

## **4.6 GEOLOGY AND SOILS**

### **4.6.1 EXISTING CONDITIONS**

#### **Geotechnical Investigation Report**

The Project's Geotechnical Investigation Report was prepared to document the environmental setting for the Project Site and includes a geologic Project Site reconnaissance, a subsurface field investigation with seven geotechnical borings to a maximum depth of 50 feet below ground surface, and laboratory testing for selected soils obtained during field exploration to characterize the subsurface materials (Group Delta 2023a).

#### **Geologic Setting**

According to the Geotechnical Investigation Report, the Project Site is situated within the central block of the Los Angeles Basin of the southern California Peninsula Ranges Geomorphic Province. The central block is structurally characterized by a northwest trending synclinal trough bound to the southeast and northwest by uplift along the Newport Inglewood and Whittier strike-slip fault zones. Mountain ranges and valleys mirror the northwest trending structural boundaries in the Project Site vicinity. Internally, the central block is filled with thousands of feet of sediment which is dissected by south-southwest trending rivers such as the Santa Ana River.

Locally, the Project Site is situated within the Anaheim Hills area of the Santa Ana Mountains. The Santa Ana River flows south-southwest about 0.1 mile north of the Project Site within a concrete-lined channel. The Project Site is located on north and west facing slopes that are natural watersheds towards the Santa Ana River. The north facing slope within the Project Site has been cut and terraced through past agricultural uses as well as due to the development of Santa Ana Canyon Road. The Project Site is also situated within Deer Canyon, a tributary drainage to the Santa Ana River. Deer Canyon is a narrow north trending drainage, with steep incised canyon walls.

The Anaheim Hills are comprised of the Puente Formation Sycamore Canyon Member locally. Folding and dormant debris flows have been mapped within formational rock in the Project Site vicinity. The formational materials are covered with a variable depth of both colluvium and alluvium associated with the localized deposition. The alluvium in the canyon bottom is covered with a variable depth of undocumented fill associated with construction of the existing access road. Generally, the alluvium and colluvial materials on the northern facing slope are less than 10 feet thick, except for the northeastern portion of the Project Site where the geotechnical borings that were collected in the Project Site encountered surficial sediments approximately at 20 feet thick below ground surface.

## **Geologic Materials and Subsurface Conditions**

The Geotechnical Investigation Report identified the following geologic materials within the Project Site.

### ***Sycamore Canyon Member – Puente Formation***

The Sycamore Canyon Member of the Pliocene-age Puente Formation is mapped regionally throughout the Project Site. The Sycamore Canyon Member of the Pliocene-age Puente Formation was encountered in all the geotechnical borings and is expected to underlie the entire Project Site at depth. Where measured, the sandstone bedding within the Puente Formation was generally observed to dip 25 to 35 degrees down to the north-northwest. Limited fracturing<sup>1</sup> was also exposed within the north slope, descending to East Santa Ana Canyon Road.

As observed in the geotechnical borings, the Puente Formation most commonly consists of silty sandstone, sandy siltstone, and claystone with a variable amount of fine sand. The rock exposures were typically tan to light gray in color. The pebble conglomerate common to the Sycamore Member was observed to thinly mantle the top of the slope near the northeast portion of the Project Site. Laboratory tests indicate that the claystone beds within the Project Site are highly expansive.

### ***Landslide Debris***

There have been historic landslides within eastern Anaheim. In 1993, the Santiago Landslide occurred following a major El Nino rain event a bluff slid and prompted the evacuation of dozens of families. This event destroyed over 30 homes and impacted over 200 other structures in the vicinity. In 2005, the Ramsgate Landslide occurred following a twenty-day rain event that led to flooding and caused a landslide along Ramsgate Drive, which destroyed three homes and a private street.

Landslide Debris was mapped at the northwestern facing slope on the Project Site, in the location between the proposed Multiple-Family Residential building and the proposed Commercial Use Area. According to the Geotechnical Report, while no geotechnical borings were drilled in this location, the landslide parameters appear to match the current topography and bedding orientation. The Landslide Debris are anticipated to be largely comprised of intact Sycamore Canyon Member. As exposed within the north facing slope, the debris are comprised of fractured thinly bedded siltstone and sandstone. Surface raveling is prevalent and smaller inter slides/creep is suspected.

### ***Alluvium***

Alluvium is deposited within drainages throughout the Project Site, except for the previously graded access road areas, which are covered with fill. Quaternary-age alluvium associated with Deer Canyon was encountered in geotechnical borings to a maximum depth of about

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<sup>1</sup> A “fracture” is a separation in a geologic formation.

25-feet below existing grades. It is generally comprised of medium dense to dense silty to clayey sand with layers of gravel and cobbles.

Older alluvium associated with a former river terrace from the Santa Ana River, was encountered up to 20 feet deep within the northeastern portion of the Project Site in the geotechnical borings. The deposits may also have at least partially been associated with an old debris flow; however, the Project Site conditions implies a possible older alluvial origin to the deposit. It is comprised of dense silty sand and poorly graded sand with layers of cobbles and boulders.

