5.6 GEOLOGY AND SOILS

This section of the Draft Environmental Impact Report (DEIR) evaluates the potential for implementation of the Ontario Ranch Business Park Specific Plan project (proposed project) to impact geological and soil resources, paleontological resources, or unique geologic features in the City of Ontario. The analysis in this section is based in part on the following technical report(s):

- *Geotechnical Feasibility Study Proposed Commercial/Industrial Development*, Southern California Geotechnical, June 4, 2019. (Appendix G1)
- *Results of Additional Infiltration Testing*, Southern California Geotechnical, June 4, 2019. (Appendix G2)
- *Cultural and Paleontological Resources Assessment*, Material Culture Consulting (MCC), September 2018. (Appendix E1)
- NONCONFIDENTIAL - Cultural and Paleontological Resources Survey Results for the Ontario Ranch Business Park Off-sites, in the City of Ontario, San Bernardino County, California, Material Cultural Consulting, November 26, 2019. (Appendix E2)

Complete copies of these studies are included in DEIR Appendices G1, G2, E1, and E2, respectively.

5.6.1 Environmental Setting

5.6.1.1 REGULATORY BACKGROUND

Federal

Earthquake Hazards Reduction Act

The Earthquake Hazards Reduction Act was enacted in 1997 to "reduce the risks to life and property from future earthquakes in the United States through the establishment and maintenance of an effective earthquake hazards and reduction program." To accomplish this, the act established the National Earthquake Hazard Reduction Program (NEHRP), which refined the description of agency responsibilities, program goals, and objectives. NEHRP's mission includes improved understanding, characterization, and prediction of hazards and vulnerabilities; improvement of building codes and land use practices; risk reduction through post-earthquake investigations and education; development and improvement of design and construction techniques; improvement of mitigation capacity; and accelerated application of research results. NEHRP designates the Federal Emergency Management Agency as the lead agency of the program and assigns it several planning, coordinating, and reporting responsibilities. Programs under NEHRP help inform and guide planning and building code requirements such as emergency evacuation responsibilities and seismic code standards.

State

California Alquist-Priolo Earthquake Fault Zoning Act

The California Alquist-Priolo Earthquake Fault Zoning Act was signed into state law in 1972, and amended, with its primary purpose being to mitigate the hazard of fault rupture by prohibiting the location of structures for human occupancy across the trace of an active fault. This act (or state law) was a direct result of the 1971 San Fernando Earthquake, which was associated with extensive surface fault ruptures that damaged numerous homes, commercial buildings, and other structures. The act requires the State Geologist (California Geologic Survey, CGS) to delineate regulatory zones known as "earthquake fault zones" along faults that are "sufficiently active" and "well defined" and to issue and distribute appropriate maps to all affected cities, counties, and state agencies for their use in planning and controlling new or renewed construction. Pursuant to this act and as stipulated in Section 3603(a) of the California Code of Regulations, structures for human occupancy are not permitted to be placed across the trace of an active fault. The act also prohibits structures for human occupancy within 50 feet of the trace of an active fault, unless proven by an appropriate geotechnical investigation and report that the development site is not underlain by active branches of the active fault, as stipulated in Section 3603(a) of the California Code of Regulations. Furthermore, the act requires that cities and counties withhold development permits for sites within an earthquake fault zone until geologic investigations demonstrate that the sites are not threatened by surface displacement from future faulting, as stipulated in Section 3603(d) of the California Code of Regulations.

Seismic Hazard Mapping Act

The Seismic Hazard Mapping Act was adopted by the state in 1990 for the purpose of protecting the public from the effects of nonsurface fault rupture earthquake hazards, including strong ground shaking, liquefaction, seismically induced landslides, or other ground failure caused by earthquakes. The goal of the act is to minimize loss of life and property by identifying and mitigating seismic 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.

