3.1.2 Geology/Soils

This section describes the existing geologic and soils conditions within the Project site and vicinity, identifies regulatory requirements and industry standards associated with geologic and soils issues, and evaluates potential impacts and attenuation measures (as applicable) related to implementation of the Proposed Project. Geotechnical investigations were undertaken on the Project site by Geocon (2015a). Relevant portions of the Project geotechnical investigations are summarized below along with other pertinent information, with the complete geotechnical report included in Appendix I of this EIR.

3.1.2.1 *Existing Conditions*

Regional Geology/Topography

The Project site is located within the Peninsular Ranges Geomorphic Province, a region characterized by northwest-trending structural blocks and intervening fault zones. Typical lithologies in the Peninsular Ranges include a variety of igneous intrusive (i.e., formed below the surface) rocks associated with the Cretaceous (between approximately 65 and 135 million years old) Southern California Batholith (a large igneous intrusive body). These igneous bodies are typically intruded into older metavolcanic and/or metasedimentary units in western San Diego County. Basement rocks in the coastal portion of San Diego County are locally overlain by a sequence of primarily Tertiary (between approximately 2 and 65 million years old) marine and non-marine sedimentary strata, with most of these deposits associated with several sea level advance/retreat cycles over approximately the last 55 million years. The described geologic sequence is locally overlain with Quaternary (less than about two million years old) materials such as alluvium, colluvium, and topsoil.

Topographically, the Peninsular Ranges Province is composed of generally parallel ranges of steep hills and mountains separated by alluvial valleys. More recent uplift and erosion has produced the characteristic canyon and mesa topography present today in much of western San Diego County, as well as the deposition of the noted Quaternary deposits.

Site Geology/Topography

Geologic and surficial units present within the Project site include Cretaceous-age granitic rocks (the Escondido Creek Granodiorite); Quaternary-age alluvium, colluvium and topsoil; and historic (recent) undocumented fill materials (i.e., fill not known to conform to current engineering standards for criteria such as composition and placement methodology). These units (except for topsoils) are depicted on Figure 3.1.2-1, *Geology Map*, with additional descriptions of on-site surficial and formational deposits provided below under the discussion of Stratigraphy.

On-site topography is generally characterized by a broad, relatively gentle valley bottom in the northern and central portions of the site, and moderately steep slopes to the south and northeast. On-site elevations range from approximately 938 feet above mean sea level (amsl) near the southeastern-most property corner, down to 570 feet amsl along portions of the northern site boundary. Surface drainage is primarily to the north and northwest (with some local variability based on topography), with all flows from the site entering Escondido Creek (which is located approximately 250 feet north and 1,000 feet west of the site, respectively, at its closest points).

Stratigraphy

Surficial and geologic exposures within or underlying the Project site and vicinity are described below in order of increasing age, with the principal units shown on Figure 3.1.2-1.

Undocumented Fill (Map Symbol Qudf)

Fill deposits within the Project site include three relatively small fill embankments located along the southwestern, northern, and southeastern site boundaries. Fill materials along the southwest and eastern boundaries are apparently associated with existing horse corrals and a previous containment structure, with fill in the northern area of unknown origin (and assumed to be undocumented, Geocon 2015a).

Topsoils (not mapped)

Topsoils blanket the majority of the site and extend to maximum depths of approximately 1 foot in tested locations (Geocon 2015a). Topsoil mapping within the Project site and vicinity has been conducted by the U.S. Natural Resources Conservation Service (NRCS, formerly the U.S. Soil Conservation Service [SCS], 1973). Mapped soils within the Project site include six soil series encompassing nine individual soil types. These soils are generally characterized as loams and sandy loams, with a summary of soil series locations and features provided in Table 3.1.2-1, *Description of On-site Soil Characteristics*.

Alluvium (Map Symbol Qal)

Quaternary alluvial materials occur within a number of drainage courses located throughout the Project site. These deposits generally consist of relatively loose (unconsolidated) to medium dense, silty sands, with varying amounts of gravel and cobbles derived from bedrock units. The maximum observed depth of alluvial deposits was approximately 19 feet in the east-central portion of the site, with some of the deeper alluvial materials exhibiting higher levels of consolidation.

Colluvium (Map Symbol Qc)

Colluvial materials are deposited by gravity and are present along the base of most on-site hillsides located above alluvial drainages. These deposits typically consist of loose sandy clays and clayey sands, with cobbles and occasional boulders (and most larger rocky materials more angular in nature than those associated with alluvium). The maximum observed depth of colluvium is approximately 21.5 feet in the east-central portion of the site, with more highly cemented colluvium in the eastern portion of the site. These consolidated materials occur both surficially and at depth, and consist of dense silty to clayey sands and gravel.