### ***Colluvium***

Colluvial soils occur on the hillsides and were encountered in the geotechnical borings. The surficial colluvial soils were typically observed to be less than 10 feet in thickness. However deeper colluvium was encountered in the northeastern portion of the Project Site where colluvium is estimated to be approximately 15 feet thick. The colluvium was typically comprised of loose, dry to moist, silty or clayey sand with few locally derived rock fragments, cobbles, and boulders. Much of the natural colluvium within the northern slope in the Project Site is believed to have been disturbed by past agricultural use.

### ***Undocumented Fill***

Undocumented Fill with no available record of geotechnical testing and observation was encountered in the geotechnical borings. Undocumented Fill is considered potentially compressible and is not considered suitable for the support of new fill or foundation loads. Roughly 4 to 9 feet of Undocumented Fill was encountered in the areas explored within the Project Site. Deeper undocumented fills may exist in areas not explored. Prior land use included agriculture over a good portion of the northern slope and the upper soils are anticipated to be loose with possible unknown debris. Old irrigation pipes, wells, and structural foundation posts were encountered during the field reconnaissance.

### **Groundwater**

One Geotechnical boring encountered groundwater at 54 feet below ground surface, located at the western portion of the Project Site and situated directly over a large natural drainage (Deer Canyon).

### **Seismicity and Surface Fault Rupture**

The Project Site is in the seismically active region of southern California. The Project Site has been and will continue to be subject to strong seismic ground shaking in the event of an earthquake on one or more of the regional faults. The Project Site is not located within an Alquist-Priolo Earthquake Fault Zone. No indications of Holocene active or potentially active faulting were found as part of the Geotechnical Investigation Report (Group Delta 2023a). The nearest known active regional faults are located within the Whittier fault zone roughly 1.9 miles northeast of the Project Site.

## **Liquefaction**

Liquefaction involves the sudden loss in strength of a saturated, cohesionless soil (i.e., sand and non-plastic silts) caused by the build-up of pore water pressure during cyclic loading, such as that produced by an earthquake. This increase in pore water pressure can temporarily transform the soil into a fluid mass, resulting in sand boils, settlement, and lateral ground deformations. Typically, liquefaction occurs in areas where there are loose to medium dense sands and silts, and where the depth to groundwater is less than 50 feet from the ground surface.

According to the Geotechnical Investigation Report, groundwater was encountered within the Deer Canyon area of the Project Site, generally west of the existing paved road, at 54 feet below ground surface (Group Delta 2023a) No seepage of groundwater was encountered within the other subsurface geotechnical borings. The California Geological Survey (CGS) Seismic Hazard Zone Map and City of Anaheim Safety Element indicate that the Project Site is not within a zone of required investigation for liquefaction (CGS 2023c, City of Anaheim 2004c).

## **Landslide and Slope Stability**

The State Zones of Required Investigation Map indicates portions of the slopes within the Project Site are mapped as having potential for earthquake-induced landslide hazard. Review of CGS Landslide Inventory reports indicate the western and northern facing slopes have a high landslide susceptibility and are considered unstable in place (CGS 2023c). The potential instability is primarily a result of adverse geologic structure and bedding in the formational materials.

## **Tsunamis, Seiches, and Flooding**

The Project Site is located approximately 20 miles east of the Pacific Ocean (Google Maps 2023a). Most of the Project Site is located more than 300 feet above mean sea level (Group Delta 2023a). Given the distance from the coast, and the relatively high elevation of the Project Site, the potential for damage due to a tsunami in the Pacific Ocean is considered negligible.

There is no potential for a seiche to occur within or near the Project Site since there are no enclosed bodies of water within or near the Project Site.

The Project Site is not located within a Federal Emergency Management Agency 100-year flood zone (FEMA 2023a). The Project Site is located within Flood Zone “X”, which is described as “Areas Outside the 0.2% Annual Chance Floodplain” per Flood Insurance Rate Map (FIRM) – Community Panel Number 06059C0157J, dated December 3, 2009. Also, a small sliver of the northeastern portion of the Project Site that is located along Santa Ana Canyon Road is shown in the FIRM as “Being Protected From The 1-Percent-Annual-Chance or Greater Flood Hazard By A Levee System. Overtopping Or Failure Of Any Levee System Is Possible.”

According to the Department of Water Resources, Division of Safety of Dams, the Project Site is not located within the dam inundation zone for the Walnut Canyon Reservoir, which is located approximately 1.25 miles south of the Project Site at a higher elevation (DWR 2023b). Due to the topography between Deer Canyon and the Walnut Canyon Reservoir, the Project Site is not located within the inundation zone for this dam (DWR 2023b). Prado Dam is located approximately 6.6 miles northeast of the Project Site (Google Maps 2023a). The lowest portions of the Project Site are located within the dam inundation zone for Prado Dam during the worst-case scenario, referred to as “Maximum High Pool Non-Breach” (U.S. Army Corps of Engineers 2023a). Consequently, this small area of the Project Site is subject to potential for earthquake induced flooding.

