

4.5 GEOLOGY AND SOILS

This section addresses the potential for structural damage due to the local geology underlying the site of the modified Dana Point Harbor Hotels Project (Modified Project), as well as slope stability, ground settlement, soil conditions, grading, and regional seismic conditions. In addition, this section analyzes the potential for the Modified Project to affect unknown paleontological resources on or within the vicinity of the project site.

This section summarizes information provided in the *Preliminary Geotechnical Investigation, Dana Point Harbor Revitalization, Hotel Component, City of Dana Point, California* (Preliminary Geotechnical Investigation) (September 2019a), the *Response to City of Dana Point Geotechnical Report Review* (December 2019b), and the *Response to City of Dana Point Geotechnical Report Second Engineering Review* (May 2020), prepared by GMU, and the *Geotechnical Review, Geotechnical Report and Responses to Review Comments Dana Point Harbor Revitalization, Hotel Component, Dana Point, California* (Geotechnical Review) (August 2020) prepared by Ninyo & Moore. The Preliminary Geotechnical Investigation, all Responses to the City of Dana Point (City), and the Geotechnical Review are included in Appendix F of this Revised Draft EIR, and remain applicable to the Modified Project based on the November 5, 2024, letter (Supplemental Geotechnical Letter) from the project geologist, GMU (included as Appendix F to this Revised Draft EIR). Information pertaining to unique geologic units and paleontological resources is summarized herein as provided in the Paleontological Resources Memorandum prepared for the Modified Project in November 2024 (included as Appendix G to this Revised Draft EIR), in addition to EIR No. 591, Dana Point Harbor Revitalization Project Program EIR (Program EIR) (2006), which is incorporated in this Revised Draft EIR by reference. Preparation of this Revised Draft EIR also involved a current review of geologic maps of the project site and relevant geological and paleontological literature, as well as a fossil locality search was conducted through the Natural History Museum of Los Angeles County (NHMLAC) to determine the status and extent of previously recorded paleontological resources within and surrounding the project site, all of which provide for an up-to-date understanding of the paleontological characteristics of the project site.

4.5.1 Scoping Process

4.5.1.1 Original Project Scoping

The City of Dana Point received eight comment letters during the public review period of the Initial Study/Notice of Preparation (IS/NOP) prepared for the Original Project. For copies of the IS/NOP comment letters, refer to Appendix B of this Revised Draft EIR. One comment letter included comments related to Geology and Soils.

The letter from the South Coast Water District (SCWD) received on October 26, 2020, suggested that the 2021 EIR should include an analysis of all off-site SCWD facilities that may have to be modified as required for the Original Project. The comment letter states that the modifications to the existing sewer line along the southern portion of the project site are outside of the existing project site boundaries. However, the project site analyzed in this Revised Draft EIR is shown in Figure 3.2, Project Vicinity Map/Aerial Photograph, in Chapter 3.0, Project Description, and includes all work proposed within adjacent roadways for utility relocations. The subsurface exploration and analysis

of site geology presented in the Preliminary Geotechnical Investigation (GMU 2019a) provides an accurate description of the project site and immediately surrounding subsurface conditions.

4.5.1.2 Modified Project Scoping

A Supplemental NOP for the Modified Project was circulated for public review from July 19, 2024, through August 19, 2024.

Copies of the Supplemental NOP and comment letters received in response to the Supplemental NOP are included within Appendix A of this Revised Draft EIR. No comment letters included comments related to geology and soils.

4.5.2 Existing Environmental Setting

The Modified Project would be located in the same geographic location as the Original Project, and underlying geologic conditions tend to remain constant over time. Therefore, the existing environmental setting as described below remains generally the same for the Original Project and the Modified Project.

4.5.2.1 Site Description and Topography

The project site is currently developed with the Dana Point Marina Inn, parking, and boater facilities. The majority of the site is covered by either asphalt pavement or concrete flatwork with some planters and landscape areas with flowers, groundcover, shrubs and occasional trees. The project site is bounded by Dana Point Harbor Drive on the north, Casitas Place on the east, Island Way on the west, and Dana Point Harbor on the south.

The majority of the project site is relatively flat and drains by sheet flow towards the south to existing storm drain catch basins. However, there is an approximately 10-foot (ft) high slope between the existing parking lot and Island Way, and a 5 to 10 ft high slope along the north side of the existing parking lot adjacent to Dana Point Harbor Drive. In addition, there are minor slopes 5 ft or less in height within the southern portion of the site between the existing Dana Point Marina Inn hotel building and the parking lot area on the southern side of the project site. Elevations range from a high of approximately 19 ft above mean sea level (amsl) in the northern portion of the site to a low of approximately 10 ft amsl in the southern portion of the site. The current mean sea level for Dana Point Harbor is based on the National Oceanic and Atmospheric Administration (NOAA) La Jolla Station, which uses the North American Vertical Datum 1988 (NAVD88) mean sea level elevation of 2.53 ft. All site plans and topographic information were prepared using the NAVD88 datum.

4.5.2.2 Regional and Local Geologic Setting

The project site is located within the northwest-trending Peninsular Ranges geomorphic province of southwestern California. The Peninsular Ranges province is an elongated area characterized by parallel fault-bounded mountain ranges and intervening valleys. The province extends southward from the Transverse Ranges at the northern side of the Los Angeles Basin southward into Mexico. The Peninsular Ranges are characterized by regional compression associated with the San Andreas fault and sub-parallel blocks sliced longitudinally by young, steep northwest trending fault zones.

4.5.2.3 Subsurface Conditions

The project site is located in an area generally underlain by the Capistrano Formation that is in turn overlain by marine deposits and artificial fill. The Capistrano Formation in the area was observed to consist predominantly of well-consolidated, fine- to medium-grained, massive sandstones with occasional beds of moderately to well indurated, gray-to-dark-gray claystone and siltstone. The artificial fill materials within the project site originated from both the marine deposits and Capistrano Formation within Dana Cove, and talus deposits and formational materials along the base of the sea cliffs. As a result of the fill materials being comprised of a variety of different geologic units, the fill materials are highly variable and consist of frequently alternating layers of clayey sands, silty sands, sands, sandy clays, and sandy silts with gravel, with isolated cobbles and scattered rock fragments greater than 6 inches in diameter. In general, the granular sand fill materials were found to be medium-dense to dense while the fine-grained clay and silt fill materials were found to be predominantly firm to very firm. The marine deposits on the site are generally comprised of materials deposited in beach and submarine environments and, where encountered, generally consist of wet, loose to medium dense, silty sand to sand.

The western portion of the site, which is planned for the proposed Surf Lodge and surface parking under the Modified Project, is underlain by approximately 15 to 25 ft of surficial soils consisting of artificial fill and marine deposits, which in turn overlie Capistrano Formation. Fill depths appear to range from approximately 12 to 25 ft with the thickest sections located near the existing sea wall of the marina. The thickness of the marine deposits appears to range from approximately 0 to 8 ft. In general, the depths of the surficial soils across the site increase in a southerly direction towards the ocean. The eastern portion of the site, which is planned for the proposed Dana House Hotel and underground parking, is underlain by approximately 15 to 30 ft of surficial soils consisting of artificial fill and marine deposits, which in turn overlies Capistrano Formation bedrock. Fill depths appear to range from approximately 5 to 20 ft, and the thickness of the marine deposits appears to range from approximately 0 to 10 ft. The northern portion of the planned below-grade parking structure adjacent to Dana Point Harbor Drive is underlain by formational materials of the Capistrano Formation.

