

## 3.7 Geology, Soils, Seismic and Paleontological Resources

This section evaluates the potential long-term effects of the No Build Alternative and the Build Alternative on geology, soils, seismic and paleontological resources. Short-term construction effects are discussed in **Section 3.17** (Construction).

The assessment of reasonably foreseeable effects in this section is based upon the temporal and geographic proximity parameters detailed in **Chapter 3.0** (Introduction).

### 3.7.1 Affected Environment

The Study Area is the 0.5-mile to 2-mile radius from the guideway centerline described in **Section 3.1.1** (Study Area) to focus on the area where impacts are most likely to occur, such as changes in soil stability and localized seismic risk. This is considered within the larger context of the geological conditions within the region. Regulations associated with geology, soils, seismic, and paleontological resources applicable to the Project are summarized in **Appendix S** (Regulatory Setting Summary).

To determine potential effects on geology, soils, and paleontological resources, existing information on geotechnical, subsurface, and seismic conditions, and paleontological resources within the Study Area and greater region was assessed. A review of previous geotechnical investigations of the Study Area and region, geologic and topographic maps, and general plans were conducted to determine the presence of seismic and other geological hazards. A geotechnical investigation boring program conducted in the Study Area by Metro in 2025 supports the information summarized below. This geotechnical investigation included 108 borings taken along the alignment and MSF Sites 1 and 2, from La Verne Avenue to just east of Montebello Boulevard (refer to the approved boring location map in **Appendix U** ([Boring Locations])). The borings were conducted to inform the advancement of the engineering for temporary and permanent Build Alternative components, such as the at-grade track, aerial structure, MSF, and the underground stations. A review of paleontological potential by geologic unit within the Study Area, a paleontological literature search, and a record search by the Natural History Museum of Los Angeles County were conducted to determine the potential presence of paleontological resources within the Study Area.

