areas have been highly disturbed through development and much of the surface materials consist of undocumented fills.

Seismicity and Faults

This section characterizes the region's existing faults, describes historical earthquakes, estimates the likelihood of future earthquakes, and describes probable groundshaking effects.

Earthquake Terminology and Concepts

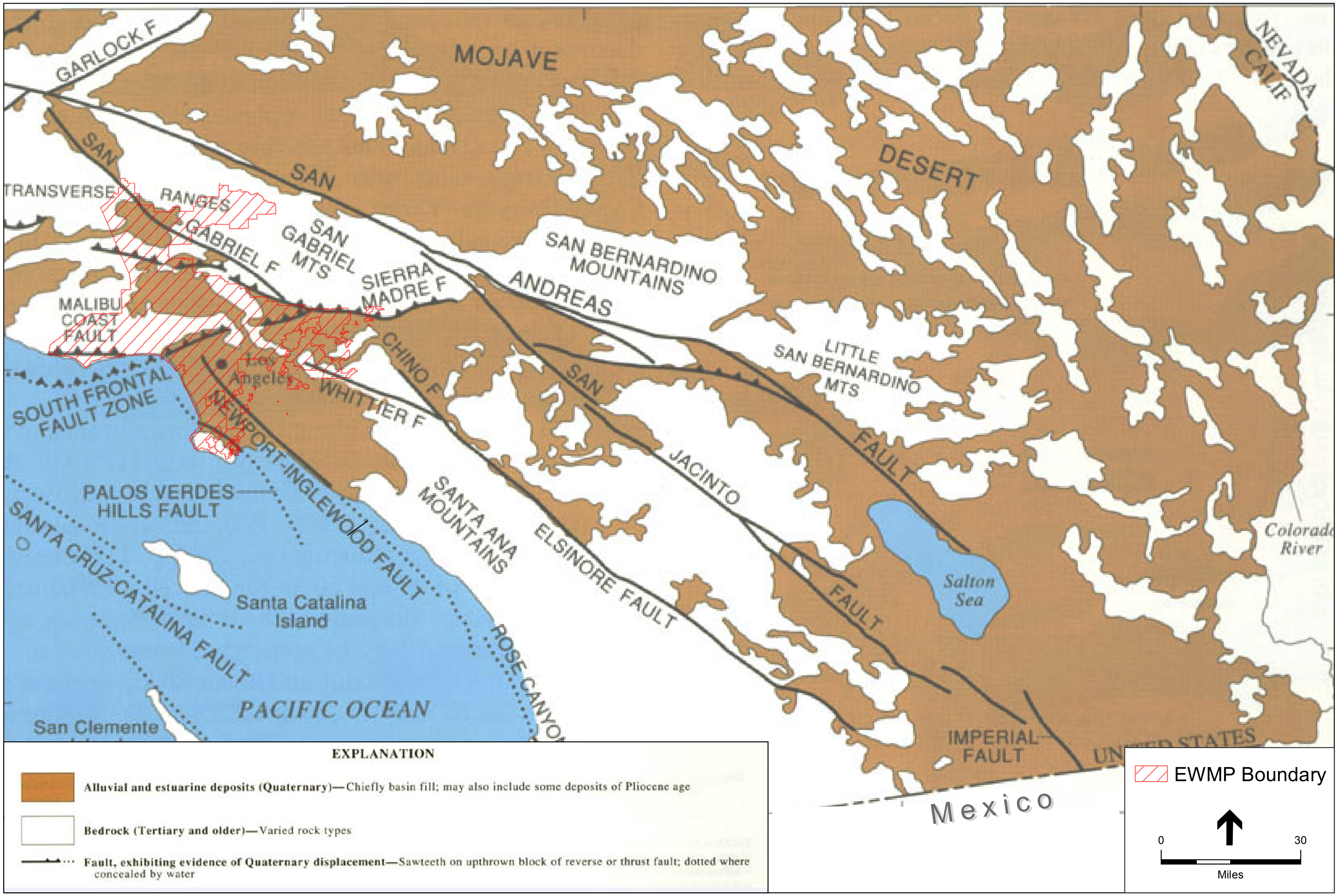
Earthquake Mechanisms and Fault Activity

Faults are planar features within the earth's crust that have formed to release strain caused by the dynamic movements of the earth's major tectonic plates. An earthquake on a fault is produced when these strains overcome the inherent strength of the earth's crust, and the rock ruptures. The rupture causes seismic waves that propagate through the earth's crust, producing the groundshaking effect known as an earthquake. The rupture also causes variable amounts of slip along the fault, which may or may not be visible at the earth's surface.

The State of California defines an active fault as one that has had surface displacement within Holocene time (the last 11,000 years).

Earthquake Magnitude

When an earthquake occurs along a fault, its size can be determined by measuring the energy released during the event. A network of seismographs records the amplitude and frequency of the seismic waves that an earthquake generates. The Richter magnitude (ML) of an earthquake represents the highest amplitude measured by the seismograph at a distance of 100 kilometers from the epicenter. While the Richter magnitude scale was historically the primary measure of earthquake magnitude, seismologists now use the moment magnitude (Mw) scale as the preferred way to express the size of an earthquake (USGS, 2009). The Mw scale is related to the physical characteristics of a fault, including the rigidity of the rock, the size of fault rupture, and the style of movement or displacement across the fault.



SOURCE: USGS, 1990

LA County PEIR WMP . 140474

Figure 3.5-1
Regional Geology

Peak Ground Acceleration

A common measure of ground motion at any particular site during an earthquake is the peak ground acceleration (PGA) (USGS, 2007b). The PGA for a given component of motion is the largest value of horizontal acceleration obtained from a seismograph. PGA is expressed as the percentage of the acceleration due to gravity (g), which is approximately 980 centimeters per second squared. In terms of automobile acceleration, one "g" of acceleration is equivalent to the motion of a car traveling 328 feet from rest in 4.5 seconds. For comparison purposes, the maximum PGA value recorded during the Mw 6.7 1994 Northridge earthquake was 1.8 g, among the highest ever instrumentally recorded in an urban area in North America. Unlike measures of magnitude, which provide a single measure of earthquake energy, PGA varies from place to place and is dependent on the distance from the epicenter and the character of the underlying geology (e.g., hard bedrock, soft sediments, or artificial fills).

Modified Mercalli Intensity Scale

The Modified Mercalli Intensity Scale assigns an intensity value based on the observed effects of groundshaking produced by an earthquake (CGS, 2002a). Unlike measures of earthquake magnitude and PGA, the Modified Mercalli Intensity Scale is qualitative in nature in that it is based on actual observed effects rather than measured values. Similar to PGA, Modified Mercalli values for an earthquake at any one place can vary depending on the earthquake's magnitude, the distance from its epicenter, the focus of its energy, and the type of geologic material. The Modified Mercalli values for intensity range from I (earthquake not felt) to XII (damage nearly total), and intensities ranging from IV to X can cause moderate to significant structural damage. Because the Modified Mercalli scale is a measure of groundshaking effects, intensity values can be correlated to a range of average PGA values, as shown in **Table 3.5-1**.

Faults and Historical Earthquake Activity

The project area is located in a seismically active region of California. Major earthquakes have affected the region in the past and are expected to occur in the near future on one of the active faults in the area. The San Andreas transform fault system, which forms the boundary between the North American and Pacific tectonic plates, is responsible for the highly seismic nature of Southern California. The fault bends in an east-west direction from the Southern end of the San Joaquin Valley to the eastern end of the San Bernardino Mountains. This portion of the San Andreas Fault system is referred to as the "Big Bend" and generates major compression forces, which in turn create many smaller fault branches (SCEC, 2011). The active faults in the vicinity of the project area are shown in **Figure 3.5-2**, Local Faults with Recent Movement.

