4.4 GEOLOGY AND SOILS

INTRODUCTION

This section analyzes potential geotechnical impacts resulting from Project implementation. This section incorporates information from the Preliminary Geotechnical Evaluation prepared for the Project by GeoPentech. The geotechnical study was conducted to determine the nature and engineering properties of the earth materials at the Project site and to provide geotechnical recommendations for design and construction of the proposed structures. The study is provided in ***Appendix 4.4*** *of this EIR.*

ENVIRONMENTAL SETTING

Existing Conditions

The Project site is 0.9-acres and developed with an office building, an alley, a 16-unit apartment building and a surface parking lot. The topography of the Project site and surrounding area is generally flat.

In order to characterize the geologic conditions on the Project site, plans of proposed structures, records of previously completed projects in the vicinity of the site including geotechnical investigations, site assessment report prepared by EP Associates, and published geological, geotechnical, and seismic information were used. Based on geologic maps of the area, the geologic units encountered in the boreholes from previous investigations in the vicinity are interpreted as artificial fill and young alluvium (Qa). The young alluvium consists of dense to very dense poorly to well-graded sand with varying degrees of silt, clay, gravel, cobbles, and occasional boulders.

The Project site is located in the Upper Los Angeles River Area, within the San Fernando Groundwater Basin. Groundwater in the basin flows generally to the east/southeast. The depth to historical high groundwater as reported in the Seismic Hazard Evaluation Report for the Burbank Quadrangle is on the order of 80 feet below the ground surface. Water and saturated soil were not observed in previous investigation borings in the vicinity at depths of up to 101 feet below the ground surface.

Regional Geologic Setting

The City of Glendale is located within the Transverse Ranges Province, is generally flat and surrounded by local mountain ranges. The Verdugo Mountains, located approximately 1 mile north of the Project site, are approximately 2,000 feet above the Project site and 2,600 feet above mean sea level. The San Rafael Hills, located approximately 2 miles east of the Project site, are approximately 400 feet above the project site and 975 feet above mean sea level. Finally, the Santa Monica Mountains, located

approximately 1.5 mile west of the Project site, are approximately 1,000 feet above the Project site and 1,500 feet above mean sea level.

Faulting and Regional Seismicity

The Project site is situated in an area of active and potentially active faults, as is all of Southern California. Active faults present a variety of potential risks to structures, the most common of which are strong ground shaking, soil densification and liquefaction, mass wasting, and surface rupture at the fault plane. Generally, the following four factors are the principal determinants of seismic risk at a given location:

- Distance to seismogenically capable faults;
- The maximum or characteristic magnitude earthquake for a capable fault;
- Seismic recurrence interval, in turn related to tectonic slip rates; and
- Nature of earth materials underlying the site.

Surface rupture represents a primary or direct potential hazard to structures built on an active fault zone. There are no known active or potentially active faults trending toward or through the Project area. The Project site is not located in a currently established Alquist-Priolo Special Studies Zone. Accordingly, the potential for surface fault rupture in the Project area is considered remote.

Ground shaking is the primary hazard most likely to affect the Project area, based primarily upon proximity to active or potentially active faults. The nearest mapped active regional faults are the Verdugo and Hollywood Faults, approximately 1.25 miles north and 2 miles south of the site, respectively. Faults, which could generate strong ground motion at the Project site, are listed in **Table 4.4-1, Regional Faults**. In addition, potentially active blind thrust faults believed to exist in the region include the Puente Hills Blind Thrust and the Upper Elysian Park Thrust. These blind thrust faults are not expressed at the surface, but are inferred to exist based on indirect information, such as seismicity and folded stratigraphy.

Subsidence

Ground surface subsidence generally results from the extraction of fluids or gas from the subsurface that can result in a gradual lowering of the overlying ground surface. Another more localized cause of ground surface subsidence is the deterioration of subsurface peat deposits. As there are no known ongoing extractions of oil or water that would lead to subsidence at the site and the subsurface soils are not known to contain significant quantities of peat, the potential for subsidence at the Project site is considered remote.

Table 4.4-1
Regional Faults

Fault	Maximum Magnitude	Distance from Site in kilometers
Verdugo	6.9	2
Hollywood	6.4	3
Raymond	6.5	4
Upper Elysian Park	6.4	6
Sierra Madre	7.2	9
Puente Hills Blind Thrust	7.1	9
Sierra Madre (San Fernando)	6.7	15
Newport-Inglewood (Los Angeles Basin)	7.1	17
Santa Monica	6.6	17
San Gabriel	7.2	19
Northridge	7.0	21
Clamshell-Sawpit	6.5	23
Whittier	6.8	28
Malibu Coast	6.7	28
Santa Susana	6.7	30
Palos Verdes	7.3	36
San Jose	6.4	36
Holser	6.5	40
Simi-Santa Rosa	7.0	43
Anacapa-Dume	7.5	44
San Andreas-Mojave	7.4	46
Cucamonga	6.9	46
Chino-Central Avenue	6.7	47
Oak Ridge (Onshore)	7.0	50
San Andreas-Carrizo	7.4	66
Elsinore (Glen Ivy)	6.8	66
San Jacinto (San Bernardino)	6.7	70
San Andreas (San Bernardino)	7.5	71
San Jacinto (San JacintoValley)	6.9	95
San Jacinto (Anza)	7.2	131
San Andreas-Coachella	7.2	166

Source: GeoPentech, May 2007.