## **Paleontological Resources**

A paleontological records search was requested for the Project Site from the Natural History Museum (LACM) of Los Angeles County, Vertebrate Paleontology Department. The results were received on December 11, 2022, and are included as Appendix G (NHM 2022a). The results indicate that there are no fossil localities that occur directly within the Project Site; however, there are fossil localities nearby from the same sedimentary deposits that occur in the Project Site, either at the surface or at depth.

## **4.6.2 REGULATORY SETTING**

### **Federal**

#### ***International Building Code***

The International Building Code (IBC) is the national model building code providing standardized requirements for construction. The IBC establishes consistent construction guidelines for the nation and has been adopted with amendments into the California Building Code. The IBC contains codes related to geology and soils, including Chapter 16 (structural design) and Chapter 18 (soils and foundations) (ICC 2021a).

#### ***National Earthquake Hazards Reduction Program***

The National Earthquake Hazards Reduction Program (NEHRP) was established by the US Congress when it passed the Earthquake Hazards Reduction Act of 1977, Public Law (PL) 95-124. In establishing NEHRP, Congress recognized that earthquake-related losses could be reduced through improved design and construction methods and practices, land use controls and redevelopment, prediction techniques and early- warning systems, coordinated emergency preparedness plans, and public education and involvement programs.

The four basic NEHRP goals are:

- Develop effective practices and policies for earthquake loss reduction and accelerate their implementation.
- Improve techniques for reducing earthquake vulnerabilities of facilities and systems.

- Improve earthquake hazards identification and risk assessment methods, and their use.
- Improve the understanding of earthquakes and their effects.

Several key federal agencies contribute to earthquake mitigation efforts. These are the four primary NEHRP agencies:

1. National Institute of Standards and Technology of the Department of Commerce
2. National Science Foundation
3. USGS of the Department of the Interior
4. Federal Emergency Management Agency of the Department of Homeland Security

Implementation of NEHRP priorities is accomplished primarily through original research, publications, and recommendations to assist and guide State, regional, and local agencies in the development of plans and policies to promote safety and emergency planning.

### ***National Pollution Discharge Elimination System General Construction Activities Permit***

Pursuant to CWA Section 402(p), which requires regulations for permitting of certain storm water discharges, the SWRCB has issued a Statewide NPDES General Permit for Storm Water Discharges Associated with the Construction and Land Disturbance Activities (Order No 2012-0006-DWQ, NPDES No. CAS000002), adopted by the State Water Resources Control Board (SWRCB) on July 17, 2012 as amended by Orders 2010-0014-DWQ and 2012-0006-DWQ is currently in effect. Construction activities subject to this permit include clearing, grading, and ground disturbances such as stockpiling or excavation, but do not include regular maintenance activities performed to restore the original line, grade, or capacity of the facility.

Under the Construction General Permit, storm water discharges from construction sites with a disturbance area of one acre or more are required to either obtain individual NPDES permits for storm water discharges or be covered by the Construction General Permit. Coverage under the Construction General Permit is obtained by completing and filing a Notice of Intent (NOI) with the SWRCB and preparing a Storm Water Pollution Prevention Plan (SWPPP) prior to any land disturbance. The SWPPP identifies erosion control, sediment control, tracking control, wind erosion control, waste management, and non-storm water management BMPs that would be implemented during the construction phase to reduce or eliminate pollutants entering the storm drain system.

### ***Excavation Rules and Regulations***

Title 29 in the Code of Federal Regulations, Part 1926, Subpart P contains rules and regulations for site excavations. Subpart P applies to all open excavations made in the earth's surface. Specific excavation requirements regulate surface encumbrances, underground

installations, access and egress, hazardous atmospheres, stability of structures, protection of employees from loose rock or soil, inspections, and walkthroughs.

### ***Paleontological Resources Preservation Act***

The Paleontological Resources Preservation Act of 2002 codifies the generally accepted practice of limited vertebrate fossil collection and limited collection of other rare and scientifically significant fossils by qualified researchers. Researchers must obtain a permit from the appropriate State or federal agency and agree to donate any materials recovered to recognized public institutions, where they would remain accessible to the public and other researchers.

### ***Society of Vertebrate Paleontology Guidelines***

The Society of Vertebrate Paleontology, a national scientific organization of professional vertebrate paleontologists, has established standard guidelines that outline acceptable professional practices in the conduct of paleontological resource assessments and surveys, monitoring and mitigation, data and fossil recovery, sampling procedures, specimen preparation, analysis, and curation. Most practicing professional paleontologists in the nation adhere to the Society of Vertebrate Paleontology's assessment, mitigation, and monitoring requirements, as specifically spelled out in its standard guidelines.

## **State**

### ***California Green Building Standards Code***

The 2022 California Green Building Standards Code (CBC; 24 California Code of Regulations [CCR], Part 11), also known as the CALGreen code, is promulgated under the CCR, Title 24 (Parts 1 through 12), and is administered by the California Building Standards Commission. CALGreen includes regulations for energy efficiency, water efficiency, and conservation, material conservation and resources efficiency, and environmental quality. The code is applicable to commercial, residential, and public school buildings, with residential and nonresidential provisions provided in separate chapters (CBSC 2023).