California Building Code

Current law states that every local agency enforcing building regulations, such as cities and counties, must adopt the provisions of the California Building Code (CBC) within 180 days of its publication. The publication date of the CBC is established by the California Building Standards Commission, and the code is under Title 24, Part 2, of the California Code of Regulations. The CBC provides minimum standards to protect property and public safety by regulating the design and construction of excavations, foundations, building frames, retaining walls, and other building elements to mitigate the effects of seismic shaking and adverse soil conditions. The CBC contains provisions for earthquake safety based on factors including occupancy type, the types of soil and rock onsite, and the strength of ground shaking with a specified probability at a site. The 2019 CBC took effect on January 1, 2020.Requirements for Geotechnical Investigations

Requirements for geotechnical investigations are included in CBC Appendix J, Grading, Section J104; additional requirements for subdivisions requiring tentative and final maps and for other specified types of structures are

in California Health and Safety Code Sections 17953 to 17955 and in CBC Section 1802. Testing of samples from subsurface investigations is required, such as from borings or test pits. Studies must be done as needed to evaluate slope stability, soil strength, position and adequacy of load-bearing soils, the effect of moisture variation on load-bearing capacity, compressibility, liquefaction, differential settlement, and expansiveness. CBC Section J106 sets forth requirements for inspection and observation during and after grading.

Storm Water Pollution Prevention Plans

Pursuant to the CWA, in 2012, the State Water Resources Control Board issued a statewide general NPDES Permit for stormwater discharges from construction sites (National Pollutant Discharge Elimination System No. CAS000002). Under this Statewide General Construction Activity permit, discharges of stormwater from construction sites with a disturbed area of one or more acres are required to either obtain individual NPDES permits for stormwater discharges or be covered by the General Permit. Coverage by the General Permit is accomplished by completing and filing a Notice of Intent with the State Water Resources Control Board and developing and implementing a Storm Water Pollution Prevention Plan (SWPPP). Each applicant under the General Construction Activity Permit must ensure that a SWPPP is prepared prior to grading and is implemented during construction. The SWPPP must list best management practices (BMPs) implemented on the construction site to protect stormwater runoff and must contain a visual monitoring program; a chemical monitoring program for "non-visible" pollutants to be implemented if there is a failure of BMPs; and a monitoring plan if the site discharges directly to a water body listed on the state's 303(d) list of impaired waters.

California Public Resources Code

The State of California Public Resources Code, Chapter 1.7, Sections 5097.5 and 30244, includes additional state level requirements for the assessment and management of paleontological resources. These statutes require reasonable mitigation of adverse impacts to paleontological resources resulting from development on state lands, define the removal of paleontological "sites" or "features" from state lands as a misdemeanor, and prohibit the removal of any paleontological "site" or "feature" from State land without permission of the jurisdictional agency. These protections apply only to State of California land.

Regional

San Bernardino County Development Code (SBCDC)

SBCDC Section 82.12.010-040 regarding paleontological resources requires an evaluation of potential paleontological resources as part of its CEQA review of proposed projects, and defines the requirement for a qualified paleontologist or technical specialist.

Local

City of Ontario General Plan

The City of Ontario General Plan Safety Element states that Ontario is susceptible to earthquakes, settlement of alluvial deposits, and subsidence. The Safety Element policies ensure that the City is prepared for and will effectively deal with seismic and geologic hazards.

- **Policy S1-1,** ***Implementation of Regulations and Standards***, requires all new habitable structures be designed in accordance with the most recent CBC adopted by the City.

- **Policy S1-2,** ***Entitlement and Permitting Process****,* indicates that the City follows state guidelines and the CBC to determine when development proposals must conduct geotechnical and geological investigations.

- **Policy S1-3,** ***Continual Update of Technical Information***, indicates that the City maintains up-to-date California Geological Survey seismic hazard maps.

- **Policy 1-4,** ***Seismically Vulnerable Structures***, states that the City conforms to state law regarding unreinforced masonry structures.

The City of Ontario General Plan Community Design Element contains the following policies that were developed to meet the City's goals regarding the management of paleontological resources:

- **Policy CD4-1,** ***Cultural Resource Management***, the City updates and maintains an inventory of historic sites and buildings, professional collections, artifacts, manuscripts, photographs, documents, maps, and other archives.

- **Policy CD4-3,** ***Collaboration with Outside Agencies.*** Pursue opportunities to team with other agencies, local organizations, and nonprofits in order to preserve and promote Ontario's heritage.

- **Policy CD4-6,** ***Promotion of Public Involvement in Preservation***. Engage in programs to publicize and promote the City's and the public's involvement in preservation efforts.

