3.7 GEOLOGY AND SOILS

This section describes the environmental and regulatory setting for geology, soils, and seismicity. It also describes the existing conditions and potential impacts on geology, soils, and seismicity that would result from implementation of the proposed project and mitigation for potentially significant impacts, where feasible.

3.7.1 Environmental Setting

Regional Geology

Two geologic provinces cover the County: the dominant Coast Ranges province in the central and southwest sections of the County, and the Klamath Mountains province in the northeast. The Coast Ranges province is composed mainly of the Franciscan complex inland, sand, and other alluvial deposits located closer to the coast. The Klamath Mountains consist generally of older rocks, many of which are sedimentary (e.g., sandstone, chert, slate, and schist). The South Fork Mountain Ridge generally divides the two provinces. The predominant rock types are the Franciscan Complex and schists, covering over 1 million acres in the County, and the Tertiary-Cretaceous Coastal Belt rocks, covering 340,000 acres. The Franciscan Complex is a suite of rocks that originated on the deep-sea floor and were later pushed up against the continental margin along the coast of California through plate tectonic forces (Humboldt County 2017c).

Local Geology

According to the R-1 Geologic and Geotechnical Investigation completed by SHN Engineers & Geologists for the project site (see Appendix E), the area comprises the gently northwest-sloping, dissected surface of a late Pleistocene age marine terrace. The project area encompasses large portions of the terrace surface, as well as the heads of several tributary stream valleys that encroach from the north, east, and south of the project area. Elevation of the terrace surface across the site ranges from about 170 to 200 feet amsl. The lowest elevation on the project site is at 30 feet in the stream valley at the northern end of the project site. The water storage tank location is at an approximate elevation of 474 feet amsl. Slopes in the project area are typically negligible on the terrace surface, with gradients of less than 5 percent, to moderately steep slopes on the stream valley walls, with gradients of 30 to 40 percent. Steeper valley and ravine wall slopes are locally present within the project area (SHN Engineers & Geologists 2017).

Project Site Soils

Based on the USDA NRCS Web Soil Survey, there are three different soils series present within the project area (USDA 2019a). The soils in this region generally consist of competent, moderately consolidated fine sandy marine deposits that are relatively uniform in texture and consistency (SHN Engineers & Geologists 2017). A complete summary of the soil series that occur in the project area is outlined in Table 3.7-1 below.

Table 3.7-1: Proposed Project Soils Summary

Soil Series Name	Typical Proposed Project Pedon	Slope (%)	Drainage
Weott	Silt loam	0-2	Very poorly drained
Hookton-Tablebluff complex	Loam	2-9	Somewhat poorly drained
Lepoil-Espa-Candymountain complex	Loam	15-50	Well drained

Source: USDA 2019

Seismic Hazards

The County is located within a seismically active area of California, and specifically, within the two highest seismic risk zones as defined in the California Uniform Building Code; Cape Mendocino/Gorda and Juan de Fuca Plates. Both the Cape Mendocino/Gorda and Juan de Fuca Plates are offshore of the County and experience the highest concentration of earthquake events in the continental U.S. In addition to causing ground shaking, an earthquake can trigger other natural disasters, such as fire, landslides, and flooding, resulting in loss of life and property damage. Seismic hazards in the County include earthquake ground shaking, surface fault rupture, liquefaction, and tsunami potential in the coastal zone areas. Geologic hazards that are not specifically related to earthquakes include landslides and unstable soils (Humboldt County 2017c).

Faults

There are six sources of damaging earthquakes in the Eureka region that include the project site, which includes the following faults: (1) the Gorda Plate; (2) the Mendocino fault; (3) the Mendocino Triple Junction; (4) the northern end of the San Andreas fault; (5) faults within the North American Plate (including the Mad River and Little Salmon fault zones; and (6) the Cascadia Subduction Zone (CSZ) (SHN Engineers & Geologists 2017).

