3.7 Geology, Soils, and Mineral Resources

This section addresses the potential impacts to geology, soils, mineral, and paleontological resources associated with implementation of the proposed Project. This section includes a description of the existing geology, soils, mineral resource, and paleontological resource conditions in the proposed Project site; a summary of applicable regulations related to geology and soil hazards, mineral resources, and paleontological resources in the proposed Project site; and an evaluation of the potential impacts of the proposed Project related to geology and soil conditions, mineral resources, and paleontological resources in the proposed Project area.

The information included in this section is partly based on the Paleontological Resources Assessment (PRA) prepared for the proposed Project and included as confidential Appendix H to this Draft EIR. In addition, the existing geology and soil conditions in this section are based on a review of previous geotechnical studies prepared for the reservoirs at the SLRC, which are included by reference. Impacts to geology, soils, and mineral resources are less than significant with the incorporation of Mitigation Measures PALEO-1: Construction Personnel Paleontological Resources Sensitivity Training, PALEO-2: Paleontological Monitoring, PALEO-3: Paleontological Resource Discovery, and PALEO-4: Reporting.

3.7.1 Environmental Setting

Topography

The proposed Project site would be located in a valley within the low-lying hills west of the Los Angeles River and southeast of the eastern end of the Santa Monica Mountains (LADWP 2013). The topography in surrounding neighborhood areas is characterized by steep slopes which ascend from the reservoir to the north, west, and east, and descend to the south. The proposed Project site is generally flat but includes several areas with significant changes in elevation. For example, the Knoll is an approximately 45-foot high hill with varied slopes, and the south Silver Lake Dam and the Ivanhoe Dam have 40-foot and 10-foot slopes, respectively. The reservoirs themselves are deep basins with paved side slopes of 30 vertical feet which extend to an approximate elevation of 428 above mean sea level (amsl). The bottom of Silver Lake Reservoir is graded to drain to a low point in the center at elevation 414 amsl, while Ivanhoe Reservoir’s bottom slopes to the southwest to an elevation of 422 amsl (CWE 2020).

Regional Geology

Regionally, the proposed Project would be located in the northern Peninsular Ranges geomorphic province, near the boundary between the Peninsular Ranges and Transverse Ranges geomorphic provinces (California Department of Conservation [DOC] 2018). The Peninsular Ranges province is characterized by a series of northwest-trending mountain ranges and sediment-filled valleys, subparallel to faults branching from the San Andreas Fault. The geology in the Peninsular Ranges is comparable to the Sierra Nevada province, with granitic rock intruding into

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1 A geomorphic province is an area that possesses similar bedrock, structure, history, and age. California has 11 geomorphic provinces.
2 Almost parallel, but diverging or converging slightly.
older metamorphic rock. The Peninsular Ranges extend into lower California and are bound on the east by the Colorado Desert (California Geologic Survey [CGS] 2002; LADWP 2013).

The proposed Project site falls within the greater Los Angeles Basin, a structural depression approximately 50 miles long and 20 miles wide in the northeastern Peninsular Ranges province (Ingersoll and Rumelhart 1999). This basin can be broken down into subbasins that share a similar geological history (Yerkes et al. 1965; Sylvester and O’Black, 2016). Each of these basins primarily formed from the migration of the San Andreas Fault Zone northward during the late Miocene (Irwin, 1990; Powell and Weldon 1992; Critelli et al., 1995). As the mountain ranges bounding the basins were folded and thrust upward, they eroded forming dissected surfaces and filling the intervening basins with thick piles of alluvium (Yerkes et al. 1965). While sediments dating back to the Cretaceous (66 million years ago) are preserved in the basin, continuous sedimentation began in the middle Miocene (around 13 million years ago) (Yerkes et al., 1965). Since that time, sediments have been eroded into the basin from the surrounding highlands, resulting in thousands of feet of accumulation. Most of these sediments are marine, until sea level dropped during the Pleistocene and deposition of the alluvial sediments that compose the uppermost units in the Los Angeles began.

**Local Geology**

This proposed Project site, specifically, would be within the “Northeastern Block” of the Los Angeles Basin dissected into uplifted Miocene-age marine sediments. The bedrock formed in deep marine conditions and comprises mostly fine-grained shale that is well-cemented (Yerkes and Graham 1997). Dibblee and Ehrenspeck (1991) refer to these sediments as the sandstone member of the Monterey Formation (Tmss). Earlier geologists ascribed these units to the Puente Formation (Lamar 1970; Yerkes et al. 1977; Weber 1980) or the Modelo Formation (Hoots 1931 and Durrell 1954). The uplift occurred in the Pliocene or Pleistocene and the eroded valleys became the site of deposition of Quaternary-age alluvium (Qa) (Dibblee and Ehrenspeck 1991). The SLRC is surrounded by alluvium deposits and the bedrock hills of the Monterey Formation.

The composition of subsurface materials at the proposed Project site was investigated in a recent geotechnical engineering report that was prepared for the Silver Lake Reservoir Bypass and Regulating Station Project (LADWP 2013). It should be noted that exploratory boring was limited to SLRC areas adjacent and northwest of Silver Lake Reservoir. However, absent Project-specific geotechnical investigations, the results of the report are useful in that they provide a range of materials that may be encountered during proposed ground disturbing activities. In addition, geologic settings included in the PRA (see Appendix H) and the SCLRMP Geotechnical Research Report (Beyaz and Patel 2019) provide additional general information about the geologic units and material compositions at the proposed Project site.

The geologic units encountered during the investigations include artificial fill (Af) materials associated with previous site improvements, as well as native Quaternary alluvium (Qa) and Miocene-age marine sedimentary bedrock (Tmss) underlying the artificial fill materials. The geologic units are summarized below from fill materials to the bedrock materials:
Artificial Fill (Af)

Subgrades of the reservoir embankments, access roads, and dams, are composed of compacted fill materials and have been paved over with asphaltic concrete. South Valley park areas located south of Silver Lake Dam are also underlain by fill materials. The results of the geotechnical investigation found that fill materials at the SLRC generally consist of sandy and clayey silts, sandy and silty clays, and clayey sands.

Quaternary Alluvium (Qa)

The majority of the SLRC is built into and surrounded by Quaternary alluvium. Exceptions include the reservoir basin, which was excavated to bedrock during reconstruction of the Silver Lake Reservoir, South Valley, and northeast portions of the Project site. Geotechnical investigations determined that younger alluvium generally consists of stiff to very stiff silty clay with sand, sandy clay, and sandy silt. The underlying older alluvium generally consists of silty sand, very stiff sandy clay, and dense clayey sand (Beyaz and Patel 2019; LADWP 2013).

Miocene Monterey Formation Sandstone (Tmss)

The northeast corner of the proposed Project site encompasses Miocene-age sedimentary bedrock assigned to the sandstone member of the Monterey Formation. Locally, the Monterey Formation consists of marine sandstone, siltstone, and shale that dates from the early Pliocene to the Miocene (Critelli et al., 1995, Morton and Miller, 2006). The sedimentary bedrock encountered during geotechnical investigations consists of fine- to coarse-grained sandstone with interbedded silty fine-grained sandstone, clayey siltstone, and silty claystone.

Soils

Soils differ in origin, composition, and slope development. When evaluating potential impacts of development, soils are typically considered for their resource value in agricultural production or for their potential development characteristics or constraints. Some soils are susceptible to erosion and/or expansive behavior while others are more suitable for compaction. Soils are classified by their distinguishing characteristics and are arranged within soil associations, which are groups of soil units that occur together in a pattern over a geographic region.

On review of the Natural Resources Conservation Service (NRCS) Web Soil Survey, soil units at the SLRC (outside of the reservoir basin) are listed as Urban Land complex soils, which consist of an uncertain mix of fill and disturbed local soil (NRCS 2022). Most of the previously disturbed areas where facilities are proposed would generally be well suited for development.

Groundwater

The groundwater table was encountered at a depth of approximately 20 feet below the ground surface (bgs) during the geotechnical explorations (LADWP 2013).

Regional Faults and Seismicity

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

Seismic activity and seismically-induced ground rupture is more likely along historically active faults. The state has established Alquist-Priolo Zones that are buffers around active faults which have been determined to be especially prone to surface fault rupture. The CGS defines an active fault as one that has had surface displacement within Holocene time (within the last 11,700 years; the U.S. Geological Survey (USGS) uses within the last 15,000 years) (CGS 2007).

The proposed Project site is located in a seismically active region of California that contains both active (Holocene age) and potentially active (Quaternary age) faults. Throughout the proposed Project region, there is the potential for damage resulting from movement along any one of a number of active faults, seismic shaking, and seismically induced ground failures (e.g., liquefaction). The Working Group on California Earthquake Probabilities (WGCEP), comprised of the USGS, the CGS, and the Southern California Earthquake Center, evaluates the probability of one or more earthquakes of Mw 6.7 or higher occurring in the state of California over the next 30 years (WGCEP 2015a). It is estimated that the Los Angeles region as a whole has a 60 percent chance of experiencing an earthquake of Mw 6.7 or higher over the next 30 years.