### ***California Building Code***

The national model code standards adopted into Title 24 apply to all occupancies in California except for modifications adopted by State agencies and local governing bodies. The CBC establishes general standards for the design and construction of buildings, including provisions related to seismic safety. The CBC provides standards that must be met to safeguard life or limb, health, property, and public welfare by regulating and controlling the design, construction, quality of materials, use and occupancy, location, and maintenance of all buildings and structures in its jurisdiction.

The CBC requires that a site-specific geotechnical investigation report be prepared by a licensed professional for proposed developments of one or more buildings greater than 4,000 square feet to evaluate geologic and seismic hazards. The purpose of a site-specific

geotechnical investigation is to identify seismic and geologic conditions that may need to be addressed to ensure safety and adequate performance of improvements, such as surface fault ruptures, ground shaking, liquefaction, differential settlement, lateral spreading, expansive soils, and slope stability. Requirements for the geotechnical investigation are presented in Chapter 16 “Structural Design”.

Chapter 18 of the CBC, Soils and Foundations, specifies the level of soil investigation required by law in California. Requirements in Chapter 18 apply to building and foundations systems and consider reduction of potential seismic hazards.

### ***California Public Resources Code***

California Public Resources Code Section 5097 et seq. specifies procedures for addressing unexpected discovery of archaeological, paleontological, and historical resources on state lands. Section 5097.5 provides for the protection of cultural and paleontological resources and prohibits the knowing and willful excavation, removal, destruction, injury, or defacement of archaeological vertebrate and paleontological sites, or any other any other archaeological, paleontological or historical feature, on any lands owned by, or under the jurisdiction of, State or local authorities, except with the express permission of the public agency having jurisdiction over the lands.

### ***California Code of Regulations***

Two sections of the California Code of Regulations (Title 14, Division 3, Chapter 1), applicable to lands administered by the California Department of Parks and Recreation (DPR), address paleontological resources. These include:

- Section 4307: Geological Features - "No person shall destroy, disturb, mutilate, or remove earth, sand, gravel, oil, minerals, rocks, paleontological features, or features of caves."
- Section 4309: Special Permits - "The Department may grant a permit to remove, treat, disturb, or destroy plants or animals or geological, historical, archaeological or paleontological materials; and any person who has been properly granted such a permit shall to that extent not be liable for prosecution for violating the forgoing."

### ***Alquist-Priolo Earthquake Fault Zoning Act of 1972***

The Alquist-Priolo Earthquake Fault Zoning Act (Alquist-Priolo Act) was adopted by the State of California in 1972 in order to mitigate surface fault rupture hazards along known active faults (California Public Resources Code [PRC] Section 2621, et seq.). The purpose of the Alquist-Priolo Act is to reduce the threat to life and property—specifically from surface fault rupture—by preventing the construction of buildings used for human occupancy on the surface trace of active faults. Under the Alquist-Priolo Act, the CGS has defined an “active” fault as one that has had surface displacement during the past 11,000 years (Holocene time). This law directs the State Geologist to establish Earthquake Fault Zones (known as “Special Studies Zones” prior to January 1, 1994) to regulate development in designated hazard areas.



In accordance with the Alquist-Priolo Act, the State has delineated “Earthquake Fault Zones” along identified active faults throughout California. City and County jurisdictions must require a geologic investigation to demonstrate that a proposed development project, which includes structures for human occupancy, is adequately set back (generally at least 50 feet) from an active fault prior to permitting. The Project Site is not within an Earthquake Fault Zone (Group Delta 2023a).

### ***Seismic Hazards Mapping Act***

The Seismic Hazards Mapping Act (SHMA) was passed in 1990 and directs the CGS (formerly the California Division of Mines and Geology) to identify and map areas subject to earthquake hazards such as liquefaction, earthquake-induced landslides, and amplified ground shaking (PRC Sections 2690–2699.6). Passed by the State legislature after the 1989 Loma Prieta Earthquake, the SHMA is aimed at reducing the threat to public safety and minimizing potential loss of life and property in the event of a damaging earthquake event. Seismic Hazard Zone Maps are a product of the resultant Seismic Hazards Mapping Program and are produced to identify Zones of Required Investigation; most developments designed for human occupancy in these zones must conduct site-specific geotechnical investigations to identify the hazard and to develop appropriate mitigation measures prior to permitting by local jurisdictions. The SHMA establishes a Statewide public safety standard for the mitigation of earthquake hazards, including providing guidance for the evaluation and mitigation of earthquake-related hazards for projects in designated zones of required investigations. Portions of the Project Site are within a landslide zone as identified on the mapping.

### **Local**

#### ***Anaheim Municipal Code***

The City of Anaheim has adopted the 2022 CBC, as amended, and the 2022 California Green Building Standards Code, as amended, which are both codified at Title 15, Buildings and Housing, of the Anaheim Municipal Code (AMC) (City of Anaheim 2024a). The City reviews construction plans to ensure design compliance with applicable codes.