#### 3.7.1.1 Geology, Soils, and Seismic Conditions

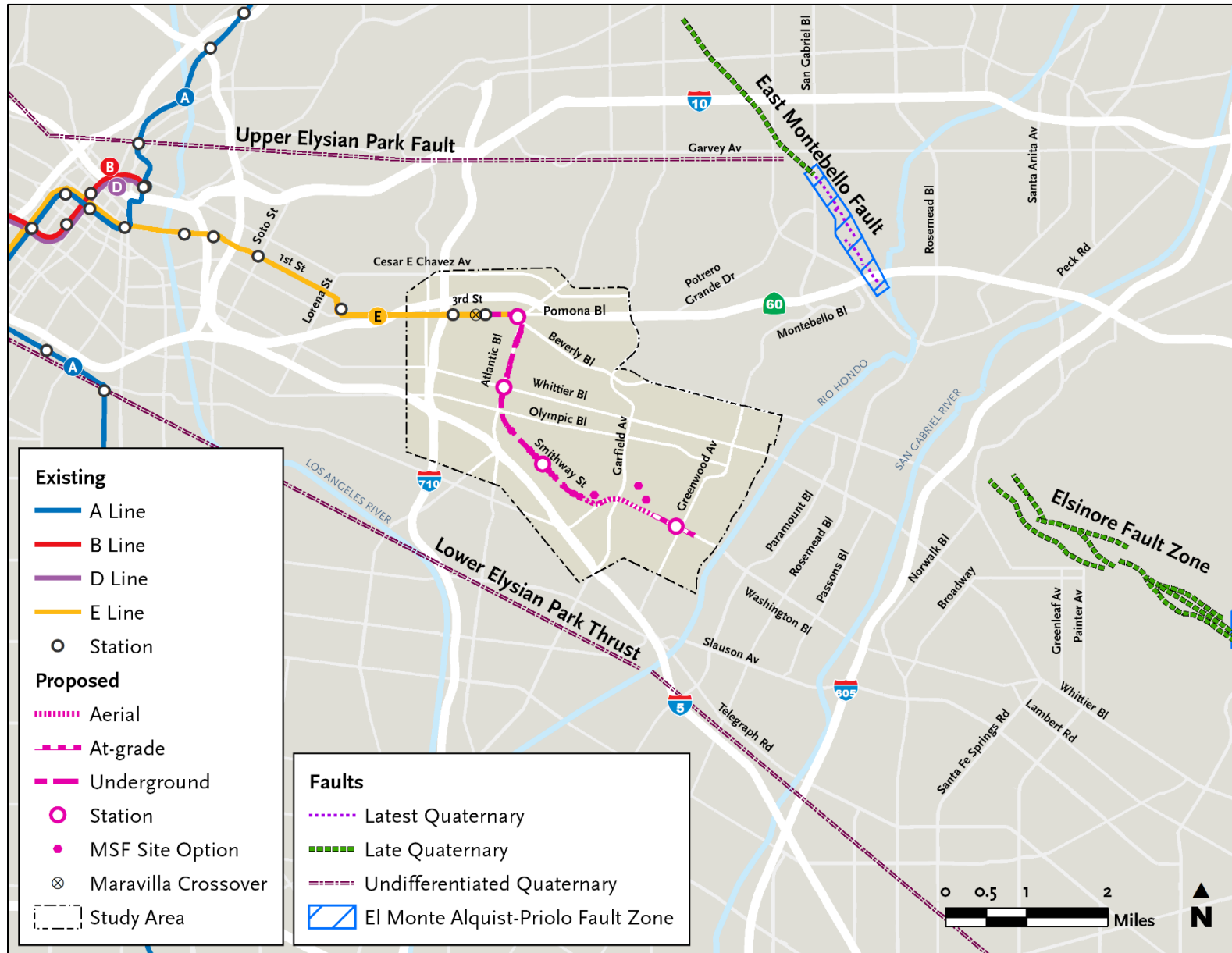
The region lies within the Peninsular Ranges geomorphic province, which is characterized by northwest-trending mountain ranges and hills separated by sub-parallel, sediment-filled valleys (California Geological Survey 2002). The subsurface soils along the Build Alternative alignment mainly consist of fill material underlain by natural Alluvial soils, and bedrock is unlikely to be encountered along the Build Alternative alignment (Diaz-Yourman and Associates 2021). Historic high groundwater levels in alluvium within the Study Area ranged from 120 to 150 feet below ground surface on the northwest at Atlantic Boulevard and 5 to 15 feet below ground surface at the Rio Hondo and San Gabriel River (Diaz-Yourman and Associates 2021). Based on a limited number of corrosion tests performed from samples collected from the limited field exploration, the on-site soils at the site-specific boring locations do not pose a corrosive environment (Diaz-Yourman and Associates 2021). The results of the geotechnical investigation conducted in 2025 show a level of asphalt to approximately 8 inches in depth followed by a brown, fine grained, poorly graded sand to sandy silt down to a depth of 5 to 25 feet. The results of the soil borings are consistent with the native soils in the area, exhibiting a brown sand to sandy loam alluvial deposit. Groundwater was encountered in three borings ranging from 120 to 125 feet in depth.

The Study Area is located in a seismically active, urbanized area that is primarily impervious with no exposed soils. As shown in **Figure 3.7-1**, there are no Alquist-Priolo Earthquake Fault Zones within the Study Area; the nearest is the East Montebello Fault approximately 4 miles northeast of the Build Alternative. Other seismic hazards include Holocene active faults such as the Whittier Fault, located approximately 4 miles to the east (Diaz-Yourman and Associates 2021), potentially active faults such as the MacArthur Park Fault approximately 5 miles northwest (Dolan and Sieh 1992), and blind thrust faults such as the Puente Hills and Elysian Park thrusts (Diaz-Yourman and Associates 2021).

As shown in **Figure 3.7-2**, the Study Area is not within a liquefaction zone or a landslide zone (California Geological Survey 2025). Although MSF Sites 1 and 2 are shown to be within a landslide zone, this area was a landfill disposal pit that was filled to street level in the 1980s and developed. Thus, the site is no longer in a landslide zone. See **Appendix J** for historical information on the closed landfill. The older alluvial deposits, which underlie the Study Area, are generally medium dense to dense (California Geological Survey 2012). Expansive soils, which are clay-rich soils that swell and shrink with wetting and drying may exist locally within alluvial soils present along the Build Alternative alignment as shown in **Figure 3.7-3**. The shrink-swell capacity of expansive soils can result in damage to pavements and foundations.