Escondido Creek Granodiorite (Map Symbol Ke)

The Cretaceous-age Escondido Creek Granodiorite (granitic rock) is present throughout the site, and occurs as both surface exposures and underlying bedrock beneath the described surficial materials. These rocks exhibit a variable weathering pattern ranging from completely weathered/decomposed granite to areas of fresh and very hard granitic bedrock.

Groundwater

Shallow groundwater seepage was encountered in alluvial deposits during a 2005 subsurface geotechnical exploration in the northern, northwestern, and northeastern portions of the site. Moderate groundwater seepage was observed at a depth of 16 feet below surface grade in the northern site area (Trench T-4 on Figure 3.1.2-1), with sediments below this level observed to be saturated (to a depth of 17.5 feet, where the trench was terminated). Minor seepage was also observed at depths of 4 and 6 feet (respectively) in the northwestern (Trench T-10) and northeastern (Trench T-16) portions of the site (refer to Figure 3.1.2-1). No deeper saturation was observed, within these trenches, which extend to maximum depths of 13 and 8 feet, respectively. These occurrences were interpreted as resulting from above average precipitation (T-10 and T-16) and associated heavy flow in Escondido Creek (T-4), with seasonal variations in groundwater seepage anticipated locally, particularly in areas proximal to Escondido Creek. Groundwater seepage was not observed in other portions of the site during geotechnical investigation, and no shallow permanent groundwater was observed (or anticipated to occur) within or adjacent to the site (Geocon 2015a).

Structure/Seismicity

The Project site is located within a broad, seismically active region characterized by a series of northwest-trending faults associated with the San Andreas Fault System. No active or potentially active faults, County-designated Near-Source Shaking Zones, California Geological Survey (CGS) Alquist-Priolo Earthquake Fault Zones, or County Special Study Fault Zones are mapped or known to occur within or adjacent to the Project site (CGS 2010, 2007; County 2007d). The closest active fault structures are located within the Newport-Inglewood and Rose Canyon Fault Zone, approximately 13 miles to the west (Table 3.1.2-2, *Summary of Regional Fault Locations and Seismicity Data*). Active faults are defined as those exhibiting historic seismicity or displacement of Holocene (less than approximately 11,000 years in age) materials, while potentially active faults have no historic seismicity and displace Pleistocene (between approximately 11,000 and 2 million years old) but not Holocene strata. The described CGS and County fault zone designations are generally intended to "[r]egulate development near active faults so as to mitigate the hazard of surface fault rupture" (CGS 2007). The closest seismic hazard designations to the Project site are CGS Earthquake Fault Zones located along onshore sections of the Newport-Inglewood and Rose Canyon Fault Zone approximately 18 miles to the southwest.

A seismic hazard analysis was conducted to estimate the maximum earthquake magnitudes and associated peak horizontal ground acceleration (PGA, or ground shaking) values associated with proximal active faults. This analysis included both deterministic and probabilistic evaluations, with the deterministic method encompassing distance/magnitude data to produce ground acceleration values for individual faults, while the probabilistic model generates a percentage probability of exceeding a ground acceleration value within a designated time period. The results of the deterministic analysis are summarized in Table 3.1.2-2, with an associated maximum on-site PGA value of 0.24g (where g equals the acceleration due to gravity) identified for the Project site in association with a magnitude 7.5 event along proximal segments of the Newport-Inglewood and Rose Canyon Fault Zone. The probabilistic evaluation identified onsite PGA values with a 10 percent chance of being exceeded in a 50-year period ranging from 0.24 to 0.3g

(Geocon 2015a). These estimated acceleration values, along with other applicable seismic considerations such as motion frequency/duration and International Building Code/California Building Code (IBC/CBC) design criteria, are used to evaluate related site-specific hazards such as liquefaction. Additional information on IBC/CBC criteria and associated Project seismic considerations is provided below under the discussion of *Regulatory Setting*, as well as in Section 3.1.2.2, below, and Appendix I.