The AMC also includes Title 17, Land Development and Resources, which provides guidelines and standards related to grading, excavation and fills and specimen tree removal, and must include an erosion and sediment control plan.

#### ***City of Anaheim General Plan – Green Element and Safety Element***

There are two specific areas in the City of Anaheim General Plan that address the issue of geology and soils: the Green Element and the Safety Element (City of Anaheim 2004b and 2004c). The Green Element comprehensively addresses topics concerning hillside grading, including minimization of grading, and completion of erosion and sediment control plans. The Safety Element establishes policies and programs to protect the community from risks associated with potential seismic and geologic hazards to avoid or minimize exposure to

these potential hazards. Applicable goals and policies from the Green Element and the Safety Element that are related to geology, soils and seismicity and are relevant to this analysis are provided in Table 4.10-1 in Section 4.10, Land Use and Planning, with a Project consistency analysis.

### **4.6.3 THRESHOLDS OF SIGNIFICANCE**

In accordance with the City of Anaheim's Environmental Checklist, the Project would result in significant 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 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.
- 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 soils, as defined in Table 18-1-B of the California 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 waste water disposal system where sewers are not available for the disposal of waste water?
- f) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.

#### 4.6.4 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.*

**Less Than Significant Impact.** According to the Geotechnical Investigation Report prepared for the Project, there is no evidence of active faulting within the Project Site. In addition, the Project Site is not located within an Alquist-Priolo Earthquake Fault Zone. There are no known faults that underlie the Project Site, and the closest surface trace of an active fault to the Project Site is the Whittier Fault Zone located approximately 1.9 miles northeast of the Project Site. The potential for ground rupture to adversely impact the proposed Project is considered low according to the Geotechnical Investigation Report (Group Delta 2023a). Therefore, the Project would not directly or indirectly cause potential substantial adverse effects to people or structures, including the risk of loss, injury, or death involving rupture of a known earthquake fault. In addition, the Project would be required to adhere to all applicable federal and State laws and regulations, programs, and standards, including those set forth in the NEHRP, Alquist-Priolo Earthquake Zoning Act, SHMA, and the CBC. Furthermore, the Project would be required to adhere to applicable goals and policies in the General Plan including, among others, those set forth in the Green Element and the Safety Element, and applicable provisions of the Municipal Code, Title 9, Chapter 9. For example, the Municipal Code would require the Project's design to adhere to the recommendations provided in the site-specific Geological Investigation Report.

Therefore, the Project would result in less than significant impacts related to this threshold, and no mitigation is required.

- (ii) Strong seismic ground shaking?*

**Less Than Significant Impact.** The Project Site, as with the entire Southern California region, is subject to secondary effects from earthquakes. The Project Site has been and will continue to be subject to strong seismic ground shaking in the event of an earthquake on one or more of the regional faults. Nevertheless, the closest surface trace of an active fault to the Project Site is the Whittier fault zone located roughly 1.9 miles northeast of the Project Site. In addition, the Project Site is not located within an Alquist-Priolo Earthquake Fault Zone. As such, the potential for ground rupture is considered low (Group Delta 2023a).

Implementation of the Project would not change the intensity of ground shaking that would occur on the Project Site during a seismic event, but it would result in new exposure for the new residents, employees, other visitors and users, and structures. The proposed buildings would be required to be designed in accordance with applicable provisions of the 2022 California Green Building Standards Code (CBSC 2023). The California Green Building

Standards Code contains stringent standards regulating the design and construction of excavations, foundations, retaining walls, and other building elements to control the effects of seismic ground shaking and adverse soil conditions. The California Green Building Standards Code also includes provisions for earthquake safety based on factors such as occupancy type, the types of soil and rock in the Project Site, and the strength of ground motion that may occur at the Project Site.

Project implementation would also be required to be consistent with the recommendations outlined in the Geotechnical Investigation Report prepared for the Project. Based on the Geotechnical Investigation Report, the Project is geotechnically feasible provided that the recommendations in the Geotechnical Investigation Report are reviewed and integrated in the context of the final Project design and are incorporated during the Project's construction phase. Seismic design acceleration parameters are included in the Geotechnical Investigation Report based on the underlying geology, subsurface exploration data, seismic zones, and proximity of known faults to the Project Site, which provide the design procedures to be implemented, which would help to avoid significant damage to proposed structures. In addition, the Geotechnical Investigation Report includes seismic wall loads which provide seismic design parameters that would be required to be imposed on all proposed retaining walls (Group Delta 2023a). In addition, the Project would be required to adhere to all other applicable federal and State laws and regulations, programs, and standards, including those set forth in the NEHRP, Alquist-Priolo Earthquake Zoning Act, SHMA, and the CBC. Furthermore, the Project would be required to adhere to applicable goals and policies in the General Plan including, among others, those set forth in the Green Element and the Safety Element, and applicable provisions of the Municipal Code, Title 9, Chapter 9.

Compliance with the applicable laws and regulations, and compliance with proper grading, design, and building construction methods specified in the Geotechnical Investigation Report and as otherwise required under applicable laws and regulations would avoid and/or minimize, to the extent feasible, potential impacts related to strong seismic ground shaking.