- **Policy CD4-7,** ***Public Outreach.*** The City provides opportunities for residents to research and learn about the history of Ontario through the Planning Department, Museum of History and Art, and Ontario and the Robert E. Ellingwood Model Colony History Room.

City of Ontario Municipal Code

The City of Ontario Municipal Code adopts the 2016 California Building Code by ordinance (Section 8-1.01), which is based on the International Building Code (IBC). These regulations provide applicable standards and documentation of requirements found in the California Building Code that address construction of structures and seismic safety. New construction, alteration, or rehabilitation shall comply with applicable ordinances set forth by the City and/or by the most recent City building and seismic codes in effect at the time of project design. In accordance with Section 1803.2 of the 2016 CBC, a geotechnical investigation is required that must evaluate soil classification, slope stability, soil strength, position and adequacy of load-bearing soils, the effect of moisture variation on soil-bearing capacity, compressibility, liquefaction, and expansiveness, as necessary, determined by the City building official. The geotechnical investigation must be prepared by registered professionals (i.e., California Registered Civil Engineer or Certified Engineering Geologist).

5.6.1.2 EXISTING CONDITIONS

Regional Geologic Setting

The project site is part of the Transverse Ranges Geomorphic Province of California. The Transverse Ranges are an east-west series of steep mountain ranges and valleys (CGS 2002). Its eastern extension, the San Bernardino Mountains, has been displaced to the south along the San Andreas Fault and intense north-south compression is squeezing the Transverse Ranges (CGS 2002). As a result, this is one of the most rapidly rising regions on earth. In this region the thickness of Cenozoic petroleum-rich sedimentary rocks have been folded and faulted, making this one of the important oil-producing areas in the United States (CGS 2002).

Project Site

Site Surface Conditions

A geotechnical feasibility study was prepared for the proposed project, which reviewed the existing site soil characteristics and geotechnical feasibility of implementation of the proposed Specific Plan. During the field investigation, existing conditions of the ground surface of the project consisted of turf grass, asphaltic concrete, concrete pavements surrounding the farmhouses and other structures, manure in the cattle pen areas, and exposed soils with sparse native grass and weed growth in the remaining areas. At the time of the surface exploration, standing water was present to a depth of several inches in the planted areas. Additionally, a detention pond is located at the south-central portion of the site with a depth of approximately 3 to 5 feet. The topography of the site generally slopes downward to the south at a gradient of approximately 1 to 2 percent, with some local variations, and grades range from 667 feet above-mean seal level (amsl) in the northern portion of the site to 631 feet amsl at the southern portion.

Near- and Subsurface Conditions

Manure

Manure was present at the ground surface with thickness of 4 to 8 inches below existing site grades. Soils encountered through boring and trenching consist of highly organic soils to depths of 1 to 1.5 feet in thickness; these materials consist of silty fine sands and contain manure and/or other fibrous organic material. The near-surface soils possess low to medium expansion potentials. Additionally, the near surface soils encountered at a boring located in the cattle pen area possess chloride concentrations that can be deleterious to steel in reinforced concrete.

Artificial Fill

Artificial fill soils were encountered at the ground surface or below the manure/topsoil at several of the boring and trench locations. These fill materials extend to depths of 2 to 4.5 feet and consist of loose to medium dense silty fine sands and fine sandy silts, and medium stiff to stiff clayey sands and sandy clays with occasional silty clays. Additional soils classified as possible fill were encountered at the ground surface at one of the boring and trench locations on site. These soils extend to depths of 1.5 to 5.5 feet at the boring and trench locations. The possible fill soils resemble the native alluvial soils at the site but possess a slightly disturbed appearance, which is the reason they have been classified as possible fill.

Alluvium

Native alluvial soils were encountered beneath the fill and possible fill soils at all of the boring and trench locations. The near surface alluvium consists of loose to medium dense silty fine sands to fine sandy silts, fine to medium sands, clayey fine sands and soft to medium stiff fine sandy clays, silty clays, and clayey silts, extending to at least the maximum depth explored of 30 feet below existing site grades.