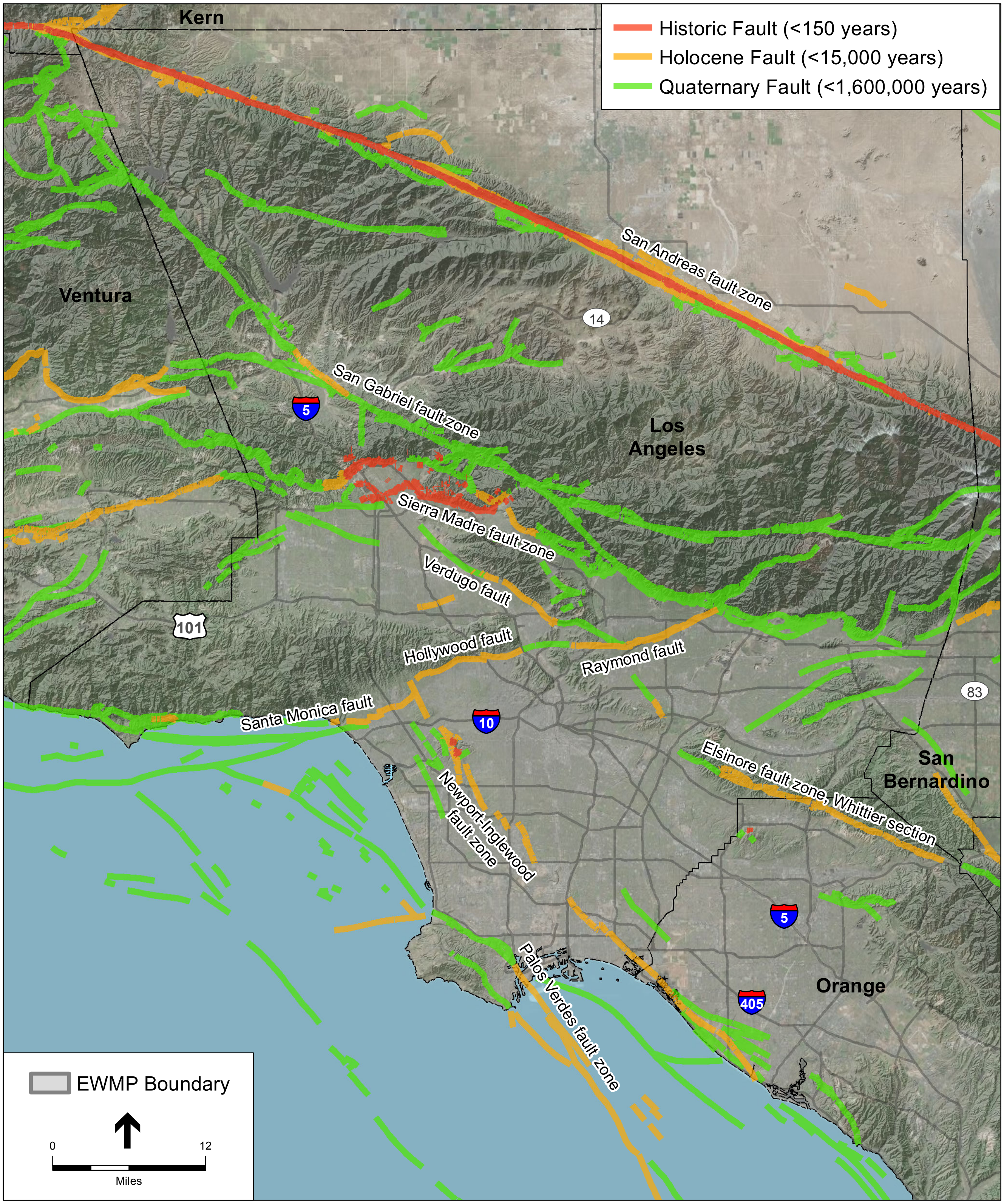
Table 3.5-2 identifies both historically active and active faults in the vicinity of the project area and their corresponding characteristics that are capable of generating significant groundshaking at the proposed EMWP facilities. Two other fault characteristics—the maximum moment magnitude and the slip rate—are also important in determining the potential damage a fault may cause. The maximum moment magnitude of a fault refers to the largest possible earthquake it can experience given its existing geology (USGS, 2009). A fault's slip rate is defined as how fast the two sides of a fault are slipping relative to one another. The fastest moving faults have more and larger earthquakes than faults that do not slip as fast.

TABLE 3.5-1
MODIFIED MERCALLI INTENSITY SCALE

Intensity Value	Intensity Description	Average Peak Ground Acceleration[a]
I	Not felt except by a very few people under especially favorable circumstances.	< 0.0017 g
II	Felt only by a few people at rest, especially on upper floors on buildings. Delicately suspended objects may swing.	0.0017 – 0.014 g
III	Felt noticeably indoors, especially on upper floors of buildings, but many people do not recognize it as an earthquake. Standing automobiles may rock slightly, vibration similar to a passing truck. Duration estimated.	0.0017 – 0.014 g
IV	During the day felt indoors by many, outdoors by few. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing automobiles rocked noticeably.	0.014 – 0.039 g
V (Light)	Felt by nearly everyone, many awakened. Some dishes and windows broken; a few instances of cracked plaster; unstable objects overturned. Disturbances of trees, poles may be noticed. Pendulum clocks may stop.	0.035 – 0.092 g
VI (Moderate)	Felt by all, many frightened and run outdoors. Some heavy furniture moved; fallen plaster or damaged chimneys. Damage slight.	0.092 – 0.18 g
VII (Strong)	Everybody runs outdoors. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable in poorly built or badly designed structures; some chimneys broken. Noticed by people driving automobiles.	0.18 – 0.34 g
VIII (Very Strong)	Damage slight in specially designed structures; considerable in ordinary substantial buildings, with partial collapse; great in poorly built structures. Panel walls thrown out of frame structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. Sand and mud ejected in small amounts. Changes in well water. People driving automobiles disturbed.	0.34 – 0.65 g
IX (Violent)	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb; great in substantial buildings, with partial collapse. Buildings shifted off foundations. Ground cracked conspicuously. Underground pipes broken.	0.65 – 1.24 g
X (Very Violent)	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations; ground badly cracked. Rails bent. Landslides considerable from riverbanks and steep slopes. Shifted sand and mud. Water splashed (slopped) over banks.	> 1.24 g
XI (Very Violent)	Few, if any, masonry structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipelines completely out of service. Earth slumps and land slips in soft ground. Rails bent greatly.	> 1.24 g
XII (Very Violent)	Damage total. Practically all works of construction are damaged greatly or destroyed. Waves seen on ground surface. Lines of sight and level are distorted. Objects are thrown upward into the air.	> 1.24 g

[a] Value is expressed as a fraction of the acceleration due to gravity (g). Gravity (g) is 9.8 meters per second squared. 1.0 g of acceleration is a rate of increase in speed equivalent to a car traveling 328 feet from rest in 4.5 seconds.

SOURCES: Adapted from CGS, 2002a.



SOURCE: ESRI, USGS

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Figure 3.5-2
Local Faults with Recent Movement

TABLE 3.5-2
PRINCIPAL HISTORICALLY ACTIVE AND ACTIVE FAULTS IN THE PROJECT VICINITY

Fault	Maximum Moment Magnitude	Historical Seismicity (Last 150 Years)	Slip Rate (mm/year)	Fault Classification
San Andreas (Mojave section)	7.4	M 7.0 (1899)	30.0	Historically Active
Newport-Inglewood	7.1	M 6.4 (1933)	1.0	Historically Active
Sierra Madre (San Fernando section)	6.7	M 6.4 (1971)	2.0	Historically Active
Whittier-Elsinore	6.8	M 5.9 (1987)	2.5	Historically Active
Palos Verdes	7.3	-	3.0	Active
San Gabriel	7.2	-	1.0	Active
Verdugo	6.9	-	0.5	Active
Santa Monica	6.6	-	1.0	Active
Raymond	6.5	-	1.5	Active
Hollywood	6.4	-	1.0	Active

SOURCES: CGS, 2003, 2010

Seismic Hazards

Seismic hazards are generally classified into two categories: primary seismic hazards (surface fault rupture and groundshaking) and secondary seismic hazards (liquefaction and other types of seismically induced ground failure, along with seismically induced landslides).

Surface Fault Rupture

Seismically induced ground rupture is defined as the physical displacement of surface deposits in response to an earthquake’s seismic waves. The magnitude, sense, and nature of fault rupture can vary for different faults or even along different strands of the same fault. Although future earthquakes could occur anywhere along the length of an active fault, only regional strike slip earthquakes of magnitude 6.0 or greater are likely to be associated with significant surface fault rupture and offset (CDMG and USGS, 1996). It is also important to note that unmapped subsurface fault traces could experience unexpected and unpredictable earthquake activity and fault rupture. Ground rupture is considered more likely along active faults, which are referenced in Figure 3.5-2 and Table 3.5-2. The highest potential for surface faulting is along existing fault traces that have had displacement in the last 11,000 years (Holocene Epoch).