4.5.2.4 Groundwater Conditions

Groundwater elevations across the site are controlled not only by the elevation of the water within the adjacent harbor, but are also somewhat influenced by the pre-development topography, with lower elevations found closest to the seawalls.

In order to evaluate the groundwater data collected during the site investigation, GMU compared the groundwater levels observed during the subsurface investigation to the depth of historically high groundwater shown in the Seismic Hazard Zone Report for the *Dana Point, California 7.5-Minute Quadrangle* (CDMG 2001). These maps indicate a historical high groundwater of approximately 5 ft below ground surface (bgs). Groundwater elevations measured during the subsurface exploration (5 ft bgs to 10 ft bgs) were affected by the local tidal cycle, and therefore should be assumed to fluctuate with the tides, the lunar cycle, and recent rainfall events. As described in the Geotechnical Investigations included in Appendix F of this Revised Draft EIR, true groundwater levels were estimated using the in-situ saturation percentage and roughly corresponded to sea level (i.e., between approximately 6 to 20 ft bgs).

4.5.2.5 Seismicity and Faulting

As stated above, the project site is located within the Peninsular Ranges geomorphic province, which is dominated by northwest-trending, fault zones. An “active” fault is defined by the State of California as having had surface displacement within Holocene time (i.e., within the last 11,700 years). A “potentially active” fault is defined as showing evidence of surface displacement during Quaternary time (i.e., during the last 1.6 million years).¹

The project site would potentially be affected by seismically active faults in the region. Several active and potentially active faults have been mapped within several miles of the project site. However, there are no known active or potentially active faults or fault traces shown on current geologic maps as crossing or being in close proximity to the site. The project site is not located within a currently State-designated Earthquake Fault (Alquist Priolo) Zone.

The Dana Cove fault is a well-defined northwest trending fault zone that passes diagonally through the Harbor, directly under and nearly parallel to the existing West Basin Pier. The seaward projection is estimated to be up to approximately 250 ft wide, consisting of sheared breccia and contorted siltstones and sandstones. No seismic activity has been reported along this fault, which has been classified as inactive.

The nearest known active fault is the offshore segment of the Newport-Inglewood fault, which is located approximately 2.4 miles (3.9 kilometers) southwest of the site and is capable of generating a maximum earthquake magnitude (M_w) of 7.1. The project site is also located within 7 miles (11.3 kilometers) of the surface projection of the San Joaquin Hills Blind Thrust fault, which is capable of generating a maximum earthquake magnitude (M_w) of 6.6. Given the proximity of the project site to these and numerous other active and potentially active faults, the site (like most of southern California) will likely be subject to earthquake ground motions in the future.

Non-Seismic Geologic Constraints.

Erosion. The erosion potential of soil is governed by the physical properties of the soil along with environmental factors such as rainfall, wind, topography, and vegetative cover. Erosion typically occurs from concentrated runoff on unprotected slopes or along unlined channels underlain by relatively erosion-prone earth materials (e.g., topsoil, soft alluvium, weakly cemented sandstone).

As previously stated, the project site is largely overlain with artificial fill that consists of highly variable materials, primarily of fine-grained materials, such as silt and clay, which may be easily eroded under conditions of uncontrolled, concentrated surface runoff.

Expansive Soils. Expansive soils typically contain certain clay minerals that expand in volume when they are wet or hydrated and occupy a larger volume than when they are dry or dehydrated. Volume changes associated with changes in the moisture content of near-surface

¹ Department of Conservation, Division of Mines and Geology (CDMG). 1997. Fault-Rupture Hazard Zones in California.

expansive soils can cause uplift or heave of the ground when they become wet or, less commonly, cause settlement when they dry out.

As previously stated, the project site is largely overlain with artificial fill. The expansion potential of the artificial fill on the site is highly variable, ranging from very low to medium. The bedrock that will be exposed in the northern portion of the project site likely consists largely of non-expansive sandstone. However, expansive fine-grained layers and beds may be present in areas of the project site.

Subsidence. Subsidence is the sinking or settlement of the ground surface relative to the surrounding area, with little or no horizontal movement. Four types of land subsidence are known to occur in California. In descending order of significance, these are (1) subsidence caused by aquifer system compaction related to the lowering of groundwater levels, generally due to pumping activities, (2) subsidence caused by hydrocompaction of soils above the groundwater table, (3) subsidence related to extraction of oil and gas deposits, and (4) subsidence related to seismic activity.

The project site does not have any oil, gas, or water pumps on site and has not been used for the extraction of any of these resources. The on-site marine deposits and Capistrano Formation units are typically not subject to subsidence related to seismic activity. In addition, the site is not located in an area with documented subsidence.¹

Corrosive Soils. Corrosive soils contain chemical constituents that may cause damage to construction materials such as concrete and ferrous metals. One such constituent is water-soluble sulfate, which, if high enough in concentration, can react with and damage concrete. Electrical resistivity, chloride content, and percentage of hydrogen (pH) level are indicators of the soil's tendency to corrode ferrous metals.

Based on the test results for pH, soluble chlorides, sulfate, and minimum resistivity of the site soils obtained during GMU's subsurface investigation, the on-site soils should be considered to have moderate sulfate content, moderate to high minimum resistivity (indicating the soils may be mildly corrosive to corrosive to ferrous metals), and moderate to high chloride content (indicating the soils may be corrosive to ferrous metals).

Seismically Induced Hazards.

Ground Shaking and Surface Fault Rupture. The primary seismic effects associated with earthquakes are ground shaking and surface fault rupture.

Ground shaking due to seismic events (earthquakes) would typically be considered the greatest source of potential damage to structures. Seismic shaking is characterized by the physical movement of the land surface during and subsequent to an earthquake. Seismic shaking has the potential to cause destruction and damage to buildings and property, including damage resulting from damaged or destroyed gas or electrical utility lines; blockage of surface seepage

¹ United States Geological Survey (USGS). Areas of Land Subsidence in California. Website: https://ca.water.usgs.gov/land_subsidence/california-subsidence-areas.html (accessed September 12, 2020).

and groundwater flow; changes in groundwater flow; dislocation of street alignments; displacement of drainage channels and drains; and possible loss of life. In addition, ground shaking can induce several kinds of secondary seismic effects, including liquefaction, lateral spreading, differential settlement, and landslides, all of which are described below.

The intensity of seismic shaking during an earthquake depends largely on nature of the geologic units and materials comprising the upper several hundred feet of the earth's surface. The greatest amplitudes and longest durations of ground shaking occur on thick, water-saturated, unconsolidated alluvial sediments. Ground shaking can also cause ground failure or deformation due to lurching and liquefaction.

Surface rupture is the displacement and cracking of the ground surface that occurs along a fault trace. Unlike seismically induced ground shaking, which can affect a wide geographic area, surface rupture is confined to the area very near the fault.

As described above, the project site is not located within a currently designated Earthquake Fault (Alquist-Priolo) Zone. Known active or potentially causative faults capable of producing strong ground shaking at the site include the Newport-Inglewood fault and the San Joaquin Hills Blind Thrust fault. No active or potentially active faults are known to cross the site or site vicinity, therefore, the potential for surface rupture due to faulting on site is considered low. However, much of southern California, including the project site, may be subject to some level of damaging ground shaking as a result of movement along the major active (and potentially active) fault zones that characterize this region. According to the Preliminary Geotechnical Investigation, the site should be designated as Site Class C, which describes very dense soil and soft rock soil profiles.

