

## 4.3 Geology and Soils

### 4.3.1 Introduction

This section evaluates the potential geologic and soils hazards associated with the Project. This includes fault rupture, seismic ground shaking, liquefaction, landslides, subsidence, expansive soils, collapsible/corrosive soils, and erosion. This Geology section is based, in part, on information and findings presented in the Report of Geotechnical Investigation: Proposed Fig+Pico Conference Center Hotels (Geotechnical Report) prepared for the Project by Amec Foster Wheeler Environmental & Infrastructure, Inc. The Geotechnical Report is included as Appendix E-1 of this Draft Environmental Impact Report (Draft EIR).<sup>1</sup> The Geotechnical Report concluded that the Project Site is suitable for development with adherence to applicable code and final design-level geotechnical requirements, and that there are no faults with surface rupture potential on the Project Site.

The Project entitlements include Sign District on the Project Site and surrounding parcels. Installation of signage would not result in material ground disturbance or geology and soils impacts. Thus, this issue is not addressed further in this Geology section.

### 4.3.2 Environmental Setting

#### Existing Conditions

##### *Regional Geology*

The Project Site is located in the northern Peninsular Ranges geomorphic province close to the boundary with the Transverse Ranges geomorphic province. The Transverse Ranges geomorphic province is characterized by east-west trending mountain ranges that include the Santa Monica Mountains. The southern boundary of the Transverse Ranges province is marked by the Malibu Coast, Santa Monica, Hollywood, Raymond, Sierra Madre, and Cucamonga faults. The Peninsular Range province is characterized by northwest/southeast trending alignments of mountains and hills and intervening basins, reflecting the influence of northwest trending major faults and folds controlling the general geologic structural fabric of the region. This province extends northwesterly from Baja California into the Los Angeles Basin and westerly into the offshore area, including Santa Catalina, Santa Barbara, San Clemente and San Nicolas islands. It is bounded by the Colorado Desert along the San Jacinto fault zone on the east. The Los Angeles Basin is the northernmost part of the Peninsular Ranges province. The Newport-Inglewood fault zone, a northwest-trending structural zone expressed at the surface by a series of discontinuous low hills, is located approximately 5.1 miles west-southwest of the Project Site.

##### *Site Geology*

Based on the materials encountered during the exploratory borings conducted for the Geotechnical Report, the Project Site is locally underlain by artificial fill to a depth of 12.5 feet below the ground surface (bgs). The fill consists primarily of silty sand and sand with silt and

<sup>1</sup> Amec Foster Wheeler, Report of Geotechnical Investigation, Proposed Fig+Pico Conference Center Hotels, 1240-1260 South Figueroa Street and 601 West Pico Boulevard, Los Angeles, California, April 3, 2017.

gravel, and is underlain by Holocene age (up to approximately 11,000 years old) alluvial deposits. As encountered in the borings, the alluvial deposits in the upper 30 feet generally consist of poorly graded sand with gravel and cobbles. Below a depth of approximately 35 feet bgs, a layer of predominantly clayey soils with occasional thin interbeds of sand and silt is present to a depth of approximately 75 feet, which is underlain by sandy deposits to the maximum depths explored in the exploratory borings.

### **Groundwater**

The Project Site is located in the Central Subbasin of the Coastal Plain of the Los Angeles Groundwater Basin of the South Coast Hydrologic Region, according to the California Department of Water Resources. Locally, the Project Site is located in the Los Angeles Forebay (LAF) region of the Central Subbasin. The LAF is characterized as a zone of unconfined aquifers in Quaternary sediments that allow for natural recharge of deeper aquifers to the south. Due to the natural geohydrologic conditions and the extensive paving in the region, the LAF is not a suitable source of groundwater. The closest active Los Angeles County-monitored groundwater well (#2778) is located approximately 3.2 miles southeast of the Project Site. The California Geological Survey (CGS) documents the historic high groundwater level in the vicinity of the Project Site at approximately 100 feet bgs. Minor water seepage was encountered at depths of between 33 and 34 feet bgs and 41.5 to 45 feet bgs in the exploratory borings drilled to depths of up to 130 feet bgs.

### **Fault Rupture**

#### **Background**

Fault rupture is defined as the displacement that occurs along the surface of a fault during an earthquake. Based on criteria established by the CGS, faults are classified as either active, potentially active, or inactive.<sup>2</sup> Faults are considered active when they have shown evidence of movement within the past 11,000 years (i.e., Holocene epoch). Potentially active faults are those that have shown evidence of movement between 11,000 and 1.6 million years ago (Quaternary age). Faults showing no evidence of surface displacement within the last 1.6 million years are considered inactive.

Buried thrust faults are defined as faults that do not exhibit surface expression but that nonetheless can become a potential source of seismic activity. Precisely because they are buried, their existence is usually not known until they produce an earthquake. As shown in **Figure 4.3-1, Regional Fault and Seismicity Map**, several blind thrust faults underlie the Los Angeles Basin at depth including the Puente Hills Blind Thrust, Compton Thrust, and Upper Elysian Park Thrust (Figure 4.3-1). However, blind thrust faults are not exposed at the ground surface and are typically identified at depths greater than 3 kilometers. These faults do not present a potential for surface fault rupture.

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<sup>2</sup> The California Geological Survey, or CGS, was formerly called the California Division of Mines and Geology.



SOURCE: Amec Foster Wheeler, 2017

Fig+Pico Conference Center Hotels  
**Figure 4.3-1**  
 Regional Fault and Seismicity Map



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The Alquist-Priolo Earthquake Fault Zoning Act (formerly known as the Alquist-Priolo Special Studies Zones Act) established state policy to identify active faults and determine a boundary zone on either side of a known fault trace, called the Alquist-Priolo Earthquake Fault Zone. The delineated width of an Alquist-Priolo Earthquake Fault Zone is based on the location precision, complexity, or regional significance of the fault and can be between 200 and 500 feet in width on either side of the fault trace. If a site lies within a designated Alquist-Priolo Earthquake Fault Zone, a geologic fault rupture investigation must be performed to demonstrate that a proposed building site is not threatened by surface displacement from the fault, before development permits may be issued.

The City of Los Angeles (City) also has a system for identifying fault lines and requiring fault rupture studies; areas within 500 feet of a fault line are designated as Fault Line Study Areas, and development proposed within these areas require a fault rupture study.

