Chapter 9—Geology, Soils, Seismicity, and Mineral Resources

9.1 Introduction

This chapter describes the existing conditions (environmental and regulatory) and assesses the potential geologic, soils, seismic, and mineral resources impacts of the 2020 Metropolitan Transportation Plan/Sustainable Communities Strategy (proposed MTP/SCS). Where necessary and feasible, mitigation measures are identified to reduce these impacts.

The information presented in this chapter is based on a review of existing and available information and is regional in scope. Data, analysis, and findings provided in this section were considered and prepared at a programmatic level. Paleontological resources are addressed in Chapter 7 – Cultural, Paleontological, and Tribal Cultural Resources. Naturally occurring asbestos is addressed in Chapter 10 – Hazards, Hazardous Materials, and Wildfire. SACOG did not receive any comments regarding geology, soils, seismicity, or mineral resources in response to the Notice of Preparation (NOP). Appendix PD-1 includes all NOP comments received.

9.2 Environmental Setting

9.2.1 Geology and Topography

Figure 9-1 provides a geologic map of the SACOG region. As illustrated in Figure 9-1, the eastern portion of the plan area is composed of marine sedimentary, plutonic, and volcanic rock; the western portion of the plan area of the proposed MTP/SCS is primarily sedimentary rock.

The plan area of the proposed MTP/SCS is located in a broad area that extends across three of California’s 11 geomorphic provinces: from the Coast Ranges on the west, across the Great Valley, to the Sierra Nevada on the east. The Coast Ranges geomorphic province, which is characterized by northwest-trending mountain ranges and valleys, formed over the past 10 million years by active uplift related to complex tectonics of the San Andreas fault and plate boundary system (Atwater and Stock 1998; Norris and Webb 1990). The larger drainages in this province preserve several generations of alluvial fan and stream deposits ranging in age from Pleistocene to Holocene (Graymer et al. 2002; Wagner and Bortugno 1982).

Comprising the center of the plan area of the proposed MTP/SCS, the Great Valley geomorphic province is a large, elongate, northwest-trending asymmetric structural trough filled with an extremely thick sequence of predominantly alluvial sediments ranging in age from Jurassic to Recent. This asymmetric geosyncline has a long, stable eastern shelf supported by the subsurface continuation of the granitic Sierran slope and a short western flank expressed by the upturned edges of the basin sediments (Hackel 1966).

The Sierra Nevada geomorphic province is a massive block of the earth’s crust that has broken free on the east along the Sierra Nevada fault system and tilted westward. It is overlapped on the west by sedimentary rocks of the Great Valley geomorphic province and on the north by volcanic sheets extending south from the Cascade Range.
Figure 9-1
Geologic Map of the SACOG Region
The topographic features of the plan area of the proposed MTP/SCS vary, depending upon physiography. In the west, the plan area of the proposed MTP/SCS is typical of an alluvial valley influenced by sediment introduction from the Sierra Nevada and its foothills. From southwest to northeast, topographic features consist of the Sacramento-San Joaquin Delta (Delta), flat alluvial valleys, river floodplains and channels, low alluvial plains and fans, and dissected uplands. The eastern portion of the plan area of the proposed MTP/SCS generally consists of rocky foothills that increase in elevation to the east to become the Sierra Nevada crest. Elevations presently range from below sea level on the western edge of the plan area to over 10,000 feet on the Sierra Nevada crest at the eastern edge.

**Unique Geological Resources**

Key geological features in the plan area of the proposed MTP/SCS include the Sutter Buttes in Sutter County, which are a small circular complex of eroded volcanic lava domes that rise as buttes above the flat plains of the Sacramento Valley. In western Yolo County, Berryessa Snow Mountain National Monument includes several mountains that were once Jurassic seamounts. The gold deposits in the Mother Lode are a unique geologic resource in the Sierra Nevada.

### 9.2.2 Seismicity

Seismic hazards include earthquake fault ground rupture and ground shaking (primary hazards), and liquefaction and earthquake-induced slope failure (secondary hazards). When compared to other areas of the state (e.g., the San Francisco Bay Region), the plan area of the proposed MTP/SCS is not located in a very seismically active region. However, earthquakes have occurred in the vicinity of the plan area of the proposed MTP/SCS and are expected to occur again. Accordingly, ground shaking and liquefaction are the most critical seismic hazards in the plan area of the proposed MTP/SCS.

**Surface Rupture and Faulting**

The purpose of the Alquist-Priolo Earthquake Fault Zoning Act of 1971 (Alquist-Priolo Act). (Public Resources Code [PRC] Section 2621 et seq.) is to regulate development near active faults to mitigate the hazard of surface rupture. As defined under the Alquist-Priolo Act, an active fault is one that has had surface displacement within Holocene time (about the last 11,000 years). An early Quaternary fault is one that has had surface displacement during Quaternary time (the last 1.6 million years). A Pre-Quaternary fault is one that has had surface displacement before the Quaternary period (Hart and Bryant 1997).

Figure 9-2 depicts fault lines within the SACOG region. El Dorado County does not have any active faults; however, one fault that is part of the Rescue Lineament-Bear Mountain fault zone is potentially active. In Yolo County, the Hunting Creek Fault is an active fault located in the extreme northwestern corner of the County, with only a very short section of the fault located within the county. Most of the trace is located in Lake and Napa counties. The Dunnigan Hills Fault is the only other potentially active fault within the plan area of the proposed MTP/SCS, which is also located in an unincorporated area of Yolo County to the west of Interstate 5, between Dunnigan and the community of Yolo.

Although recent evidence suggests that buried thrust and inferred faults may located within the plan area of the proposed MTP/SCS, these faults do not have surface ruptures and are not officially recognized by the State of California or the International Building Code (IBC).
Figure 9-2
Fault Lines in the Plan Area of the Proposed MTP/SCS
**GROUND-SHAKING HAZARD**

The measurement of the energy released at the point of origin, or epicenter, of an earthquake is referred to as the magnitude. The greater the energy released from the fault rupture, the higher the magnitude of the earthquake. Earthquake energy is most intense at the fault epicenter. The farther an area from an earthquake epicenter, the less likely that ground shaking will occur. Geologic and soil units comprising unconsolidated, clay-free sands and silts can reach unstable conditions during ground shaking, which can result in extensive damage to structures built on them (see the “Liquefaction and Related Hazards” section below). Ground shaking is described by two methods: 1) ground acceleration as a fraction of the acceleration of gravity (\(g\)) or 2) the Modified Mercalli scale, which is a more descriptive method involving 12 levels of intensity denoted by Roman numerals. Modified Mercalli intensities range from I (shaking that is not felt) to XII (total damage).

**ESTIMATES OF EARTHQUAKE SHAKING**

The plan area of the proposed MTP/SCS is in a region of California characterized by a generally low ground-shaking hazard. Based on a probabilistic seismic hazard map that depicts the peak horizontal ground acceleration values exceeded with a 2 percent probability in 50 years, the probabilistic peak horizontal ground acceleration values in the plan area of the proposed MTP/SCS range from 0.3 to 0.8g (DOC 2008a). Because the plan area of the proposed MTP/SCS is distant from known, active faults, the intensity and frequency of ground-shaking and the associated hazard in the plan area of the proposed MTP/SCS are predicted to be low (Figure 9-3). In most earthquakes, only unreinforced masonry buildings would be damaged. The highest g values occur in the extreme western portions of Sacramento and Yolo counties and the easternmost portions of the plan area of the proposed MTP/SCS, specifically the eastern portions of Placer and El Dorado counties. In the majority of the plan area of the proposed MTP/SCS, the ground-shaking hazard is less due to fewer faults and fault complexes.

**LIQUEFACTION AND RELATED HAZARDS**

Liquefaction is a phenomenon in which the strength and stiffness of unconsolidated sediments are reduced by earthquake shaking or other rapid loading. Poorly consolidated, water-saturated fine sands and silts having low plasticity and located within 50 feet of the ground surface are typically considered to be the most susceptible to liquefaction (DOC 1997). Based on the sedimentological characteristics of the soils and the depth to groundwater, the liquefaction hazard is expected to be moderate for the portion of the plan area of the proposed MTP/SCS within the Great Valley geomorphic province and low for the portions of the plan area of the proposed MTP/SCS within the Sierra Nevada and Coast Range geomorphic provinces. Additionally, the plan area of the proposed MTP/SCS does not fall within any liquefaction seismic hazard zones of required investigation (DOC 2005).

The two potential ground failure types associated with liquefaction in the Great Valley geomorphic province are lateral spreading and differential settlement (Association of Bay Area Governments 2001). Lateral spreading involves a layer of ground at the surface being carried on an underlying layer of liquefied material over a gently sloping surface toward a river channel or other open face. Lateral spreading is common in the Great Valley geomorphic province (especially in the Delta) and poses a moderate to significant hazard (Association of Bay Area Governments 2001).
Figure 9-3
Fault Shaking Hazards Map in the Plan Area of the Proposed MTP/SCS

These regions are near major, active faults and will on average experience stronger earthquake shaking more frequently. This intense shaking can damage even strong, modern buildings.

These regions are distant from known, active faults and will experience lower levels of shaking less frequently. In most earthquakes, only weaker, masonry buildings would be damaged. However, very infrequent earthquakes could still cause strong shaking here.

Sources: Esri, USGS, NOAA
Another common hazard in the Great Valley geomorphic province (specifically the Delta) is differential settlement (also called ground settlement and, in extreme cases, ground collapse) as soil compacts and consolidates after ground shaking ceases. Differential settlement occurs when the layers that liquefy are not of uniform thickness, a common problem when the liquefaction occurs in artificial fills. Settlement can range from one to five percent, depending on the cohesiveness of the sediments (Tokimatsu and Seed 1984). Ground shaking and liquefaction could also result in dam failure, which is addressed in Chapter 11 – Hydrology and Water Quality.

9.2.3 Other Geologic Conditions

LAND SUBSIDENCE

Land subsidence (lowering of the land-surface elevation) primarily occurs in three ways: as a result of compaction and oxidation of peat soils; hydrocompaction (a condition that occurs when soil particles in saturated soils become highly consolidated as moisture is removed); and groundwater overdraft, which is the main mechanism for subsidence in the plan area.

Figure 9-4 illustrates the California Department of Water Resources’ estimates of the recent, historical, and estimated potential for future land subsidence due to groundwater extraction. Historical and recent subsidence is present throughout northern and central Yolo County, where subsidence is highly likely to occur in the future. Sutter County extensometers have reported subsidence in the south, and south Sacramento and western Placer counties have recorded subsidence trends of up to one inch and up to two and a half inches, respectively. Land subsidence is also moderately likely to occur in the future in Sacramento County (highly likely in the southwestern tip and less likely in the southeast area), western Placer County, and southern Sutter County. The remainder of Sutter County and southern Yuba County have a lower risk of subsidence in the future. No past or future subsidence is estimated for El Dorado County (California Department of Water Resources 2014).

