4.5 Geology and Soils

4.5.1 Summary

Table 20 summarizes the identified environmental impacts, proposed Mitigation Measures, and residual impacts of the proposed project with regard to geology and soils. Additional detail is provided in Section 4.5.3 (Impact Analysis).

Table 20 Impact and Mitigation Summary: Geology and Soils

Impact	Mitigation Measures	Residual Impact
Impact GEO-1. Seismically induced groundshaking could destroy or damage structures and infrastructure, resulting in loss of property or risk to human safety. However, mandatory compliance with applicable California Building Code requirements and specifications for the project's building foundations would reduce impacts to a less than significant level.	No mitigation is required.	Impacts would be less than significant.
Impact GEO-2. Seismically included ground shaking could destroy or damage structures and infrastructure, resulting in loss of property or risk to human safety. The probability of liquefaction occurring in the sand strata extending from 15 to 48 feet below ground surface is high to very high. However, the potential for liquefaction-induced lateral spreading is low. Potential impacts resulting from liquefaction would be significant but mitigable.	**GEO-2 Reduction of Liquefaction Potential** Prior to issuance of a grading permit, the applicant shall submit to RMA Building Services for Building Official review and approval, a design-build ground improvement program prescribed by a qualified engineer to minimize liquefaction potential on the site. Measures to reduce liquefaction impacts could include, but may not be limited to specialized design of foundations by a structural engineer. Liquefaction shall be reduced such that people and structures would not be exposed to a substantial adverse effect, including the risk of loss, injury, or death involving seismic-related liquefaction, nor be exposed to on- or off-site liquefaction as a result of the proposed project, as determined by a registered professional engineer and the Building Official. To minimize construction-related vibration impacts of ground improvement techniques such as the vibro replacement stone column technique, piles shall not be driven within 20 feet of any existing, adjacent structures or fuel tanks unless a qualified engineer first certifies that the impacts of this technique to shake or crack foundations, or liquefy soil supporting these structures can be avoided. All ground improvement techniques shall reduce the liquefaction potential to an acceptable level, as determined by the Building Official, and shall be implemented by the applicant. **Monitoring Action:** Prior to the issuance of building permits, the applicant shall submit a report prepared by a qualified, registered engineer to the Building Official for	Implementation of Mitigation Measure GEO-2 would reduce potential liquefaction impacts to a less than significant level.

Impact	Mitigation Measures	Residual Impact
	review and approval. The engineer's report shall address the requirements of this mitigation including but not limited to recommendations for adequate foundation design to avoid loss of life or injury resulting from liquefaction and, as applicable, addressing the potential for impacts of the construction of the recommending foundation on adjacent structures. The Building Official shall not approve a construction permit until potential impacts from liquefaction and construction are adequately addressed. Prior to final of building permits, the applicant shall submit written information from a qualified engineer, to the satisfaction of the Building Official verifying that the mitigation has been satisfactorily completed.	
Impact GEO-3. Construction of the proposed project could result in soil erosion or loss of topsoil. However, compliance with existing regulations would reduce impacts to a less-than-significant level.	No mitigation is required.	Impacts would be less than significant.
Impact GEO-4. The project site is not located on a geological unit or soil that is unstable, and would not result in landslides, subsidence, or soil expansion. Impacts would be less than significant.	No mitigation is required.	Impacts would be less than significant.

4.5.2 Setting

a. Regional Setting

The Carmel Valley is geologically complex and seismically active. The predominant structural feature in the California Coast Ranges, in which the Carmel Valley is situated, is the San Andreas Fault, which is the structural boundary of the Pacific and North American tectonic plates. Uplift along faults is the primary force that created the mountains and valleys of the Southern Coast Ranges, including the Santa Lucia and Sierra de Salinas Mountains. Erosion and deposition of soil from the uplifted mountains formed broad alluvial fans of well-drained, nutrient rich soil, including the soils found in Carmel Valley.