Liquefaction and Ground Settlement. Liquefaction is caused by sudden temporary increases in pore water pressure due to seismic densification or other displacement of submerged granular soils. Layers of loose sand and sandy silt may, therefore, be subject to liquefaction if these materials are or were to become submerged and are also exposed to strong seismic ground shaking. Seismic ground shaking of relatively loose granular soils that are saturated or submerged can cause the soils to liquefy and temporarily behave as a dense fluid. This loss of support can produce local ground failure such as settlement or lateral spreading that may damage overlying improvements.

Ground settlement is a secondary seismic effect that can result in damage to property when an area settles to different degrees over a relatively short distance. The sinking or settlement of a structure, area of fill, or other imposed load is usually the result of compaction or consolidation of the underlying soil. Soils susceptible to seismically induced settlement typically include loose granular materials.

The site is located within a zone of required investigation for liquefaction as shown on the Seismic Hazard Zone Map for the Dana Point Quadrangle (CGS 2001), which indicates a risk for seismic settlement and lateral spreading related to liquefaction conditions.

Lateral Spreading. Lateral spreading typically occurs as a form of horizontal displacement of relatively flat-lying alluvial material toward an open or “unconfined” face such as an open body of water, drainage channel, or excavation. In soils, this movement is generally due to failure along a weak plane and may often be associated with liquefaction. As described above, the project site is considered subject to lateral spreading related to liquefaction.

Slope Instability and Seismically Induced Landslides. The downslope movement of loose rock or soil is also a potential secondary seismic effect that can occur during strong ground shaking. Based on the review of geologic mapping, literature, topographic mapping, aerial photographs and subsurface evaluation for the project site, no landslides or related features underlie the site; however, areas of potential earthquake-induced landsliding are mapped adjacent to the project site. The adjacent mapped areas are located within the existing bluffs where surficial instability and cracking may occur.

4.5.2.6 Existing Paleontological Setting

The existing setting for paleontological resources for the project site was determined through a Paleontology Literature and Records Review obtained from the San Bernardino County Museum conducted for the Dana Point Harbor Revitalization Project Program EIR (2006). The results of this review indicate that Dana Point Harbor is underlain by sediments of the Capistrano Formation and marine terrace deposits. The Capistrano Formation has yielded fossil remains of foraminifera, echinoids, and marine vertebrates, including sharks and whales. The marine deposits have yielded marine invertebrate fossils (mollusks, crustaceans, and echinoids) and marine vertebrate fossils (sharks, rays, and bony fish).

In addition to the information provided in the Dana Point Harbor Revitalization Project Program EIR (2006), updated research was conducted in support of the Paleontological Resources Memorandum prepared by LSA in November 2024 for the Modified Project (Appendix G to this Revised Draft EIR). This research included a review of geologic maps of the project site and relevant geological and paleontological literature, as well as a fossil locality search through the NHMLAC conducted in November 2024. The results of this review indicate that the project site is underlain by Miocene (23.03–5.333 million years ago) Undivided Sedimentary Rocks in Offshore Region and early Pliocene to late Miocene (3.6–11.63 Ma) Capistrano Formation, Siltstone facies, both of which are considered to have high paleontological sensitivity. While not officially mapped, Artificial Fill is also likely present from prior construction of the harbor and adjacent roads.

4.5.3 Regulatory Setting

As the Modified Project would be located in the same geographic location as the Original Project and would result in the development of the same types of uses on the project site, the following regulatory setting would remain the same for the Modified Project, with minor updates in certain cases.

4.5.3.1 Federal Regulations

National Pollution Discharge Elimination System. A Stormwater Pollution Prevention Plan (SWPPP) prepared in compliance with a National Pollutant Discharge Elimination System (NPDES) General

Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities, Order No. 2022-0057-DWQ, NPDES No. CAS000002 (Construction General Permit) describes erosion and sediment controls, runoff water quality monitoring, means of waste disposal, implementation of approved local plans, control of post-construction sediment and erosion control measures and maintenance responsibilities, and non-stormwater management controls. Dischargers are also required to inspect construction sites before and after storms to identify stormwater discharge from construction activity and to identify and implement controls where necessary.

Additionally, the City operates under a municipal separate storm sewer system (MS4) permit (San Diego Regional MS4 Permit) under the NPDES. MS4 permits require an aggressive water quality ordinance, specific municipal practices, and the use of best management practices (BMPs) in many development-related activities to further reduce the amount of contaminants in urban runoff. MS4 permits also require local agencies to cooperatively develop a public education campaign to inform people about what they can do to protect water quality.

Earthquake Hazards Reduction Act. In 1977, the United States Congress passed the Earthquake Hazards Reduction Act, which established the National Earthquake Hazards Reduction Program (NEHRP). When NEHRP was first established, the primary purpose of this program was to improve understanding, characterization, and prediction of earthquakes and associated vulnerabilities. However, in recent years, NEHRP has recently shifted its primary focus to minimizing losses from earthquakes. In order to minimize this risk, NEHRP helps to improve building codes and land use practices, risk reduction through post-earthquake investigations, development of new design and construction techniques, and mitigation. The Federal Emergency Management Agency (FEMA) is the lead agency for NEHRP, and as such, authorizes funding for earthquake preparedness and mitigation programs.

4.5.3.2 State Regulations

Alquist-Priolo Earthquake Fault Zoning Act (1972). Regulations that are applicable to geologic, seismic, and soil hazards include the Alquist-Priolo Earthquake Fault Zoning Act of 1972 and updates (Alquist-Priolo Act, Public Resources Code [PRC], Section 2621, et seq.), State-published Seismic Hazards maps, and provisions of the applicable edition of the California Building Code (CBC). There are no earthquake fault zones established on or in the near vicinity of the project site, and procedures and regulations as recommended by the California Geological Survey (CGS) for investigations conducted in such zones do not specifically apply.

Seismic Hazard Mapping Act (1990). The Seismic Hazard Mapping Act (SHMA) was adopted by the state in 1990 for the purpose of protecting public safety from the effects of (non-surface fault rupture) earthquake hazards. The CGS prepares and provides local governments with seismic hazard zones maps that identify areas susceptible to amplified shaking, liquefaction, earthquake-induced landslides, and other ground failures. The seismic hazards zones are referred to as “zones of required investigation” because site-specific geological investigations are required for construction projects located within these areas. Before a project can be permitted, a geologic investigation, evaluation, and written report must be prepared by a licensed geologist to demonstrate that proposed buildings will not be constructed across active faults. If an active fault is found, a structure for human occupancy must be set back from the fault (generally 50 ft). In addition, sellers (and their

agents) of real property within a mapped Seismic Hazard Zone must disclose that the property lies within such a zone at the time of sale.

California Building Code (2022). California Code of Regulations (CCR), Title 24, Part 2, the CBC, provides minimum standards for building design in the State. It should be noted that while the 2021 Draft EIR referenced the 2019 CBC, this has since been superseded by the 2022 CBC. Local codes are permitted to be more restrictive than Title 24, but not less restrictive. The procedures and limitations for the design of structures are based on site characteristics, occupancy type, configuration, structural system height, and seismic zoning. Construction activities are subject to occupational safety standards for excavation, shoring, and trenching as specified in California Occupational Safety and Health Administration (Cal/OSHA) regulations (CCR, Title 8).

California Health and Safety Code. Sections 17922 and 17951–17958.7 of the California Health and Safety Code require cities and counties to adopt and enforce the current edition of the CBC, including a grading section. The City of Dana Point and the County of Orange, through adoption of the CBC, ensure these provisions are followed (refer to Title 8 of the City’s Municipal Code and Section 7-1-12 of the Orange County Municipal Code). Sections of Volume 2 of the CBC specifically apply to select geologic hazards. The 2022 CBC addresses requirements for seismic safety and regulates excavation, foundations, and retaining walls. The 2022 CBC also contains specific requirements pertaining to site demolition, excavation, and construction.