In the Delta, land subsidence has occurred due to oxidation and hydrocompaction. Subsidence initiated when the Delta was drained and reclaimed for agriculture. Continued exposure of the organic soils to oxygen during agricultural operations has accelerated the rate of decomposition of the organic matter (United States Geological Survey 2007).

The primary hazards associated with subsidence are increased pressure on levees and damage to underground utilities. Other effects of subsidence include changes in the gradients of stormwater and sanitary sewer drainage systems in which the flow is gravity-driven.

LANDSLIDES

California Department of Conservation has mapped the relative likelihood of deep-seated landslides based on regional estimates of rock strength and steepness of slopes (Wills, Perez, Gutierrez 2011). Generally, weak rocks and steep slopes are more likely to generate landslides. There is high landslide susceptibility at the eastern edge of the plan area in Placer and El Dorado counties and the western edge of the plan area in Yolo County. There is moderate susceptibility mapped in the foothills of Yuba, Placer, El Dorado, and Sacramento counties. The potential for landslides in the valley is generally low. While several sites in northwest and southwest Yolo County (Lower Lake, Wilson Valley, and Glascock Mountain) and mid-east El Dorado County (Riverton, Kyburz, and Pyramid Peak) have been identified as landslide hazards, the plan area of the proposed MTP/SCS does not fall within any landslide seismic hazard zones of required investigation (DOC 2005).
Summary of Recent, Historical, and Estimated Potential for Future Land Subsidence in California

Figure 9-4
Recent, Historical, and Estimated Potential for Future Land Subsidence in California

MAP LIMITATIONS: This map summarizes areas where subsidence due to groundwater extraction is occurring or has occurred historically (LCSE, Borchers and Carpenter, 2014) and identifies general areas that may have a greater potential to experience subsidence in the future. The map is intended to be advisory only in order to assist state and local agencies in defining areas of potential subsidence that may require additional study. No assurance as to actual amounts of subsidence in groundwater basins or specific sites is expressed or implied by this report or the accompanying maps.

1The estimated potential for land subsidence was calculated in each groundwater basin by combining the ranking values of groundwater levels, previous subsidence studies, borehole extensometers, and continuous GPS data (Appendix A). 1Land subsidence data modified from LCSE, Borchers and Carpenter, 2014.
1Continuous GPS data from UHAKC.org. 1Extensometer data from DWR (http://www.water.ca.gov/wateracalibrary) and LCSE, Borchers and Carpenter, 2014.
9.2.4 Soils

The following describes the physical properties of soil, including such qualities as expansiveness and permeability. The resource value of the soil for support of agricultural practices is described in Chapter 4 – Agriculture and Forestry Resources. The potential for soil erosion to impair water quality is described in Chapter 11 – Hydrology and Water Quality.

Soils in the plan area of the proposed MTP/SCS are extensively mapped by the Natural Resources Conservation Service (NRCS), which provides current (2013–2014) data produced by the National Cooperative Soil Survey through the Web Soil Survey system. Figure 9-5 depicts soil taxonomy in the SACOG region. NRCS defines 12 dominant soil orders in Earth’s soil taxonomy, characterized by vegetation, parent material, climate, weathering, or soil profile development, as shown in Table 9-1.

<table>
<thead>
<tr>
<th>Soil Taxonomy Dominant Orders</th>
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<tbody>
<tr>
<td>Alfisols: rich deciduous forest materials</td>
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<tr>
<td>Entisols: sloped, weather-resistant minerals</td>
</tr>
<tr>
<td>Histosols: organic materials</td>
</tr>
<tr>
<td>Inceptisols: unweathered sediment</td>
</tr>
</tbody>
</table>


See Chapter 4 – Agriculture and Forestry Resources for a discussion of farmland mapping and the agricultural value of soils.

**EXPANSIVE SOILS**

During cycles of wetting/swelling and drying/shrinking, expansion and contraction of soil volume can occur. Expansive soils can damage property and structures if these conditions are not considered during building design and construction. El Dorado, Placer, Sacramento, and Yuba counties generally contain little to no swelling clay (Olive et al. 1989). Abundant clay with slight to moderate swelling potential covers most of Sutter County, as well as portions of western Placer and Yuba counties. Most of Yolo County and the southernmost Delta portion of Sacramento County have less than 50 percent expansive soils with slight to moderate swelling potential. In the far western tip, Yolo County also has less than 50 percent expansive soils that have high swelling potential. Figure 9-6 shows where expansive soils are located within the plan area of the proposed MTP/SCS.

**GEOGRAPHIC RELATIONSHIPS AND DISTRIBUTION OF SOILS IN MAJOR LAND RESOURCE AREAS**

NRCS designates Major Land Resource Areas (MLRAs) and associated Land Resource Units (LRUs) as the basic units for delineating statewide patterns of soils, climate, water resources, and land use. Elevation, topography, and rainfall (i.e., amount, timing, type, and distribution) are the primary factors used to delineate these LRUs (Natural Resources Conservation Service 2006).

As shown in Figure 9-7 the plan area of the proposed MTP/SCS falls within five MLRAs across two land resource regions identified by NRCS. Most of the plan area is located within MLRA 17 - the Sacramento and San Joaquin Valleys, MRLA 18 - the Sierra Nevada Foothills and MRLA 22A - the Sierra Nevada Mountains. Descriptions of soil texture and erosion, runoff, and expansion hazards for the five MLRAs are provided below for the surface horizon of the soils.
Figure 9-5
Soil Taxonomy in the Plan Area of the Proposed MTP/SCS
Central California Coast Range

The westernmost portion of the plan area of the proposed MTP/SCS in Yolo County is located within MLRA 15—the Central California Coast Range. Soils within this area are gently sloping on hilly landscapes and primarily include Alfisols, Entisols, Mollisols, and Vertisols. Soil textures are generally clayey to loamy sand. Soil depth ranges from very shallow to deep, and these soils are somewhat excessively drained to well drained. Major soil resource concerns are erosion, maintenance of the content of organic matter in the soils, water quality, and low infiltration rates.

California Delta

The southern portion of the plan area of the proposed MTP/SCS, at the edge of Yolo and Sacramento counties, is located within MLRA 16—the California Delta. Soils within this area are nearly level, and primarily include Entisols, Histosols, and Mollisols. Soil depth is very deep, and soils are poorly to very poorly drained and clayey in texture. The major soil resource concern is the subsidence caused mainly by oxidation, wind erosion, and shrinkage of organic soils.

Sacramento and San Joaquin Valleys

The mid-western portion of the plan area of the proposed MTP/SCS, including the majority of Yolo and Sacramento counties, as well as portions of Yuba and Placer counties, is located within MLRA 17—the Sacramento and San Joaquin valleys. Soils within this area are nearly level and primarily include alluvial Alfisols, Aridisols, Entisols, Mollisols, and Vertisols on low terraces, fans, floodplains, and basins. Soil textures are generally clayey to loamy sand. Soils in the northern plan area are organic and very deep. Erosion hazard is slight to none, runoff is very slow, and soil expansiveness is low to high, depending on geographic location and texture.
Figure 9-7
Major Land Resource Areas in the Plan Area of the Proposed MTP/SCS

*Source: The U.S. Department of Agriculture
USDA/NRCS - National Soil Survey Center

Sources: Esri, USGS, NOAA
Sierra Nevada Foothills

The mid-eastern portion of the plan area of the proposed MTP/SCS, including portions of Yuba, Placer, and El Dorado counties, is located within MLRA 18—the Sierra Nevada Foothills. Soils within this area are nearly level to moderately sloping, and are primarily alluvial, although soils are residual at the highest elevations. Soil orders include Alfisols, Entisols, Inceptisols, and Mollisols. Soil textures are generally loamy to sandy and some are even gravel-like. Soil depth ranges from shallow to deep. The erosion hazard is moderate due to the presence of poorly aggregated volcanic and igneous rocks. Runoff is moderate to rapid, and soil expansiveness is low moderate.

Sierra Nevada Mountains

The easternmost portion of the plan area of the proposed MTP/SCS in Placer and El Dorado counties is located within MLRA 22A—the Sierra Nevada Mountains. Soils within this area are sloping on hilly landscapes and primarily include Alfisols, Entisols, Inceptisols, Mollisols, and Ultisols. Soil depth ranges from very shallow to deep, and these soils are well drained or somewhat excessively drained. Soil textures and are loamy or sandy. Erosion hazard is highest on the moderately coarse textured, granitic soils that have been disturbed by logging, fires, overgrazing, or cultivation. Drainage can be a problem in many of these soils, depending on geographic location and texture.

9.2.5 Mineral Resources

A number of mineral resources can be found within the region, including construction aggregate (sand, gravel, and crushed stone), clay, and gold. Mineral Resource Zone (MRZ) classifications are provided in accordance with the California’s Surface Mining and Reclamation Act (SMARA) (PRC Sections 2710–2796) described in further detail in Section 9.3 – Regulatory Setting.

MRZs are classified as follows:

- **MRZ-1**: Areas where adequate information indicates that no significant mineral deposits are present, or where it is judged that little likelihood exists for their presence.
- **MRZ-2**: Areas 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 containing mineral deposits, the significance of which cannot be evaluated from available data.
- **MRZ-4**: Areas where available information is inadequate for assignment into any other MRZ.

El Dorado County includes MRZ-2 locations directly north and south of the City of Placerville, extending to the county boundary, and south of Jenkinson Lake. Placer County includes MRZ-2 locations in the central portion of the county east of Colfax and west of French Meadows Reservoir. Sacramento County includes MRZ-2 locations in the north-central part of the county near the Jackson Corridor and in northeastern part of the county north of the Eaton area. Sutter County includes a small MRZ-2 location at the southern edge of Yuba City. Yolo County includes MRZ-2 location in the central part of the county along Cache Creek, surrounding Highway 16, west of Interstate 5 and east of the Capay Valley. Yuba County includes MRZ-2 locations west of Highway 70 along the south side of Highway 20. MRZ locations within the plan area of the MTP/SCS are depicted in Figure 9-8.
Figure 9-8
Mineral Resources Zones in the Plan Area of the Proposed MTP/SCS


Sources: Esri, USGS, NOAA
9.3 Regulatory Setting

9.3.1 Federal Regulations

CLEAN WATER ACT OF 1972

The Clean Water Act (CWA) (33 U.S. Code Section 1251 et seq.) is discussed in detail in Chapter 11 – Hydrology and Water Quality. However, because CWA Section 402 is directly relevant to excavation and grading, the following additional information is provided for this chapter.

Amendments in 1987 to the CWA added Section 402(p), which establishes a framework for regulating municipal and industrial stormwater discharges under the National Pollutant Discharge Elimination System (NPDES) Program. The U.S. Environmental Protection Agency (EPA) has delegated to the State Water Resources Control Board (SWRCB) the authority for the NPDES program in California, which is implemented by the state’s nine regional water quality control boards (RWQCBs) (CalEPA and SWRCB 2019) (SWRCB 2013).

