5.6 GEOLOGY AND SOILS

This section describes the geologic and seismic setting of the project site, including risks associated with existing environmental conditions, including fault rupture, ground shaking, soil liquefaction, soil expansion, and/or landslides. The project's potential impacts regarding these topics are based on analysis provided in the *Geology and Soil Discipline Report, La Brea Tar Pits Museum Master Plan Project* (Geology and Soil Discipline Report), prepared by Shannon and Wilson, dated January 27, 2023 (Appendix E).

This section also evaluates the potential for the project to impact paleontological resources or unique geologic features. Information related to the existing conditions and analysis for paleontological resources is based on the *Paleontological Resources Technical Report, La Brea Tar Pits Master Plan, Los Angeles, California* (Paleontological Resources Technical Report), prepared by SWCA Environmental Consultants (SWCA), dated January 25, 2023 (Appendix F).

5.6.1 Existing Conditions

5.6.1.1 Regional Faulting and Seismicity

FAULTING

There are numerous faults in Southern California including active, potentially active, and inactive faults. Based on criteria established by the California Geological Survey (CGS), active faults are those that have shown evidence of surface displacement within the past 11,000 years (i.e., Holocene-age). Potentially active faults are those that have shown evidence of surface displacement within the last 1.6 million years (i.e., Quaternary-age). Inactive faults are those that have not shown evidence of surface displacement within the last 1.6 million years. The Alquist-Priolo Earthquake Fault Zoning Act defines "active" and "potentially active" faults using the same aging criteria as those used by the CGS, as described above. However, according to the Alquist-Priolo Earthquake Fault Zoning Act, only those faults which have direct evidence of movement within the last 11,000 years are required to be zoned. The CGS considers fault movement within this period to be a characteristic of faults that have a relatively high potential for ground rupture in the future.

The Los Angeles Basin and the Southern California region are located within a complex zone of faults, fault systems, folds, and other geologic features. Since the project site is located within a seismically active area, it is expected to experience the effects of future earthquakes on active faults. Figures included in the Geology and Soil Discipline Report (see Appendix E) illustrate active and potentially active faults mapped in the vicinity of the project site. There are no known active or potentially active faults mapped within the project site or immediately adjacent to the project site. In addition, the project site is not located within an Alquist-Priolo Earthquake Fault Zone. The closest active faults to the project site include the following: Elysian Park Fault - Lower Thrust located approximately 1.7 miles southeast; Newport-Inglewood-Rose Canyon Fault Zone located approximately 1.7 miles southwest; Santa Monica Fault located approximately 2.4 miles west; and the Hollywood Fault located approximately 2.6 miles north. The closest potentially active faults to the project site include the Overland Avenue Fault located approximately 4.2 miles southwest of the project site and the Charnock Fault located approximately 6 miles from the project site. Refer to Appendix E for a detailed discussion of these nearby active faults.

SEISMICITY

Several earthquakes of moderate to large magnitude (greater than 5.0) have occurred in Southern California area within the last 90 years. Table 5.6-1 provides a list of some of these earthquakes (with magnitudes greater than 5.7) within approximately 150 miles of the project site. As shown, recent historic earthquakes in the greater Los Angeles region include the 1933 Long Beach Earthquake (Moment Magnitude Scale [Mw] 6.4), the 1971 San Fernando Earthquake (Mw 6.5), the 1987 Whittier Narrows Earthquake (Mw 5.9), the 1991 Sierra Madre Earthquake (Mw 5.8), and the 1994 Northridge Earthquake (Mw 6.7).

Table 5.6-1. Major Historic Earthquakes in Southern California

Earthquake	Date of Earthquake	Moment Magnitude Scale (M_w)	Distance to Epicenter (miles)	Direction to Epicenter
Long Beach	March 10, 1933	6.4	38	SE
Kern County	July 21, 1952	7.5	75	N-NW
Borrego Mountain	April 9, 1968	6.5	143	SE
San Fernando	February 9, 1971	6.5	24	N
Whittier Narrows	October 1, 1987	5.9	16	E
Superstition Hills	November 24, 1987	6.6	162	SE
Sierra Madre	June 28, 1991	5.8	24	NE
Joshua Tree	April 22, 1992	6.1	117	E
Big Bear	June 28, 1992	6.4	88	E
Landers	June 28, 1992	7.3	110	E
Northridge	January 17, 1994	6.7	15	NW
Hector Mine	October 16, 1999	7.1	125	NE
Ridgecrest Sequence	July 4–5, 2019	6.4, 7.1	123, 125	NE

Source: Shannon and Wilson (2023). Information provided by the Southern California Earthquake Data Center (SCEDC). Distances to epicenter values were determined based on the latitude and longitude values presented by SCEDC.

5.6.1.2 Regional Geology

The project site is located in the coastal Los Angeles Basin at the northern edge of the Peninsular Ranges Geomorphic Province and adjacent to the southern edge of the Transverse Ranges Geomorphic Province. The basin includes the low-lying area between the San Gabriel Mountains and the Pacific Ocean shoreline. Nearby hills and mountain ranges bordering the basin include the prominent Santa Monica Mountains to the north, the Hollywood Hills to the northeast, the Elysian and Repetto Hills to the east, the Peninsular Ranges to the southeast, and the Baldwin Hills to the south. Further discussion of regional geology can be found in the Paleontological Resources Technical Report (see Appendix F).

5.6.1.3 Project Site Geology

The project site occupies the westerly extent of the La Brea Plain. The La Brea Plain is a broad, slightly elevated, and dissected surface underlain by coalescing Quaternary age (recent to 2.6 million years ago) alluvial fan and floodplain deposits. These alluvial sediments were deposited on the underlying Tertiary-age (2.6 to 66 million years ago) shallow marine sedimentary bedrock formations. Faulting and folding of the bedrock over millions of years has formed structural traps for petroleum deposits. Several oil and gas fields were developed within this portion of the Los Angeles Basin, including the Salt Lake and South Salt Lake fields.

At the project site, crude oil and gas leaking from the petroleum deposits of the Salt Lake Field have migrated toward the ground surface through fractures and faults in the bedrock, permeating into the overlying alluvium. Upon reaching shallower depths, the lighter petroleum components are altered by evaporation and biologic processes resulting in a more viscous remnant tar (or asphalt) deposit.

LOCAL GEOLOGY AND GEOLOGIC UNITS

Regional geologic maps indicate the project site is underlain by alluvial deposits, as shown in figures included in the Geology and Soil Discipline Report (see Appendix E). Specifically, the geologic map depicts the project site being underlain by slightly elevated and dissected, older alluvium and alluvial fan sediments (mapped as Qae). Geotechnical explorations near the project site indicate much of the alluvial deposits are covered by a layer of artificial fill, extending to depths of approximately 1 to 8 feet below ground surface. The fill is of variable composition, consisting of silty clay, sandy clay, clayey silt, and silty sand.

The project site is underlain by units described as late-Pleistocene to Holocene (recent to about 11,000 years old) in age. The Pleistocene-age (about 11,000 to 1.8 million years) alluvial deposits consist of stiff to very stiff clays with some dense silt and silty sand layers. These relatively fine-grained materials overlie thicker deposits of dense to very dense sand. The fine-grained alluvial deposits belong to the Lakewood Formation, while the deeper sand beds correspond to the San Pedro Formation.
The youngest surficial deposits observed in this area are Holocene sediments of modern alluvial fans, stream channels (e.g., Los Angeles and San Gabriel Rivers), and their floodplains. These debris-flow, sheetflood, and fluvial deposits consist of boulder, cobble, and pebble gravel lenses and sheets, interbedded with sand, silt, and clay derived from the surrounding highlands.

As noted previously, natural hydrocarbons are present in the alluvium due to the upward migration of crude oil leaking from oil deposits within the underlying bedrock. The crude oil has been altered near the ground surface to viscous tar, and the more permeable sand deposits are permeated with tar.

The Lakewood and San Pedro Formations are directly underlain by Tertiary-age sedimentary bedrock of the Fernando Formation. The bedrock consists primarily of well stratified, locally folded, interbedded claystone, siltstone, and sandstone.

GROUNDWATER

The project site is located within the Central Groundwater Basin of the Los Angeles Coastal Plain. The principal freshwater-bearing sediments of the Central Basin include the Holocene-age alluvial deposits, and the Pleistocene-age Lakewood and San Pedro Formations at depth. According to the Seismic Hazard Zone Report for the Hollywood 7.5-minute quadrangle, the project site lies within the 10-foot water level contour of the historically high groundwater levels. This indicates that the historical high groundwater depth is at or shallower than 10 feet below ground surface. Previous subsurface explorations conducted at the project site encountered groundwater levels at depths less than 10 feet below ground surface. Groundwater depth is anticipated to fluctuate in response to rainfall, seasonal variations, and other factors, and is anticipated to vary throughout the site.

TAR SANDS AND SEEPS

Tar sands and seeps are present at various locations within and around the project site. These tar seeps occur randomly and are likely the result of methane and hydrogen sulfide gas pressure at depth mobilizing groundwater and tar to the surface. Based on previous subsurface explorations at and in the immediate vicinity of the project site, tar sands were encountered at depths varying from approximately 6 feet to 30 feet below ground surface, correlating to elevations ranging from 137 feet to 180 feet above mean sea level. Soils excavated within the top 10 feet and above the groundwater level at the project site are not anticipated to contain significant natural oil or tar. Soils from excavations that extend below the groundwater level could contain natural oil and/or tar.

OIL FIELD AND ADJACENT OIL WELLS

The project site is located within the limits of the Salt Lake Oil Field. According to maps prepared by the State of California Department of Conservation, Geologic Energy Management Division (CalGEM), there are several oil and gas wells located within the vicinity of the project site (within a 1-mile radius), the nearest including the Mars Oil Co. Masselin 1 to the south and three Chevron Salt Lake oil wells to the north and east of the project site. According to CalGEM records, these wells are plugged and abandoned. The CalGEM maps, dating back to the 1900s, do not show abandoned or active oil wells within the footprint of the project site and the likelihood of encountering an abandoned oil well is low (CalGEM 2023; Shannon and Wilson 2023).