Public Resources Code Section 5097.5. Public Resources Code (PRC) Section 5097.5 provides for the protection of paleontological resources and prohibits the removal, destruction, injury, or defacement of paleontological features on any lands under the jurisdiction of State or local authorities. PRC Section 5097.5 also protects cultural resources, which are evaluated in Section 4.3, Cultural Resources, of this Revised Draft EIR.

4.5.3.3 Regional Regulations

There are no regional land use policies or regulations that are applicable to Modified Project with respect to geology or soils.

4.5.3.4 Local Regulations

City of Dana Point Municipal Code. The City Council of the City of Dana Point has adopted for the purpose of prescribing regulations for the erection, construction, enlargement, alteration, repair, improving, removal, conversion, demolition, occupancy, equipment, use, height, area and maintenance of all buildings and structures by reference the California Code of Regulations Title 24, Part 2, known and designated as the California Building Code (CBC), 2022 Edition. The purpose of a building code is to provide minimum standards 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 within the City. Building Code provisions apply to the construction, alteration, moving, demolition, repair, and use of any building or structure within the City.

County of Orange Municipal Code. Similar to the City of Dana Point, the County of Orange has adopted the California Building Code, 2022 Edition, for the purpose of prescribing regulations for the

erection, construction, enlargement, alteration, repair, improving, removal, conversion, demolition, occupancy, equipment, use, height, area and maintenance of all buildings and structures.

City of Dana Point General Plan.

Public Safety Element of the City's General Plan. The primary goal of the Public Safety Element (June 1995) of the City's General Plan is to identify features which exist in the City that represent a potential danger to the safety of the citizens, sites and structures, public facilities, and infrastructure. The element also establishes goals and policies to minimize danger to residents.

Goal 1: Reduce the risk to the community from geologic hazards including bluff instability, seismic hazards, and coastal erosion.

Policy 1.1: Require review of soil and geologic conditions by a State-Licensed Engineering Geologist under contract to the City, to determine the stability prior to the approval of development where appropriate. (California Coastal Act [Coastal Act], Sections 30250 and 30253)

Policy 1.12: Specifically review and limit development on lands with seismic, slide, liquefaction, fire, or topographic constraints.

Conservation/Open Space Element of the City's General Plan. The goals and policies of the Conservation/Open Space Element (August 1997) are intended to serve as a guide for preserving natural features that create the desirable character of the area, including protection from erosion and the preservation of the community's historical and cultural assets.

Policy 2.3: Control erosion during and following construction through proper grading techniques, vegetation replanting, and the installation of proposed drainage and erosion control improvements. (Coastal Act, Section 30243)

Policy 8.1: Require reasonable mitigation measures where development may affect historical, archaeological, or paleontological resources. (Coastal Act, Sections 30244 and 30250)

Policy 8.2: Retain and protect resources of significant historical, archaeological, or paleontological value for education, visitor-serving, and scientific purposes. (Coastal Act, Sections 30213, 30250, and 30253)

An analysis of the Modified Project's consistency with the goals and policies of the City's General Plan is provided in Section 4.9, Land Use and Planning, of this Revised Draft EIR.

Local Coastal Program (LCP)/Dana Point Harbor Revitalization Plan and District Regulations. The Dana Point Harbor Revitalization Plan and District Regulations (DPHRP&DR) were certified in October 2011 as a local coastal program amendment (LCPA) replacing in its entirety the Dana Point Harbor Planned Community District Development Plan (DPHCDDP) contained in the County of Orange's 1986 Dana Point Specific Plan/LCP, and replacing any reference to the DPHCDDP in the DPZC. The DPHRP includes policies aimed at achieving the California Coastal Act's goals for the

protection of coastal resources through the location of new development. Because Dana Point Harbor is presently completely built-out, all new development, including the Modified Project, will occur in the form of replacement or in-fill development projects.

Policy 8.2.1-5: Require new development to assure stability and structural integrity and neither create nor contribute significantly to erosion, geologic instability or destruction of the site or surrounding area or in any way require the construction of protective devices that would substantially alter natural landforms along bluffs and cliffs.

Policy: 8.6.7-1: Geotechnical studies are required for developments that are proposed on or adjacent to coastal or inland bluff tops and where geological instability is suspected. (Coastal Act, Section 30253)

Policy 8.6.7-2: Applications for Grading and Building Permits will be reviewed for adjacency to threats from and impacts on geologic hazards arising from seismic events, tsunami run-up, landslides, beach and bluff erosion or other geologic hazards such as expansive soils and subsidence areas. In areas of known geologic hazards, a geologic report shall be required. Require such reports be signed by a licensed Certified Engineering Geologist or Geotechnical Engineer and subject to review and approval by the City. Mitigation measures will be required where necessary.

Policy 8.6.7-3: New development shall:

- a. Minimize risks to life and property in areas of high geologic, flood and fire hazard; and
- b. Assure stability and structural integrity and neither create nor contribute significantly to erosion, geologic instability or destruction of the site or surrounding area or in any way require the construction of protective devices that would substantially alter natural landforms along bluffs and cliffs. (Coastal Act, Section 30253)

Policy 8.6.7-7: Foundation setback requirements will be implemented for proposed Harbor improvements as specified in the geotechnical report. Setback distances will reflect geologic and structural engineering evaluations of the site and recommendations included in the geotechnical report, subject to the review and approval of the County of Orange and the City.

Policy 8.6.7-8: Prior to the issuance of a grading permit, a geotechnical report shall be submitted to the County for approval and shall include the information and be in the form as required by the Orange County Grading Code and Manual.

Policy 8.6.7-9: If cranes and pile-driving equipment are required, adequate setbacks shall be observed from bulkhead areas to prevent failures due to increased lateral and surcharge loads.

Policy 8.6.7-10: Construction work performed within public roadways or public properties adjacent to the Harbor will require compliance with specifications presented in the latest edition of the Standard Specifications for Public Works Construction (the Greenbook).

Policy 8.6.7-11: Further investigation and detailed characterization of the existing fill conditions is required to identify the extent of the potential for liquefaction and include:

- Recommended new building setback distances from the quay wall ranging from 2 to 3 times the height of the bulkhead wall for localized liquefaction and lateral spreading failure to several times the height of the revetment slope and bulkhead system for global seismic instability, to be considered during the planning and design phases of the project;
- Supporting proposed structures on deep foundations extending into bedrock;
- Stiffened floor slab designs;
- Total or partial removal of the potentially liquefiable soils and replacement with compacted fill; and
- Soil remediation and site improvement.

Policy 8.6.7-12: Require applications for new development, where applicable, to include a geologic/soils and geotechnical study that identifies any geologic hazards affecting the proposed development locations, any necessary mitigation measures and contains a statement that the project site is suitable for the proposed development in a manner consistent with the County of Orange Grading and Excavation Code.

Policy 8.6.7-13: Conformance with the latest Uniform Building Code, California Building Code, or International Building Code and County Ordinances can be expected to satisfactorily mitigate the effect of seismic groundshaking. Conformance with applicable codes and ordinances shall occur in conjunction with the issuance of Building Permits in order to ensure that over excavation of soft, broken rock and clayey soils within sheared zones will be required where development is planned.