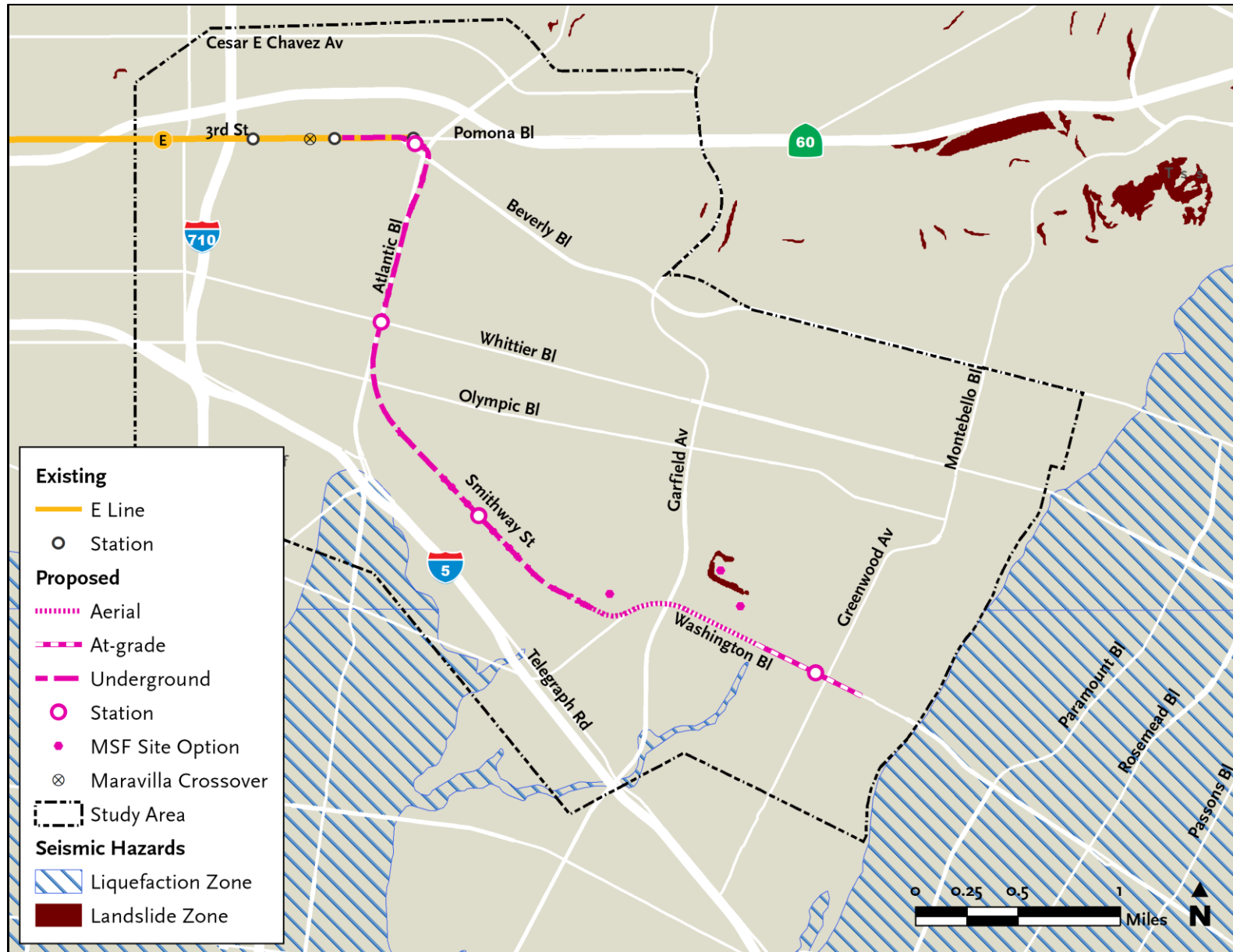
### 3.7.1.2 Paleontological Resources

The soils that are present in the Study Area include old alluvial fan sediments (late to middle Pleistocene). According to the fossil locality searches conducted by the Natural History Museum of Los Angeles County in 2019, one fossil locality was identified near north of Floral Drive between the Long Beach Freeway (Interstate 710) and Monterey Park Road (northwest of the Study Area) and a second locality was identified near the intersection of Atlantic Avenue and Interstate 710 (southwest of the Study Area) at a depth of 20 to 35 feet that produced mastodon, horse, deer, sabretooth cat, and turkey fossils (McLeod 2019). Another locality, located north of Leffingwell Road and east of La Mirada Boulevard (southeast of the Study Area), identified horse fossils at only 2 feet below ground surface (McLeod 2019). The findings suggest that soils in the Study Area are associated with old alluvial fan sediments and could be categorized as having high potential for paleontological resources. In addition, a review of published and unpublished literature of known paleontological resources was conducted to determine if there is a presence of paleontological resources. The literature search yielded no records of fossil localities near the Build Alternative.