Groundshaking

Groundshaking intensity varies depending on the overall earthquake magnitude, distance to the fault, focus of earthquake energy, and type of geologic materials underlying an area. Geologists and engineers attempt to predict earthquake ground acceleration at sites to improve the structural design of buildings so that the building can withstand earthquake motion and not collapse. A probabilistic seismic hazard assessment describes seismic hazard from earthquakes that geologists and seismologists agree could occur. The analysis takes into consideration the uncertainties in the size and location of earthquakes and the resulting ground motions that can affect a particular site. Given the presence of the known active faults listed in Table 3.5-2, the entire project area is susceptible to seismic groundshaking.

Liquefaction and Lateral Spreading

Liquefaction is the rapid loss of shear strength experienced in saturated, predominantly granular soils below the groundwater level during strong earthquake groundshaking and occurs due to an increase in pore water pressure (VT, 2013). Liquefaction-induced lateral spreading is defined as the finite, lateral displacement of gently sloping ground as a result of pore-pressure buildup or liquefaction in a shallow underlying deposit during an earthquake. The occurrence of this phenomenon is dependent on many complex factors, including the intensity and duration of groundshaking, particle-size distribution, and density of the soil.

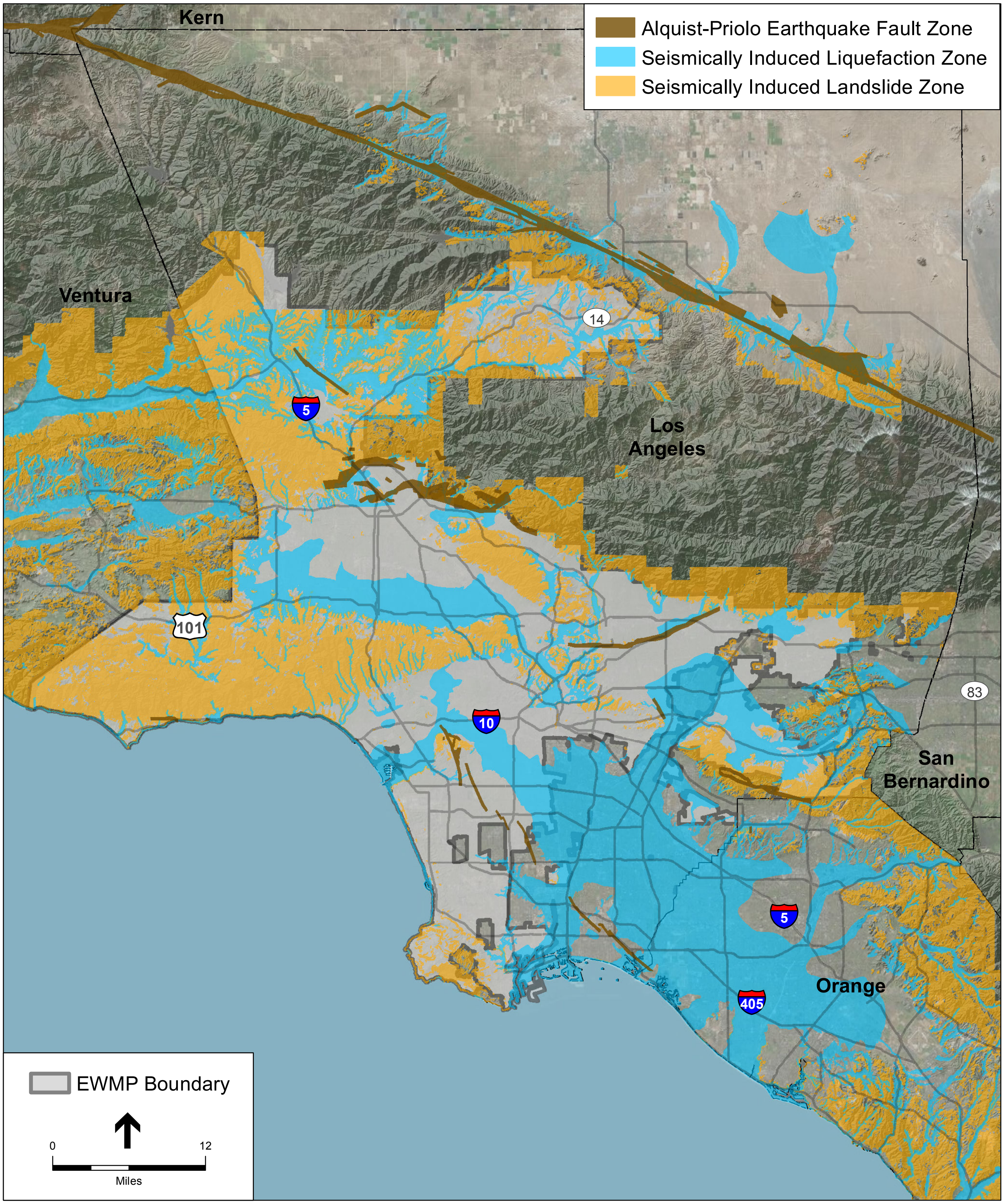
The potential damaging effects of liquefaction include differential settlement, loss of ground support for foundations, ground cracking, heaving and cracking of structures due to sand boiling, and buckling of deep foundations due to ground settlement. Dynamic settlement (i.e., pronounced consolidation and settlement from seismic shaking) may also occur in loose, dry sands above the water table, resulting in settlement of and possible damage to overlying structures. In general, a relatively high potential for liquefaction exists in loose, sandy soils that are within 50 feet of the ground surface and are saturated (below the groundwater table). Lateral spreading can move blocks of soil, placing strain on buried pipelines that can lead to leaks or pipe failure. **Figure 3.5-3**, Liquefaction and Landslide Potential Map, shows areas susceptible to seismically induced liquefaction and landslides within the county.

Earthquake-Induced Settlement

Settlement of the ground surface can be accelerated and accentuated by earthquakes. During an earthquake, settlement can occur as a result of the relatively rapid rearrangement, compaction, and settling of subsurface materials (particularly loose, noncompacted, and variable sandy sediments). Settlement can occur both uniformly and differentially (i.e., where adjoining areas settle at different rates). Areas are susceptible to differential settlement if underlain by compressible sediments, such as poorly engineered artificial fill. Earthquake-induced settlement could occur in the event of an earthquake and is a potential seismic hazard discussed further in the Impact and Mitigations Measures section.

Seismically Induced Landslides

Landslides are defined as the movement of rock, debris, or earth masses down a slope. Landslides are a form of "mass wasting," which refers to any downslope movement of soil and rock under the direct influence of gravity (USGS, 2004). Landslide events include rock falls, topples, slides, spreads, and debris flows. Causes of landslides include rainfall, earthquakes, volcanic activity, groundwater changes, and alteration of a slope by man-made construction activities. Figure 3.5-3, Liquefaction and Landslide Potential Map shows areas susceptible to seismically induced liquefaction and landslides within the County.



SOURCE: ESRI Imagery, California Department of Conservation

Figure 3.5-3
Liquefaction and Landslide Potential Map

Geologic Hazards

Geologic hazards include land movement of problematic soils, including landslides and other slope failures, expansive soils, erosion, settlement and subsidence, and sinkholes. These geologic hazards are discussed below.

Landslides and Slope Failure

As discussed, ground failure is dependent on the slope and geology as well as the amount of rainfall, excavation, or seismic activities. A slope failure is a mass of rock, soil, and debris displaced down a slope by sliding, flowing, or falling. Steep slopes and downslope creep of surface materials characterize landslide-susceptible areas. The areas shown in Figure 3.5-3 that are susceptible to seismically induced landslides and slope failure would also be susceptible to movement from non-seismic causes, such as excavation of the toe of a landslide area or the introduction of excessive water to the head of the landslide area.

Expansive Soils

Expansive soils are clay-rich and subsequently subject to changes in volume with changes in moisture (NRCS, 2013). This results in the shrinking and swelling of expansive soils from changes in water content. Expansive soils can exert pressure on building foundations, “heaving” or lifting buildings during periods of high moisture and resulting in the settlement of buildings during periods of low moisture. They can also exhibit high amounts of pressure on building foundations, resulting in lateral movement. Techniques exist to reduce effects of expansive soils. Such techniques include prewetting of the soil, which allows for pre-expansion of the soil with the idea that further pressure would be minimized, and structural slabs, which provide extra reinforcement to resist movement and distress caused by pressure of underlying expansive soil.