### Project Site

Based on the available geologic data, no active or potentially active faults with the potential to cause surface fault rupture are known to be located directly beneath the Project Site. The closest active faults to the Project Site with surface rupture potential (e.g., non-blind thrust faults) include the Hollywood Fault located 4.8 miles to the north, the Newport-Inglewood Fault Zone located 5.1 miles to the west-southwest, the Raymond Fault located 5.2 miles to the north, and the Verdugo Fault located 7.5 miles to the north-northeast, while the closest potentially active faults with surface rupture potential include the Overland Fault located 7.7 miles to the west-southwest and the Carnock Fault located 8.9 miles to the west-southwest (see Figure 4.3-1). Furthermore, the Project Site is not located within or near a currently established Alquist-Priolo Earthquake Fault Zone. Therefore, as indicated in the Geotechnical Report, the potential for surface rupture due to fault plane displacement at the Project Site is considered low.

### Ground Shaking

The Project Site is located within the seismically active Southern California region, within 50 miles or less of approximately 34 active or potentially active faults, and within 5 miles or less of the Hollywood Fault and three blind thrust faults including the Puente Hills Blind Thrust Fault, Compton Thrust Fault, and Upper Elysian Park Thrust Fault. A number of earthquakes of moderate to major magnitude have occurred in Southern California within the last 83 years, including but not limited to the San Fernando earthquake of 1971 (6.6 magnitude), Whittier Narrows earthquake of 1987 (5.9 magnitude), Sierra Madre earthquake of 1991 (5.8 magnitude), and Northridge earthquake of 1994 (6.7 magnitude). Furthermore, the Project Site is within the surface projection of two of the above blind thrust faults, including Puente Hills Thrust and Compton Thrust faults, which have an estimated average slip rate of 0.9 mm/yr and a moment magnitude of 7.1, and an average slip rate of 0.9 mm/yr and cumulative moment magnitude of 7.0 to 7.4 for observed events, respectively. These blind thrusts do not present surface rupture potential at the Project Site.

The effects of seismic shaking are dependent on the distance between the Project Site and causative fault and the on-site geology. Based on the latest forecasting by the United States Geological Survey (USGS), the Southern California region is expected to have a 93 percent

likelihood of experiencing a magnitude 6.7 or greater earthquake over the following 30 years.<sup>3</sup> The secondary effects of seismic shaking potentially include soil liquefaction, lateral spreading, landslides, seiches, and tsunamis. Liquefaction and landslides are discussed further below, while seiches, inundation, and tsunamis are discussed in the Initial Study in Appendix A of this Draft EIR, as the Project Site is not located within a potential dam inundation area, a hazard area for seiches, or a coastal area.

### **Subsidence**

Subsidence is characterized as a sinking of ground surface relative to surrounding areas, and can occur when underlying soils fail to support new loadings such as structures or placement of additional fill materials. Subsidence in areas of thick alluvial deposits can also be associated with regional fluid (groundwater and/or petroleum) withdrawal, peat oxidation, or hydrocompaction. Subsidence can result in the development of ground cracks and damage to subsurface vaults, pipelines and other improvements.

Settlement can occur from immediate settlement, consolidation, shrinkage of expansive soil, and liquefaction. Immediate settlement occurs when a load from a structure or placement of new fill material is applied, causing distortion in the underlying materials. This settlement occurs quickly and is typically complete after placement of the final load. Consolidation settlement occurs in saturated clay from the volume change caused by squeezing out water from the pore spaces. Consolidation occurs over a period of time and is followed by secondary compression, which is a continued change in void ratio under the continued application of the load. Soils tend to settle at different rates and by varying amounts depending on the load weight or changes in properties over an area, which is referred to as differential settlement. According to the Geotechnical Report, the estimated settlement potential at the Project Site is 2.25 inches for the Hotel A/B Tower, 3.5 inches for the Hotel C Tower, and 0.5 inch for the tunnel interconnecting the basements of the two buildings.

According to the California Division of Gas and Geothermal Resources (DOGGR), the Project Site is located within the limits of the Los Angeles Downtown Oil Field. However, the Project Site does not contain existing groundwater extraction or oil wells, and no plugged or abandoned oil exploration wells are known to be located at the Project Site. The closest known oil production well is located approximately 1,000 feet northwest of the Project Site and is categorized as “plugged and abandoned.” An oil production well located approximately 0.5 mile southeast of the Project Site is categorized as “active.” Therefore, while there is some history of oil extraction in the area, no groundwater or oil extraction occurs or is known to have historically occurred at the Project Site. As indicated in the Geotechnical Report, the Project Site is not located within an area of known subsidence associated with fluid (e.g., groundwater or petroleum) withdrawal, peat oxidation, or hydrocompaction.

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<sup>3</sup> United States Geological Survey, UCERF3: A New Earthquake Forecast for California’s Complex Fault System, March 2015, <https://pubs.usgs.gov/fs/2015/3009/pdf/fs2015-3009.pdf>. Accessed July 29, 2017.

## **Liquefaction**

Liquefaction is a form of earthquake-induced ground failure that occurs when relatively shallow, loose, granular, water-saturated soils behave similarly to a liquid when subject to high-intensity ground shaking. Liquefaction occurs when three general conditions exist: (1) shallow (50 feet bgs or less) groundwater; (2) low-density non-cohesive (granular) soils; and (3) high-intensity ground motion. Liquefaction is typified by a buildup of pore-water pressure in the affected soil layer to a point where a total loss of inherent shear strength occurs, thus causing the soil to behave as a liquid. Saturated, loose to medium density, near-surface cohesionless soils and cohesive soils exhibit the highest liquefaction potential. Liquefaction usually results in horizontal and vertical movement of soils from lateral spreading of liquefied materials and post-earthquake settlement of liquefied materials. The effects of liquefaction on level ground include potential seismic settlement, sand boils, ground oscillation, and bearing capacity failures below structures.

According to the County of Los Angeles General Plan Seismic Safety Element (2015), the City's General Plan Safety Element (1996), and the CGS (1999), the Project Site is not located within an area identified as having a potential for liquefaction. The CGS documents historic-high groundwater levels in the area as being 100 feet bgs, and groundwater was not encountered in the boring logs carried out for the Geotechnical Report, which were drilled to a maximum depth of 130 feet bgs. Therefore, according to the Geotechnical Report and other sources, the potential for liquefaction and associated ground deformation at the Project Site is considered low.

## **Seismically Induced Settlement**

Settlement of the ground surface can be accelerated and accentuated by earthquakes. During an earthquake, settlement can occur as a result of the relatively rapid compaction and settling of subsurface materials (particularly loose, uncompacted, and variable sandy sediments above the water table) due to the rearrangement of soil particles during prolonged ground shaking. Settlement can occur both uniformly and differentially (i.e., where adjoining areas settle at different amounts). Areas underlain by artificial fill can be susceptible to this type of settlement. Given the geologic setting of the Project area and the artificial fill identified beneath the Project Site, this area could potentially be subjected to earthquake-induced settlement. The Geotechnical Report found that the potential for seismically induced settlement at the Project Site is considered low.

