4.6 GEOLOGY AND SOILS

4.6.1 Setting

a. Geologic Conditions and Topography. The Project Site is located in the Coast Range geomorphic province in the San Juan Valley, on the south end of the Santa Clara Valley with the Gabilan Range situated to the west. The San Juan Valley is bounded by the Santa Cruz Mountains to the west, the Hollister Valley to the east and the Sargent Hills to the north. Tectonic processes formed the San Juan and Hollister Valleys during Pleistocene time.

The predominant structural feature in the California Coast Ranges is the San Andreas fault, which is the structural boundary between two tectonic plates: the Pacific Plate to the southwest of the fault and the North American Plate northeast of the fault. The Project Site is predominantly located in an alluvial valley with the southern portion of the site located on the foothills of a northwest trending ridge situated east of the San Andreas Rift Zone (refer to Figures 4.6-1 and 4.6-3).

Regional geologic mapping shows the Project Site as underlain by Pliocene unnamed continental mudstone in the foothills and Holocene alluvium in the low-lying portion of the site (Wagner 2002 as cited in ENGEO 2013). Bedrock units at the site are described as weakly lithified terrestrial valley and lacustrine deposits, predominantly mudstone with fine grained sandy layers. Regional bedrock orientation is generally shown as striking northwest and dipping approximately 50 degrees southwest.

The overall Project Site is characterized by rolling hills and ridges separated by northwest trending valleys. The majority of the residential component of the Project would be developed on the northern third of the Project Site, in the relatively flat northwestern part of the site. The topographic relief across the overall site is approximately 900 feet, with elevations ranging from approximately 1,120 feet above mean sea level (msl) in the hilly southeastern portion of the overall site to about 220 msl near in the relatively flat pasturelands toward the westerly edge of the Project Site. Topographic elevations within the area to be developed with the residential uses includes approximately 350 feet above msl in the southeastern portion of the development (approximately 450 feet msl at the proposed water tank site) to approximately 220 feet above msl in the northwestern portion.

Project Site. As shown on Figure 2-4b, the development of residential, commercial, and resort land uses would occur within the northwestern portion of the Project Site, which is referred to as the Development Area. The Development Area is bounded by agricultural land to the west and north, the Existing Golf Club to the east, and undeveloped foothills to the south.

The geotechnical reports covered the Development Area proposed for Phases 1 through 4 of the proposed Project. These reports do not cover Phase 5 of the proposed Project, which would include 67 non-age restricted housing units, a resort hotel, and neighborhood commercial uses on 338 acres near the existing golf course on the Project Site. However, geologic and soil-related constraints including soil type, faults, and landslides in these Phase 5 areas were considered in the 2003 *San Juan Oaks Golf Club General Plan Amendment/Zone Change/Vesting Tentative Subdivision Map EIR* (2003 EIR) for the previously approved project and remain unchanged for purposes of this analysis.

As noted in the two ENGEO reports, the Project Site consists of foothills along the southern boundary transitioning to relatively flat ground towards the north. The highest topographic area within the Development Areas is the southeastern foothill at approximately 460 feet above msl while the site typically slopes towards the north/northwest to the lowest topographic area in the northwestern corner of the site at approximately 220 feet above msl.

b. Soils. As mapped by the U.S. Department of Agriculture, Natural Resource Conservation Service (NRCS), 20 different soil associations are present on the Project Site. Soil names and selected physical properties for the Project Site are summarized in Table 4.6-1. It should be noted that considerable variation is expected within the given soil types (Figure 4.6-2). Refer to Section 4.9, *Agricultural Resources,* for a discussion of prime soils and on-site soil fertility classifications.

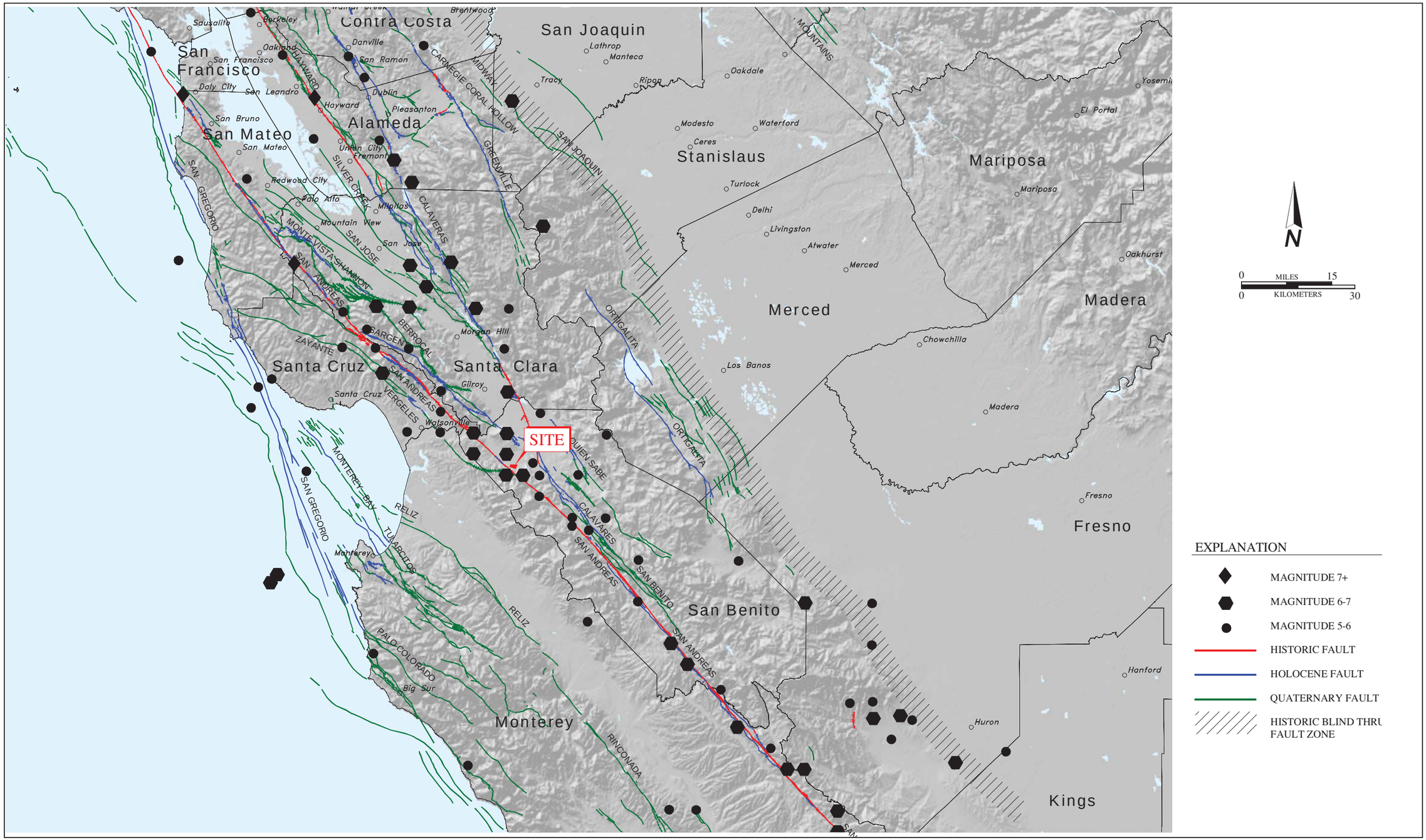
Although 20 different soils can be found on-site, development of the Project would primarily occur on seven soil types given that construction is focused within specific Development Areas. The soils underlying the main part of the Development Areas are listed below and described in Table 4.6-1:

- Antioch Loam (2-5% slopes)
- Clear Lake Clay
- Cropley Clay (2-9% slopes)
- Diablo Clay (9-15% slopes)
- Diablo Clay (15-30 % slopes, eroded)
- Salinas Clay Loam (0-2% slopes)
- Willows Sandy Loam

c. Seismic and Fault Hazards. Similar to much of California, the Project Site is located within a seismically active region. The seismic and fault hazards relevant to the Project Site are described below (See March 2013 and August 2013 ENGEO reports, at Appendix E).

