4.4 GEOLOGY AND SOILS

This section addresses the potential for geologic hazards, such as fault rupture, seismic ground shaking, liquefaction, lateral spreading, expansive soils, and slopes and erosion to impact the Project Site and the surrounding area, and evaluates the significance of the potential hazards on or resulting from the Project.

4.4.1 ENVIRONMENTAL SETTING

4.4.1.1 Existing Conditions

The Project site is located in the northwestern portion of the Transverse Range Geomorphic Province in the southwestern part of California. The region is separated by an east to west trending series of steep mountain ranges and valleys, subparallel to faults branching from the San Andreas Fault. The Project site is situated in the portion of the Province drained by the Los Angeles River.

The Project site is positioned in the southeastern end of the San Fernando Valley Basin. The Basin consists of Quaternary alluvial valley fill with a maximum depth of approximately 1,000 feet. Alluvial deposits comprising the eastern portion of the basin consist almost entirely of detrital material derived from the crystalline basement complex of the San Gabriel Mountains. These sediments mostly consist of sand and gravel interbedded with silt and clay.

Based on information depicted on the Geologic Map of Los Angeles (California Geological Survey [CGS], 1969), the Project site is underlain by Quaternary age alluvial deposits consisting of silt, silty sand, sand, and sand with gravel transported by the Los Angeles River and Verdugo Wash. These alluvial sediments are derived from early Cretaceous quartz diorite and granitic rock in the San Gabriel Mountains and Verdugo Hills to the north and northeast, respectively.

4.4.2 LAWS, ORDINANCES, REGULATIONS, AND STANDARDS (LORS)

Table 4-33 Applicable Federal, State, Local LORS for Geology and Soils

LORS	Administering Agency
Federal	
Clean Water Act (Erosion Control)	
Earthquake Hazards Reduction Act	
State	
Alquist-Priolo Earthquake Fault Zoning Act	Affected Local Agencies
Seismic Hazards Mapping Act	Affected Local Agencies
California Building Code	
Uniform Building Code	
Local	
Building and Safety Code	City of Glendale
General Plan, Safety Element	City of Glendale

Federal LORS

Clean Water Act (Erosion Control)

The Federal Clean Water Act (CWA) (33 USC 1251 et seq.), formally known as the Federal Water Pollution Control Act of 1972, was enacted with the intent of restoring and maintaining the chemical, physical, and biological integrity of the waters of the United States. The Federal Clean Water Act requires states to set standards to protect, maintain, and restore water quality through the regulation of point-source and certain nonpoint-source discharges to surface water. Such discharges are regulated by the National Pollutant Discharge Elimination System (NPDES) permit process (Federal Clean Water Act Section 402). Projects that disturb one-acre or more are required to obtain NPDES coverage under the NPDES General Permit for Stormwater Discharges Associated with Construction Activity (Construction General Permit) administered by the State Water Resources Control Board, Order No. 2009-0009-DWQ (SWRCB 2015). The Construction General Permit requires the development and implementation of a Stormwater Pollution Prevention Plan (SWPPP), which includes best management practices (BMPs) to regulate stormwater runoff, including measures to prevent soil erosion. Requirements of the CWA and associated SWPPP are described in further detail in Section 3.6, *Hydrology and Water Quality* of this EIR.

Earthquake Hazards Reduction Act

The Earthquake Hazards Reduction Act was enacted in 1977 to "*reduce the risks to life and property from future earthquakes in the United States through the establishment and maintenance of an effective earthquake hazards and reduction program.*" To accomplish this, the Act established the National Earthquake Hazards Reduction Program. This program was significantly amended in November 1990, which refined the description of agency responsibilities, program goals, and objectives.

National Earthquake Hazards Reduction Program's mission includes improved understanding, characterization, and prediction of hazards and vulnerabilities; improvement of building codes and land use practices; risk reduction through post-earthquake investigations and education; development and improvement of design and construction techniques; improvement of mitigation capacity; and accelerated application of research results. The National Earthquake Hazards Reduction Program designates the Federal Emergency Management Agency (FEMA) as the lead agency of the program and assigns it several planning, coordinating, and reporting responsibilities. Programs under National Earthquake Hazards Reduction Program help inform and guide planning and building code requirements such as emergency evacuation responsibilities and seismic code standards such as those to which the Project would be required to adhere.