## **Site Soils**

### **Compressible/Collapsible Soils**

Compressible or collapsible soils refers to soils susceptible to a sudden change in volume (as opposed to subsidence discussed above), and such events are considered to have a greater potential in soils with high porosities, and low densities, such as windblown silt deposits known as loess, which are often found in more arid climates. Loess is characterized by relatively low density and cohesion and appreciable strength and stiffness in the dry state, but is susceptible to significant deformation (including compression) as a result of wetting.

Typical collapsible soils are lightly colored, low in plasticity, and have relatively low densities. Based on the geotechnical borings completed at the Project Site, the underlying natural soils beneath the Project Site are generally firm and dense, which is not consistent with soils that would

be considered susceptible to collapse. There are fill materials above the natural soils that consist of silty sand and sand with sparsely scattered layers of gravel, and are not uniformly well-compacted, which would be excavated and recompacted prior to building construction.

### **Expansive Soils**

Expansive soils include clay minerals characterized by their ability to undergo significant volume change (shrink or swell) due to variation in moisture content. Sandy soils are generally not expansive, while clayey soils generally are expansive. Changes in soil moisture content can result from rainfall, irrigation, pipeline leakage, perched groundwater, drought, or other factors. Volumetric change of expansive soil may cause excessive cracking and heaving of structures with shallow foundations, concrete slabs-on-grade, or pavements supported on these materials.

According to the Geotechnical Report, the materials encountered in the exploratory borings conducted at the Project Site include: (1) a mantling of artificial fill to a depth of 12.5 feet bgs consisting primarily of silty sand and sand with silt and gravel; (2) alluvial deposits from 12.5 feet to 30 feet bgs consisting of sand, gravel and cobbles; and (3) a layer of predominantly clayey soils with occasional thin interbeds of sand and silt below a depth of approximately 35 feet to a depth of approximately 75 feet, which is underlain by sandy deposits to the maximum boring depths up to 130 feet bgs. Typically, sandy soils have a low expansion potential while clayey soils can have a high expansion potential. The predominance of granular content in the soils on-site including gravels, sands, and cobbles would indicate a generally low potential for expansive soils at the Project Site.

### **Corrosive Soils**

Soil corrosion is a geologic hazard that affects buried metal and concrete structural components that come into direct contact with soil or bedrock. Depending on the chemical constituents of the soil or bedrock, electrochemical corrosion processes can degrade the structural integrity of the buried metal or concrete. Soil corrosion is a complex phenomenon, with a multitude of variables involved. Pitting corrosion and stress-corrosion cracking (SCC) are a result of soil corrosion, which can eventually lead to substantive damage.

The results of corrosivity tests conducted as part of the geotechnical investigation for the Project Site, indicated that the on-site soils, at present moisture content, are mildly corrosive to ferrous metals, aggressive to copper, and that the potential for sulfate attack on Portland cement concrete is considered negligible.

### **Soil Erosion**

Erosion is the wearing away of soil and rock by processes such as mechanical or chemical weathering, mass wasting, and the action of waves, wind, and underground water. Excessive soil erosion can eventually lead to damage to building foundations and roadways. In general, areas exposed during the construction phase, when earthwork activities disturb soils that require stockpiling, are the most susceptible to erosion. Typically, soil erosion potential is reduced once a site is graded and paved, developed with building or structures, or landscaped; however, changes in drainage patterns can cause other unpaved areas to be susceptible to the effects of erosion.

## ***Landslides***

Landslides, slope failures, and mudflows of earth materials generally occur where slopes are steep and/or the earth materials are too weak to support themselves. Earthquake-induced landslides may also occur due to seismic ground shaking. According to the Geotechnical Report, the relatively flat-lying topography at the Project Site precludes both stability problems and the potential for lurching (earth movement at right angles to a cliff or steep slope during seismically induced ground shaking). Also, according to the County of Los Angeles General Plan Safety Element (1990) and the City's General Plan Safety Element (1996), the Project Site is not located within an area identified as having a potential for slope instability. Furthermore, there are no known landslides near the Project Site, nor is it in the path of any known or potential landslides. Lastly, the Project is not located within an area identified as having a potential for seismic slope instability, according to the California Division of Mines and Geology. Therefore, the potential for landslides, slope failures, and mudflows is considered low.

## **Regulatory Framework**

### ***Federal Regulations***

#### **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 (NEHRP). This program was significantly amended as by the Earthquake Hazards Reduction Program Reauthorization Act of 2004 (Public Law 108-360).

NEHRP'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 NEHRP 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 NEHRP 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 of California***

#### **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 facilities, 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. Under State law, all building standards must be centralized in Title 24 or they are not enforceable. 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 2016 edition of the CBC is based on the 2015 International Building Code (IBC) published by the International Code Council. The code is updated triennially, and the 2016 edition of the CBC was published by the California Building Standards Commission in July, 2016, and took effect starting January 1, 2017. The 2016 CBC contains California amendments based on the American Society of Civil Engineers (ASCE) Minimum Design Standard ASCE/Structural Engineering Institute (SEI) 7-16, *Minimum Design Loads for Buildings and Other Structures*, provides requirements for general structural design and includes means for determining earthquake loads 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 substantial 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, which thereby reduces the likelihood of substantial adverse effects, including the risk of loss, injury, or death resulting from strong ground shaking, rupture of an earthquake fault, and seismically induced ground failure.

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 Project Site; SDC ranges from 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 Chapter 16 of the CBC. Chapter 18 of the CBC covers the requirements of geotechnical investigations (Section 1803), excavation, grading, and fills (Section 1804), load-bearing of soils (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.

Chapter 18 also describes analysis of expansive soils and the determination of the depth to groundwater table. Expansive soils are defined in the CBC as follows:

**1803.5.3 Expansive Soil.** In areas likely to have expansive soil, the building official shall require soil tests to determine where such soils do exist. Soils meeting all four of the following provisions shall be considered expansive, except that tests to show compliance with Items 1, 2 and 3 shall not be required if the test prescribed in Item 4 is conducted:

1. Plasticity index (PI) of 15 or greater, determined in accordance with ASTM D 4318
2. More than 10 percent of the soil particles pass a No. 200 sieve (75 micrometers), determined in accordance with ASTM D 422
3. More than 10 percent of the soil particles are less than 5 micrometers in size, determined in accordance with ASTM D 422
4. Expansion index greater than 20, determined in accordance with ASTM D 4829

Specific CBC building and seismic safety regulations contained in Chapter 16 and Chapter 18 regarding soils and foundations of the CBC have been incorporated by reference into the Los Angeles Municipal Code (LAMC) with local amendments.