The Project site, like all of San Diego County, is located within a Seismic Zone 4 designation. Seismic Zone 4 is the highest risk category of the four nationwide seismic zones, and is generally defined as exhibiting a 10 percent chance of experiencing an earthquake-generated peak ground acceleration of 0.4g within the next 50 years. For comparison purposes, Seismic Zone 1 (the lowest risk category) exhibits a 10 percent chance of experiencing an earthquake-generated peak ground acceleration of 0.1g within the next 50 years. As noted above, the identified PGA values for the Project site (0.24 to 0.3g) are lower than the 10 percent recurrence ground acceleration level noted for Seismic Zone 4 (0.4g)

Regulatory Setting

Development of the Proposed Project is subject to a number of regulatory requirements and industry standards related to potential geologic hazards. These requirements and standards typically involve measures to evaluate risk and mitigate potential hazards through design and construction techniques. Specific guidelines encompassing geologic criteria that may be applicable to the design and construction of the Proposed Project include: (1) the San Diego County General Plan Safety Element (2011a); (2) the County Guidelines for Determining Significance – Geologic Hazards (2007d); (3) Title 8, Division 4 (Design Standards and Performance Requirements) and Division 7 (Excavation and Grading), and Title 5, Division 1 (Amendments to the State Building Standards Code) of the County Code of Regulatory Ordinances; (4) the International Code Council, Inc. (ICC) IBC (2012 or most recent update), and the related CBC (California Code of Regulations, Title 24, Part 2, Volumes 1 and 2, 2013 or most recent update); and (5) the Greenbook Committee of Standard Specifications for Public Works Projects (2012 or most recent update). Regulatory requirements related to potential erosion and sedimentation effects (e.g., under the NPDES Construction General Permit) are discussed in Section 3.1.5, *Hydrology/Water Quality* of this EIR, due to their relationship to water quality issues. Summary descriptions of the listed geologic standards are provided below, with specific elements applicable to the Proposed Project discussed in Section 3.1.2.2.

Local

The San Diego County General Plan Safety Element is intended to identify and evaluate seismic hazards in the County, and to provide policies to reduce the loss of life and property damage related to seismic hazards. Associated policies in the Safety Element applicable to the Proposed Project include requirements to minimize risk resulting from seismic hazards and to minimize personal injury and property damage by mudslides, landslides, or rockfalls. The Safety Element requires conformance with applicable laws and standards such as the referenced County Guidelines for Determining Significance – Geologic Hazards, the Alquist-Priolo Act (for Fault-Rupture Hazard Zones), the CBC/IBC, and the Greenbook.

The County Guidelines for Determining Significance – Geologic Hazards provide direction for evaluating environmental effects related to geologic hazards. Specifically, these guidelines address potential adverse effects to life and property (pursuant to applicable CEQA standards) from hazards including fault rupture, ground shaking, liquefaction, landslides, rockfalls, and expansive soils. Significance guidelines are identified for the noted issues, as well as related regulatory standards, impact analysis methodologies, potential attenuation/design strategies, and reporting requirements.

The County Excavation and Grading requirements are implemented through issuance of grading permits, which apply to most projects involving more than 200 cubic yards of material movement (e.g., grading and excavation). Specific requirements for such "Major Grading" efforts include, among other criteria, use of qualified engineering and geotechnical consultants to design and implement grading plans, implementation of appropriate measures related to issues such as manufactured slope design and construction, and conformance with requirements related to issues including erosion and storm water controls.

County Building Code standards related to geotechnical concerns include applicable portions of the CBC and IBC, along with specific County amendments. The County Building Code is implemented through the issuance of building permits, which may encompass requirements related to preparation of soils reports and implementation of structural loading and drainage criteria.

Industry Standards

The IBC (which encompasses the former Uniform Building Code [UBC]) is produced by the ICC (formerly the International Conference of Building Officials) to provide standard specifications for engineering and construction activities. Publication of the *Greenbook*, *the Standard Plans for Public Works Construction*, is under the oversight of Public Works Standards, Inc. (PWSI), a nonprofit mutual benefit corporation whose members include the American Public Works Association, Associated General Contractors of California, and Engineering Contractors Association. The IBC and Greenbook provide standard specifications for engineering and construction activities, including measures to address geologic and soil concerns. Specifically, these measures encompass issues such as seismic loading (e.g., classifying seismic zones and faults), ground motion, engineered fill specifications (e.g., compaction and moisture content), expansive soil characteristics, and pavement design. The referenced guidelines, while not comprising formal regulatory requirements per se, are widely accepted by regulatory authorities and are routinely included in related standards such as municipal grading codes. The IBC and Greenbook guidelines are regularly updated to reflect current industry standards and practices, including criteria such as the American Society of Civil Engineers (ASCE) and ASTM International.