This region has three active faults with evidence of historic or recent movement. The San Andreas Fault runs through the southeastern portion of Monterey County for approximately 30 miles and poses the greatest seismic hazard to the County. The two other active faults affecting Monterey County include the Palo Colorado-San Gregorio fault zone and the Monterey Bay fault zone. The Palo Colorado-San Gregorio fault zone connects the Palo Colorado Fault near Point Sur, south of Monterey, with the San Gregorio fault near Point Año Nuevo in Santa Cruz County. The Monterey Bay fault lies seaward of the City of Seaside extending northwesterly to the Pacific Ocean.

b. Project Site Setting

The project site is located on the floor of the Carmel Valley approximately one mile east of the Pacific Ocean on a flood-plain terrace on the northern banks of the Carmel River, which is located approximately 1,000 feet south of the project site. The project site is located within the United States Geological Survey (USGS) Monterey 7.5-minute topographic quadrangle at approximately latitude of 36.539 degrees and longitude -121.908 degrees (PCE 2017). This section covers the geology of the project site, its topographic relief, seismic hazards, landslide hazards, and soil characteristics.

Topography

The project site is relatively flat and ranges in elevation from 26 feet to 30 feet above mean sea level at the highest knolls. Spoil piles ranging from one to six feet in height are located in the eastern half of the project site.

Geology

The majority of the project site is mapped as being underlain by older flood plain deposits, with the southeast corner mapped as younger flood plain deposits. A field investigation conducted by Pacific Crest Engineering verifies that the native soils encountered are consistent with this general description. According to the *Preliminary Geotechnical Investigation* (PCE 2017), the majority of the project site contains imported artificial fill that has been dumped on the site over the years. Figure 20 shows the approximate location of the fill. The composition of the fill is generally silty sand with gravel. The fill depth is approximately three to five feet in the eastern half of the site and large granitic cobbles and boulders up to 12 inches in size are scattered across the surface of this area. Fill in the western portion of the property is generally less than 2 ½ feet in depth, and appears to have less cobbles and boulders and contain more fine grained material. The native soils encountered underneath the fill were mainly older flood plain deposits with younger flood plain deposits in the southeast corner (PCE 2017).

Seismic Hazards

The USGS defines active faults as those that have had surface displacement within Holocene time, or approximately within the last 11,000 years. Evidence of surface displacement can be recognized by the existence of cliffs in alluvium, terraces, offset stream courses, fault troughs and saddles, the alignment of depressions, sag ponds, and the existence of steep mountain fronts. Potentially active faults are those that have had surface displacement during Quaternary time, or within the last 1.6 million years. Inactive faults have not had surface displacement within the last 1.6 million years.