Therefore, the Project would have a less than significant impact related to this threshold, and no mitigation is required.

***(iii) Seismic-related ground failure, including liquefaction?***

**Less Than Significant Impact.** The CGS Seismic Hazard Zone Map and City of Anaheim Safety Element indicate that the Project Site is not within an earthquake zone of required investigation for liquefaction. According to the Project's Geotechnical Investigation Report, the areas within the Project Site where bedrock is at or near the existing surface, liquefaction potential is considered negligible. In addition, existing loose alluvium and or fill materials below the proposed development are planned would be removed and recompacted in preparation of new structures as recommended in the Geotechnical Investigation Report. As such, the potential for liquefaction to adversely affect the Project Site is considered negligible (Group Delta 2023a). In addition, the Project would be required to adhere to all other applicable federal and State laws and regulations, programs, and standards, including those set forth in the NEHRP, Alquist-Priolo Earthquake Zoning Act, SHMA, and the CBC. Furthermore, the Project would be required to adhere to applicable goals and policies in the

General Plan including, among others, those set forth in the Green Element and the Safety Element, and applicable provisions of the Municipal Code, Title 9, Chapter 9. For example, the Municipal Code would require the Project's design to adhere to the recommendations provided in the site-specific Geological Investigation Report. Adherence to the foregoing laws, regulations, and programs and standards would ensure that impacts with respect to seismic-related ground failure such as liquefaction would be less than significant.

Therefore, the Project would have a less than significant impact related to this threshold, and no mitigation is required.

**(iv) Landslides?**

**Less Than Significant Impact.** The State Earthquake Zones of Required Investigation map indicates portions of the slopes within the Project Site are mapped with the potential for earthquake induced landslide hazard. Review of the CGS Landslide Inventory reports indicate the western and northern facing slopes within the Project Site have a high landslide susceptibility and are considered unstable.

The Project would include grading and the installation of retaining walls to accommodate the proposed buildings and related Project improvements. Implementation of the Project's grading plan, which would be required to adhere to all applicable laws and regulations, would result in stabilized slopes that would not present any significant hazards to any existing or proposed buildings due to landslides.

The Project's proposed buildings would be designed in accordance with applicable provisions of the 2022 California Green Building Standards Code, which contains stringent standards regulating the design and construction of excavations, foundations, retaining walls, and other building elements to control the effects of seismic ground shaking and adverse soil conditions. Project implementation would also be required to comply with the recommendations outlined in the Geotechnical Investigation Report prepared for the

Project. Based on the Geotechnical Investigation Report, the Project is geotechnically feasible provided that the recommendations in the report are reviewed and integrated in the context of the final Project design and are incorporated during the Project's construction phase.

Slope stability evaluations are included in the Geotechnical Investigation Report and provide design procedures for global and surficial stability to avoid significant damage to proposed structures from landslides or slope instability. Slope instability at the Project Site can be properly addressed with ground anchor retaining walls and a buttress fill, as specified by the Geotechnical Investigation Report (Group Delta 2023a). Compliance with the applicable laws and regulations, and adherence to the proper grading, design, and building construction methods specified in the Geotechnical Investigation Report would avoid and/or minimize, to the extent feasible, potential impacts related to landslides. In addition, the Project would be required to adhere to all other applicable federal and State laws and regulations, programs, and standards, including those set forth in the NEHRP, Alquist-Priolo Earthquake Zoning Act, SHMA, and the CBC. Furthermore, the Project would be required to adhere to applicable goals and policies in the General Plan including, among others, those set forth in the Green

Element and the Safety Element, and applicable provisions of the Municipal Code, Title 9, Chapter 9. Adherence to the foregoing laws, regulations, and programs and standards would ensure that impacts with respect to landslides would be minimized.

Therefore, the Project would have a less than significant impact related to this threshold, and no mitigation is required.

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

**Less Than Significant Impact.** The Project has the potential to result in soil erosion during construction and operations.

Project grading activities would disturb and expose soils on the Project Site and would require the hauling of soil off-site, which could result in substantial soil erosion and the loss of topsoil if not implemented consistent with applicable regulatory requirements. However, the Project would be required to adhere to all applicable federal, State, and local laws and regulations, including, among others, applicable provisions of the General Plan and Municipal Code. For example, as discussed in more detail in Section 4.9, Hydrology and Water Quality, the National Pollutant Discharge Elimination System (NPDES) permit program controls water pollution by regulating point sources that discharge pollutants into “Waters of the U.S.”. The Project’s construction activities would be required to be conducted in compliance with the statewide NPDES General Permit for Storm Water Discharges Associated with the Construction and Land Disturbance Activities (Order No 2012-0006-DWQ, NPDES No. CAS000002), which was adopted by the State Water Resources Control Board on July 17, 2012. Prior to construction, the Project would be required to develop a Storm Water Pollution Prevention Plan (SWPPP) that would outline construction stormwater Best Management Practices (BMPs) that would be implemented during construction to manage erosion, fugitive dust, and stormwater-related issues. With implementation of standard construction BMPs in accordance with a SWPPP, the Project’s construction would result in less than significant impacts related to soil erosion and loss of topsoil.