Erosion

Erosion is the wearing away of soil and rock by processes such as mechanical or chemical weathering, mass wasting, and the action of waves, wind, and underground water (NCRS, 2001a, 2001b). Excessive soil erosion can eventually damage infrastructure such as pipelines, wellheads, building foundations, and roadways. In general, granular soils with relatively low cohesion and soils located on steep topography have a higher potential for erosion. In addition, soils erosion can be accelerated beyond natural rates in areas with depleted plant cover and degraded soil structure resulting from excessive disturbance or reduced organic matter input. During construction, exposed soils within the project area would be susceptible to erosion due to stormwater runoff during the rainy season.

Settlement and Subsidence

Settlement of the ground surface can occur under static forces (e.g., due to gravity or groundwater removal) but can also be accelerated and accentuated by earthquakes. As stated previously, during an earthquake, settlement can occur from rapid rearrangement, compaction, and settling of subsurface materials (particularly loose, noncompacted, and variable sandy sediments). Settlement can occur both uniformly and differentially (i.e., where adjoining areas settle at different rates). In addition, areas are susceptible to differential settlement if underlain by compressible sediments, such as poorly engineered artificial fill or poorly graded gravels. The sediments within the basins and valleys are typically alluvium comprised mostly of sand and silt. The potential for settlement would be higher in unconsolidated sediments and lower in consolidated or sediments reworked during development.

Subsidence is a form of settlement defined as the gradual settling or sudden sinking of the earth's surface due to subsurface movement of earth materials. Principle causes include either natural (tectonic movement) or human extraction activities, such as the removal of groundwater, oil, or gas. The extraction activities reduce the pore pressure, increase void spaces, and allow the underlying soils to compact.

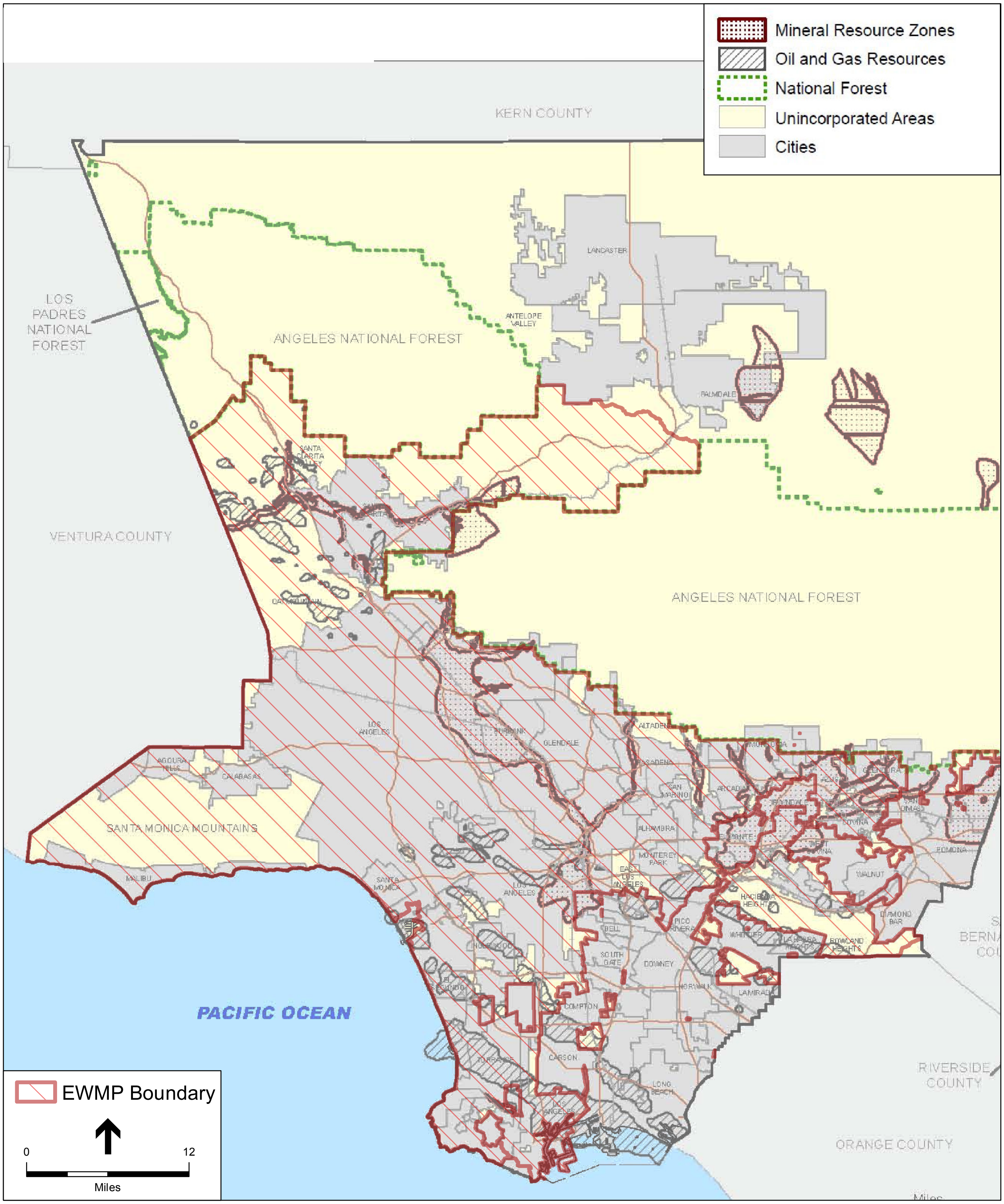
Sinkholes

A sinkhole is an area of ground which has no natural external surface drainage; all water stays inside the sinkhole and rains into the subsurface. Some sinkholes form so slowly they are not noticed, but others form suddenly when a collapse occurs. Sinkholes can have a dramatic effect if they occur in an urban setting. Sinkhole occurrence within Los Angeles County is generally limited but depends on several characteristics, including frequency of drought, type and structure of parent material, changes in groundwater dispersal, and localized topographic conditions, which can directly cause or exacerbate sinkholes (USGS, 2007a).

Mineral Resources

Mineral resources include commercially viable oil and gas deposits, and nonfuel mineral resources deposits. Nonfuel mineral resources include metals such as gold, silver, iron, and copper; industrial metals such as boron compounds, rare-earth elements, clays, limestone, gypsum, salt, and dimension stone; and construction aggregate, including sand, gravel, and crushed stone. **Figure 3.5-4**, Mineral Resources Map, shows the mineral and oil and gas resources zones identified in the draft County General Plan (County of Los Angeles, 2014c).

California is the largest producer of sand and gravel in the nation and the greater Los Angeles area is the nation's leading producer for its geographical size. The County has large quantities of sand and gravel, which are located close to the market. Major sand and gravel extraction sites are located in the alluvial fans of the Big Tujunga Wash in the San Fernando Valley and in the San Gabriel River near Irwindale. Other extraction areas are located in northern Los Angeles County in other washes.



SOURCE: County of Los Angeles, 2014c

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Figure 3.5-4
Mineral Resources Map

3.5.2 Regulatory Framework

State

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act was passed in 1972 to protect structures for human occupancy from the hazard of surface faulting (Bryant and Hart, 2007). In accordance with the Act, the State Geologist established regulatory zones—called earthquake fault zones—around the surface traces of active faults, and published maps showing these zones. Buildings for human occupancy[1] cannot be constructed across surface traces of faults that are determined to be active. Because many active faults are complex and consist of more than one branch that may experience ground-surface rupture, earthquake fault zones extend approximately 200 to 500 feet on either side of the mapped fault trace. Cities and counties must regulate certain development projects within the zones, which includes withholding permits until geologic investigations demonstrate that development sites are not threatened by future surface displacement. Surface fault rupture is not necessarily restricted within an Alquist-Priolo Zone. This applies to the project because structural Best Management Practices (BMPs) would be either prohibited within these fault zones or a geotechnical investigation would be required to develop design features to limit the impact from a seismic event.