Table 3.7-1 identifies both historically active (i.e., within last 150 years) and active (i.e., within last 11,700 years) faults in the vicinity of the Project site and their corresponding characteristics that are capable of generating significant ground shaking at the proposed Project site.

### Table 3.7-1

**ACTIVE FAULTS IN THE PROJECT VICINITY**

<table>
<thead>
<tr>
<th>Fault</th>
<th>Distance to and Direction from SLRC (Miles)</th>
<th>Maximum Moment Magnitude (Mw)(^1)</th>
<th>Historical Seismicity (Last 150 Years)</th>
<th>Slip Rate (mm/year)</th>
<th>Fault Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>San Andreas (Mojave section)</td>
<td>37 north</td>
<td>7.4</td>
<td>M 7.0 (1899)</td>
<td>30.0</td>
<td>Historically Active</td>
</tr>
<tr>
<td>Newport-Inglewood</td>
<td>8 southwest</td>
<td>7.1</td>
<td>M 6.4 (1933)</td>
<td>1.0</td>
<td>Historically Active</td>
</tr>
<tr>
<td>Sierra Madre (San Fernando section)</td>
<td>12 northwest</td>
<td>6.7</td>
<td>M 6.4 (1971)</td>
<td>2.0</td>
<td>Historically Active</td>
</tr>
<tr>
<td>Whittier-Elsinore</td>
<td>17 southeast</td>
<td>6.8</td>
<td>M 5.9 (1987)</td>
<td>2.5</td>
<td>Historically Active</td>
</tr>
<tr>
<td>San Gabriel</td>
<td>20 miles north</td>
<td>7.2</td>
<td>-</td>
<td>1.0</td>
<td>Active</td>
</tr>
<tr>
<td>Verdugo</td>
<td>17 northwest</td>
<td>6.9</td>
<td>-</td>
<td>0.5</td>
<td>Active</td>
</tr>
<tr>
<td>Santa Monica</td>
<td>7.5 southwest</td>
<td>6.6</td>
<td>-</td>
<td>1.0</td>
<td>Active</td>
</tr>
<tr>
<td>Raymond</td>
<td>3.0 northeast</td>
<td>6.5</td>
<td>-</td>
<td>1.5</td>
<td>Active</td>
</tr>
<tr>
<td>Hollywood</td>
<td>0.8 northwest</td>
<td>6.4</td>
<td>-</td>
<td>1.0</td>
<td>Active</td>
</tr>
</tbody>
</table>

**NOTES:**

1. While Richter magnitude was historically the primary measure of earthquake magnitude, seismologists now use Moment Magnitude (Mw) as the preferred way to express the size of an earthquake.

**SOURCES:** CGS 2003, CGS 2021; WGCEP 2015b
The proposed Project site itself is not mapped within an Alquist-Priolo Earthquake Fault Zone, and no active or historically active faults are known to pass through the SLRC (CGS 2021). The nearest faults to the proposed Project, the Hollywood and Raymond faults, are considered active by CGS and mapped within an Alquist-Priolo Earthquake Fault Zone (CGS 2003). Therefore, the risk of ground rupture at the sites is considered very low.

In addition to the faults listed above in Table 3.7-1, several concealed thrust faults, commonly referred to as blind thrusts, underlie the Los Angeles Basin at depth. These faults are not exposed at ground surface and are typically identified at depths greater than 3 kilometers. These faults do not present a potential surface fault rupture hazard; however, they are considered active and potential sources for future earthquakes. The closest blind thrust fault is the Upper Elysian Park fault, which is approximately 1.6 miles beneath the Project site as measured perpendicular to the fault, dips 50 degrees northward, and the thrust tip is at 3 km depth (LADWP 2013).

**Geologic Hazards**

Potential geologic hazards at the proposed Project site are discussed below. Liquefaction and lateral spreading, while possible without seismic shaking, are more commonly triggered by a seismic event, as discussed further below in seismic hazards.

**Erosion and Landslides**

The term landslide refers to the downward movement of large masses of rocks, soil, mud, and/or organic debris. Areas with steep slopes are particularly susceptible to landslide hazards. Most landslides are caused by one or more factors that act together to destabilize the slope. The primary driving force of slope failure is the influence of gravity acting on weakened materials that make up a sloping area of land. While some landslides occur slowly over time, the most destructive landslides happen suddenly after a triggering event, such as heavy rainfall or an earthquake. Landslides can be triggered by human activities that weaken the stability of a slope, such as excavation of the toe of a slope removing a restraining force to slope failure, the addition of water at the head of a slope increasing the weight of the materials within the upper slope area and adding a lubricant (i.e., water) to the materials, and construction activities that disturb soil conditions and create unstable slopes.

CGS mapping identifies an area on the west side of Silver Lake Drive towards the south end of Silver Lake Reservoir as a landslide hazard zone. The potential for landslides in this area is presumably due to the steep topography of the Monterey Formation hillside located across the road from the southwest portion of the proposed Project site. However, the proposed Project site itself is not mapped within the landslide hazard zone (CGS 2021).

**Expansive Soil**

Expansive soils are subject to volume changes from changes in moisture content such as swelling with increases in moisture or shrinkage with decreases in moisture. The shrinking and swelling can damage foundations and other infrastructure. Expansive soils consist of certain clays and some silts. As previously discussed, soils in the proposed Project site consist mostly of disturbed fill, sandy loams, and silty clays that would be less susceptible to expansion since their clay content would not be anticipated to be very high.
3. Environmental Setting, Impact Analysis, and Mitigation Measures

3.7 Geology, Soils, and Mineral Resources

Subsidence

Subsidence is characterized as a sinking of the ground surface relative to surrounding areas and can generally occur where deep soil deposits are present. Subsidence in areas of deep soil deposits is typically associated with regional groundwater withdrawal or other fluid withdrawal from the ground, such as oil and natural gas. Subsidence can result in the development of ground cracks and damage to sidewalks, pipelines, and other improvements. According to USGS, southern parts of Los Angeles Basin that have historically been used for oil extraction and groundwater pumping have had various degrees of land subsidence. However, the proposed Project is not included in USGS-mapped subsidence areas (USGS 2022).

Seismic Hazards

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

Surface Fault Rupture

Seismically-induced ground rupture is defined as the physical displacement of surface deposits in response to an earthquake’s seismic waves. The magnitude, sense, and nature of fault rupture can vary for different faults or even along different segments of the same fault. Ground rupture is considered more likely along active faults. As described previously, no known active faults have been mapped through the proposed Project site and risk associated with ground rupture at the sites is considered very low.

Seismic Ground Shaking

As discussed previously, it is estimated that a major earthquake has a 60 percent chance of affecting the Los Angeles region in the next 30 years and would produce strong ground shaking throughout the region, including the proposed Project site. Earthquakes on active or potentially active faults could produce a range of ground shaking intensities at the Project site. Historically, earthquakes have caused strong ground shaking and damage in the Los Angeles Basin.

Areas most susceptible to intense ground shaking are those located closest to an earthquake-generating fault, and areas underlain by thick, loosely unconsolidated and saturated sediments. Ground movement during an earthquake can vary depending on the overall magnitude, distance to the fault, focus of earthquake energy, and type of geologic material. While the earthquake magnitude measures the energy released in an earthquake, intensity is a measure of the ground shaking effects at a particular location. Areas underlain by bedrock typically experience less severe ground shaking than those underlain by loose, unconsolidated materials. Unconsolidated materials, even when located relatively distant from faults, can intensify ground shaking.

This complex Los Angeles regional fault system’s interaction with alluvial soils and other geologic conditions in the hills and basins appears to pose a potential seismic threat for every part of the City, regardless of the underlying geologic and soils conditions (City of Los Angeles 1996). Due to the numerous active faults in the vicinity of the proposed Project site, such as the Hollywood fault which has the potential to generate an earthquake of 6.7 Mw approximately 0.8-
3. Environmental Setting, Impact Analysis, and Mitigation Measures

3.7 Geology, Soils, and Mineral Resources

miles north of the Project site, high-intensity ground shaking could cause some degree of damage to Project facilities. However, the reservoirs have undergone several seismic stability improvements to ensure safety in the event of an earthquake, including using modern compaction methods based on recommendations of the Division of Safety of Dams (DSOD) (Beyaz and Patel 2019). As the proposed facilities would be founded on bedrock underlying the proposed Project site, well-designed structures are not anticipated to experience serious damage or collapse.

**Liquefaction and Lateral Spreading**

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

The potential damaging effects of liquefaction include differential settlement, loss of ground support for foundations, ground cracking, heaving and cracking of structure slabs due to sand boiling, and buckling of deep foundations due to ground settlement. Dynamic settlement (i.e., pronounced consolidation and settlement from seismic shaking) may also occur in loose, dry sands above the water table, resulting in settlement of and possible damage to overlying structures. In general, a relatively high potential for liquefaction exists in loose, sandy soils that are within 50 feet of the ground surface and are saturated (below the groundwater table). Lateral spreading can move blocks of soil, placing strain on levees and roads that can lead to ground failure.