The Project would grade and develop portions of the Project Site with new impervious surfaces and new pervious landscaped areas. Once built, the Project would increase impervious surface coverage on the Project Site, which could lead to erosion and loss of topsoil if stormwater is not conveyed and dissipated appropriately. The Project would increase impervious surface area from approximately 1.22 acres in existing conditions to 17.6 acres with the Project (Hunsaker & Associates 2024b). To determine how stormwater within the Project Site would be captured and conveyed, a Drainage Report was developed for the Project. Also, a Preliminary Water Quality Management Plan was prepared for the Project that specifies the operational BMPs that would be implemented to properly address the Project’s water quality impacts (Hunsaker & Associates 2024b). On-site storm drainage facilities, which would consist of bioswales, inlets, underground piping, and basins, would be installed as part of stormwater infrastructure and would be required to adhere to all applicable standards and requirements for purposes of stormwater improvements, which would also prevent topsoil loss and erosion on-site during operation. With implementation of the Project’s Drainage Plan and compliance with the operational water quality BMPs

identified in the Preliminary Water Quality Management Plan, operation of the Project would result in less than significant impacts related to soil erosion and loss of topsoil.

Therefore, the Project would have a less than significant impact related to this threshold, and no mitigation is required.

***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?***

**Less Than Significant Impact.** According to the Project's Geotechnical Investigation Report, the existing soils within the Project Site, including undocumented fill and alluvium, are considered potentially compressible and unsuitable for the direct support of new fill or foundation loads during Project construction. Therefore, as detailed in the Project's Geotechnical Investigation Report, the existing undocumented fill and unsuitable alluvium soil that remains beneath the planned slab subgrade elevations after grading occurs shall be excavated and replaced with structural compacted fill.

There is an existing asphalt concrete pavement road within the Project Site that would need to be demolished as part of the Project. This asphalt concrete pavement may contain hydrocarbons; therefore, these materials would not be suitable for reuse as on-site fill and would need to be disposed of off-site.

The Geotechnical Investigation Report stated that laboratory tests indicate the on-site soils appear to be corrosive to buried metals. As such, the Project would be required to comply with all applicable corrosion control measures such as providing minimum clearance between reinforcing steel and soil or sacrificial anodes or buried metal structures. Project implementation would also occur consistent with the recommendations outlined in the Geotechnical Investigation Report prepared for the Project.

As noted above, the Project is not in a location susceptible to liquefaction. The western and northern facing slopes have a high landslide susceptibility and are considered unstable in places, which is primarily a result of adverse geologic structure and bedding in the formational materials. As such, to minimize potential liquefaction effects, the Project would be designed in accordance with applicable provisions of the 2022 California Green Building Standards Code and would be required to implement the recommendations outlined in the Geotechnical Investigation Report. In addition, the Project would be required to adhere to all other applicable federal, State, and local laws and regulations, including, among others, applicable provisions of the General Plan and Municipal Code to address slope instability issues.

Subsidence occurs when a large portion of land is displaced vertically, usually due to the withdrawal of groundwater, oil, or natural gas. Soils that are particularly subject to subsidence include those with high silt or clay content. As stated in the Geotechnical Investigation Report, although near surface soils at the Project Site primarily consist of silty and clayey sand, they contain a low expansion potential. The Project would not cause a large

withdrawal of groundwater, oil or natural gas, and as the soils exhibit a low expansion potential, subsidence within the Project Site is considered unlikely.

Lateral spreading occurs when surface material extends or spreads on gentle slopes and is often associated with earthquake shaking. As stated above, the Project Site, as with the entire Southern California region, is subject to secondary effects from earthquakes. However, the potential for ground rupture within the Project Site is considered low (Group Delta 2023a).

To minimize effects related to lateral spreading to the extent feasible, the Project would be required to be designed in accordance with applicable provisions of the 2022 California Green Building Standards Code and would be required to implement the recommendations outlined in the Geotechnical Investigation Report. Moreover, as noted above, the Project would be required to adhere to all other applicable federal, State, and local laws and regulations, including, among others, applicable provisions of the General Plan and Municipal Code, which would further reduce risks associated with lateral spreading.

Therefore, the Project would have a less than significant impact related to this threshold, and no mitigation is required.

***d) Would the Project be located on expansive soils, as defined in Table 18-1-B of the California Building Code (1994), creating substantial direct or indirect risks to life or property?***

**Less Than Significant With Mitigation Incorporated.** Expansive soils are materials that, when subject to a constant load, are prone to expand when exposed to water. The hazard associated with expansive soils is that they can overstress and cause damage to the foundation of buildings set on top of them. As stated in the Geotechnical Investigation Report, laboratory tests conducted for the Project indicate that the near surface soils at the Project Site primarily consist of silty and clayey sand with a low expansion potential. However, some expansive clay may also be present in the Project Site in areas that were not explored. Therefore, based on the recommendations from the Geotechnical Investigation Report additional testing should be conducted by the geotechnical consultant during fine grading to confirm that any fill placed within the new building areas throughout the Project Site shall consist of very low expansion soil. Moreover, as noted above, the Project would be required to adhere to all other applicable federal, State, and local laws and regulations, including, among others, applicable provisions of the General Plan and Municipal Code, which would further reduce risks associated with expansive soils.