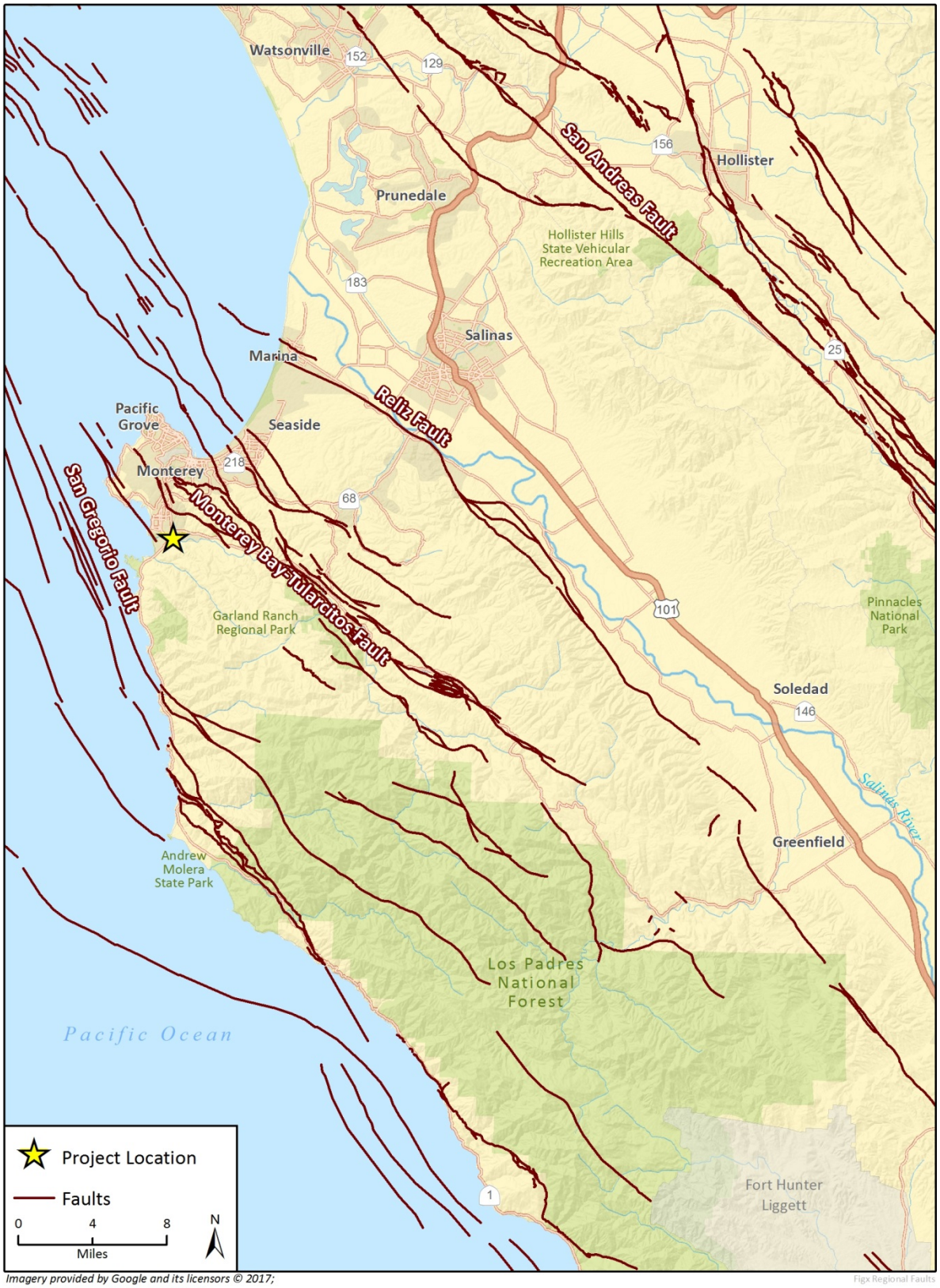
The project site is located within the seismically active central California Coast Ranges geomorphic province, but is not located in an Alquist-Priolo Earthquake Fault Zone (DOC 2015). The major active faults capable of producing large magnitude events and that have a high seismic activity rate recognized in the region are the San Andreas and San Gregorio Faults. The project site lies approximately 30 miles southwest of the San Andreas Fault and 4.5 miles northeast of the San Gregorio Fault. Other active faults in the region include the Monterey Bay-Tularcitos and Reliz. There are no faults mapped on or adjacent to the project site (PCE 2017). Figure 21 shows the faults in the area in comparison to the project location.

Potential seismic hazards resulting from a nearby moderate to major earthquake can generally be classified as primary and secondary. The primary effect is fault ground rupture, also called surface

Figure 20 Location of Fill and Boring Sites

Source: Pacific Crest Engineering, Inc., 2017.

Figure 21 Regional Faults



rupture. Common secondary seismic hazards include ground shaking, liquefaction, and subsidence. Each of these potential hazards is discussed below.

Surface Rupture

Surface rupture is an actual cracking or breaking of the ground along a fault during an earthquake. Since the project site is not located in a State Earthquake Fault Zone and no active faults are known to occur on or adjacent to the site, the potential for surface ground rupture on the project site is low.

Ground Shaking

Fault displacement generates seismic ground shaking, which is the greatest cause of widespread damage in an earthquake. Whereas surface rupture affects a narrow area above an active fault, ground shaking covers a wide area and is greatly influenced by the distance of the site to the seismic source, soil conditions, and depth to groundwater. The project site is in a region of generally high seismicity and has the potential to experience strong ground shaking from earthquakes on regional and/or local causative faults.

Liquefaction and Lateral Spreading

Soil liquefaction occurs when ground shaking from an earthquake causes a sediment layer saturated with groundwater to lose strength and take on the characteristics of a fluid, thus becoming similar to quicksand. The project site lies within an area deemed to have a moderate susceptibility for liquefaction (Monterey County 2008). According to the *Preliminary Geotechnical Investigation* prepared for the project (refer to Appendix F), the project site has a high to very high potential of liquefaction occurring in the sand strata that extends from about 15 feet to about 48 feet below ground surface. Total ground settlement due to liquefaction in these loose sand layers is estimated to be between about 5.8 and 8.5 inches. Differential settlement is typically estimated to be about ⅔ and ¾ of the total settlement values (PCE 2017).