The proposed Project is mapped in a liquefiable area in the City of Los Angeles Safety Element due to occurrences of shallow groundwater and recent alluvial deposits (City of Los Angeles 1996). Maps prepared by CGS also identify most of the proposed Project within a liquefaction zone, though the reservoir basin and southern portions of the site are excluded (CGS 2021).

The potential for liquefaction in the reservoir basin is presumed to be very low due previous excavation of sandy silt in the reservoir beds to bedrock elevation, and the use of artificial fill to compact the embankments to 95 percent (Beyaz and Patel 2019). However, as described above in Section 3.7.1, *Environmental Setting, Local Geology*, young alluvial deposits underlie most of the Project site, not including the reservoir basin. These geologic units typically contain soils which may be susceptible to saturation if they are low in density and underlain by shallow groundwater (less than 40 feet bgs) (DOC 1998). Due to the presence of young alluvium and the shallow groundwater table beneath the Project site, there is the potential for liquefaction to occur in areas other than the reservoirs in the event of an earthquake. Liquefaction risk would vary based on specific subsurface characteristics beneath each park zone and the structures that would be constructed upon them. As described above in Section 3.7.1, *Environmental Setting, Soils*, most of the facilities are proposed in areas that have been previously excavated or developed, and thus are not anticipated to be built into loose or sandy soils susceptible to saturation and liquefaction.
**Collapse and Settlement**

Settlement of the ground surface can occur under static forces (e.g., due to gravity or groundwater removal) but can also be accelerated and accentuated by earthquakes. During an earthquake, settlement can occur from rapid rearrangement, compaction, and settling of subsurface materials (particularly loose, non-compacted, and variable sandy sediments). Settlement can occur both uniformly and differentially (i.e., where adjoining areas settle at different rates). In addition, areas are susceptible to differential settlement if underlain by compressible sediments, such as poorly engineered artificial fill or poorly graded gravels. As described previously, the reservoirs at the proposed Project site were reconstructed using modern compaction methods to comply with DSOD seismic standards and are not considered susceptible to settlement. Areas not previously reworked or developed at the proposed Project site could be susceptible to settlement.

**Paleontological Setting**

The Society of Vertebrate Paleontology (SVP) has established standard guidelines (SVP 2010) that outline professional protocols and practices for conducting paleontological resource assessments and surveys, monitoring and mitigation, data and fossil recovery, sampling procedures, and specimen preparation, identification, analysis, and curation. Most practicing professional vertebrate paleontologists adhere closely to the SVP’s assessment, mitigation, and monitoring requirements as specifically provided in its standard guidelines. Most state and local regulatory agencies accept and use the professional standards set forth by the SVP.

Paleontological resources are the fossilized remains or impressions of plants and animals, including vertebrates (animals with backbones; mammals, birds, fish, etc.), invertebrates (animals without backbones; starfish, clams, coral, etc.), and microscopic plants and animals (microfossils). They are valuable, nonrenewable, scientific resources used to document the existence of extinct life forms and to reconstruct the environments in which they lived. Fossils can be used to determine the relative ages of the depositional layers in which they occur and of the geologic events that created those deposits. The age, abundance, and distribution of fossils depend on the geologic formation in which they occur and the topography of the area in which they are exposed. The geologic environments within which the plants or animals became fossilized usually were quite different from the present environments in which the geologic formations now exist.

Paleontological sensitivity is defined as the potential for a geologic unit to produce scientifically significant fossils. This is determined by rock type, past history of the geologic unit in producing significant fossils, and fossil localities recorded from that unit. Paleontological sensitivity is derived from the known fossil data collected from the entire geologic unit, not just from a specific survey. In its “Standard Guidelines for the Assessment and Mitigation of Adverse Impacts to Non-renewable Paleontologic Resources,” the SVP (2010) defines four categories of paleontological sensitivity (potential) for rock units: high, low, undetermined, and no potential, and makes recommendations for the level of monitoring for each.

**Paleontological Resources Records Search**

A paleontological resources database search was conducted by the Natural History Museum of Los Angeles County (LACM) on November 2, 2021 (Bell, 2021). The search entailed an...
examination of current geologic maps and known fossil localities within the proposed Project and vicinity. The purpose of the records search was to: (1) determine whether any previously recorded fossil localities occur in the proposed Project Site or vicinity; (2) assess the potential for disturbance of these localities during construction; and (3) assist in evaluating the paleontological sensitivity of the proposed Project.

The results of the paleontological resources database search indicate that while no recorded fossil localities occur within the proposed Project site, fossil localities do exist nearby and within the same sedimentary deposits that occur in the Project site, including the Monterey Formation and older Quaternary Alluvium, either at surface or at depth (Bell, 2021). The Quaternary Alluvium underlying the proposed Project site is of low paleontological sensitivity, increasing to high sensitivity with depth. While the exact depth is not known, similar geological settings suggest greater than 10 feet bgs is a reasonable expectation. Excavations below this depth have the potential to expose and destroy paleontological resources unless properly mitigated. Furthermore, excavations in the northwest portion of the Project Site could impact the Miocene Monterey Formation that is known to contain significant vertebrate fossils.

**Paleontological Sensitivity Analysis**

The review of the geologic mapping, scientific literature, and database search results from the LACM were used to assign paleontological sensitivity to the geologic units present at the surface and in the subsurface of the proposed project area, following the guidelines of the SVP (2010) and are as follows:

- **Younger Quaternary Alluvium (Qa)** – The current reservoir is built into and surrounded by young, surficial sediments. While these units are too young to contain significant fossil resources at the surface, they are deemed to have Low-to-High Potential, increasing with depth. The exact depth at which the transition from low to high potential occurs is unknown in the proposed project though it is likely over 10 feet below current ground surface. The notation in LACM records of Pleistocene fauna from the area justifies the increase to “high potential” at this depth.

- **Miocene Monterey Formation sandstone (Tmss)** – Also listed as the Puente or Modelo formations, the Monterey Formation is found in the uplifted hills surrounding the reservoir. These hard siltstones were deposited in a marine environment as there is a clear record from both the literature and LACM records of significant fossils. Therefore, the unit is considered High Potential for paleontological resources.

**Mineral Resources**

Minerals are commercially-viable aggregate or mineral deposits, including metals such as gold, silver, iron, and copper; industrial metals such as boron compounds, rare-earth elements, clays, limestone, gypsum, salt and dimension stone; and construction aggregate including sand, gravel, and crushed stone. The Los Angeles metropolitan area produces and consumes more construction aggregate than any other metropolitan area in the country (County of Los Angeles 2015). From 1920 to the present, the demand for sand and gravel has been spurred by construction associated with growth in California and the southwestern United States (City of Los Angeles 2001).
The CGS provides information about California’s mineral resources and classifies lands which include regionally significant mineral resources. Mineral Resource Zones (MRZs) have been designated to indicate the significance of mineral deposits. The MRZ categories are 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 significant mineral deposits are present, or where it is judged that a high likelihood exists for their presence.

**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 to any other MRZ.

According to CGS mineral resource mapping and the City of Los Angeles Conservation Element, the proposed Project site is not mapped within an MRZ-2 zone (CGS 1979; City of Los Angeles 1996). Thus, the proposed Project facilities would not be located within areas known to contain mineral resources.

**Sand and Gravel**

Sand and gravel (aggregate) have been determined to be important resources for construction, development, and physical maintenance, from highways and bridges to swimming pools and playgrounds. The availability of sand and gravel affects construction costs, tax rates, and affordability of housing and commodities. The State of California has statutorily required the protection of sand and gravel operations. Because transportation costs are a significant portion of the cost of sand and gravel, the long-term availability of local sources of this resource is an important factor in maintaining the economic attractiveness of a community to residents, business, and industry. The only available deposit site in the City is the Tujunga alluvial fan in the San Fernando Valley, which is rich in accumulations of high quality sand and gravel washed from the adjacent mountains (City of Los Angeles 2001). The alluvial fan deposits are designated in an MRZ-2 zone that begins at the Tujunga Wash and encompasses downstream areas of the Los Angeles River (CGS 1979). The MRZ-2 includes an area that is approximately 0.6 miles northeast of the proposed Project site but does not include the Project site.

**Oil and Natural Gas Resources**

The MRZs also include areas that are appropriate for the drilling and production of oil and natural gas. Oil production still occurs in many parts of Los Angeles County and is regulated by the California Geologic Energy Management Division (CalGEM). Proposed Project facilities would not be located within areas known to contain oil and natural gas (City of Los Angeles 2001).
3.7.2 Regulatory Framework

Federal

Clean Water Act

The federal Clean Water Act (CWA) and subsequent amendments, under the enforcement authority of the U.S. Environmental Protection Agency (USEPA), was enacted “to restore and maintain the chemical, physical, and biological integrity of the Nation’s waters.” The purpose of the CWA is to protect and maintain the quality and integrity of the nation’s waters by requiring states to develop and implement state water plans and policies. The CWA gave the USEPA the authority to implement pollution control programs such as setting wastewater standards for industry. In California, implementation and enforcement of the National Pollutant Discharge Elimination System (NPDES) program is conducted through the California State Water Resources Control Board (SWRCB) and the nine RWQCBs. The CWA also sets water quality standards for surface waters and established the NPDES program to protect water quality through various sections of the CWA, including Sections 401 through 404 and 303(d) that are implemented and regulated by the SWRCB and the nine RWQCBs. Section 402 of the CWA would apply to the proposed Project because the Project would be required to control discharges of pollutants from point sources, as discussed below.