METHANE AND HYDROGEN SULFIDE GAS

The project site is located within an area delineated by the City of Los Angeles as a Methane Zone or a zone of known shallow methane and hydrogen sulfide gas accumulation with high potential for seepage of methane gas. Crude oil and methane gas leak out from the petroleum deposits and migrate through fractures and faults located within the bedrock until encountering the alluvial soils, where they permeate into the alluvium and continues to travel upward to the ground surface. Many of the light petroleum components are lost to evaporation and biogenic processes, resulting in viscous tar seeping out of the ground surface. Impacts related to methane and hydrogen sulfide gas are discussed in Section 5.8, Hazards and Hazardous Materials, and the project-specific Methane Study is included as Appendix G.

5.6.1.4 Paleontological Resources

Paleontological resources are the evidence of once-living organisms preserved in the rock record. They include both the fossilized remains of ancient plants and animals and the traces thereof (e.g., trackways, imprints, burrows, etc.). In general, fossils are considered to be older than recorded human history or greater than 5,000 years old and are typically preserved in sedimentary rocks. Although rare, fossils can also be preserved in volcanic rocks and low-grade metamorphic rocks under certain conditions.

Paleontological potential is defined as the potential for a geologic unit to produce scientifically significant fossils. This is determined by rock type, history of the geologic unit in producing significant fossils, and fossil localities recorded from that unit. Paleontological potential is derived from the known fossil data collected from the entire geologic unit, not just from a specific survey or study. A geologic unit known to contain significant fossils is considered sensitive to adverse impacts if there is a high probability that earth-moving or ground-disturbing activities in that rock unit would either disturb or destroy fossil remains, directly or indirectly.

The project site is considered the most recognized paleontological locality in the world due to its unique geologic conditions linked to the origin and development of petroleum reservoirs within the Los Angeles Basin. As discussed in detail in the Paleontological Resources Technical Report (see Appendix F), the paleoecological and paleoenvironmental conditions as well as the unique geologic setting during the late Pleistocene and Holocene within Rancho La Brea[1] have contributed to the high level of fossil

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[1] The project site is located within the former Rancho La Brea, a 4,439-acre Mexican land grant given to Antonio Jose Rocha and Nemisio Dominguez in 1828. Rancho La Brea consisted of approximately 4,500 acres of land in current-day Wilshire Miracle Mile, Hollywood, and parts of West Hollywood.

preservation at the project site, which has historically yielded millions of significant fossils (SWCA 2023). A detailed history of the paleontology of the project site as well as in depth records of previous excavations at the project site are provided in the Paleontological Resources Technical Report (see Appendix F). The following discussion focuses on the most recent excavations and paleontological discoveries in the vicinity of the project site and provides an overview of more recent local geological mapping and geotechnical investigations within the project site and its immediate vicinity.

PALEONTOLOGICAL RESOURCES IDENTIFIED WITHIN THE PROJECT SITE AND VICINITY

Recent Excavations

Several recent construction projects within or immediately adjacent to the project site have yielded numerous significant paleontological resources from the same deposits as those that could potentially be encountered during implementation of the project. Figure 5.6-1 illustrates the fossil collection localities within the greater area of Hancock Park, including the project site. As indicated in the Paleontological Resources Technical Report (see Appendix F), recent projects from within or immediately adjacent to Hancock Park include the Los Angeles County Museum of Art (LACMA) Transportation Project, the Academy Museum of Motion Pictures Project, the New LACMA Building for the Permanent Collection Project, and the One Museum Square Project. From the LACMA Transportation Project, numerous paleontological resources were discovered during monitoring of ground disturbances. In fact, 16 deposits of asphalt (or asphalt-rich sediments) containing abundant fossilized remains were extracted in 23 “landscaping/tree box” crates, as well as several isolated macrofossils (for example, one isolate yielded a nearly complete adult Columbian mammoth nicknamed “Zed”) and 327 buckets of matrix containing microfossils (SWCA 2023).

The crated deposits—referred to as “Project 23” by the George C. Page Museum (Page Museum)—are still being processed on the grounds of Hancock Park, with estimates of the number of fossils contained within ranging from 1 million to 3 million (ArchaeoPaleo Resource Management, Inc. 2014). Similar discoveries have been made during ground-disturbing activities at the Academy Museum of Motion Pictures and the New LACMA Building projects, each of which uncovered numerous significant fossil discoveries that were crated in a similar fashion, with each crate possibly containing hundreds to thousands of fossils remaining to be processed. Table 5.6-2 provides a sample of completed local paleontological resources discovered during monitoring for development projects in the vicinity of the project site.

Table 5.6-2. Sample of Completed Local Paleontological Resources Monitoring Projects

Project Name	Year	Distance/Direction from Proposed Project	Monitoring Results
The Grove at Farmers Market	2001	1,000 meters (0.62 mile) north	Pleistocene gopher and plants; blue-green sandy silt
Farmers Market Renovation (also known as The Grove at Farmers Market Phases 2 and 3)	2001–2004	1,000 meters (0.62 mile) north	Pleistocene macrofauna, such as mammoth, horse, and indeterminant mammal; microfauna and flora; streambed soils, some asphalt deposit stringers
Park La Brea Community Center	2004	650 meters (0.40 mile) northeast	No fossils, caliche soils

Project Name	Year	Distance/Direction from Proposed Project	Monitoring Results
Palazzo West/Palazzo at Park La Brea	1999–2003	700 meters (0.43 mile) north	Pleistocene macrofauna, such as horse, mammoth, bison, sloth; other vertebrates, such as frog, bird, rabbit, snake, skunk, various rodents; microfauna, such as clam, gastropod; plants; streambed sandstone, siltstone, claystone, some asphaltic deposit stringers
Palazzo East/Palazzo at Park La Brea	1999–2003	1,100 meters (0.68 mile) northeast	Pleistocene macrofauna, such as horse, sloth, camel, bison, and proboscidean/elephant; microfauna, such as ostracod; plants; fluvial alluvium composed of sandstone, siltstone, and claystone
The Villas at Park La Brea	1999–2003	1,100 meters (0.68 mile) east-northeast	No fossils observed; silty clay, caliche
Median Improvements, Wilshire Boulevard from Fairfax Avenue to La Brea Avenue	1996	80 meters (263 feet) south	No fossils observed; deposits too young to contain fossils
Hancock Park Renovation	1989–2003	*Adjacent, east and north	Pleistocene macrofauna, such as mammoths; microfauna and flora; streambed soils and asphaltic deposits
Hancock Park Replacement Pipeline Discharge System	2012	245 meters (0.15 mile) east	Indeterminant mammal, large bird, small bird, microfossils; asphaltic deposits
Luxe@375 (apartment construction with subterranean parking)	2012	2,200 meters (1.37 miles) northwest	Pleistocene indeterminant bony fish, toad, frog, pond turtle, rattlesnake, indeterminant reptile, indeterminant bird, various rodents, camel, horse, rabbit, mastodon, ground sloth, bivalve, gastropod, plant (i.e., charcoal)
LACMA Transformation Project	2006–2008	Adjacent, west	"Project 23". During construction, 16 asphaltic deposits, recovered in 23 trapezoidal/prismatic "tree boxes" holding 383 cubic meters of material contain an array of Pleistocene fossils, including terrestrial macrofauna, such as bison, dire wolf, mammoth, sloth, lynx, saber-toothed cat, horse, bird, turtle; microfossils; and plants resulting in thousands of fossil specimens. Additionally, individual or isolated specimens were jacketed or collected, including a Columbian mammoth.
Academy Museum of Motion Pictures	2019–2020	Adjacent, west	Numerous macrofauna, including saber-toothed cat, dire wolf, bison, ground sloth; and microfauna; plants; fluvial deposits with some asphaltic deposits
New LACMA Building Project	2016–2017	Adjacent, west and southwest	Gastropods and bivalves from depths of 41 to 65 feet below ground surface; fine-grained sand and silty clay, saturated with asphalt
One Museum Square Project	2018–2019	Adjacent, east	Approximately 20,000 fossil specimens of birds and small mammals

Sources: AECOM (2016a, 2017); ArchaeoPaleo Resource Management, Inc. (2014); Environmental Science Associates (2020)
* "Adjacent" refers to projects that are within Hancock Park or along its boundary but not within the La Brea Tar Pits Master Plan area.