Faulting. The U.S. Geological Survey (USGS) defines active faults as those that have had surface displacement within Holocene time (about the last 11,000 years). Surface displacement can be recognized by the existence of scarps 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 ones that have had surface displacement during the last 1.6 million years. Inactive faults have not had surface displacement within the last 1.6 million years.

Figure 4.6-3 shows the nearest known active fault zones to the Project Site. The San Andreas rift zone is located along the southern property line of the Project Site and represents the structural divide between Pliocene terrestrial bedrock on the northeast and Salinian block granitic rocks to the southwest. The San Andreas Fault system generally strikes northwest and is characterized by a combination of strike-slip and reverse displacement. The area around the San Andreas Fault is located within a State of California Earthquake Fault Zone (1982), otherwise known as an Alquist-Priolo zone. The portion of the Project Site within the Earthquake Fault Zone is designated as proposed open space (see Figures 2-4a and 4.6-3). The San Andreas Earthquake Fault Zone is located approximately 2,000 feet from the Development Areas at its closest point; no portion of the Development Areas is located within a State of California Earthquake Fault Zone (1982).



Regional Seismicity

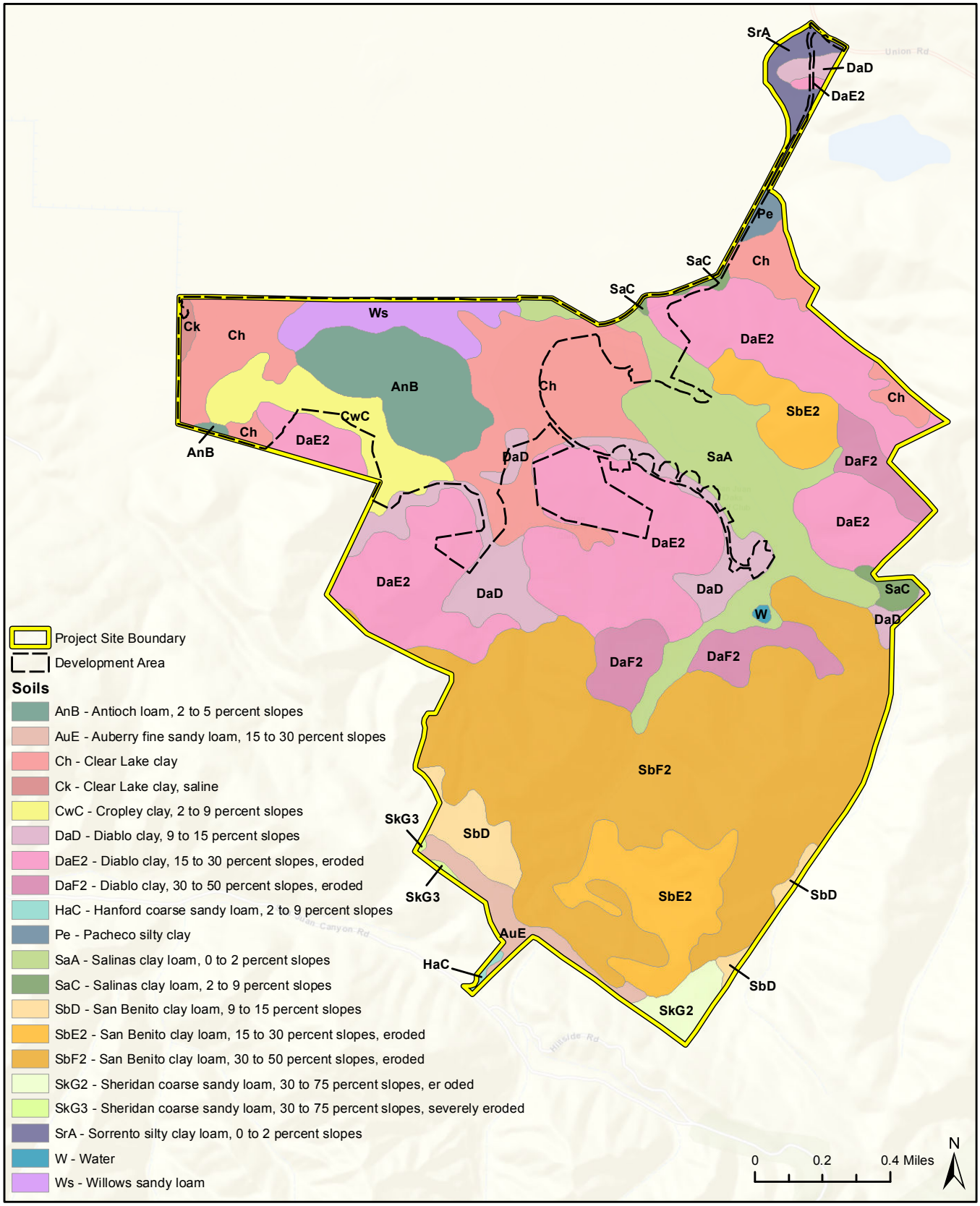
Figure 4.6-1

Source: ENGEO, Geotechnical Exploration, August 2013.

Table 4.6-1
Selected General Parameters of On-Site Soils

Name	Map Name	Permeability	Shrink-Swell Potential	Rate of Surface Runoff	Erosion Hazard
Antioch Loam (2-5% slopes)	AnB	Very Slow	Moderate	Slow	Slight
Auberry Fine Sandy Loam (15-30% slopes)	AuE	Moderate	Moderate	Medium to Rapid	Moderate to Severe
Clear Lake Clay	Ch	Slow	High	Ponded to Very Slow	None to Slight
Clear Lake Clay, saline	Ck	Slow	High	Ponded to Very Slow	None to Slight
Cropley Clay (2-9% slopes)	CwC	Slow	High	Slow to Medium	Slight to Moderate
Diablo Clay (9-15% slopes)	DaD	Slow	High	Medium	Moderate
Diablo Clay (15-30% slopes, eroded)	DaE2	Slow	High	Rapid	Severe
Diablo Clay (30-50% slopes, eroded)	DaF2	Slow	High	Rapid	Severe
Hanford Coarse Sandy Loam (2-9% slopes)	HaC	Rapid	Low	Slow to Medium	Slight to Moderate
Pacheco Silty Clay	Pe	Slow	High	Very Slow to Ponded	None
Salinas Clay Loam (0-2% slopes)	SaA	Moderately Slow	Moderate	Very Slow	None to Slight
Salinas Clay Loam (2-9% slopes)	SaC	Moderately Slow	Moderate	Slow to Medium	Slight to Moderate
San Benito Clay Loam (9-15% slopes)	SbD	Moderately Slow	Moderate	Medium	Moderate
San Benito Clay Loam (15-30% slopes, eroded)	SbE2	Moderately Slow	Moderate	Rapid	Severe
San Benito Clay Loam (30-50% slopes, eroded)	SbF2	Moderately Slow	Moderate	Rapid to Very Rapid	Severe to Very Severe
Sheridan Coarse Sandy Loam (30-75% slopes, eroded)	SkG2	Moderately Rapid	Low	Rapid to Very Rapid	Severe to Very Severe
Sheridan Coarse Sandy Loam (30-75% slopes, severely eroded)	SkG3	Moderately Rapid	Low	Rapid to Very Rapid	Severe
Sorrento Silty Clay Loam (0-2% slopes)	SrA	Moderately Slow	Moderate	Very Slow	Slight to None
Willows Sandy Loam	Ws	Very Slow	High	Very Slow to Ponded	None

Source: Natural Resource Conservation Service (NRCS) Soil Survey of San Benito County, 1969.