Lateral spreading can occur when a liquefied soil moves toward a free slope face during the cyclic earthquake loading. Liquefaction-induced lateral spreading can also occur on mild slopes (flatter than 5 percent underlain by loose sands and a shallow water table. If liquefaction occurs, the unsaturated overburden soil can slide as intact blocks over the lower, liquefied deposit, creating fissures and scarps. Based on the site topography and the lack of topographical “free face” in the near vicinity, the potential for lateral spreading at the project site is low (PCE 2017).

Seismically-induced Settlement

Seismically-induced settlement of sufficient magnitude to cause structural damage is normally associated with poorly consolidated, predominantly sandy soils. Non-saturated “dry” sands may settle and densify when subjected to earthquake shaking. Settlement tends to occur in loose clean sands with little or few cohesive fines. Settlement of dry sands, and the corresponding effects on structures, is a function of the magnitude and duration of the earthquake, the ground accelerations that occur at the site, the relative density of the sand, the amount of cohesiveness of the fines within the sand, and the thickness and depth of the sand strata. Based on borings (Figure 20) and Cone Penetrometer Testing (CPT) data, the magnitude of dry sand settlement at the project site would be on the order of approximately ½ to 1 inch.

Landslides

Landslides and other forms of mass wasting, including mud flows, debris flows, soil slips, and rock falls, occur as soil or rock moves down slope under the influence of gravity. Intense rainfall or seismic shaking could trigger landslides. The site is essentially flat and there are no substantial slopes on or adjacent to the project site. According to the *Preliminary Geologic Investigation*, the potential for shallow or localized slope failures to occur and cause damage to the proposed project is low (PCE 2017).

Soil Characteristics

As mapped by the U.S. Department of Agriculture (USDA), Natural Resource Conservation Service (NRCS), the soil type of the project site is Metz fine sandy loam and Elder very fine sandy loam, two to nine percent slopes (USDA 2017). However, as shown in Figure 20, the project site has been covered with artificial fill. The composition of the fill is generally a silty sand with gravel and the depth of fill is described as two to five feet. According to PCE, beneath the fill, native earth materials encountered in all three borings were similar. The upper 10 to 13 feet of soil predominantly consist of silty sand and silty sand with gravel with fines content ranging from about 15 to 45 percent. The density of the sand ranges from loose to medium loose. Below about 13 feet and extending to 25 feet, the soils are more consistently loose to medium dense sand which contained one to four percent fines. Loose to medium dense sands extend to about 48 feet below ground surface. Groundwater was encountered between 16 and 18 feet below the ground surface. Therefore, it is anticipated that perched and regional groundwater tables may vary with location and could fluctuate with variations of rainfall, runoff, irrigation and other changes to existing conditions (PCE 2017).

Soil erosion is the removal of soil by water and wind. The rate of erosion is estimated from four soil properties: texture, organic matter content, soil structure, and permeability. Other factors that influence erosion potential include the amount of rainfall and wind, the length and steepness of the slope, and the amount and type of vegetative cover. The surface soils are classified as having a high potential for erosion (PCE 2017).

4.5.3 Regulatory Setting

Federal

National Pollutant Discharge Elimination System

Stormwater-related erosion is one major source of soil-related impacts. Stormwater discharges from construction activities (such as clearing, grading, excavating, and stockpiling) that disturb one or more acres, or smaller sites that are part of a larger common plan of development or sale, are regulated under the National Pollutant Discharge Elimination System (NPDES) stormwater program. Prior to discharging stormwater, construction operators must obtain coverage under an NPDES permit. In California, the General Permit for Discharges of Stormwater Associated with Construction Activity are regulated by the State Water Resources Control Board and administered through the local Regional Water Quality Control Board, which for this area is the Central Coast Regional Water Quality Control Board (CCRWQCB).

The Construction General Permit requires the development and implementation of a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP should contain a site map(s) which shows the construction site perimeter, existing and proposed buildings, lots, roadways, storm water collection and discharge points, general topography both before and after construction, and drainage patterns

across the project site. The SWPPP must list Best Management Practices (BMPs) the discharger will use to protect storm water runoff and the placement of those BMPs. Additionally, the SWPPP 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 sediment monitoring plan if the site discharges directly to a water body listed on the 303(d) list for sediment. Section A of the Construction General Permit describes the elements that must be contained in a SWPPP.