Seismic Hazard Mapping Act

The Seismic Hazards Mapping Act was passed in 1990 following the Loma Prieta earthquake to reduce threats to public health and safety and to minimize property damage caused by earthquakes, strong ground shaking, liquefaction, landslides, or other hazards caused by earthquakes. This act requires the State Geologist to delineate various seismic hazard zones, and Cities, Counties, and other local permitting agencies to regulate certain development projects within these zones. Before a development permit is granted for a site within a seismic hazard zone, a geotechnical investigation must be conducted and appropriate mitigation measures incorporated into the project's design. For projects that would locate structures for human occupancy within designated Zones of Required Investigation, the Seismic Hazards Mapping Act requires project applicants to perform a site-specific geotechnical investigation to identify the potential site-specific seismic hazards and corrective measures, as appropriate, prior to receiving building permits. The CGS *Guidelines for Evaluating and Mitigating Seismic Hazards* (Special Publication 117A, CGS, 2008) provides guidance for evaluating and mitigating seismic hazards. The CGS is in the ongoing process of producing official maps based on USGS topographic quadrangles. This act applies to the program because structural BMPs would be either prohibited within these seismic hazard zones or a geotechnical investigation would be required to develop design features to limit the impact from a seismic event.

California Building Code

The California Building Code (CBC), which is codified in Title 24 of the California Code of Regulations, Part 2, was promulgated to safeguard the public health, safety, and general welfare

[1] A habitable building is any structure where human occupancy would exceed approximately 2,000 hours annually.

by establishing minimum standards related to structural strength, egress facilities, and general building stability. The purpose of the CBC is to regulate and control the design, construction, quality of materials, use/occupancy, location, and maintenance of all building and structures within its jurisdiction. Title 24 is administered by the California Building Standards Commission, which, by law, is responsible for coordinating all building standards. Under State law, all building standards must be centralized in Title 24 or they are not enforceable. The provisions of the CBC apply to the construction, alteration, movement, replacement, and demolition of every building or structure or any appurtenances connected or attached to such buildings or structures throughout California.

NPDES Construction General Permit

Construction associated with the proposed program would disturb more than one acre of land surface for centralized and regional structural BMPs (and possibly for those distributed structural BMPs larger than one acre), affecting the quality of stormwater discharges into waters of the United States. The proposed program would therefore be subject to the *NPDES General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities* (Order 2009-0009-DWQ, NPDES No. CAS000002, Construction General Permit [CGP]), as amended by Order 2010-0014-DWQ and Order 2012-0006-DWQ). The CGP regulates discharges of pollutants in stormwater associated with construction activity to waters of the United States from construction sites that disturb one or more acres of land surface, or that are part of a common plan of development or sale that disturbs more than one acre of land surface.

The CGP requires the development and implementation of a Stormwater Pollution Prevention Plan (SWPPP) that includes specific BMPs designed to prevent pollutants from contacting stormwater and keep all products of erosion from moving off-site into receiving waters. The SWPPP BMPs are intended to protect surface water quality by preventing the off-site migration of eroded soil and construction-related pollutants from the construction area. The CGP and SWPPPs are described in more detail in Section 3.8, Hydrology and Water Quality.

Surface Mining and Reclamation Act of 1975

The State Surface Mining and Reclamation Act (SMARA), as amended, is the primary State law governing the conservation and development of mineral resources in California (Health and Safety Code, Division 2, Chapter 9, Section 2710, et seq.). Specifically, it mandates the development of mineral land classifications to help identify and protect mineral resources in areas within the State that are subject to urban expansion or other irreversible land uses that would preclude mineral extraction. After classification of mineral resource zones, SMARA provides for the designation of lands containing mineral deposits of regional or statewide significance, as discussed further below in the CGS section. In addition, SMARA was designed to provide guidelines for the proper reclamation of mineral lands. Local jurisdictions are required to enact specific procedures to guide mineral conservation and extraction at particular sites and to incorporate mineral resource management policies into their General Plans. SMARA applies to the program because structural BMPs would be either prohibited within these mineral resource areas or the local jurisdiction would be required to approve the placement of the structural BMP within the mineral resource zone.

California Geological Survey

Based on guidelines adopted by CGS, areas known as Mineral Resource Zones (MRZs) are classified according to the presence or absence of significant nonfuel mineral resources deposits. Nonfuel mineral resources include metals such as gold, silver, iron, and copper; industrial metals such as boron compounds, rare-earth elements, clays, limestone, gypsum, salt, and dimension stone; and construction aggregate including sand, gravel, and crushed stone. These classifications indicate the potential for a specific area to contain significant mineral resources.

The classification process involves the determination of Production-Consumption (P-C) Region boundaries, based on identification of active aggregate operations (Production) and the market area served (Consumption). The P-C regional boundaries are modified to include only those portions of the region that are urbanized or urbanizing and are classified for their aggregate content. An aggregate appraisal further evaluates the presence or absence of significant sand, gravel, or stone deposits that are suitable sources of aggregate. The classification of these mineral resources is a joint effort of the State and local governments. It is based on geologic factors and requires that the State Geologist classify the mineral resources area as one of the four MRZs, or Scientific Resource Zones (SZs) or Identified Resource Areas (IRAs), which are described as the following (County of Los Angeles, 2014c):

- MRZ-1: Areas where available geologic information indicates there is little or no likelihood for presence of significant mineral resources.
- MRZ-2: Areas where available geologic information indicates that significant measured or indicated resources are present or where adequate information indicates that significant mineral deposits are present or where it is judged that a high likelihood for their presence exists.
- MRZ-3: Areas where available geologic information indicates known or inferred mineral occurrences of undetermined mineral resource significance.
- MRZ-4: Areas of no known mineral occurrences where geologic information does not rule out the presence or absence of significant mineral resources.
- SZ Areas: Containing unique or rare occurrences of rocks, minerals, or fossils that are of outstanding scientific significance shall be classified in this zone.
- IRA Areas: County or State Division of Mines and Geology Identified Areas where adequate production and information indicates that significant minerals are present.

Much of the area within the MRZ sites in Los Angeles was developed with structures prior to the MRZ classification and, therefore, is unavailable for extraction.

Local

County of Los Angeles General Plan

A General Plan is a basic planning document that, alongside the zoning code, governs development in a city or county. The State requires each city and county to adopt a General Plan with seven mandatory elements: land use, open space, circulation, housing, noise, conservation, and safety, along with any number of optional elements as appropriate. The proposed Enhanced

Watershed Management Programs (EWMPs, or “program”) would be subject to the local plans and policies of the areas in which they are located.

The County of Los Angeles is currently updating their General Plan from the element versions adopted in the 1980s and 1990s; the new comprehensive plan is expected to be complete by late 2014. Below are the relevant goals and policies from both the existing General Plan (County of Los Angeles, 1980, 1990) and the Draft General Plan 2035 (County of Los Angeles, 2014a) which relate to the EWMPs.

Existing General Plan – Conservation and Open Space Element, Adopted 1980

Goal – Conserve Natural Areas: The variety and stability of plant and animal communities requires the preservation of important natural habitats. These are threatened by land development and the resultant extension of roads through environmentally sensitive areas.

Policy 12: Protect watershed, stream, and riparian vegetation to minimize water pollution, soil erosion and sedimentation, maintain natural habitats, and aid in ground water recharge.

Goal – Protect Mineral Resources: In the past, valuable mineral resources have been lost when incompatible urban uses were moved into productive areas. These reserves must be protected, and potential sites identified. At the same time, mineral production must not be allowed top conflict seriously with the goals of environmental protection.

Policy 15: Protect and conserve existing mineral resources, evaluate the extent and value of additional deposits, and require future reclamation of depleted sites.

Goal – Protect Public Safety: Our society places high value on human life. Development in areas subject to fires, floods, seismic and geologic hazards can result in loss of life and property, and increased governmental costs. Steep sloping lands are particularly vulnerable to fire, landslide, mudslide and erosion hazards. Protection and proper management of lands subject to these hazards are needed.

Policy 21: Restrict urban development in areas subject to seismic and geologic hazards.

Policy 22: Restrict urban development in flood prone areas, and thus avoid major new flood control works. Maintain natural watershed processes by regulating development in tributary watersheds. Minimize increased runoff, erosion, and siltation of streambeds that would limit the uses of streams and water bodies for recreation and other beneficial water-rated uses.

Existing General Plan – Safety Element, Seismic Hazards, Adopted 1990

Goal: Minimize injury and loss of life, property damage, and the social, cultural, and economic impacts caused by earthquake hazards.

Policy 1: Encourage the use of non-urbanized segments of active fault zones for rural and open space purposes.

Policy 2: Review projects proposing new expansion and construction of new development, especially critical facilities, and encourage them to avoid localities exposed to high earthquake hazards through such techniques as cluster development and transfer of development rights.