The most significant seismic faults relative to the project site are the Little Salmon fault and the CSZ. The Little Salmon fault is the closest known active fault to the project site. Its surface trace is mapped approximately 5 miles to the southwest, although the fault dips beneath the site and may be within 2 miles in the subsurface. The fault appears to be the most active fault in the Humboldt Bay region and is capable of generating very large earthquakes (SHN Engineers & Geologists 2017).

Ground Shaking and Ground Failure

Primary seismic hazard concerns include potential ground shaking and ground rupture along the surface trace of faults. Secondary seismic hazards are caused by the interaction of ground shaking with soft or unstable soils, resulting in liquefaction, settlement, and landslides. Ground shaking can vary over an area as a result of factors such as topography, bedrock type and the location and orientation of a fault rupture due to seismic activity. Ground settlement (i.e., subsidence) is the lowering of the ground surface during seismic activity and is caused by consolidation or the failure of the ground foundation, densification of soil material, or liquefaction (discussed below). Ground failure can cause serious direct damage or collapse of infrastructure caused by seismic activity and is considered the second “primary” earthquake hazard. The severity of ground failure depends on the strength and depth of the earthquake, but there are several other contributing factors such as the regional geology, local topography and the site-specific ground characteristics within the project area.

The primary seismic hazard within the project area is associated with strong ground shaking from the nearest faults, including the Little Salmon Fault and CSZ. This strong seismic ground shaking could introduce slope failure along the steeper and/or wetter portions of the stream valley walls, particularly if the earthquake occurs during the wet season.

Landslides and Lateral Displacement

Any incline where relatively large masses of material are supported by soil that is likely to soften under strain is prone to a landslide. The risk increases in areas where the ground is steep, weak or fractured; is saturated by heavy rain; or is compromised by historical ground movements (Branz 2019). Landslides occur most frequently during or following large storms or seismic activity and will most likely take place in areas where they have previously occurred.

Lateral movement (i.e., displacement, spreading, etc.) occurs when seismic shaking causes a mass of soil to lose cohesion and move relative to the surrounding soil. Lateral movement can be entirely horizontal and occur on flat ground, but it is more likely to occur on or around sloping ground, such as adjacent to hillsides and waterways (Branz 2019).

In general, the potential for landslide, slope failure, and/or lateral displacement in the project area in its current condition is high due to the varying slopes in the area and distance to nearby active fault zones. A desktop review of the Landslide Maps and Report Indices was conducted for the project area. The review of the results indicated that the landslides are considered a minor problem within the Eureka Fields Landing quadrangle, and most of the historic landslides within the area occur at older sites (CGS 2019c). Based on the review of the Geologic and Geotechnical Investigation, the risk of deep-seated rotational landslides at the project site was determined to be predominately low, with the exception of some lots on the northern portion of the site.

Liquefaction

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. Factors determining liquefaction potential are soil type, the level and duration of seismic ground motions, the type and consistency of soils, and the depth to groundwater. Loose sands and peat deposits, along with recent Holocene age deposits, are more susceptible to liquefaction, while older deposits of clayey silts, silty clays, and clays deposited in freshwater environments are generally stable under the influence of seismic ground shaking.

Liquefaction can damage buildings, roads, and pipelines through loss of structural support capabilities and subsequent destabilization of soils. The project area consists of primarily poorly drained, loamy soils (see Table 3.7-1 above) that have a high potential for liquefaction to occur. However, because of the geologic age (Pleistocene) of the upland site soils and their generally cohesive nature, it is unlikely that the project site soils would liquefy under seismic conditions (SHN Engineers & Geologists 2017).