Section 402

The 1972 amendments to the Federal Water Pollution Control Act established the NPDES permit program to control discharges of pollutants from point sources (Section 402). The 1987 amendments to the CWA created a new section of the CWA devoted to stormwater permitting (Section 402[p]). The USEPA has granted the SWRCB primacy in administering and enforcing the provisions of CWA and NPDES through the local RWQCBs. NPDES is the primary federal program that regulates point-source and non-point-source discharges to waters of the United States.

The SWRCB issues both general and individual permits for discharges to surface waters, including for both point-source and non-point-source discharges. In response to the 1987 amendments, the USEPA developed the Phase I NPDES Storm Water Program for cities with populations larger than 100,000, and Phase II for smaller cities. In California, the SWRCB has drafted the General Permit for Discharges of Storm Water from Municipal Separate Storm Sewer Systems (MS4 General Permit).

National Pollutant Discharge Elimination System Permit

The NPDES permit system was established in the CWA to regulate municipal and industrial point discharges to surface waters of the U.S. Each NPDES permit for point discharges contains limits on allowable concentrations of pollutants contained in discharges. Section 402 of the CWA contain general requirements regarding NPDES permits.

The CWA was amended in 1987 to require NPDES permits for non-point source (i.e., stormwater) pollutants in discharges. Stormwater sources are diffuse and originate over a wide area rather than from a definable point. The goal of NPDES stormwater regulations is to improve the quality of stormwater discharged to receiving waters to the “maximum extent practicable” through the use of structural and non-structural Best Management Practices (BMPs). BMPs can include the
development and implementation of various practices including educational measures (workshops informing public of what impacts results when household chemicals are dumped into storm drains), regulatory measures (local authority of drainage facility design), public policy measures, and structural measures (filter strips, grass swales and detention ponds). The NPDES permits that apply to activities in Los Angeles County are described under State and local regulations below.

State

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act (Alquist-Priolo Act) was passed in 1972 to provide a mechanism for reducing losses from surface fault rupture on a statewide basis. The main intent of the Alquist-Priolo Act is to ensure public safety by preventing the construction of buildings used for human occupancy on the surface trace of active faults. The Alquist-Priolo Act only addresses the hazard of surface fault rupture and is not directed toward other earthquake hazards. The law requires the State Geologist to establish regulatory zones, known as Earthquake Fault Zones, around the surface traces of active faults and to issue appropriate maps. The maps are distributed to all affected cities, counties, and state agencies for their use in planning and controlling new or renewed construction. Local agencies must regulate most development projects within the zones.

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act was passed in 1990 following the Loma Prieta earthquake to reduce threats to public health and safety and to minimize property damage caused by earthquakes. This act requires the State Geologist to delineate various seismic hazard zones, and cities, counties, and other local permitting agencies to regulate certain development projects within these zones. For projects that would locate structures for human occupancy within designated Zones of Required Investigation, the Seismic Hazards Mapping Act requires project applicants to perform a site-specific geotechnical investigation to identify the potential site-specific seismic hazards and corrective measures, as appropriate, prior to receiving building permits. The CGS Guidelines for Evaluating and Mitigating Seismic Hazards (Special Publication 117A) provides guidance for evaluating and mitigating seismic hazards (CGS 2008).

Division of Safety of Dams

In the state of California, dam safety is regulated by DSOD under the authority granted by the California Water Code (Parts 1 and 2 of Division 3, Dam and Reservoirs). The DSOD provides oversight to the design, construction, and maintenance of over 1,200 jurisdictional sized dams in California, including dams at the SLRC. Jurisdictional dams are dams that are more than 6 feet high and impound 50 acre-feet or more of water, or 25 feet or higher and impound more than 15 acre-feet of water. The jurisdictional height of a dam, as determined by DSOD, is the vertical distance measured from the lowest point at the downstream toe of the dam to its maximum storage elevation, which is typically the spillway crest. The DSOD ensures dam safety by:

- Reviewing and approving dam enlargements, repairs, alterations, and removals to ensure that the dam appurtenant structures are designed to meet minimum requirements.
- Performing independent analyses to understand dam and appurtenant structures performance. These analyses can include structural, hydrologic, hydraulic, and geotechnical evaluations.
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- Overseeing construction to ensure work is being done in accordance with the approved plans and specifications.
- Inspecting each dam on an annual basis to ensure it is safe, performing as intended, and is not developing issues. Roughly 1/3 of these inspections include in-depth instrumentation reviews of the dam surveillance network data.
- Periodically reviewing the stability of dams and their major appurtenances in light of improved design approaches and requirements, as well as new findings regarding earthquake hazards and hydrologic estimates in California.

The structural elements of the proposed Project would undergo appropriate and final design-level geotechnical evaluations prior to final design and construction. Implementing the regulatory requirements in the DSOD regulations and ensuring that all structures constructed in compliance with the law is the responsibility of the project engineers and building officials. The design engineer, as a registered professional with the State of California, is required to comply with the DSOD and local codes while applying standard engineering practice and the appropriate standard of care for the particular region in California.\(^3\) The California Professional Engineers Act (Building and Professions Code Sections 6700-6799), and the Codes of Professional Conduct, as administered by the California Board of Professional Engineers and Land Surveyors, provides the basis for regulating and enforcing engineering practice in California. Any dam enlargements, repairs, alterations and removals will require review and approval by DSOD. Improvements that impact areas within the dams’ areas of influence are subject to more restrictions and oversight.

**NPDES Construction General Permit**

Construction associated with the proposed Project would disturb more than one acre of land surface affecting the quality of stormwater discharges into waters of the U.S. The proposed Project would, therefore, be subject to the *NPDES General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities* (Order 2009-0009-DWQ, NPDES No. CAS000002; as amended by Orders 2010-0014-DWQ and 2012-006-DWQ). The Construction General Permit regulates discharges of pollutants in stormwater associated with construction activity to waters of the U.S. from construction sites that disturb one acre or more of land surface, or that are part of a common plan of development or sale that disturbs more than one acre of land surface. The permit regulates stormwater discharges associated with construction or demolition activities, such as clearing and excavation; construction of buildings; and linear underground projects, including installation of water pipelines and other utility lines.

The Construction General Permit requires that construction sites be assigned a Risk Level of 1 (low), 2 (medium), or 3 (high), based both on the sediment transport risk at the site and the receiving waters risk during periods of soil exposure (e.g., grading and site stabilization). The sediment risk level reflects the relative amount of sediment that could potentially be discharged to receiving water bodies and is based on the nature of the construction activities and the location of the site relative to receiving water bodies. The receiving waters risk level reflects the risk to the

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\(^3\) A geotechnical engineer (GE) specializes in structural behavior of soil and rocks. GEs conduct soil investigations, determine soil and rock characteristics, provide input to structural engineers, and provide recommendations to address problematic soils.
receiving waters from the sediment discharge. Depending on the risk level, the construction projects could be subject to the following requirements:

- Effluent standards;
- Good site management “housekeeping;”
- Non-stormwater management;
- Erosion and sediment controls;
- Run-on and runoff controls;
- Inspection, maintenance, and repair; or
- Monitoring and reporting requirements.

The Construction General Permit requires the development and implementation of a Stormwater Pollution Prevention Plan (SWPPP) that includes specific BMPs designed to prevent sediment and pollutants from contacting stormwater from moving off site into receiving waters. The BMPs fall into several categories, including erosion control, sediment control, waste management and good housekeeping, and are intended to protect surface water quality by preventing the off-site migration of eroded soil and construction-related pollutants from the construction area. Routine inspection of all BMPs is required under the provisions of the Construction General Permit. In addition, the SWPPP is required to contain a visual monitoring program, a chemical monitoring program for non-visible pollutants, and a sediment monitoring plan if the site discharges directly to a water body listed on the 303(d) list for sediment.

The SWPPP must be prepared before the construction begins. The SWPPP must contain a site map(s) that delineates the construction work area, existing and proposed buildings, parcel boundaries, roadways, stormwater collection and discharge points, general topography both before and after construction, and drainage patterns across the Project site. The SWPPP must list BMPs and the placement of those BMPs that the applicant would use to protect stormwater runoff. Additionally, the SWPPP must contain a visual monitoring program; a chemical monitoring program for “non-visible” pollutants to be implemented if there is a failure of BMPs; and a sediment monitoring plan if the site discharges directly to a water body listed on the 303(d) list for sediment. Examples of typical construction BMPs include scheduling or limiting certain activities to dry periods, installing sediment barriers such as silt fence and fiber rolls, and maintaining equipment and vehicles used for construction. Non-stormwater management measures include installing specific discharge controls during certain activities, such as paving operations, vehicle and equipment washing and fueling. The Construction General Permit also sets post-construction standards (i.e., implementation of BMPs to reduce pollutants in stormwater discharges from the site following construction).