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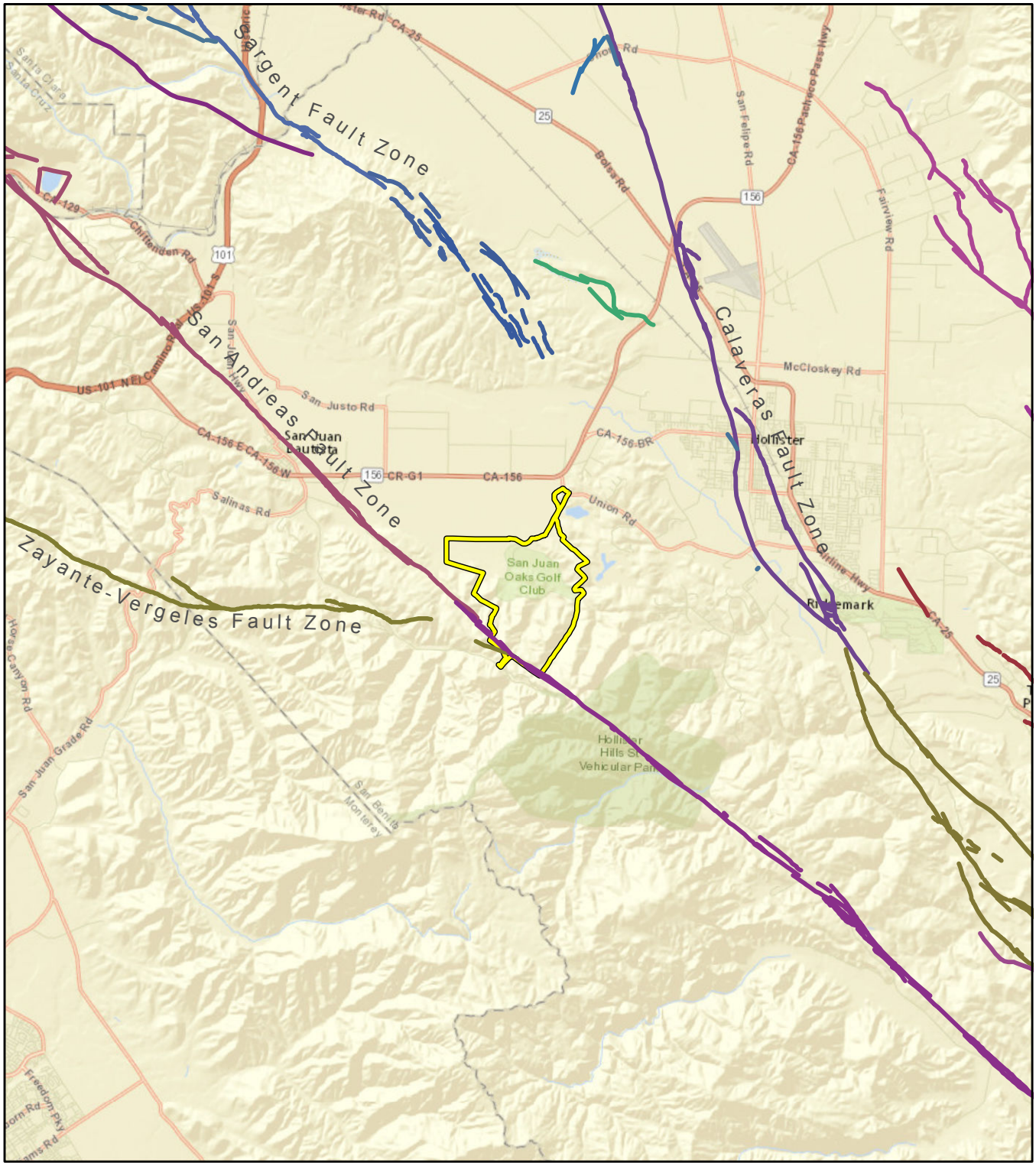
Soils by the NRCS.

On-Site Soil Types Figure 4.6-2



Known Faults in Proximity
To the Project Site

Figure 4.6-3

As described in the ENGEO report (August 2013), previous regional mapping at the site also shows two north-west trending, concealed faults crossing the Development Areas: the Nutting fault crossing the southern portion of the Development Areas, and the Morse fault in the northeastern portion of the Development Areas.

The Nutting fault has been depicted as trending parallel with the mapped bedrock and alluvium contact at the front of the foothills on the southern portion of the Development Areas. To update information about this fault since the 2003 EIR was prepared, and to verify the existence of the fault on-site, an exploratory trench (Trench T-1) was excavated by ENGEO as part of its March 2013 geotechnical study. No evidence of faulting was observed in the trench. Because ENGEO found no physical evidence that the Nutting fault occurs on-site, it concluded that land planning setbacks or design constraints associated with the Nutting fault are not required at the Project Site.

Previous regional geologic mapping depicts the Morse fault as crossing the northeast corner of the Development Areas, where it generally trends parallel with the Nutting fault, although this mapping indicates that the existence of Morse fault is doubtful on-site. To update information about this fault since the 2003 EIR was prepared, and to establish whether it occur on-site, an exploratory trench (Trench T-2) was excavated by ENGEO as part of its August 2013 geotechnical study. No evidence of faulting was observed in the trench. Furthermore, any discontinuities within the exploratory trench appear to be related to depositional and erosional processes, rather than to faulting. Because ENGEO found no evidence that the Morse fault occurs in the Development Areas, it concluded that land planning setbacks or design constraints associated with this fault are not required at the site.

Other nearby known active faults consist of: the Sargent fault that was mapped approximately 3.2 miles north of the Project Site; the Calaveras fault that was mapped approximately 3.5 miles northeast of the Project Site; and the Hayward Fault that was mapped approximately 33 miles northwest of the Project Site. As discussed above, although the Nutting and Morse faults have been mapped as occurring in the Development Areas, exploratory trenches dug by ENGEO in 2013 found no evidence that either fault occurs on-site. Based on geotechnical investigations by ENGEO, no known active faults occur within the Development Areas.

Ground Rupture. Surface fault rupture is a manifestation of the fault displacement at ground surface. The amount of surface displacement can range up to several feet or more, depending on the earthquake magnitude and other factors.

Because of the presence of nearby active faults, including the San Andreas Fault Zone, the region is considered seismically active. Numerous small earthquakes occur every year in the region, and large (>M7) earthquakes have been recorded and may occur in future (ENGEO, 2013).

As noted above, a mapped Earthquake Fault Zone is located at the southwestern boundary of the Project Site. However, no active faults cross the Development Areas.

Secondary Seismic Hazards. Common secondary seismic hazards include ground shaking, ground lurching, soil liquefaction, lateral spreading, and landsliding. Determination of

the potential for each of these secondary hazards to occur at the Project Site is based on the ENGEO reports (March 2013; August 2013), which are attached to this SEIR in Appendix E, and is discussed below.

Ground Shaking. Ground shaking is typically reduced to ground motion components of wave velocity and acceleration. The intensity of ground shaking at a site are dependent upon the distance to the fault, the magnitude and failure mechanics of the earthquake, and the nature of the bedrock, alluvium, and soil through which the shock waves travel. Generally, shock waves attenuate with distance from the focus of the earthquake.

The Uniform California Earthquake Rupture Forecast (UCERF, 2008 as cited in ENGEO, 2013) evaluated the 30-year probability of a6.7 or greater magnitude earthquake occurring on the known active fault systems in the Bay Area, including the San Andreas fault.