The NPDES Permit Program controls water pollution by regulating point sources that discharge pollutants, including rock, sand, dirt, and agricultural, industrial, and municipal waste, into waters of the U.S. Under the NPDES Phase II Rule, construction activity disturbing one or more acres must obtain coverage under the state’s General Permit for Discharges of Storm Water Associated with Construction Activity (General Construction Permit). Proponents of specific projects under the proposed MTP/SCS that would disturb one or more acres are required to obtain a General Construction Permit, prepare a Notice of Intent and a Storm Water Pollution Prevention Plan (SWPPP), and implement and maintain Best Management Practices (BMPs) to avoid adverse effects on water quality as a result of construction activities, including earthwork.

INTERNATIONAL BUILDING CODE

The International Building Code (IBC) is published by the International Code Council (ICC). The ICC was established in 1994 as a non-profit organization dedicated to developing a single set of comprehensive and coordinated national model construction codes. The IBC is used widely across the nation, and many states such as California adopt the IBC and then add requirements that are more stringent.

9.3.2 State Regulations

ONSITE WASTEWATER TREATMENT SYSTEMS

The SWRCB adopted the Onsite Wastewater Treatment Systems (OWTS) Policy: Water Quality Control Policy for Siting, Design, Operation, and Maintenance of Onsite Wastewater Treatment Systems in 2012. RWQCBs have principal responsibility for overseeing implementation of the policy, which requires local agencies to determine whether their regulations are consistent with the statewide minimum standards for water quality or whether the local agency will implement a Local Agency Management Program. The policy establishes a risk-based tiered approach for the regulation and management of OWTS installations and replacements, setting performance and protection level expectations and requiring actions where OWTS contribute to water quality degradation that adversely affect beneficial uses.
Most of Sacramento, Sutter, and Yolo counties (with the exception of westernmost mountainous Yolo County) have an annual average rainfall between 10 and 25 inches, which would have an allowed density of 1.5 dwelling units per acre under OWTS Tier 1 (Oregon Climate Service 1995). In El Dorado, Placer, and Yuba counties, the average annual rainfall is between 20 and 30 inches in the west, 30 to 55 inches in the middle, and 55 to 70 inches to the east (only limited areas in El Dorado County). Under OWTS Tier 1, the allowable density for areas with an average annual rainfall over 35 inches is less than 1 dwelling unit per acre. Most Rural Residential Communities are located in the western to middle portion of these counties where there is less annual average rainfall, and while the maximum allowable density is one dwelling unit per acre, many communities build at lower densities. A Local Agency Management Program under Tier 2 would be required for approval by SWRCB for subdivisions at densities greater than 0.75 dwelling units per acre in areas with less than 40 inches of annual average rainfall and 0.5 dwelling units per acre in areas with over 40 inches of annual average rainfall (SWRCB 2012).

**Alquist-Priolo Act**

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

**Surface Mining and Reclamation Act of 1975**

The Surface Mining and Reclamation Act (SMARA) (PRC Sections 2710–2796) was enacted in response to land use conflicts between urban growth and essential mineral production. The stated purpose of the SMARA is to provide a comprehensive surface mining and reclamation policy that will encourage the production and conservation of mineral resources, while ensuring that adverse environmental effects of mining are prevented or minimized, mined lands are reclaimed and residual hazards to public health and safety are eliminated, and consideration is given to recreation, watershed, wildlife, aesthetic, and other related values. The SMARA includes noticing requirements when permitting a use that would preclude future extraction of identified mineral resources, defined as: 1) the potential to extract minerals in MRZ-2 lands or 2) the potential to extract minerals in land designated in a lead agency’s general plan as having important mineral resources to be protected. In addition, these noticing requirements are subject to CEQA public review requirements.

**Seismic Hazards Mapping Act of 1990**

Like the Alquist-Priolo Act, the Seismic Hazards Mapping Act (PRC Sections 2690–2699-6) is intended to reduce damage resulting from earthquakes. While the Alquist-Priolo Act addresses surface fault rupture, the Seismic Hazards Mapping Act addresses other earthquake-related hazards, including strong ground shaking, liquefaction, and seismically-induced landslides. Its provisions are similar in concept to those of the Alquist-Priolo Act: the state is charged with identifying and mapping areas at risk of strong ground shaking, liquefaction, landslides, and other corollary hazards, and cities and counties are required to regulate development within mapped Seismic Hazard Zones.
Permit review is the primary mechanism for local regulation of development. Specifically, cities and counties are prohibited from issuing development permits for sites in Seismic Hazard Zones until appropriate site-specific geologic or geotechnical investigations have been carried out, and measures to reduce potential damage have been incorporated into the development plans. Seismic hazard maps have been prepared for parts of the San Francisco Bay Area and in the Los Angeles area; no such maps are presently available for the plan area due to the relatively low seismic risk.

In addition to the Seismic Hazards Mapping Act, the California Geologic Survey (CGS) provides guidelines (Guidelines for Evaluating and Mitigating Seismic Hazards in California) for evaluating seismic hazards other than surface fault rupture, and for mitigation measures as required by PRC Section 2695(a) (CGS 2008). The most current guidelines are provided in Special Publication 117A of 2008.

**CALIFORNIA BUILDING CODE**

The California Building Code (CBC) has been codified in the California Code of Regulations (CCR) as Title 24, Part 2. Title 24 is administered by the California Building Standards Commission, which, by law, is responsible for coordinating all building standards. The purpose of the CBC is to establish minimum standards to safeguard the public health, safety, and general welfare through structural strength, means of egress facilities, and general stability 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 2019 CBC is based on the 2018 IBC published by the International Code Council. In addition, the CBC contains necessary California amendments, which are based on reference standards obtained from various technical committees and organizations such as the American Society of Civil Engineers (ASCE), the American Institute of Steel Construction, and the American Concrete Institute. ASCE Minimum Design Standards 7-05 provides requirements for general structural design and includes means for determining earthquake loads, as well as other loads (e.g., flood, snow, wind), for inclusion into building codes. 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.

The earthquake design requirements consider the occupancy category of the structure, site class, soil classifications, and various seismic coefficients that are used to determine a Seismic Design Category (SDC) for a project as described in Chapter 16 of the CBC. The SDC is a classification system that combines the occupancy categories with the level of expected ground motions at the site and ranges from SDC A (very small seismic vulnerability) to SDC E (very high seismic vulnerability and near a major fault), as well as SDC F (hospitals, police stations, emergency control centers in areas near major active faults). Design specifications are then determined in accordance with Chapter 16 of the CBC. Chapter 16, Section 1613 provides earthquake loading specifications for design and construction to resist the effects of earthquake motions in accordance with ASCE 7-05.

Chapter 18 of the CBC covers the requirements of geotechnical investigations (Section 1803), excavation, grading, and fills (Section 1804), load-bearing of soils (1806), as well as foundations (Section 1808), shallow foundations (Section 1809), and deep foundations (Section 1810). Chapter 18 also describes analysis of expansive soils and the determination of the depth to groundwater table. For SDC D, E, and F, Chapter 18 requires analysis of slope instability, liquefaction, and surface rupture attributable to faulting or lateral spreading, plus an evaluation of lateral pressures on
basement and retaining walls, liquefaction and soil strength loss, and lateral movement or reduction in foundation soil-bearing capacity. It also addresses mitigation measures to be considered in structural design, which may include ground stabilization, selecting appropriate foundation type and depths, selecting appropriate structural systems to accommodate anticipated displacements, or any combination of these measures. The potential for liquefaction and soil strength loss must be evaluated for site-specific peak ground acceleration magnitudes and source characteristics consistent with the design earthquake ground motions.

Specifically, Section 1803.7 of the 2019 CBC requires geologic and earthquake engineering reports for all proposed construction. The purpose of the engineering report is to identify geologic and seismic conditions that may require mitigations. The reports, which are prepared by a California certified engineering geologist in consultation with a California-registered geotechnical engineer, assess the nature of the site and potential for earthquake damage based on appropriate investigations of the regional and site geology, project foundations conditions, and potential seismic shaking at the site. These reports must consider the most recent CGS Note 48 (Checklist for the Review of Engineering Geology and Seismology Reports California Public Schools, Hospitals, and Essential Services Buildings), CGS Special Publication 42: Fault Rupture hazard Zones in California (for projects sites within an Alquist-Priolo Zone), and the most recent version of CGS Special Publication 117: Guidelines for Evaluating and Mitigating Seismic Hazard in California (project sites proposed within a Seismic Hazard Zone). All conclusions must be fully supported by satisfactory data and analysis.

The geotechnical report required in Section 1802.8.1 provides completed evaluations of the foundation conditions of the site and the potential geologic and seismic hazards. It includes site-specific evaluations of design criteria related to the nature and extent of foundation materials, groundwater conditions, liquefaction potential, settlement potential and slope stability; as well as the results of the analysis of problem areas identified in the engineering geologic report. The geotechnical report incorporates estimates of the characteristics of site ground motion provided in the engineering geologic report. The geotechnical report must be prepared by a geotechnical engineer registered in the State of California with the advice of the certified engineering geologist and other technical experts, as necessary. The approved engineering geologic report is submitted with, or as part of, the geotechnical report. Local jurisdictions in the proposed Plan area typically regulate construction activities through a process that requires the preparation of a site-specific geotechnical investigation, consistent with Title 24, Part 2, Chapter 18 of the CBC.

CCR Title 24 also includes the California Residential Code and the California Green Building Code, which have been adopted as separate documents (CCR Title 24, Part 2.5 and 11, respectively). The California Green Building Standards Code, otherwise known as “CALGreen,” establishes mandatory minimum green building standards and optional Tier 1 and Tier 2 more stringent provisions. Cities and counties have the discretion to adopt either tier as mandatory or to adopt their own more stringent standards. The green building standards included in CALGreen enhance the design and construction of buildings using planning and design concepts that reduce negative impacts to the environment through energy efficiency, water efficiency and conservation, and material conservation and resource efficiency. Sections 4.106.2 and 5.106.1 contain requirements intended to limit erosion due to development that would disturb less than 1 acre. The California Residential Code includes structural design standards for residential one- and two-family dwellings and covers all structural requirements for conventional construction. This part incorporates by adoption the 2009 International Residential Code of the International Code Council with necessary California
amendments for seismic design. All other structures, including multi-family residential projects, are found in the other parts of the CBC as discussed above.

**CALIFORNIA DEPARTMENT OF TRANSPORTATION SEISMIC DESIGN CRITERIA AND ENCROACHMENT PERMITS**

The California Department of Transportation (Caltrans) provides Seismic Design Criteria (SDC), which is an encyclopedia of new and currently-practiced seismic design and analysis methodologies for the design of new bridges in California. The SDC adopts a performance-based approach, specifying minimum levels of structural system performance, component performance, analysis, and design practices for ordinary standard bridges. The SDC has been developed with input from the Caltrans Offices of Structure Design, Earthquake Engineering and Design Support, and Materials and Foundations. The *Engineering Service Manual: Bridge Memo 20-1 to Designers* outlines the bridge category and classification, seismic performance criteria, seismic design philosophy and approach, seismic demands and capacities on structural components and seismic design practices that collectively make up Caltrans’ seismic design methodology.

