4.8 Geology and Soils

This section discusses impacts of the 2018 RTP/SCS pertaining to geologic conditions in the San Joaquin County Planning Area.

4.8.1 Setting

San Joaquin County is located within the Great Valley Geomorphic Province, an asymmetrical synclinal trough, approximately 50 miles wide and 400 miles long. The region is an unusual lowland in that sediments within the basin are relatively underformed, while the surrounding rock units are highly deformed. Little geologic variation exists within the Great Valley, with surficial deposits consisting primarily of unconsolidated Quaternary sediments. The Great Valley is flanked on the east by the west-sloping Sierran bedrock surface, which continues westward beneath alluvium and older sediments. The Western border is underlain by east-dipping Cretaceous and Cenozoic strata that form a deeply buried synclinal trough. The San Joaquin Valley comprises the southern portion of the Great Valley, while the Sacramento Valley is present in the northern portion. Oil fields follow anticlinal uplifts that mark the southwestern border of the San Joaquin Valley and its southernmost basin. The Sacramento Valley plain is interrupted by the Marysville Buttes, an isolated Pliocene volcanic plug approximately 2,000 feet high. Existing geologic, soils, and flooding conditions are briefly summarized below.

a. Existing Conditions

Geologic Formations

San Joaquin County is located at the northern end of the San Joaquin Valley, a sedimentary basin filled with an up to 6-mile thick sequence of interbedded clay, silt, sand, and gravel deposits ranging in age from more than 144 million years old to less than 10,000 years. Recent sediments consist of coarse-grained sand and gravel deposits along river courses and fine-grained alluvium consisting of silt and clay deposited in low-lying areas or flood basins. Older alluvial deposits underlie the edges of the valley and slope gradually towards the center. The foothills of the Diablo Range in the southwestern part of the County are composed of alluvial deposits and older marine sediments deposited during the Tertiary Period when an inland sea occupied the Central Valley (SJCOG, 2014). Geologic formations underlying 2018 RTP/SCS projects include the Pleistocene-age Modesto and Riverbank Formations consisting of granitic sand over stratified silt and sand through the central and eastern portion of the county; the Dos Palos alluvium, consisting of granitic sand over gravel in the Delta region within the western portion of the County; Quaternary-age dune sand in the Manteca area; Quaternary-age alluvial fan deposits in the southwestern portion of the County; and Miocene-age fanglomerate at the base of the foothills of the Diablo range in the southwestern portion of the County (CGS, 1981, 1991; CDMG, 1962).

Earthquake Ground-Shaking and Fault Rupture

The State of California designates faults as active, potentially active, and inactive depending on how recent the movement that can be substantiated for the fault. Active faults show evidence of movement within the Holocene Epoch, or last 11,000 years, while potentially active faults show evidence of movement within the last 1.6 million years, or within the Quaternary period. Inactive faults have not moved within the last 1.6 million years.

The California legislature passed the Alquist-Priolo Special Studies Zone Act in 1972 to address seismic hazards associated with faults and to establish criteria for development within areas identified as seismic hazard zones. Based on a review of the California Geological Survey Alquist-Priolo Fault Zone and Seismic Hazard Zone Maps, there are no Alquist-Priolo Zones located within San Joaquin County.

San Joaquin County is located between two areas of significant tectonic activity. Active faults of the San Andreas Fault System are present to the west of the county line, with the Marsh Creek-Greenville active fault located immediately west of the southern tip of the county. The regional shear zone associated with the Sierra Nevada foothills known as the Foothills Fault System, including the Melones and Bear Mountain fault zones, is present to the east of the county. Active faults potentially affecting San Joaquin County include the San Andreas (Peninsula Section), Hayward, Calaveras, Marsh Creek-Greenville, Midland, Mt. Diablo Thrust, and Concord Faults. These faults are capable of producing earthquakes of a maximum moment magnitude between 6.2 and 7.1. Several potentially active faults are located in the southwest area of the County, in or near the Tracy Planning Area. These include the San Joaquin Fault Zone, Midway-Black Butte Fault, the Vernalis Fault, and the Corral Hollow-Carnegie Fault Zone (CGS 2010; SJCOG 2014; SJC 2014). Notable active faults present in the region are discussed below and Figure 13 shows potentially active faults that are known within San Joaquin County.