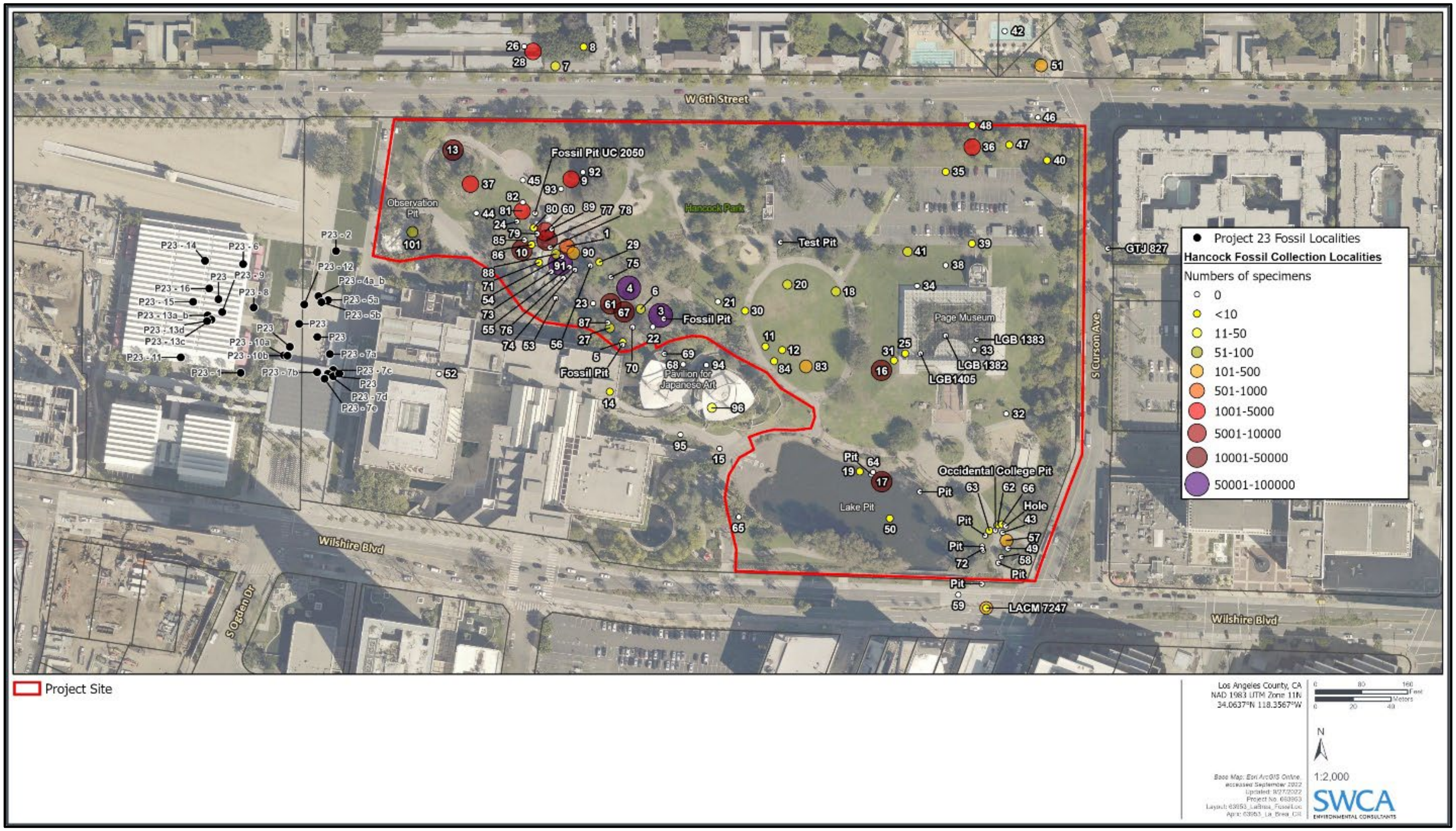

Figure 5.6-1. Fossil collection localities within Hancock Park.

Museum Records Search

Table 5.6-3 summarizes the results from a museum records search that was requested and conducted in early 2022. The search was led by the Natural History Museum of Los Angeles County (Natural History Museum) and was completed on February 5, 2022. The records search highlights several known fossil localities within the project site and its vicinity. See the Paleontological Resources Technical Report (Appendix F) for additional information regarding the records search.

Table 5.6-3. Museum of Natural History Fossil Localities within and near the Project Site

Locality Number	Approximate Distance from the Project Site	Formation	Taxa	Approximate Depth Below the Ground Surface
LACM VP 7298	Within Hancock Park	Variably asphaltic silts and silty clays	Approximately 10,000 botanical, invertebrate, and vertebrate specimens	Unrecorded (approximately 25 feet below ground surface based on elevation of Hancock Park)
LACM VP 6909	Within Hancock Park	Asphaltic sands	Vertebrate, invertebrate, and plant fossils	0–20 feet
Project 23 (16 separate fossil deposits)	Within Hancock Park	Pleistocene fluvial deposits and asphaltic sands	Over 1 million fossil specimens including one nearly complete mammoth	Starting at 10 feet
LACM VP 7297	0.01 mile (53 feet/ 16 meters)	Asphaltic sand grading to asphaltic clay	Approximately 250,000 botanical, invertebrate, and vertebrate specimens	Unrecorded (approximately 2 to 10 feet below ground surface based on elevation of Hancock Park)
LACM VP 7247	0.02 mile (106 feet/ 32 meters)	Asphalt impregnated silt with lenses of asphaltic sand	Dire wolf (*Canis dirus*); horse (*Equus*)	2 feet
LACM VP 4204	0.07 mile (370 feet/ 113 meters)	Pleistocene asphaltic older alluvium	Antelope (*Antilocapra*)	Unrecorded
LACM VP 6345	0.10 mile (528 feet/ 161 meters)	Asphaltic sands	Bird (Aves); horse (*Equus* cf. *E. occidentalis*)	Unrecorded
LACM VP 5481	0.13 mile (686 feet/ 209 meters)	Asphalt-impregnated Palos Verdes Sand	Mammoth (*Mammuthus*); tapir (*Tapirus*); horse (*Equus*); camelid (*Camelops*, cf. *Hemiauchenia*); bison (*Bison*)	27–28 feet
LACM VP 1724	0.20 mile (1,056 feet/ 322 meters)	Pleistocene asphaltic sands	Pond turtle (*Clemmys marmorata*); bird (Aves); racoon (Procyonidae); saber-toothed cat (*Smilodon fatalis*); dire wolf (*Canis dirus*), coyote (*Canis latrans*), pronghorn antelope (*Capromeryx minor*); bison (*Bison*)	8 feet

Source: Natural History Museum (2022)

Fossil localities within the project site include fossil locality LACM VP 7298 that produced approximately 10,000 plant, invertebrate, and vertebrate specimens. Additional vertebrate, invertebrate, and plant fossils have been discovered at locality LACM VP 6909 at the surface down to 20 feet below ground surface (bgs) within the project site. Numerous other fossil localities, including Project 23 described above, have been discovered and curated from within the project site.

Outside of the project site, the closest fossil locality is LACM VP 7297, which is located 16 meters (53 feet) southwest of the project site and has yielded approximately 250,000 vertebrate, invertebrate, and botanical specimens from asphaltic sand and clay. Fossil locality LACM VP 7247 was recorded 32 meters (106 feet) away from the project site and yielded an extinct dire wolf and horse from a depth of approximately 2 feet bgs. The presence of Pleistocene fossil taxa at 2 feet bgs suggests that fossils could be present just below the surface throughout most of Hancock Park. Additionally, an antelope fossil was discovered 113 meters (370 feet) from the project site within Pleistocene asphaltic older alluvium at locality LACM VP 4204. Other fossil localities approximately 322 meters (0.2 mile) or less from the project site, such as LACM VP 6345, LACM VP 5481, and LACM VP 1724, have yielded Pleistocene taxa “typical” of asphaltic alluvial sand deposits within La Brea Tar Pits, including fossil turtle, bird, racoon, saber-toothed cat, dire wolf, coyote, mammoth, horse, tapir, camel, antelope, and bison.

Although not included in the Natural History Museum’s records search results, fossil locality LACM VP 8090, recorded during construction of the One Museum Square Project located approximately 100 meters (330 feet) away from the Page Museum on the east side of Curson Avenue, yielded approximately 20,000 small mammal and bird fossils that are currently being processed at the Page Museum (personal communication, Dr. Regan Dunn [2022]).

GEOLOGIC MAPPING AND GEOTECHNICAL INVESTIGATIONS

The geologic setting is another key to understanding the potential for important paleontological resources at the project site (see Sections 5.6.1.2 and 5.6.1.3 for broad-scale geological setting). Local geologic mapping and previous geotechnical investigations of Hancock Park and the surrounding area provide the geological framework that informs the paleontological setting of the project site, although the fossil deposits follow asphalt pits and are not confined to one particular geologic unit. Geologic mapping by Dibblee and Ehrenspeck (1991) and Yerkes and Graham (1997) indicate that the surface of the project site is mapped as late Pleistocene older alluvium (Qao) (for the purposes of the paleontological resources assessment, SWCA uses Yerkes and Graham [1997]; however, this geologic unit is also referred to as the Lakewood Formation by some geologists, as noted in the Geology and Soil Discipline Report [see Appendix E]). Previous geotechnical investigations of the site summarized in the Geology and Soil Discipline Report (see Appendix E) indicate that the surface of the project site is capped by a thin layer of artificial fill that overlies the “native” older alluvium. The presence of artificial fill and/or previously disturbed sediments is evident along the 15-foot-high soil slopes surrounding the base of the Page Museum but extends across the site in the subsurface. Additionally, regional and local subsurface geological data suggest that the early Pleistocene San Pedro Sand and the early Pleistocene to Pliocene Fernando Formation are also present at depth within Hancock Park, despite not being exposed at the surface in the immediately vicinity. Therefore, artificial fill, older alluvium, San Pedro Sand, and Fernando Formation are considered in this analysis and are described in geochronological order (youngest to oldest) below. Table 5.6-4 summarizes the paleontological potential of the geologic units that are underlying the project site, and each is discussed in detail in the following subsections.

Table 5.6-4. Geologic Units and Paleontological Potential Underlying the Project Site

Geologic Unit Name	Age	Paleontological Potential
Artificial fill and reworked sediments	Late Pleistocene and Holocene	High
Older alluvium (Qao) (i.e., Lakewood Formation)	Late Pleistocene	High
San Pedro Sand	Early Pleistocene	High
Fernando Formation	Early Pleistocene to Pliocene	High

Unmapped Recent Artificial Fill and Reworked Sediments

Based on previous site development, unmapped recent artificial fill and reworked (i.e., previously disturbed) sediments are present at the surface of the project site from 1- to 3-foot depth or 1- to 8-foot depth, likely partially replacing the uppermost “native” sediments of older alluvium (AECOM 2017; Shannon and Wilson 2023). The presence of artificial fill and reworked sediments across the entirety of the site to varying depths was confirmed during the archaeological testing conducted by SWCA within Hancock Park (Millington and Dietler 2023).

The artificial fill material consists of silty clay, sandy clay, clayey silt, and silty sand (Shannon and Wilson 2023). In general, fill sediments typically consist of reworked and recompacted sediments originating from within a project site during its construction, or they consist of imported sediments delivered from other regions that are delivered and recompacted at a project site. Artificial fill or previously disturbed sediments may contain fossils, but any such fossil from these deposits has been removed from its original stratigraphic, taphonomic, or paleoenvironmental context (provenance), making it scientifically invalid in most instances. Here, artificial fill sediments, at least in part, consist of reworked and compacted sediments originating from Hancock Park, which explains the presence of some fossil fragments recovered from the sediment stratum capping the project site.