Additionally, Caltrans requires any construction project within a State highway right of way to obtain an encroachment permit (Streets and Highway Code 660). Encroachment permits require site grading and drainage plans, as well as additional analysis for erosion and sediment control and stormwater pollution prevention.

**9.3.3 Local Regulations**

**GENERAL PLANS**

The Safety Elements of the various city and county general plans of the plan area of the proposed MTP/SCS contain goals, objectives, and policies aimed at reducing the geologically-related hazards and seismic risk to people and property. Jurisdictions also address geologic hazards through land use regulation, including designation for lower densities and intensities in higher risk areas, and the use of land use overlays to denote areas with shared land use characteristics (e.g., mineral resource and natural resource overlays). Proponents of specific projects in the plan area of the proposed MTP/SCS would be required to consult the applicable general plans and design the projects consistent with the applicable guidelines of the jurisdictions in which the projects are located.

**LOCAL GRADING AND EROSION CONTROL ORDINANCES**

Local jurisdictions have grading and erosion control ordinances that are intended to control erosion and sedimentation caused by construction activities. A grading permit is typically required for construction-related projects. As part of the permit, project applicants usually must submit a grading and erosion control plan, vicinity and site maps, and other supplemental information. Standard conditions in the grading permit include a description of BMPs similar to those contained in a SWPPP.

**GEOTECHNICAL INVESTIGATIONS**

Local jurisdictions in the plan area of the proposed MTP/SCS typically regulate construction activities through a process that may require the preparation of a site-specific geotechnical investigation, as required in CBC, Title 24, Part 2, Chapter 18. The purpose of a site-specific
A geotechnical investigation is to provide a geologic basis for the development of appropriate construction design. Geotechnical investigations typically assess bedrock and Quaternary geology, geologic structure, soils, and the previous history of excavation and fill placement. Proponents of specific projects in the plan area of the proposed MTP/SCS that require design of earthworks and foundations for proposed structures would need to prepare geotechnical investigations on the physical properties of soil and rock at the site prior to project design.

## 9.4 Impacts and Mitigation Measures

### 9.4.1 Methods and Assumptions

This program-level analysis generally evaluates the potential for implementation of the proposed MTP/SCS to directly or indirectly result in seismic, geologic, or soil hazards based on the projected land use pattern and planned transportation network relative to the known distribution of existing faults, geology, and soil types.

By 2040, implementation of the proposed MTP/SCS would result in a land use pattern and transportation network that is different from existing conditions. Unless otherwise stated, “existing conditions” in the proposed MTP/SCS refers to conditions in the baseline year of 2016. The proposed MTP/SCS uses 2016 because it is the most recent year for which comprehensive land use, demographic, traffic count, and VMT data are available for the SACOG region. Chapter 1 – Introduction includes a more detailed discussion of the baseline for the proposed MTP/SCS.

For each impact, implementation of the proposed MTP/SCS is assessed on three levels. First, impacts are assessed at the regional level for the entire plan area. Second, impacts are assessed for the plan area’s five Community Types: Center and Corridor Communities, Established Communities, Developing Communities, Rural Residential Communities, and Lands Not Identified for Development. And third, implementation of the proposed MTP/SCS is assessed in terms of its impacts to the region’s High Frequency Transit Areas (HFTAs). Refer to Chapter 2 – Project Description for a full description of the Community Types and HFTAs and the projected land use pattern and planned transportation improvements within these areas.

This impact analysis assesses how implementation of the proposed MTP/SCS, including changes to the land use pattern and transportation network, may impact geology, seismicity, soils, and mineral resources. Impacts are evaluated qualitatively by considering the conditions of the plan area, the areas where growth and development are most likely to occur based on the projected land use pattern and planned transportation improvements in the proposed MTP/SCS, and the existing regulations that would apply to the subsequent land use pattern and planned transportation improvements to analyze its geological, soils, and mineral resources impacts.

The analysis assumes implementing agencies would ensure geologic, soils, seismicity, and mineral resources are treated in accordance with applicable federal, state and local laws and regulations as part of project planning, design and engineering.

### 9.4.2 Criteria for Determining Significance

For the purposes of this EIR, SACOG has determined that adoption and/or implementation of the proposed MTP/SCS would result in significant impacts under CEQA if the following would occur:
GEO-1 Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:
   a. 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;
   b. strong seismic ground shaking;
   c. seismic-related ground failure, including liquefaction; or
   d. landslides.

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

GEO-3 Locate a project on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in an on-site or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse.

GEO-4 Result in development on expansive soil, as defined in Section 1803.5.3 of the International Building Code (International Conference of Building Officials, 2012), creating substantial direct or indirect risks to life or property.

GEO-5 Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater.

GEO-6 Directly or indirectly destroy a unique geologic feature.

GEO-7 Result in substantial impacts related to geology, seismicity, and soils from construction of proposed MTP/SCS projects.

GEO-8 Result in the loss of availability of a known designated mineral resource that would be of value to the region and the residents of the state.

GEO-9 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.

GEO-10 Result in a substantial impact to mineral resources from construction of proposed MTP/SCS projects.

Impacts to unique paleontological resources are addressed in Chapter 7 – Cultural, Tribal, and Paleontological Resources.

9.4.3 Impacts and Mitigation Measures

**IMPACT GEO-1A: DIRECTLY OR INDIRECTLY CAUSE SUBSTANTIAL ADVERSE EFFECTS, INCLUDING THE RISK OF LOSS, INJURY, OR DEATH DUE TO RUPTURE OF A KNOWN EARTHQUAKE FAULT.**

Regional Impacts

The risk of surface fault rupture in the plan area of the proposed MTP/SCS is generally low because of the scarcity of active faults. The only officially-recognized active fault (having surface displacement within the last 11,000 years) on the current Alquist-Priolo Map is the Hunting Creek Fault (see Figure 9-2 above) at the very northwestern edge of Yolo County (Yolo County 2009).
Buried thrust faults and inferred faults are also located within the boundaries of the proposed MTP/SCS; however, they do not have surface ruptures and are not officially-recognized.

The Alquist-Priolo Act strictly regulates where the projected land use pattern and planned transportation improvements can occur in relation to faults. The Hunting Creek Fault is in a predominately agricultural and open space area where no land use development or transportation improvements are planned. As a result, implementation of the proposed MTP/SCS would not cause substantial adverse effects due to rupture of a known fault.

The potential to directly or indirectly cause adverse regional impacts due to rupture of a known earthquake fault related to the projected land use pattern and planned transportation improvements from implementation of the proposed MTP/SCS is considered less than significant (LS) for Impact GEO-1a. No mitigation is required.

**Localized Impacts**

*Center and Corridor Communities, Established Communities, Developing Communities, Rural Residential Communities, and Lands Not Identified for Development in the MTP/SCS*

The localized impacts associated with implementation of the proposed MTP/SCS are the same in each of these Community Types as described in the regional impacts discussion above. Because no land use or planned transportation improvements are proposed where there are active faults in the region, land use and planned transportation improvements in Center and Corridor Communities, Established Communities, Developing Communities, and Rural Residential Communities Community Types are not likely to expose people or structures to substantial risk related to fault rupture. Although some housing and employment growth, consistent with historical trends, may occur in this Community Type within the MTP/SCS planning period, the proposed MTP/SCS does not forecast any development in these areas by 2040. Further, under the proposed MTC/SCS, limited funding for the maintenance and improvement of transportation facilities would be allocated to the Lands Not Identified for Development Community Type.

The potential to directly or indirectly cause adverse localized impacts due to rupture of a known earthquake fault related to the projected land use pattern and planned transportation improvements from implementation of the proposed MTP/SCS is considered less than significant (LS) in all Community Types for Impact GEO-1a. No mitigation is required.

**High Frequency Transit Area Impacts**

*Placer County, Sacramento County, and Yolo County High Frequency Transit Areas*

As discussed above, the only officially-recognized active fault is the Hunting Creek Fault at the very northwestern edge of Yolo County. There are no HFTAs in this area.

Therefore, the potential for adverse fault impacts related to the projected land use pattern and planned transportation improvements associated with implementation of the proposed MTP/SCS in the HFTAs is considered less than significant (LS) for Impact GEO-1a. No mitigation is required.

**Mitigation Measures**

None required.
**IMPACT GEO-1B: DIRECTLY OR INDIRECTLY CAUSE SUBSTANTIAL ADVERSE EFFECTS, INCLUDING THE RISK OF LOSS, INJURY, OR DEATH INVOLVING STRONG SEISMIC GROUND SHAKING.**

**Regional Impacts**

The plan area of the proposed MTP/SCS is not very seismically active; however, ground shaking has occurred in the region and will likely occur again. The possibility of widespread exposure of people and structures to ground shaking can vary across an area and depends on such factors as earthquake intensity and fault mechanism, duration of shaking, soil conditions, and building type.

Figure 9-3 (shown above in Section 9-2) shows the levels of earthquake hazard and the related intensity of ground shaking that areas within the region may experience. The western portion of the region has a higher expected level of earthquake hazard (low to moderate) compared with the rest of the plan area of the proposed MTP/SCS, which is expected to experience lower levels of shaking, less frequently. However, very infrequent earthquakes could potentially cause strong ground shaking within the region.

As described above, 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. Design specifications are determined in accordance with Chapter 16 of the CBC according to the SDC (a classification system that combines the occupancy categories with the level of expected ground motions at the site, as described above). Chapter 16, Section 1613 provides earthquake loading specifications for design and construction to resist the effects of earthquake motions in accordance with ASCE 7-05. Chapter 18 requires analysis of slope instability, liquefaction, and surface rupture attributable to faulting or lateral spreading, plus an evaluation of lateral pressures on basement and retaining walls, liquefaction and soil strength loss, and lateral movement or reduction in foundation soil-bearing capacity. It also addresses mitigation measures to be considered in structural design, which may include ground stabilization, selecting appropriate foundation type and depths, selecting appropriate structural systems to accommodate anticipated displacements, or any combination of these measures. Compliance with the regulatory requirements in the CBC and any applicable local ordinances, and ensuring that structures are constructed in compliance with the law, is the responsibility of the project engineers and building officials (typically associated with the local jurisdiction).

Similarly, bridge design would be required to comply with Caltrans design criteria. Caltrans provides the SDC for design of new bridges in California, specifying minimum levels of structural system performance, component performance, analysis, and design practices for bridges. Proposed developments would also adhere to the local building code requirements for seismic safety to resist ground shaking through modern construction techniques. In addition, development would comply with local general plans and with standard industry practices and state provided guidance, such as CGS Special Publication 117A which provides guidance for the evaluation and mitigation of earthquake-related hazards.