San Andreas Fault

The San Andreas Fault is one of the longest and most active faults in the world. The surface trace of this fault extends from the Northern California coastline to the Gulf of California, a distance of over 600 miles. The Peninsula Segment is located approximately 35 miles to the southwest of San Joaquin County. The last major ground rupture of this fault in the Bay Area occurred in 1906 and induced strong seismic shaking in San Joaquin County. The probability of a large earthquake (magnitude 6.7 or greater) within the next 30 years along the northern section of the San Andreas Fault is 6.4 percent.

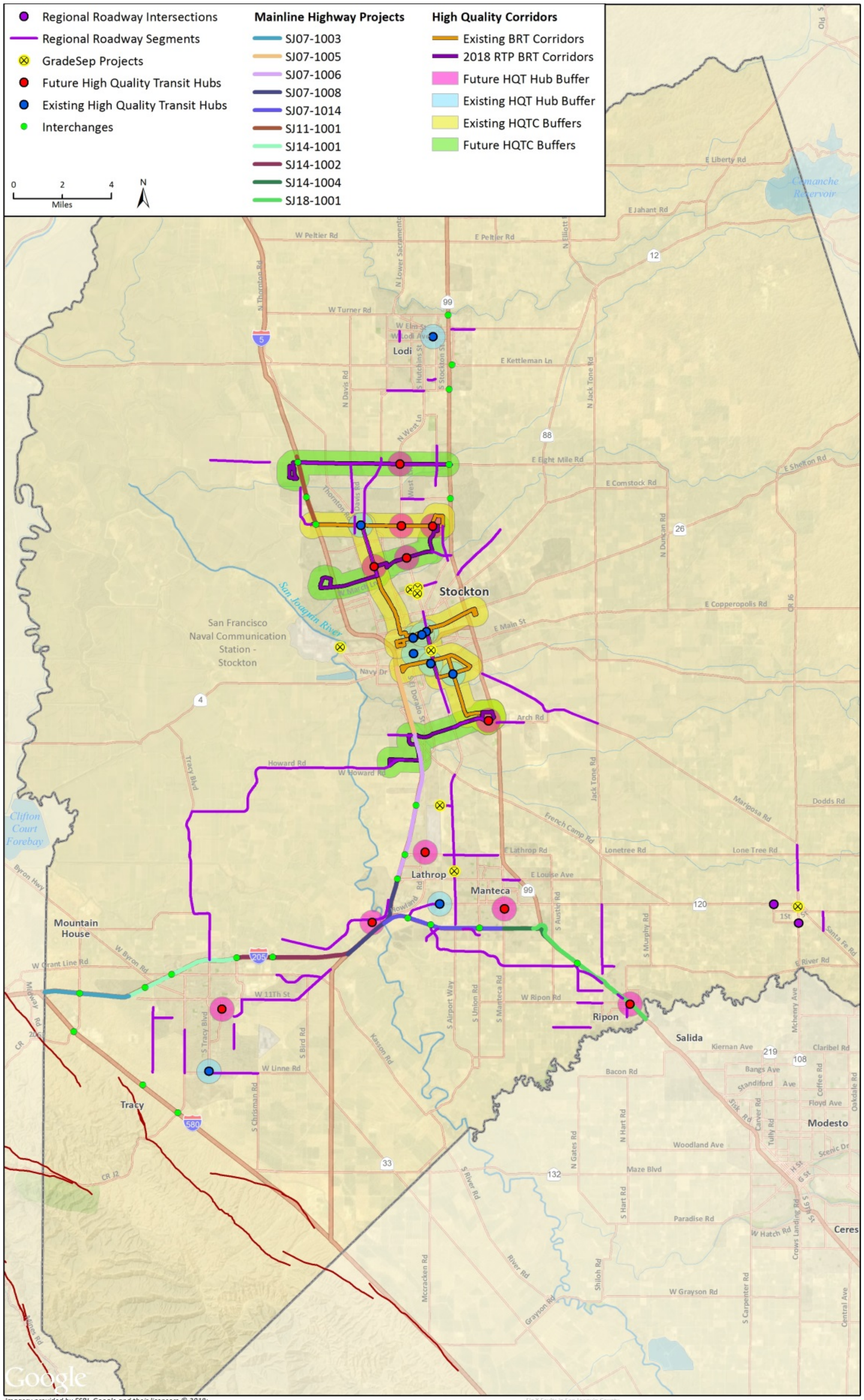
Hayward Fault

The Hayward Fault is located east of San Francisco Bay and extends southeast to where it most likely merges with the Calaveras Fault north of the City of Hollister. The recent history of this fault shows two major earthquakes (1836 and 1868) each with an estimated Richter scale magnitude of 6.5 to 7.5. In addition, between January 1969 and September 1973 approximately 70 small earthquakes were recorded along the fault. Tectonic creep continues to damage structures that cross the fault zone. The probability of a large earthquake (magnitude 6.7 or greater) within the next 30 years is 14.3 percent.

Calaveras Fault

The Calaveras Fault, approximately 100 miles long, borders the eastern flank of the Berkeley-Hayward Hills and extends southeast where it joins the San Andreas Fault south of the City of Hollister. The fault is located approximately 15 miles southwest of San Joaquin County. Due to the physiographic and geologic evidence and earthquake epicenters located along the trace of the fault, the Calaveras Fault Zone is considered active. The probability of a large earthquake (magnitude 6.7 or greater) within the next 30 years is 7.4 percent.

Figure 13 San Joaquin County Active Faults



Imagery provided by ESRI, Google and their licensors © 2018;
Additional data provided by USGS, 2017.

Marsh Creek-Greenville Fault

This fault zone extends from east of Concord southeastward approximately 57 miles to the San Antonio Valley. The fault is located approximately 1 mile southwest of the southwestern portion of the county. The northern section experiences creep at rate of 2 millimeters per year. A magnitude 5.8 earthquake occurred in 1980 north of Livermore. The maximum moment magnitude for an earthquake on this fault is expected to be 6.9.

Liquefaction