The CBC standards encompass a number of requirements related to geologic issues. Specifically, these include general provisions (Chapter 1); structural design, including soil and seismic loading (Chapters 16/16A); structural tests and special inspections, including seismic resistance (Chapters 17/17A); soils and foundations (Chapters 18/18A); concrete (Chapters 19/19A); masonry (Chapters 21/21A); steel (Chapters 22/22A), wood, including consideration of seismic design categories (Chapter 23); construction safeguards (Chapter 33); and grading, including excavation, fill, drainage, and erosion control criteria (Appendix J of the CBC). The CBC encompasses standards from other applicable sources, including the IBC and ASTM International, with appropriate amendments and modifications to reflect site-specific conditions and requirements in California.

3.1.2.2 *Analysis of Project Effects and Determination as to Significance*

Fault Rupture

Guidelines for the Determination of Significance

A significant geologic impact would occur if:

1. The Project proposes any building or structure to be used for human occupancy within 50 feet of the trace of an Alquist-Priolo fault or County Special Study Zone fault.

2. The Project proposes the following uses within an Alquist-Priolo Zone which are prohibited by the County:

    a. Uses containing structures with a capacity of 300 people or more. Any use having the capacity to serve, house, entertain, or otherwise accommodate 300 or more persons at any one time.

    b. Uses with the potential to severely damage the environment or cause major loss of life. Any use having the potential to severely damage the environment or cause major loss of life if destroyed, such as dams, reservoirs, petroleum storage facilities, and electrical power plants powered by nuclear reactors.

    c. Specific civic uses. Police and fire stations, schools, hospitals, rest homes, nursing homes, and emergency communication facilities.

Guidelines Source

These guidelines are based on the County Guidelines for Determining Significance – Geologic Hazards (2007d).

Analysis

Seismic fault (or ground) rupture is the physical surface or near surface displacement resulting from earthquake-induced movement (typically along a fault structure). No known active or potentially active faults, or associated Alquist-Priolo/County Special Study Zones, are mapped or known to occur within or adjacent to the Project site, with the closest active fault located approximately 13 miles to the west along the Newport-Inglewood and Rose Canyon Fault Zone (refer to Table 3.1.2-2). The closest fault zone designations include an Alquist-Priolo Earthquake Zone approximately 18 miles to the southwest along a section of the Newport-Inglewood and Rose Canyon Fault Zone in La Jolla, while the closest County Special Study Zone is located along the Elsinore Fault Zone approximately 20 miles to the northeast (CGS 2010, 2007; County 2007d). Accordingly, Project-related impacts associated with seismic ground rupture or the placement of prohibited uses within an Alquist-Priolo Earthquake Fault Zone or County Special Study Zone would be **less than significant.**

<u>Seismic Ground Acceleration (Ground Shaking)</u>

Guideline for the Determination of Significance

A significant geologic impact would occur if:

3. The Project is located within a County Near-Source Shaking Zone or within Seismic Zone 4 and the Project does not conform to the International Building Code (IBC, which encompasses the former UBC).

Guideline Source

This guideline is based on the County Guidelines for Determining Significance – Geologic Hazards (2007d).

Analysis

Seismically generated ground shaking typically represents the most substantial hazard associated with earthquakes, and can affect the integrity of surface and subsurface facilities such as structures, foundations and utilities. Specifically, associated potential effects can occur directly from vibration-related damage to rigid structures, or indirectly through associated hazards including liquefaction (as described below). While the Project site is not located within or adjacent to a County Near-Source Shaking Zone (County 2007d), it is within a Seismic Zone 4 designation as previously described.

Based on the Project geotechnical analyses outlined above in Section 3.1.2.1, the estimated maximum on-site peak ground acceleration values range from approximately 0.24 to 0.3g, which are lower than the 10 percent recurrence ground acceleration level noted above for Seismic Zone 4 (i.e., 0.4g). These ground shaking levels could potentially result in damage to Proposed Project facilities such as structures, foundations, and utilities. Accordingly, the Project geotechnical investigations recommend that seismic design considerations, including the frequency/duration of motion and the soil conditions underlying the site, should be incorporated into the Project design, pursuant to applicable regulatory/industry standards and related guidelines currently adopted by the County of San Diego. Appendix I identifies a number of specific seismic design criteria to address the noted potential on-site ground shaking hazards, pursuant to applicable criteria in the County Building Code, IBC/CBC, and Greenbook. Specifically, these regulatory measures would involve incorporating the noted seismic factors into the design of facilities such as structures, foundations/slabs, pavement and utilities, as well as related activities including remedial grading (e.g., removal and/or reconditioning unsuitable soils), manufactured slope/retaining wall design, site drainage, and proper fill composition/placement. This process would include verification through standard plan review and site-specific geotechnical observations and testing during Project excavation, grading, and construction activities, with these efforts included in the Project description as design considerations (see Table 1-2 of this EIR). Implementation of these standard engineering and construction practices, as well as conformance with applicable regulatory/industry requirements and standards, would effectively avoid or reduce potential seismic ground acceleration hazards to **less than significant levels.**