Policy 3: Continue enforcement of stringent site investigations (such as seismic, geologic, and soils investigations) and implementation of adequate hazard mitigation measures for development projects in areas of high earthquake hazard, especially those involving critical facilities. Do not approve proposals and projects which cannot mitigate safety hazards to the satisfaction of responsible agencies.

Existing General Plan – Safety Element, Geologic Hazards, Adopted 1990

Goal: Protect public safety and minimize the social and economic impacts from geologic hazards.

Policy 8: Review proposals and projects proposing new development and expansion of existing development in areas susceptible to land sliding, debris flow, and rock falls and in areas where collapsible or expansive soils are a significant problem; and disapprove projects which cannot mitigate safety hazards to the satisfaction of responsible agencies.

Policy 9: Continue to improve and enforce stringent slope investigation and design standards, and to apply innovative hazard mitigation and maintenance plans for development in hillside areas.

Policy 10: Upgrade slope maintenance measures and improve emergency response capability in hillside areas.

Existing General Plan – Land Use Element, Adopted 1980

Goal: Conserve resources and enhance environmental quality.

Policy 26: Protect known mineral resource reserves (including sand and gravel) from encroachment of incompatible land uses.

Draft General Plan, 2014 – Conservation and Natural Resources Element

Goal – C/NR-5: Protected and useable local surface water resources. (Some of these policies also apply to this geology section)

Policy C/NR 5.2: Require compliance by all County departments with adopted Municipal Separate Storm Sewer System (MS4), General Construction, and point source NPDES permits.

Policy C/NR 5.4: Actively engage in implementing all approved Enhanced Watershed Management Programs/Watershed Management Programs and Coordinated Integrated Monitoring Programs/Integrated Monitoring Programs or other County-involved TMDL implementation and monitoring plans.

Policy C/NR 5.6: Minimize point and non-point source water pollution. (This applies to this geology section because this policy would include minimizing erosion that generates sediment)

Goal – C/NR-10: Locally available mineral resources to meet the needs of construction, transportation, and industry.

Policy C/NR 10.1: Protect MRZ-2s and access to MRZ-2s from development and discourage incompatible adjacent land uses.

Draft General Plan, 2014 – Safety Element

Goal S 1: An effective regulatory system that prevents or minimizes personal injury, loss of life and property damage due to seismic and geotechnical hazards.

Policy S 1.1: Discourage development in Seismic Hazard and Alquist-Priolo Earthquake Fault Zones.

Policy S 1.3: Require developments to mitigate geotechnical hazards, such as soil instability and landsliding, in Hillside Management Areas through siting and development standards.

City General Plans

The numerous cities encompassed by the EWMP area all have their own respective city General Plans, which may contain policies that address geology and minerals. As implementation of the individual structural BMP projects proceeds, specific policies and objectives pertaining to geology and minerals from applicable city General Plans would be identified and evaluated on a project-by-project basis during subsequent CEQA environmental processes.

County of Los Angeles Building Code Section 113

Section 113 prohibits the location of most structures for human occupancy across the traces of active faults, and lessens the impacts of fault rupture.

County of Los Angeles Low Impact Development Manual

- The County of Los Angeles (County) prepared the 2014 Low Impact Development Standards Manual (LID Standards) to comply with the requirements of the National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit for stormwater and non-stormwater discharges from the MS4 within the coastal watersheds of Los Angeles County (CAS004001, Order No. R4-2012-0175), referred to as the 2012 MS4 Permit (County of Los Angeles, 2014b). The LID

Standards provide guidance for the implementation of stormwater quality control measures in new development and redevelopment projects in unincorporated areas of the County with the intention of improving water quality and mitigating potential water quality impacts from stormwater and non-stormwater discharges. The November 2013 LID Ordinance became effective December 5, 2013.

City of Los Angeles Low Impact Development Manual

In November 2011, the City of Los Angeles adopted the Stormwater Low Impact Development (LID) Ordinance #181899) with the stated purpose of:

- Requiring the use of LID standards and practices in future developments and redevelopments to encourage the beneficial use of rainwater and urban runoff
- Reducing stormwater/urban runoff while improving water quality
- Promoting rainwater harvesting
- Reducing offsite runoff and providing increased groundwater recharge
- Reducing erosion and hydrologic impacts downstream
- Enhancing the recreational and aesthetic values in our communities

The City institutionalized the use of LID techniques for development and redevelopment projects. Subsequent to the adoption of the Stormwater LID Ordinance, the City prepared the *Development Best Management Practices Handbook, Low Impact Development Manual*, dated June 2011, to describes the required BMPs (City of Los Angeles, 2011).

Other Cities LID

Various other cities within the County also have LID standards or guidance. The goals, objectives, and content of the LID document are similar to that of the County and City of Los Angeles, and are not referenced here.

3.5.3 Impact Analysis

The proposed program's potential impacts were assessed using the California Environmental Quality Act (CEQA) Guidelines Appendix G Checklist. This section discusses the key issue areas identified in the CEQA Guidelines with respect to the project's potential effect to geologic and mineral resources.

Thresholds of Significance

For the purposes of this PEIR and consistency with Appendix G of the CEQA Guidelines, the project would have a significant impact on geologic resources if it would:

- 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 issued by the State Geologist for the area or based on other substantial evidence of a known fault;
  - Strong seismic groundshaking;
  - Seismic-related ground failure, including liquefaction; or
  - Landslides
- Result in substantial soil erosion or the loss of topsoil
- Be located on a geologic unit 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
- Be located on expansive soils, as defined in 24 CCR 1803.5.3 of the CBC (2013)[2]
- Have soils incapable of adequately supporting the use of a septic tank or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater

The project would have a significant impact on mineral resources if it would:

- Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state
- Result in the loss of availability of a locally important mineral resource recovery site delineated on a local General Plan, Specific Plan, or other land use plan

Project Impact Discussion

Exposure to Seismic-Related Hazards

Impact 3.5-1: The proposed program could locate new facilities in areas susceptible to seismic impacts such as (1) rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault, (2) strong seismic groundshaking, or (3) seismically induced liquefaction or landslides, which could expose people, structures, or habitat to potential risk of loss, damage, injury, or death.

Structural (Regional, Centralized, and Distributed) BMPs

The EWMP area lies in a region that is seismically active and includes numerous active faults. In the event of an earthquake, fault rupture and seismic groundshaking could be experienced in the project area, as is typical throughout Southern California. The seismic groundshaking could trigger seismically induced liquefaction, landslides, or other slope failure. As discussed in Section 3.5.1, *Environmental Setting*, and shown in Figure 3.5-2, 10 active faults are known within the project area. Facilities constructed on or within up to 500 feet of an active fault trace could be damaged by fault rupture. Seismic groundshaking and seismically induced liquefaction,

[2] The updated CBC no longer cites the UBC Table 18-1-B for identifying expansive soils. The checklist in Appendix G of the CEQA Guidelines still refers to this out of date table. This PEIR uses the updated CBC section as defined in 24 CCR 1803.5.3 of the CBC (2013).

landslides, or other slope failure could result in structural damage to facilities, which in turn could affect operation of related systems. Regional and centralized BMPs with above-ground infrastructure components that could be seismically impacted include infiltration, bioretention, or detention basins with above ground berms or levees that form the basin. Subsurface infiltration, retention, or storage structures (e.g., trenches, galleries, and wells) and structures generally flush with the surrounding area (e.g., permeable pavement, swales, filter strips, and wetlands) would be less vulnerable to significant seismic damage, but could still be damaged during large earthquakes. Damage to these underground systems include structural damage to the underground vaults, connection to existing MS4, and underdrains that connect to the MS4. Centralized BMPs that consist of large diversion and treatment systems can also experience structural damage under seismic events.

Distributed structural BMPs would be smaller, site- or parcel-specific structures and would therefore be less vulnerable to seismic damage. Although distributed structural BMPs that include above-ground components (e.g., sides or levees to basins, planter boxes, rain barrels, water clarifiers) could be damaged by a seismic event, the resulting release of water would be smaller and less likely to cause significant damage. Damage to these underground systems includes structural damage to the underground vaults, connection to existing MS4, and underdrains that connect to the MS4. For all three structural BMPs, infiltration of water to the underlying soil can result in an increased potential for soil instability and liquefaction.