State LORS

Alquist-Priolo Earthquake Fault Zoning Act – Affected Local Agencies

The state legislation protecting the population of California from the effects of fault-line ground-surface rupture is the Alquist-Priolo Earthquake Fault Zoning Act (California Public Resources Code [PRC] 1972, 1997), passed in the wake of the 1971 Sylmar (or San Fernando) Earthquake, which resulted in extensive surface fault ruptures that damaged numerous structures. The Act is intended to a) prevent the construction of buildings intended for human occupancy on the surface traces of active faults, and b) to increase safety and minimize the loss of life resulting from earthquakes by facilitating seismic retrofitting to strengthen buildings against ground shaking. At the direction of the Act, in 1972 the State Geologist became responsible for delineating Earthquake Fault Zones (called Special Studies Zones prior to 1994) around active and potentially active fault traces to reduce fault-rupture risks to structures for human occupancy. The zones are revised periodically, and extend 200 to 500 feet on either side of identified active fault traces. The CGS has prepared nearly 600 maps delineating Earthquake Fault Zones, which are provided to cities and counties in planning, zoning, and building regulation functions.

Local agencies must enforce the Act in the development permit process, where applicable, and may be more restrictive than State law requires. According to the Act, before a project can be permitted, cities and counties must require a geologic investigation, prepared by a licensed geologist, to demonstrate that buildings will not be constructed across active faults. If an active fault is found, a structure for human occupancy cannot be placed over the trace of the fault and must be set back. Although setback distances may vary, a minimum 50-foot setback is required.

Seismic Hazards Mapping Act – Affected Local Agencies

One of the state legislations protecting the public from geo-seismic hazards other than surface faulting, such as strong ground shaking, liquefaction, landslides, and other ground failures, is the Seismic Hazards Mapping Act (California 1991). The Act's regulations apply to public buildings intended for human occupancy and a large percentage of private buildings intended for human occupancy. The Act became effective in 1991 with the purpose of identifying and mapping seismically hazardous areas to assist cities and counties in preparing the safety elements of their general plans and to encourage land use management policies and regulations that reduce seismic hazards. Under the terms of the Act, cities and counties must require a geotechnical report defining and delineating any seismic hazard prior to the approval of a project in a state-identified seismic hazard zone. The local jurisdiction is required to submit one copy of the approved geotechnical report to the State Geologist within 30 days of approval of the report.

At the direction of the Act, the State Geologist became responsible for preparing maps delineating Liquefaction Zones of Required Investigation and Earthquake-Induced Landslide Zones of Required Investigation in the Los Angeles Basin and San Francisco Bay areas. Mapping has been completed for the project area and hazards have been identified (e.g., earthquake shaking, liquefaction, earthquake-induced landslides) and evaluated (CDMG, 1998).

California Building Code

California Code of Regulations (CCR) Title 24, Part 2, the California Building Code (CBC), provides minimum standards for building design in the state. The current CBC, published July 1, 2016 with an effective date of January 1, 2017, is based on the 2009 International Building Code (IBC) (CBSC, 2016). However, given the State's susceptibility to seismic events, the seismic standards within the CBC are among the strictest in the world, augmenting and superseding the Uniform Building Code with stricter requirements to reduce the risks associated with buildings in Seismic Zone 4 to the maximum extent practical. In turn, each jurisdiction in California may adopt its own building code based on the California Building Code, which is permitted to be more stringent than the California Building Code, but, at a minimum, is required to meet all state standards and enforce the regulations of the California Building Code.

Chapter 16 of the California Building Code deals with structural design requirements governing seismically resistant construction (Section 1604), including factors and coefficients used to establish seismic site class and seismic occupancy category for the soil/rock at the building location and the proposed building design (Sections 1613.5 through 1613.7). Chapter 18 includes the requirements for foundation and soil investigations (Section 1803); excavation, grading, and fill (Section 1804); allowable load-bearing values of soils (Section 1806); and the design of footings, foundations, and slope clearances (Sections 1808 and 1809), retaining walls (Section 1807), and pier, pile, driven, and cast-in-place foundation support systems (Section 1810). Chapter 33 includes requirements for safeguards at work sites to ensure stable excavations and cut or fill slopes (Section 3304). California Building Code includes (but is not limited to) grading requirements for the design of excavations and fills and for erosion control. Construction activities are subject to occupational safety standards for excavation, shoring, and trenching as specified in the California Occupational Safety and Health Administration (Cal-OSHA) regulations (CCR Title 8). The California Building Code is revised every three years.