### **Alquist–Priolo Earthquake Fault Zoning Act**

The Alquist–Priolo Earthquake Fault Zoning Act (Public Resources Code Section 2621) was enacted by the State of California in 1972 to address the hazard of surface faulting to structures for human occupancy. The Alquist–Priolo Earthquake Fault Zoning Act was enacted in response to the 1971 San Fernando Earthquake, which was associated with extensive surface fault ruptures that damaged homes, commercial buildings, and other structures. The primary purpose of the Alquist–Priolo Earthquake Fault Zoning Act is to prevent the construction of buildings intended for human occupancy on the surface traces of active faults. The Alquist–Priolo Earthquake Fault Zoning Act is also intended to provide citizens with increased safety and to minimize the loss of life during and immediately following earthquakes by facilitating seismic retrofitting to strengthen buildings against ground shaking.

The Alquist–Priolo Earthquake Fault Zoning Act 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 to assist cities and counties in planning, zoning, and building regulation functions. Maps are distributed to all affected cities and counties for the controlling of new or renewed construction and are required to sufficiently define potential surface rupture or fault creep. The State Geologist is charged with continually reviewing new geologic and seismic data, and revising existing zones and delineating additional earthquake fault zones when warranted by new information. Local agencies must enforce the Alquist–Priolo Earthquake Fault Zoning Act in the development permit process, where applicable, and may be more restrictive than State law requires. According to the Alquist–Priolo Earthquake Fault Zoning Act, before a project can be permitted, cities and counties shall 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. The Alquist–Priolo Earthquake Fault Zoning Act and its regulations are presented in California Department of Conservation, California Geological Survey, Special Publication 42, Fault-Rupture Hazard Zones in California.

### **Seismic Safety Act**

The California Seismic Safety Commission was established by the Seismic Safety Act in 1975 with the intent of providing oversight, review, and recommendations to the Governor and State Legislature regarding seismic issues. The Commission’s name was changed to Alfred E. Alquist Seismic Safety Commission in 2006. Since then, the Commission has adopted several documents based on recorded earthquakes, including: (1) research and Implementation Plan for Earthquake Risk Reduction in California 1995 to 2000, report dated December 1994; (2) Seismic Safety in California’s Schools, “Findings and Recommendations on Seismic Safety Policies and Requirements for Public, Private, and Charter Schools,” report dated December 2004; (3) Findings and Recommendations on Hospital Seismic Safety, report dated November 2001; and (4) Commercial Property Owner’s Guide to Earthquakes Safety, report dated October 2006.

### **Seismic Hazards Mapping Act**

In order to address the effects of strong ground shaking, liquefaction, landslides, and other ground failures due to seismic events, the State of California passed the Seismic Hazards Mapping Act of 1990 (Public Resources Code Section 2690-2699). Under the Seismic Hazards Mapping Act, the State Geologist is required to delineate “seismic hazard zones.” Cities and counties must regulate certain development projects within these zones until the geologic and soil conditions of the project site are investigated and appropriate mitigation measures, if any, are incorporated into development plans. The State Mining and Geology Board provides additional regulations and policies to assist municipalities in preparing the Safety Element of their General Plan and encourage land use management policies and regulations to reduce and mitigate those hazards to protect public health and safety. Under Public Resources Code Section 2697, cities and counties shall require, prior to the approval of a project located in a seismic hazard zone, a geotechnical report defining and delineating any seismic hazard. Each city or county shall submit one copy of each geotechnical report, including mitigation measures, to the State Geologist within 30 days of its approval. Public Resources Code Section 2698 does not prevent cities and counties from establishing policies and criteria which are stricter than those established by the Mining and Geology Board.

State publications supporting the requirements of the Seismic Hazards Mapping Act include the California Geological Survey Special Publication 117, Guidelines for Evaluating and Mitigating Seismic Hazards in California and California Geological Survey Special Publication 118, Recommended Criteria for Delineating Seismic Hazard Zones in California. The objectives of Special Publication 117 are to assist in the evaluation and mitigation of earthquake-related hazards for projects within designated zones of required investigations and to promote uniform and effective statewide implementation of the evaluation and mitigation elements of the Seismic Hazards Mapping Act. Special Publication 118 implements the requirements of the Seismic Hazards Mapping Act in the production of Probabilistic Seismic Hazard Maps for the State.

## **City of Los Angeles**

### **Los Angeles General Plan Safety Element**

The City's General Plan Safety Element, which was adopted in 1996, addresses public safety risks due to natural disasters including seismic events and geologic conditions, as well as sets forth guidance for emergency response during such disasters. The Safety Element also provides maps of designated areas within the City that are considered susceptible to earthquake-induced hazards, such as fault rupture and liquefaction. Safety Element goals, objectives, and policies are broadly stated to provide information for planning future development and guidance for the City's Emergency Operations Organization in planning to address emergency situations. Exhibit A of the Safety Element shows that there are no Alquist-Priolo Special Study Zone Areas or Fault Rupture Study Areas in the vicinity of the Project. The 1996 Safety Element acknowledged that it was based on available official maps at the time and that exhibits should be revised following receipt of reliable new information. In 2014, the State of California released current official maps for the Hollywood Quadrangle Earthquake Zone of Required Investigation, and delineated boundaries of earthquake fault zones and seismic hazard zones. The following information supplements and confirms the conclusions in the Safety Element: (1) the Geotechnical Report confirms that the Project Site is not within a currently established Alquist-Priolo Earthquake Fault Zone; (2) Navigate LA<sup>4</sup> and the Parcel Profile Report available on the City's Zone Information and Map Accessed System (ZIMAS) website confirm there is no surface fault rupture potential at the Project Site;<sup>5</sup> (3) the 2014 USGS Hollywood Quadrangle map illustrates that the Project Site is not within a designated seismic hazard zone;<sup>6</sup> and (4) the state's Alquist-Priolo maps confirms the Project Site is not within fault zone with surface rupture potential.<sup>7</sup>

### **Los Angeles Municipal Code**

Chapter IX of the LAMC contains the City's Building Code, which incorporates by reference the CBC, with City amendments for additional requirements. The Los Angeles Department of Building and Safety (LADBS) is responsible for implementing the provisions of the City's Building Code. To that end, LADBS issues building and grading permits for construction projects. Building permits are required for any building or structure that is erected, constructed, enlarged, altered, repaired, moved, improved, removed, converted, or demolished. Grading permits are required for all grading projects other than those specifically exempted by the LAMC. The sections of Chapter IX address numerous topics including earthwork and grading activities, import and export of soils, erosion and drainage control and general construction requirements that address flood and mudflow protection, slides and unstable soils. Additionally, the City's

<sup>4</sup> City of Los Angeles, Navigate LA, <http://navigatela.lacity.org/index.cfm>. Accessed March 30, 2017.

<sup>5</sup> City of Los Angeles, Zone Information and Map Access System (ZIMAS), <http://zimas.lacity.org>. Accessed March 30, 2017.