Section 1803.7 of the 2019 CBC requires preparation of a geohazard reports for all proposed construction, with few exceptions. The purpose of the engineering report is to identify geologic and seismic conditions that may require mitigations. The reports, which are prepared by a California certified engineering geologist in consultation with a California-registered geotechnical engineer, assess the nature of the site and potential for earthquake damage based on appropriate investigations.
of the regional and site geology, project foundations conditions, and potential seismic shaking at the site. In connection with grading, foundation, building, and other site development permits, the local jurisdiction reviews the geotechnical investigation and recommendations and imposes permit requirements based on the geotechnical recommendations and CBC provisions. Recommended corrective measures, such as structural reinforcement and replacing native soils with engineered fill, must be incorporated into project designs. Developments must also adhere to local building code requirements for seismic safety, which identify and require specified construction techniques that aid in structural resistance to ground shaking, as well as local general plans and zoning ordinances, where applicable policies exist.

Therefore, the potential for implementation of the proposed MTP/SCS to cause adverse ground shaking impacts through the projected land use pattern and planned transportation improvements associated with implementation of the proposed MTP/SCS at the regional level is considered less than significant (LS) for Impact GEO-1b. No mitigation is required.

Localized Impacts

Center and Corridor Communities, Established Communities, Developing Communities, Rural Residential Communities and Lands Not Identified for Development in the Proposed MTP/SCS

The localized impacts associated with implementation of the proposed MTP/SCS would be the same in each of these Community Types as described in the regional impacts discussion above. The projected land use pattern and planned transportation improvements in Center and Corridor Communities, Established Communities, Developing Communities, and Rural Residential Communities Community Types are required to comply with state and local regulations related to seismic design, and therefore, are not likely to expose people or structures to substantial risk related to ground shaking. Although some housing and employment growth, consistent with historical trends, may occur in this Community Type within the MTP/SCS planning period, the proposed MTP/SCS does not forecast any development in these areas by 2040. In addition, all transportation improvements would be required to follow design provisions of the IBC and CBC, and bridge design would be required to comply with Caltrans design criteria.

Therefore, the potential for implementation of the proposed MTP/SCS to cause adverse ground shaking impacts related to the projected land use pattern and planned transportation improvements in all Community Types is considered less than significant (LS) for Impact GEO-1b. No mitigation is required.

High Frequency Transit Area Impacts

Placer County, Sacramento County, and Yolo County High Frequency Transit Areas

The effects of implementing the proposed MTP/SCS would be the same in each of the HFTAs as described in the regional impacts discussion above. Land use and planned transportation improvements in the HFTAs would be required to comply with local regulations related to seismic design and, therefore, are not likely to cause substantial ground shaking.

The potential for adverse ground shaking impacts related to the projected land use pattern and planned transportation improvements from implementation of the proposed MTP/SCS in the HFTAs is considered less than significant (LS) for Impact GEO-1b. No mitigation is required.
MITIGATION MEASURES

None required.

IMPACT GEO-1C: DIRECTLY OR INDIRECTLY CAUSE SUBSTANTIAL ADVERSE EFFECTS, INCLUDING THE RISK OF LOSS, INJURY, OR DEATH INVOLVING SEISMIC-RELATED GROUND FAILURE, INCLUDING LIQUEFACTION.

Regional Impacts

Ground failure as a result of an earthquake, including liquefaction, could occur in the plan area of the proposed MTP/SCS, potentially damaging structures and property and exposing people to substantial risk from the sudden loss in strength of unconsolidated sediments. However, since the region is not very seismically active, the potential for implementation of the proposed MTP/SCS to generate substantial seismic-related ground failure is generally low to moderate.

The effects of ground failure, including liquefaction, from development of the land uses or transportation improvements in the proposed MTP/SCS would be addressed through site-specific geotechnical studies required by local jurisdictions to be prepared in accordance with standard industry practices and state-provided guidance, such as CGS Special Publication 117A, which specifically address liquefaction. In addition, development would conform to the current seismic design provisions of the IBC and CBC in order to address losses from ground failure as a result of an earthquake. Proposed developments or improvements would also adhere to local general plans and local building code requirements that contain seismic safety requirements to resist ground failure through modern construction techniques.

Therefore, the potential for regional adverse ground failure impacts related to the projected land use pattern or planned transportation improvements associated with implementation of the proposed MTP/SCS is considered less than significant (LS) for Impact GEO-1c. No mitigation is required.

Localized Impacts

Center and Corridor Communities, Established Communities, Developing Communities, Rural Residential Communities and Lands Not Identified for Development in the MTP/SCS

The localized impacts associated with implementation of the proposed MTP/SCS are the same in each of these Community Types as described in the regional impacts discussion above. The projected land use pattern and planned transportation improvements in Center and Corridor Communities, Established Communities, Developing Communities, and Rural Residential Communities Community Types are required to comply with state and local regulations related to seismic design and, therefore, are not likely to expose people or structures to substantial risk from seismic-related ground failure, including liquefaction. Although some housing and employment growth, consistent with historical trends, may occur in this Community Type within the MTP/SCS planning period, the proposed MTP/SCS does not forecast any development in these areas by 2040. Because no development is proposed and there are no active faults identified within these areas, there is no potential to cause substantial adverse effects due to seismically-induced ground failure. Further, because planned transportation improvements are required to adhere to the seismic design provisions of the IBC, CBC, and local building code requirements, as well as conduct site-specific geotechnical studies, which would reduce the potential effects related to seismic-related ground failure in the region.
The potential for adverse localized ground failure impacts related to the projected land use pattern and planned transportation improvements from implementation of the proposed MTP/SCS in all Community Types is considered less than significant (LS) for Impact GEO-1c. No mitigation is required.

**High Frequency Transit Area Impacts**

*Placer County, Sacramento County, and Yolo County High Frequency Transit Areas*

Impacts associated with implementation of the proposed MTP/SCS would be the same in each of the HFTAs as described in the discussion of regional impacts above. The projected land use pattern and planned transportation improvements in the HFTAs are required to comply with state and local regulations related to seismic design and, therefore, are not likely to cause seismic-related ground failure, including liquefaction.

The potential for adverse ground failure impacts in HFTAs related to the projected land use pattern and planned transportation improvements associated with implementation of the proposed MTP/SCS is considered less than significant (LS) for Impact GEO-1c. No mitigation is required.

**Mitigation Measures**

None required.

**IMPACT GEO-1D: DIRECTLY OR INDIRECTLY CAUSE SUBSTANTIAL ADVERSE EFFECTS, INCLUDING THE RISK OF LOSS, INJURY, OR DEATH INVOLVING LANDSLIDES.**

**Regional Impacts**

The proposed MTP/SCS includes the projected land use pattern and planned transportation improvements that could be located in areas with potential for landslides. Because the region is generally level, not seismically active, and has a low probability of ground shaking (see Figure 9-3 above), the risk of landslides caused by earthquakes is also generally low in most parts of the region and moderate in the Sierra Nevada Foothills. However, the northwest and southwest portion of Yolo County, the northwest portion of Sutter County (at the Sutter Buttes), the middle to southern portion of El Dorado County, and most of Placer County east of Interstate-80 are at very high risk of landslide susceptibility or are identified as landslide hazard areas (refer to Figure 9-5).

Most landslide susceptible and landslide hazard areas are located in predominately agricultural and open space areas where no development is planned. As discussed above, all new development would be subject to local building codes and the IBC, and CBC, which require implementation of design standards in seismically-active areas in order to safeguard against major structural failures or loss of life. Local jurisdictions also require a site-specific geologic investigation and analysis in accordance with standard industry practices and state-provided guidance, such as CGS Special Publication 117A, to minimize risk associated with landslides.

The potential for regional adverse landslide impacts related to projected land use pattern and planned transportation improvements from implementation of the proposed MTP/SCS is considered less than significant (LS) for Impact GEO-1d. No mitigation is required.
Localized Impacts

Center and Corridor Communities, Established Communities, Developing Communities, Rural Residential Communities and Lands Not Identified for Development in the Proposed MTP/SCS

The localized impacts associated with implementation of the proposed MTP/SCS would be the same in each of these Community Types as described in the regional impacts discussion above. The proposed land use pattern and planned transportation improvements in Center and Corridor Communities, Established Communities, Developing Communities, and Rural Residential Communities would be required to comply with state and local regulations related to seismic design and, therefore, are not likely to result in substantial risk related to landslides. Although some housing and employment growth, consistent with historical trends, may occur in this Community Type within the MTP/SCS planning period, the proposed MTP/SCS does not forecast any development in these areas by 2040. Because no development is proposed in the Lands Not Identified for Development and there are no active faults identified within these areas, there is no potential to cause substantial adverse effects due to landslide. Further, because transportation improvements are required to adhere to the seismic design provisions of the IBC, CBC, and local building code requirements, as well as conduct site-specific geotechnical studies, there are no potential impacts from risks related to seismic-related ground failure in the region.

The potential for local adverse localized landslide impacts related to the projected land use pattern and planned transportation improvements in all Community Types associated with implementation of the proposed MTP/SCS is considered less than significant (LS) for Impact GEO-1d. No mitigation is required.

High Frequency Transit Area Impacts

Placer County, Sacramento County, and Yolo County High Frequency Transit Areas

Impacts associated with implementation of the proposed MTP/SCS would be the same in each of the HFTAs as described in the regional impacts discussion above. The projected land use pattern and planned transportation improvements in the HFTAs are required to comply with state and local regulations related to seismic design and, therefore, are not likely to expose people or structures to substantial risk related to landslides.

The potential for adverse landslide impacts related to the projected land use pattern and planned transportation improvements associated with implementation of the proposed MTP/SCS in the HFTAs is considered less than significant (LS) for Impact GEO-1d. No mitigation is required.

Mitigation Measures

None required.

Impact GEO-2: Result in substantial soil erosion or the loss of topsoil.

Regional Impacts

The projected land use pattern as a result of implementing the proposed MTP/SCS could result in soil erosion or the loss of topsoil due to a greater degree of exposed graded surfaces, excavation, stock piling, or boring, which are necessary during development. Development may disturb
previously undisturbed soils, and new development may increase water runoff, causing erosion problems, and, potentially, slope failure. Similarly, soil erosion and loss of topsoil could result from implementation of the proposed MTP/SCS planned transportation improvements that involve the expansion or extension of the transportation system into previously undeveloped land, which usually involves grading or earthwork and increased impervious surfaces and removal of vegetative cover.

However, with the exception of the Sierra Nevada Foothills where moderate erosion hazards may be present, the plan area of the proposed MTP/SCS has limited to no erosion hazards. Local jurisdictions generally have grading ordinances requiring a grading permit for major earthwork in order to minimize erosion and ensure that development in geologic hazard areas does not pose a threat to human life and property. While grading standards differ depending on the jurisdiction (e.g., project size, application requirements, approval process), all jurisdictions require submittal of a grading plan that includes erosion and sediment control measures for approval of a grading permit.