The UCERF generated an overall probability of 63 percent for the Bay Area as a whole, a probability of 59 percent for the south San Andreas fault, a probability of 31 percent for the Hayward-Rodgers Creek fault, and a probability of 7 percent for the Calaveras fault.

An earthquake of moderate to high magnitude generated within the San Francisco Bay Region could cause considerable ground shaking at the Project Site, similar to that which has occurred in the past (ENGEO, 2013).

Ground Lurching. Ground lurching is a result of the rolling motion imparted to the ground surface during energy released by an earthquake. Such rolling motion can cause ground cracks to form in weaker soils. The potential for the formation of these cracks is considered greater at contacts between deep alluvium and bedrock. Such an occurrence is possible at the Project Site; however, based on the site's location, ENGEO (August 2013) found that any ground lurching would be expected to be minor.

Liquefaction. Liquefaction is defined as the sudden loss of soil strength due to a rapid increase in soil pore water pressures resulting from seismic ground shaking. Liquefaction potential is dependent on such factors as soil type, depth to groundwater, degree of seismic shaking, and the relative density of the soil. When liquefaction of the soil occurs, buildings and other objects on the ground surface may tilt or sink, and lightweight buried structures (such as pipelines) may float toward the ground surface. Liquefied soil may be unable to support its own weight or that of structures, which could result in loss of foundation bearing or differential settlement. Liquefaction may also result in cracks in the ground surface followed by the emergence of a sand-water mixture.

The geotechnical exploration conducted for the Project revealed predominantly alluvial deposits within the relatively flat, low-lying Development Areas. The majority of the Development Areas are underlain with very stiff to hard silty lean clay, lean clay and silt. Subsurface investigations of the Development Areas indicated that thin layers (½ to 2 feet thick) of loose to medium dense silty sand and sand are located below the design groundwater level and are potentially liquefiable. In addition, select clayey silt and sandy silt layers, between 1½ and 7 feet thick in the Development Areas, are potentially susceptible to liquefaction during a strong earthquake. The potentially liquefiable silt-based layers are located along the northern

portion of the Development Areas at depths ranging from 25½ to 40 feet below ground surface (bgs).

Based on the liquefaction analysis, ENGEO (August 2013) concluded that approximately 1 inch of total liquefaction-induced settlement could occur within the Development Areas based on existing conditions. In addition, potentially liquefiable soils may also be susceptible to earthquake-induced surface rupture. In order for liquefaction-induced ground failure to occur, the pore water pressure generated within the liquefied strata must exert a force sufficient to break through the overlying soil and vent to the surface resulting in sand boils or fissures.

ENGEO (August 2013) found that the Project Site has a thick non-liquefiable soil cap overlying the potentially liquefiable soils; therefore, the risk of liquefaction-induced surface rupture at the site is considered low given the current groundwater level.

Lateral Spreading. Lateral spreading is a failure within a nearly horizontal soil zone (possibly due to liquefaction) that causes the overlying soil mass to move toward a free face or down a gentle slope. Generally, effects of lateral spreading are most significant at the free face or the crest of a slope and diminish with distance from the slope (ENGEO, 2013).

The majority of the Project Site is relatively flat with the exception of the southern foothills and the seasonal drainage channel extending from the southeastern corner of the Development Areas (ENGEO, August 2013). The channel varies in size from 20 to 25 feet wide and 5 to 10 feet deep with vegetated sides sloped generally 1½ :1 or flatter while sections of approximately 15 feet deep typically comprise slopes at 1:1.

Overall, there would be low potential for lateral spreading at the Project Site, with the exception of that portion of the Project Site that is in the vicinity of the drainage channel where slope deformation could occur (ENGEO, August 2013).

Seismically Induced Slope Failure. The risk of slope instability is greater during major earthquakes than during other time periods. Given the topography of the Development Areas, it is not anticipated that they would be subject to seismically induced landsliding. There are mapped landslides within the foothills on the southern portion of the Project Site; however, based on field observations by ENGEO (August 2013) the landslides are relatively shallow slumps or earthflows, which can be effectively addressed through avoidance (setback) or corrective grading.

d. Other Geologic Hazards. Geologic hazards that are not necessarily associated with seismic or faulting activity may be present on-site. The hazards that may be applicable to the Project Site are described below.

Landslides. Landslides result when the driving forces that act on a slope (i.e., the weight of the slope material, and the weight of objects placed on it) are greater than the slope's natural resisting forces (i.e., the shear strength of the slope material). A number of previous authors have mapped landslides at the Project Site including: Dibblee and Rogers (1975), Sarna-Wojcicki, et. al., (1975), Rogers (1993) and Majmundar (1994). This work was compiled with other research to form the basis for the Landslide Susceptibility Map for the Project Site created

by Whitson Engineers (2002) (see Figure 4.6-4). The Landslide Susceptibility Map classifies susceptibility to landslides on a scale from 1 (Least Susceptible) to 4 (Most Susceptible).

The proposed development of the Project would be concentrated in the northwestern portion of the Project Site (i.e., Development Area), which Landslide Susceptibility Map for the Project Site depicts as having a low susceptibility to landslides.

In addition, the mapped landslides located within the foothills at the southern end of the Development Areas are relatively shallow slumps or earthflows, which can be avoided or mitigated during grading (ENGEO, August 2013), as described further below.

Expansive Soils. During periods of water saturation, soils with high clay content tend to expand. Conversely, during dry periods, the soils tend to shrink. The amount of volume change depends upon the soil swell potential (amount of expansive clay in the soil), availability of water to the soil, and soil confining pressure. Swelling occurs when the soils containing clay become wet due to excessive water from poor surface drainage, over irrigation of lawns and planters, and sprinkler or plumbing leaks. These volume changes with moisture content can cause cracking of structures built on expansive soils. In addition, swelling clay soils can cause distress to lightly loaded structures, walks, drains, and patio slabs.