Liquefaction, or the loss of soil bearing strength during a strong earthquake, is a potential occurrence in areas with younger soils as well as in areas where the groundwater table is less than 50 feet deep. Specifically in areas of loose sand and silt that is saturated with water, soils can behave like liquid during earthquakes. Liquefaction can cause serious damage to foundations and bases of structures (USGS n.d.). The California Department of Conservation has not identified any liquefaction hazard zones within San Joaquin County (CGS 2017); however, various areas of the county may be subject to liquefaction during seismic events due to high groundwater levels. Liquefaction is found near the Manteca-Lathrop area, the area just west of Woodbridge (including a small portion of the town site), and the Delta region. The soils in the Tracy area are not considered to be as susceptible to liquefaction, even though the groundwater is high, because the near-surface soils are predominantly clays or sands with high silt and clay content. The east and northeast portions of the county are less susceptible because groundwater is deep. The most serious liquefaction threat lies in the Delta, with many levees directly underlain by relatively clean, water-saturated sands and peats. Strong ground shaking could cause liquefaction under these levees and lead to levee failure and localized flooding (SJCOG 2014; SJC 2014).

Slope Stability

Landslides and surficial slope failures are most likely to occur in areas of greater than 25 percent slope (hillside areas) and along steep bluffs. Landslides also occur due to specific events, such as loss of vegetation after fires or earthquakes adding loads to barely stable slopes. Small landslides are common in the County’s mountain areas as loose material moves naturally down slope. The potential for landslides is considered remote in the valley floors due to the lack of significant slopes. Portions of San Joaquin County that are susceptible to this hazard are located in the foothills in the eastern and southwestern portions of the county, the steep banks along the major rivers, and in the Delta. The foothills are most susceptible to unstable slope conditions and specifically include the steep hills of the Diablo Range in the southwest section of the county and the Sierra Nevada Foothills along the county’s eastern edge (SJCOG 2014). The California Geological Survey has not designated any areas within San Joaquin County as a landslide hazard zone (CGS 2017).