Groundwater

Free water was not encountered during the drilling for borings conducted for the geotechnical feasibility report. Based on the lack of any water within the borings and the moisture content of site soils, static groundwater is considered to be present at depths of 30 feet or greater. Recent water level data obtained from a State Water Resources Control Board monitoring well approximately 4,200 feet west of the site indicates that the highest groundwater levels range around 83 feet below ground surface (bgs) (SoCalGeo 2019).

Faulting and Seismicity

Fault Zones

The project site is not located within an Alquist-Priolo Earthquake Fault Zone, and no evidence of faulting was identified during the geotechnical investigation. There are no Alquist-Priolo Earthquake Fault Zones within the project area (CGS 2003). The nearest faults to the project site are the Central Avenue Fault and Chino Fault approximately 2.3 miles and 3 miles southwest of the site, respectively (CDC 2015).

There have been no notable earthquakes, of a magnitude of 5.5 or more, affecting the Ontario-Chino region within the last 50 years (SCEDC 2019). The most recent earthquakes were the 1988 and 1990 Upland Earthquakes which occurred at the northwestern portion of Upland had a magnitude of 4.7 and 5.4, respectively (SCEDC 2019).

Surface Fault Rupture

Ground rupture due to a fault movement typically results in a small percentage of total impact caused by an earthquake. Due to the distance of the project site to a known active fault (approximately 2.3- to 3-miles southwest), there is limited potential for surface fault rupture at the site.

Seismic Ground Shaking

Horizontal ground acceleration, which frequently results in widespread damage to structures, is estimated as a percentage of g, the acceleration of gravity. The damage that an earthquake will cause to a structure depends on the earthquake's size, location, distance, and depth; the types of rock and soil at the surface of the site; and the type of construction of the structure.

When comparing the sizes of earthquakes, the most meaningful feature is the amount of energy released. Thus, scientists most often consider seismic moment, a measure of the energy released when a fault ruptures. We are more familiar, however, with scales of magnitude, which measure amplitude of ground motion. The energy released by an earthquake is measured as moment magnitude (Mw). The moment magnitude scale is

logarithmic; therefore, each one-point increase in magnitude represents a 10-fold increase in amplitude of the waves as measured at a specific location and a 32-fold increase in energy. That is, a magnitude 7 earthquake produces 100 times (10 x 10) the ground motion amplitude of a magnitude 5 earthquake.

Geologic Hazards

Liquefaction and Related Ground Failure

Strong ground shaking in sediment layers that are saturated with groundwater may cause them to lose strength and behave as a fluid. Liquefaction near or at the ground surface can result in property damage and structural failure. Surface ground failure usually takes the form of lateral spreading, flow failures, ground oscillation, and/or general loss of bearing strength. Sand boils (injections of fluidized sediment) commonly accompany these types of failure.

Three major factors determine a region's susceptibility to liquefaction:

- Intensity and duration of ground shaking.
- Age and texture of the Alluvial sediments. Generally, the younger, less compacted sediments are more susceptible to liquefaction. The texture of sediment also plays a role. Sand and silty sands deposited in river channels and floodplains tend to be more susceptible to liquefaction than coarser or finer grained alluvial materials.
- Depth to groundwater. Earthquake-induced liquefaction requires that sediments be saturated. In general, groundwater depths shallower than 10 feet to the surface cause the highest liquefaction susceptibility.

The project site is not within a zone of liquefaction susceptibility. The subsurface conditions at the boring locations are not considered to be conducive to liquefaction.

Earthquake-Induced Landslides

The project site has a downward slope to the south at a gradient of 1 to 2 percent, with some local variations. There are no slopes on or near the project site that would cause earthquake-induced landslides.

Expansive Soils

Expansive soils contain substantial amounts of clay that swells when wetted and shrinks when dried; the swelling or shrinking can shift, crack, or break structures built on such soils. The composition of the near surface soils at the site ranges from sands, silty sands, and sandy silts to silty clays, sandy clays, and clayey silts which possess low (expansion index of 21-50) to medium (expansion index of 51-90) expansion potentials based on expansion index test results of 27 to 60.

Subsidence

Subsidence occurs when a large portion of land sinks, 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. Minor

ground subsidence is expected to occur in the soils below the zone of removal, due to settlement and machinery working. The subsidence is estimated to be 0.10 feet.