In the Project area, the Construction General Permit is implemented and enforced by the Los Angeles RWQCB, which administers the stormwater permitting program. Dischargers must electronically submit a notice of intent and permit registration documents to obtain coverage under this Construction General Permit. Dischargers are to notify the RWQCB of violations or incidents of non-compliance, and submit annual reports identifying deficiencies in the BMPs and explaining
how the deficiencies were corrected. The risk assessment and SWPPP must be prepared by a State Qualified SWPPP Developer, and implementation of the SWPPP must be overseen by a State Qualified SWPPP Practitioner. A legally responsible person, who is legally authorized to sign and certify permit registration documents, is responsible for obtaining coverage under the permit.

**California Building Code**

The California Building Code (CBC), which is codified in Title 24 of the California Code of Regulations, Part 2, was promulgated to safeguard the public health, safety, and general welfare by establishing minimum standards related to structural strength, means of egress to facilities (entering and exiting), and general stability of buildings. The purpose of the CBC is to regulate and control the design, construction, quality of materials, use/occupancy, location, and maintenance of all buildings and structures within its jurisdiction. Title 24 is administered by the California Building Standards Commission, which, by law, is responsible for coordinating all building standards. The provisions of the CBC apply to the construction, alteration, movement, replacement, location, and demolition of every building or structure or any appurtenances connected or attached to such buildings or structures throughout California.

The 2019 edition of the CBC is based on the 2018 International Building Code (IBC) published by the International Code Council, which replaced the Uniform Building Code (UBC). The code is updated triennially, and the 2019 edition of the CBC was published by the California Building Standards Commission on July 1, 2019, and took effect starting January 1, 2020. The 2019 CBC contains California amendments based on the American Society of Civil Engineers (ASCE) Minimum Design Standard ASCE/SEI 7-16, Minimum Design Loads for Buildings and Other Structures, provides requirements for general structural design and includes means for determining earthquake loads\(^4\) as well as other loads (such as wind loads) for inclusion into building codes. Seismic design provisions of the building code generally prescribe minimum lateral forces applied statically to the structure, combined with the gravity forces of the dead and live loads of the structure, which the structure then must be designed to withstand. The prescribed lateral forces are generally smaller than the actual peak forces that would be associated with a major earthquake. Consequently, structures should be able to: (1) resist minor earthquakes without damage; (2) resist moderate earthquakes without structural damage but with some nonstructural damage; and (3) resist major earthquakes without collapse, but with some structural as well as nonstructural damage. Conformance to the current building code recommendations does not constitute any kind of guarantee that significant structural damage would not occur in the event of a maximum magnitude earthquake; however, it is reasonable to expect that a structure designed in accordance with the seismic requirements of the CBC should not collapse in a major earthquake.

The earthquake design requirements take into account the occupancy category of the structure, site class, soil classifications, and various seismic coefficients, all of which are used to determine a seismic design category (SDC) for a project. The SDC is a classification system that combines the occupancy categories with the level of expected ground motions at the site; SDC ranges from

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\(^4\) A load is the overall force to which a structure is subjected in supporting a weight or mass, or in resisting externally applied forces. Excess load or overloading may cause structural failure.
A (very small seismic vulnerability) to E/F (very high seismic vulnerability and near a major fault). Seismic design specifications are determined according to the SDC in accordance with CBC Chapter 16. CBC Chapter 18 covers the requirements of geotechnical investigations (Section 1803), excavation, grading, and fills (Section 1804), load-bearing of soils (Section 1806), as well as foundations (Section 1808), shallow foundations (Section 1809), and deep foundations (Section 1810). For Seismic Design Categories 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 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.

Requirements for geotechnical investigations are included in Appendix J, CBC Section J104, Engineered Grading Requirements and by LA City code amendments. As outlined in Section J104, applications for a grading permit are required to be accompanied by plans, specifications, and supporting data consisting of a soils engineering report and engineering geology report. Additional requirements for subdivisions requiring tentative and final maps and for other specified types of structures are in California Health and Safety Code Sections 17953 to 17955 and in 2013 CBC Section 1802. Testing of samples from subsurface investigations is required, such as from borings or test pits. Studies must be done as needed to evaluate slope stability, soil strength, position and adequacy of load-bearing soils, the effect of moisture variation on load-bearing capacity, compressibility, liquefaction, differential settlement, and expansiveness.

The design of the proposed Project would be required to comply with CBC requirements, which would make the Project consistent with the CBC, and with any applicable LA City code amendments.

The State CEQA Guidelines (Title 14, Chapter 3 of the California Code of Regulations, Section 15000 et seq.), define the procedures, types of activities, individuals, and public agencies required to comply with CEQA. As part of CEQA’s Initial Study process, one of the questions that must be answered by the lead agency relates to paleontological resources: “Will the proposed project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?” (State CEQA Guidelines, Appendix G, Section VII, Part f).

The loss of a significant paleontological resources which includes any identifiable fossil that is unique, unusual, rare, uncommon, diagnostically or stratigraphically important, and/or those that add to an existing body of knowledge in specific areas – stratigraphically, taxonomically, and/or regionally, would be a significant environmental impact. Direct impacts to paleontological resources primarily concern the potential destruction of nonrenewable paleontological resources and the loss of information associated with these resources. This includes the unauthorized collection of fossil remains. If potentially fossiliferous bedrock or surficial sediments are
disturbed, the disturbance could result in the destruction of paleontological resources and subsequent loss of information.

The CEQA threshold of significance for a significant impact to paleontological resources is reached when a project is determined to “directly or indirectly destroy a significant paleontological resource or unique geologic feature” (State CEQA Guidelines Appendix G, Section VII, Part f). In general, for project sites that are underlain by paleontologically sensitive geologic units, the greater the amount of ground disturbance, the higher the potential for significant impacts to paleontological resources.

**Public Resources Code Section 5097.5 and Section 30244**

Other state requirements for paleontological resource management are included in Public Resources Code Section 5097.5 and Public Resources Code Section 30244. Section 5097.5 states that “a person shall not knowingly and willfully excavate upon, or remove, destroy, injure, or deface, any historic or prehistoric ruins, burial grounds, archaeological or vertebrate paleontological site, including fossilized footprints, inscriptions made by human agency, rock art, or any other archaeological, paleontological or historical feature, situated on public lands, except with the express permission of the public agency having jurisdiction over the lands.” Section 5097.5 also states that “a violation of this section is a misdemeanor, punishable by a fine not exceeding ten thousand dollars ($10,000), or by imprisonment in a county jail not to exceed one year, or by both that fine and imprisonment.” This section defines public lands as “lands owned by, or under the jurisdiction of, the state, or any city, county, district, authority, or public corporation, or any agency thereof.”

Section 30244 states that “where development would adversely impact archaeological or paleontological resources as identified by the State Historic Preservation Officer, reasonable mitigation measures shall be required.”

**Local**

The proposed Project is located within the planning area governed by the Los Angeles County General Plan (County General Plan) and the City of Los Angeles General Plan (Los Angeles County 2015; City of Los Angeles 1999). Goals and policies relevant to geologic hazards, safety, conservation of identified mineral deposits, and protection of lands classified as MRZ-2 which would be applicable to the proposed Project are listed below.

**Los Angeles County General Plan**

**Safety Element**

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

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

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

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

Policy C/NR 10.5: Manage mineral resources in a manner that effectively plans for access to, development and conservation of, mineral resources for existing and future generations.

City of Los Angeles General Plan

Safety Element

Goal 1: A city where potential injury, loss of life, property damage and disruption of the social and economic life of the City due to fire, water related hazard, seismic event, geologic conditions or release of hazardous materials disasters is minimized.

Objective 1.1: Implement comprehensive hazard mitigation plans and programs that are integrated with each other and with the City’s comprehensive emergency response and recovery plans and programs.

Policy 1.1.6: State and federal regulations. Assure compliance with applicable state and federal planning and development regulations, e.g., Alquist-Priolo Earthquake Fault Zoning Act, State Mapping Act and Cobey-Alquist Flood Plain Management Act.