<sup>6</sup> California Department of Conservation, California Geological Survey, Earthquake Zones of Required Investigation – Hollywood Quadrangle, November 6, 2014, [ftp://ftp.consrv.ca.gov/pub/smgb/2014/August\\_2014/08%20RBM%200814-7%20Hollywood%20Quadrangle%20Prel%20A-P%20Map/RBM%200814-7%20I%20Hollywood%20Background.pdf](ftp://ftp.consrv.ca.gov/pub/smgb/2014/August_2014/08%20RBM%200814-7%20Hollywood%20Quadrangle%20Prel%20A-P%20Map/RBM%200814-7%20I%20Hollywood%20Background.pdf). Accessed July 22, 2017.

<sup>7</sup> California Department of Conservation, California Geological Survey, Earthquake Zones of Required Investigation – Hollywood Quadrangle, November 6, 2014, [ftp://ftp.consrv.ca.gov/pub/smgb/2014/August\\_2014/08%20RBM%200814-7%20Hollywood%20Quadrangle%20Prel%20A-P%20Map/RBM%200814-7%20I%20Hollywood%20Background.pdf](ftp://ftp.consrv.ca.gov/pub/smgb/2014/August_2014/08%20RBM%200814-7%20Hollywood%20Quadrangle%20Prel%20A-P%20Map/RBM%200814-7%20I%20Hollywood%20Background.pdf). Accessed July 22, 2017.

Building Code includes specific requirements addressing seismic design, grading, foundation design, geologic investigations and reports, soil and rock testing, and groundwater.

### 4.3.3 Environmental Impacts

#### **Methodology**

This analysis of impacts associated with geology and soils is based on the Geotechnical Report provided as Appendix E-1 to the Draft EIR. The Geotechnical Report was based on review of prior explorations at the Project Site, review of relevant maps and reports, Project Site testing and reconnaissance, subsurface investigations, laboratory testing, and geotechnical analysis and evaluation. The Geotechnical Report is prepared according to requirements established by LADBS. The requirements are based on guidelines and specifications established in such sources as the City's Building Code, the CGS, American Society for Testing and Materials (ASTM) and Department of Building and Safety Information Bulletins, which document LADBS requirements and guidelines for specific topics in greater detail than the City's Building Code.

The Geotechnical Report evaluated the underlying geologic and soil conditions to determine their potential for causing hazardous conditions and identifies foundation requirements needed to ensure that new building construction is safe. Ten subsurface borings of depths ranging from 76 to 130 feet bgs were conducted across the Project Site, with the number and locations of the borings selected to ensure representative coverage across the Project Site. The soil samples collected from the borings were then subjected to laboratory testing to properly characterize their geotechnical engineering properties. All testing was performed in general accordance with applicable ASTM specifications at the time of testing. The Geotechnical Report provides sufficient detail to determine the geotechnical hazards present at the Project Site and whether the Project Site is suitable for the intended use. The Geotechnical Report also identifies recommendations to be taken into account in the design of Project Site preparations and building foundations.

A final design-level geotechnical report must ultimately be prepared and approved by the City prior to issuance of building permits, and would be based on the final construction and building plans prepared by the Applicant. Based on the ground conditions and building design, the Geotechnical Report includes specific recommendations for Project Site preparation, excavation, foundation design, and shoring/retaining wall specifications. Moreover, State and local code requirements ensure that buildings are designed and constructed in a manner that, although the buildings may sustain damage during a major earthquake, will reduce the risk that buildings will collapse resulting in potential for injury or death. The Geotechnical Report contains an extensive discussion regarding potential methods of construction and Site-specific recommendations for the Project Site, that would be reviewed and implemented before construction. In addition, the LADBS would review a final design-level geotechnical report prior to issuance of any grading, shoring, or building permit for the Project. This methodology ensures seismic risks are adequately reduced through conformity with applicable building codes, in conjunction with other requirements specified in preliminary and final geotechnical reports, that are reviewed and approved by licensed engineers at the City before development of the Project.

## Thresholds of Significance

### ***Appendix G of the CEQA Guidelines***

In 2015, the California Supreme Court in *CBIA v. BAAQMD*, held that CEQA generally does not require a lead agency to consider the impacts of the existing environment on the future residents or users of the project. The revised thresholds are intended to comply with this decision. Specifically, the decision held that an impact from the existing environment to the project, including future users and/or residents, is not an impact for purposes of CEQA. However, if the project, including future users and residents, exacerbates existing conditions that already exist, that impact must be assessed, including how it might affect future users and/or residents of the project.

In accordance with Appendix G of the California Environmental Quality Act State (CEQA) Guidelines and the *CBIA v. BAAQMD* decision, the applicable thresholds of significance with regard to geology and soils are below. The Project would have a significant impact if it results in any of the following impacts to future residents or users:

- 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 based on other substantial evidence of a known fault caused in whole or in part by the Project’s exacerbation of the existing environmental conditions. Refer to Division of Mines and Geology Special Publication 42;
  - Strong seismic ground shaking caused in whole or in part by the Project’s exacerbation of the existing environmental conditions;
  - Seismic-related ground failure, including liquefaction caused in whole or in part by the Project’s exacerbation of the existing environmental conditions; or
  - Landslides caused in whole or in part by the Project’s exacerbation of the existing environmental conditions.
- 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 caused in whole or in part by the project’s exacerbation of the existing environmental conditions;
- Be located on expansive soils, as defined by Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property caused in whole or in part by the Project’s exacerbation of the existing environmental conditions; or
- 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.

As discussed in the Initial Study, provided in Appendix A-2 of this Draft EIR, and in Chapter 6, Other CEQA Considerations, of this Draft EIR, given the Project Site’s location in an urbanized area of Downtown Los Angeles, and given the lack of topography on the Project Site or in the Project area, the Project would not be subject to, exacerbate, or cause adverse effects related to

landslides. Also as determined in the Initial Study, the Project is currently served, and will continue to be served, by the City's sewer system and would have no impact related to the use of septic tanks or alternative waste water systems. No further analysis of these potential impacts is necessary.

### **LA CEQA Thresholds Guide**

#### **Geologic Hazards**

In accordance with the City of Los Angeles CEQA Thresholds Guide (LA CEQA Thresholds Guide), the Project would normally have a significant geologic hazard impact if it would cause or accelerate geologic hazards which would result in substantial damage to structures or infrastructure, or expose people to substantial risk of injury.

#### **Sedimentation and Erosion**

In accordance with the LA CEQA Thresholds Guide, the Project would normally have a significant impact related to sedimentation and erosion if it would:

- Constitute a geologic hazard to other properties by causing or accelerating instability from erosion; or
- Accelerate natural processes of wind and water erosion and sedimentation, resulting in sediment runoff or deposition which would not be contained or controlled on the Project Site.