State

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act was signed into California law on December 22, 1972 to mitigate the hazard of surface faulting to structures for human occupancy. The Alquist-Priolo Act provides for special seismic design considerations if developments are planned in areas adjacent to active or potentially active faults. The project site is not located in an Alquist-Priolo Earthquake Fault Zone.

California Building Code (CBC)

The CBC requires, among other things, seismically resistant construction and foundation and soil investigations prior to construction. The CBC also establishes grading requirements that apply to excavation and fill activities, and requires the implementation of erosion control measures. The County is responsible for enforcing the 2016 CBC, or most current CBC version.

Local

Monterey County General Plan

The Monterey County General Plan (2010) Conservation and Open Space Element, and Safety Element contains goals and policies related to geologic hazards and geotechnical requirements. Goal OS-3 of the Conservation and Open Space Element is to prevent soil erosion and enhance water quality. Policy OS-3.1 requires best management practices to prevent erosion. Goal S-1 of the Seismic Element is to minimize the potential for loss of life and property resulting from geologic and seismic hazards. Policy S-1.1 requires land uses to be sited and measures applied to reduce the potential for loss of life, injury, property damage, and economic and social dislocations resulting from ground shaking, liquefaction, landslides, and other geologic hazards in the high and moderate hazard susceptibility areas. Policy S-1.3 requires site-specific geologic studies for new development to verify the presence or absence and extent of the hazard on the property and identify Mitigation Measures for any development proposed. Policy S-1.5 states that structures in areas that are at high risk from fault rupture, landslides, or coastal erosion shall not be permitted unless measures recommended by a registered engineering geologist are implemented to reduce the hazard to an acceptable level. Policy S-1.6 states that new development shall not be permitted in areas of known geologic or seismic hazards unless measures recommended by a California certified engineering geologist or geotechnical engineer are implemented to reduce the hazard to an acceptable level. Policy S-1.7 requires site specific reports addressing geologic hazards and geotechnical conditions for the planning phase in accordance with the California Building Code.

Carmel Valley Master Plan

The Carmel Valley Master Plan (2013) contains Policy CV-4.1 to reduce erosion and rapid runoff by limiting the amount of land to be cleared at one time, prohibiting motorized vehicles on the banks or in the bed of the Carmel River, and requiring native vegetative cover.

Monterey County Code, Chapter 16.08 Grading

Chapter 16.08 of the Monterey County Code regulates grading activities. The purpose of these regulations is to safeguard health, safety, and public welfare, to minimize erosion, protect fish and wildlife, and to otherwise protect the natural environment. A grading permit is required for all activities that would exceed 100 cubic yards of grading. Where grading operations obstruct and/or otherwise impair the flow or runoff of a drainage course, appropriate drainage facilities are required to be implemented to convey flows past the point of obstruction (§16.08.330). Chapter 16.08 also contains measures to protect water quality from grading related activities and associated erosion. These requirements are codified in §16.08.340 of the Monterey County Code, which requires that all areas disturbed in connection with grading related activities shall be consistently maintained to control erosion. The project would be required to comply with these requirements.

Monterey County Code, Chapter 16.12, Erosion Control

Monterey County Code Chapter 16.12 requires that development activities control runoff to prevent erosion. The purpose of these regulations is to eliminate and prevent conditions of accelerated erosion that have led to, or could lead to, degradation of water quality, loss of fish habitat, damage to property, loss of topsoil or vegetation cover, disruption of water supply, increased danger from flooding. An erosion control plan is required to be submitted to the County of Monterey prior to any land disturbing activities (§16.12.060). This plan is required to indicate methods to control erosion. Runoff control must be implemented to control runoff from a 10-year storm event (§16.12.070). All runoff must be detained or dispersed so that the runoff rate does not exceed the pre-development level. Any concentrated runoff which cannot be effectively detained or dispersed without causing erosion is to be carried in non-erodible channels or conduits to the nearest drainage course designated for such purpose or to on-site percolation devices with appropriate energy dissipaters to prevent erosion at the point of discharge. Runoff from disturbed areas must be detained or filtered by berms, vegetated filter strips, catch basins, or other means as necessary to prevent the escape of sediment from the disturbed area. The project would be required to comply with these requirements.