3.7.2 Regulatory Setting

Federal

Earthquake Hazards Reduction Act of 1977

The Earthquake Hazards Reduction Act of 1977 (FEMA 1977) established the National Earthquake Hazards Reduction Program (NEHRP) "to reduce the risks of life and property from future earthquakes in the U.S. through the establishment and maintenance of an effective earthquake hazards reduction program." The National Earthquake Hazards Reduction Program Act significantly amended this program in 1990 by refining the description of the agency responsibilities, program goals, and objectives. The four principal goals of the NEHRP are:

- Develop effective practices and policies for earthquake loss reduction and accelerate their implementation;
- Improve techniques for reducing earthquake vulnerabilities of facilities and systems;
- Improve earthquake hazards identification and risk assessment methods, and their use; and
- Improve the understanding of earthquakes and their effects.

The National Earthquake Hazards Reduction Program Act designates the Federal Emergency Management Agency (FEMA) as the lead agency of the program and assigns it several planning, coordinating, and reporting responsibilities.

State

Alquist-Priolo Fault Zoning Act

In 1972, the Alquist-Priolo Earthquake Fault Zoning Act was passed to mitigate the effects of surface faulting on structures designed for human occupancy (CGS 2019a). This act required the State Geologist to delineate Earthquake Fault Zones along known active faults that have a relatively high potential for ground rupture. Faults that are zoned under the Alquist-Priolo Earthquake Fault Zoning Act must meet the strict definition of being "sufficiently active" and "well-defined" for inclusion as an Earthquake Fault Zone. The Earthquake Fault Zones are revised periodically, and they extend 200 to 500 feet on either side of identified fault traces. No structures for human occupancy may be built across an identified active fault trace. An area of 50 feet on either side of an active fault trace is assumed to be underlain by the fault, unless proven otherwise. Proposed construction in an Earthquake Fault Zone is permitted only following the completion of a fault location report prepared by a California Registered Geologist.

California Building Standards Code

The California Building Standards Code establishes building requirements for construction and renovation. The most recent version of the California Building Standards Code was published July 1, 2016, with an effective date of January 1, 2017. The California Building Standards Code is based on the International Code Council's Building and Fire Codes. Included in the California Building Standards Code are the Electrical Code, Mechanical Code, Plumbing Code, Energy Code, and Fire Code. Title 24, Part 2 of the California Building Standards Code of the CCR contains specific requirements for construction with respect to earthquakes and seismic hazards intended to be protective of public health. Chapter 16

Section 1613, Earthquake Loads, deals with structural design and requires that every structure, and portion thereof, including nonstructural components that are permanently attached to structures and their supports and attachments, shall be designed and constructed to resist the effects of earthquake motions.

California Seismic Hazards Mapping Act

The California Seismic Hazards Mapping Act of 1990 (California PRC Section 1690-2699.6) addresses seismic hazards other than surface rupture, such as liquefaction and induced landslides. The Seismic Hazards Mapping Act specifies that the lead agency for a project may withhold development permits until geologic or soils investigations are conducted for specific sites and mitigation measures are incorporated into plans to reduce hazards associated with seismicity and unstable soil (CGS 2019b).

National Pollutant Discharge Elimination System Permit

In California, the SWRCB administers the USEPA's promulgated regulations (55 CFR 47990) requiring the permitting of stormwater-generated pollution under the National Pollutant Discharge Eliminations System (NPDES). In turn, the SWRCB's jurisdiction is administered through RWQCBs. Pursuant to these federal regulations, an operator must obtain a General Permit under the NPDES Stormwater Program for all construction activities with ground disturbance of 1 acre or greater. The General Permit requires the implementation of Best Management Practices (BMPs) to reduce pollutant loads into the waters of the State and measures to reduce sediment and erosion control. In addition, a SWPPP must be prepared. The SWPPP addresses water pollution control during construction. SWPPPs require that all stormwater discharges associated with construction activity, where clearing, grading, and excavating results in soil disturbances, must by law be free of site pollutants.

Local

Humboldt County General Plan

The Humboldt County General Plan, adopted October 23, 2017, contains several policies that directly pertain to geology, soils, and seismic activity, including the following:

Goal S-G1. Minimize Loss. Communities designed and built to minimize the potential for loss of life and property resulting from natural manmade hazards.