Uniform Building Code

Development standards would require the project to comply with the seismic design criteria found in the Uniform Building Code. In addition, an adequate design for drainage facilities and preconstruction soil and grading studies would be required. Although seismic design standards have been established to reduce many of the structural problems that occur during major earthquakes, the Uniform Building Code was revised in 1998 as follows:

- Upgrade the level of ground motion used in the seismic design of buildings,

- Add site amplification factors based on local soil conditions, and
- Improve the way ground motion is applied in detailed design.

Local LORS

City of Glendale Building and Safety Code

The Grading Section of the CBC 2016, was adopted into the Glendale Building and Safety Code, 2017. The City's Code was amended to read as follows: The provisions of this chapter apply to grading, excavation, and earthwork construction, including fills and embankments and the control of grading site runoff, including erosion sediments and construction-related pollutants. Where conflicts occur between the technical requirements of this chapter and the geotechnical report, the more restrictive requirement shall govern.

Grading permit application submittal and approval is required for projects in the City of Glendale. All projects requiring a grading permit must prepare a Soil Engineering Report and Engineering Geology Report that includes recommendations to be incorporated in the grading plans or specifications as a condition of project approval. Additionally, an electric service plan must be obtained from the City of Glendale Water & Power Division and included in the grading permit application package.

City of Glendale General Plan, Safety Element

The Glendale General Plan, Safety Element includes the following policies applicable to seismic hazards:

Goal 1: Reduce the loss of life, injury, private property damage, infrastructure damage, economic losses and social dislocation and other impacts resulting from seismic hazards.

Policy 1-1 The City shall ensure that new buildings are designed to address earthquake hazards and shall promote the improvement of existing structures to enhance their safety in the event of an earthquake.

Policy 1-2 The City shall enforce the provisions of the Alquist-Priolo Earthquake Fault Zoning Act and the Seismic Hazards Mapping Act, with additional local provisions.

Policy 1-3 The City shall ensure to the fullest extent possible that, in the event of a major earthquake, essential structures and facilities will remain safe and operational. Essential facilities include hospitals, police stations, fire stations, emergency operation centers (as shown on Plate 1-4 of the Technical Background Report), communication centers, generators and substations, reservoirs and "lifeline"

infrastructure (as defined in Section 1.8.3 of the Technical Background Report). The vulnerability of some of these critical facilities is summarized in Table 1 (at the end of this document).

Policy 1-4 The City shall ensure that current seismic and geologic knowledge and State-certified professional review are incorporated into the design, planning and construction stages of a project, and that site-specific data are applied to each project.

Policy 1-5 The City shall ensure that all residents and business owners in the City have access to information regarding seismic and geologic hazards.

Goal 2: Reduce the loss of life, injury, private property damage, infrastructure damage, economic losses and social dislocation and other impacts resulting from geologic hazards.

Policy 2-1 The City shall avoid development in areas of known slope instability or high landslide risk when possible, and will encourage that developments on sloping ground use design and construction techniques appropriate for those areas.

4.4.3 ENVIRONMENTAL IMPACTS

4.4.3.1 Methodology

This section incorporates information from the Phase II Environmental Site Assessment (ESA; Appendix E.2), Geotechnical Study (Appendix E.3), and Preliminary Grading and Drainage Plans (Appendix H).

4.4.4 PROJECT IMPACTS

Threshold: Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving seismic-related ground failure, including liquefaction

Fault Rupture Hazard

The Project site is not located within a mapped Alquist-Priolo Special Studies Fault Zone (CDMG, 2002). The nearest fault is the Verdugo fault, located approximately 1.7 miles northeast of the Site. Based on available geologic data, there is low to moderate potential for surface rupture from the Verdugo fault and other nearby active faults during the design life of the proposed development.

Ground Shaking

Strong ground shaking can be expected at the Project site during moderate to severe earthquakes in the general region. This is common to most areas in Southern California.