With implementation of the standard design and construction measures, adherence to all other applicable requirements and standards, and implementation of additional testing for expansive soils and related mitigation of same as required by **MM GEO-1**, the Project would result in a less than significant impact related to this threshold.



***e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal system where sewers are not available for the disposal of waste water?***

**No Impact.** The Project Site would be served by the City's municipal wastewater system. The Project would not require the installation or use of any septic systems.

Therefore, the Project would have no impact related to this threshold, and no mitigation is required.

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

**Less Than Significant With Mitigation.** A paleontological records search was requested from LACM, Vertebrate Paleontology Department and results were received on December 11, 2022. The results indicate that there are no fossil localities<sup>2</sup> located directly within the Project Site. However, there are fossil localities identified by the LACM records search from the same type of sedimentary deposits that occur in the Project Site (e.g., Puente Formation soil types). Deeper excavation activities that would occur during Project construction would involve disturbance of Puente Formation soil types which could contain paleontological resources. To minimize impacts to any potential paleontological resources to the extent feasible, the Project would be required to implement **MM GEO-2**, which requires that a qualified paleontologist be contacted to evaluate any potential paleontological resources encountered during Project construction and implement related measures to the extent any resource is determined to be significant.

With implementation of **MM GEO-2**, the Project would result in a less than significant impact related to this threshold.

## **4.6.5 CUMULATIVE IMPACTS**

Projects considered in the cumulative impact analysis consist of eight projects within the City of Anaheim. These cumulative projects include new industrial, commercial, and residential land uses on a mix of previously developed and undeveloped project sites. These cumulative projects are described in more detail in Table 4-1, which is provided in Section 4.0.

As described above, the Project would have less than significant impacts related to ground rupture, seismic ground shaking, seismic related ground failure, landslides, erosion, and loss of topsoil. The Project would have a potentially significant impact related to expansive soils prior to mitigation. Therefore, to minimize Project impacts to less than significant level, **MM GEO-1** would be implemented, which requires that additional soil testing be conducted during fine grading of the Project Site to evaluate the expansion potential of soils within the Project Site that are to be utilized for fill purposes. Also as described above, the Project could result in potentially significant impacts to paleontological resources without mitigation.

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<sup>2</sup> A fossil locality is a location where fossils have been found in the past.

Therefore, to minimize Project impacts to paleontological resources, **MM GEO-2** would be implemented, which requires that an on-call paleontologist be retained prior to construction and that the paleontologist be contacted in the event of a discovery of a potential paleontological resource during construction.

Other cumulative projects involving grading and development of structures would be required to evaluate their potential impacts related to geology and soils, typically through the preparation of a geotechnical investigation, and to implement mitigation measures, as appropriate. Therefore, cumulative impacts from the Project and other cumulative projects related to cultural resources would be less than significant.

#### **4.6.6 MITIGATION PROGRAM**

**MM GEO-1** During fine grading activities and prior to building construction for each building, advanced expansive soils testing shall be conducted by an approved geotechnical consultant to confirm that any proposed fill placed within the new building areas consists of very low expansion potential (EI<50). The geotechnical consultant shall provide recommendations related to the expansion potential of the soils that are evaluated to the Property Owner/Developer, which shall be incorporated into the Project's final design to the satisfaction of the City's Public Works Department.

**MM GEO-2** In the event that paleontological resources are inadvertently unearthed during excavation activities, the contractor shall temporarily halt or delay all earth-disturbing activities within a 25-foot radius of the area of discovery until the discovery is examined by a qualified Paleontologist in accordance with Society of Vertebrate Paleontology standards, and the contractor shall contact the City's Planning and Building Department immediately. In connection with each specific individual development proposal, the relevant Applicant shall include a standard inadvertent discovery clause in every Project-related construction contract to inform contractors of this requirement. The Property Owner/Developer shall retain a qualified professional paleontologist to evaluate the significance of the find, and in consultation with the City's Planning and Building Department, determine an appropriate course of action to feasibly mitigate impacts to same. If the paleontological resources are found to be significant, the paleontologist, in consultation with the City's Planning and Building Department, shall determine appropriate and feasible actions for avoidance, exploration, salvage, and/or curation that is consistent with the standards prescribed by the Society of Vertebrate Paleontology in the guideline document Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontological Resources (2010). Any recovered fossil should be deposited in an appropriate repository, such as the University of California Museum of Paleontology (UCMP), where it will be properly curated and made accessible for future studies. After the recommended measures have been implemented, work within the 25-foot vicinity of the find shall be permitted to resume and no further mitigation for said find shall be necessary.

#### **4.6.7 SIGNIFICANCE AFTER MITIGATION**

With implementation of mitigation measures **MM GEO-1 and MM GEO-2**, the Project would result in a less than significant impact related to geology and soils.

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