It is also important to note that early paleontological investigations prioritized salvage or collection of large fossil specimens or extinct fauna, with little regard for the small-sized fossil fragments or smaller taxa (e.g., rodents, plants, insects, etc.). Asphalt or asphalt-rich sediments containing small fossils may have been discarded or ignored by early investigators and later reworked as fill at the site. Although considered scientifically less valuable or scientifically nonsignificant in *most* circumstances (Society of Vertebrate Paleontology [SVP] 2010), fossils from artificial fill and reworked sediments originating from within Hancock Park may still provide scientifically important information due to level of fossil preservation that allows radiocarbon dating of specimens from the site to help elucidate the changing environment during the late Pleistocene and Holocene of Southern California. Therefore, recent artificial fill and reworked sediments originating from Hancock Park have a high potential to produce significant paleontological resources and are immediately underlain by “native” geologic units that also have a high potential for scientifically significant fossils.

Older Alluvium (Qao)

Yerkes and Graham (1997) map late Pleistocene older alluvium (Qao) (also referred to as the Lakewood Formation) at the surface of the project site; however, the uppermost strata of older alluvium likely have been partially replaced by artificial fill/reworked sediments to 1- to 3-foot depth or 1- to 8-foot depth within Hancock Park. Older alluvium consists of slightly to moderately consolidated to moderately to well consolidated (stiff to very stiff) clays with some dense silt and silty sand deposits (Campbell et al. 2014; Dibblee and Ehrenspeck 1991; Shannon and Wilson 2023; Yerkes and Graham 1997). These deposits have subsequently been uplifted and variably dissected at the surface (Campbell et al. 2014; Dibblee and Ehrenspeck 1991; Yerkes and Graham 1997). The thickness of older alluvium varies across the Los Angeles Basin (Woodring et al. 1946; Yerkes et al. 1965). For example, deposits of sands, clay, gravel, and angular rubble are approximately 40 to 190 feet thick (only a subset of that thickness is classified as older alluvium) within the Salt Lake Oil Field immediately north of and adjacent to Hancock Park (Stock and Harris 2007); however, most asphalt or asphalt-saturated alluvial sediments that have yielded Rancholabrean fossils are from 13 to 20 feet bgs (Shannon and Wilson 2023), but possibly range from near the surface to approximately 40 feet bgs (AECOM 2016b).

Since the onset of geologic investigations into the petroleum reservoirs within the Los Angeles Basin, geologists have reviewed the structural deformation of the Pleistocene strata overlying the Miocene and Pliocene marine rocks containing petroleum. Given the northwest-southeast trend of fossiliferous sites within Hancock Park, the asphalt springs may originate from a subsurface fault along West 6th Street (Stock and Harris 2007). Early Pleistocene strata are deeply eroded and sloped, suggesting the same tectonic forces that caused considerable folding and faulting of the deeper Miocene and Pliocene marine rocks within the subsurface of the Los Angeles Basin were still active during the early Pleistocene, as evidenced by similar deformed marine and nonmarine deposits from the early Pleistocene. Horizontal beds of late Pleistocene older alluvium unconformably overlie the deformed beds of early Pleistocene (i.e., San Pedro Sand) and older strata (Stock and Harris 2007). The stratigraphic succession and orientation of the Pleistocene sediments may be relevant for understanding the paleoenvironmental and tectonic changes that occurred between the early and late Pleistocene that resulted in the development of asphalt pools at the surface, trapping or miring organisms, and the subsequent burial of organic remains by alluvial or fluvial processes (i.e., alluvial fans and stream channels of the Los Angeles and San Gabriel Rivers) at the surface during the late Pleistocene and early Holocene. Despite the near horizontal stratigraphy of older alluvium, geotechnical investigations indicate that asphalt is present within the older alluvium, seeping to the surface via fissures, fractures, and chimneys crosscutting the stratigraphy and concentrating in sandy layers (AECOM 2016b; Shannon and Wilson 2023).

In general, equivocal non-asphaltic older alluvial deposits within Southern California have yielded similar taxa from sporadic fossil localities; however, the level of fossil preservation of both micro-fossils and macro-fossils is far less at these localities (Jefferson 1991a, 1991b; McDonald and Jefferson 2008; Miller 1971; Reynolds and Reynolds 1991; Springer et al. 2009), demonstrating the unique state of preservation at the project site. Therefore, late Pleistocene older alluvium has a high potential for producing significant paleontological resources.

San Pedro Sand

Although the early Pleistocene San Pedro Sand is not mapped at the surface within the project site, it is noted in geotechnical investigations as underlying the late Pleistocene older alluvium at depth ranges of approximately 17 to 50 feet bgs within Hancock Park (AECOM 2016b). However, other geotechnical investigations summarized by Shannon and Wilson (2023) indicate that the San Pedro Sand may extend to depths of 65 to 94 feet bgs, indicating variation in the thickness of the older alluvium and San Pedro Sand overlying “bedrock” Fernando Formation (see below). Previous and recent geotechnical investigations indicate that some asphalt is present within the matrix of the San Pedro Sand to varying degrees (AECOM 2016b; Shannon and Wilson 2023).

During early investigations, Pleistocene-aged marine deposits in the San Pedro area were broken up into two distinct horizons, the Upper and Lower San Pedro Series, distinguished by a prominent unconformity (Arnold and Arnold 1902). The Lower San Pedro Series consists largely of gray sandstone, and Arnold and Arnold (1902) noted that these sands were deposited in a nearshore environment. The Lower San Pedro Series has been the main focus of research and is currently referred to as the San Pedro Sand (Woodring et al. 1946). The Upper San Pedro Series, consisting of a bed of lime-hardened gravel overlain by a thick layer of fine-grained sand (Arnold and Arnold 1902), is now known as the “Palos Verdes Sand” in the Palos Verdes/San Pedro geographic areas (Woodring et al. 1946), and throughout the Los Angeles Basin, it may be equivalated to late Pleistocene older alluvium, as discussed above.

The abundance of fossil specimens known from the San Pedro Sand is one of the major reasons for the importance of this unit. Fossils recovered from the San Pedro Sand include: foraminifera, bryozoans, bivalves, gastropods, scaphopods, polyplacophorans, crabs, sea urchins, sharks, rays, bony fish, turtle, cormorants, ducks, sea eagles, quail, gulls, geese, whales, bison, camels, horses, saber-toothed cats, ground sloths, elephants, and rodents (Fitch 1967; Howard 1948; Jordan and Hannibal 1923; Miller 1930; Oldroyd 1924; Woodring et al. 1946). Therefore, early Pleistocene San Pedro Sand has a high potential for producing significant paleontological resources, even without the subsequent asphalt deposits.

Fernando Formation

Although not mapped at the surface within the project site or its immediate vicinity, early Pleistocene to Pliocene Fernando Formation is mapped at the surface near downtown Los Angeles (Campbell et al. 2014; Dibblee and Ehrenspeck 1991) and is present at depth throughout the Los Angeles Basin. Previous geotechnical investigations summarized by AECOM (2016b) and Shannon and Wilson (2023) indicate that the Fernando Formation is present in the subsurface at depths as shallow as 65 feet bgs and may extend to depths of 120 feet bgs. The Fernando Formation consists of light olive brown and light yellowish brown to dark yellowish brown, clayey siltstone, fine- to medium-grained sandstone, and pebbly conglomerate of marine origin, which is massive, highly weathered, and oxidized and becoming darker in color, more massive, unoxidized, and more lithified with depth (Campbell et al. 2014; Dibblee and Ehrenspeck 1991; Lamar 1970; Shannon and Wilson 2023). The Fernando Formation has yielded marine and nonmarine fossils and is generally regarded as having the potential to yield fossils. It is also a significant petroleum reservoir for the Los Angeles Basin, with petroleum seeping through fractures to the surface. Fossil localities from surface exposures from this unit have yielded foraminifera, sponges, corals, brachiopods, bryozoans, scaphopods, gastropods, bivalves, cephalopods, fiddler crabs, sea urchins, sharks, bony fish, birds, unidentifiable mammals, and plants (Clarke et al. 1980; Groves 1992; Huddleston and Takeuchi 2006; Morris 1976; Paleobiology Database 2022; Schoellhamer et al. 1981; University of California Museum of Paleontology 2022; Woodring 1938). Therefore, the early Pleistocene and Pliocene Fernando Formation has a high potential to yield significant paleontological resources.

5.6.2 Regulatory Setting

5.6.2.1 Federal

There are no specific federal regulations addressing geology and soils issues relevant to the project.

5.6.2.2 State

ALQUIST-PRIOLO EARTHQUAKE FAULT ZONING ACT

The Alquist-Priolo Geologic Hazard Zones Act was passed by the State of California in 1972 to address the hazard and damage caused by surface fault rupture during an earthquake. The Act was renamed the Alquist-Priolo Earthquake Fault Zoning Act, effective January 1, 1994 (Alquist-Priolo Act). The Alquist-Priolo Act has since been revised 12 times; most recently a version became available in 2018 (CGS 2018). The Alquist-Priolo Act requires the State Geologist to establish “earthquake fault zones” along known active faults (faults that have moved in the last ~11,000 years) in the state. The intent of the act is to ensure public safety by prohibiting the siting of most structures for human occupancy across traces of active faults that constitute a potential hazard to structures from surface faulting or fault creep. This Act groups faults into categories of active, potentially active, and inactive. Historic- and Holocene-age faults are considered active, Late Quaternary- and Quaternary-age faults are considered potentially active, and pre-Quaternary-age faults are considered inactive. Cities and counties with earthquake fault zones are required to regulate development projects within these zones. As previously noted, the project site is not within a Alquist-Priolo Earthquake Fault Zone.

