2.2.3 Geology/Soils/Seismic/Topography

2.2.3.1 Regulatory Setting

For geologic and topographic features, the key federal law is the Historic Sites Act of 1935, which establishes a national registry of natural landmarks and protects "outstanding examples of major geological features." Topographic and geologic features are also protected under the California Environmental Quality Act (CEQA).

This section also discusses geology, soils, and seismic concerns as they relate to public safety and project design. Earthquakes are prime considerations in the design and retrofit of structures. The Department's Office of Earthquake Engineering is responsible for assessing the seismic hazard for Department projects. The current policy is to use the anticipated Maximum Credible Earthquake (MCE) from young faults in and near California. The MCE is defined as the largest earthquake that can be expected to occur on a fault over a particular period of time.

2.2.3.2 Affected Environment

The project is located within a Holocene-era alluvial valley where the nonactive deposits include unconsolidated sand, silt, and clay-bearing alluvium. According to the project area geological map (Figure 2.2.3-1), the site location is identified as geological unit Qya, which describes the geology as "Young axial channel deposits of the Holocene and latest Pleistocene eras." Just adjacent to the northbound ramp, the geological unit Qoa, which is described the geology as old axial channel deposits (late to middle Pleistocene), locally capped by thin, discontinuous alluvial deposits of Holocene age.

Being located in an alluvial valley, there is a potential for high liquefaction during a seismic event.

The project is located within seismically active southern California. No faults are known to traverse the project area, and it is not located within an Alquist-Priolo Special Studies or Earthquake Fault Zone; however, the City is located within 80.5 kilometers (km) (50 miles) of several known potential sources of strong seismic shaking, including the offshore segment of the Newport-Inglewood fault system, which is located approximately 9.7 km (6 miles) west of the City (City of San Juan Capistrano, 1999). Other faults located within 80.5 km (50 miles) of the City include the offshore Palos Verdes fault, Elsinore fault, Whittier fault, and San Jacinto fault.

There are no outstanding geological or topographic features within the project area.

2.2.3.3 Environmental Consequences

A Temporary Impacts

Alternatives 3 and 5. Although the project site is located in an area with a potential for high liquefaction during a seismic event, construction of the proposed project would not alter the geotechnical properties of the project site and would not cause regional vibration. Soil loss due to grading and other construction activities is expected to be

minimal and standard Department best management practices (BMPs) would be followed to minimize soil loss and erosion during construction.