Goal S-G2. Prevent Unnecessary Exposure. Areas of geologic instability, floodplains, tsunami run-up areas, high risk wildland fire areas, and airport areas planned and conditioned to prevent unnecessary exposure of people and property to risks of damage or injury.

- **Policy S-P1: Reduce the Potential for Loss.** Plan land uses and regulate new development to reduce the potential for loss of life, injury, property damage, and economic and social dislocations resulting from natural and manmade hazards, including but not limited to, steep slopes, unstable soil areas, active earthquake faults, wildland fire risk areas, airport influence areas, military operating areas, flood plains, and tsunami run-up areas.
- **Policy S-P7: Structural Hazards.** The County shall protect life and property by applying and enforcing state adopted building codes and Alquist-Priolo requirements to new construction.

- **Policy S-P11: Site Suitability.** New development may be approved only if it can be demonstrated that the proposed development will neither create nor significantly contribute to, or be impacted by, geologic instability or geologic hazards.
- **Policy WR-P9: Mitigate Controllable Sediment Discharge Sites.** Proposed development applications involving a site identified as part of the Total Maximum Daily Loads (TMDL) Controllable Sediment Discharge Inventory shall be conditioned to reduce sediment discharge.
- **Policy WR-P10: Erosion and Sediment Discharge**. Ministerial and discretionary projects requiring a grading permit shall comply with performance standards adopted by ordinance and/or conditioned to minimize erosion and discharge of sediments into surface runoff, drainage systems, and water bodies consistent with best management practices, adopted TMDLs, and non-point source regulatory standards.
- **Policy WR-P42: Erosion and Sediment Control Measures.** Incorporate appropriate erosion and sediment control measures into development design and improvements.

Additionally, the following standards from the Humboldt County General Plan would apply to the proposed project:

- **Standard S-S1: Geologic Report Requirements**. Site specific reports addressing geologic hazards and geologic conditions shall be required as part of the review of discretionary development and ministerial permits. Geologic reports shall be required and prepared consistent with land use regulations (Title III, Land Use and Development, Division 3, Building Regulations, Chapter 6—Geologic Hazards).
- **Standard S-S2: Landslide Maps**. Utilize California Division of Mines and Geology, North Coast Watersheds landslide mapping as information to assist in review of developments.
- **Standard S-S3. Alquist-Priolo Fault Hazard Zones.** Utilize California Mines and Geology Board Policies and Criteria for Alquist-Priolo Fault Hazard Zones (Special Publication #42) as standards of implementation within zones.
- **Standard WR-S7: Erosion and Sediment Discharge**. Ministerial and discretionary projects shall conform to grading ordinance standards for erosion and sediment control.

Humboldt County Code

Title III, Land Use and Development, Division 3, Building Regulations, Section 331-12 (Grading, Excavation, Erosion, and Sedimentation Control) of the Humboldt County Code includes specific rules and regulations to control excavation, grading, and earthwork construction. Compliance with this ordinance is mandatory for any project that is required to obtain a grading permit from the County. Requirements in order to obtain a grading permit include the design plans for a project and any accompanying soils engineering, geology, or liquefaction studies required to appropriately document the conditions of the soils in the area.

3.7.3 Methodology for Analysis

The applicable geology, soils, and seismic regulations were reviewed and the applicable geologic database searches conducted in order to complete the analysis portion of this section. Additionally, SHN Engineers & Geologists prepared a R-1 Geologic and Geotechnical Investigation for the project area in October 2017, which provided preliminary geotechnical recommendations for the site development and initial building design. This report summarized the findings of a field investigation and laboratory testing.

The results of this investigation, applicable regulations, and databases were analyzed in conjunction with the thresholds of significance identified below.