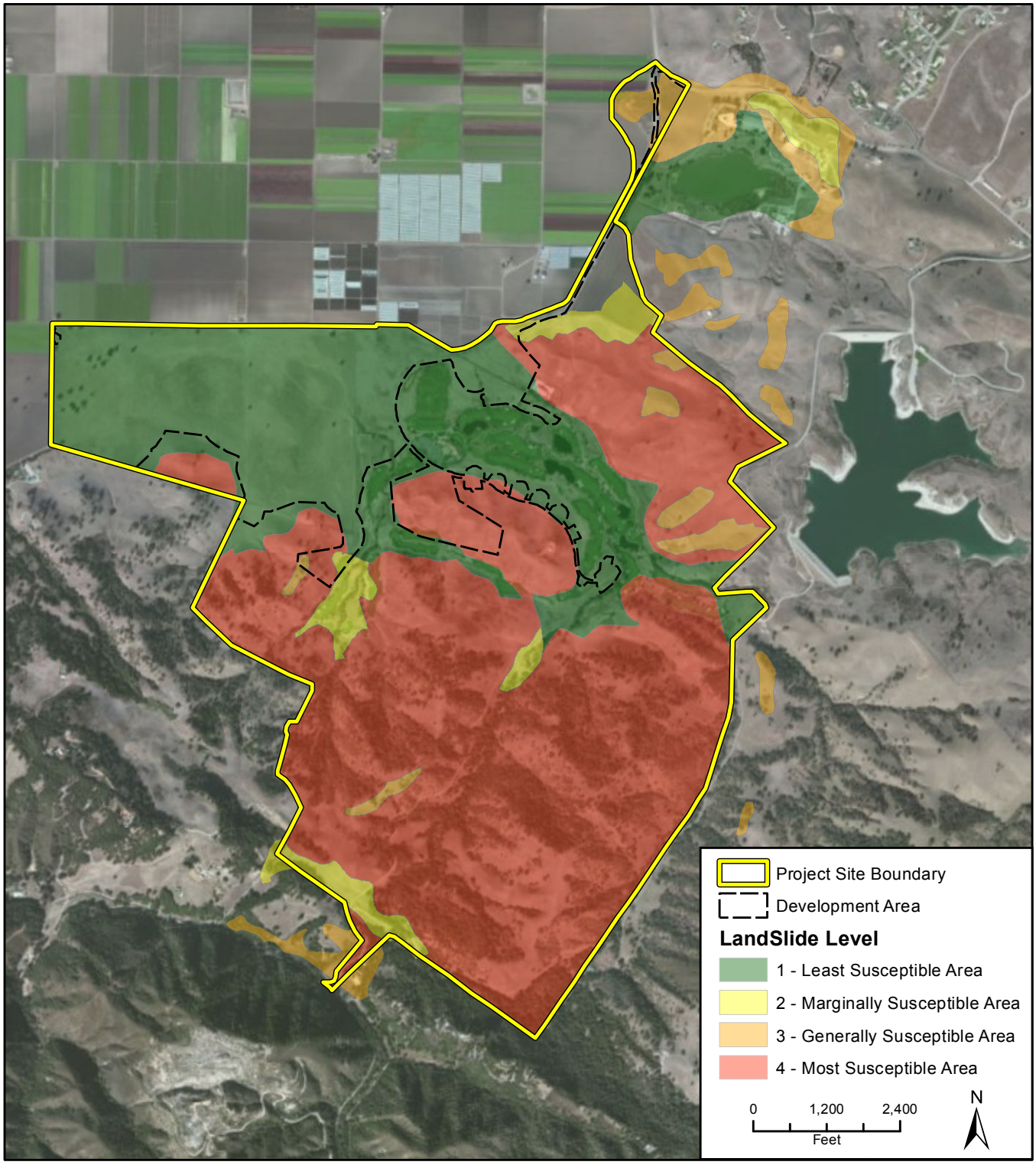
To further evaluate the susceptibility of the Development Areas to soil-related hazards, ENGEO (August 2013) conducted tests on several samples of the near-surface soil in the Development Areas. The results of the tests indicated a plasticity indices ranging from 19 to 35, indicating that the near-surface soils generally have a moderate to high expansion potential.[1]

Erosive Soils. 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 erosional hazard for soils at the Project Site varies considerably between soil types, as shown in Table 4.6-1, and ranges from none to slight (for Clear Lake Clays) to severe to very severe (for San Benito clay loam and Sheridan coarse sandy loam).

Subsidence. Subsidence is the lowering of ground surface. It often occurs as a result of withdrawal of fluids such as water, oil, and gas from the subsurface. When fluids are removed from the subsurface, the overburden weight, which the water had previously helped support through buoyant forces, is transferred to the soil structure. Subsidence typically occurs over a long period of time and results in a number of structural impacts. Earthquakes also can induce subsidence or uplift of the ground surface. Facilities most affected by subsidence are long, surface infrastructure facilities such as canals, sewers, and pipelines.

[1] *The plasticity index (PI) is a measure of the plasticity of a soil. The plasticity index is the size of the range of water contents where the soil exhibits plastic properties. The PI is the difference between the liquid limit and the plastic limit (PI = LL-PL). Soils with a high PI tend to be clay, those with a lower PI tend to be silt, and those with a PI of 0 (non-plastic) tend to have little or no silt or clay. PI and their meanings: (0-3) = Non-plastic; (3-15) = Slightly plastic; (15-30) = Medium plastic; and 30+ = Highly plastic.*



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Landslide data from Whitson Engineers, 2002.

On-Site Landslide Susceptibility Figure 4.6-4

The extraction of groundwater from an aquifer beneath an alluvial valley can result in subsidence or settlement of the alluvial soils. The factors that influence the potential occurrence and severity of alluvial soil settlement due to groundwater withdrawal include: degrees of groundwater confinement; thickness of aquifer systems; individual and total thickness of fine-grained beds; and compressibility of the fine-grained layers. No documented areas of subsidence have been identified on the Project Site or in San Benito County generally to date (County of San Benito, 2013). The risk of earthquake-induced subsidence or uplift is low to negligible at the Project Site (ENGEO, August 2013).

e. Regulatory Setting.

Federal

Clean Water Act – National Pollutant Discharge Elimination System. 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. Most states are authorized to implement the NPDES Stormwater permitting program. 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.

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.

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.

State.

Seismic Hazards Mapping Act. The Seismic Hazards Mapping Act (SHMA) of 1990 (Public Resources Code, Chapter 7.8, Section 2690-2699.6) directs the Department of Conservation, California Geological Survey to identify and map areas prone to earthquake hazards of liquefaction, earthquake-induced landslides and amplified ground shaking. The purpose of the

SHMA is to reduce the threat to public safety and to minimize the loss of life and property by identifying and mitigating these seismic hazards. The SHMA was passed by the legislature following the 1989 Loma Prieta earthquake. The Seismic Hazards Mapping Act addresses geo-seismic hazards, other than surface faulting, and applies to public buildings and most private buildings intended for human occupancy.

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 2013 CBC in the case of the Project.

The 2013 CBC is based on the 2012 International Building Code, which is published by the International Code Council (ICC). The scope of this code as used by the CBC covers major aspects of construction and design of structures and buildings, except for one-and two-family dwellings, efficiency dwelling units, and town homes up to three stories in height(which are covered by the California Residential Code). The International Building Code contains provisions for structural engineering design and addresses the design and installation of structures and building systems through requirements that emphasize performance. The International Building Code includes codes governing structural as well as fire- and life-safety provisions covering seismic, wind, accessibility, egress, occupancy, and roofs.

California Residential Code (CRC). Similar to the CBC, the CRC requires seismically resistant construction and foundation and soil investigations prior to construction, but applies to projects involving detached one- and two-family dwellings, efficiency dwelling units, and town homes up to three stories in height. The County is responsible for enforcing the 2013 CRC in the case of the Project.

The 2013 CRC is based on the 2012 International Residential Code, which is published by the ICC. The purpose of this code is to establish the minimum requirements to safeguard public health, safety, and general welfare through structural strength, means of egress, stability, access to persons with disabilities, sanitation, safety to life and property from fire and other hazards of the environment, and other means.

Geologic Hazard Abatement District. A Geologic Hazard and Abatement District (GHAD) is a special district that would provide for long-term monitoring and maintenance of the open-space slopes, in-tract slopes, drainages, storm water detention and treatment improvements, and other improvements within a project site that are covered under the GHAD law. GHADs can be structured to respond to slope maintenance issues that may arise in a timely, effective and efficient manner.

As defined by the California Department of Conservation, GHADs, enabled by the Beverly Act of 1979 (SB 1195), are useful financing and implementation mechanisms for preventing, reducing, abating and mitigating various hill, slope or other geological hazards. The enabling statute (Division 17 of the Public Resources Code, Sections 26500 - 26654) provides for the formation of GHADs for the purpose of prevention, mitigation, abatement, or control of geologic hazards. The Act broadly defines "geologic hazard" as "an actual or threatened

landslide, land subsidence, soil erosion, earthquake, or any other natural or unnatural movement of land or earth."

A GHAD is able to integrate multiple monitoring and maintenance functions in addition to its primary function of prevention, mitigation, abatement and control of geologic hazards. Through a Plan of Control, the GHAD can also assume duties which may include maintenance of fire breaks, trails, fences, stormwater facilities, water-quality ponds and vegetation and habitat management in open space areas. Having the GHAD responsible for vegetation and habitat management allows these activities to be accomplished with sensitivity toward slope stability issues and other site geologic conditions.