Liquefaction

Liquefaction potential is greatest where the groundwater level is shallow and submerged loose to medium dense sand or sensitive silts or clays occur within a depth of about 50 feet or less below the ground surface. As ground acceleration and shaking duration increase during an earthquake, liquefaction potential increases.

According to the CDMG Seismic Hazard Zones Map of the Burbank Quadrangle (1999), the Project site is not located within an area identified as having a potential for liquefaction. Historic groundwater levels beneath the Project site are at depths greater than 80 feet below the existing ground surface. In addition, groundwater was not encountered within the 101-foot depth explored in previous investigations near the site. Therefore, there is no potential for liquefaction and associated ground deformation beneath the site.

Seiching and Tsunamis

Tsunamis and seiches are large seismic generated waves in the ocean or large enclosed bodies of water, respectively. Based upon the distance to the ocean, lakes and/or reservoirs, tsunamis or seiches are not a potential hazard at the Project site.

Landslides

Potential for a landslide is often indicated in areas of moderate to steep terrain that are underlain by unfavorably oriented geologic layering or discontinuities. The Project site is located on relatively flat terrain, underlying alluvial sediments are relatively flat lying and no landslides have been mapped in the site vicinity. In addition, the Project site is not in a designated earthquake-induced landslide hazard zone. Therefore, the potential for a landslide at the Project site is considered negligible.

Earthquake-Induced Flooding

Earthquake-induced flooding is generally associated with a body of water located adjacent to a site, or from seismically induced failure of a reservoir located on a drainage upstream of a site. According to the Summary of Hazards Map (II) for Glendale, the Project site is not located within a defined dam inundation area. As such, earthquake-induced flooding is not considered a hazard at the Project site.

REGULATORY FRAMEWORK

Building and construction within the City are subject to Chapter 15.12 of the Glendale Municipal Code, which governs grading, fill, and excavation activities. In addition, seismic design criteria are contained within the California Building Code (CBC). Finally, the Safety Element of the Glendale General Plan

includes standards and plans to reduce the loss of life, injuries, damage to property, and economic and social dislocations resulting from natural and urban-related hazards.

ENVIRONMENTAL IMPACTS

Thresholds of Significance

The following thresholds for determining the significance of impacts related to geology and soils are contained in the environmental checklist form contained in Appendix G of the most recent update of the *California Environmental Quality Act (CEQA) Guidelines*. The *CEQA Guidelines* state that a significant impact would occur if the Project would:

- Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:

  i) 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.

  ii) Strong seismic ground shaking.

  iii) Seismic-related ground failure, including liquefaction.

  iv) Landslides.

- Result in substantial soil erosion or the loss of topsoil.

- 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.

- Be located on expansive soil, as defined in Table 18-1-B of the California Building Code (2001), creating substantial risks to life and property.

- 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.

Impact Analysis

Each applicable threshold of significance is listed below followed by analysis of the significance of potential impacts and the identification of mitigation measures that would lessen or avoid potential impacts. Finally, the significance of potential impacts after implementation of all identified mitigation measures is presented.

Thresholds: **Expose people or structures to 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.

Impact Analysis: Based on the available geologic data, active or potentially active faults with the potential for surface fault rupture are not located directly beneath or projecting toward the Project site. Additionally, the Project site is not located in a currently established Alquist-Priolo Special Studies Zone. Therefore, the potential to expose people or structures to substantial adverse effects resulting from rupture of a known earthquake fault is less than significant.

***Level of Significance Before Mitigation*:** Less than significant.

***Mitigation Measures*:** No mitigation measures are recommended.

Level of Significance After Mitigation: Less than significant.

Thresholds: **Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:**

Strong seismic ground shaking.

Impact Analysis: The Project site could be subject to strong ground shaking in the event of an earthquake originating along one of the faults listed as active or potentially active in the Southern California area. This hazard exists throughout Southern California and could pose a risk to public safety and property by exposing people, property, or infrastructure to potentially adverse effects including strong seismic ground shaking. Proposed structure design would be required to comply with the California Building Code (CBC) and applicable City codes to ensure safety in the event of an earthquake. Therefore, impacts are considered less than significant.

***Level of Significance Before Mitigation*:** Less than significant.

Mitigation Measures: No mitigation measures are recommended.

Level of Significance After Mitigation: Less than significant.

Thresholds: **Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:**

Seismic-related ground failure, including liquefaction.

Impact Analysis: Generally, liquefaction potential is greatest where the ground water level is shallow, and submerged loose, fine sands occur within a depth of about 50 feet or less below the ground surface. The depth to historical high groundwater as reported in the Seismic Hazard Evaluation Report for the Burbank Quadrangle is on the order of 80 feet below the ground surface. Additionally, water and saturated soil were not observed in previous investigation borings in the vicinity at depths of up to 101 feet below the ground surface. Further, the Project site is not within a liquefaction hazard zone, as designated by the State of California and the City of Glendale. Excavation during Project construction would not exceed a depth of 30 feet and, therefore, would not reach the existing groundwater level below the site. Based on the above, the potential for liquefaction on the Project site is less than significant.