Corrosive Soils

The near-surface soils are considered corrosive to ferrous metals (metals that contain mostly iron), including ductile iron pipe. Additionally, the near surface soils encountered at a boring located in the cattle pen area possess chloride concentrations which can be deleterious to steel in reinforced concrete (SoCalGeo 2019).

Paleontological Resources

The Specific Plan area is situated in the San Bernardino Basin, adjacent to the Transverse Ranges Geomorphic Province. This Province is comprised of a series of mountain ranges that run transverse to most mountain ranges in southern California – roughly east/west trending. The mountains within the province, including the San Gabriel and San Bernardino mountains to the north and northeast, were uplifted by tectonic activity, and provide a major sedimentary source for the alluvium basins of the adjacent areas. The geologic units underlying the project area are mapped entirely as younger Quaternary alluvium (Qyfa)[1] dating from the late Holocene to Pleistocene. These deposits derived broadly as alluvial fan deposits from the San Bernardino Mountains to the north.

Young Quaternary alluvium (Qyfa) are Holocene to late Pleistocene-aged alluvial fan deposit that typically consists of river and stream derived sediments. The sediments are comprised of slightly consolidated gray-hued arkosic, sandy and gravel-sand deposits derived from local Peninsular Range batholith granitic bodies (Morton 2003).

5.6.2 Thresholds of Significance

According to Appendix G of the CEQA Guidelines, a project would normally have a significant effect on the environment if the project would:

G-1 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.

[1] Young Quaternary alluvium (Qyfa) are Holocene to late Pleistocene-aged alluvial fan deposits that typically consists of river and stream derived sediments. The sediments are comprised of slightly consolidated gray-hued arkosic, sandy and gravel-sand deposits derived from the local Peninsular Ranges batholith granitic bodies.

iv) Landslides.

G-2 Result in substantial soil erosion or the loss of topsoil.

G-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- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse.

G-4 Be located on expansive soil, as defined in Table 18-1B of the Uniform building Code (1994), creating substantial direct or indirect risks to life or property.

G-5 Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water.

G-6 Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

The Initial Study, included as Appendix A, substantiates that impacts associated with the following thresholds would be less than significant:

- Threshold G1 i), iv)
- Threshold G-2
- Threshold G-4
- Threshold G-5

These impacts will not be addressed in the following analysis.

5.6.3 Plans, Programs, and Policies

PPP GEO-1 The project would be required to comply with the California Building Code and the Ontario Municipal Code Section 1803.2, with requires a geotechnical investigation to evaluate soil classification, slope stability, soil strength, position and adequacy of load-bearing soils, the effect of moisture variation on soil-bearing capacity, compressibility, liquefaction, and expansiveness, as necessary, determined by the City building official. The geotechnical investigation must be prepared by registered professionals (i.e., California Registered Civil Engineer or Certified Engineering Geologist.

5.6.4 Environmental Impacts

5.6.4.1 METHODOLOGY

Geotechnical

The subsurface exploration conducted for this project consisted of four (4) borings advanced to depths of 10 to 30± feet below existing site grades. In addition to the four borings, a total of four (4) trenches were excavated at the site to depths of 4 to 12± feet below existing site grades.

These trenches were excavated using a backhoe with a 36-inch wide bucket. All of the borings and trenches were logged during excavation by geotechnical staff. The trenches were excavated using a rubber tire backhoe with a 24-inch wide bucket. Three of the borings, Boring Nos. B-1 through B-3, inclusive, were advanced with hollow-stem augers, by a limited access track-mounted drilling rig. One boring, Boring No. B-4, was advanced utilizing manually operated augering equipment. Representative bulk and relatively undisturbed soil samples were obtained during drilling and trenching. Relatively undisturbed samples were taken with a split barrel "California Sampler" containing a series of one inch long, 2.416± inch diameter brass rings. This sampling method is described in ASTM Test Method D-3550. Samples were also taken using a 1.4± inch inside diameter split spoon sampler, in general accordance with ASTM D-1586. Both of these samplers were driven into the ground with successive blows of a 140-pound weight falling 30 inches. The blow counts obtained during driving are recorded for further analysis. Bulk samples were collected in plastic bags to retain their original moisture content. The relatively undisturbed ring samples were placed in molded plastic sleeves that were then sealed and transported to our laboratory.