Policy 8.6.7-14: Engineering design for all structures shall be based on the probability that new structures will be subjected to strong ground motion during the lifetime of development. Construction plans shall be subject to the County review and shall include applicable standards, which address seismic design parameters.

Policy 8.6.7-15: Mitigation of earthquake ground shaking shall be incorporated into the design and construction in accordance with Uniform Building Code requirements and site specific design.

An analysis of the Modified Project's consistency with the policies of the DPHRP is provided in Section 4.9, Land Use and Planning, of this Revised Draft EIR.

4.5.4 Methodology

4.5.4.1 Geology and Soils

To assess the impacts of the Original Project with respect to geologic and soil conditions, an investigation was undertaken by GMU as part of the Preliminary Geotechnical Investigation and associated responses provided in the *Response to City of Dana Point Geotechnical Report Review* (2019b), and the *Response to City of Dana Point Geotechnical Report Second Engineering Review* (2020) both prepared by GMU, as well as the Geotechnical Review (August 2020) prepared by Ninyo & Moore. Further, GMU prepared a letter (Supplemental Geotechnical Letter) on November 5, 2024 (Appendix F to this Revised Draft EIR) evaluating whether the conclusions and recommendations provided in the Preliminary Geotechnical Investigation remain valid under the Modified Project.

The scope of the exploration included a review of published geologic maps and reports, previous geotechnical reports by other geotechnical consultants for the project site and entire harbor area, and a previous report for the existing seawalls, aerial photo review, subsurface exploration program to evaluate the soil conditions within the project limits, laboratory tests, engineering analysis, and report preparation. The Geotechnical Review by Ninyo & Moore provided a third-party peer review based generally on the standards presented in the 2019 California Building Code, which was the most current at the time of the Geotechnical Review's preparation, and standards of practice. It should be noted that at the time of submittal to the County of Orange for building permits, the geotechnical investigation for the Modified Project would have to reflect the requirements of the currently adopted version of the California Building Code (CBC).

Soils and geologic and seismic hazards, as identified in the Preliminary Geotechnical Investigation and all Responses to City of Dana Point Comment documents, were assessed with respect to significance within the context of Appendix G of the Guidelines for the California Environmental Quality Act (*State CEQA Guidelines*). Because the design changes proposed under the Modified Project would not affect the underlying soils and geologic hazards of the project site, the analysis presented below can be applied to the Modified Project as well.

4.5.4.2 Paleontological Resources

The existing paleontological setting of the project site and its vicinity was determined through a review of geologic maps of the project site and relevant geological and paleontological literature, as well as a fossil locality search that was executed through the NHMLAC, conducted in November 2024, during preparation of the Paleontological Resources Memorandum for the Modified Project (Appendix G to this Revised Draft EIR). The existing setting for paleontological resources was also determined through a review of the paleontological resource analysis provided in the Dana Point Harbor Revitalization Project Program EIR (2006) and the fossil locality search conducted at the San Bernardino County Museum for that Program EIR, which covers development within all of Dana Point Harbor, including the project site. The purpose of both locality searches was to identify previously recorded or otherwise known fossil localities in or adjacent to the Dana Point Harbor, which the project site is included in; and to obtain information about the geological setting of the project site and the potential for geological formations underlying the project site for containing fossils.

4.5.5 Thresholds of Significance

The thresholds for geology and soils impacts used in this analysis are consistent with Appendix G of the *State CEQA Guidelines*. The Modified Project may be deemed to have a significant impact with respect to geology and soils if it would:

Threshold 4.5.1: Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:

Threshold 4.5.1(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 evidences of known fault. Refer to Division of Mines and Geological Special Publication 42.

Threshold 4.5.1(ii): Strong seismic ground shaking.

Threshold 4.5.1(iii): Seismic-related ground failure, including liquefaction.

Threshold 4.5.1(iv): Landslides.

Threshold 4.5.2: Result in substantial soil erosion or the loss of topsoil.

Threshold 4.5.3: 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-site or off-site landslides, lateral spreading, subsidence, liquefaction, or collapse.

Threshold 4.5.4: Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating direct or indirect substantial risks to life or property.

Threshold 4.5.5: 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.

Threshold 4.5.6: Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.

The Initial Study prepared for the Original Project in September 2020, included as Appendix B to this Revised Draft EIR, substantiated that there would be no impacts associated with Threshold 4.5.1(i) as the project site was not located within Alquist-Priolo Earthquake Fault Zones, there were no known active earthquake faults within the City, and more precisely, none on the project site.¹ As described above, the nearest known active fault is the offshore segment of the Newport-Inglewood fault, which is located approximately 3.9 kilometers (2.4 miles) southwest of the project site. Therefore, the Original Project was not anticipated to result in any impacts related to the rupture of a known earthquake fault as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning

¹ California Department of Conservation (DOC). 2019. California Earthquake Hazards Zone Application. Website: <https://maps.conservation.ca.gov/cgs/EQZApp/app/> (accessed September 12, 2024).

Map (DOC 2019). In addition, there would be no impact associated with Threshold 4.5.5, as it was anticipated that the Original Project would connect to existing sanitary sewer and wastewater facilities located in the public right-of-way that collect and convey raw sewage and wastewater generated from the project site. As the Original Project would not use septic tanks or alternative waste water disposal systems, there was found to be no impact related to soils incapable of supporting these systems. As the Modified Project would be located in the same geographic location as the Original Project and does not propose the use of a septic tank, the conclusions of the Initial Study prepared for the Original Project remain the same for the Modified Project. Therefore, the aforementioned thresholds will not be addressed in the following analysis.

In addition, it should be noted that Threshold 4.5.4 is included as written in the adopted *State CEQA Guidelines*, which cite the 1994 Uniform Building Code (UBC). The 1994 UBC has since been replaced by the current 2021 International Building Code (IBC), and the currently adopted 2022 CBC has been developed based on the 2021 IBC. The analysis under Threshold 4.5.4 below considers the Original Project's and Modified Project's potential impacts related to expansive soils, as defined by both Section 1803.5.3 of the CBC as well as Table 1-18-B of the 1994 UBC.

4.5.6 Project Impacts

Threshold 4.5.1(ii): Would the project directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving: Strong seismic ground shaking?

Less Than Significant with Mitigation Incorporated. As described above, the project site is subject to strong ground motion resulting from earthquakes on nearby faults. There are several faults near the project site that are capable of producing strong ground motion, including the Newport-Inglewood fault and the San Joaquin Hills Blind Thrust fault. During an earthquake along any of these faults, seismically induced ground shaking would be expected to occur. The severity of the shaking would be influenced by the distance of the site to the seismic source, the soil conditions, and the depth to groundwater. According to the Preliminary Geotechnical Investigation prepared for the Original Project, the peak horizontal ground acceleration (PGA) for the project site was estimated to be 0.67 PGA, and a mean contributing magnitude 6.8 earthquake was the Maximum Considered Earthquake (MCE). The Supplemental Geotechnical Letter prepared for the Modified Project upholds this analysis. This acceleration and magnitude are consistent with other sites in this region of southern California and indicate that strong seismic ground shaking generated by seismic activity is considered a potentially significant impact that may affect the Modified Project.

Mitigation Measures (MM) 4.5-1 and 4.5-2 require the Project Applicant to comply with the recommendations of the project Preliminary Geotechnical Investigation and the most current CBC requirements, which stipulates appropriate seismic design provisions that shall be implemented with project design and construction. Consistent with the Original Project, with implementation of MM 4.5-1 and MM 4.5-2, potential impacts of the Modified Project related to seismic ground shaking would be reduced to a less than significant level.