SEISMIC HAZARDS MAPPING ACT

The Seismic Hazards Mapping Act of 1990 (Public Resources Code [PRC] Chapter 7.8, Sections 2690–2699.6) directs the CGS to delineate seismic hazard zones. The purpose of the act is to reduce the threat to public health and safety and to minimize the loss of life and property by identifying and mitigating seismic hazards. Cities, Counties, and state agencies are directed to use seismic hazard zone maps developed by the CGS in their land use planning and permitting processes. The act requires that site-specific geotechnical investigations be performed prior to permitting most urban development projects within seismic hazard zones. Pursuant to the Seismic Hazards Mapping Act, a site-specific geotechnical investigation (see Appendix E) was prepared for the project.

CALIFORNIA BUILDING CODE

The State of California adopted the 2019 California Building Code (CBC), Volumes 1 and 2, which went into effect on January 1, 2020. Based in part on the 2018 International Building Code (IBC), the 2019 CBC makes up Part 2 of Title 24 of the California Code of Regulations. In Chapter 16 of Volume 2, the code contains provisions for structural design, including soil lateral loads (Section 1610) and earthquake loads (Section 1613). Provisions for soils and foundations include the following: Geotechnical explorations (Section 1803); Excavation, grading and fill (Section 1804); and Foundations (Sections 1808-1810). Appendix J of the CBC applies to grading.

PUBLIC RESOURCES CODE SECTION 5097.5

Requirements for paleontological resource management are included in PRC Division 5, Chapter 1.7, Section 5097.5, which states,

> No person shall knowingly and willfully excavate upon, or remove, destroy, injure or deface any historic or prehistoric ruins, burial grounds, archaeological or vertebrate paleontological site, including fossilized footprints, inscriptions made by human agency, or any other archaeological, paleontological or historical feature, situated on public lands, except with the express permission of the public agency having jurisdiction over such lands. Violation of this section is a misdemeanor.

These statutes prohibit the removal, without permission, of any paleontological site or feature from land under the jurisdiction of the State or any City, County, district, authority, or public corporation, or any agency thereof. Consequently, local agencies are required to comply with PRC Section 5097.5 for their own activities, including construction and maintenance, as well as for permit actions (e.g., encroachment permits) undertaken by others. PRC Section 5097.5 also establishes the removal of paleontological resources as a misdemeanor and requires reasonable mitigation of adverse impacts to paleontological resources from developments on public (state, county, city, and district) land.

5.6.2.3 County of Los Angeles

COUNTY OF LOS ANGELES 2035 GENERAL PLAN SAFETY AND CONSERVATION AND NATURAL RESOURCES ELEMENTS

The County of Los Angeles General Plan Safety Element guides the long-term management of geotechnical issues and geotechnical hazards, including seismic hazards, hillside hazards such as mud and debris flows, landslides, hillside erosion, and human-induced slope instability. The following Safety Element goals and policies may be applicable to the proposed project.

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

> ***Policy S 1.1.*** Discourage development in Seismic Hazard and Alquist-Priolo Earthquake Fault Zones.

Policy S 1.2. Prohibit the construction of most structures for human occupancy adjacent to active faults until a comprehensive fault study that addresses the potential for fault rupture has been completed.

Policy S 1.3. Require developments to mitigate geotechnical hazards, such as soil instability and landsliding, in Hillside Management Areas through sitting and development standards.

Policy S 1.4. Support the retrofitting of unreinforced masonry structures to help reduce the risk of structural and human loss due to seismic hazards.

The Conservation and Natural Resources Element of the *Los Angeles County General Plan 2035* (General Plan) (County of Los Angeles 2015) recognizes paleontological resources in Section VIII: Historic, Cultural, and Paleontological Resources, and aims to promote public awareness of their value and foster their public enjoyment. Therefore, the General Plan contains one goal (C/NR 14) aimed at the protection of historic, cultural, and paleontological resources, with the following four policies pertinent to paleontological resources:

Goal C/NR14. Protect historic, cultural, and paleontological resources.

Policy C/NR 14.1. Mitigate all impacts from new development on or adjacent to historic, cultural, and paleontological resources to the greatest extent feasible.

Policy C/NR 14.2. Support an inter-jurisdictional collaborative system that protects and enhances historic, cultural, and paleontological resources.

Policy C/NR 14.5. Promote public awareness of historic, cultural, and paleontological resources.

Policy C/NR 14.6. Ensure proper notification and recovery processes are carried out for development on or near historic, cultural, and paleontological resources.

COUNTY OF LOS ANGELES BUILDING CODE

The County adopted portions of the 2019 CBC and 2018 IBC together with a series of County amendments as the 2020 County of Los Angeles Building Code (CLABC), Volumes 1 and 2. The 2020 amendments were published on January 1, 2020. Together, the provisions in Volumes 1 and 2 of the CLABC address issues related to the following: site grading; cut and fill slope design; soil expansion; geotechnical studies before and during construction; slope stability; allowable bearing pressures and settlement below footings; effects of adjacent slopes on foundations; retaining and basement walls; and shoring of adjacent properties. Appendix J of the CLABC addresses grading and excavation requirements.

The County of Los Angeles (County) Department of Public Works Building and Safety (Building and Safety) is responsible for implementing the provisions of the CLABC and grading standards. Building and Safety has jurisdiction over projects to be approved by the County where grading is required, to ensure project design follows County regulations, to ensure the safety of the workers during construction, and to ensure the safety of the public once construction is complete.

As outlined in the Geology and Soil Discipline Report, the following sections of the CLABC would be required for the project.

The project would be designed and constructed in accordance with the 2020 CLABC, which calls for consideration of seismic loading factors. Required earthquake loading considerations are outlined in Section 1613. Per Section 1613, every structure or portion of a structure shall be designed to resist the effects of earthquake motions in accordance with the CLABC and the American Society of Civil Engineers (ASCE) 7, which provides standards for design loads and associated criteria, as applicable.

Per Section 1803 of the CLABC, a project-specific geotechnical investigation and geologic hazard report (i.e., geotechnical design report) is required to be prepared to address final design of the project, incorporating recommendations to mitigate the hazards identified herein. The report would be required to meet 2020 CLABC requirements and the most current guidelines developed by the County of Los Angeles Department of Public Works Geotechnical and Materials Engineering Division. Specifically, the report would be required to:

- Confirm seismic ground-motion parameters
- Further develop the soil profile at the site
- Confirm groundwater conditions at the site are as anticipated
- Evaluate soil strength and adequacy of load-bearing soils
- Evaluate total and differential settlement potential
- Recommend structural fill material properties and testing
- Provide recommendations and design criteria for deep foundation systems
- Provide special design and construction criteria for shallow foundations and flatwork founded on expansive soils.

Earthwork activities, such as excavation, grading, and fill placement, would be required to follow the 2020 CLABC standards outlined in Section 1804 and Appendix J, or more current standards if they are adopted prior to the final geotechnical design. The final geotechnical design would provide design and construction requirements for earthwork activities.

5.6.2.4 City of Los Angeles

While the project site is located within the city of Los Angeles, it is owned by the County of Los Angeles. Accordingly, the project is not subject to the regulatory controls of the City of Los Angeles (City). Nonetheless, City regulatory and planning documents that are most relevant to the project as they relate to geology and soils are provided herein for informational purposes.

CITY OF LOS ANGELES GENERAL PLAN SAFETY AND CONSERVATION ELEMENTS

The City's General Plan Safety Element addresses public safety risks due to natural disasters, including seismic events and geologic conditions and sets forth guidance for emergency response during such disasters. The Safety Element also provides maps of designated areas within Los Angeles that are considered susceptible to earthquake-induced hazards, such as fault rupture and liquefaction.

The City's General Plan Conservation Element identifies paleontological resources in Section 3: "Archaeological and Paleontological," which includes an objective and policy (see below) for the protection of paleontological resources.

Objective. protect the city's archaeological and paleontological resources for historical, cultural, research and/or educational purposes.

Policy. continue to identify and protect significant archaeological and paleontological sites and/or resources known to exist or that are identified during land development, demolition or property modification activities.

CITY OF LOS ANGELES BUILDING CODE

Earthwork activities, including grading, are governed by the Los Angeles Building Code, which is contained in the City of Los Angeles Municipal Code (LAMC), Chapter IX, Article 1. Specifically, Section 91.7006.7 includes requirements regarding import and export of material; Section 91.7010 includes regulations, pertaining to excavations; Section 91.7011 includes requirements for fill materials; Section 91.7013 includes regulations pertaining to erosion control and drainage devices; Section 91.1803 includes specific requirements addressing seismic design, grading, foundation design, geologic investigations and reports, soil and rock testing, and groundwater. The Los Angeles Building Code incorporates the California Building Code, with City amendments. The City Department of Building and Safety is responsible for implementing the provisions of the Los Angeles Building Code.

5.6.3 Thresholds of Significance

The following thresholds of significance are based on the Environmental Checklist contained in Appendix G of the State CEQA Guidelines. A project would result in significant adverse impacts related to geology and soils if it would:

a) Directly or indirectly cause 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 based on other substantial evidence of as 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.

b) Result in substantial soil erosion or the loss of topsoil.

c) 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.

d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property.

e) 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.

f) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.

5.6.4 Impact Assessment Methodology

The evaluation of potential project impacts related to geology and soils is based on analysis provided in the Geology and Soil Discipline Report prepared for the project (Shannon and Wilson 2023 [see Appendix E]). The Geology and Soil Discipline Report describes the geologic conditions of the project site based on a general site reconnaissance, extensive review of previous subsurface explorations and laboratory testing performed in the project site vicinity and provides a geotechnical analysis of these data to determine potential impacts that could occur as a result of project implementation. The geology and soils impact analysis includes consideration of potential seismic or geotechnical hazards discussed within the Safety Element of the County General Plan.

The evaluation of potential project impacts related to paleontological resources is based on the Paleontological Resources Technical Report (see Appendix F). The Paleontological Resources Technical Report uses methodology in conformance with industry standards as developed by the Society of Vertebrate Paleontology (SVP) to assess potential impacts as a result of project implementation. This analysis included a review of existing data pertinent to paleontological resources within Hancock Park, including a review of asphalt pit and fossil locality data from multiple sources including published scientific literature; online fossil locality database results; previous paleontological resources assessments; museum records search results from the Natural History Museum; regional and local geologic maps; and subsurface geotechnical/borehole data. Upon evaluation of the existing data, the potential for direct and indirect impacts to significant paleontological resources due to project implementation was determined based on the paleontological sensitivity of the project site and surrounding vicinity, and anticipated depths of grading as it relates to the potential for uncovering paleontological resources.