#### **Landform Alteration**

In accordance with the LA CEQA Thresholds Guide, the Project would normally have a significant impact related to landform alteration if one or more distinct and prominent geologic or topographic features would be destroyed, permanently covered, or materially and adversely modified. Such features may include, but are not limited to, hilltops, ridges, hillslopes, canyons, ravines, rock outcrops, water bodies, streambeds, and wetlands.

The Project Site is a flat, already paved and developed property within the urbanized South Park district of Downtown Los Angeles. Given this setting, the Project would have no impact on any distinct or prominent geologic or topographic features and no further analysis of this potential impact is necessary.

### **Project Characteristics and Project Design Features**

The Project proposes to demolish the existing two-story, 35-foot-tall, 27,800-square-foot commercial building and associated surface parking lots on the Project Site, along with the construction of two towers. The building housing Hotels A and B, on the western side of the Project Site, would have a footprint of approximately 28,750 square feet. The building housing Hotel C, on the eastern side of the Project Site, would have a footprint of approximately 11,650 square feet. Construction activities would include excavation for two 18-foot-deep basements (one for each building), grading, and the construction of appropriate foundations. The two basements would be connected by a subterranean tunnel beneath the alley that bisects the eastern and western sides of the Project Site. Excavation to a depth of approximately 27 feet bgs is anticipated to construct the building basements, foundations, and tunnel.

Approximately 49,000 cubic yards of soil would be excavated, all of which would require export and either recycling or disposal at a facility licensed to accept such soil. Activities associated with the excavation, grading and export of soil would occur in accordance with City requirements, as specified in the LAMC and through the grading plan review and the approval process.

All development would be undertaken pursuant to applicable codes and regulations, including the City's Building Code as well as applicable regulations established by LADBS and the Bureau of Engineering.

The following Project Design Feature (PDF) would be implemented to reduce potential geology and soils impacts of the Project:

**PDF GEO-1:** A qualified geotechnical engineer shall be present on the Project Site during excavation, grading, and general Project Site preparation activities to monitor implementation of the recommendations specified in the geotechnical reports.

## Project Impacts

**Threshold GEO-1:** Would the Project 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; (ii) strong seismic ground shaking caused in whole or in part by the Project's exacerbation of the existing environmental conditions; or (iii) seismic-related ground failure, including liquefaction caused in whole or in part by the Project's exacerbation of the existing environmental conditions?

### ***Fault Rupture***

Fault rupture is the ground displacement that occurs along the surface of a fault during an earthquake. As indicated previously, no active or potentially active faults with surface rupture potential (e.g., non-blind thrust faults) bisect or underlie the Project Site. The closest active non-blind thrust faults to the Project Site are the Hollywood Fault located 4.8 miles to the north, the Newport-Inglewood Fault located 5.1 miles to the west-southwest, the Raymond Fault located 5.2 miles to the north, and the Verdugo Fault located 7.5 miles to the north-northeast. The closest potentially active non-blind thrust faults are the Overland Fault located 7.7 miles to the west-southwest and the Carnock Fault located 8.9 miles to the west-southwest.

Furthermore, as indicated previously, the Project Site is not within a mapped Alquist-Priolo Earthquake Fault Zone, any fault zones mapped by the City's General Plan Safety Element, or any other mapped fault zones with surface rupture potential. The potential for surface fault rupture at the Project Site is very low. The City's ZIMAS system, and the Geotechnical Report, identify the Project Site as within the projection of the Puente Hills Blind Thrust (PHBT). The PHBT is buried deep below the surface extending from Downtown Los Angeles to the City of Brea. The nearest subsurface rupture potential for the PHBT is between 5 and 13 kilometers below grade in the vicinity of the Project Site. Accordingly, the PHBT does not represent a risk of surface rupture on the Project Site. Therefore, the Project would not expose people or structures

to substantial adverse effects, including the risk of loss, injury, or death involving the rupture of a known earthquake fault or exacerbate existing environmental conditions. As such, impacts related to fault rupture would be less than significant.

### ***Seismic Ground Shaking***

The Project Site is located within the seismically active Southern California region, within 50 miles or less of 34 active or potentially active faults, and within 5 miles or less of the Hollywood Fault and three blind thrust faults. The Project Site is located within the surface projection area of two blind thrust faults, including the PHBT and the Compton Thrust. Neither of these thrusts have the potential for surface rupture potential at the Project Site. Nonetheless, a number of moderate to strong earthquakes have occurred in Southern California within the last 83 years.

In addition, the USGS estimates that over the next 30 years there is a 93 percent chance of a magnitude 6.7 or greater earthquake occurring in the Southern California region.<sup>8</sup> However, the level of ground shaking at any given location depends on many factors, including the size and type of earthquake, the distance from the earthquake epicenter, time of shaking, and subsurface geologic conditions. The type and quality of construction also affects how particular structures and improvements perform during seismic ground shaking.

As discussed above, a Site-specific preliminary geotechnical investigation was conducted at the Project Site to evaluate the soils, potential levels of ground shaking that could occur, and determine that development on the Project Site was feasible. The Project Site's seismic characteristics were evaluated per the guidelines set forth in Chapter 16, Section 1613 of the City's Building Code. The Project Site was determined to be a Site Class "C" (i.e., moderate seismic vulnerability) using the 2016 edition of the CBC, site-specific geologic conditions, and the results of shear wave velocity measurements. The Geotechnical Report concluded that seismic conditions on the Project Site can be overcome with engineering design solutions, standard engineering approaches, and conformance with current building codes. Nonetheless, potential impacts from seismic ground shaking hazards during Project construction and operation would be potentially significant due to the inherent risk of damage associated with earthquakes in the Southern California region. This level of impact, however, would be reduced through conformance with existing regulatory compliance measures that require final design level geotechnical engineering approvals before issuance of grading and building permits.

The Project would be constructed in conformance with all applicable state and local seismic regulatory requirements, including but not limited to, the CBC and the City's Building Code. Thus, prior to issuance of grading permits, the Applicant shall submit final design plans and a site-specific, final design level, geotechnical engineering report (Final Geotechnical Report) to the Los Angeles Department of Building and Safety for review and approval. The Final Geotechnical Report shall be used for final design of the foundation system for the structures and will take into consideration the engineering properties beneath the proposed structures and the projected loads. The Final Geotechnical Report shall specify exact design coefficients that are

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<sup>8</sup> United States Geological Survey, UCERF3: A New Earthquake Forecast for California's Complex Fault System, March 2015, <https://pubs.usgs.gov/fs/2015/3009/pdf/fs2015-3009.pdf>. Accessed July 29, 2017.

needed by structural engineers to determine the type and sizing of structural building materials. Development of the Project shall be subject to the specific performance criteria recommended in the Final Geotechnical Report, and all applicable state and local codes and building standards. The Final Geotechnical Report shall be prepared by a registered and licensed civil engineer, or certified engineering geologist, and include appropriate measures to minimize seismic hazards and ensure structural safety of the proposed structures.