<u>Liquefaction</u>

Guideline for the Determination of Significance

A significant geologic impact would occur if:

4. The Project site has potential to expose people or structures to substantial adverse effects because:

   a. The Project site has potentially liquefiable soils; and

   b. The potentially liquefiable soils are saturated or have the potential to become saturated; and

   c. In-situ densities are not sufficiently high to preclude liquefaction.

Guideline Source

This guideline is based on the County Guidelines for Determining Significance – Geologic Hazards (2007d).

Analysis

Liquefaction and related effects such as dynamic settlement can be caused by strong vibratory motion, and are most commonly associated with seismic ground shaking. Loose (cohesionless), saturated, and granular (low clay/silt content) soils with relative densities of less than approximately 70 percent are the most susceptible to these effects. Liquefaction results in a rapid pore-water pressure increase and a corresponding loss of shear strength, with affected soils behaving as a viscous liquid. Surface and near-surface manifestations from these events can include loss of support for structures/foundations, excessive (dynamic) settlement, the occurrence of sand boils (i.e., sand and water ejected at the surface), and other related effects such as lateral spreading (horizontal displacement on sloped surfaces as a result of underlying liquefaction).

The Project site is not located within or adjacent to a County Potential Liquefaction Area (County 2007d). Liquefaction potential for the site is characterized as low due to the high density and grain-size distribution of local fill and formational materials, as well as the absence of a permanent water table in most development areas (Geocon 2015a). It should also be noted, however, that two areas of potentially shallow, seasonal groundwater were identified during site investigation (refer to the discussion of Groundwater in Section 3.1.2.1 and Figure 3.1.2-1). A number of standard design and construction measures have been identified that would address any associated liquefaction potential in these (or other) areas, including efforts such as installation of subdrains in appropriate areas to avoid near-surface saturation, removal of unsuitable (e.g., compressible) deposits in areas proposed for development, and replacement of unsuitable materials with engineered fill (i.e., fill exhibiting characteristics such as proper composition, moisture content, application methodology and compaction (Geocon 2015a). In addition, as noted above under the discussion of Ground Shaking, these standard remedial efforts associated with liquefaction and related hazards would be verified through plan review and site-specific geotechnical observations and testing during Project excavation, grading, and construction activities, with these efforts included in the Project description as design considerations (see Table 1-2 of this EIR). Implementation of standard engineering and construction practices, as well as conformance with applicable regulatory/industry standards, would avoid or reduce potential Project-related impacts associated with seismically induced liquefaction and related hazards to **less than significant** levels.

Landslides/Slope Stability

Guidelines for the Determination of Significance

A significant geologic impact would occur if:

5. The Project site would expose people or structures to substantial adverse effects, including the risk of loss, injury, or death involving landslides.

6. The Project is located on a geologic unit or soil that is unstable, or would become unstable as a result of the Project, potentially resulting in an on- or off-site landslide.

7. The Project site lies directly below or on a known area subject to rockfall which could result in collapse of structures.

Guidelines Source

These guidelines are based on the County Guidelines for Determining Significance – Geologic Hazards (2007d).

Analysis

The Project site is not located within or adjacent to any County Landslide Susceptibility Areas (County 2007d), and the Project geotechnical report concludes that there is no evidence of ancient landslide deposits at the site (Geocon 2015a). Additionally, the geotechnical investigations included a stability analysis for manufactured fill slopes, which concludes that: (1) fill slopes constructed with approved material and at a maximum grade of 2:1 (horizontal to vertical) per the Proposed Project design, would exhibit a factor of safety of at least 1.5 as required by current County guidelines (and other related industry standards); and (2) cut slopes with maximum grades of 1.5:1 and maximum heights of 90 feet are anticipated to exhibit factors of safety of at least 1.5 (per current standards).

A number of additional design and construction measures related to cut and fill slope stability are also identified in the report, including standard requirements for proper compaction and surface treatment of fill slopes, height limitations, over-excavation or -blasting for cut slopes in granitic rock (to reach unweathered and stable rock exposures), field observation and design/construction modification where applicable (as noted above under the discussion of Ground Shaking), and use of drought-tolerant landscaping and irrigation controls (refer to Chapter 8.0 of Appendix I;

Geocon 2015a). These standard recommendations are included in the Project description as design considerations (see Table 1-2 of this EIR).