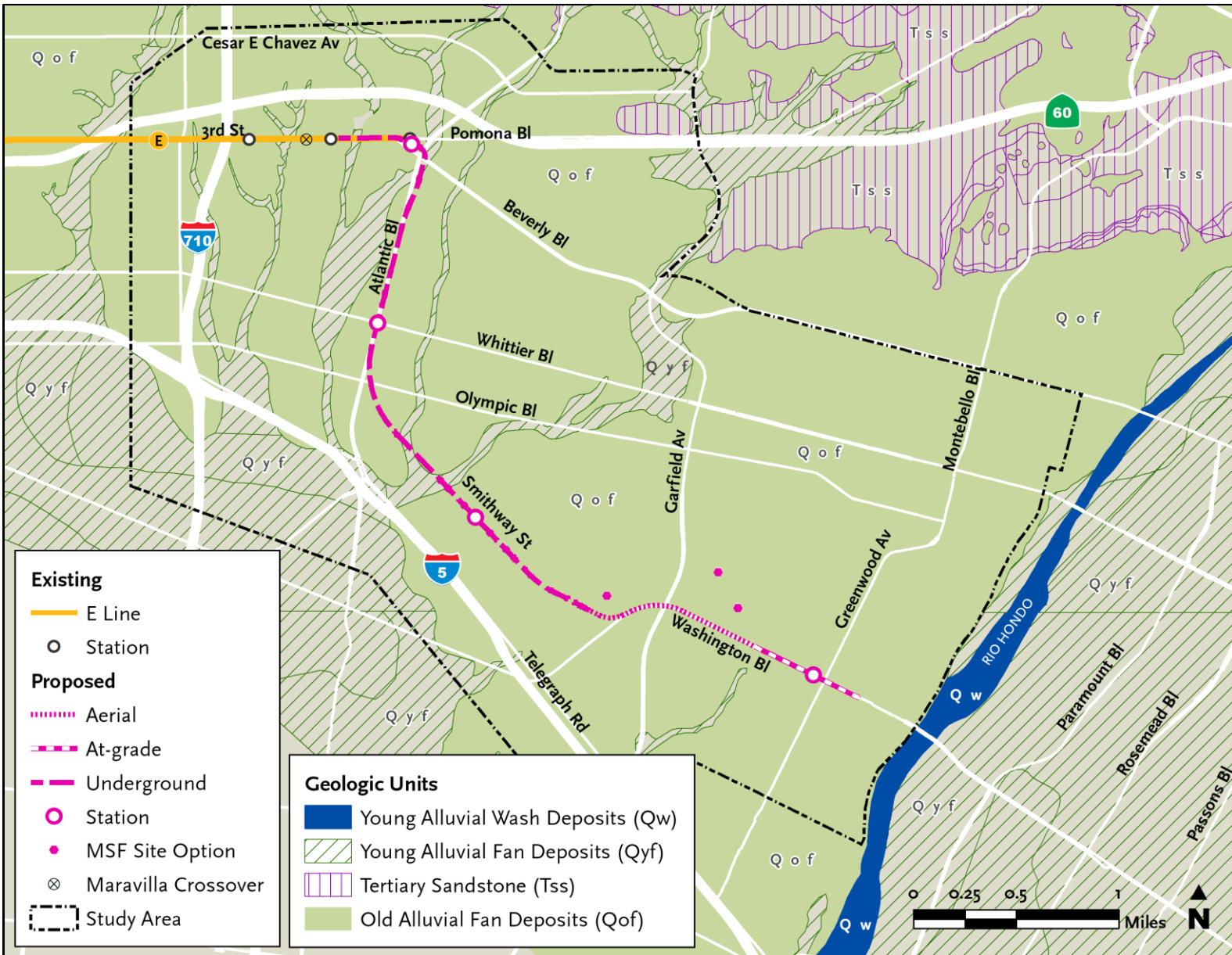
Source: Metro; CDM Smith/AECOM JV 2026.