Expansive Soils

Soils with relatively high clay content are expansive because the clay absorbs water and swells (expands). According to the General Plan, soil survey data for San Joaquin County indicates that close to half of the upper five feet of soils have a low shrink-swell potential, a lesser portion is considered to have a moderate potential, and about an eighth of the area, primarily in the southwestern end of the county, has been mapped with a high potential. The hazards associated with expansive soils can be mitigated through proper geotechnical engineering, which is a requirement in San Joaquin County (SJCOG 2014; SJC 2014).

Erosion

Erosion naturally occurs on the surface of the earth as surface material (i.e., rock, soil, debris, etc.) is loosened, dissolved, or worn away, and transported from one place to another by gravity. Two common types of soil erosion include wind erosion and water erosion. The steepness of a slope is an important factor that affects soil erosion. Erosion potential in soils is influenced primarily by loose soil texture and steep slopes. Loose soils can be eroded by water or wind forces, whereas soils with high clay content are generally susceptible only to water erosion. The potential for erosion generally increases as a result of human activity, primarily through the development of facilities and impervious surfaces and the removal of vegetative cover. The Delta and portions of the southeast County are subject to wind erosion, as well as some areas in Stockton, Lathrop, and Tracy. During times of high winds (15 mph or higher), clouds of peat dust are visible in the Delta area, sometimes creating road closures. As a result of loose soils, steep slopes and high rates of runoff, water erosion is also occurring in the Delta (SJCOG 2014).

Water erosion from a combination of loose soils, steep slopes, and high rates of runoff is taking place in the Delta and in the foothills in the southwest and eastern sections of the County. By reducing the ability of the Delta levees to withstand water pressure, erosion caused by tidal action, wind-induced waves, and boating, increases the potential for failure and flooding (SJC 2014).

Subsidence

Land subsidence is the gradual, local settling or sinking of the earth’s surface with little or no horizontal motion. Land subsidence occurs in San Joaquin County and is generally attributed to the overdrafting of groundwater basins and peat oxidation of the Delta islands. This type of ground failure can be aggravated by ground shaking, and is often caused by the withdrawal of large volumes of fluid from underground reservoirs. Other causes of subsidence include sinking tectonics, oil and gas extraction, and deficient alluvial deposits. Subsidence from any cause accelerates maintenance problems on roads, canals, and underground utilities, and contributes to drainage and flood problems. Seismic activities also aggravate subsidence areas. Maintenance or raising water tables can mitigate effects from subsidence.

Subsidence caused by hydrocompaction of moisture-deficient alluvial deposits is a onetime densification from collapse of the soil structure in near-surface strata where the rainfall or other moisture has not penetrated during a long period of time (SJCOG 2014).

Settlement

Loose, soft soil material comprised of sand, silt and clay, if not properly engineered, has the potential to settle after a building is placed on the surface. Settlement of the loose soils generally occurs slowly but over time can amount to more than most structures can tolerate. Building settlement could lead to structural damage such as cracked foundations and misaligned or cracked walls and windows. Settlement problems are site-specific and can generally be remedied through standard engineering applications (SJCOG 2014).

b. Regulatory Setting

State

The Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act, California's Alquist-Priolo Act (PRC 2621 et seq.), is intended to reduce the risk to life and property from surface fault rupture during earthquakes. The Alquist-Priolo Act prohibits the location of most types of structures intended for human occupancy across the traces of active faults and strictly regulates construction in the corridors along active faults (Earthquake Fault Zones). It also defines criteria for identifying active faults, giving legal weight to terms such as "active," and establishes a process for reviewing building proposals in and adjacent to Earthquake Fault Zones. Under the Alquist-Priolo Act, faults are zoned, and construction along or across them is strictly regulated if they are "sufficiently active" and "well-defined." A fault is considered sufficiently active if one or more of its segments or strands shows evidence of surface displacement during Holocene time (defined 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).

Seismic Hazards Mapping Act

Like the Alquist-Priolo Act, the Seismic Hazards Mapping Act of 1990 (PRC 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.