The approximate locations of the borings and trenches are indicated on the Boring and Trench Location Plan, included as Plate 2 in Appendix A of the geotechnical report (Appendix G1 of this DEIR). The Boring and Trench Logs, which illustrate the conditions encountered at the boring and trench locations, as well as the results of some of the laboratory testing, are included in Appendix B of the geotechnical report (Appendix G1 of this DEIR).

Paleontological Resources

MCC conducted thorough background research and analysis, including geologic map and literature reviews, and previous locality data searches, to evaluate the paleontological sensitivity of the project area. Specifically, MCC conducted a paleontological records search with the Natural History Museum of Los Angeles County (LACM). The record search included a one-mile radius around the Specific Plan area, as well as the Specific Plan area itself, and identified any vertebrate localities in the museum's records that exist near the study area in the same or similar deposits.

MCC also conducted a field survey of the off-site infrastructure improvement areas. Brian Waldo, MCC Archaeologist and cross-trained Paleontologist, conducted the survey of the proposed off-site areas on November 15, 2019. The survey consisted of walking in parallel transects spaced at approximately 15-meter intervals while closely inspecting the ground surface. The type of sediment and land formations were also noted in order to assess the potential for paleontological sensitivity. Existing ground disturbances (e.g. cutbanks, ditches, animal burrows, etc.) were also visually inspected to get a sense of subsurface deposits and soil horizons.

5.6.4.2 IMPACT ANALYSIS

The following impact analysis addresses thresholds of significance for which the Initial Study disclosed potentially significant impacts. The applicable thresholds are identified in brackets after the impact statement.

Impact 5.6-1: Project occupants would be subject to strong ground shaking, however, project development would not subject people or structures to seismic-related ground failure including liquefaction. [Threshold G-1ii and iii])

Surface Fault Rupture

The project site is not within an Alquist-Priolo Earthquake Fault Zone, and no evidence of faulting was identified during the geotechnical investigation (SoCalGeo 2019). The project site is not subject to surface rupture of a known active fault, as the nearest faults to the site are approximately 2.3- to 3-miles southwest. The possibility of significant fault rupture on the site is considered to be low (SoCalGeo 2019). Therefore, impacts would be less than significant.

Ground Shaking

Southern California is considered a seismically activity region and regional vicinity of the project site contains a number of known earthquake faults. As part of the geotechnical report, 2016 California Building Code Seismic Design Parameters were generated for future structural improvements within the Specific Plan area. Structures for human occupancy must be designed to meet or exceed 2016 CBC standards for earthquake resistance. The CBC contains provisions for earthquake safety based on factors including occupancy type, the types of soil and rock onsite, and the strength of ground motion with a specified probability at the site. Therefore, future development of habitable structures within the site would be conducted in accordance with the 2016 CBC Seismic Design Parameters generated as part of the geotechnical report, which would reduce impacts from seismic ground shaking to a less than significant level.

Liquefaction

Liquefaction occurs when saturated fine-grained sands or silts lose their strengths during an earthquake and behave as a liquid. Three main factors contribute to susceptibility to liquefaction: 1) shallow groundwater; 2) low density non-cohesive (granular) soil; and 3) strong ground shaking. According to the geotechnical report, the project site is not within a zone of liquefaction susceptibility and the subsurface conditions at the boring locations are not considered to be conducive to liquefaction (SoCalGeo 2019). Liquefaction potential under the site is low due to the depth to groundwater and the mix of soil type and is not considered to be a design concern for the proposed project. Therefore, project development would not subject people or structures to liquefaction hazards, and impacts would be less than significant.

Level of Significance Before Mitigation: With construction of structural improvements in accordance with the Specific Plan, the CBC and PPP GEO-1, Impact 5.6.-1 would be less than significant.

Impact 5.6-2: Unstable geologic unit or soils conditions would not result from development of the project. [Threshold G-3]

Lateral Spreading and Subsidence

As discussed in Impact 5.6-1, above, liquefaction is not considered to be a design concern for the proposed project, and potential for lateral spreading would be low (SoCalGeo 2019).