***Level of Significance Before Mitigation*:** Less than significant.

***Mitigation Measures*:** No mitigation measures are recommended.

Level of Significance After Mitigation: Less than significant.

Thresholds: **Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:**

Landslides.

Impact Analysis: The Project site is located on relatively flat terrain, underlying alluvial sediments are relatively flat lying and no landslides have been mapped in the site vicinity. In addition, the Project site is not in a designated earthquake-induced landslide hazard zone. Therefore, impacts related to landslides would be less than significant.

***Level of Significance Before Mitigation*:** Less than significant.

***Mitigation Measures*:** No mitigation measures are recommended.

Level of Significance After Mitigation: Less than significant.

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

Impact Analysis: Construction activity associated with Project development may result in wind and water driven erosion of soils due to grading activities if soil is stockpiled or exposed. The applicant would be required to adhere to conditions under the National Pollutant Discharge Elimination System

(NPDES) Permit issued by the Regional Water Quality Control Board (RWQCB) and prepare and submit a Storm Water Pollution Prevention Plan (SWPPP) to be administered throughout Project construction. The SWPPP would incorporate Best Management Practices (BMPs) to ensure that potential water quality impacts during construction from water erosion would be reduced to less than significant. In addition, the applicant would be required to adhere to SCAQMD Rule 403—Fugitive Dust, which would further reduce the impacts associated with wind erosion. Therefore, impacts would be less than significant.

Level of Significance Before Mitigation: Less than significant.

***Mitigation Measures*:** No mitigation measures are recommended.

Level of Significance After Mitigation: Less than significant.

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 or collapse.**

Impact Analysis: The relatively flat-lying topography at the Project site precludes the risk of landslide or lateral spreading. As there are no known ongoing extractions of oil or water that would lead to subsidence at the Project site and the subsurface soils are not known to contain significant quantities of peat, the potential for subsidence at the Project site is considered remote. Historic groundwater levels beneath the Project site are at depths greater than 80 feet below the existing ground surface. In addition, groundwater was not encountered within the 101-foot depth explored in previous investigations near the site. Therefore, there is no potential for liquefaction or collapse at the Project site.

While Project development would not result in the hazards addressed above, the Preliminary Geotechnical Evaluation prepared for the Project included a design and construction recommendation. Without implementation of the geotechnical recommendation, a potentially significant impact could occur. With implementation of the design recommendation provided in the Preliminary Geotechnical Evaluation, impacts would be less than significant.

***Level of Significance Before Mitigation*:** Significant.

***Mitigation Measure*:**

The following measure is recommended by the Preliminary Geotechnical Evaluation prepared for the Project to mitigate impacts related to unstable geologic conditions to a less than significant level:

4.4-1 Walls below grade shall be designed to resist lateral earth pressures, seismic lateral pressures and any surcharges from adjacent loads. Subterranean walls shall be designed to resist hydrostatic

pressures in addition to lateral earth pressures or a positive drainage system shall be provided behind the walls.

Level of Significance After Mitigation: Less than significant.

Threshold: **Be located on expansive soil, as defined in Table 18-1-B of the California Building Code (2001), creating substantial risks to life and property.**

Impact Analysis: Foundations for the proposed residential building would be established in very dense native sands, stiff to hard silt and clay layers. Expansive soils, as defined in Table 18-1-B of the California Building Code do not exist beneath the Project site. Thus, impacts would be less than significant.

Level of Significance Before Mitigation: Less than significant.

***Mitigation Measures*:** No mitigation measures are recommended.

Level of Significance After Mitigation: Less than significant.

Threshold: **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.**

Impact Analysis: The Project would connect to and use the City's existing sewage conveyance system and would not use septic tanks. No impact would occur.

Level of Significance Before Mitigation: No impact.

***Mitigation Measures*:** No mitigation measures are recommended.

Level of Significance After Mitigation: No impact.

CUMULATIVE IMPACTS

The potential for cumulative impacts associated with geology and soils was assessed, based upon consideration of the Project and related projects in the City. These related projects are identified in **Section 4.0, Environmental Impact Analysis**. The applicable threshold is listed below in bold followed by an analysis of the cumulative impact of the project and related projects, and their potential significance.

Thresholds: **Expose people or structures to 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.

Strong seismic ground shaking.

Seismic-related ground failure, including liquefaction.

Landslides.

Result in substantial soil erosion or the loss of topsoil.

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.

Be located on expansive soil, as defined in Table 18-1-B of the California Building Code (2001), creating substantial risks to life and property.

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.

Geotechnical impacts tend to be site-specific rather than cumulative in nature and any development occurring within the City would be subject to, at minimum, uniform site development and construction standards relative to seismic and other geologic conditions that are prevalent within the region. As Project development and each related project would be required to be consistent with recommendations contained in each project's geotechnical study and designed in accordance with the CBC, cumulative impacts associated with known geologic conditions would be less than significant.