California Building Standards Code

The California Building Standards Code (CBSC) is based on the Uniform Building Code (International Code Council 1997), which is used widely throughout United States and has been modified for California conditions with numerous, more detailed or more stringent regulations. The CBSC provides standards for various aspects of construction, including, but not limited to: excavation, grading, and earthwork construction; fills and embankments; expansive soils; foundation investigations; and liquefaction potential and soil strength loss. In accordance with California law, proponents of specific projects are required to comply with all provisions of the CBSC for certain aspects of design and construction.

California Department of Transportation - Seismic Design Criteria

The California Department of Transportation (Caltrans) has Seismic Design Criteria (SDC) which contain 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. Memo 20-1 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 comprise Caltrans' seismic design methodology.

Regional and Local

San Joaquin County General Plan

The 2035 San Joaquin County General Plan Public Health and Safety Element contains goals and policies related to seismic and geologic hazards. Goal PHS-3 is "To protect life and property from seismic and geologic hazards." The County shall consider the risk to human safety and property from seismic and geologic hazards in designating the location and intensity for new development (PHS-3.1). Emergency services, major utility lines and facilities, manufacturing plants using or storing hazardous materials, high occupancy structures, and facilities housing dependent populations are not to be located within one-eighth of a mile of any active fault or on soil that is highly susceptible to liquefaction (PHS-3.2). Emergency service facilities must be capable of withstanding earthquakes and remain operational to provide emergency response (PHS-3.3). New developments in areas determined to have high liquefaction potential must include detailed site-specific liquefaction studies (PHS-3.4). All proposed structures, utilities, or public facilities within County-recognized areas of near-surface subsidence or liquefaction shall be located and constructed in a manner that minimizes or eliminates potential damage (PHS-3.5). The county shall promote regional and local efforts to reduce subsidence in the Delta (PHS-3.6). The county shall encourage the planting of vegetation to decrease loss of soil by erosion (PHS-3.7). The county shall support soil conservation and restoration efforts of the US Soil Conservation Service and the Resource Conservation Districts (PHS-3.8).

4.8.2 Impact Analysis

a. Methodology and Significance Thresholds

Appendix G of the State CEQA Guidelines identifies the following criteria for determining whether a project's impacts would have a significant impact related to geology and soils:

1. Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving rupture of a known earthquake fault, strong seismic ground-shaking, seismic-related ground failure, including liquefaction, or landslides;
2. Result in substantial soil erosion or the loss of topsoil;
3. Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse;
4. Be located on expansive soil, creating substantial risks to life or property; and/or
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.

Projects under the 2018 RTP/SCS would not require the use of septic tanks and land use projects are anticipated to connect to existing facilities. Therefore, Threshold 5 is discussed in Section 4.16, *Less Than Significant Environmental Factors*. Because the location of each proposed improvement can be different in geologic character, the determination of impact significance and identification of mitigation measures is based on site-specific analysis at the time of the project design and environmental review. Therefore, for the purposes of this EIR, proposed transportation modifications and future projects under the land use scenario envisioned by the 2018 RTP/SCS that are located in areas of moderate to high geologic or soil hazards shall be considered to have a potentially significant impact.

b. Project Impacts and Mitigation Measures

This section describes generalized impacts associated with the 2018 RTP/SCS. Due to the programmatic nature of the 2018 RTP/SCS, a precise, project-level analysis of the specific impacts associated with individual transportation and land use projects is not possible at this time. In general, however, implementation of proposed transportation improvements and future projects under the land use scenario envisioned by the 2018 RTP/SCS could be exposed to impacts caused by geology/soil conditions as described in the following sections.

Threshold 1:	Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving rupture of a known earthquake fault, strong seismic ground-shaking, seismic-related ground failure, including liquefaction, or landslides.

IMPACT GEO-1 IMPLEMENTATION OF PROPOSED TRANSPORTATION IMPROVEMENTS AND FUTURE PROJECTS FACILITATED BY THE LAND USE SCENARIO ENVISIONED IN THE 2018 RTP/SCS COULD BE SUBJECT TO SEISMIC HAZARDS, INCLUDING FAULT RUPTURE, GROUND-SHAKING, LIQUEFACTION, AND LANDSLIDING, THAT COULD EXPOSE PEOPLE OR STRUCTURES TO SUBSTANTIAL ADVERSE EFFECTS. IMPACTS WOULD BE SIGNIFICANT BUT MITIGABLE.