3.7.3 Significance Thresholds and Criteria

The significance criteria used to evaluate the proposed Project impacts to geology, soil and mineral resources are based on Appendix G of the CEQA Guidelines. According to Appendix G of the CEQA Guidelines, the proposed Project would have a significant impact if it would:

- Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:
  - Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42. (Refer to Impact 3.7-1)
  - Strong seismic ground shaking. (Refer to Impact 3.7-1)
  - Seismic-related ground failure, including liquefaction. (Refer to Impact 3.7-1)
  - Landslides. (Refer to Impact 3.7-1)

- Result in substantial soil erosion or the loss of topsoil. (Refer to Impact 3.7-2)

- 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. (Refer to Impact 3.7-3)
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- Be located on expansive soil creating substantial direct or indirect risks to life or property.\(^5\) (Refer to Impact 3.7-4)
- Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water. (Refer to Impact 3.7-5)
- Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature. (Refer to Impact 3.7-6)
- Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state. (Refer to Impact 3.7-7)
- 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. (Refer to Impact 3.7-8)

In addition to the thresholds identified in Appendix G of the State and CEQA Guidelines, the L.A. CEQA Thresholds Guide holds that the determination of significance shall be made on a case-by-case basis after considering the following factors:

**Paleontological Resources**

- Whether, or the degree to which, the project might result in the permanent loss of, or loss of access to, a paleontological resource. (Refer to Impact 3.7-6)
- Whether the paleontological resource is of regional or statewide significance. (Refer to Impact 3.7-6)

**Methodology**

This environmental analysis of the potential impacts related to geology and soils, mineral resources, and paleontological resources is based on a review of literature and database research (geologic, seismic, and soils, and paleontological resources reports and maps), as well as the City of Los Angeles General Plan and ordinances.

### 3.7.4 Project Design Features

No specific project design features are proposed with regard to geology, soils, and minerals.

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\(^5\) The CBC, based on the International Building Code and the now-defunct Uniform Building Code, no longer includes a Table 18-1-B. Instead, CBC Section 1803.5.3 describes the criteria for analyzing expansive soils.
3.7.5 Impacts and Mitigation Measures

Seismic Hazards

Impact 3.7-1: Would the proposed Project directly or indirectly cause 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?

Construction

There are no earthquake faults that bisect that proposed Project site. The proposed construction activities would therefore have no impact with regard to causing fault rupture. Construction would include mass grading and excavation activities, but would not exceed depths greater than 10 feet bgs throughout the majority of the proposed Project site. Thus, the proposed project would not excavate to depths where liquefiable soils are present, and no effects to liquefaction would occur. There would be the potential for ground disturbing activities to result in substantial displacement of soils and other materials in areas where substantial slopes are present. However, implementation of standard construction BMPs would ensure that migration of sediments and construction materials would not occur or increase the potential for landslide hazards. Soil units underlying the proposed construction areas consist of an uncertain mix of fill and disturbed local soil. Thus, most of the previously disturbed areas where construction would occur would not be susceptible to, or increase risk of seismic collapse and settlement.

Other construction activities associated with the proposed Project and offsite improvements would not include methods that could exacerbate the risk of loss, injury, or death involving seismic hazards. Compliance with the applicable federal, state, and local regulations and engineering standards discussed in Section 3.7.2, Regulatory Framework, is required during construction activities. Impacts would be considered less than significant.

Mitigation Measures:
None Required

Significance Determination:
Less than Significant Impact

Operation

As discussed above in Section 3.7.1, Environmental Settings, there are no active or historically active faults known to pass through the proposed Project site. The nearest active fault that would be susceptible to surface rupture during an earthquake is located approximately 0.8-mile north of the proposed Project site. As such, the potential risks for surface fault rupture at the proposed Project site is considered very low, and would not be exacerbated by implementation of proposed facilities at shallow depths. The topography in the surrounding vicinity of the proposed Project site includes steep slopes and hillsides, some of which are identified as potential landslide areas. However, the proposed Project site is generally flat and no areas within the proposed Project site are identified as having landslide potential (CGS 2021). The proposed Project would not include
on-site or off-site facilities in proximity to potential landslide areas. Therefore, impacts to fault rupture and seismically-induced landslide risks would be less than significant.

The southern California region includes numerous active and historically faults which are capable of producing strong ground shaking and damage in the Project area. As such, the potential exists for a large regional earthquake to occur in during operation of the proposed Project. In the event of a large regional earthquake, intense ground shaking and high ground accelerations would have the potential to affect the proposed Project site, including proposed park facilities, buildings, and other structures. Occurrence of a large seismic event would have the potential to result in some degree of damage to the proposed Project facilities and the safety of workers and visitors. However, the proposed Project would not include uses that could potentially increase risks for seismic ground shaking. As discussed in Section 3.10, Hydrology and Water Quality, groundwater pumping would be required during operations to maintain reservoir water levels and sustain the proposed wetland habitats. However, the groundwater would be extracted from the San Fernando Basin in amounts similar to existing refill operations and therefore would not exacerbate the potential for causing earthquakes during operation. Impacts would be less than significant.

As discussed in Section 3.7.1, Environmental Settings, Seismic Hazards, much of the proposed Project site has been previously developed with compacted fill materials or soils. However, there is a potential for loose, non-compacted, and variable sandy sediments to occur within underlying geologic units, which may be susceptible to seismically-induced collapse and settlement hazards. For example, younger alluvial deposits underlying areas surrounding the reservoir basin have the potential to be saturated by shallow groundwater beneath the proposed Project site, and may be susceptible to liquefaction as a result of seismic loading. Based on review of geologic mapping, groundwater has the potential to reach shallow depths below the site of the proposed Education Center. However, all proposed structures including the Education Center would be built in areas of the SLRC that have been previously excavated or developed. Thus, it is anticipated that soils underlying the proposed structures would be compact, without loose or sandy soils susceptible to saturation and liquefaction.

The structural elements of the proposed Project would undergo appropriate design-level geotechnical evaluations prior to final design and construction. Implementing the regulatory requirements in the CBC and County and City ordinances and ensuring that all buildings and structures are constructed in compliance with the law is the responsibility of the project engineers and building officials. The geotechnical engineer, as a registered professional with the State of California, is required to comply with the CBC and local codes while applying standard engineering practice and the appropriate standard of care for the particular region in California, which, in the case of the proposed Project, is the City of Los Angeles. For example, the City requires special foundation designs that are different than standard foundations for structures that would be constructed within or adjacent to liquefaction zones. The California Professional Engineers Act (Building and Professions Code Sections 6700-6799), and the Codes of

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6 A geotechnical engineer (GE) specializes in structural behavior of soil and rocks. GEs conduct soil investigations, determine soil and rock characteristics, provide input to structural engineers, and provide recommendations to address problematic soils.
Professional Conduct, as administered by the California Board of Professional Engineers and Land Surveyors, provides the basis for regulating and enforcing engineering practice in California. The local Building Officials are typically with the local jurisdiction (i.e., City of Los Angeles) and are responsible for inspections and ensuring CBC and City of Los Angeles code compliance prior to approval of the building permit. The proposed Project would be required meet or exceed the current safety and design requirements established by the DSOD. The proposed Project would comply with appropriate regulatory requirements and would include the implementation of geotechnical design recommendations. Impacts to risks related to seismic shaking and seismically-induced ground failures, including liquefaction, during operations would be less than significant.

The proposed Project would not impact the existing dams. Please refer to Section 3.10, *Hydrology and Water Quality*, for an analysis of the impacts relative to downstream flooding and inundation due to dam failure (see Impact 3.9-4).

**Mitigation Measures:**

None Required

**Significance Determination:**

Less than Significant Impact

**Soil Erosion**

**Impact 3.7-2: Would the proposed Project result in substantial soil erosion or the loss of topsoil?**

**Construction**

The proposed Project would include clearing, mass grading, trenching, and excavation material in portions of the proposed Project site that may have substantial slopes including, but not limited to, the open lawn area of the South Valley park zone and reservoir embankments. Ground disturbance and stockpiling of soils and construction materials could result in stormwater-driven or wind-driven soil erosion, resulting in potentially significant impacts. The extent of erosion that would occur would vary depending on slope steepness/stability, vegetation/cover, concentration of runoff, and weather conditions.

Construction activities would be required to comply with South Coast Air Quality Management District (SCAQMD) Rule 403 for dust control that would ensure the prevention and/or management of wind erosion and subsequent topsoil loss. Compliance with SCAQMD Rule 403 would ensure that construction activities generating wind-induced soil erosion are below SCAQMD significance thresholds as stated and discussed in more detail in Chapter 3.3, *Air Quality*. For a discussion of potential impacts associated with waterborne erosion, refer to Chapter 3.10, *Hydrology and Water Quality*.

Because the overall footprint of construction activities would exceed one acre, construction of the proposed Project and offsite improvements would require compliance with the NPDES Construction General Permit and its required preparation and implementation of a SWPPP to
comply with Section 402 of the federal CWA (refer to Section 3.7.2, Regulatory Framework, NPDES Construction General Permit). The SWPPP would include specific BMPs to control erosion, sedimentation, and hazardous materials potentially released from construction sites into surface waters. For example, as part of the proposed Project, temporary netting would be installed near the reservoirs to prevent soils and other materials from dumping or spreading into the reservoirs during construction. Compliance with the Construction General Permit, the required SWPPP, and BMPs would reduce erosion impacts during construction of the proposed Project to less than significant levels.

**Mitigation Measures:**
None Required

**Significance Determination:**
Less than Significant Impact

**Operation**

As discussed above in Section 3.6.1, Environmental Setting, the proposed Project site is generally flat and the proposed Project would not include areas susceptible to landslides (CGS 2021). Impacts associated with erosion and landslides would be considered less than significant.