Society of Vertebrate Paleontology Guidelines

The Society of Vertebrate Paleontology (SVP) has guidance for assessing and mitigating paleontological resources which could potentially be impacted from land development. This guidance is included in SVP's *Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontological Resources*. As part of the assessment process for paleontological resources, the SVP guidance groups rock units into a high, undetermined, low, or no potential category for containing significant paleontological resources. These categories then determine the level of mitigation required, or further assessment prior to construction, for adequate protection or salvage of paleontological resources within a project area (SVP 2010).

Known Resources

The paleontological database at the University of California, Berkeley's Museum of Paleontology (2020), and soil data from the USDA's NRCS Web Soil Survey (USDA 2019) were reviewed to determine the potential for paleontological resources within the project area. The project area is classified as being between Pleistocene and Holocene age and is composed of marine sedimentary rocks.

A search of the University of California Museum of Paleontology database for mammal fossils identified one paleontological resource in the vicinity of the project site (UCMP 2020). The closest vertebrate fossil sites to the project include an assemblage located approximately 1.5 miles southeast of Cutten, within similar geologic landforms and soils as the project area (UCMP 2020). Therefore, the project site possesses a high potential for significant paleontological resources.

3.7.4 Thresholds of Significance

The CEQA Guidelines' Appendix G Environmental Checklist was assessed during the NOP scoping process to identify the proposed project components that have the potential to cause a significant impact. The following thresholds of significance were used to determine if further evaluation within this EIR was warranted to ascertain wither the proposed project may:

- Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:
    - 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 or strong seismic ground shaking
    - Seismic-related ground shaking
    - Seismic-related ground failure, including liquefaction
    - Landslides
- Result in substantial soil erosion or the loss of topsoil

- 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
- Be located on expansive soil, as (previously) defined in Table 18-1-B of the Uniform Building Code (UBC) (1994), creating substantial direct or indirect risks to life or property
- Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater [refer to Section 7, Effects Found Not To Be Significant]
- Directly or indirectly destroy a unique paleontological resources or site or unique geologic feature

3.7.5 Project Impact Analysis and Mitigation Measures

This section analyzes the proposed project's potential to result in significant impacts to geology, soils, and seismicity. When a potential impact is determined to be potentially significant, mitigation measures were identified that would reduce or avoid that impact.

Seismic Hazards

Impact GEO-1:	**The proposed project would not directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:**
	i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map, issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.
	ii) Strong seismic ground shaking.
	iii) Seismic-related ground failure, including liquefaction.
	iv) Landslides.

Impact Analysis
Fault Rupture

There are no Alquist-Priolo Earthquake Fault Zones within the project site boundaries. In addition, the Geologic and Geotechnical Investigation noted the potential for surface fault rupture is considered to be negligible. This condition precludes the possibility of the proposed project being exposed to fault rupture. No impacts would occur.

Ground Shaking

The faults within the region, including the Little Salmon Fault and CSZ, have the potential to produce strong ground shaking within the vicinity of the proposed project. Strong ground shaking could cause serious structural damage to buildings and other structural components of the proposed project if not engineered and constructed to comply with the current California Building Standards Code and could even cause extensive non-structural damage to properly constructed buildings.

The Geologic and Geotechnical Investigation included conclusions and recommendations for the proposed project as they relate to seismic hazards. These conclusions and recommendations included the incorporation of site-specific design considerations, such as using engineered fill, building structures utilizing wood-frames, and building structures in conformance with the current edition of the California Building Standards Code seismic design parameters. Ultimately, for many areas, the Geologic and Geotechnical Investigation recommends that in order to properly determine if individual lot sites are suitable for construction, further site-specific geotechnical evaluations should be conducted. A soils engineering report and engineering geology report would be required for the project in accordance with the County's Title III, Division 3, Building Regulations of the County Code related to grading permit requirements.