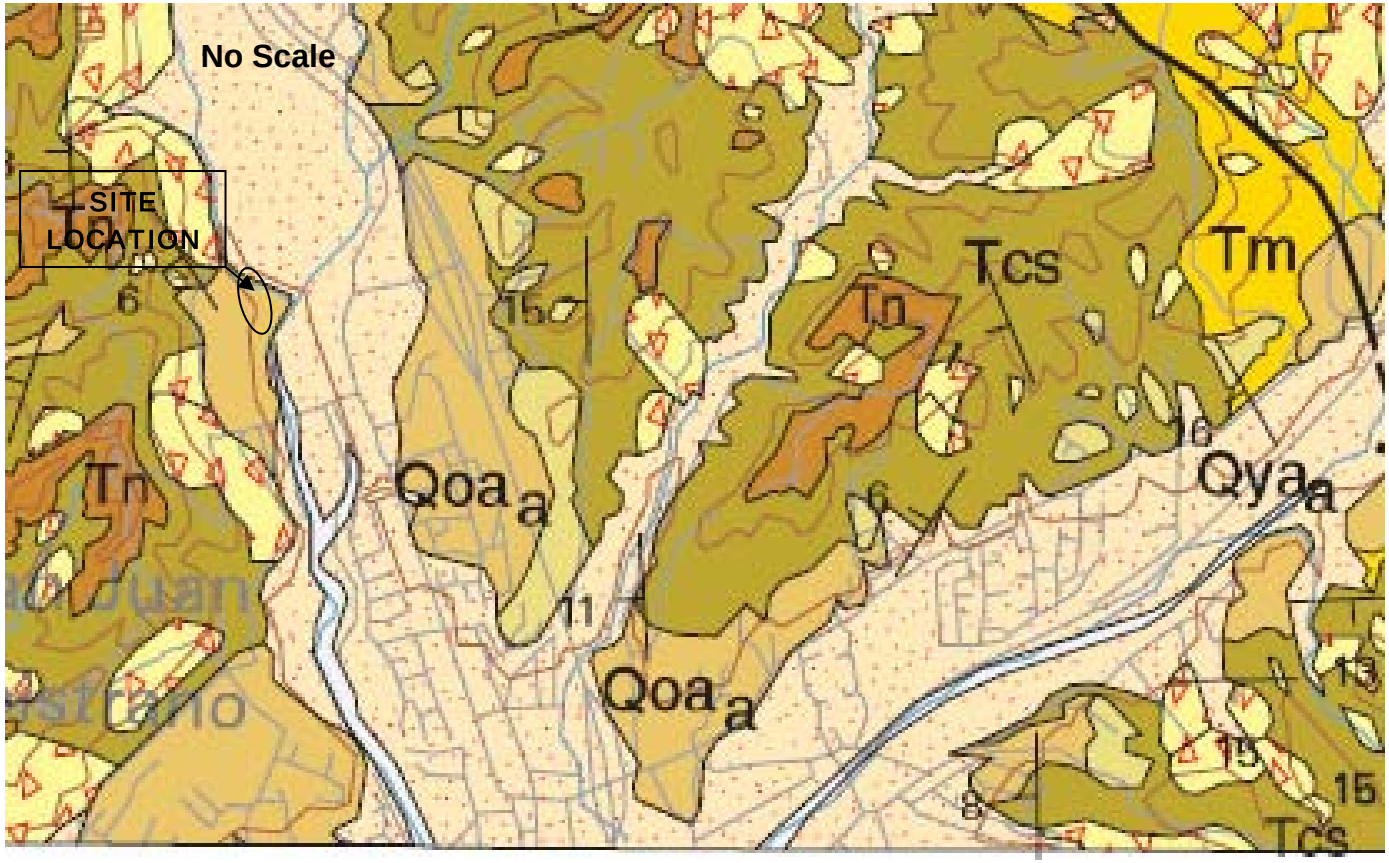
B Permanent Impacts

Alternatives 3 and 5. The project location is not located within an Alquist-Priolo Special Studies or Earthquake Fault Zone. Consequently, the potential for ground rupture in the project area because of fault movement is low; however, several major faults are located within 50 miles (80.5 km) of the City, a major earthquake associated with any of these faults could result in moderate to severe ground shaking in the project area.

Although the project site is located in an area with a potential for high liquefaction during a seismic event, long-term operation of the proposed project would not alter the geotechnical properties of the project site and would not cause regional vibration. The project would be designed to meet current City and Department design standards to minimize liquefaction hazards. The current risks associated with liquefaction at the interchange area would remain the same as existing conditions if either of the proposed build Alternatives 3 or 5 were constructed. Thus, the proposed build alternatives would not have the potential to introduce new liquefaction-related hazards.

Although the proposed project site is located in seismically active southern California, it is within an existing transportation corridor. The project would be designed to meet current City and Department design standards which would minimize geologic and seismic hazards. No structures would be constructed that would increase the current risk of loss, injury, or death as a result of ground shaking or other seismically-induced effects. The proposed project would not increase the risk of exposing people or structures to potential substantial adverse effects because of seismic activities or seismic-related ground failure beyond the existing level already present with the current interchange configuration.

Measures MM GEO-1 and MM GEO-2 have been incorporated to ensure that the project is designed to minimize any potential long-term operational hazards due to ground motion, liquefaction, and load-bearing concerns related to seismic activities.



Geologic Map Legend

Qya: Young axial channel deposits (Holocene and late Pleistocene). Gravel, sand, and silty alluvium, gray unconsolidated.

Qoa: Old axial channel (late to middle Pleistocene). Gravel, sand, and silt gray unconsolidated to indurated.

Tn: Nigel formation (Pliocene). Interbedded marine sandstone, conglomeratic sandstone, and conglomerate.

Tcs: Siltstone facies siltstone and mudstone white to pale gray, massive to crudely bedded friable.

Tm: Monterey formation (Miocene). Marine siltstone and sandstone, siliceous, and diatomaceous.

(SOURCE: http://pubs.usgs.gov/of/1999/of99-172/sanana2cmu.pdf)

Figure 2.2.3-1
Project Area Geologic Map

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2.2.3.4 Avoidance, Minimization, and/or Mitigation Measures

A Temporary Measures

None required.

B Permanent Measures

MM GEO-1 In accordance with standard Department requirements, detailed geotechnical studies shall be conducted during the project's future plans, specifications, and estimates (PS&E) phase. Resulting recommendations shall be incorporated into the project's final design plans to address seismic safety, liquefaction, and load-bearing concerns present in the project area.

MM GEO-2 Monitoring during construction shall be done by a licensed geologist and engineer to ensure the construction site was properly characterized by the geotechnical studies and that the project design is in compliance with geotechnical and seismic safety standards and practices included in the final design package.

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