Generally, earthwork and ground-disturbing activities, unless below minimum requirements, require a grading permit, compliance with which minimizes erosion, and local grading ordinances ensure that construction practices include measures to protect exposed soils such as limiting work to dry seasons, covering stockpiled soils, and use of straw bales and silt fences to minimize off-site sedimentation. Additional reports, such as a soil engineering report, engineering geology report, or plans and specifications for grading may be required by the local building or engineering departments, depending on the development proposal. The application, plans, and specifications (if any) would be checked by the appropriate building official or engineer, and may be reviewed by other departments of the county or city to ensure compliance with the laws and ordinances under their jurisdiction. Earthwork recommendations for improved erosion controls, based on site conditions, would be incorporated into the project construction documents.

Development that disturbs more than 1 acre is subject to compliance with a NPDES permit, including the implementation of BMPs, some of which are specifically implemented to reduce soil erosion or loss of topsoil, and the implementation of a SWPPP through the local jurisdiction. BMPs that are required under a SWPPP would include erosion prevention measures that have proven effective in limiting soil erosion and loss of topsoil. Projects that would disturb less than 1 acre would be subject to the CALGreen requirements related to stormwater drainage that have been designed to prevent or reduce discharges of sediments through BMPs that include on-site retention and filtration. Generally, once construction is complete and exposed areas are revegetated or covered by buildings, asphalt, or concrete, the erosion hazard is substantially eliminated or reduced.

Existing regulatory requirements specify mandatory and relatively prescriptive actions that must occur during project development. There are regulations in place that would effectively reduce the potential for loss of topsoil or erosion impacts. Therefore, the potential for regional adverse erosion impacts related to projected land use pattern or planned transportation improvements associated with implementation of the proposed MTP/SCS would be considered less than significant (LS) for Impact GEO-2. No mitigation is required.
Localized Impacts

Center and Corridor Communities, Established Communities, Developing Communities, Rural Residential Communities, and Lands Not Identified for Development in the MTP/SCS

The projected land use pattern and planned transportation improvements in Center and Corridor Communities, Established Communities, Developing Communities, and Rural Residential Communities have the potential to result in substantial soil erosion or the loss of topsoil. With respect to transportation in Lands Not Identified for Development, the proposed MTP/SCS would make a limited number of planned transportation improvements in this Community Type by 2040, including road maintenance, safety enhancements, other roadway operational improvements, and targeted capacity improvements to existing facilities that accommodate increased travel between urban areas. Although some housing and employment growth, consistent with historical trends, may occur in this Community Type within the MTP/SCS planning period, the proposed MTP/SCS does not forecast any development in these areas by 2040. Because no development is proposed in the Lands Not Identified for Development, there is no potential for implementation of the project to cause substantial erosion.

Land use and planned transportation improvements in these communities would be subject to the regulations described in the evaluation of regional impacts above. The potential for loss of topsoil and erosion impacts related to the projected land use pattern and transportation improvements associated with implementation of the proposed MTP/SCS is considered less than significant (LS) for Impact GEO-2 because there are regulations in place that would effectively reduce the potential for loss of topsoil or erosion impacts related to land use and planned transportation improvements in all Community Types. No mitigation is required.

High Frequency Transit Area Impacts

Placer County, Sacramento County, and Yolo County High Frequency Transit Areas

As with the localized impacts discussed above, the HFTA impacts associated with implementation of the proposed MTP/SCS would be adequately addressed through existing regulations. Therefore, the potential for loss of topsoil and erosion impacts related to the projected land use pattern and transportation improvements associated with implementation of the proposed MTP/SCS in the HFTAs is considered less than significant (LS) for Impact GEO-2. No mitigation is required.

MITIGATION MEASURES

None required.

IMPACT GEO-3: LOCATE A PROJECT 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-SITE OR OFF-SITE LANDSLIDE, LATERAL SPREADING, SUBSIDENCE, LIQUEFACTION, OR COLLAPSE.

Regional Impacts

Projected land use pattern or transportation improvements in the proposed MTP/SCS could be located on geologic units or soils that are unstable, or that could become unstable and result in geologic hazards. Structures, including residential units and commercial buildings, could be damaged
as a result of a landslide or mudslide from unstable soils or geologic units. Slope failure can occur naturally through rainfall or seismic activity, or through earthwork and grading related activities.

As mentioned previously, the northwest and southwest portion of Yolo County, the northwest portion of Sutter County, the middle to southern portion of El Dorado County, and most of Placer County east of Interstate-80 are at very high risk of landslide susceptibility or identified as landslide hazards (see Figure 9-5 above). Lateral spreading and differential settlement pose a moderate hazard in the Great Valley geomorphic province (Sacramento, Sutter, and Yolo counties, as well as western El Dorado, Placer, and Yuba counties). Construction of new structures near relatively steep slopes could provide additional loading, causing landslides or slope failure from unstable soils or geologic units. The loading associated with new construction could also induce differential settlement and ground collapse, particularly in the Great Valley geomorphic province.

Historical and recent subsidence is present throughout northern and central Yolo County, south Sutter County, south Sacramento County, and western Placer County (see Figure 9-4 above). Land subsidence is highly likely to occur in the future in Yolo County and southwest Sacramento County, and moderately likely to occur in the future in Sacramento County, western Placer County, and southern Sutter County. The potential for water demand associated with the projected land use pattern of the MTP/SCS to exacerbate subsidence due to additional groundwater extraction is addressed in Chapter 11 – Hydrology and Water Quality.

New development would also include earthwork and grading which may cause soils to become unstable and cause slope failure. This impact is addressed largely through the integration of geotechnical information in the planning and design process for projects to determine the local soil suitability for specific projects in accordance with standard industry practices and state-provided guidance, such as CGS Special Publication 117A, used to minimize the risk associated with these hazards. Corrective measures, such as structural reinforcement for unstable geologic units and using engineered fill to replace unstable soils, would be required for the design of individual future projects. These measures generally are enforced through compliance with local requirements for geotechnical stability and local building codes and ordinances, to avoid or reduce hazards relating to unstable soils and slope failure.

All site designs would be reviewed and approved by the appropriate federal, State, and local agencies. Project-specific geotechnical investigations consistent with existing regulatory requirements would identify areas of potential concern and recommend geotechnical measures for long-term stability, ensuring that regional growth and the projected land use pattern would not result in unstable soil conditions. Therefore, the potential for landslide, lateral spreading, subsidence, liquefaction, or collapse impacts related to the projected land use pattern or transportation improvements from implementation of the proposed MTP/SCS at the regional level is considered less than significant (LS) for Impact GEO-3. No mitigation is required.

Localized Impacts

Center and Corridor Communities, Established Communities, Developing Communities, Rural Residential Communities, and Lands Not Identified for Development in the Proposed MTP/SCS

The localized impacts associated with implementation of the proposed MTP/SCS are the same in each of these Community Types as described in the regional impact discussion above. Land use and planned transportation improvements in Center and Corridor Communities, Established
Communities, Developing Communities, and Rural Residential Communities are not likely to result in landslide, lateral spreading, subsidence, liquefaction, or collapse.

With respect to transportation changes in Lands Not Identified for Development, the proposed MTP/SCS would make a limited number of planned transportation improvements in this Community Type by 2040, including road maintenance, safety enhancements, other roadway operational improvements, and targeted capacity improvements to existing facilities that accommodate increased travel between urban areas. Although some housing and employment growth, consistent with historical trends, may occur in this Community Type within the MTP/SCS planning period, the proposed MTP/SCS does not forecast any development in these areas by 2040. Because the MTP/SCS does not include projected land use pattern in the Lands Not Identified for Development, there is no potential for implementation of the project to result in geologic or soil instability.

The proposed changes in land use and planned transportation improvements would be located on a range of different geologic materials and conditions. Hazards associated with unstable soils or geologic units are dependent on site-specific conditions, as well as the specific nature of the individual project proposed. With adherence to grading permit and building code requirements, including seismic design criteria as required by the CBC, Caltrans, Special Publication 117A, and local building code requirements, all improvements associated with both the land use development and planned transportation improvements would be designed to minimize potential risks related to unstable soils and geologic units. Because all land use development and transportation improvement are subject to state and local requirements for geotechnical stability that specify mandatory and relatively prescriptive actions that must occur during project development, the potential for landslide, lateral spreading, subsidence, liquefaction, or collapse impacts related to the projected land use pattern and transportation improvements from implementation of the proposed MTP/SCS in all Community Types is considered less than significant (LS) for Impact GEO-3. No mitigation is required.

**High Frequency Transit Area Impacts**

*Placer County, Sacramento County, and Yolo County High Frequency Transit Areas*

Impacts associated with implementation of the proposed MTP/SCS are the same in each of the HFTAs as described in the regional impact discussion above. Land use and planned transportation improvements in the HFTAs are not likely to result in landslide, lateral spreading, subsidence, liquefaction, or collapse because all land use development and transportation improvement are subject to state and local geotechnical requirements. The potential for impacts related to the projected land use pattern and transportation improvements associated with implementation of the proposed MTP/SCS in the HFTAs is considered less than significant (LS) for Impact GEO-3. No mitigation is required.

**Mitigation Measures**

None required.
**Impact GEO-4: Result in development on expansive soil, creating substantial risks to life or property.**

**Regional Impacts**

The projected land use pattern and transportation improvements in the proposed MTP/SCS could be located on expansive soil, which would create risks to life or property. However, most areas in the proposed MTP/SCS planning area have little to no expansive soils or contain expansive soils with slight to moderate swelling potential (Figure 9-7 above). Only the far western edge of Yolo County has expansive soils with high swelling potential. This area is not planned for development.

As discussed under Impact GEO-3, this condition would be addressed largely through the integration of geotechnical information in the planning and design process for development projects to determine the local soil suitability for specific projects in accordance with standard industry practices and state-provided guidance used to minimize the risk associated with these hazards. These measures generally are enforced through compliance with CBC requirements, and local building codes and ordinances, to avoid or reduce hazards relating to unstable soils and slope failure. Therefore, the potential for expansive soil impacts related to the projected land use pattern or transportation improvements from implementation of the proposed MTP/SCS at the regional level is considered less than significant (LS) for Impact GEO-4. No mitigation is required.

**Localized Impacts**

*Center and Corridor Communities, Established Communities, Developing Communities, Rural Residential Communities, and Lands Not Identified for Development in the Proposed MTP/SCS*

The localized impacts associated with implementation of the proposed MTP/SCS are the same in each of these Community Types as described in the regional impact discussion above. Land use and planned transportation improvements in Center and Corridor Communities, Established Communities, Developing Communities, and Rural Residential Communities are required to comply with state and local regulations related to geotechnical safety, which address the potential for substantial risks to life or property from developing on expansive soil.

With respect to transportation changes in Lands Not Identified for Development, the proposed MTP/SCS would make a limited number of planned transportation improvements in this Community Type by 2040, including road maintenance, safety enhancements, other roadway operational improvements, and targeted capacity improvements to existing facilities that accommodate increased travel between urban areas. Although some housing and employment growth, consistent with historical trends, may occur in this Community Type within the MTP/SCS planning period, the proposed MTP/SCS does not forecast any development in these areas by 2040. Because the proposed MTP/SCS does not include projected land use pattern in the Lands Not Identified for Development, there is no potential for implementation of the project to result in a direct or indirect risk in this area.