Implementation of standard engineering and construction practices, as well as conformance with County guidelines and other applicable regulatory/industry standards, would avoid or reduce potential Project-related impacts associated with landslides and slope stability to **less than significant levels**.

<u>Expansive Soils</u>

Guideline for the Determination of Significance

A significant geologic impact would occur if:

8. The Project is located on expansive soil, as defined in Section 1803.5.3 of the IBC and CBC (2012 and 2013 Editions, respectively), and does not conform to the IBC and CBC.

Guideline Source

This guideline is based on the County Guidelines for Determining the Significance – Geologic Hazards (2007d).

Analysis

Expansive (or shrink-swell) behavior in soils is attributable to the water-holding capacity of clay minerals, and can adversely affect the integrity of facilities such as foundations, pavement, and underground utilities. Soil conditions encountered on site range from very low expansive silty sands, to potentially highly expansive topsoil, alluvium and/or colluvium containing clay materials. Specifically, several mapped on-site soils exhibit moderate or high expansion potential (refer to Table 3.1.2-1), and the Project geotechnical investigations identify the presence of clay soils in alluvium and note that observed colluvial deposits "…generally possess low to high expansion potential…" Accordingly, a number of standard measures are identified to address potential expansion impacts. Specifically, these include efforts such as: (1) removing and replacing expansive soils with engineered fill exhibiting very low or low expansion potential (per IBC/CBC or other applicable regulatory/industry criteria); (2) use of appropriate foundation design (including post-tensioned slabs), reinforcement and footing depths (as detailed in Appendix I); (3) implementation of appropriate concrete placement methodology and design, including proper installation/curing and moisture conditioning, doweling (anchoring) of exterior flatwork and driveways to building foundations, and use of crack-control joints; and (4) use of subdrains in appropriate areas to avoid near-surface saturation. As previously described, these standard recommendations would be verified through plan review and site-specific geotechnical observations and testing during Project excavation, grading and construction activities, and are included in the Project description as design considerations (see Table 1-2 of this EIR). Implementation of such design and construction recommendations, as well as conformance with applicable County, IBC/CBC, Greenbook or other pertinent guidelines, would avoid or reduce impacts from expansive soils to a **less than significant** level.

<u>Construction-related Hazards</u>

Guideline for the Determination of Significance

A significant geologic impact would occur if:

9. The Project is located on a geologic unit that is unstable, or that would become unstable as a result of the Project, and potentially result in on- or off-site subsidence or collapse.

Guideline Source

This guideline is based on the County Guidelines for Determining the Significance – Geologic Hazards (2007d).

Analysis

Corrosive Soils

Potential issues related to corrosive soils include pH levels, soluble sulfate concentrations and resistivity values (i.e., the ability to restrict, or resist, electric current). Long-term exposure to corrosive soils can result in deterioration and eventual failure of underground concrete (from sulfate) and metal structures (from pH and resistivity), including foundations or utility lines. As noted in Table 3.1.2-1, on-site soils exhibit slightly to moderately acidic conditions, and may also potentially encompass corrosive sulfate and/or resistivity levels. Associated potential impacts would be addressed through conformance with applicable industry/regulatory criteria (e.g., County Guidelines and the IBC/CBC and/or Greenbook). Specifically, these measures may involve standard efforts such as removal of unsuitable deposits and replacement with non-corrosive fill, use of corrosion-resistant construction materials (e.g., coated or non-metallic facilities) and/or installation of cathodic protection devices (e.g., use of a more easily corroded "sacrificial metal" to serve as an anode and draw current away from the structure to be protected). These standard recommendations are included in the Project description as design considerations (see Table 1-2 of this EIR). Implementation of such standard design and construction measures, in conformance with applicable County, IBC/CBC, Greenbook or other pertinent regulatory guidelines, would avoid or reduce impacts from corrosive soils to a **less than significant** level.

Oversize Materials

As described above in Section 3.1.2.1, granitic deposits within the Project site range from a highly weathered and rippable condition to fresh and very hard bedrock. Based on a rippability analysis conducted as part of the Project geotechnical investigations, it was concluded that excavations below depths of between approximately 29 to 60 feet (depending on location) may require blasting. While blasting operations do not represent geotechnical issues per se, blasting typically generates oversize materials (rocks greater than 12 inches in maximum dimension), which can potentially result in development hazards if improperly handled or placed on site. That is, the presence of oversize materials in engineered fills can result in effects such as differential settlement (different degrees of settlement over relatively short distances), with associated potential effects to structures, pavement, foundations/footings, subsurface utilities or drainage.