4.5.4 Impact Analysis

a. Methodology and Significance Thresholds

Based on the environmental checklist included in Appendix G of the *CEQA Guidelines,* impacts would be considered potentially significant if the proposed project would:

1. Expose people or structures to 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;
    ii. Strong seismic shaking

iii. Seismic-related ground failure, including liquefaction,

iv. Landslides;

2. Result in substantial soil erosion or the loss of topsoil;
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;
4. Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property; and/or
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.

There are no faults mapped on or adjacent to the project site and the project site is not located in an Alquist-Priolo Earthquake Fault Zone. The potential for surface ground rupture is therefore low. The project site is relatively flat and would not be subject to the risk of landslides. The proposed project also would not involve installation and use of septic tanks or alternative waste water disposal systems. Wastewater from the project site would be collected and conveyed through a conventional gravity system to an existing Carmel Area Wastewater District sanitary sewer main. Therefore, impacts related to Thresholds 1.i, 1.iv and 5 are not discussed further in this section, but details are provided in Section 4.9, *Effects Found Not to Be Significant*.

b. Project Impacts and Mitigation Measures

Threshold 1.ii:	Would the project expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving: strong seismic shaking?

Impact GEO-1 SEISMICALLY INDUCED GROUND SHAKING COULD DESTROY OR DAMAGE STRUCTURES AND INFRASTRUCTURE, RESULTING IN LOSS OF PROPERTY OR RISK TO HUMAN SAFETY. HOWEVER, MANDATORY COMPLIANCE WITH APPLICABLE CALIFORNIA BUILDING CODE REQUIREMENTS AND SPECIFICATIONS FOR THE PROJECT'S BUILDING FOUNDATIONS WOULD REDUCE IMPACTS TO LESS THAN SIGNIFICANT LEVELS.

The project site is located within the seismically active central California Coast Ranges, but is not located in an Alquist-Priolo Earthquake Fault Zone. The major active faults capable of producing large magnitude events and that have a high seismic activity rate recognized in the region are the San Andreas and San Gregorio faults. Other active faults in the site region include the Monterey Bay- Tularcitos and Reliz faults. Based on the *Preliminary Geotechnical Investigation* (PCE 2017) and Figure 21, there are no faults mapped on or adjacent to the project site. However, the project would potentially experience strong ground shaking from earthquakes on any active or potentially active faults in the area, as would other properties in the Carmel Valley.

Despite the potential for ground shaking, the project would be required meet the current CBC seismic-resistance standards, which ensure that new structures are engineered to withstand the expected ground acceleration at a given location. The County of Monterey also has policies and standards in place that regulate construction in areas subject to ground shaking. In accordance with General Plan Policy S-1.8, new development may be approved only if it can be demonstrated that the project site is physically suitable and the development would neither create nor significantly contribute to geologic instability or geologic hazards (Monterey County 2010). Recommendations of the *Preliminary Geotechnical Investigation* prepared for the project to reduce impacts from groundshaking include specifications for building foundations including a structural mat with

reinforced-concrete, tie-beams, and designed to move as a unit and to tolerate the differential settlement potential on the site. Recommendations would ensure that the building foundation have a structural mat designed to accommodate a differential settlement of two inches in 15 feet and allow for a bearing capacity of 1500 psf. Compliance with all applicable provisions of state and local construction and designs standards, and implementation of the recommendations of the *Preliminary Geotechnical Investigation* prepared for the project (PCE 2017) would ensure that potential impacts would be less than significant.

Mitigation Measures

No mitigation is required.

Threshold 1.iii:	Would the project expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving seismic-related ground failure, including liquefaction?
Threshold 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- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?

Impact GEO-2 SEISMICALLY INDUCED GROUND SHAKING COULD DESTROY OR DAMAGE STRUCTURES AND INFRASTRUCTURE, RESULTING IN LOSS OF PROPERTY OR RISK TO HUMAN SAFETY. THE PROBABILITY OF LIQUEFACTION OCCURRING IN THE SAND STRATA EXTENDING FROM 15 TO 48 FEET BELOW GROUND SURFACE IS HIGH TO VERY HIGH. HOWEVER, THE POTENTIAL FOR LIQUEFACTION-INDUCED LATERAL SPREADING IS LOW. POTENTIAL IMPACTS RESULTING FROM LIQUEFACTION WOULD BE SIGNIFICANT BUT MITIGABLE.