5.6.5 Environmental Impact Analysis

a) Would the project directly or indirectly cause 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?***

The project site is located within the seismically active Southern California area and is expected to experience the effects of future earthquakes on active faults. Potential project impacts related to seismic hazards including surface fault rupture, strong seismic ground motion, seismically induced settlement due to liquefaction, and landslides are discussed below.

Given that seismic activity and associated hazards could occur during both construction and operation of the project, the impact analyses below are intended to be inclusive of both construction and operation impacts unless otherwise noted.

SURFACE FAULT RUPTURE

Based on the “Earthquake Zones of Required Investigation” map for the Hollywood quadrangle, the project site does not lie within an Alquist-Priolo Earthquake Fault Zone. The nearest Alquist-Priolo Earthquake Fault Zones are the Newport-Inglewood-Rose Canyon Fault Zone, located approximately 1.6 miles southwest of the site, and the Hollywood Fault Zone, located approximately 2.2 miles north-northwest of the site.

The trace of the Sixth Street Fault is projected through the southern to southwestern portion of the project site. The Sixth Street Fault is a near-vertical fault, with north side movement up relative to the south side.

The near-surface location of the fault is not well defined, nor is the fault listed as active or potentially active by the CGS. Therefore, it is not included in the Alquist-Priolo Earthquake Fault Zone maps.

Given that the project site is not located within a designated Alquist-Priolo Earthquake Fault Zone and the project would adhere to the CLABC, impacts related to surface fault rupture during project construction and operation would be *less than significant*.

SEISMIC GROUND SHAKING

The project site is located within the seismically active region of Southern California and could potentially be subject to strong seismic ground shaking if a moderate to strong earthquake were to occur on a local or regional fault. The intensity of earthquake motion and seismic hazards that may impact the project site depends on the characteristics of the generating fault, distance to the earthquake fault, earthquake magnitude, earthquake duration, and site-specific geologic conditions. Likely sources for strong ground motion are known active faults or potentially active faults. Ground motions may be amplified or attenuated at the site depending on the level of ground shaking in the underlying bedrock, underlying soil type, depth to bedrock, and other factors. While the project does not include mining operations, exceptionally deep excavations, or boring of large areas creating unstable seismic conditions, the project site is located within a seismically active region. As such, potentially significant impacts related to seismic ground shaking at the project site are anticipated and are considered to be part of the baseline environmental conditions at the project site but are not unique to the project or the project site.

The project would be designed and constructed in accordance with the 2020 CLABC, which calls for consideration of seismic loading factors. Specifically, Section 1613 provides discussion toward earthquake loads and toward development of seismic ground motion design values. Per Section 1613, structures "shall be designed and constructed to resist the effects of earthquake motions in accordance with Chapters 11, 12, 13, 15, 17 and 18 of ASCE 7, as applicable. The seismic design category for a structure is permitted to be determined in accordance with Section 1613 or ASCE 7." ASCE 7 refers to "Minimum Design Loads and Associated Criteria for Buildings and Other Structures", prepared by the American Society of Civil Engineers and the Structural Engineering Institute. Adherence to the code will address the potential hazards associated with strong seismic ground shaking. In addition, the Geology and Soil Discipline Report provides recommended ground motion design parameters in accordance with the 2019 CBC for the project. Further, the recommendations of the Geology and Soil Discipline Report (Appendix E) would be incorporated into the project design. Therefore, impacts related to seismic ground shaking during project construction and operation would be *less than significant*.

LIQUEFACTION

Soil liquefaction is a phenomenon in which pore pressure in loose, saturated, granular soil increases during ground shaking to a level near the initial effective stress, resulting in a reduction of shear strength of the soil (i.e., quicksand-like conditions). The loss in shear strength may generate ground settlement, lateral spreading (ground movement on gentle slopes), bearing-capacity failure, and/or landslides. Liquefaction potential is greatest where loose granular soil (sand and non-plastic silt) is present below groundwater and is more likely to affect structures when it occurs at depths shallower than 50 feet. Liquefaction potential decreases as the fines (clay and silt content of soil) increases, and the liquefaction potential increases as ground shaking increases.

The seismic hazard zone map for the Hollywood quadrangle includes liquefaction hazard zones for the quadrangle. The site is not mapped within a liquefaction hazard zone. The geologic materials underlying the project site generally consist of stiff cohesive (fine-grained) soil underlain by dense to very dense tar sand. Based on the stiff and dense nature of the on-site subsurface materials, the potential for liquefaction is considered to be low. Therefore, impacts related to liquefaction during project construction and operation are *less than significant*.

LANDSLIDES

Hazards associated with slope stability include landslides and mudflows. The project site and surrounding area are relatively level. Therefore, the potential for the site or the area surrounding the site to experience slope stability hazards, including landslides and mudflows, is negligible. Therefore, *no impact* would occur during project construction and operation related to landslides.

GEO Impact 1
The project would not directly or indirectly cause substantial adverse effects, including the risk of loss, injury, or death involving surface fault rupture, seismic ground shaking, or seismic-related ground failure including liquefaction. Impacts associated with these issues would be less than significant during project construction and operation. The project would not directly or indirectly cause substantial adverse effects, including the risk of loss, injury, or death involving landslides during either project construction or operation. No impact would occur during project construction and operation related to landslides. (CEQA Checklist Appendix G Threshold VII. a)
Mitigation Measures
No mitigation is required.
Impacts Following Mitigation
Not applicable. Impacts associated with surface fault rupture, seismic ground shaking, and seismic-related ground failure including liquefaction would be less than significant during project construction and operation. No impact would occur during project construction and operation related to landslides.

b) Would the project result in substantial soil erosion or the loss of topsoil?

Erosion is the process in which soil or earth material is worn away and removed from its original location by natural forces such as moving water or wind. Erosion or the loss of topsoil can potentially lead to unstable soil conditions, especially for hillside development or development containing or adjacent to slopes.

CONSTRUCTION

Grading, excavation, and other earth-moving activities would result in disrupting the ground surface and could potentially result in erosion and loss of topsoil during construction. Grading and earthwork would be required to be implemented in accordance with the 2020 CLABC (specifically Section 1804 and Appendix J, or more current standards if they are adopted prior to the final geotechnical design), which includes guidelines for site grading to promote positive drainage flow. For grading performed in the “rainy season” (defined by the CLABC as the months of October to April), provisions will need to be made to control erosions. A Stormwater Pollution Prevention Plan would be required to be prepared prior to the start of construction in accordance with County regulations and would be required to be implemented during construction. No further measures beyond the implementation of existing regulations are required to address these potential impacts. Therefore, construction impacts related to soil erosion or loss of topsoil would be *less than significant*.

OPERATION

Based on the project site conditions, site topography, and the proposed improvements, the project is not anticipated to result in significant impacts associated with erosion, sedimentation, or loss of topsoil during project operation. Operation impacts related to soil erosion or loss of topsoil would be *less than significant*.

GEO Impact 2
Through compliance with existing regulations, the project would not result in substantial soil erosion or the loss of topsoil during project construction or operation. Impacts would be less than significant during project construction and operation. (CEQA Checklist Appendix G Threshold VII. b)
Mitigation Measures
No mitigation is required.
Impacts Following Mitigation
Not applicable. Impacts would be less than significant.

c) 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?

As previously discussed, geologic instability at the project site resulting from project activities as they relate to landslides, liquefaction, and lateral spreading is not anticipated due to both the relatively minimal change in elevation throughout and adjacent to the project site, as well as the stiff and dense nature of the on-site subsurface materials. *No impact* would occur during either project construction or operation related to landslides, liquefaction, and lateral spreading.

However, implementation of the project would occur on soils susceptible to subsidence and/or compressible and collapsible soils. These issues are discussed further below.

SUBSIDENCE

Subsidence of the ground surface within the project site could be caused by the removal of groundwater and/or petroleum from subsurface sources. As previously discussed, the project site is located in the southern part of the Salt Lake Oil Field and is subject to naturally occurring tar (petroleum) seeps. Based on research conducted in support of the Geology and Soil Discipline Report, there is no existing documentation indicating subsidence has occurred due to removal of petroleum at the project site. Similarly, no evidence of subsidence from groundwater pumping at the project site has been documented. Therefore, potentially damaging subsidence from extraction of groundwater and/or petroleum during construction or operation of the structures is unlikely. However, due to the possibility of tar seeps occurring throughout the project site, impacts related to subsidence during project construction and operation could be *significant*.

COMPRESSIBLE AND COLLAPSIBLE SOILS

Compressible soils are soils which undergo consolidation when subject to a new load, such as a structure load or fill placement. Collapsible soils are soils which significantly decrease in volume when they are wetted and experience an increase in moisture content, regardless of whether a new load is placed on them. Compressible or collapsible soils can lead to excessive settlement distress for structural improvements.

Artificial fill that was not engineered and the near-surface alluvial deposits may be weak and compressible and/or collapsible, particularly with the addition of water. The existing artificial fill present within the project site may not be suitable to support foundations, slabs on grade, paving, or new compacted fills. Furthermore, the surficial alluvial deposits may not be suitable for supporting building loads. Using the existing artificial fill or upper alluvial soils for load support during project construction could result in potential significant impact for the proposed structures once built, as it could lead to structural distress due to total or differential settlement during operation of the project. Impacts related to compressible and collapsible soils during project construction and operation could be *significant*.