Appendix I identifies a number of standard measures to address potential hazards from oversize materials, pursuant to applicable industry/regulatory standards (e.g., the IBC/CBC and/or Greenbook). Specifically, these measures may involve standard efforts such as selective disposal (e.g., burial in deeper fills), crushing (a rock crusher is currently anticipated), use in landscaping efforts, or off-site disposal, with these efforts included in the Project description as design considerations. Implementation of standard engineering and construction practices, as well as conformance with applicable County, IBC/CBC, Greenbook or other pertinent regulatory guidelines, would avoid or reduce potential impacts from oversize materials to a **less than significant** level.

3.1.2.3 *Cumulative Impact Analysis*

As noted above, all potential Project-specific geotechnical impacts would be avoided or reduced below identified significance guidelines through implementation of geotechnical recommendations and conformance with established regulatory requirements as part of the Project design and/or construction efforts. Most potential geologic and soils effects are site-specific (inherently restricted to the areas proposed for development) and would not contribute to cumulative impacts associated with other planned or proposed development. That is, issues including seismic ground acceleration and liquefaction, as well as landslide/slope stability, expansive soils and construction-related hazards would involve effects to (and not from) the proposed development and/or are specific to on-site conditions.

Addressing these potential hazards for the proposed development would involve using standard geotechnical measures to comply with existing requirements, and/or implementing site-specific design and construction efforts that have no relationship to, or impact on, off-site areas. Avoiding liquefaction impacts through efforts such as removing/replacing unsuitable materials, for example, would not affect or be affected by similar deposits/hazards in off-site areas. Similarly, while landslide/slope stability hazards could potentially affect off-site areas (e.g., sloughing of surficial material onto off-site roadways), these issues would be reduced to less than significant levels through identified design and construction measures, and these efforts would not affect or be affected by similar deposits/hazards in off-site areas. Based on the described nature of potential geologic hazards and the measures to address them, there would be no connection to similar potential issues or cumulative effects to or from other properties. Accordingly, the Project’s contribution to potential cumulative geologic hazard impacts would be less than considerable and therefore **less than significant.**

3.1.2.4 *Significance of Impacts*

Based on the analysis provided above, the Proposed Project would have less than significant impacts related to geologic and soils hazards. Accordingly, no additional attenuation measures are required or proposed.

3.1.2.5 *Conclusion*

Based on the analysis provided above, no significant Project-specific or cumulative impacts related to geologic hazards would result from implementation of the Project.

Table 3.1.2-1
DESCRIPTION OF ON-SITE SOIL CHARACTERISTICS

Soil Series	Physical Characteristics/Location	Expansion (shrink-swell) Potential	Reactivity	Erosion Potential
Cieneba	Excessively-drained coarse sandy loam with boulders and outcrops derived from granitic rock. Occurs widely on moderate to steep slopes in the southern site area.	Low	Moderately acidic (pH 5.6 to 6.0)	Low to high
Escondido	Well-drained, fine sandy loam derived from metamorphosed sandstone. Occurs on moderate slopes in the northwestern site area.	Low	Slightly acidic to neutral (pH 6.1 to 7.3)	Moderate to high
Huerhuero	Moderately well-drained loam with a clay subsoil derived from marine sediments. Occurs on shallow to moderate slopes along the west-central site boundary.	High	Strongly acidic to neutral (pH 5.1 to 7.8)	Low to moderate
Las Posas	Well-drained, moderately deep stony fine sandy loam with a clay subsoil derived from igneous rock. Occurs on shallow to moderate slopes in the northeastern central and southern portions of the site.	High	Neutral (pH 6.6 to 7.3)	Moderate
Visalia	Moderately well-drained sandy loam derived from granitic alluvium. Occurs on shallow slopes along the northern-most site boundary.	Low	Slightly acidic (pH 6.1 to 6.5)	Low to moderate
Wyman	Well-drained loam derived from igneous rock and alluvium. Occurs in the northwestern and north-central portions of the site.	Moderate	Slightly acidic to neutral (pH 6.1 to 7.3)	Low

Source: NRCS/SCS 1973

Table 3.1.2-2
SUMMARY OF REGIONAL FAULT LOCATIONS AND SEISMICITY DATA

Fault Zone	Distance From Site (miles)	Maximum Earthquake Magnitude	Estimated Peak Ground Acceleration (g)[1]
Newport-Inglewood	13	7.5	0.24
Rose Canyon	13	6.9	0.21
Elsinore	18	7.85	0.23
Coronado Bank	28	7.4	0.16
Palos Verde Connected	28	7.7	0.17
Earthquake Valley	32	6.8	0.116
San Jacinto	43	7.88	0.14
San Joaquin Hills	47	7.1	0.09
Palos Verdes	47	7.3	0.10

Source: Geocon 2015a
[1] Maximum on-site peak horizontal deterministic ground acceleration, where g equals the acceleration due to gravity.