The project site is located within a seismically active area and strong seismic shaking is expected to occur within the design lifetime of the project. Non-saturated dry sands may settle and densify when subjected to earthquake shaking. The upper 10 to 13 feet of soil on the project site is predominantly silty sand and silty sand with gravel with fines content ranging from about 15 to 45 percent. The density of the sand ranges from loose to medium loose. Below about 13 feet and extending to 25 feet, the soils are more consistently loose to medium dense sand which contained one to four percent fines. Loose to medium dense sands extend to about 48 feet below ground surface. Dry sand settlement at the project site would be on the order of 0.5 to 1 inch (PCE 2017). According to the *Preliminary Geotechnical Investigation* prepared for the project (PCE 2017), there is a high to very high probability of liquefaction occurring in the sand strata on the project site that extends from 15 to about 48 feet below the ground surface. Total ground settlement due to liquefaction in these loose sand layers is estimated to be between about 5.8 and 8.5 inches. Differential settlement is estimated to be about ⅔ to ¾ of the total settlement values. Soils on the project site are liquefiable and significant settlement of the ground surface may occur during a major earthquake. Liquefaction can result in bearing failure and differential ground settlement, which can cause major damage to the structures on the project site (PCE 2017). Therefore, potential impacts resulting from liquefaction would be significant but mitigable. To mitigate earthquake induced settlement, the *Preliminary Geotechnical Investigation* recommends the employment of ground improvement techniques to density soils at depth. With incorporation of the following Mitigation Measure, impacts from liquefiable soils would be less than significant.

Lateral spreading can occur when a liquefied soil moves toward a free slope face during the cyclic earthquake loading. Liquefaction-induced lateral spreading can also occur on mild slopes (flatter than five percent) underlain by loose sands and a shallow groundwater table. Based on the site

topography and lack of topographical "free face" in the near vicinity the potential of lateral spreading on the project site is low and impacts from lateral spreading would be less than significant (PCE 2017).

Mitigation Measures

The following mitigation is required:

GEO-2 Reduction of Liquefaction Potential

Prior to issuance of a grading permit, the applicant shall submit to RMA Building Services for Building Official review and approval, a design-build ground improvement program prescribed by a qualified engineer to minimize liquefaction potential on the site. Measures to reduce liquefaction impacts could include, but may not be limited to specialized design of foundations by a structural engineer.

Liquefaction shall be reduced such that people and structures would not be exposed to a substantial adverse effect, including the risk of loss, injury, or death involving seismic-related liquefaction, nor be exposed to on- or off-site liquefaction as a result of the proposed project, as determined by a registered professional engineer and the Building Official.

To minimize construction-related vibration impacts of ground improvement techniques such as the vibro replacement stone column technique, piles shall not be driven within 20 feet of any existing, adjacent structures or fuel tanks unless a qualified engineer first certifies that the impacts of this technique to shake or crack foundations, or liquefy soil supporting these structures can be avoided. All ground improvement techniques shall reduce the liquefaction potential to an acceptable level, as determined by the Building Official, and shall be implemented by the applicant.

MONITORING ACTION

Prior to the issuance of building permits, the applicant shall submit a report prepared by a qualified, registered engineer to the Building Official for review and approval. The engineer's report shall address the requirements of this mitigation including but not limited to recommendations for adequate foundation design to avoid loss of life or injury resulting from liquefaction and, as applicable, addressing the potential for impacts of the construction of the recommending foundation on adjacent structures. The Building Official shall not approve a construction permit until potential impacts form liquefaction and construction are adequately addressed.

Prior to final building permits, the applicant shall submit written information from a qualified engineer to the satisfaction of the Building Official verifying that the mitigation has been satisfactorily completed.

Significance After Mitigation

Implementation of a design-build ground improvement program, as required by Mitigation Measure GEO-2, would ensure that the proposed project would not expose people or structures to a substantial adverse effect involving seismic-related liquefaction, nor would the project cause on-site soil to result in on- or off-site liquefaction. Impacts would be reduced to a less than significant level.

Threshold 2: Would the project result in substantial soil erosion or the loss of topsoil?

Impact GEO-3 CONSTRUCTION OF THE PROPOSED PROJECT COULD RESULT IN SOIL EROSION OR LOSS OF TOPSOIL. HOWEVER, COMPLIANCE WITH EXISTING REGULATIONS WOULD REDUCE IMPACTS TO A LESS THAN SIGNIFICANT LEVEL.