All of the proposed facilities would be uninhabitable. However, damage to facilities could result in threats to the safety of people in downslope areas or damage to other downslope facilities. To ensure impacts to public safety are minimized, prior to construction of each specific project, a design-level geotechnical investigation would be required. The geotechnical evaluation would identify the potential geologic and seismic hazards and would recommend site-specific design criteria to abate seismic hazards, such as special foundations and structural setbacks, and these recommendations would be incorporated into the design of individual proposed projects.

The geotechnical investigations would be conducted by a geotechnical engineer. Furthermore, project designs would be subject to the CBC design standards and local codes.[3] The California Professional Engineers Act (Building and Professions Code Sections 6700-6799), and the Codes of Professional Conduct, as administered by the California Board of Professional Engineers and Land Surveyors, provide the basis for regulating and enforcing engineering practice in California.

In addition, the County of Los Angeles LID Standards, as well as LID Standards for the various cities, require that all structural BMPs (regional, centralized, and distributed) that include ground-disturbance activities, regardless of size; conduct a site assessment; and identify design considerations. The site assessment specifically includes identifying the potential for fault rupture, seismic shaking, and seismically induced liquefaction and other ground failures. The

[3] A geotechnical engineer specializes in structural behavior of soil and rocks. Geotechnical engineers conduct soil investigations, determine soil and rock characteristics, provide input to structural engineers, and provide recommendations to address problematic conditions or soils.

design considerations must be prepared by a geotechnical engineer and must specifically include design features to minimize or avoid damage from fault rupture and seismic events.

It is likely that the structural elements of each proposed project would be subjected to a moderate to strong earthquake at least once during their operational life which could include surface displacement from fault rupture or seismic shaking. Completion of a comprehensive design-level geotechnical investigation, adherence to the current CBC, LID Standards, and local ordinances and laws regulating construction, and the application of proven seismic design criteria as standard engineering practice would ensure that structures are designed to withstand seismic events without sustaining substantial damage or collapsing. Therefore, this impact is considered less than significant.

Mitigation Measures: None required

Significance Determination: Less than significant

Non-Structural/Institutional BMPs

As discussed in Chapter 2.0, *Project Description*, non-structural/institutional BMPs do not include the construction of new facilities that are susceptible to seismic impacts. Consequently, there would be no new facilities that would place people or structures at risk to injury or damage due to fault rupture. Therefore, this impact would have no impact relative to fault rupture.

Mitigation Measures: None required

Significance Determination: No impact

Soil Erosion or Topsoil Loss

Impact 3.5-2: The proposed program could result in substantial soil erosion or the loss of topsoil.

Structural (Regional, Centralized, and Distributed) BMPs

Construction activities for proposed program facilities such as excavation and grading could result in soil erosion or loss of topsoil during rain or high-wind events. Erosion could damage facilities, pose risk to people, or damage habitat or improvements downslope of a proposed program, resulting in potentially significant impacts. However, each BMP type would generally serve to slow down or fully retain stormwater runoff. This would act to reduce erosion potential compared with existing conditions. Discharge points from centralized and distributed BMPs would be designed to minimize scour potential, and in any case improve scour potential from existing conditions.

To prevent erosion and runoff from construction sites, the CGP requires the preparation and implementation of a SWPPP that would include BMPs to control erosion and off-site sedimentation from construction sites. The required compliance with the SWPPP and implementation of erosion control BMPs would ensure that soil erosion and loss of topsoil would be minimized to levels considered less than significant.

Proposed projects that are smaller than one acre would be required to comply with the BMPs identified in the Los Angeles County MS4 Permit (RWQCB Order No. R4-2010-0175), which would implement minimum-control BMPs to provide erosion control and sediment control strategies for small construction sites (see Chapter 3.8, *Surface Hydrology and Water Quality*, for a more detailed explanation of the MS4 Permit.). Compliance with SWPPPs and runoff BMPs (will vary with the area of disturbance, construction vehicles used, site grade, and duration of project) would ensure less than significant erosion during construction.

Mitigation Measures: None required

Significance Determination: Less than significant

Non-Structural/Institutional BMPs

As discussed in Chapter 2.0, *Project Description*, non-structural/institutional BMPs do not include the construction of new facilities. Consequently, there would be no new facilities that would increase erosion or the loss of topsoil due to the construction of new facilities.

Mitigation Measures: None required

Significance Determination: No impact

Soil Stability

Impact 3.5-3: The proposed program could be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the program, and potentially result in on-site or off-site non-seismically induced geologic hazards such as landslides, lateral spreading, subsidence, collapse or sinkholes, settlement, or slope failure.

Structural (Regional, Centralized, and Distributed) BMPs

Non-seismically-induced geologic hazards such as landslides, lateral spreading, settlement, and slope failure can be caused by unstable soils. Infiltration of water into surficial soils can increase soil instability. Distributed structural BMPs would be smaller, site- or parcel-specific structures and would therefore be less vulnerable to geologic hazards. Although distributed structural BMPs that include above ground components (e.g., sides or levees to basins, planter boxes, rain barrels, water clarifiers) could be damaged by geologic hazards, the resulting release of water would be smaller and less likely to cause significant damage. The regional and centralized structural BMPs that include the construction of larger physical structures would be more susceptible to unstable soils.

Furthermore, infiltration could result in saturated soils, soil piping through preferential pathways, breakouts due to infiltrated water finding utility trenches and other preferential pathways, and raising the local groundwater levels such that infrastructure foundations and underground structures could be affected by unstable soils. Increased saturation of shallow soils could reduce the strength of the soils, resulting in an increased susceptibility to failure (e.g., lateral spreading, settlement, instability, soil piping, reduced or loss of shear strength). In addition, infiltrated water could become perched or find preferential pathways such as utility trenches and potentially inundate or destabilize subterranean structures and utilities, or breakout downstream and damage above ground structures. To ensure that structural BMPs are not undermined by unstable soils or impact adjacent infrastructure and buildings, **Mitigation Measure GEO-1** requires that each specific project would require a design-level geotechnical investigation. The geotechnical evaluation would identify the potential for geologic hazards and would recommend site-specific design criteria to abate geologic hazards, such as drainage barriers, lined trenches, continued monitoring of subsurface conditions, added site drainage, special foundations, and structural setbacks, and these recommendations would be incorporated into the design of individual proposed projects.

Implementing the design requirements in the CBC and local (County and city) ordinances and recommendations of geotechnical investigations would ensure that all structures are constructed in compliance with the applicable laws, regulations, and policies, including the LID Ordinances. Therefore, this impact is considered less than significant.

Mitigation Measures:

GEO-1: Prior to approval of infiltration BMPs, implementing agencies shall conduct a geotechnical investigation of each infiltration BMP site to evaluate infiltration suitability. If infiltration rates are sufficient to accommodate an infiltration BMP, the geotechnical investigation shall recommend design measures necessary to prevent excessive lateral spreading that could destabilize neighboring structures. Implementing agencies shall implement these measures in project designs.

Significance Determination: Less than significant (The application of this mitigation measure to specific BMP types and categories is identified in Table 3.5-3.)

Non-Structural/Institutional BMPs

As discussed in Chapter 2.0, *Project Description*, non-structural/institutional BMPs do not include the construction of new facilities that would be located on a geologic unit or soil that is unstable. Consequently, there would be no new facilities that would increase erosion or the loss of topsoil due to the construction of new facilities.

Mitigation Measures: None required

Significance Determination: No impact

Expansive Soils

Impact 3.5-4: The proposed program could be located on expansive soil as defined in 24 CCR 1803.5.3 of the California Building Code (2013), creating substantial risks to life or structures.

Structural (Regional, Centralized, and Distributed) BMPs

Soil expansion, also referred to as linear extensibility or shrink-swell, occurs in certain clayey soils that when subjected to repeated wetting and drying, undergo shrinking or swelling. As discussed in Section 3.5.1, *Environmental Setting*, some areas within the project area have expansive soil. Soil expansion can occur in expansive soils that have not been removed or properly conditioned. The differential ground movement that occurs through soil expansion could result in structural damage to facilities over the long term, which in turn could affect operation of related systems. Damage to the facilities could result in threats to the safety of people at or near the facilities.

All structural BMPs, regardless of size (regional, centralized, or distributed) would be susceptible to damage from soil expansion if placed on susceptible soil. Some distributed structural BMPs would be less or not susceptible (e.g., bioswales, planter boxes, flow-through treatment BMPs [debris booms/nets, end-of-pipe nets, floating trash booms]) because soil expansion beneath these BMPs, if any, would not result in significant damage.