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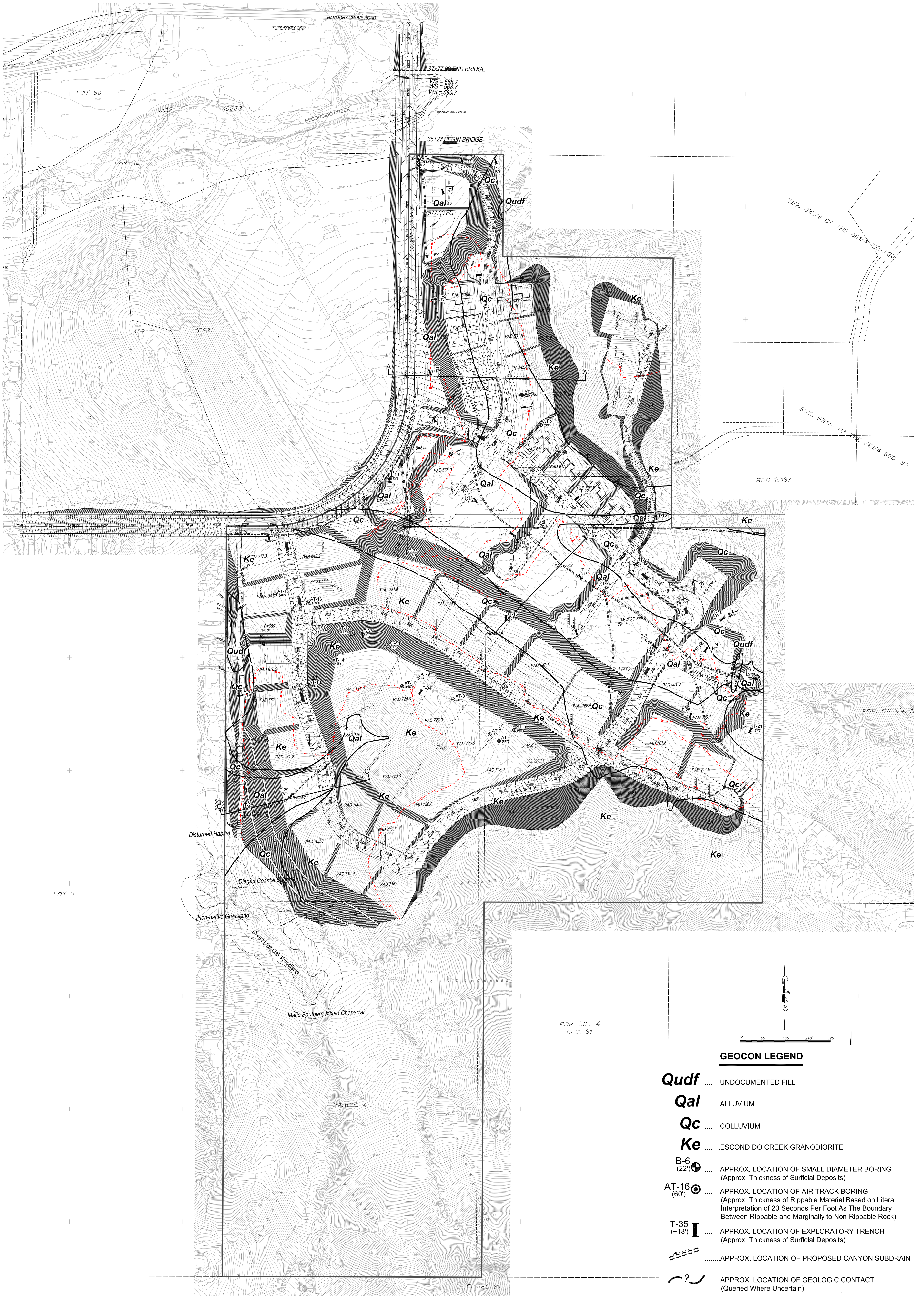

Source: GEOCON 2015

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Geology Map

HARMONY GROVE VILLAGE SOUTH

HELIX Environmental Planning

Figure 3.1.2-1