Figure 3.7-1 Alquist-Priolo Earthquake Fault Zone Northeast of the Region



Source: Metro; CDM Smith/AECOM JV 2026.

Figure 3.7-2 Liquefaction and Landslide Hazard Zone Map



Source: Metro; CDM Smith/AECOM JV 2026.

Figure 3.7-3 Regional Geology Map

### 3.7.2 No Build Alternative

The No Build Alternative, as described in **Section 2.2** (No Build Alternative) of the EA, would include already planned and funded roadway and transit projects but would not provide a rail transit option for communities in eastern Los Angeles County. Overall, as shown in **Table 3.7-1**, the No Build Alternative would result in no long-term adverse effect on geology, soils, seismic, and paleontology resources.

**Table 3.7-1 Geology, Soils, Seismic, and Paleontological Resources Impact Summary – No Build Alternative**

Topic	Impact	Rationale
Seismic Hazards, Soil Erosion, Flood risk, Soil Stability, Expansive Soils, and Paleontological Resources	No Adverse Effect	<ul style="list-style-type: none"> <li>▪ The Study Area is located within a seismically active, and highly urbanized region.</li> <li>▪ Already planned transit and roadway projects would comply with applicable standards and design requirements relative to seismic safety, soil erosion, flood risk, soil stability, expansive soils, and paleontological resources.</li> </ul>

Source: Metro; CDM Smith/AECOM JV 2026.

### 3.7.3 Build Alternative

The Build Alternative would not exacerbate the potential for geological and seismic related hazards. As discussed in **Section 3.7.1**, the Study Area is located within a seismically active region. To address potential seismic hazards, the Build Alternative would be constructed in compliance with the Metro Rail Design Criteria, applicable building codes, and standards as identified in NEPA Project Measure (NPM) GEO-1. Compliance with the latest earthquake-resistant building design standards would substantially reduce potential structural damage and the risk to public safety from seismic events. Further, as set forth in NPM GEO-1, the Build Alternative would be designed and constructed in compliance with Metro Rail Design Criteria, which includes detailed requirements for planning and conducting a geotechnical investigation, geotechnical design methodologies, and reporting, such as the preliminary geotechnical investigation conducted in 2025 within the Study Area, which, as described in **Section 3.7.1**, confirmed that underlying soils are associated with alluvial sediments and groundwater at depths at or below 120 feet. Specific structural engineering recommendations identified in the geotechnical investigations required under NPM GEO-1 would be incorporated into the final design plans consistent with standard practice. The Build Alternative would also would comply with California Department of Transportation design criteria for aerial structures and the Los Angeles County Building Code requirements for structures as set forth in NPM GEO-1. Thus, the Build Alternative would not have long-term adverse effects relative to unstable soil geologic conditions and seismic hazards.

As discussed in **Section 3.7.1**, the Study Area is located in an urbanized area that is primarily impervious with no exposed soil. As discussed in **Section 3.10** (Water Resources), operation of the Build Alternative would not result in ground disturbance or a change in the amount of exposed soil as compared to existing conditions. A small increase in impervious surface would not lead to a meaningful change in the amount of runoff and associated erosion. The Build Alternative would comply with post-construction measures in applicable National Pollutant Discharge Elimination System permits and low impact development standards required by Los Angeles County and other local jurisdictions, which aim to minimize erosion impacts from development projects, as identified in NPM HWQ-1. As discussed in **Section 3.10**, the Build Alternative alignment, including MSF sites, is entirely within an area of minimal flood risk and would thus not be susceptible to flooding. Thus, the Build Alternative would not have long-term adverse effects relative to soil erosion.

As discussed in **Section 3.7.1**, the Study Area is within an area of generally flat topography and stable soils. It is not within a liquefaction zone. Therefore, risks associated with soil stability are minimal. Further, as identified in NPM GEO-1, the Build Alternative would be designed in accordance with recommendations developed based on detailed site-specific geotechnical investigations. Thus, the Build Alternative would not have long-term adverse effects related to soil stability.