The Project site would be improved with structures, hardscape, wetland habitats, and landscaping. Operation of the Project could result in a limited degree of soil erosion from vegetated areas. Nonerosive drainage features such as infiltration gardens, swales, and biofiltration planting would be implemented, and maintenance of these structures would be conducted over the operational life of the Project in accordance with the City’s Low Impact Development (LID) Ordinance (See Section 3.10, Hydrology and Water Quality). The proposed drainage facilities would prevent substantial sediments and soils carried by stormwater from entering the reservoirs. However, areas adjacent to the reservoir, such as the great lawn and seating terraces, would be designed for surface runoff to move through the proposed habitat island areas before entering the reservoirs. During heavy storm events, this could result in some erosion in the reservoir embankments. As described in Chapter 2, Project Description, a Wetlands Habitat Management Plan would be developed as part of the proposed Project, and would require periodic maintenance of vegetated embankments and slopes to repair undercut areas and erosion.

Due to the isolated nature of the reservoirs at the proposed Project site, any sediment that does collect inside the reservoir would not be able to escape the Project site and could be removed during maintenance periods when the reservoir has low water levels. Therefore, with compliance with existing regulations, geotechnical design recommendations, and DSOD regulations, impacts associated with soil erosion during construction would be less than significant.

**Mitigation Measures:**
None Required

**Significance Determination:**
Less than Significant Impact
Unstable Geologic Units or Soil

Impact 3.7-3: Would the proposed Project 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?

Construction

The geologic units encountered during previous subsurface investigations include artificial fill (Af) materials associated with previous site improvements, as well as native Quaternary alluvium (Qa) and Miocene-age marine sedimentary bedrock (Tmss) underlying the artificial fill materials (LADWP 2013). Soil units outside of the reservoir basin are listed as Urban Land complex soils, which consist of an uncertain mix of fill and disturbed local soil (NRCS 2022). Thus, most of the previously disturbed areas where facilities are proposed would generally be well-suited for development and would not be susceptible to, or increase risk of collapse and settlement. There would be the potential for ground disturbing activities to result in substantial displacement of soils and other materials in areas where substantial slopes are present. However, implementation of standard construction BMPs would ensure that migration of sediments and construction materials would not occur or increase the potential for landslide hazards. Further, construction activities generally would not include grading or excavation at depths greater than 10 feet bgs throughout most of the proposed Project site, and thus would not occur at depths where liquefiable soils may be present. Therefore, the proposed Project relative to unstable geologic or soil units during construction would be considered less than significant.

Mitigation Measures:
- None Required

Significance Determination:
- Less than Significant Impact

Operation

The proposed Project site is generally flat and is not located in an area mapped by CGS as having potential for landslides (CGS 2021). Geologic units at the proposed Project site contain alluvial deposits which have the potential to be saturated by shallow groundwater table, which could result in significant liquefaction and lateral spreading impacts. Liquefaction and lateral spreading, commonly triggered by seismic events, are analyzed in greater detail in Impact 3.6-1. The proposed Project is not included in USGS-mapped subsidence areas (USGS 2022). Further, groundwater supplies would be extracted from the San Fernando Basin in amounts similar to existing reservoir refill operations, and would not exacerbate the potential for subsidence or collapse at the proposed Project site.

The proposed Project would be designed in accordance with the recommendations of a site-specific geotechnical investigation as required by the CBC and the City of Los Angeles code amendments. In addition, implementation of proposed facilities within DSOD jurisdictional areas would require review and approval by DSOD prior to construction to reduce potential impacts to the safety of the dams and reservoirs at the Project site. Therefore, through compliance with
applicable regulatory requirements and geotechnical design recommendations, impacts associated with unstable geologic or soil units during operations would be less than significant.

**Mitigation Measures:**
None Required

**Significance Determination:**
Less than Significant Impact

### Expansive Soil

**Impact 3.7-4: Would the proposed Project be located on expansive soil creating substantial direct or indirect risks to life or property?**

**Construction**

As discussed above in Section 3.6.1, *Environmental Setting*, previous geotechnical investigations indicate that soil units in the proposed Project site consist mostly of disturbed fill, sandy loams, and silty clays that would be less susceptible to expansion since their clay content would not be anticipated to be very high. In addition, expansive soils such as clays would not be used as materials for construction of the proposed Project. Therefore, impacts would be less than significant.

**Mitigation Measures:**
None Required

**Significance Determination:**
Less than Significant Impact

**Operation**

Soils in the proposed Project site consist mostly of disturbed fill and sandy loams that would be less susceptible to expansion since their clay content would not be anticipated to be very high. The proposed Project would not use expansive soils for construction, and would not create a substantial direct or indirect risk to life or property. Therefore, with the implementation of the geotechnical recommendations, and adherence to the CBC, City of Los Angeles Code Amendments, and DSOD regulatory requirements, the impact relative to expansive soils would be less than significant.

**Mitigation Measures:**
None Required

**Significance Determination:**
Less than Significant Impact
Septic Tanks

Impact 3.7-5: Would the proposed Project 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?

The proposed Project would not involve the use of septic tanks or alternative wastewater disposal. Therefore, no impact related to soils incapable of supporting these uses would occur.

Mitigation Measures:
None Required

Significance Determination:
No Impact

Paleontological Resources or Unique Geologic Feature

Impact 3.7-6: Would the proposed Project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

Construction

The proposed Project does not include unique geologic features that would be adversely modified during construction. The Knoll within the Project impact area is a hill feature that would be re-vegetated, but would not be adversely altered during grading. The open water of Silver Lake would be modified with wetland vegetation designed to enhance the habitat and scenic values. No other construction activity would affect unique geologic features including hilltops, ridges, wetlands, or water bodies.

As discussed above in Section 3.7.1, Environmental Setting, Paleontological Resources, the Quaternary alluvium underlying the proposed Project site is of low paleontological sensitivity, increasing to high sensitivity with depth. While the exact depth is not known, similar geological settings suggest greater than 10 feet bgs is a reasonable expectation. Excavations below this depth have the potential to expose and destroy paleontological resources unless properly mitigated.

Based on the limited geotechnical report (LADWP 2013), the proposed Project likely would not excavate within Pleistocene alluvium. Therefore, for the majority of the Project site, significant fossils are not likely to be impacted. However, excavations are expected to exceed 10-feet in depth, or are within the Monterey (Puente) Formation in the Knoll or other locations such as the bottom of the reservoir. Therefore, it is possible that Pleistocene alluvium of higher potential could be impacted. Furthermore, excavations in the northwest and northeast portion of the Project site could impact the Miocene Monterey Formation that is known to contain significant vertebrate fossils. The proposed Project would implement Mitigation Measures PALEO-1 through PALEO-4, which include retention of a qualified paleontologist, paleontological monitoring of excavations exceeding 10 feet in previously undisturbed Quaternary alluvium (though see exclusions in the details below) or at any depth within the Monterey (Puente) Formation, and procedures to follow in the event of the discovery of paleontological resources, salvage and
Mitigation Measures:

**PALEO-1 Construction Personnel Paleontological Resources Sensitivity Training:** The City shall retain a paleontologist who meets the Society of Vertebrate Paleontology’s (SVP 2010) definition for Qualified Professional Paleontologist (Qualified Paleontologist) to carry out all mitigation related to paleontological resources. Prior to the start of ground-disturbing activities, the Qualified Paleontologist or their designee shall conduct construction worker paleontological resources sensitivity training for all construction personnel. Construction personnel shall be informed on how to identify the types of paleontological resources that may be encountered, specific Project activities that would require paleontological monitoring, the proper procedures to be enacted in the event of an inadvertent discovery of paleontological resources, and safety precautions to be taken when working with paleontological monitors. The City shall ensure that construction personnel are made available for and attend the training and retain documentation demonstrating attendance.

**PALEO-2 Paleontological Monitoring:** Paleontological monitoring shall be conducted during ground-disturbing activities that produce visible spoils or cuts for project construction below 10-feet in previously undisturbed Quaternary alluvium or at any depth in the Miocene Monterey Formation. Monitoring shall be conducted by a qualified paleontological monitor (SVP, 2010) working under the direct supervision of the Qualified Paleontologist. Monitoring shall consist of visually inspecting fresh exposures of rock for larger fossil remains and, where appropriate, collecting sediment samples to wet or dry screen to test promising horizons for smaller fossil remains. If the Qualified Paleontologist determines that full-time monitoring is no longer warranted, based on the specific geologic conditions at the surface or at depth, the Qualified Paleontologist may recommend that monitoring be reduced to periodic spot-checking or cease entirely.