As such, MM GEO-1 would be required and would ensure that performance standards for those reports are met and recommendations are incorporated into the final design of the proposed project. Therefore, the potential for rupture of a known earthquake fault that could expose people or structures to risk from the proposed project would be less than significant with mitigation.

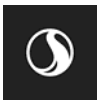
Ground Failure and Liquefaction

As discussed above, the proposed project could be subject to an earthquake event from one of the active faults within the area. However, according to the Geologic and Geotechnical Investigation, the soil liquefaction potential or other ground failure due to strong seismic shaking is considered low for the project area because of the geologic age of the underlying site soils and the generally cohesive nature of these soils (SHN Engineers & Geologists 2017). Additionally, the proposed project would be constructed in conformance with the current California Building Standards Code requirements, related to seismic design parameters, and MM GEO-1. Therefore, the potential for the proposed project to expose people or structures to potentially adverse effects related to liquefaction or seismic related ground failure would be less than significant.

Landslides

As discussed in the environmental setting section above, a review of the California Geological Survey (CGS) Landslide Maps and Report Indices for the project area indicated that the area could be subject to a minor landslide potential (CGS 2019c). The project area has varying slopes, which could be subject to shallow to deep-seated land sliding, depending on exact location within the project area (SHN Engineers & Geologists 2017). In the event of a large earthquake, particularly during the rainy season for the area, these slopes may initiate larger, deeper landslides that could pose a hazard to people and structures associated with the proposed project, thus resulting in a potentially significant impact prior to mitigation.

The Geological and Geotechnical Investigation included recommendations for setbacks for any structures with a moderate to high slope stability hazard. These areas were determined to require additional site-specific geologic and geotechnical investigations. In addition, a site-specific geotechnical study would be needed for the water storage tank site. As such, MM GEO-1 would be required and would ensure that these sites are investigated in conformance with the County Code grading permit requirements. Therefore, with implementation of MM GEO-1 the potential for landslides to expose people or structures to potentially significant effects related to landslides would be less than significant.



Level of Significance Before Mitigation
Potentially Significant Impact.

Mitigation Measure

MM GEO-1: **Conduct Site-Specific Geotechnical Investigation for Development.** Prior to filing a map for each phase, the Applicant shall submit a design-level geotechnical study and building plans for each phase and the water tank location which would be prepared by a registered geologist or geotechnical engineer. The detailed, design-level geotechnical investigations shall include foundation design, criteria for placing proposed fills, as well as structures, deep foundation, subdrainage, and/ or retaining wall systems, setbacks for each lot, and specific engineering criteria for moderate to high slopes. The building plans shall demonstrate that they incorporate all applicable recommendations of the design-level geotechnical study and comply with all applicable requirements of the most recent version of the California Building Standards Code. The approved plans shall be incorporated into the proposed project. All on-site soil engineering activities shall be conducted under the supervision of a licensed Geotechnical Engineer or Certified Engineering Geologist. A design-level geotechnical study shall be prepared for the water storage tank site in coordination with Humboldt Community Services District (HCSD).

Level of Significance After Mitigation
Less Than Significant Impact with Mitigation Incorporated.

Erosion

Impact GEO-2:	**The proposed project would not result in substantial soil erosion or the loss of topsoil.**

Impact Analysis
Construction

Construction activities associated with the proposed project would consist of the excavation and the movement of soil, which could result in the loss of topsoil if not properly handled. This would be anticipated throughout the project area, including any paved or previously disturbed areas and the water storage tank location site. Temporary stockpiles of soil have the potential to result in loss of topsoil during construction when soils are exposed and being transported; however, implementation of the proposed project would comply with Title III, Division 3, Building Regulations of the County Code related to grading, excavations, erosion, and sediment control for construction projects. The County Code includes requirements for obtaining a grading permit and general design standards, as well as BMPs for construction related grading and drainage activities. MM HYD-1, Prepare a Stormwater Pollution and Prevention Plan (SWPPP), would incorporate the principals outlined in the County Code requirement for the Applicant and the chosen Contractor to follow, which would minimize the potential for erosion and loss of topsoil from the proposed project construction activities. The Erosion Control Plan and SWPPP would include other requirements from the NPDES Permit related to stormwater, erosion, and sediment control. Therefore, construction-related erosion and loss of topsoil would be considered less than significant with the incorporation of MM HYD-1.