Threshold 4.5.1(iii): Would the project directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving: Seismic-related ground failure, including liquefaction?

Less Than Significant with Mitigation Incorporated. Liquefaction commonly occurs when three conditions are present simultaneously: (1) high groundwater; (2) relatively loose, cohesionless (sandy) soil; and (3) earthquake-generated seismic waves.

The project site is located with a zone of required investigation for liquefaction as shown on the Seismic Hazard Zone Map for the Dana Point Quadrangle (CGS 2001). A liquefaction evaluation was performed utilizing software and the 2009 Robertson methodology (GMU 2019a) as well as data obtained from the subsurface investigation and drilled borings to perform liquefaction analysis. Although groundwater was encountered at approximately 6 to 20 ft below existing grade during previous and current investigations, a historic high groundwater depth of 5 ft was used in the analysis. The northernmost portion of the site, which would include surface parking, is underlain by formational materials while the southern portion is underlain by surficial soils over formational materials. Seismic settlement on the southern portion of the project site was estimated to be on the order of 3.5 inches.

Based on this analysis, the potential for liquefaction is considered high while the potential for lateral spreading is also considered high along the existing sea wall of the marina. Based on the Geotechnical Review prepared for the Original Project, the preliminary recommendation to build the proposed hotels on 2 ft thick mats should be further evaluated during the final design phase. Mitigating the impact of liquefaction through the use of a ground improvement technique (i.e., geopiers) may prove to be a more robust option for the proposed improvements. MM 4.5-1 would require the Project Applicant to comply with the recommendations of the Preliminary Geotechnical Investigation and the Geotechnical Review. Both the Preliminary Geotechnical Investigation and Geotechnical Review prepared for the Original Project include recommendations for additional investigation and analysis during the final design phase. Compliance with the recommendations of a final design-level geotechnical report would also be required by MM 4.5-1. In addition, MM 4.5-2 would require the Project Applicant to comply the most current CBC requirements (including provisions related to foundation design), which stipulate appropriate seismic design provisions that shall be implemented with design and construction of the Modified Project. Consistent with the Original Project, with implementation of MM 4.5-1 and MM 4.5-2, potential impacts of the Modified Project related to seismically induced ground failure, including liquefaction, would be reduced to a less than significant level.

Threshold 4.5.1(iv): Would the project directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving: Landslides?

Less Than Significant Impact. According to the Preliminary Geotechnical Investigation (GMU 2019a) and associated responses provided in the *Response to City of Dana Point Geotechnical Report Review* (2019b), and the *Response to City of Dana Point Geotechnical Report Second Engineering Review* (2020) both prepared by GMU, as well as the Geotechnical Review (August 2020) prepared by Ninyo & Moore for the Original Project, which included a review of available geologic maps, literature, topographic maps, aerial photographs, and a subsurface evaluation, no landslides or

related features underlie the project site. As noted previously, the Supplemental Geotechnical Letter states that the conclusions and recommendations provided in the Preliminary Geotechnical Investigation remain applicable to the Modified Project. The existing coastal bluffs adjacent to the project site have been mapped where surficial instability and cracking may occur. However, based on the distance between the bluffs and the project site, the potential for landslides to impact the Modified Project is considered very low. Development of the Modified Project would occur entirely within the limits of the project site south of Dana Point Harbor Drive and would not involve construction activities near the adjacent coastal bluffs. Furthermore, as the Modified Project would replace an existing hotel on the site, it would not introduce a new land use that would expose people or structures to hazards for potential landslides that may occur as a result of seismic activity at the adjacent coastal bluffs. Based on the distance between the coastal bluffs and the project site, and the nature of the development of the proposed hotels on a previously developed site, neither construction nor operation of the Modified Project would cause potential substantial adverse effects including loss, injury or death involving landslides. Consistent with the Original Project, impacts related to seismically induced landslides under the Modified Project would be less than significant, and no mitigation is required.

Threshold 4.5.2: Would the project result in substantial soil erosion or the loss of topsoil?

Less Than Significant Impact. During construction activities associated with the Modified Project, soil would be exposed and there would be an increased potential for soil erosion compared to existing conditions due to soil disturbance and the exposure of substantial amounts of soil to weather conditions (e.g., wind and rain). During a storm event, soil erosion could occur at an accelerated rate. The increased erosion potential could result in short-term water quality impacts as identified in Section 4.8, Hydrology and Water Quality, of this Revised Draft EIR. During construction, the Project Applicant would be required to adhere to the requirements of the General Construction Permit and utilize typical BMPs specifically identified in the SWPPP (as required by Standard Condition 4.8-1 [SC 4.8-1]) for the Modified Project in order to prevent construction pollutants from contacting stormwater and to keep all products of erosion from moving off-site into receiving waters. The DPHRP&DR require erosion control plans for all projects within Dana Point Harbor requiring a grading permit, and the County of Orange Municipal Code Section 7-1-836 also requires erosion control plans to be prepared in accordance with Subarticle 13 of the Grading Manual and submitted to the County Building Office for approval. The SWPPP and Erosion Control Plan would detail the BMPs to be implemented during construction. Construction BMPs would include, but not be limited to Erosion Control and Sediment Control BMPs designed to minimize erosion and retain sediment on site and Good Housekeeping BMPs to prevent spills, leaks, and discharge of construction debris and waste into receiving waters. Compliance with the requirements of the requirements of the Construction General Permit, the County of Orange Municipal Code, and the City Municipal Code, would ensure that construction impacts related to erosion would be less than significant under the Modified Project.

The Modified Project would result in an overall decrease in the proportion of impervious surface area within the project site and a subsequent net decrease in stormwater runoff. In addition, a Revised Preliminary Water Quality Management Plan (Revised pWQMP) has been prepared for the Modified Project. The Revised pWQMP includes proposed Site Design BMPs, including: minimizing

impervious area; preserving existing drainage patterns and timing of concentration; disconnecting impervious areas; revegetating disturbed areas; minimizing soil compaction; runoff collection; and water efficient landscaping with native or drought tolerant species. Therefore, the Modified Project would not result in substantial on-site or downstream erosion, siltation, or flooding. Consistent with findings related to the Original Project, impacts from operation of the Modified Project related to erosion would be less than significant, and no mitigation is required.

Threshold 4.5.3: Would the project be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on-site or off-site landslides, lateral spreading, subsidence, liquefaction, or collapse?

Slope Stability.

Less Than Significant with Mitigation Incorporated. As previously stated, no existing landslides are present on or immediately adjacent to the project site. Geologic mapping for the site does not indicate that the site is susceptible to landsliding. In addition, the project site is in a generally flat area with no evidence of historic landslides. Therefore, the potential for seismically induced landslides on site is considered low.

As part of the design of the Modified Project, the building walls of Dana House Hotel would receive planted fill slopes as part of the architectural design. Portions of the fill slopes are anticipated to be constructed at 1.5H:1V (horizontal:vertical) inclination using on-site soil and reinforced with geogrid in order to minimize surficial instability. The recommendations provided in the Preliminary Geotechnical Investigation prepared for the Original Project are based on a surficial stability analysis for 15 ft high geogrid-reinforced fill slopes. In addition, grading would entail cut-and-fill slopes, and construction of retaining walls and below-grade walls would be necessary in some areas. Furthermore, shoring would be required during excavation. Unstable cut-and-fill slopes could create significant short-term and long-term hazards. Mitigation Measure (MM) 4.5-1 requires planned grading and shoring to conform to the recommendations of the Preliminary Geotechnical Investigation, which contains specific recommendations for addressing potential slope instability and geogrid-reinforced fill slopes. Because the Supplemental Geotechnical Letter prepared for the Modified Project upholds the analysis and recommendations presented in the Preliminary Geotechnical Investigation, these recommendations would remain applicable to the Modified Project. Consistent with the Original Project, with implementation of MM 4.5-1, the Modified Project's impacts related to slope instability would be less than significant.