Liquefaction

Liquefaction occurs when loose, unconsolidated, water-laden soils are subject to ground shaking, causing the soils to lose cohesion. According to the State of California Seismic Hazards Zones – Burbank Quadrangle Map (released March 25, 1999), the Project area is located within a liquefaction zone, which is defined as an area where historic occurrence of liquefaction or where local geological, geotechnical, and groundwater conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

Liquefaction of saturated soils generally results in a sudden decrease in soil shear strength due to vibration/shaking of the ground. Generally, three basic factors must exist concurrently in order for liquefaction to occur:

- A source of ground shaking, such as an earthquake, capable of generating soil mass distortions.
- A relatively loose, clean sandy soil matrix exhibiting a potential for volume reduction.
- A relative shallow groundwater table (within approximately 50 feet below ground surface; bgs) or completely saturated soil conditions that will allow positive pore pressure generation.

Because the site is located within a currently, mapped California Liquefaction Hazard Zone, a liquefaction evaluation for the site was completed. Results of this evaluation (encompassing the upper 40 feet of soils of the Project area) indicated that site conditions may be susceptible to seismically induced liquefaction in the event of a major earthquake (Stantec, 2015).

Based on the available data for the Site, the potentially liquefiable soils are overlain by approximately 30 to 40 feet of sand and silt soils in the unsaturated zone; hence, the potential for surface manifestation of sand boils and lateral spreading are considered minor. However, the anticipated settlement in the potentially liquefiable layers between 30 to 40 feet bgs is expected to be approximately two inches, with differential settlements in the order of one inch.

To date, based on results provided in Stantec's Geotechnical Study, dated December 10, 2015, the implementation of applicable building codes and recommendations provided in the aforementioned report, geological impacts are expected to be less than significant. The results of additional, forthcoming geotechnical assessments within the Project Area will be utilized to

further evaluate potential engineering impacts and to design possible mitigation measures as they pertain to liquefiable soils.

Level of Significance before Mitigation:

Less than Significant Impact

Mitigation Measures:

No mitigation is required.

Level of Significance after Mitigation:

Less Than Significant Impact

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

Implementation of the Project would result in exposure of onsite soils during demolition and construction. Earth-moving activities, including trenching, excavating, stockpiling, and grading would occur. Each earth-moving and ground-disturbing activity mobilizes the soil and increases the chance of erosion, which would be a significant impact. An erosion control plan, which is subject to review and approval by the City Engineer, would be required prior to any demolition- and construction-related activities. Such plans must include procedures and equipment necessary to contain onsite soils and minimize potential for contaminated runoff from the Project site. In addition to the erosion control plan, preparation and implementation of a SWPPP, Dust Control Plan and BMPs would also minimize erosion. With implementation of these required plans and procedures, impacts from soil erosion are anticipated to be less than significant.

Level of Significance before Mitigation:

Less than Significant Impact

Mitigation Measures:

No mitigation is required

Level of Significance after Mitigation:

Less Than Significant Impact

Threshold: 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 of collapse

Landslides

Due to minimal slopes at the Project Site, landslides are not considered a potential hazard. Impacts would be less than significant.

Seismic Induced Settlement in Unsaturated Zone

Near surface soils in the unsaturated zone consist of loose to very dense silty sands and stiff to very stiff silt. Loose, silty sands may be prone to volumetric strain resulting from cyclic loading of seismic activity. Surface settlements in the unsaturated zone were estimated to be approximately 11 inches, with differential settlements in the order of five to six inches. Impacts would be less than significant.

Lateral Spreading

Lateral spreading typically occurs as a form of horizontal displacement of relatively flat-lying alluvial material toward an open or "free" face such as an open body of water, channel, or excavation. This movement is generally due to failure along a weak plane, and may often be associated with liquefaction. As cracks develop within the weakened material, blocks of soil displace laterally toward the open face. Due to the depth of groundwater, the potential for lateral spreading is considered minimal. Impacts would be less than significant.

Expansive Soil Potential

The near-surface soils encountered in the proposed construction area consist predominantly of sands with varying amounts of silt. These soil types are not considered expansive, as identified in Table 18-1-B of the Uniform Building Code (1994), and do not create substantial risks to life or property. It is not anticipated that soil will be imported for the Project. If imported soils are used for earthwork at the site, they should be tested for expansion potential prior to import. Impacts would be less than significant.

Level of Significance before Mitigation:

Less than Significant Impact

Mitigation Measures:

No mitigation is required

Level of Significance after Mitigation:

Less Than Significant Impact