GHADs are funded by an assessment of the property owners within the boundaries of the GHAD. Subject to Proposition 218 parameters, the assessment is based on projected funding requirements necessary to address future maintenance responsibilities, geologic events, and to accumulate appropriate long-term reserves for these functions, as documented in the approved Plan of Control. Financial projections are typically prepared showing a multi-year period for the GHAD. As needed, the GHAD manager would be able to retain outside professionals to perform certain duties, particularly by land management specialists such as biologists, botanists, arborists, and engineers, to implement the GHAD's responsibilities.

Local.

Current Adopted San Benito County General Plan. Following are relevant policies from the San Benito County General Plan Land Use Element, Open Space and Conservation Element, Seismic Safety Element, and Transportation Element. In particular, the Seismic Safety Element is intended to reduce loss of life, injuries, damage to property and economic and social dislocation resulting from earthquakes and other geologic hazards (San Benito County, 1980). The Seismic Safety Element addresses seismic hazards such as surface rupture from faulting, ground shaking, ground failure (liquefaction, lateral spreading, lurching, landslides), and effects of seismically induced waves such as tsunamis and seiches. In addition, it also addresses geologic hazards such as mudslides, landslides, slope stability, and erosion. Likewise, the San Benito County Land Use Element, the Open Space and Conservation Element Update, and the Transportation Element (updated in 2002, 1995, and 1992, respectively) include goals and policies for public health and safety that include areas that require special management or regulation because of hazardous or special conditions, such as earthquake fault zones and unstable soil areas.

Land Use Element:

Policy 32 *Specific development sites shall be free from the hazards identified within the Open Space and Conservation Element Maps (e.g. faults, landslides, hillsides over 30% slope, flood plains). The site shall also be on soil suitable for building and maintaining well and septic systems (i.e. avoid impervious soils, high percolation or high groundwater areas, set back from creeks). Absent adequate mitigation, development shall not be located on environmentally sensitive lands (wetlands, erodable soil, archaeological resources, important plant and animal communities).*

Policy 33 *Specific development sites shall avoid, when possible, locating in an environmentally sensitive area (wetlands, erodable soils, important plant and animal communities, archaeological resources).*

Policy 36 *The County should maintain high standards of siting and design in the development of all land uses. Standards and criteria shall be established by the County.*

Open Space and Conservation Element:

Policy 7 *Grading, erosion, and native tree removal. It is the policy of the County to minimize erosion resulting from grading and cutting and native tree removal for all development proposals.*

Policy 37 *Development policy for hazardous areas. It will be the policy of the County to limit densities in areas that are environmentally hazardous (fault, landslides/erosion, hillsides over 30% slope, flood plains) to levels that are acceptable for public health and safety for citizens and property. It is the County's policy to apply zoning categories, and scenic easements for the protection of environmentally hazardous or aesthetically valuable resources.*

Policy 39 *Restrict creation of new lots in hazardous areas. It is the policy of the County to prohibit new subdivision or lot-line adjustments that will create new lots located entirely within hazardous areas (slopes greater than or equal to 30%, 100-year flood plain, landslide/erosion hazard, fault zone).*

Seismic Safety Element:

Policy 1 *In general, urban expansion should be directed to areas of least risk from natural and man-made hazards.*

Policy 3 *The diversity of housing types within San Benito County should be evaluated with regard to suitable locations for high density housing. The location of buildings three stories and higher should be carefully examined in relation to ground shaking characteristics, potential for ground failure and other seismic hazards.*

Transportation Element:

Policy 12 *Road development shall minimize the extent of building in hazardous areas (e.g. faults, flood plains, landslide areas, fire hazard areas).*

Draft 2035 General Plan Update. The proposed (but not yet adopted) Draft 2035 General Plan Update Land Use Element, Circulation Element, Natural and Cultural Resources Element, and Health and Safety Element provide the following goals, policies and objectives pertaining to geology and soils. Because the Draft 2035 General Plan Update has not yet been adopted by the Board of Supervisors, these policies are included for informational purposes only.

Land Use Element:

Goal LU-1 *To maintain San Benito County's rural character and natural beauty while providing areas for needed future growth.*

LU-1.6 *Hillside Development Restrictions. The County shall prohibit residential and urban development on hillsides with 30 percent or greater slopes.*

LU-1.8 *Site Plan Environmental Content Requirements. The County shall require all submitted site plans, tentative maps, and parcel maps to depict all environmentally sensitive and hazardous areas, including: 100-year floodplains, fault zones, 30 percent or greater slopes, severe erosion hazards, fire hazards, wetlands, and riparian habitats.*

LU-1.10 *Development Site Suitability. The County shall encourage specific development sites to avoid natural and manmade hazards, including, but not limited to, active seismic faults, landslides, slopes greater than 30 percent, and floodplains. Development sites shall also be on soil suitable for building and maintaining well and septic systems (i.e., avoid impervious soils, high percolation or high groundwater areas, and provide setbacks from creeks). The County shall require adequate mitigation for any development located on environmentally sensitive lands (e.g., wetlands, erodible soil, archaeological resources, important plant and animal communities).*

LU-4.3 *Residential Density Reductions. The County shall consider reducing the base density of a proposed residential development project if a combination of environmental hazards (e.g., fire, seismic, flooding, greater than 30 percent slope) and/or natural resources (e.g., sensitive habitat, wetlands) existing on the site, after consideration of the mitigations to be implemented to address those hazards, make higher densities less appropriate.*

Circulation Element:

Goal C-1 *To provide an adequate road system that is safe, efficient, reliable, and within the County's ability to finance and maintain.*

C-1.16 *Roads on Hillsides. The County shall require that new public and private roads on hillsides minimize visual impact by blending with natural landforms and by following the natural contours of the land as much as possible and that driveway access in hillside areas be consolidated where possible and limited to areas where adequate sight distance is available for all approaches.*

C-1.17 *Grades on Hillsides. The County shall require that new roads on hillsides do not exceed a 15 percent grade. The County may allow grades on hillsides of up to 20 percent for distances of up to 400 feet. Grades over 15 percent must have all weather surfaces, such as asphalt or concrete.*

C-1.19 *Avoid Hazardous Areas. The County shall ensure that road development is minimized in hazardous areas (e.g. faults, flood plains, landslide areas, fire*

hazard areas) and that, if a hazard is present within a planned road alignment, the planned alignment is modified to the extent feasible to avoid the hazard.

Natural and Cultural Resources Element:

NCR-1.1 *Integrated Network of Open Space. The County shall maintain an integrated network of open space lands that support natural resources, recreation, tribal resources, wildlife habitat, water management, scenic quality, and other beneficial uses.*

NCR-1.2 *Conservation Easements. The County shall support and encourage the use of conservation easements to protect open space that contains valuable natural resources.*

NCR-1.3 *Open Space Overlay District. The County shall continue to protect and preserve the rural landscape and implement open space policies for: public health, safety, and welfare; continued agricultural uses; scenic viewscape preservation, including scenic highway corridors, park and recreation uses; conservation of significant natural resources; the containment and definition of limits to urbanization; and the preservation of the natural habitat for threatened and/or endangered plant and animal species.*

NCR-2.2 *Habitat Protection. The County shall require major subdivisions within potential habitat of Federal- or State-listed rare, threatened, or endangered plant or animal species to mitigate the effects of development. Mitigation for impacts to species may be accomplished on land preserved for open space, agricultural, or natural resource protection purposes.*

NCR-2.4 *Maintain Corridors for Habitat. The County shall protect and enhance wildlife migration and movement corridors to ensure the health and long-term survival of local animal and plant populations, in particular contiguous habitat areas, in order to increase habitat value and lower and management costs. As part of this effort, the County shall require road and development sites in rural areas to:*

a. Be designed to maintain habitat connectivity with a system of corridors for wildlife or plant species and avoiding fragmentation of open space areas; and

b. Incorporate measures to maintain the long-term health of the plant and animal communities in the area, such as buffers, consolidation of/or rerouting access, transitional landscaping, linking nearby open space areas, and habitat corridors.