Therefore, the potential for expansive soil impacts related to the projected land use pattern and transportation improvements associated with implementation of the proposed MTP/SCS in all Community Types is considered less than significant (LS) for Impact GEO-4. No mitigation is required.
High Frequency Transit Area Impacts

Placer County, Sacramento County, and Yolo County High Frequency Transit Areas

Impacts associated with implementation of the proposed MTP/SCS are the same in each of the HFTAs as described in the regional impact discussion above. The land use pattern and planned transportation improvements in the HFTAs are required to comply with state and local regulations related to geotechnical safety that address the potential for substantial risks to life or property from developing on expansive soil. Therefore, the potential for expansive soil impacts related to the projected land use pattern and transportation improvements associated with implementation of the proposed MTP/SCS in the HFTAs is considered less than significant (LS) for Impact GEO-4. No mitigation is required.

Mitigation Measures

None required.

Impact GEO-5: Have soils incapable of adequately supporting the use of septic tanks or alternative water disposal systems where sewers are not available for the disposal of wastewater.

Regional Impacts

Land uses and development in the plan area of the proposed MTP/SCS include a mix of projects ranging from high-density land uses in urbanized areas to low-density projects in the Rural Residential Communities. Sewer systems are required for most of the area of the proposed MTP/SCS. However, SWRCB identifies certain densities that can instead rely on a traditional septic tank or alternative septic system depending on the amount of annual average rainfall that an area receives.

OWTS are regulated at the state, regional, and local level. Local jurisdictions also have general plans that contain policies and implementation measures, including BMPs relevant to the use of septic tanks or alternative water disposal systems, and county environmental health departments regulate septic tanks through measures such as requiring a Sewage Disposal Permit for construction, reconstruction, repair, or abandonment of septic tanks. In terms of alternative water disposal systems, the same measures would be enforced.

Planned transportation improvements in the proposed MTP/SCS would not require septic tanks or alternative water disposal systems.

Therefore, the potential for regional impacts related to OWTS as a result implementation of the projected land use pattern and planned transportation improvements contemplated in the proposed MTP/SCS is considered less than significant (LS) for Impact GEO-5. No mitigation is required.

Localized Impacts

Center and Corridor Communities, Established Communities, Developing Communities, Rural Residential Communities, and Lands Not Identified for Development in the MTP/SCS

The localized impacts associated with implementation of the proposed MTP/SCS are the same in each of these Community Types as described in the regional impact discussion above. Land use and
planned transportation improvements in Center and Corridor Communities, Established Communities, Developing Communities, Rural Residential Communities, and Lands Not Identified for Development would be required to comply with applicable regulations related to OWTS, and therefore, are not likely to have adverse impacts from soils incapable of adequately supporting the use of septic tanks or alternative water disposal systems.

Therefore, the potential for localized impacts related to OWTS as a result of the projected land use pattern or planned transportation improvements contemplated in the proposed MTP/SCS in all Community Types is considered less than significant (LS) for Impact GEO-5. No mitigation is required.

**High Frequency Transit Area Impacts**

*Placer County, Sacramento County, and Yolo County High Frequency Transit Areas*

Impacts associated with implementation of the proposed MTP/SCS are the same in each of the HFTAs as described in the regional impact discussion above. Land use and planned transportation improvements in the HFTAs are required to comply with applicable regulations related to OWTS, and therefore, are not likely to have soils incapable of adequately supporting the use of septic tanks or alternative water disposal systems. Moreover, HFTAs are generally in urban areas where access to public sewer systems is common.

The potential for impacts related to OWTS as a result of land use or planned transportation improvements contemplated in the proposed MTP/SCS HFTAs is considered less than significant (LS) for Impact GEO-5. No mitigation is required.

**Mitigation Measures**

None required.

**Impact GEO-6: Directly or Indirectly Destroy a Unique Geologic Feature.**

**Regional Impacts**

Unique geologic features in the plan area of the proposed MTP/SCS include Berryessa Snow Mountain National Monument at the far western edge of Yolo County, the Sutter Buttes in northeast Sutter County, and various elements to the Sierra Nevada Mountains. These large features are not located near existing or proposed communities and are unlikely to be affected by implementation of the proposed MTP/SCS.

At a regional scale, the type and pattern of development proposed in the MTP/SCS is unlikely to result in the destruction of unique geologic features. Therefore, the potential for regional impacts due to the projected land use pattern and planned transportation improvements contemplated in the proposed MTP/SCS is considered less than significant (LS) for Impact GEO-6. No mitigation is required. For additional discussion of the potential for the MTP/SCS to indirectly affect unique geologic features by altering the surrounding landscape or viewshed, refer to Chapter 3 – Aesthetics.
Localized Impacts

*Center and Corridor Communities, Established Communities, Developing Communities, Rural Residential Communities, and Lands Not Identified for Development in the Proposed MTP/SCS*

As discussed above, unique geologic features are generally in rural portions of the plan area of the proposed MTP/SCS outside of the Established Communities. The potential for localized impacts because of the projected land use pattern and planned transportation improvements contemplated in the proposed MTP/SCS in all Community Types is considered less than significant (LS) for Impact GEO-6. No mitigation is required.

**High Frequency Transit Area Impacts**

*Placer County, Sacramento County, and Yolo County High Frequency Transit Areas*

The HFTAs are generally within the established communities in the Sacramento Valley. This area is not associated with unique geological features and the development of these areas is unlikely to directly or indirectly destroy such resources. The impact of the projected land use pattern or planned transportation improvements contemplated in the proposed MTP/SCS HFTAs is considered less than significant (LS) for Impact GEO-6. No mitigation is required.

**Mitigation Measures**

None required.

**IMPACT GEO-7: RESULT IN SUBSTANTIAL IMPACTS TO GEOLOGY, SEISMICITY, AND SOILS FROM CONSTRUCTION OF PROPOSED MTP/SCS PROJECTS.**

**Regional Impacts**

Many potential effects on geology, seismicity, and soils associated with implementation of the MTP/SCS would occur during the construction of individual projects. As addressed in Impacts GEO-1a through GEO-1c, the potential for the projected land use pattern or planned transportation improvements contemplated in the proposed MTP/SCS to cause substantial seismic effects is low because the plan area is not a seismically active region and there are existing regulations that address residual concerns at the project level. Implementation of the MTP/SCS is also unlikely to directly or indirectly result in the destruction of unique geologic features, as discussed in Impact GEO-6, due to the relative location of anticipated development and the existing regulatory environment. As described in Impact GEO-2, the projected land use pattern and transportation improvements could affect resources during normal construction activities, such as grading, excavation, clearing, removal of vegetation cover, and soil removal that could temporarily increase runoff, erosion, and sedimentation. Construction activities could also result in soil compaction and wind erosion effects that could adversely affect soils and reduce the revegetation potential at construction sites and staging areas. The extent of these impacts would depend on the project size and location.

Existing regulatory requirements specify mandatory and relatively prescriptive actions that must occur during project development. While grading standards differ depending on the jurisdiction (e.g., project size, application requirements, approval process), all jurisdictions require submittal of a grading plan that includes erosion and sediment control measures for approval of a grading permit.
As discussed above, development that disturbs more than 1 acre is subject to compliance with a NPDES permit, including the implementation of best management practices. Projects that would disturb less than 1 acre would be subject to the CALGreen requirements related to stormwater drainage that have been designed to prevent or reduce discharges of sediments through BMPs that include on-site retention and filtration.

Although grading and soil erosion are protected differently among the various local jurisdictions in the plan area of the proposed MTP/SCS, these statewide requirements would address the potential effects of project construction on soils. Therefore, the potential impacts related to the projected land use pattern or transportation improvements from implementation of the proposed MTP/SCS at the regional level is considered less than significant (LS) for Impact GEO-7. No mitigation is required.

**Localized Impacts**

*Center and Corridor Communities, Established Communities, Developing Communities, and Rural Residential Communities, and Lands Not Identified for Development in the MTP/SCS*

Localized impacts associated with construction of the development and planned transportation improvements identified in the MTP/SCS would be the same as those identified for the region. As discussed above, land use and planned transportation improvements in Center and Corridor Communities, Established Communities, Developing Communities, and Rural Residential Communities have the potential to result in substantial soil erosion or the loss of topsoil during construction. With respect to transportation changes in Lands Not Identified for Development, the proposed MTP/SCS would make a limited number of planned transportation improvements in this Community Type by 2040, including road maintenance, safety enhancements, other roadway operational improvements, and targeted capacity improvements to existing facilities that accommodate increased travel between urban areas. Although some housing and employment growth, consistent with historical trends, may occur in this Community Type within the MTP/SCS planning period, the proposed MTP/SCS does not forecast any development in these areas by 2040. Because no development is proposed in these areas under the plan, construction-generated impacts would not occur within this Community Type. As described in the evaluation of regional impacts above, the impact of the projected land use pattern and planned transportation improvements is considered less than significant (LS) for Impact GEO-7 because there are regulations in place that would effectively reduce the potential for loss of topsoil or erosion impacts due to construction of the projected land use pattern and planned transportation improvements in all Community Types. No mitigation is required.

**High Frequency Priority Area Impacts**

*Placer County, Sacramento County, and Yolo County High Frequency Transit Areas*

Impacts associated with implementation of the proposed MTP/SCS are the same in each of the HFTAs as described in the regional impact discussion above. The projected land use pattern and planned transportation improvements are subject to state and local requirements for geotechnical stability and erosion prevention that would adequately address effects during construction. Therefore, the potential impacts related to the projected land use pattern and planned transportation improvements from implementation of the proposed MTP/SCS in the HFTAs is considered less than significant (LS) for Impact GEO-7. No mitigation is required.
MITIGATION MEASURES

None required.

IMPACT GEO-8: RESULT IN THE LOSS OF AVAILABILITY OF A KNOWN DESIGNATED MINERAL RESOURCE THAT WOULD BE OF VALUE TO THE REGION AND THE RESIDENTS OF THE STATE.

Regional Impacts

Local jurisdictions have general plan policies to manage mineral resources, and are required under SMARA to consider mineral resource recovery areas that have been designated MRZ-2 locations (Figure 9-8), indicating that significant mineral deposits are present or are likely to be present. The proposed MTP/SCS uses the adopted and proposed land use and transportation plans from the cities and counties of the SACOG region to help determine where housing and employment growth is likely to occur.

The projected land use pattern associated with implementation of the proposed MTP/SCS could result in a reduction in availability of important designated mineral resources by making certain mineral resources inaccessible for future extraction. Most MRZ-2 areas are located in predominately agricultural and open space areas where no development is planned or in Rural Residential communities where limited development is planned. However, some MRZ-2 areas in the proposed MTP/SCS, such as those in Sacramento County, are already developed. The proposed MTP/SCS emphasizes further development within these already developed areas.