<table>
<tr><th colspan="2">GEO Impact 3</th></tr>
<tr><td colspan="2">The project could cause geologic instability at the project site related to subsidence as well as compressible and collapsible soils during project construction and operation. Impacts during construction and operation could be significant.
(CEQA Checklist Appendix G Threshold VII. c)</td></tr>
<tr><td colspan="2">Mitigation Measures</td></tr>
<tr><td>GEO/mm-3.1</td><td>To prevent subsidence of the ground surface within the project site, temporary dewatering shall be required during construction for excavations which extend below the existing groundwater level (i.e., greater than 10 feet below ground surface), anticipated for deepest excavations associated with the proposed Page Museum one-story addition, as excavations will be required for construction of the proposed mat foundation and associated new utility placement. Dewatering activities shall be conducted as follows:
a. Dewatering shall be performed prior to excavation. Temporary dewatering shall be performed during the construction stage, prior to beginning any excavation which will extend beneath the groundwater. The Construction Contractor shall decide the proper timeline which will permit a dry environment for the excavation work and prevent water seepage into the excavation.
b. The design of a temporary dewatering system shall be performed by an experienced, qualified dewatering contractor. Prior to proceeding with the actual design of the dewatering system, a test installation shall be constructed to verify the design's effectiveness.
c. The dewatering system shall be designed to lower the site groundwater sufficiently to permit a dry environment and to prevent water seepage from the temporary perimeter cut slopes. The design shall balance the soil conditions with well spacing and well depth. Recommendations for well design provided in the project's Geology and Soil Discipline Report shall be incorporated into the final design of the dewatering system, including:
• Installation of relatively closely spaced wells around the excavation perimeter, referred to as well points
• Wells shall include perforated casing with annular space filled with suitable filter material
• Well points shall extend past the depth of proposed excavation</td></tr>
</table>

GEO Impact 3	
	• *Elements of current dewatering system within the Lake Pit shall be incorporated, including collection piping, sump pumps, a sand-oil separator device, and a micro-filter device. In addition, separator and filter devices shall be considered for temporary dewatering pumps to help maintain the system's efficiency and increase the amount of time prior to the pumps being plugged up with tar.* d. *Groundwater shall be pumped from the tar sands and is anticipated to contain a relatively high percentage of tar. The tar shall be removed, and the groundwater treated in accordance with all applicable regulatory requirements prior to disposal.*
GEO/mm-3.2	*To ensure proper design and stability of structures to be constructed on existing artificial fill or upper alluvial soils, the excavation and replacement of existing compressible materials within the areas of the proposed improvements shall be required. Excavation and replacement shall consist of complete removal of artificial fill and/or compressible surficial alluvial soil beneath the areas of the proposed improvements and replacement with compacted structural fill, with an anticipated artificial fill depth ranging between 1 and 8 feet below ground surface based on review of existing explorations performed within or adjacent to the project site. This value will be confirmed after completion of subsurface explorations during the final geotechnical design to further characterize the subsurface conditions underlying the improvement areas (i.e., compressibility of the soft layers and the depth to firm material). Due to the anticipated soil contamination, on-site soils are not anticipated to be suitable for reuse as fill material and shall be exported for proper remediation and disposal in accordance with all applicable regulatory requirements. The final engineering design of the structures included in the project shall be reviewed and approved by the Los Angeles County Department of Public Works, Building and Safety Division.*
Impacts Following Mitigation	
With implementation of Mitigation Measures GEO/mm-3.1 and GEO/mm-3.2, impacts would be less than significant.	

d) Would the project be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?

Expansive soil occurs when clay particles of certain mineralogy interact with water, causing a volume change. Clay soil may swell with increasing moisture content and contract when dried. This phenomenon generally decreases in magnitude with increasing confining pressure at depth. These volume changes may damage spread footings, grade beams, floor slabs, pavement, and other shallow improvements.

As stated in the Geology and Soil Discipline Report, the upper clay soils within the existing artificial fill and alluvium are subject to expansion and shrinkage resulting from changes in the moisture content. Review of existing data available for the project site confirmed the presence of moderately to highly expansive soil on-site, posing a potential significant impact to lightly loaded foundation elements and flatwork (e.g., sidewalks, driveways). Therefore, impacts related to expansive soils during project construction and operation could be *significant*.

GEO Impact 4
The project site is located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating a potentially significant risk to life and/or property during project construction and operation. Impacts could be significant. (CEQA Checklist Appendix G Threshold VII. d)

<table>
<tr><th colspan="2">GEO Impact 4</th></tr>
<tr><td colspan="2">Mitigation Measures</td></tr>
<tr><td>GEO/mm-4.1</td><td>To address impacts related to expansive soils within the project site, additional expansion testing shall be required as part of the final geotechnical design for the project. Based on the outcome of the additional expansion testing, one or more of the following options shall be implemented to address expansive soils:
a. <u>Over-excavation:</u> Over-excavation and replacement of the expansive material with a soil having low or non-expansive potential, with the upper 2 feet of expansive soil (where encountered at the site) being removed and replaced with non-expansive fill.
OR
b. <u>Soil Treatment:</u> Chemical treatment, such as lime treatment. This generally involves mixing a certain percentage of the chemical into the subgrade soil, compacting the mixed soil-chemical material, and then allowing the material curing time prior to continuing construction. The percentage of the chemical addition and the associated engineering properties of the improved soil will need to be determined through geotechnical laboratory testing. If chosen, the final geotechnical design shall provide design and construction recommendations related for this option.
OR
c. <u>Structural Design:</u> The structural design option would involve increasing the bearing pressure on the soil and/or extending the foundation or flatwork depth. However, while increasing the bearing pressure reduces the potential impact from expansive soil, it does increase the potential impact associated with excessive settlement. If this option is elected, settlement evaluation shall be performed as part of the final geotechnical design and based on the proposed loading conditions. Loading conditions shall be limited to a maximum differential of 1 inch over a 20-foot span within the structure.
The final design solution will be determined by the project engineer consistent with the above measures. The final engineering design of the structures included in the project shall be reviewed and approved by the Los Angeles County Department of Public Works, Building and Safety Division.</td></tr>
<tr><td colspan="2">Impacts Following Mitigation</td></tr>
<tr><td colspan="2">With implementation of Mitigation Measure GEO/mm-4.1, impacts related to expansive soils during project construction and operation would be less than significant.</td></tr>
</table>

e) Would the project have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?

The project site is served by existing sewage infrastructure. The project's wastewater demand would be accommodated via connections to the existing wastewater infrastructure system, and the project would not require the use of septic tanks or alternative wastewater disposal systems during project construction or operation. Therefore, the project would not result in impacts related to the ability of soils to support septic tanks or alternative wastewater disposal systems. *No impact* would occur during project construction or operation.

GEO Impact 5
The project would not include the use of septic tanks or alternative wastewater disposal systems during either project construction or operation. No impact would occur. (CEQA Checklist Appendix G Threshold VII. e)
Mitigation Measures
No mitigation is required.
Impacts Following Mitigation
Not applicable. No impacts would occur related to septic tanks or alternative wastewater disposal systems as none of these systems would be used for the project.

f) Would the project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

The analysis provided in the Paleontological Resources Technical Report (see Appendix F) indicates the project site has historically yielded millions of significant fossils and the entirety of Hancock Park, including the project site, contains a veneer of artificial fill overlying older alluvium that is subsequently underlain by the San Pedro Sand and Fernando Formation at greater depths, each having high paleontological sensitivity and high potential for producing significant paleontological resources (SWCA 2023). Specifically, recent artificial fill and reworked sediments originating from within the project site have a high potential to produce significant paleontological resources. Additionally, asphalt deposits seeping from the underlying geologic units to the surface through the artificial fill may contain fossils, albeit to lesser degrees than the underlying older alluvium. The thickness of fill and disturbed sediments likely varies across the site but may extend as deep as 8 feet bgs in some areas, or as shallow as 3 feet bgs in others. Generally, older alluvium, San Pedro Sand, and Fernando Formation have high paleontological potential throughout their extents within the Los Angeles Basin, and within the project site. Artificial fill or previously disturbed sediments also have a high paleontological potential. Regardless of the site's stratigraphy, asphalt pools, seeps, and chimneys have yielded a substantial proportion of the fossils recovered from Hancock Park, particularly in the uppermost 40 feet of sediments.

CONSTRUCTION

Given the high paleontological sensitivity of the project site, paleontological resources may be impacted by construction or implementation of the project regardless of depth of grading and/or excavation activities, since all ground-disturbing activities associated with the construction of the project have the potential to impact asphalt seeps containing aggregates of fossils. Any fossils encountered during ground-disturbing activities could be at risk for damage or destruction from such activities depending on the nature of the fossil encountered. Therefore, impacts related to paleontological resources during project construction could be *significant*.

OPERATION

Operation of the project would not result in any ground-disturbing activities such as grading or excavation outside of the existing research sites; therefore, project operation would not directly or indirectly destroy a unique paleontological resource, site, or unique geologic feature. *No impact* would occur during project operation.