**PALEO-3 Paleontological Resource Discovery:** If a potential fossil is found, the paleontological monitor shall be allowed to temporarily divert or redirect grading and excavation activities in the area of the exposed fossil to facilitate evaluation of the discovery. An appropriate buffer area shall be established around the find where construction activities shall not be allowed to continue. Work shall be allowed to continue outside of the buffer area. At the monitor’s discretion, and to reduce any construction delay, the grading and excavation contractor shall assist in removing rock/sediment samples for initial processing and evaluation. If a fossil is determined to be significant, the Qualified Paleontologist shall implement a paleontological salvage program to remove the resources from their location, following the guidelines of the SVP (2010). If the discovery is considered scientifically significant, the monitor will collect the fossil specimen(s) and associated data. For this Project, the SVP (2010) criteria of scientific significance will be used to make this determination in the field. In general, small unidentifiable vertebrate fossils will not be collected and only well-preserved or representative invertebrates or plants will be salvaged if avoidance is not feasible. Any fossils encountered and recovered shall be prepared to the point of identification, catalogued, and curated at an accredited repository.

If construction personnel discover any potential fossils during construction while the paleontological monitor is not present, regardless of the depth of work or location, work...
at the discovery location shall cease in a 25-foot radius of the discovery until the Qualified Paleontologist has assessed the discovery and recommended and implemented appropriate treatment as described in this measure.

**PALEO-4 Reporting:** At the conclusion of paleontological monitoring, the Qualified Paleontologist shall prepare a report summarizing the results of the monitoring and any salvage efforts, the methodology used in these efforts, as well as a description of the fossils collected and their significance. The report shall be submitted by the Applicant to the City, the Natural History Museum of Los Angeles County, and representatives of other appropriate or concerned agencies to signify the satisfactory completion of the proposed project and required mitigation measures.

**Significance Determination:**
Less than Significant with Mitigation Incorporated

**Operation**
Once construction of the proposed Project is complete, the operations phase of the proposed Project would have no potential to encounter paleontological resources or to unique geologic features.

**Mitigation Measures:**
None Required

**Significance Determination:**
No Impact

**Known Mineral Resources**

**Impact 3.7-7:** Would the proposed Project result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?

As described in Section 3.7.1, *Environmental Setting, Mineral Resources*, the nearest MRZ-2 is located along the Los Angeles River segment approximately 0.6-mile northeast of the proposed Project site. The Los Angeles River is designated as having the potential to contain sand and gravel deposits originating from the Tujunga Wash alluvial fan in the San Fernando Valley. However, the MRZ-2 does not include the proposed Project site. In addition, no oil or gas wellfields are located in the vicinity of the proposed Project. Therefore, the proposed Project would have no impact related to mineral resources or regional or statewide importance.

**Mitigation Measures:**
None Required

**Significance Determination:**
No Impact
Locally-Important Mineral Resources

Impact 3.7-8: Would the proposed Project 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?

As described above in Impact 3.7-7, the proposed Project site would not be located in an area designated as MRZ-2, and would not be located in the vicinity of active oil or gas wellfields. No impact to local important mineral resource recovery sites, including mineral resources identified in the City Conservation Element as being of local importance, would occur.

Mitigation Measures:
None Required

Significance Determination:
No Impact

Cumulative Impact

Impact 3.7-9: Would the proposed Project construction and operation, when considered with related projects in the geographic scope, result in a cumulatively impact to geology, soils, and minerals?

Table 3-2 identifies thirteen related projects that are planned or are under construction within the Project area. The geographic area affected by the Project and its potential to contribute to cumulative impacts varies based on the environmental resource under consideration. The geographic scope of analysis for cumulative geologic impacts encompasses and is limited to the Project site and its immediately adjacent area. This is because impacts relative to geologic hazards are generally site-specific. For example, the effect of erosion would tend to be limited to the localized area of a project and could only be cumulative if erosion occurred as the result of two or more adjacent related projects that spatially overlapped. Additionally, geologic hazards could only be cumulative if two or more geologic hazards occurred at the same time. Significant cumulative impacts related to geologic hazards could occur if the incremental impacts of the Project combined with the incremental impacts of one or more of the related projects to substantially increase risk that people or the environment would be exposed to geologic hazards.

Two of the thirteen related projects listed in Table-3-2 are adjacent to the proposed Project. Related Project 13 includes water infrastructure improvements within Silver Lake and Ivanhoe Reservoirs at the Project site and Related Project 14 would involve sidewalk repairs along roadways located adjacent to the Project site. The projects would require ground disturbing activities with the potential to impact geology, soils, and minerals. Once constructed, Related Projects 13 and 14 would not involve ground disturbing activities with the potential to substantially impact geology, soils, and minerals (LADWP 2020b; City of Los Angeles 2019).

The Project would have no impact with respect to septic tanks and alternate wastewater disposal systems, or mineral resources impacts. Accordingly, the Project could not contribute to cumulative impacts related to these topics. If the projects are constructed at the same time, the erosion effects could be cumulatively significant if stormwater runoff from the sites were not
controlled. However, the state Construction General Permit would require each project to prepare and implement a SWPPP. The SWPPPs would describe BMPs to control runoff and prevent erosion for each project. Through compliance with this requirement, the potential for erosion impacts would be reduced. The Construction General Permit has been developed to address cumulative conditions arising from construction throughout the state, and is intended to maintain cumulative effects of projects subject to this requirement below levels that would be considered significant. For example, two adjacent construction sites would be required to implement BMPs to reduce and control the release of sediment and/or other pollutants in any runoff leaving their respective sites. The runoff water from both sites would be required to achieve the same action levels, measured as a maximum amount of sediment or pollutants allowed per unit volume of runoff water. Thus, even if the runoff waters were to combine after leaving the sites, the sediments and/or pollutants in the combined runoff would still be at concentrations (amount of sediment or pollutants per volume of runoff water) below action levels and would not be cumulatively considerable.

Seismic groundshaking, seismic-induced ground failures (e.g., liquefaction and lateral spreading, and landslides), unstable geologic and soils units (e.g., landslides, liquefaction and lateral spreading, subsidence, or collapse), and expansive soils could cause structural damage or pipeline leaks or ruptures. State and local building regulations and standards, described in the Section 3.7.3, Regulatory Framework, have been established to address and reduce the potential for such impacts to occur. The Project and related projects would be required to comply with applicable provisions of these laws and regulations. Through compliance with these requirements, the potential for impacts would be reduced. As explained in the Regulatory Framework, the purpose of the CBC and local ordinances is to regulate and control the design, construction, quality of materials, use/occupancy, location, and maintenance of all buildings and structures within its jurisdiction. By design, it is intended to reduce the cumulative risks from buildings and structures. Therefore, based on compliance with these requirements, the incremental impacts of the Project combined with impacts of related projects in the area would not cause a significant cumulative impact related to seismic groundshaking, seismic-induced ground failures, unstable geologic and soils units, and expansive soils and the Project’s contribution to cumulative effects would not be cumulatively considerable and this impact would be less than significant.

Mitigation Measures PALEO-1 through PALEO-4 would ensure that the proposed Project did not result in a significant impact to paleontological resources. Although related projects may also encounter paleontological resources, impacts to paleontological resources are generally site specific. Since the proposed Project would not result in a significant impact, its contribution to the cumulative impact would not be considerable.

**Mitigation Measures:**
Implementation of Mitigation Measures PALEO-1 through PALEO-4.

**Significance Determination:**
Less than Significant Impact with Mitigation Incorporated
3.7.6 Summary of Impacts

Table 3.7-2 summarizes the impact significance determinations and lists mitigation measures related to geology, soils and mineral resources.

<table>
<thead>
<tr>
<th>Impact</th>
<th>Mitigation Measure</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.7-1: Seismic Hazards</td>
<td>None Required.</td>
<td>LTS</td>
</tr>
<tr>
<td>3.7-2: Soil Erosion</td>
<td>None Required.</td>
<td>LTS</td>
</tr>
<tr>
<td>3.7-3: Unstable Geologic Units or Soil</td>
<td>None Required.</td>
<td>LTS</td>
</tr>
<tr>
<td>3.7-4: Expansive Soil</td>
<td>None Required.</td>
<td>LTS</td>
</tr>
<tr>
<td>3.7-5: Septic Tanks</td>
<td>None Required.</td>
<td>NI</td>
</tr>
<tr>
<td>3.7-6: Paleontological Resources or Unique Geologic Features</td>
<td>Mitigation Measures PALEO-1 through PALEO-4.</td>
<td>LTSM</td>
</tr>
<tr>
<td>3.7-7: Known Mineral Resources</td>
<td>None Required.</td>
<td>NI</td>
</tr>
<tr>
<td>3.7-8: Locally-Important Mineral Resources</td>
<td>None Required.</td>
<td>NI</td>
</tr>
<tr>
<td>3.7-9: Cumulative</td>
<td>Mitigation Measures PALEO-1 through PALEO-4</td>
<td>LTSM</td>
</tr>
</tbody>
</table>

NOTES:
NI = No Impact, no mitigation proposed
LTS = Less than Significant, no mitigation proposed
LTSM = Less than Significant Impact with Mitigation Incorporated
SU = Significant and Unavoidable

3.7.7 References

Bell, Alyssa. 2021. Paleontological Resources Records Search Results from the Natural History Museum of Los Angeles County for the Silver Lake Reservoir Complex Master Plan Project.


Virginia Polytechnic Institute and State University (Virginia Tech [VT]). 2013. *Liquefaction-Induced Lateral Spreading.*


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