Fault rupture can occur along or immediately adjacent to faults during an earthquake. Fault rupture is characterized by ground cracks and displacement which could endanger life and property. Damage is typically limited to areas close to the moving fault. There are no active faults that intersect the County; therefore the ground surface rupture is considered very unlikely. However, several potentially active faults cross San Joaquin County. The Vernalis Fault, a potentially active Quaternary fault exhibiting displacement within the last 1.6 million years, crosses several transportation projects in the southwestern corner of the County.

Ground-shaking effects are also the result of an earthquake, but the impacts can be widespread. Although a function of earthquake intensity, ground-shaking effects can be magnified by the underlying soils and geology, which may amplify shaking at great distances. It is difficult to predict the magnitude of ground-shaking following an earthquake, as shaking can vary widely within a relatively small area.

Seismic-related ground failure such as liquefaction or landslides may result from an earthquake in or near San Joaquin County. Projects in the Delta region and near the Manteca-Lathrop area are particularly susceptible to liquefaction. Projects in mountainous areas, along steeply sloped streambanks, or within the Delta region, are most susceptible to landslides which may be triggered during an earthquake.

Potential structural damage and the exposure of people to the risk of injury or death from structural failure would be minimized by compliance with California Building Code engineering design and construction measures. Foundations and other structural support features would be designed to resist or absorb damaging forces from strong ground-shaking and liquefaction. These requirements would partially reduce seismic impacts. However, compliance with the California Building Code would not completely reduce the potential of seismic hazards and seismic damage may still occur as a result of implementation of 2018 RTP/SCS projects. Seismic impacts would be potentially significant.

Mitigation Measures

For transportation projects under their jurisdiction, SJCOG shall implement, and transportation project sponsor agencies can and should implement, the following mitigation measure developed for applicable transportation projects identified in Appendix B. Municipalities in the SJCOG region can and should implement this measure, where relevant to land use projects implementing the 2018 RTP/SCS.

GEO-1 Geotechnical Analysis

Project sponsors shall complete site-specific geotechnical reports conducted by a qualified geotechnical expert. Any investigations shall comply with the California Geological Survey's Guidelines for Evaluating and Mitigating Seismic Hazards in California and projects shall comply with the recommendations stated in the geotechnical analysis. Recommendations may include, but are not limited to, the following: fill placement and compaction, isolated and continuous footing, site specific pipe bedding, and site specific seismic design criteria.

Significance After Mitigation

Implementation of Mitigation Measure GEO-1 would reduce impacts to a less than significant level.

Threshold 2: Result in substantial soil erosion or the loss of topsoil

IMPACT GEO-2 GRADING ASSOCIATED WITH TRANSPORTATION IMPROVEMENTS AND FUTURE PROJECTS FACILITATED BY THE LAND USE SCENARIO ENVISIONED IN THE 2018 RTP/SCS COULD CAUSE SOIL EROSION. HOWEVER, COMPLIANCE WITH APPLICABLE ORDINANCE CODES WOULD ENSURE THAT IMPACTS WOULD REMAIN LESS THAN SIGNIFICANT.

Typically, erosion impacts from grading and development occur on a very small scale and do not present a quantifiable threat to a community. However, erosion and grading also have the potential to create unstable slopes. The UBC and CBC regulate slope instability and conditions that can lead to erosion, and requires foundation engineering and investigation of soils on sites proposed for development in geologic hazard areas. The reports from these investigations must demonstrate the hazard from the project will be eliminated or there is no danger for the intended use of the site. All major earthwork requires a grading permit to minimize erosion, and local grading ordinances ensure that development in geologic hazard areas does not pose a threat to human life and property. Erosion control can be accomplished on critical slopes being affected by natural agents.

In addition, the Regional Water Quality Control Board would require a project-specific Storm Water Pollution Prevention Plan (SWPPP) to be prepared for each project that disturbs an area one acre or larger. The SWPPPs would include project-specific best management practices (BMPs) designed to control drainage and erosion. Project BMPs may include, but would not be limited to: silt fencing, fiber rolls, slope stabilization, and sand bags. These BMPs would be required as part of each individual project permit and would mitigate potential impacts on soil erosion as a result of construction or grading.