Operation

Long-term operation of the proposed project would not result in substantial soil erosion or loss of topsoil. The majority of the project site would be covered by the proposed structures; thus, no exposed areas subject to erosion would be created or affected by the proposed project. Therefore, operation impacts related to erosion or the loss of topsoil would be less than significant.

Level of Significance Before Mitigation
Potentially Significant Impact.

Mitigation Measures
MM HYD-1 would be required.

Level of Significance After Mitigation
Less Than Significant Impact with Mitigation Incorporated.

Unstable Geological Unit or Soil

Impact GEO-3:	**The proposed project would not 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 Analysis
As discussed in the environmental setting and under Impact GEO-1 above, the proposed project contains areas that are potentially susceptible to minor liquefaction, slope failure, and ground shaking from the surrounding earthquakes in the area. As such, structures associated with the proposed project could be located on soils that are unstable, thus resulting in a potentially significant impact prior to mitigation.

Implementation of County Code grading permit requirements through MM GEO-1 would ensure that a site-specific geologic and geotechnical investigation is completed for the entire project area as a condition of permit approval. The results and design recommendations of the investigation would be incorporated into the project design to ensure feasibility of constructability and the long-term stability of the site soils. Thus, with implementation of MM GEO-1, the proposed project would be constructed in conformance with current federal, state, and local regulations, and the impact associated with locating proposed project structures on unstable soils would be less than significant with mitigation.

Level of Significance Before Mitigation
Potentially Significant Impact.

Mitigation Measures
MM GEO-1 would be required.

Level of Significance After Mitigation
Less Than Significant Impact with Mitigation Incorporated.

Expansive Soil

Impact GEO-4:	**The proposed project would not be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property.**

Impact Analysis
According to the Geologic and Geotechnical Investigation, no evidence of high-plasticity or potentially expansive soils were observed on the project site, although occasional moderately plastic clayey soils are indicated. As a precaution, at the time the foundation excavations are made, the building sites would be reviewed to confirm the absence of plastic, potentially expansive clay deposits, and MM GEO-1 would be required to conduct a site-specific geologic and geotechnical investigation as a condition of permit approval for the project. This investigation would help determine if the site is located on an expansive soil type and the feasibility of constructability of the proposed project for each individual plot identified for development, including the water storage tank location. Therefore, the impact associated with expansive soils would be less than significant with mitigation.

Level of Significance Before Mitigation
Potentially Significant Impact.

Mitigation Measures
MM GEO-1 would be required.

Level of Significance After Mitigation
Less Than Significant Impact with Mitigation Incorporated.

Unique Paleontological Resource or Site or Unique Geologic Feature

Impact GEO-5:	**The proposed project would not directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.**

Impact Analysis
The project area lies within an area of Pleistocene era deposits. According to the SVP guidance for assessing and mitigating paleontological resources, and the proximity of a known resource in similar context, the paleontological potential of the proposed project would be considered high, due to the age and geographic context of these deposits. Given the high paleontological potential of the underlying rock units within the project area, there is the potential for ground-disturbing construction activities to unearth potentially significant paleontological resources in previously undisturbed areas. Therefore, in order to ensure that construction personnel are trained in appropriate identification and treatment procedures for these potentially significant resources, MM GEO-2 would be required and would include the development of a Worker Environmental Awareness Program (WEAP) for paleontological resources. Further, if previously undiscovered paleontological resources are encountered on the proposed project site, MM GEO-3 would also be required, in order to ensure that the proper handling of these resources is followed in compliance with federal and state regulations for treatment of paleontological resources. Proper handling of these previously undiscovered resources would include stopping all work within 100 feet of the discovery, notifying the County staff and a qualified geologist or paleontologist to evaluate the resource, and implementing further treatment measures if the identified resource is determined to be significant. Implementation of MM GEO-2 and MM GEO-3 would protect resources and develop treatment

measures to effectively eliminate potentially significant impacts to previously undiscovered paleontological resources. Therefore, the impact would be less than significant with mitigation incorporated.