According to the NRCS soils mapping for the project site, the project site is underlain by two soil types, Metz fin sandy loam and Elder very fine sandy loam two- to nine percent slopes. The surface soils on the majority of the project site are composed of fill, which is generally silty sand with gravel. These soils are classified as having a high potential for erosion. Grading associated with construction would temporarily expose bare soils, which could be removed from the site and transported through wind shearing or stormwater runoff. Therefore, there could be substantial erosion or loss of topsoil during project construction.

The *Preliminary Geotechnical Investigation (PCE 2017)* recommends minimizing surface erosion by planting and maintaining the finished ground surface with ground cover. Specific and detailed recommendations regarding erosion control would be provided by the project engineer or an erosion control specialist when implementing stormwater requirements described below. As discussed in Section 4.6, *Hydrology and Water Quality*, implementation of an NPDES-compliant SWPPP and additional requirements detailed in Chapter 16.12 of the Monterey County Code of Ordinances and other applicable standards would be incorporated into the design of the project and would reduce potential impacts related to soil erosion by requiring project specific BMPs. Potential BMPs and erosion control measures include, but are not limited to filtered berms, vegetated filter strips, catch basins to prevent the escape of sediment from the disturbed area. Therefore, erosion impacts would be less than significant.

Mitigation Measures

No mitigation is required.

Threshold 4: Would the project be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?

Impact GEO-4 THE PROJECT SITE IS NOT LOCATED ON A GEOLOGIC UNIT OR SOIL THAT IS UNSTABLE, AND WOULD NOT RESULT IN SOIL EXPANSION. IMPACTS WOULD BE LESS THAN SIGNIFICANT.

Topography at the project site is relatively flat and ranges in elevation from 26 feet to 30 feet above mean sea level at the highest knolls. Fill material has been dumped on the project site and there is a fill depth of approximately three to five feet. The site is directly underlain by sand with fines content on the order of 7 percent to 8 percent, which has a low potential for soil expansion. There are no substantial slopes on or adjacent to the project site and there is low potential for shallow or localized slope failures to occur (PCE 2017). The *Preliminary Geological Investigation* for the project states that there is a low potential for soil expansion on the project site, but recommends that import fill should have a Plasticity index between 4 and 12, and a minimum Resistance “R” Value of 30, and be non-expansive (PCE 2017). As such, construction of the proposed project would be guided by recommendations documented in the *Preliminary Geotechnical Investigation* prepared for the project (PCE 2017). Further, the project would be required to meet the current CBC standards for expansive soils, including foundation design or soil removal, in Section 1803.5.3 and Section 1808.6.0 of the CBC, as adopted by Monterey County Code Section 18.02.010. As described above,

implementation of the recommendations of the *Preliminary Geotechnical Investigation* prepared for the project (PCE 2017), and compliance with all applicable provisions of state and local standards would ensure the potential impacts related to soil expansion to a less than significant level.

Mitigation Measures

No mitigation is required.

c. Cumulative Impacts

The geographic scope for considering cumulative impacts to geology and soils is the project site along with the immediately adjacent areas. The geographic scope would also include off-site lands where earth movements at the project site could affect the local watershed. This scope is appropriate because geologic materials and soils occur at specific locales and are generally unaffected by activities not acting on them directly or immediately adjacent to them. In addition, any geologic impacts of the project would be site-specific.

Past, present, and reasonably foreseeable future projects in Carmel Valley, as shown in Table 5 in Section 3, *Environmental Setting*, would add approximately 537 dwelling units to the Carmel Valley. Such development would expose new residents and property to seismic and other geologic hazards. However, these seismic and soil issues are specific to each project and therefore, for purposes of this cumulative analysis, the geographic context is more narrow. It is expected that because of the site-specific nature of these issues, each development would be required to address said issues on a case-by-case basis through preparation of required soils and geotechnical engineering studies and adherence to the recommendations therein, in addition to adherence to existing local and state laws and regulations including the applicable CBC standards and requirements. Thus, the combination of the project with other cumulative developments would not have a significant cumulative impact. Furthermore, with adherence to the applicable laws and regulations, the project's contribution to any cumulative geology and soils impacts would be less than significant.