Completion of a comprehensive design-level geotechnical investigation, implementing the design requirements in the CBC and local (County and city) ordinances, and ensuring that all structures are constructed in compliance with the applicable laws, regulations, and policies, including the LID Ordinances, would ensure that structural BMPs are constructed in a manner that avoids impacts from expansive soils. Therefore, this impact is considered less than significant.

Mitigation Measures: None required

Significance Determination: Less than significant

Non-Structural/Institutional BMPs

As discussed in Chapter 2.0, *Project Description*, non-structural/institutional BMPs do not include the construction of new facilities. Therefore, this impact would have no impact relative to expansive soils.

Mitigation Measures: None required

Significance Determination: Less than significant

On-Site Wastewater Treatment Systems

Impact 3.5-5: The proposed program could have soils incapable of adequately supporting the use of a septic tank or alternative wastewater treatment systems where sewers are not available for the disposal of wastewater.

Implementation of the proposed program would not include facilities that require the use of septic systems or alternate wastewater disposal systems where sewers are not available for the disposal of wastewater. Therefore, no impact would occur related to soil suitability for septic or alternative wastewater disposal systems.

Mitigation Measures: None required

Significance Determination: No impact

Mineral Resources

Impact 3.5-6: The proposed program could result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state or a locally important mineral resource recovery site delineated on a local General Plan, Specific Plan, or other land use plan.

Structural (Regional, Centralized, and Distributed) BMPs

The EWMP project area includes mineral resource areas in Los Angeles County that contain known or potentially productive petroleum fields, natural gas, construction aggregate, and mineral deposits. If the construction of a specific proposed program occurred within a mineral resources area, the access to or availability of that mineral resource could be restricted or eliminated.

Typical distributed structural BMPs would be constructed within areas that are already urbanized and disturbed, and would therefore not be available for mineral resource activities. Regional or centralized structural BMPs could be constructed in locations that are not already urbanized and are located within a designated MRZ, specifically an MRZ-2, an area with known mineral resources. Siting projects within designated MRZs could be conducted if the BMPs do not impede access to the mineral resources. In any case, siting large and small BMPs would need to comply with local and County General Plan zoning restrictions. Compliance with local General Plans and the County of Los Angeles General Plan would ensure that impacts to mineral resources would be less than significant.

Mitigation Measures: None required

Significance Determination: Less than significant

Non-Structural/Institutional BMPs

As discussed in Chapter 2.0, *Project Description*, Non-structural/institutional BMPs do not include the construction of new facilities. Consequently, there would be no new facilities that would affect mineral resources. Therefore, this impact would have no impact.

Mitigation Measures: None required

Significance Determination: Less than significant

Cumulative Impact Discussion

Structural (Regional, Centralized, and Distributed) BMPs

Although the EWMP area is located within a seismically active region, with a wide range of geologic and soil conditions, these conditions can vary greatly within a short distance, making the cumulative context for potential impacts one that is typically more localized. Consequently, most projects would have minimal potential to impact or be impacted by other projects. Impacts would be largely contained within the footprint of each individual proposed project.

Many of the distributed BMPs, as well as the larger-scale regional and central BMPs, would include infiltration as a primary component. Consequently, many infiltration projects could be implemented within each watershed. This would result in a significant amount of water infiltrated into the subsurface, which would saturate some shallow soils below the infiltration basins and raise groundwater levels. A general rise in groundwater levels due to stormwater retention and infiltration would provide water supply benefits to the region, but could also raise groundwater levels above current levels. A regional increase in the amount of infiltration added to subsoils throughout the urbanized areas where the structural BMPs will be installed may increase the potential for impacts to existing infrastructure and buildings. To ensure that structural BMPs are not undermined by unstable soils or impact adjacent infrastructure and buildings, each specific project would require a design-level geotechnical investigation. The geotechnical evaluation would identify the potential for geologic hazards and would recommend site-specific design criteria to abate geologic hazards, such as drainage barriers, lined trenches, continued monitoring of subsurface conditions, added site drainage, special foundations, and structural setbacks, and these recommendations would be incorporated into the design of individual proposed projects. Implementation of these requirements for a geotechnical investigation, assessment, and design recommendation for structural BMPs that include adding flows by infiltration and filtration to the subsurface should address the potential for cumulative impacts.

All the groundwater basins in Los Angeles County are actively used for multiple beneficial uses; most are designated as drinking water sources. The potential for groundwater levels to rise high enough to impact structural foundations and other support structures is low since the aquifers are generally over 100 feet below ground surface and are actively managed by overlying users. Furthermore, targeted pumping in areas with elevated groundwater levels would mitigate any soil stability issues. However, water levels may rise in local areas with limited extraction capabilities.

In addition, percolating water could become perched or find preferential pathways such as utility trenches and inundate underground utilities or structures. The cumulative effect of multiple infiltration projects could increase the severity of the perched or migrating water. However, Mitigation Measure GEO-1 would require that BMPs be designed to avoid infiltrating in areas with the potential for perched groundwater or migration. This would minimize the cumulative impact to regional infrastructure.

In addition, groundwater managers in each of the watersheds currently manage pumping effectively to prevent impacts to structural foundations resulting from groundwater mounding from existing recharge efforts. Under existing conditions, in areas with chronically high groundwater levels, dewatering operations are installed, and the water is beneficially used wherever possible. Implementation of **Mitigation Measure GEO-2** would require that the Implementing Agency notify groundwater managers of local infiltration projects to provide better coordination between stormwater retention and groundwater levels management. With this coordination, the potential contribution to cumulative effects to soil stability from elevated groundwater levels would be considered less than significant.

Significance Determination before Mitigation: Potentially significant

Mitigation Measures:

GEO-2: Prior to installing BMPs designed to recharge the local groundwater supplies, the Implementing Agency shall notify local groundwater managers, including the Upper Los Angeles River Area Water Master, the Water Replenishment District of Southern California, or the San Gabriel Water Master as well as local water producers such as local municipalities and water companies. The Implementing Agency shall coordinate BMP siting efforts with groundwater managers and producers to mitigate high groundwater levels while increasing local water supplies.

Significance Determination after Mitigation: Less than significant (The application of this mitigation measure to specific BMP types and categories is identified in Table 3.5-3.)

Non-Structural (Institutional) BMPs

As discussed in Chapter 2.0, *Project Description*, non-structural/institutional BMPs do not include the construction of new facilities. Consequently, there would be no new facilities that would contribute to cumulative impacts.

Mitigation Measures: None required

Significance Determination: Less than significant

3.5.4 Summary of Impact Assessment

Table 3.5-3 shows a summary of the structural BMPs requiring mitigation.

TABLE 3.5-3
SUMMARY OF GEOLOGIC RESOURCE IMPACTS REQUIRING MITIGATION MEASURES

	Thresholds of Significance						
Structural BMPs	**Exposure to Seismic-Related Hazards**	**Soil Erosion or Topsoil Loss**	**Soil Stability**	**Expansive Soils**	**On-Site Wastewater Treatment Systems**	**Mineral Resources**	**Cumulative Impacts**
Applicable Mitigation Measures:	**None Required**	**None Required**	**GEO-1**	**None Required**	**None Required**	**None Required**	**GEO-2**
Regional BMPs							
Regional Detention and Infiltration	No	No	No	No	No	No	Yes
Regional Capture, Detention and Use	No	No	No	No	No	No	Yes
Centralized BMP							
Bioinfiltration	No	No	No	No	No	No	Yes
Constructed Wetlands	No	No	No	No	No	No	Yes
Treatment/Low-Flow Diversions	No	No	No	No	No	No	Yes
Creek, River, Estuary Restoration	No	No	No	No	No	No	Yes
Distributed BMPs							
Site-Scale Detention	No	No	No	No	No	No	Yes
LID – Infiltration/Filtration BMPs – Porous Pavement, Green Streets, Bioswale/Filter Strips, Downspout Disconnects	No	No	No	No	No	No	Yes
LID – Green Infrastructure – Capture and Use – Cisterns, Rain Barrels, Green roofs, Planter Boxes	No	No	No	No	No	No	Yes
Flow through Treatment BMPs	No	No	No	No	No	No	Yes
Source-Control Treatment BMPs (catch basin inserts/screens, hydrodynamic separators, gross solids removal devices)	No	No	No	No	No	No	Yes
Low-Flow Diversions	No	No	No	No	No	No	Yes

NOTE: These conclusions are based on typical BMP size and location.