GEO Impact 6	
Given the high paleontological sensitivity of the project site, ground-disturbing activities associated with project construction could damage paleontological resources that may be present below the surface. Construction impacts could be significant. Operation of the project would not directly or indirectly destroy a unique paleontological resource, site, or unique geologic feature. No operational impacts would occur. (CEQA Checklist Appendix G Threshold VII. f)	
Mitigation Measures	
GEO/mm-6.1	***Retain a Qualified Professional Paleontologist (Project Paleontologist):*** *Prior to the start of construction and/or ground-disturbing activities, the Los Angeles County Museum of Natural History Foundation, at the direction of the County, shall retain a Qualified Professional Paleontologist (Project Paleontologist) who meets or exceeds the professional standards defined by the SVP (2010), and who has specific experience overseeing mitigation projects in Pleistocene deposits of the Los Angeles Basin. The SVP (2010:10) defines a qualified professional paleontologist as: "a practicing scientist who is recognized in the paleontological community as a professional and can demonstrate familiarity and proficiency with paleontology in a stratigraphic context." The Project Paleontologist shall have a graduate degree in paleontology or geology, and/or a publication record in peer reviewed journals; have demonstrated competence in field techniques, preparation, identification, curation, and reporting; have at least 2 full years of professional experience as assistant to a qualified professional paleontologist with administration and project management experience (supported by a list of projects and referral contacts); have proficiency in recognizing fossils in the field and in determining their significance; have expertise in local geology, stratigraphy, and biostratigraphy; and have experience collecting vertebrate fossils in the field (SVP 2010). The Project Paleontologist and Page Museum curators and collections managers shall meet weekly during scheduled ground-disturbing activities associated with the construction of the project to address any outstanding questions or concerns that arise during mitigation efforts to ensure effective communication and coordination. The Project Paleontologist shall oversee all regulatory compliance measures, shall oversee mitigation protocols related to paleontological resources, and shall be a point of contact for the Page Museum curators and County officials. A professional resume or curriculum vitae of the Project Paleontologist shall be submitted to the County for approval prior to the start of ground-disturbing activities.*
GEO/mm-6.2	***Prepare a Paleontological Resources Management Plan:*** *After finalization of the engineering, design, and grading plans for the project and prior to the start of preconstruction ground-disturbing activities, a Paleontological Resources Management Plan (PRMP) shall be prepared by the Project Paleontologist and submitted to the Page Museum curators, who shall review and approve the final PRMP on behalf of the County and Natural History Museum. The PRMP shall define the processes and procedures for paleontological monitoring and fossil excavation based on the nature of ground-disturbing activities required for project. The PRMP shall:* *a. Incorporate the results of the Paleontological Resources Technical Report (SWCA 2023), the final geotechnical investigation, and the final engineering/grading plans for the project.* *b. Require all construction personnel to attend a Worker Environmental Awareness Program (WEAP) training to be presented by the Project Paleontologist, or their designee.* *c. Define the processes and procedures for coordinating and communicating with responsible parties and stakeholders (including but not limited to the contractors, consultants, County officials, and the Page Museum curators and collections managers), when construction activities would be halted due to discovery and subsequent salvage efforts during ground-disturbing activities, and when regularly scheduled meetings between the Project Paleontologist and the Page Museum curators and collections managers would be required.*

GEO Impact 6	
	d. Outline a procedure whereby mechanical excavation is conducted to remove any non-fossil-bearing sediments or soils subject to environmental soil remediation, such that adequate time is afforded to identify fossil localities and to conduct scientific salvage operations to a feasible extent (see Millington and Dietler 2023); the timing of scientific fossil salvage operations during initial grading should be given special considerations in the PRMP such that delays to earthwork activities are minimized while allowing paleontological material to be salvaged at an acceptable level that retains the scientific integrity of the discoveries. *e. Require full-time paleontological monitoring by qualified paleontological monitors who meet the standards of the SVP (2010) and shall be supervised by the Project Paleontologist; qualified paleontological monitors shall have the authority to temporarily halt construction activities to record and salvage fossil discoveries as they are unearthed to allow for potentially significant fossils to be collected with their scientific integrity intact to the extent feasible and practical.* *f. Discuss unanticipated fossil discovery and communication protocols if paleontological resources are discovered by non-paleontology staff working on the project in instances where paleontological monitors are documenting or recording paleontological resources discovered elsewhere within the project site.* *g. Discuss feasible monitoring procedures for each of the different ground-disturbing activities, including but not limited to active observation or inspection of sediments during active ground disturbances, whether they be trenching, grading, excavating, drilling, or some other activity that disturbs sediments; inspection of sedimentary spoils spiles or cuttings, as well as backfill originating from Hancock Park that may contain asphaltum or fossil material; and/or matrix screening of spoils for small or microfossils as needed.* *h. Define fossil salvaging procedures, including but not limited to outlining the treebox method for asphaltum bearing large accumulations of fossils, salvaging of isolated fossils, matrix screening in the field for microfossils, and chain-of-custody procedures for transferring the fossil discoveries to the Page Museum curators or collection managers as they are exhumed from the project site. Because of the unique conditions of La Brea Tar Pits and the chemical considerations of working with asphaltum fossil deposits, any paleontological resource discoveries shall remain on-site with the Page Museum. The paleontological monitor shall record pertinent geologic data and collect appropriate sediment samples from any fossil localities.* *i. Require the Project Paleontologist to prepare a report of the findings of the monitoring efforts within 90 days after construction is completed.*
GEO/mm-6.3	***Conduct Worker Training.*** *The Project Paleontologist shall develop and present a WEAP training to educate the construction crew on the legal requirements for preserving fossil resources, as well as the procedures to follow in the event of an unanticipated fossil discovery. This training program shall be given to the crew before ground-disturbing work commences and shall include handouts to be given to new workers as needed.*
GEO/mm-6.4	***Monitor for Paleontological Resources:*** *Full-time monitoring shall be required during all ground-disturbing activities (including artificial fill or previously disturbed sediments), regardless of depth. Additionally, special considerations shall be given to the project design elements and geotechnical and soils remediation or hazard reduction recommendations, including but not limited to the paleontological screening of tar sands prior to disposal or treatment. Procedures and protocols for paleontological monitoring and fossil salvage shall be outlined in the PRMP. Monitoring shall:* *a. Be conducted by a qualified paleontological monitor who meets the standards of the SVP (2010) and shall be supervised by the Project Paleontologist, who shall coordinate with the Page Museum curators and collections managers and County officials. The Project Paleontologist may periodically inspect construction activities to recommend adjusting the level of monitoring in response to subsurface conditions; however, modifications, such as increasing, reducing, or ceasing of paleontological*

GEO Impact 6	
	monitoring, or any changes of the implementation of the PRMP, should be approved by Page Museum curators and the Natural History Museum. b. *Include inspection of exposed sedimentary units during active excavations, grading, tar sand removal, and any other ground-disturbing activity that has the potential to impact sediments capable of preserving significant fossils. The Page Museum curators (or their representatives) and the paleontological monitor shall have authority to temporarily divert activity away from exposed fossils to evaluate the significance of the find and, shall the fossils be determined significant or likely significant, professionally and efficiently recover the fossil specimens and collect associated data while minimizing delays. Data collection procedures may require the support of construction contractors to carefully and efficiently collect field data and extract the fossils to allow construction to continue.* c. *Require grading and earthwork contractors to follow the guidance of Page Museum staff or the Project Paleontologist regarding the collection and/or extraction of paleontological resources. The paleontological monitor shall record pertinent geologic data and collect appropriate sediment samples from any fossil localities. Recovered fossils shall be directly retained by the Page Museum for later analysis, laboratory preparation, and eventual curation if deemed significant or important by the Page Museum curators or collection managers.*
GEO/mm-6.5	***Prepare a Paleontological Resources Monitoring Report:*** *Upon conclusion of ground-disturbing activities, the Project Paleontologist overseeing the implementation of the PRMP, including paleontological monitoring and fossil salvaging, shall prepare a final monitoring report that documents the paleontological monitoring efforts for the project and describes any paleontological resources discoveries observed and/or recorded during the life of the project. The final monitoring report and any associated data pertinent to the salvaged fossil specimen(s) shall be submitted to the Natural History Museum of Los Angeles County within 90 days after construction is completed. If the project is developed in phases, the final report is only necessary at the completion of the last phase to be constructed. At the discretion of the County, if there are unanticipated gaps in the phases of construction or other reasons why the County would prefer phased final reports, multiple final reports could be prepared.*
Impacts Following Mitigation	
With implementation of Mitigation Measures GEO/mm-6.1 through GEO/mm-6.5, construction impacts would be less than significant. No operational impacts would occur.	

5.6.6 Cumulative Impact Analysis

Due to the site-specific nature of geological conditions (i.e., soils, geological features, subsurface features, seismic features, etc.), geological impacts are typically assessed on a project-by-project basis, rather than on a cumulative basis. Nonetheless, cumulative growth in the surrounding area as discussed in Chapter 4, Environmental Setting, and other future development projects would be subject to established guidelines and regulations pertaining to building design and seismic safety, including those set forth in the CBC and the City of Los Angeles Building Code, which applies to the properties adjacent to and surrounding the project site, as well as site-specific geotechnical evaluations that would identify potential effects related to the underlying geologic and soil conditions for a particular related project site.

With the adherence to the applicable regulations of 2020 CLABC (and future updates to the building code, when they occur) as discussed above and any site-specific recommendations set forth in a site-specific final geotechnical design evaluation, and the requirement that projects in the surrounding city of Los Angeles adhere to the City of Los Angeles Building Code, the project and related projects would not result in significant impacts related to geological and soil conditions. As such, the project's contribution to geotechnical or soils-related hazards would not be cumulatively considerable.

However, in specific consideration of paleontological resources, future and nearby development projects with the potential for substantial excavation would be subject to environmental review, but each of these development projects in the area could result in incremental impacts to paleontological resources that, when viewed together, could be considered cumulatively considerable.

As addressed in the direct impact analysis, the project has the potential to disturb geological units that are conducive to retaining paleontological resources. If not mitigated, the potential for the loss, alteration, and destruction of the paleontological resources at the project site would be considered significant contributions to cumulative paleontological resource impacts. Therefore, the project could result in *significant* contributions to cumulative paleontological impacts.

Because of the potential for significant impacts on paleontological resources resulting from the project, Mitigation Measures GEO/mm-6.1 through GEO/mm 6.5 are required. These measures include retention of a qualified paleontologist, paleontological resources sensitivity training, paleontological resources monitoring, and treatment and curation of discoveries, if encountered. Implementation of these measures would reduce the potential for adverse effects on fossil resources individually and cumulatively, and would preserve and maximize the potential of these resources to contribute to the body of scientific knowledge.

GEO Impact 7 (Cumulative)
The project would not result in significant contributions to cumulatively considerable impacts related to geotechnical or soils-related hazards; however, the project could result in significant contributions to cumulatively considerable impacts related to paleontological resources.
Mitigation Measures
Implement Mitigation Measures GEO/mm-6.1 through GEO/mm-6.5.
Impacts Following Mitigation
With implementation of Mitigation Measures GEO/mm-6.1 through GEO/mm-6.5, the project's contribution to cumulative impacts related to paleontological resources would be reduced to less than significant. No other geotechnical, geologic, or soil-related contributions to cumulative impacts would occur.