By developing more compactly, the proposed MTP/SCS directs more growth to the areas that are already urbanized and prevents undeveloped land from being converted to urban uses. Keeping growth contained to areas that are already developed limits the amount of growth that takes place at the urban edge, adjacent to areas containing mineral resources. Mining of mineral resources in or near urban development may create land use incompatibilities and may be economically infeasible. Compact growth and urban infill allow for the preservation of non-urban areas where mineral resources may be more feasible to remove.

Similarly, much of the planned transportation improvements from implementation of the proposed MTP/SCS would serve urban uses in urbanized areas of the region. The proposed MTP/SCS planned transportation improvements are developed to most efficiently meet the demands created by the forecasted growth in population and jobs, and focus mainly on the existing regional transportation system. Planned transportation improvements would largely be constructed within existing rights-of-way and without the acquisition of land, or within an urbanizing area.

Planned transportation improvements that occur in the federal or state right-of-way must also comply with the Caltrans encroachment permit process, and provide information on the location of mineral resources. The encroachment permit application requirements include information on the location of mineral resources approved under SMARA. Compliance with SMARA requirements for mineral resource sites and notice requirements would further minimize impacts to locally-important mineral resource sites. The potential loss of availability of a designated mineral resource is a consideration in the final design of individual land use projects and transportation improvements and may be addressed in the project-level environmental review and mitigation process.
Although the proposed MTP/SCS could result in land uses that would preclude the future extraction of mineral resources, these impacts are considered less than significant because the projected land use growth was generally designed to be consistent with local planning documents, which are required to consider mineral resource zones mapped by the state in the land use decisions. Further, most development would be in urban areas or within existing right of way for transportation-related uses where extraction of mineral resources is unlikely. Therefore, the potential for loss of availability of a designated mineral resource related to the projected land use pattern and planned transportation improvements from implementation of the proposed MTP/SCS at the regional level is considered less than significant (LS) for Impact GEO-8. No mitigation is required.

**Localized Impacts**

*Center and Corridor Communities, Established Communities, Developing Communities, Rural Residential Communities, and Lands Not Identified for Development in the MTP/SCS*

The projected land use pattern in Center and Corridor Communities, Established Communities, Developing Communities, and Rural Residential Communities, and transportation improvement projects in all of the Community Types, would be have similar impacts as discussed in the regional analysis and planned transportation improvements have the potential to result in the loss of availability of a designated mineral resource that would be of value to the region and the residents of the state.

Although some housing and employment growth, consistent with historical trends, may occur in the Lands Not Identified for Development within the MTP/SCS planning period, the proposed MTP/SCS does not forecast any projected land use pattern related to the proposed MTP/SCS in these areas by 2040. Because the MTP/SCS does not include projected land use pattern in this area, there is no potential to result in the loss of availability of a designated mineral resource that would be of value to the region and the residents of the state. Thus, the potential for loss of availability of a designated mineral resource related to projected land use pattern associated with the implementation of the proposed MTP/SCS in the Community Types is considered less than significant (LS) for Impact GEO-7. No mitigation is required.

With respect to transportation in Lands Not Identified for Development, the proposed MTP/SCS would make a limited number of planned transportation improvements in this Community Type by 2040, including road maintenance, safety enhancements, other roadway operational improvements, and targeted capacity improvements to existing facilities that accommodate increased travel between urban areas.

Specific projects would be designed to be consistent with local planning documents, which are required to consider mineral resource zones mapped by the state. Further, most development would be in Center and Corridor Communities, Established Communities, and Developing Communities (or within existing right of way for transportation-related uses) where extraction of mineral resources is unlikely. Therefore, the potential for loss of availability of a designated mineral resource related to projected land use pattern and planned transportation improvements associated with implementation of the proposed MTP/SCS in all Community Types is considered less than significant (LS) for Impact GEO-7. No mitigation is required.
High Frequency Transit Area Impacts

**Placer County, Sacramento County, and Yolo County High Frequency Transit Areas**

Impacts associated with implementation of the proposed MTP/SCS would be the same in each of the HFTAs as described in the regional impacts discussion above. The projected land use pattern and planned transportation improvements in the HFTAs may result in the loss of availability of a designated mineral resource that would be of value to the region and the residents of the state. Specific projects would be designed to be consistent with local planning documents, which are required to consider mineral resource zones mapped by the State. Further, most HFTAs are in established urban areas where extraction of mineral resources is unlikely.

The potential for loss of availability of a designated mineral resource related to the projected land use pattern and planned transportation improvements from implementation of the proposed MTP/SCS in the HFTAs is considered less than significant (LS) for Impact GEO-8. No mitigation is required.

**MITIGATION MEASURES**

None required.

**IMPACT GEO-9: 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.**

**Regional Impacts**

Implementation of the projected land use pattern in the proposed MTP/SCS would include new residential, commercial, and other land uses, as well as infill development. Expansion or extension of the roadway network from implementing proposed MTP/SCS planned transportation improvements would require the need for additional land.

Local general plans, specific plans, and other land use plans include policies to protect existing and future mineral production and extraction activities from surrounding uses, and require that future projects near mining activities have compatible land uses. In addition, compliance with SMARA requirements for mineral resource sites and notice requirements would further minimize impacts to locally-important mineral resource sites. Any improvements proposed in federal or state right-of-way are required to obtain an encroachment permit from Caltrans and provide information on mineral resources.

Therefore, regional impacts associated with the loss of availability of a locally-important mineral resource recovery site related to the projected land use pattern or planned transportation improvements from implementation of the proposed MTP/SCS is considered less than significant (LS) for Impact GEO-9. No mitigation is required.
Localized Impacts

*Center and Corridor Communities, Established Communities, Developing Communities, Rural Residential Communities, and Lands Not Identified for Development in the MTP/SCS*

The localized impacts associated with implementation of the proposed MTP/SCS are the same in each of these Community Types as described in the regional impact discussion above. The projected land use pattern and planned transportation improvements in Center and Corridor Communities, Established Communities, Developing Communities, and Rural Residential Communities are not likely to result in the loss of availability of a locally-important mineral resource recovery site.

With respect to transportation improvements in Lands Not Identified for Development, the proposed MTP/SCS would make a limited number of planned transportation improvements in this Community Type by 2040, including road maintenance, safety enhancements, other roadway operational improvements, and targeted capacity improvements to existing facilities that accommodate increased travel between urban areas. Although some housing and employment growth, consistent with historical trends, may occur in this Community Type within the MTP/SCS planning period, the proposed MTP/SCS does not forecast any development in these areas by 2040. Therefore, there is no potential to result in the loss of availability of a designated mineral resource that would be of value to the region and the residents of the state.

All land use development and transportation improvement are subject to SMARA requirements and locally-important resources are regulated by local jurisdictions through policies incorporated into general plans, specific plans, and other land use plans. Thus, local impacts associated with the loss of availability of a locally-important mineral resource recovery site related to the projected land use pattern and planned transportation improvements from implementation of the proposed MTP/SCS in all Community Types is considered less than significant (LS) for Impact GEO-9. No mitigation is required.

High Frequency Transit Area Impacts

*Placer County, Sacramento County, and Yolo County High Frequency Transit Areas*

Impacts associated with implementation of the proposed MTP/SCS are the same in each of the HFTAs as described in the regional impact discussion above. The projected land use pattern and planned transportation improvements in the HFTAs are not likely to result in the loss of availability of a locally-important mineral resource recovery site.

All land use development and transportation improvement are subject to SMARA requirements and locally-important resources are regulated by local jurisdictions through policies incorporated into general plans, specific plans, and other land use plans. Thus, impacts associated with the loss of availability of a locally-important mineral resource recovery site related to the projected land use pattern and planned transportation improvements from implementation of the proposed MTP/SCS HFTAs is considered less than significant (LS) for Impact GEO-8. No mitigation is required.

**Mitigation Measures**

None required.
IMPACT GEO-10: RESULT IN A SUBSTANTIAL IMPACT TO MINERAL RESOURCES FROM CONSTRUCTION OF PROPOSED MTP/SCS PROJECTS.

Regional Impacts

Construction activities associated with implementation of proposed MTP/SCS planned transportation improvements and land uses would require the use of mineral resources such as aggregate (sand, gravel, and crushed stone) and other mineral resources. However, the production and conservation of mineral resources is provided through a comprehensive surface mining and reclamation policy under SMARA. Additionally, local land use plans provide policies that protect mineral resources within their jurisdiction. Compliance with these policies would avoid or minimize substantial impact to mineral resources during construction of the proposed land uses and developments.

Therefore, regional impacts associated with adverse mineral resource impacts during construction related to the projected land use pattern and planned transportation improvements from implementation of the proposed MTP/SCS is considered less than significant (LS) for Impact GEO-10. No mitigation is required.

Localized Impacts

Center and Corridor Communities, Established Communities, Developing Communities, Rural Residential Communities, and Lands Not Identified for Development in the Proposed MTP/SCS

The localized impacts associated with implementation of the proposed MTP/SCS are the same in each of these Community Types as described in the regional impacts discussion above. Land use and planned transportation improvements in Center and Corridor Communities, Established Communities, Developing Communities, and Rural Residential Communities are not likely to result in a substantial impact to mineral resources during construction. With respect to transportation changes in Lands Not Identified for Development, the proposed MTP/SCS would make a limited number of planned transportation improvements in this Community Type by 2040, including road maintenance, safety enhancements, other roadway operational improvements, and targeted capacity improvements to existing facilities that accommodate increased travel between urban areas.

Although some housing and employment growth, consistent with historical trends, may occur in Lands Not Identified for Development within the MTP/SCS planning period, the proposed MTP/SCS does not include projected land use pattern in this Community Type by 2040. Because no land use development is proposed in this area, there are no potential impacts likely to result in a substantial impact to mineral resources during construction.

The localized impacts associated with implementation of the proposed MTP/SCS are the same as described in the regional impacts discussion above. Because all land use development and transportation improvement are subject to SMARA requirements and locally-important resources are regulated by local jurisdictions through policies incorporated into general plans, specific plans, and other land use plans, the potential for local impacts associated with adverse mineral resource impacts during construction in all Community Types related to the projected land use pattern and planned transportation improvements from implementation of the proposed MTP/SCS is considered less than significant (LS) for Impact GEO-10. No mitigation is required.
High Frequency Transit Area Impacts

Placer County, Sacramento County, and Yolo County High Frequency Transit Areas
Impacts associated with implementation of the proposed MTP/SCS are the same in each of the HFTAs as described in the regional impact discussion above. The projected land use pattern and planned transportation improvements in the HFTAs are not likely to result in a substantial impact to mineral resources during construction because all land use development and transportation improvements are subject to SMARA requirements and locally-important resources are regulated by local jurisdictions through policies incorporated into general plans, specific plans, and other land use plans.

Thus, impacts associated with adverse mineral resource impacts during construction in HFTAs related to the projected land use pattern and planned transportation improvements from implementation of the proposed MTP/SCS is considered less than significant (LS) for Impact GEO-10. No mitigation is required.

Mitigation Measures

None required.