Unsuitable Soils.

Corrosive Soils and Soluble Sulfate Content.

Less Than Significant with Mitigation Incorporated. Corrosive soils contain constituents or physical characteristics that attack concrete (water-soluble sulfates) and/or ferrous metals (chlorides, ammonia, nitrates, low pH levels, and low electrical resistivity). Corrosive soils could potentially create a significant hazard to the Modified Project by weakening the structural

integrity of the concrete and metal used to construct the building and could potentially lead to structural instability. Corrosion testing indicates that the on-site soils have a moderate sulfate exposure level and are corrosive to buried ferrous metals and reinforcing steel. Consequently, any metal exposed to the soil will need protection.

As required by MM 4.5-1, the use of special coatings or cathodic protection around buried metal structures would reduce corrosion potential. Additional provisions will be required to address high chloride contents of the soil per the 2022 CBC to protect the concrete reinforcement. The laboratory testing program performed as part of the Preliminary Geotechnical Investigation does not address the potential for corrosion to copper piping. The Supplemental Geotechnical Letter prepared for the Modified Project also did not include copper piping corrosion analysis. In this regard, a corrosion engineer should be consulted to perform more detailed testing and develop appropriate mitigation measures, if necessary. MM 4.5-2 would also require the Project Applicant to comply with the requirements of the 2022 CBC related to corrosive soils. Consistent with the Original Project, with implementation of MM 4.5-1 and MM 4.5-2, potential impacts of the Modified Project related to corrosive soils would be reduced to a less than significant level.

Settlement Potential.

Less Than Significant with Mitigation Incorporated. The amount of settlement for a site is dependent on the thickness of design fills, the loading conditions, and the nature of the native materials underlying the fill. Potential ground settlement may be separated into three types: (1) hydroconsolidation of unconsolidated soils left in place above the water table, (2) consolidation settlement of compressible soils left in place below the water table, and (3) liquefaction-induced settlement of loose, granular layers below the water table.

Static settlement of the site will be induced by introducing new building loads to existing grades and subsurface soils. The underlying artificial fill and native soils encountered are slightly to moderately compressible under load with low levels of hydro-collapse (based on laboratory testing performed for adjacent sites). However, the geotechnical engineering characteristics of the underlying surficial soils are highly variable.

As described in Threshold 4.5.1(iii), the Preliminary Geotechnical Investigation found that seismic settlements due to liquefaction could be up to 3.5 inches on the project site. Corrective grading would be required to support the proposed improvements under the Modified Project.

Compliance with the recommendations contained in the Preliminary Geotechnical Investigation prepared for the Original Project, which remain applicable to the Modified Project including those related to earthwork activities, such as corrective grading, and foundation design, would be required to reduce potential impacts related to ground settlement under the Modified Project. Consistent with the Original Project, implementation of MM 4.5-1 would reduce potential impacts of the Modified Project with respect to ground settlement to a less than significant level.

Subsidence.

Less Than Significant Impact. The phenomenon of widespread land sinking, or subsidence, is generally related to substantial overpumping of groundwater or petroleum reserves from deep underground reservoirs. Overpumping and excessive groundwater withdrawal have not occurred in the project area. In addition, the project site does not have an oil, gas, or water pump on site and none are located near the site. The project site has not been used for the extraction of these resources. Subsidence is therefore not considered a potential constraint or a potentially significant impact for the Modified Project, similar to the Original Project, and no mitigation is required.

Lateral Spreading.

Less Than Significant with Mitigation Incorporated. The project site has a high potential for lateral spreading due to the free face geometry of the site adjacent to the existing sea wall and harbor and the presence of shallow liquefiable soils with low residual shear strengths. The lateral displacement was analyzed utilizing the MCE seismic loading and indicated that the post-earthquake slope stability safety factors with liquefied residual shear strengths were less than 1.3, indicating the potential for earthquake-induced flow failure. Therefore, there will be a high potential for some lateral movements of these slopes after liquefaction of the soils during the design earthquake. The lateral deformations due to the cyclic mobility of the slopes are estimated to be greater than 90 inches. Therefore, the Modified Project would result in potentially significant impacts related to lateral spreading and mitigation will be required along the southern portion of the site adjacent to the existing sea wall (i.e., such as some type of ground improvement). Compliance with the recommendations contained in the Preliminary Geotechnical Investigation prepared for the Original Project, including the installation of a series of deep soil mixing columns or rammed aggregate piers to reduce lateral deformations to an acceptable range, would be required to reduce potential impacts related to lateral spreading. Consistent with the Original Project, implementation of MM 4.5-1 would reduce potential impacts of the Modified Project with respect to ground settlement to a less than significant level.

Threshold 4.5.4: Would the project be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating direct or indirect substantial risks to life or property?

Less Than Significant with Mitigation Incorporated. Expansive soils contain types of clay minerals that may expand considerably when they are wet or hydrated. Volume changes associated with changes in the moisture content of near-surface expansive soils can cause uplift or heave of the ground when they become wet or, less commonly, cause settlement when they dry out.

As described above, the project site is largely overlaid with artificial fill. Site soils within the foundation influence zone are anticipated to have a low-to-medium expansion potential based on GMU's recent laboratory test results and local experience. The Preliminary Geotechnical Investigation prepared for the Original Project, which is still applicable to the Modified Project per the Supplemental Geotechnical Letter, contains specific construction recommendations for building

foundations and other structural design elements to reduce project impacts associated with expansive soils to a less than significant level. These recommendations are upheld by the Supplemental Geotechnical Letter prepared for the Modified Project. MM 4.5-1 incorporates the recommendations in the Preliminary Geotechnical Investigation related to expansive soils, including the use of mat foundations or geopier-supported foundations and the use of on-site soil material for trench backfilling. Therefore, as with the Original Project, adherence to MM 4.5-1 would reduce impacts of the Modified Project related to expansive soils to a less than significant level.

Threshold 4.5.6: Would the project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

Less Than Significant Impact. The paleontological resources analysis contained in the 2021 Draft EIR relied upon the Paleontology Literature and Records Review obtained from the San Bernardino County Museum for the Dana Point Harbor Revitalization Project Program EIR (2006). However, as described above, a Paleontological Resources Memorandum was prepared for the Modified Project by LSA in November 2024 (Appendix G to this Revised Draft EIR). Preparation of this report involved geological and paleontological literature review as well as a fossil locality search through the NHMLAC to determine the status and extent of previously recorded paleontological resources within and surrounding the project site.

The results of the updated literature review determined that there are no known fossil localities within the project site boundaries. However, this search noted several fossil localities in the vicinity of the project site within sediments similar to those found underlying the project site. Further, the Paleontology Literature and Records Review obtained from the San Bernardino County Museum for the Dana Point Harbor Revitalization Project Program EIR (2006) indicates that Dana Point Harbor, including the project site, is underlain by sediment that have yielded fossil remains of foraminifera, mollusks, echinoids, and marine vertebrates including sharks and whales. As described above, the results of the Geotechnical Investigations conducted for the Original Project have shown that the project site is underlain by artificial fill and marine deposits, which in turn overlie bedrock of the Capistrano Formation (see Appendix F, Geotechnical Investigations [GMU], to this Revised Draft EIR). The depths of these materials vary slightly under each proposed hotel but generally, most of the area of disturbance is underlain by approximately 15 to 30 ft of surficial soils consisting of artificial fill atop marine deposits. A small area near Dana Point Harbor Drive has no fill and consists of the Capistrano Formation only. As described in Chapter 3.0, Project Description, excavation depths for the hotel would range up to 3 ft, and excavation for utility trenching may extend up to 10 ft. Therefore, construction activities are not anticipated to include excavation depths that have the potential to reach the Capistrano Formation underlying these surficial soils.