The major cause of ground subsidence is the excessive withdrawal of groundwater. Based on the conditions encountered in the borings and trenches conducted for the geotechnical report groundwater was not observed within 30 feet of the ground surface, and recent water level data obtained from a State Water Resources Control Board indicates that the highest groundwater levels range around 83 feet bgs in the vicinity of the project site (SoCalGeo 2019). Therefore, based on anticipated groundwater depths, it is not expected that groundwater would affect excavations for the foundations and utilities (SoCalGeo 2019). However, minor subsidence is expected to occur in the soils below the zone of soil removal, due to settlement and machinery working; the subsidence is estimated to be 0.10 feet (SoCalGeo 2019).

The geotechnical report provides recommendations to support the proposed structures and offset impacts from subsidence of 0.10 feet such as scarification and air drying of over-excavated materials to obtain a stable subgrade. The City of Ontario adopts the California Building Code by reference and PPP GEO-1 requires compliance with the recommendations of the geotechnical report. Therefore, with implementation of PPP GEO-1, the project applicant would comply with the recommendations of the geotechnical report and impacts from potential subsidence of 0.10 feet would be reduced to a less than significant level.

Consolidation and Collapsible Soils

Collapsible soils shrink upon being wetted and/or subjected to a load. Selected soil samples were tested to determine their consolidation potential, and their potential for collapse of heave. As the existing fill soils and the upper portion of the near surface alluvium are not considered suitable for support of new structures, remedial grading would be necessary (SoCalGeo 2019). The recommended remedial grading would remove the existing undocumented fill soils as well as a portion of the near-surface native alluvium and replace these materials as compacted structural fill (SoCalGeo 2019). The native soils that would remain in place below the recommended depth of over excavation would not be subject to significant load increases from the foundations of the proposed buildings (SoCalGeo 2019). Provided the recommended remedial grading is completed in accordance with the geotechnical report, post-construction settlements of the proposed structures are expected to be within tolerable limits. Therefore, development of the proposed improvements would result in a less than significant impact with implementation of PPP GEO-1.

Level of Significance Before Mitigation: With incorporation of PPP GEO-1, impacts would be less than significant.

Impact 5.6-3: The proposed project could directly or indirectly destroy a unique paleontological resource or site or unique geologic feature. [Threshold G-6]

The project site currently operates with agricultural uses and is frequently disturbed by human and machine activity. A cultural and paleontological resources assessment was prepared for the proposed project to review the susceptibility of subsurface geologic units to provide paleontological resources as well as review records for fossil localities near the project site. No paleontological resources or unique geologic formations were identified on the project site during the field survey (MCC 2018). A records search within a 1-mile radius of the project site did not yield any fossil localities and there were no fossil localities identified within the project site boundaries. The closest vertebrate fossil locality from similar sediments is located west of Mira Loma, east

of Archibald Avenue along Sumner Road, north of Cloverdale Road, which produced a fossil specimen of a whipsnake at a depth of 9 to 11 feet below the surface (MCC 2018).

The geologic units underlying the project site are mapped entirely as younger Quaternary alluvium (Qyfa) dating from the late Holocene to Pleistocene. While these deposits typically do not contain significant vertebrate fossils within the uppermost layers, it is likely they are underlain in the area by older Quaternary deposits at relatively shallow but unknown depth (MCC 2018). There are nearby localities from similar sedimentary deposits found within the proposed off-site improvement area (MCC 2019). Therefore, the Specific Plan area is considered low to moderate sensitivity for paleontological resources (MCC 2018). The proposed project would require remedial grading to remove all existing undocumented fill soils and near-surface alluvial soils (SoCalGeo 2019). Over excavation to depths of 4 to 6 feet below site grades are anticipated, however, design level investigation could result in additional over excavation requirements (SoCalGeo 2019). Should excavation exceed a depth of 10 feet below surface, there is the potential to encounter paleontological resources. Therefore, grading activities have the potential to encounter unknown, buried resources, and impacts are considered potentially significant.

Level of Significance Before Mitigation: Potentially significant impact.