Further, transportation improvement projects include roadway widening, bicycle and pedestrian infrastructure improvements, roundabouts, new turn lanes, new rail lines, and upgrades to interchanges. Soil erosion and loss of topsoil could result from implementation of 2018 RTP/SCS projects that involve the expansion or extension of the transportation system into previously undeveloped land. Soil erosion and loss of topsoil could be impacted through transportation network improvements, since these usually involve grading or earthwork, and increased impervious surfaces and removal of vegetative cover. Transportation network improvements would be subject to a variety of state and local regulations, including the UBC, CBC, and NPDES requirements and local ordinances and regulations, which are designed to avoid potential hazards associated with soil erosion. With adherence to the applicable ordinance codes and other local, State, and county regulatory programs, impacts related to erosion would be less than significant.

Mitigation Measures

No Mitigation Measures are required.

Significance After Mitigation

Impacts would be less than significant without mitigation.

Threshold 3:	Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse
Threshold 4:	Be located on expansive soil, creating substantial risks to life or property

IMPACT GEO-3 IMPLEMENTATION OF PROPOSED TRANSPORTATION IMPROVEMENTS AND FUTURE PROJECTS FACILITATED BY THE LAND USE SCENARIO ENVISIONED IN THE 2018 RTP/SCS COULD BE LOCATED ON POTENTIALLY UNSTABLE SOILS, OR IN AREAS OF HIGH LIQUEFACTION POTENTIAL. HOWEVER, ADHERENCE TO EXISTING REGULATORY REQUIREMENTS WOULD REDUCE THIS IMPACT TO LESS THAN SIGNIFICANT.

Implementation of proposed transportation improvements and future projects under the land use scenario envisioned by the 2018 RTP/SCS could be prone to slope instability, liquefaction, and other soil-related hazards. Excavation related to construction projects or as needed to construct anticipated development could result in unstable soils. Some projects could be located on geologic units or soils that are unstable, or that could become unstable. Slope failure can occur naturally through rainfall or seismic activity, or through earthwork and grading related activities.

The hazards of unstable soil or geologic units would be 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 requirements, such as local and CBC requirements, used to minimize the risk associated with these hazards. Incorporation of geotechnical recommendations such as foundation design and site preparation prior to construction enforced through compliance with local building codes and ordinances would avoid or reduce hazards relating to unstable soils and slope failure. In addition, Policy PHS-3.6 of the San Joaquin County General Plan specifically addresses the ongoing hazard of subsidence in the Delta and recognizes the need to reduce this hazard. With implementation of the existing regulatory requirements, such as local and CBC building code requirements and proposed policies, this impact would be less than significant.

According to the 2035 County General Plan, soil survey data for the county indicates that close to half of the upper five feet of soils have a low shrink-swell potential and areas with a high potential are primarily confined to the southwestern end of the county. In most developed areas, any native existing layers of clay have been blended into more granular soils as a part of the general site excavation, which helps to reduce the overall expansiveness of the soil. However, the hazard of expansive soils can only definitively be determined based on site-specific data that would be included as part of a typical development process as required by Policy PHS-3.1 in the General Plan. With implementation of this policy and existing regulatory requirements such as local and CBC building code requirements, impacts associated with expansive soils would be less than significant.

Mitigation Measures

No Mitigation Measures are required.

Significance After Mitigation

Impacts are less than significant without mitigation.

c. Cumulative Impacts

Geology, soils and seismicity impacts may be related to: increased exposure to seismic hazards, increased erosion and/or loss of topsoil, and the presence of unstable/expansive soils. These effects occur independently of one another, and are caused by site-specific and project-specific characteristics and conditions. In addition, existing regulations, such as the California Building Code, specify mandatory actions that must occur during project development, which would minimize effects from construction and operation of projects related to geology, soils and seismicity as discussed above. Cumulative impacts related to geology, soils and seismicity would not be significant, and the 2018 RTP/SCS would not make a cumulatively considerable contribution to significant cumulative impacts related to geology, soils and seismicity.

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