Because the updated NHMLAC search conducted for the Modified Project found fossil localities in the vicinity of the project site within soils similar to those contained on site, there is a potential to encounter paleontological resources during ground-disturbing activities under the Modified Project. Therefore, the Modified Project would be subject to paleontological monitoring requirements, as provided in Standard Condition 4.5-1 (SC 4.5-1). With implementation of SC 4.5-1, impacts to paleontological resources would be less than significant under the Modified Project, consistent with the determination regarding the Original Project. No mitigation is required.

4.5.7 Level of Significance Prior to Mitigation

The Modified Project would result in potentially significant impacts with respect to strong seismic ground shaking, ground failure (including liquefaction), slope stability, corrosive soils, ground settlement and expansive soils, without the implementation of applicable mitigation measures.

4.5.8 Standard Conditions of Approval and Mitigation Measures

In addition to the standard condition and mitigation measures provided below, refer to SC 4.8-1 detailed in Section 4.8, Hydrology and Water Quality, of this Revised Draft EIR.

Standard Condition 4.5-1

Paleontological Resource Monitoring. Prior to issuance of any grading permit, the Project Applicant shall provide written evidence that a County of Orange-certified paleontologist has been retained to observe grading activities that may extend to the Capistrano Formation and salvage and catalogue paleontological resources as necessary. The paleontologist shall be present at the pre-grading conference, shall establish procedures for resource surveillance, and shall establish, in cooperation with the Project Applicant, procedures for temporarily halting or redirecting work to permit the sampling, identification, and evaluation of the artifacts as appropriate. If paleontological resources are found to be significant, the paleontologist shall determine appropriate actions, in cooperation with OC Parks, the State Office of Historic Preservation (SHPO), and the City of Dana Point, for exploration and/or salvage.

The Project Applicant shall obtain approval of the paleontologist's follow-up report from the Director of OC Parks. The report shall include the period of inspection, an analysis of any artifacts found, and the present repository of the artifacts. Excavated finds shall be made available for curatorial purposes to the County of Orange, or its designee, on a first refusal basis. These actions, as well as final mitigation and disposition of the resources, shall be subject to the approval of the Director of OC Parks.

Mitigation Measure 4.5-1

Incorporation of and Compliance with the Recommendations in the Preliminary Geotechnical Investigation and the Geotechnical Review. All grading operations and construction on the project site shall be conducted in conformance with the recommendations included in the Preliminary Geotechnical Investigation (GMU 2019a), the *Response to City of Dana Point Geotechnical Report Review* (GMU 2019b), the *Response to City of Dana Point Geotechnical Report Second Engineering Review* (GMU 2020), and the Geotechnical Review (Ninyo & Moore 2020). Design, grading, and construction shall be performed in accordance with the requirements of the City of Dana Point (City) Municipal Code, County of Orange (County) Codes, and the California Building Code

(CBC) applicable at the time of grading, appropriate local grading regulations, and the recommendations of the project Geotechnical Consultant as summarized in a final written report. All grading and construction documents shall be subject to review by the Director of the County Public Works Department, or designee, prior to commencement of grading activities. Recommendations in the Preliminary Geotechnical Investigation and the Geotechnical Review include, but are not limited to, the following topics:

- Clearing and Grubbing
- Remedial Grading
- Foundation Design (either Mat Founds or Geopiers/Equivalent Gravel Piers)
- Appurtenant Structures/Retaining Walls
- Screen Walls
- Vehicular Pavement
- Flatwork/Hardscape/Pedestrian Pavers
- Geogrid Reinforced Fill Slopes
- Temporary Excavations
- Shoring
- Lateral Spreading
- Pole Foundations
- Structural Concrete
- Ferrous Metal Corrosion
- Trench Backfill

Final Design-Level Geotechnical Report. Additional site testing and evaluation shall be conducted by the project Geotechnical Consultant to refine and enhance these recommendations during the final design phase. A corrosion engineer shall be consulted to perform more detailed testing and develop appropriate mitigation measures, if necessary. Grading plan review shall also be conducted by the Geotechnical Consultant and the Director of the County Public Works Department, or designee, prior to the start of grading to verify that the recommendations provided in the final design-level geotechnical report have been appropriately incorporated into the project plans. Final design shall be based on testing and analyses of the near-surface soils following the completion of grading. Design, grading, and construction shall be conducted in accordance with the specifications of the Geotechnical Consultant as summarized in a final report based on the California Building Code

(CBC) applicable at the time of grading and building and the County Municipal Code. On-site inspection during grading shall be conducted by the Geotechnical Consultant and the Director of the County Public Works Department to ensure compliance with geotechnical specifications as incorporated into project plans.

Mitigation Measure 4.5-2

California Building Code Compliance and Seismic Standards. Structures shall be designed in accordance with the seismic parameters presented in the 2022 CBC. Prior to issuance of building permits for planned structures, the project Geotechnical Consultant and the Director of the County Public Works Department, or designee, shall review building plans to verify that structural design conforms to the recommendations of the CBC.

4.5.9 Level of Significance after Mitigation

The Modified Project would result in less than significant impacts with respect to geology and soils following implementation of MM 4.5-1 and MM 4.5-2.

4.5.10 Cumulative Impacts

As defined in Section 15130 of the *State CEQA Guidelines*, cumulative impacts are the incremental effects of an individual project when viewed in connection with the effects of past, current, and probable future projects.

For geology and soils, the cumulative study area consists of the area that could be affected by activities of the Modified Project, and the areas affected by other projects whose activities could directly or indirectly affect the geology and soils of the project site. The analysis above indicated no rare or special geological features or soil types on the project site that would be affected by project activities and no other known activities or projects with activities that affect the geology and soils of this site. In addition, the Modified Project, as with all foreseeable projects, would be required to comply with the applicable State and local requirements, including the DPHRP&DR, the Orange County Code, and CBC requirements. Therefore, the Modified Project's contribution to cumulative geotechnical and soil impacts is less than significant.

For paleontological resources, the cumulative study area is the geographical area of the Dana Point Harbor, which is the geographical area covered by the City's General Plan and DPHRP&DR, including all goals and policies included therein. Future development in Dana Point Harbor could include excavation and grading that could potentially affect paleontological resources. The cumulative effect of the Modified Project is the continued loss of these resources. The Modified Project, in conjunction with other development in the City, has the potential to cumulatively impact paleontological resources; however, it should be noted that each development proposal received by the City that requires discretionary approval would be required to undergo environmental review pursuant to CEQA. If there is a potential for significant impacts to paleontological resources, an investigation would be required to determine the nature and extent of the resources and identify appropriate mitigation measures. If subsurface paleontological resources are assessed and/or protected as they are discovered, impacts to these resources would be less than significant. In

addition, the City's General Plan policies would be implemented as appropriate to reduce the effects of additional development within the City. Therefore, the contribution of the Modified Project to the cumulative destruction of known and/or unknown paleontological resources within the City would be less than significant, similar to the Original Project.

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