As part of regulatory compliance, the City requires that, prior to issuance of a grading permit for any portion of the Project Site, a qualified geotechnical engineer shall submit a site-specific, design-level geotechnical report for the Project that: (1) confirms the expected ground motions at the Project Site from known active faults using accepted methodologies; (2) determines final structural design requirements considering site specific soil conditions and local seismicity factors; and (3) provides final design parameters for walls, foundations, foundation slabs, utilities, roadways, parking, sidewalks, and other related improvements. The final development plans for foundation design, earthwork, and Project Site preparation would incorporate all of the recommendations in the Final Geotechnical Report.

In addition, PDF GEO-1 requires a qualified geotechnical engineer to be present on the Project Site during excavation, grading, and general Project Site preparation activities to monitor implementation of the recommendations specified in the geotechnical reports. Therefore, with adherence to all applicable regulatory requirements, in conjunction with the Project Design Feature provided herein, the Project would not expose people or structures to substantial adverse effects, including the risk of loss, injury, or death involving strong seismic ground shaking or exacerbate existing environmental conditions. Impacts would be less than significant.

### ***Seismic-Related Ground Failure Including Liquefaction***

Liquefaction is a form of earthquake-induced ground failure that occurs when relatively shallow, loose, granular, water-saturated soils behave similarly to a liquid when subject to high-intensity ground shaking. Liquefaction typically occurs when there is shallow groundwater (50 feet bgs or less), low density non-cohesive (granular) soils are present such as clays, and strong seismic ground shaking occurs. Lateral spreading is a ground failure associated with liquefaction and generally results from predominantly horizontal displacement of materials toward relatively unsupported free slope faces.

The Project Site is relatively flat and the surrounding area is developed such that the potential for lateral spreading is low. As indicated previously, according to the County of Los Angeles General Plan Seismic Safety Element (2015), the City's General Plan Safety Element, and the CGS geotechnical mapping, the Project Site is not located within an area identified as having a potential for liquefaction. Furthermore, while the Project Site is subject to potentially strong seismic ground shaking (see above), and while some clayey soils occur at depth (between approximately 30 and 130 feet bgs), the CGS documents historic-high groundwater levels in the area as being 100 feet bgs. Substantial amounts of groundwater were not encountered in the borings carried out for the preliminary geotechnical investigation at the Project Site that were advanced to a maximum depth of 130 feet bgs. Therefore, according to the Geotechnical Report

findings, and other reliable sources, the potential for liquefaction and associated ground deformation (e.g., lateral spreading) at the Project Site is considered low. As such, impacts related to liquefaction would be less than significant.

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**Threshold GEO-2:** Would the Project result in substantial soil erosion or the loss of topsoil?

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The Project Site is located in an urban area that is surrounded by development and largely covered in impervious surfaces. As previously stated, the Project Site is underlain by artificial fill of up to approximately 12.5 feet in thickness over underlying alluvial deposits. The fill consists primarily of silty sand and sand with silt and gravel, while the alluvial deposits in the first 30 feet below this fill consist of poorly graded sand with gravel and cobbles. The fill has relatively low cohesive properties, and has a relatively high potential for erosion from surface runoff if exposed. Construction activities would include ground-disturbing activities (e.g., excavation, grading, soil stockpiling, foundation construction, the installation of utilities) that would temporarily expose soils, allowing for possible erosion if not managed appropriately. In addition, the change in on-site drainage patterns resulting from the Project could also result in limited soil erosion if not designed appropriately.

However, all grading activities would require grading permits from LADBS, which would include requirements and standards designed to limit potential impacts associated with erosion. Grading and Project Site preparation would also comply with all applicable provisions of Chapter IX, Division 70 of the LAMC, which includes requirements such as the preparation of an erosion control plan to reduce the effects of sedimentation and erosion during construction. The Project would include a Stormwater Pollution Prevention Plan (SWPPP) in accordance with the National Pollutant Discharge Elimination System (NPDES) permit for General Construction. The SWPPP would be subject to review by the City for compliance with its Best Management Practices (BMP) Handbook. The SWPPP and BMPs would control erosion and minimize the effects of potential erosion caused by wind and water. As part of these regulatory requirements, these proven BMPs would be implemented to control erosion during construction and reduce the potential to create any instability from erosion or accelerate the natural processes of wind and water erosion to less than significant levels. In addition, if grading activities occur during the rainy season (October 1<sup>st</sup> to April 14<sup>th</sup>), then a Wet Weather Erosion Control Plan would be prepared pursuant to the “Manual and Guideline for Temporary and Emergency Erosion Control,” adopted by the Los Angeles Board of Public Works. To reduce wind-related erosion, wetting of soil surfaces and/or covering exposed ground areas and soil stockpiles could be implemented during construction, as appropriate. The use of soil tackifiers may also be considered to reduce the potential for wind related soil erosion, if necessary. Implementation of BMPs would ensure that water- and wind-related erosion would be confined to the construction area and not transported off-site.

Finally, once construction activities are completed, the Project Site would be covered in impervious surfaces, landscaping, and completed with drainage control measures that would reduce the potential for erosion. Once constructed, the proposed development would include drainage control features in accordance with local and regional requirements (See Section 4.6

Hydrology and Water Quality, of this Draft EIR) to ensure that stormwater is managed in a way that minimizes the potential for erosion or sedimentation. The Project Site would be largely covered in impervious surfaces and landscaping that would leave very little of the Project Site vulnerable to the effects of wind and water erosion.

Therefore, with adherence to applicable regulations, substantial soil erosion or the loss of topsoil during Project construction and operation would not occur. In addition, the Project would not cause or accelerate natural processes of wind and water erosion. Impacts would be less than significant.

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**Threshold GEO-3:** Would the 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 caused in whole or in part by the Project's exacerbation of the existing environmental conditions?

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### ***Subsidence***

According to DOGGR, the Project Site is located within the limits of the Los Angeles Downtown Oil Field. However, the Project Site does not contain existing groundwater extraction or oil wells, and no plugged and abandoned oil exploration holes are known to be located at the Project Site. The closest known oil production well is located approximately 1,000 feet northwest of the Project Site and is categorized as "plugged and abandoned." An oil production well located approximately 0.5 mile southeast of the Project Site is categorized as "active" While there is some history of oil extraction in the area, no groundwater or oil extraction occurs, or is known to have historically occurred, at the Project Site. In addition, the Geotechnical Report concluded that the Project Site is not located within an area of known subsidence associated with fluid (e.g., groundwater or petroleum) withdrawal, peat oxidation, or hydrocompaction. Impacts related to subsidence during Project construction or operation would be less than significant.