As described in **Section 3.7.1**, expansive clay-rich soils may exist locally within alluvial soils present along the Build Alternative alignment. The Build Alternative would be constructed in compliance with applicable building codes and standards and as set forth in NPM GEO-1, in accordance with the recommendations contained in the detailed site-specific geotechnical investigations, including remediation of expansive soils if required. Thus, the Build Alternative would not have long-term adverse effects related to expansive soils.

Operation of the Build Alternative would not involve any ground-disturbance that could have an adverse effect on paleontological resources. Therefore, the Build Alternative would not have long-term adverse effects on paleontological resources.

### **3.7.4 Avoidance, Minimization, and Mitigation Measures for the Build Alternative**

The measures identified in **Table 3.7-2** would be implemented for the Build Alternative in the long-term. Construction measures are provided in **Section 3.17**.

**Table 3.7-2 Long-Term Avoidance, Minimization, and Mitigation Measures**

Topic	Potential Effect	Proposed Measure	Measure Type	Effects After Implementation of Measure(s)
Exposure to Seismic Hazards	Structural damage or safety risks due to regional seismic activity	<p><b>NPM GEO-1 (Geotechnical Investigation).</b> The Project shall be designed and constructed per the Metro Rail Design Criteria (MRDC). The MRDC incorporates various design specifications from the Federal Highway Administration (FHWA), California Department of Transportation (Caltrans), the State of California, the County of Los Angeles, and other sources by reference. Key compliance sections of the MRDC relative to geology and soils are Section 5.3, Section 5.4, Section 5.6, and MRDC Section 5 Appendix, Metro Supplemental Seismic Design Criteria. Section 5.6 of the MRDC provides detailed requirements for planning and conducting a geotechnical investigation, geotechnical design methodologies, and reporting. In addition, Caltrans and the Los Angeles County Building Code (based on the California Building Code [CBC]) have independent design criteria for aerial structures (Caltrans) and building structures (County of Los Angeles) that are also required. In accordance with the MRDC, geotechnical report recommendations shall be incorporated into the project plans and specifications. These recommendations shall be a product of final design and shall address potential subsurface hazards. Without these report recommendations, the project plans and specifications shall not be approved and the Project shall not be allowed to advance into the final design stage or into construction.</p>	Project Measure	<p><b>No Adverse Effect -</b> Operational best management practices for the Build Alternative would be implemented</p>
Soil Erosion	Negligible increase in impervious surface	<p><b>NPM HWQ-1 (Operational Best Management Practices for Water Resources).</b> Operational best management practices (BMP) may include but shall not be limited to:</p> <ul style="list-style-type: none"> <li>▪ Treatment of stormwater runoff using infiltration BMPs such as detention basins or tanks, infiltration basins, bioretention facilities media filters, porous pavement, or vegetated filter strips to remove particulate pollutants.</li> <li>▪ Development of a stormwater pollution prevention plan (SWPPP) in compliance with the State Water Resources Control Board (SWRCB) Industrial General Permit for maintenance and storage facility (MSF) operations. The SWPPP shall include BMPs such as: <ul style="list-style-type: none"> <li>○ Preventing disposal of any rinse/wash waters or industrial materials into the stormwater conveyance system</li> </ul> </li> </ul> <p>Establishing procedures for prompt maintenance and repair of equipment that may result in leaks and spills.</p>	Project Measure	<p><b>No Adverse Effect -</b> Operational best management practices and runoff control measures would be implemented to control runoff and erosion</p>

Topic	Potential Effect	Proposed Measure	Measure Type	Effects After Implementation of Measure(s)
Soil Stability	Minimal risk as Build Alternative would operate in generally flat area with stable soils	<b>NPM GEO-1</b> (defined previously)	Project Measure	<b>No Adverse Effect</b> - Operational best management practices for the Build Alternative would be implemented
Expansive Soils	Build Alternative located within potentially expansive soils	<b>NPM GEO-1</b> (defined previously)	Project Measure	<b>No Adverse Effect</b> - Operational best management practices for the Build Alternative would be implemented
Paleontological Resources	Operations would not require ground-disturbance and would not affect paleontological resources	No avoidance, minimization, or mitigation measures needed	None	<b>No Adverse Effect</b>

Source: Metro; CDM Smith/AECOM JV 2026.