NCR-8.3 *Grading within Scenic Corridors. The County shall review all projects involving grading within Scenic Corridors to protect valuable soil resources, preserve the natural environment, and avoid significant adverse impacts within scenic areas.*

Healthy and Safety Element:

Goal HS-3 *To protect lives and property from seismic and geologic hazards.*

HS-3.2 *Subsidence or Liquefaction. The County shall require that all proposed structures, utilities, or public facilities within recognized near-surface subsidence or liquefaction areas be located and constructed in a manner that minimizes or eliminates potential damage.*

HS-3.6 *Unstable Soils. The County shall require and enforce all standards contained in the current California Building Code related to construction on unstable soils, and shall make a determination as to site suitability of all development projects during the building permit review process. The County shall not approve proposed development sited within areas of known or suspected instability until detailed area studies are completed that evaluate the extent and degree of instability and its impact on the overall development of the area.*

HS-3.7 *Setback from Fault Traces. The County shall require setback distances from fault traces to be determined by individual site specific surface rupture investigations.*

HS-3.8 *Liquefaction Studies. The County shall require proposals for development in areas with high liquefaction potential to include detailed site specific liquefaction studies.*

HS-3.9 *Seismic Safety Evaluations. The County shall require buildings three stories or higher, and locations zoned for multifamily housing, to include in development proposals measures to determine ground shaking characteristics, evaluate potential for ground failure, identify any other geologic hazards that might exist on the site, and mitigate for these hazards.*

Consistency with key General Plan and Draft 2035 General Plan Update policies that apply to the Project are evaluated in Section 4.10, *Land Use and Planning*.

San Benito County Code of Ordinances. Several chapters of the San Benito County Code address geology and soils, including the Grading Ordinance (Title 19 [Land Use and Environmental Regulations], Chapter 17 [Grading, Drainage and Erosion Control]); Building Regulations Ordinance (Title 21 [Building and Engineering], Chapter 21.01 [Building Regulations])**;** and the Subdivision Ordinance (Title 23 [Subdivision]).

The County's Grading Ordinance (Chapter 19.17 of the San Benito County Code) regulates excavation, grading, drainage and erosion control measures and activities. The purpose of these regulations is to minimize erosion, protect fish and wildlife, and to otherwise protect public health, property, and the environment. A grading permit is required for all activities that would exceed 50 cubic yards of grading. Grading activity is prohibited within 50 feet from the top of the bank of a stream, creek, or river, or within 50 feet of a wetland or body of water in order to protect riparian areas. Additionally, development is limited in areas of high landslide potential and slopes greater than 30%, unless approved under special conditions. All proposed developments are required to submit an erosion control plan and drainage plan prior to issuance of a grading permit. These requirements are codified in Chapter 19.17 of the San Benito County Code, which requires that all areas disturbed in connection with grading related activities shall be consistently maintained to control erosion.

Chapter 21.01 of the San Benito County Code (Building Regulations Ordinance) adopts, with modifications pertaining to local conditions, the provisions of the California Building Code (CBC) and California Residential Code (CRC). As stated above, these codes require, among other things, seismically resistant construction and foundation and soil investigations prior to construction. The CBC and CRC also establish grading requirements that apply to excavation and fill activities, and require the implementation of erosion control measures. The County is responsible for enforcing the 2013 CBC and CRC in the case of the Project.

Subdivision design standards and road standards are set forth in the Subdivision Ordinance (San Benito County Code of Ordinances, Title 23). Road standards designed to minimize on-site hazardous geological or soil conditions and to provide erosion control measures regarding excavation, grading, and drainage, are set forth in Chapter 23.25 (Design Standards), sections 23.25.009 (Streets) and 23.25.013 (Grading and Erosion Control); and Chapter 23.31 (Improvement Designs), Article II (Roadway Design Standards). Additionally, Chapter 23.31 (Improvement Designs), Article III (Storm Drainage Design Standards)pertain to the prevention of erosion caused by flooding.

4.6.2 Previous Environmental Review

The 2003 *San Juan Oaks Golf Club General Plan Amendment/Zone Change/Vesting Tentative Subdivision Map EIR* (2003 EIR) examined the geologic and seismic setting of the Project Site and vicinity and the potential significant impacts resulting from development under the San Juan Oaks Golf Club General Plan Amendment/Zone Change/Vesting Tentative Subdivision Map Project. The 2003 EIR concluded that impacts related to potential expansive soil, ground shaking, liquefaction, and geologic hazards were potentially significant. Mitigation measures included compliance with applicable building code provisions, lot-specific geotechnical investigations, minimum building envelope setbacks from known faults, implementation of a grading and erosion control plan, and minimum building envelope locations for certain parcels. With mitigation measures identified in the 2003 EIR, impacts were considered as reduced to a less than significant level.

The 2003 San Juan Oaks Golf Club project included a General Plan Amendment/Zone Change/Vesting Tentative Tract Map. This previously approved project allowed for the development of 156 market rate residential units, 30 affordable units, a resort hotel, a village commercial site, a park, a permanent wildlife habitat/open space, an additional 18-hole golf course, and an additional nine-hole golf course. None of the previously approved uses have been constructed.

Although the 2003 EIR addressed impacts of the 2003 project related to geology and soils, substantial changes to the previously approved 2003 San Juan Oaks Golf Club project are proposed as part of the Del Webb at San Juan Oaks Specific Plan Project.

The development footprint of the 2003 San Juan Oaks Golf Club Project and the current proposed Project are substantially similar, as shown in Figure 1-1 in Section 1.0, *Introduction*. However, substantial changes to the previously approved 2003 San Juan Oaks Golf Club project are proposed as part of Del Webb at San Juan Oaks Specific Plan Project. Specifically, the Del Webb at San Juan Oaks Specific Plan Project proposes to increase the previously approved

overall impervious building area from approximately 193 acres to approximately 323 acres, increase the total number of residential dwellings from 186 single-family residential dwellings to 1,084 single-family residential dwellings, increase the neighborhood commercial area from approximately seven acres to approximately 14 acres, increase roadway areas from approximately 44 acres to approximately 88 acres, increase the permanent wildlife habitat/open space from approximately 1,163 acres to approximately 1,243 acres, and develop an approximately ten-acre amenity center. In addition, the Project provides for the permanent preservation of approximately 153 acres of off-site prime agricultural land. Although the development footprint for these uses is substantially similar to the previous 2003 project, the proposed changes have the potential to substantially increase the severity of the previously identified impacts and trigger additional analysis under Public Resources Code section 21166 and CEQA Guidelines Section 15162 with regard to geology and soils. Therefore, due to the revisions to the project since the 2003 EIR the following impact analysis has been prepared pursuant to Public Resources Code Section 21166 and CEQA Guidelines Section 15162 (a).

4.6.3 Impact Analysis

a. Methodology and Significance Thresholds. To update information for the Project Site, this evaluation is based in part on a *Geotechnical Exploration* prepared for the San Juan Oaks Del Webb Residential Development (ENGEO, August 2013) and a *Geotechnical/Geologic Feasibility Assessment* for the San Juan Oaks – Del Webb Residential Development (ENGEO, March 2013); the above-referenced technical information has been peer reviewed, as appropriate, by Rincon. The ENGEO technical reports are included in Appendix E of this SEIR. The analysis also included a review of existing information and other available regional sources, including data from the California Department of Conservation and the Natural Resources Conservation Service.