### ***Liquefaction and Lateral Spreading***

See liquefaction analysis under Threshold GEO-1 above. For the reasons stated therein, impacts related to liquefaction would be less than significant.

### ***Collapse (Compressible/Collapsible Soils)***

The Geotechnical Report states that the Project Site is mantled with artificial fill to a depth of approximately 12.5 feet bgs. The fill is considered unsuitable to support the proposed new loadings that would occur with development of the Project. However, the fill would be removed during excavation to accommodate the construction of the proposed subterranean levels and building foundations. The geotechnical properties of the underlying alluvial sediments were deemed to be sufficient to support the proposed mat foundations as recommended in the Geotechnical Report.

More specifically, Geotechnical Report calculated estimates for settlement that would occur with development of the proposed buildings would be 2.25 inches for the Hotel A/B Tower and 3.5 inches for the Hotel C Tower. The estimated settlement of the tunnel connecting the basements of

the two buildings would be approximately one-half inch. The Geotechnical Report notes that, if not addressed appropriately through geotechnical recommendations, differential settlement could result in damage to the proposed improvements. The Geotechnical Report therefore recommended delaying construction of the structural connections between the building basements and the tunnel to allow for this settlement to occur, reducing the potential for damage. In other words, the Geotechnical Report recommends that development of certain components of the Project be sequenced properly so soil compression can occur in accordance with the anticipated settlement of the structures. This compression would not create an unstable geologic unit, but the two mat foundations for the buildings, and the tunnel foundation, should be connected at the appropriate time in accordance with the final recommendations of the Final Geotechnical Report approved by LADBS before construction. Development of the Project would occur in accordance with the recommendations in the Geotechnical Report, the Final Geotechnical Report required by regulatory compliance, and in conformance with all applicable building codes.

Therefore, the Project would not be located on a geologic unit or soil that is unstable, or that would become unstable, and the Project would not result in any on- or off-site lateral spreading, subsidence, liquefaction or collapse caused in whole or in part by exacerbation of the existing environmental conditions.

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**Threshold GEO-4:** The Project could have a potentially significant impact if it would be located on expansive soils, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property caused in whole or in part by the Project's exacerbation of the existing environmental conditions.

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### ***Expansive Soils***

According to the Geotechnical Report, the materials encountered in the exploratory borings conducted at the Project Site include: (1) a mantling of artificial fill to a depth of 12.5 feet bgs consisting primarily of silty sand and sand with silt and gravel; (2) alluvial deposits from 12.5 feet to 30 feet bgs consisting of sand, gravel and cobbles; and (3) alluvial deposits from 30 feet bgs to the maximum boring depths up to 130 feet bgs consisting of silty sand, sand, silty clay and sandy clay. In general, sandy soils with relatively low clay content have a low expansion potential while soils with higher clay content have a higher expansion potential. The Geotechnical Report classified the underlying soils as primarily sandy alluvial materials and where silts and clays were observed, they were classified as "lean," indicating a relatively low potential for expansion.<sup>9</sup> As part of the construction of the proposed subterranean level and foundations, the upper materials, primarily artificial fills, would be removed by excavation. Any new fill that would be brought onto the Project Site would be required to meet fill requirements that include standards for expansive properties. Therefore, the Project would not be located on expansive soils or create substantial risks to life or property caused in whole or in part by exacerbation of the existing soil conditions.

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<sup>9</sup> Amec Foster Wheeler, Report of Geotechnical Investigation, Proposed Fig+Pico Conference Center Hotels, 1240-1260 South Figueroa Street and 601 West Pico Boulevard, Los Angeles, California, April 3, 2017.

## Cumulative Impacts

Chapter 3, General Description of Environmental Setting, of this Draft EIR provides a list of projects that are planned or are under construction in the Project study area. The related projects primarily reflect infill development within the Downtown Los Angeles area and surrounding communities. Generally, the geographic context for cumulative analysis of potential geology and soils impacts encompasses the greater Los Angeles Basin because the Los Angeles Basin is subject to similar seismic activity and related hazards. Seismic hazards can vary widely within the Los Angeles Basin as underlying conditions and proximity to an earthquake can present different levels of susceptibility to damage and injury to occupants. Development at the Project Site and elsewhere in the region could expose additional people and structures to potentially adverse effects associated with earthquakes including seismic ground shaking. Site-specific geotechnical studies required by local agencies in accordance with current building code standards would determine how future development projects must be designed to minimize the risk of loss, injury, or death involving earthquakes. Building code standards are based on the latest developments in seismic design and are routinely updated to include the best available science. Therefore, current and future development would be constructed in accordance with the most advanced seismic design standards.

More specifically, there are two projects in close proximity to the Project Site that are analyzed for potential cumulative effects. One, the Circa project at 1200 S. Figueroa Street, is immediately north of the Project Site and shares a property line. The Circa project consists of two 36-story towers on parking podiums and is currently under construction. Grading, excavation, and construction of the subterranean building components for the Circa project are complete. The Geotechnical Report concluded that the construction of the Project (including all grading and excavation activities) would have no adverse effect on the geologic stability of properties outside of the Project Site. The second nearby project, a 56-story hotel high-rise, is proposed, but not yet approved or under construction, south of the Project Site and across W. Pico Boulevard on the site of the existing City Lights at Fig multi-family residential development. The excavations for the Project would be separated from any eventual excavation at the City Lights at Fig by W. Pico Boulevard. Thus, there would be no potential for combined incremental geology and soils impacts between these two projects.

Adherence to Geotechnical Report recommendations, in conjunction with applicable building code compliance during grading, excavation, and construction of the Project (including recommendations pertaining to construction shoring of excavation sites and the design of permanent retaining walls and below-grade walls to account for the foundations of adjacent buildings) would ensure stability of the Project Site and any nearby related project. The Geotechnical Report also recommends surveying adjacent buildings and streets for horizontal and vertical locations as well as surveying, photographing, and documenting cracks and offsets in those buildings and streets. Project construction and operation would not have individual or combined adverse effects on the geologic stability of any nearby related projects.

Therefore, the Project would not have a cumulatively considerable geology and soils impact when viewed in connection with the potential effects of the related projects. Impacts are less than significant.

#### 4.3.4 Mitigation Measures

Impacts related to geology and soils were determined to be less than significant because adherence to regulatory requirements (including review and approval of the Final Geotechnical Report) and applicable building codes would adequately reduce potential geotechnical impacts.

#### 4.3.5 Level of Significance After Mitigation

Potentially significant impacts would be less than significant with compliance with regulatory requirements and implementation of the PDF.