5.6.5 Cumulative Impacts

Geology and soils impacts are site-specific and generally do not combine to result in cumulative impacts. Similar to the proposed project, future development projects would be required to comply with applicable state and local building regulations, including the CBC. Site-specific geologic hazards would be addressed in each project's geotechnical investigation. Therefore, no significant cumulative impact would occur.

Additionally, other projects in the area would involve ground disturbance and could damage paleontological resources that could be buried in those project sites. As with the proposed project, other projects would require site specific paleontological analysis that could lead to mitigation requiring monitoring and recovery, identification, and curation of any resources discovered. Cumulative impacts to paleontological resources would be less than significant, and project contribution would not be cumulatively considerable.

5.6.6 Level of Significance Before Mitigation

Upon implementation of regulatory requirements and standard conditions of approval, some impacts would be less than significant: 5.6-1 and 5.6-2.

Without mitigation, these impacts would be **potentially significant**:

- **Impact 5.6-3** Grading activities have the potential to encounter buried paleontological resources at depths below 10 feet.

5.6.7 Mitigation Measures

Impact 5.6-3

GEO-1 The project applicant shall retain an on-call paleontologist to prepare a Paleontological Resources Impact Mitigation Program consistent with the guidelines of the Society of Vertebrate Paleontology. The report shall include the methods that will be used to protect paleontological resources, as well as procedures for monitoring, fossil preparation and identification, curation into a repository, and preparation of a report at the conclusion of grading. Excavation and grading activities at a depth of 10 feet below surface or within areas of older Quaternary deposits, shall require a full-time paleontological monitor. If paleontological resources are encountered during the course of ground disturbance, the paleontological monitor shall have the authority to temporarily redirect construction away from the area of the find in order to assess its significance. In the event that paleontological resources are encountered when a paleontological monitor is not present, work in the immediate area of the find shall be redirected, and a paleontologist should be contacted to assess the find for significance. If determined to be significant, the fossil shall be collected and prepared to the point of identification, identified to the lowest taxonomic level possible, cataloged, and curated into the permanent collections of a museum repository. At the conclusion of curation, a report of findings shall be prepared to document the results of the monitoring program.

5.6.8 Level of Significance After Mitigation

Because fossils may be present at depths greater than 10 feet below the existing ground surface, paleontological monitoring in these areas is required. Mitigation Measure GEO-1 would require a paleontological monitor to ensure that any paleontological finds are properly excavated and preserved and that grading is halted to assess the find for significance. With the implementation of Mitigation Measure GEO-1, potential impacts associated with paleontological resources would be less than significant. Therefore, no significant unavoidable adverse impacts relating to paleontological resources have been identified.

5.6.9 References

California Department of Conservation (CDC). 2015. Fault Activity Map of California (2010). http://maps.conservation.ca.gov/cgs/fam/.

California Geological Survey (CGS). 2002, December. Note 36: California Geomorphic Provinces. https://www.conservation.ca.gov/cgs/Documents/Publications/Note_36.pdf.

_____. 2003, May 1. Earthquake Zones of Required Investigation Prado Dam Quadrangle. http://gmw.conservation.ca.gov/SHP/EZRIM/Maps/PRADO_DAM_EZRIM.pdf.

Material Culture Consulting (MCC). 2018, September. Cultural and Paleontological Resources Assessment.

———. 2019, November 26. NONCONFIDENTIAL - Cultural and Paleontological Resources Survey Results for the Ontario Ranch Business Park Off-sites, in the City of Ontario, San Bernardino County, California.

Morton, M. J. 1984. *California Archaeology*. New York: Academic Press.

Southern California Earthquake Data Center (SCEDC). 2019. Significant Earthquakes and Faults: Chronological Earthquake Index. http://scedc.caltech.edu/significant/.

Southern California Geotechnical (SoCalGeo). 2019, June 4. Geotechnical Feasibility Study. Proposed Commercial/Industrial Development NEC Grove Avenue and Merrill Avenue, Ontario, California.

US Geological Survey (USGS). 2017, March 15. The Modified Mercalli Intensity Scale. http://earthquake.usgs.gov/learn/topics/mercalli.php.

Wald, David J., et al. 1999, August. Relationships Between Peak Ground Acceleration, Peak Ground Velocity, and Modified Mercalli Intensity in California. *Earthquake Spectra* 15, no. 3.

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