Level of Significance Before Mitigation
Potentially Significant Impact.

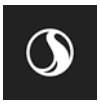
Mitigation Measures

MM GEO-2: **Pre-Construction Worker Environmental Awareness Program (Paleontological Resources).** Prior to start of any construction activity, the Applicant and the contractor shall prepare and implement a Worker Environmental Awareness Program (WEAP). The purpose of the WEAP is to educate personnel (i.e., construction workers) about the existing on-site and surrounding resources and the measures required to protect these resources as well as avoidance and potential hazards within these sites. The WEAP shall include materials and information on potentially sensitive cultural and paleontological resources resulting from construction within the project area and applicable precautions personnel should take to reduce potential impacts. The WEAP shall be subject to review by the County Planning and Building Department.

The WEAP presentation shall be given to all personnel who may harm sensitive environmental resources as identified within the WEAP mitigation measures (i.e., work in non-culturally cleared areas or equipment operators who may encounter sensitive species or resources). The WEAP presentation shall be given prior to the start of construction and as necessary throughout construction as new personnel arrive on-site. The Applicant and the contractor shall be responsible for ensuring all on-site personnel attend the WEAP presentation, receive a summary handout, and sign a training attendance acknowledgement form to indicate that the contents of the program are understood and to provide proof of attendance. Each participant of the WEAP presentation shall be responsible for maintaining their copy of the WEAP reference materials and making sure other on-site personnel are complying with the recommended precautions. The contractor shall keep the sign in sheet on site and submit copies of the WEAP sign-in sheet to the Applicant's Project Manager who shall distribute to the County.

Paleontological resources include any remains, traces, or imprints of a plant or animal that has been preserved in the Earth's crust since some past geologic time and may include fossil materials such as bones, leaf impressions and other carbonized remains and shells of invertebrates such as snails and clams. For the paleontological materials portion of the WEAP, presentation of the following information and implementation steps shall be prepared, presented, and executed prior to and during construction to prevent exposure and raise awareness of potential impacts to unknown paleontological resources:

- The Applicant shall retain a qualified Geologist or Paleontologist to conduct the pre-construction paleontological resource and/or unique geologic feature portion of the construction worker awareness training; and



- Construction personnel shall be informed of the possibility of such resources within the project area and the protocol to be followed if a resource is encountered as detailed in MM GEO-3.

MM GEO-3: **Proper Handling of the Unanticipated Discovery of Paleontological Resources or Unique Geologic Features**. If paleontological resources (i.e., fossils) and/or unique geologic features are encountered during construction, compliance with federal and state regulations and guidelines regarding the treatment of such resources shall be required. If paleontological resource or unique geologic features are encountered during ground disturbing activities, work within 100 feet of the discovery shall be halted until the Applicant notifies a qualified Geologist or Paleontologist to evaluate the significance of the find. If the find is determined to be significant and the landowner consents, the Applicant will determine the appropriate avoidance measures or other appropriate mitigation in consultation with a qualified archaeologist and landowner, such as site salvage. Significant paleontological resources recovered shall be subject to scientific analysis, professional museum curation, and a report prepared by the qualified paleontologist according to current professional standards. The Society of Vertebrate Paleontology (SVP) provides guidelines on assessment and mitigation of adverse impacts to paleontological resources.

Level of Significance After Mitigation
Less Than Significant Impact with Mitigation Incorporated.