Based on the environmental checklist included in Appendix G of the *State 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 ground shaking;*
    iii. *Seismic-related ground failure, including liquefaction; and*
    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.*

The Project does not propose installation and use of septic tanks or alternative wastewater disposal systems. However, the Project may include construction of an optional on-site wastewater treatment plant (WWTP). The treated water from this WWTP could be used for irrigation on the Project Site including the golf course, open space areas, and public landscaped medians. During the non-irrigation periods (winter months), the treated water would be stored in existing dedicated ponds within or adjacent to the golf course. Therefore, the on-site WWTP would not require the infiltration of treated wastewater into the surrounding soil and groundwater table during the non-irrigation periods. If the WWTP is not constructed, wastewater from the proposed Project would instead be conveyed from the site via a sanitary sewer force main to the City of Hollister's domestic wastewater treatment plant/water reclamation facility (DWWTP/WRF), located just north of San Juan Road. Therefore, this impact ([Threshold 5] is not discussed further in this section, but details are provided in Section 4.15, *Effects Found Not to Be Significant*.

b. Project Impacts and Mitigation Measures.

Impact GEO-1 Although an active fault surface trace occurs along the southern property line, no other active faults are mapped on the Project Site. The Development Areas are not located in a mapped Alquist-Priolo fault zone and would not be subject to rupture of a known fault. Seismically induced ground shaking could destroy or damage structures and infrastructure, resulting in loss of property or risk to human safety. However, given mandatory compliance with applicable County of San Benito, and California Building Code requirements, impacts from seismic ground shaking would be Class III, *less than significant*. [Threshold number 1]

Given the highly seismic character of the region and the Project Site's proximity to known active and potentially active faults, severe ground shaking is anticipated during the life of the Project. As discussed above, the nearest known active fault surface trace is the San Andreas Fault, which is mapped along the southern property line of the Project Site. However, no known active or potentially active faults underlie the Development Areas. In addition, no evidence of faulting was observed in ENGEO's fault trenches T-1 and T-2 across the concealed Nutting and Morse faults mapped by Majmundar (1994), Wagner (2002) and Rogers (1993). Therefore, the Development Areas would not be affected by the rupture of any known active faults. However, earthquakes along any of the faults in the region could potentially damage buildings and pose risks to human health and safety. Any new habitable structures that would be constructed for the proposed Project would be required to comply with the applicable California Building Code standards and applicable County of San Benito requirements. Section 1613 of the California Building Code would require that all structures on the Project Site are designed and built to resist forces generated by ground shaking during an earthquake, in accordance with the American Society of Civil Engineers' standards for minimum design loads. Structures on-site would be designed and constructed pursuant to the seismic design parameters derived from the California Building Code and shown in Table 4.8-1 in ENGEO's *Geotechnical Exploration* of the Project Site. With mandatory compliance with California Building Code and other applicable standards and requirements, impacts from ground shaking would be less than significant.

Mitigation Measures. Impacts would be less than significant without mitigation.

Significance After Mitigation. The risk of sustaining an earthquake with higher ground accelerations can never be completely eliminated. Any structure built in California is susceptible to failure due to seismic activity. However, the potential for structural failure due to seismic ground shaking would be less than significant through implementation of the most recent industry standards for structural design, as required in the California Building Code, and the San Benito County Code.

Impact GEO-2 The Project could be subject to structural damage related to the presence of liquefiable soils, due to the presence of sand and silty sand below the groundwater level in the Development Areas. Potentially liquefiable soils can result in settlement or rupture of the ground surface during earthquakes. Liquefaction also has the potential to cause lateral spreading at the site. This is considered a Class II, *significant but mitigable* impact. [Threshold numbers 1 and 3]

As discussed above, ENGEO evaluated the Development Areas in 2013 for potential hazards from liquefaction. As noted in Section 4.6.1, ENGEO concluded that earthquakes could induce approximately 1 inch of total settlement in liquefiable soils, based on existing soils and groundwater levels. In addition, potentially liquefiable soils may be susceptible to earthquake-induced surface rupture, if water pressure within liquefied soil layers exerts a force sufficient to break through the overlying soil and vent to surface in sand boils or fissures. Regional earthquake activity would have the potential to induce such rupture. ENGEO (August 2013) also found that the Project Site has a thick non-liquefiable soil cap overlying the potentially liquefiable soils; therefore, the risk of liquefaction-induced surface rupture at the site is considered low as a result of these conditions.

Based on review of the preliminary site plan for the Project, some proposed residential lots would overlay the current drainage channel and some would abut a portion of the drainage channel that may remain. Although it is anticipated that there would be a low potential for lateral spreading, the proposed residential lots located in the vicinity of the drainage channel could be at risk of slope deformation depending on proposed finished grades unless mitigated. However, impacts from liquefaction and lateral spreading would be less than significant with mitigation incorporated.

Mitigation Measures. The following mitigation measure is required in order to reduce impacts from liquefaction hazards related to settlement and surface rupture and lateral spreading to less than significant.

GEO-2(a) **Adherence to Geotechnical Report.** Compliance with the recommendations included in the *Geotechnical/Geologic Feasibility Assessment* (March 7, 2013) and *Geotechnical Exploration* (August 6, 2013), prepared by ENGEO, for foundation design plans and new geotechnical studies undertaken at the site shall be required. This includes, but is not limited to the following:

- Foundation design considerations of a 1-inch thick total settlement due to liquefaction-induced settlement, as well as a reevaluation of the design-level study if finished site grades are lowered by more than ten feet when site grades are further refined. The County of San Benito shall review and approve all final plans for foundational design for each phase prior to issuance of a grading permit. Final plans for foundational design shall be designed to protect structures from anticipated liquefaction-induced settlement.
- Once grading plans with a scale of 1 inch to 40 feet are available, a site-specific geotechnical report shall be produced by a County-approved geotechnical engineer to confirm the scope of any lateral spreading and slope deformation and to specify the most appropriate remedial measures. Mitigation measures may include, without limitation, specifications for cut and fill slopes, specification of minimum setbacks from unstable natural slope areas, construction of a toe shear keyway that extends below the flow line elevation of the adjacent drainage channels, and other common remedial grading practices used to minimize potential impacts from settlement, surface rupture, and lateral spreading. The developer shall implement all recommended mitigation measures, as required by the County approved geotechnical engineer and the County Public Works Department.

GEO-2(b) **Site-Specific Geotechnical Studies and Hazard Minimization.** Prior to issuance of grading permits for each phase of development in the Project Site, a site-specific geotechnical study shall be prepared by a County-approved geotechnical engineer to more specifically identify any areas that could be subject to geologic or soil-related hazards, including liquefaction, slope instability, ground shaking, faults, and expansive soils. If such hazards are identified, then the appropriate phase of development shall be designed in compliance with the recommendations of the geotechnical survey and in conformance with the County's Subdivision Ordinance and shall comply with recommendations in the *Geotechnical/Geologic Feasibility Assessment* (March 7, 2013) and *Geotechnical Exploration* (August 6, 2013), prepared by ENGEO, for foundation design plans. Site-specific geotechnical studies and grading and design recommendations shall be reviewed and approved by the County of San Benito Public Works Department.

Significance After Mitigation. Impacts related to liquefaction and lateral spreading would be reduced to less than significant with compliance with the required mitigation measure.

Impact GEO-3 The geotechnical analysis prepared for the Project Site concluded that the on-site unstable existing and proposed slopes could be subject to seismically induced landslides. This is considered a Class II, *significant but mitigable* impact. [Threshold numbers 1 and 3]

The majority of the Development Areas is relatively flat and would not be subject to seismically induced landsliding. However, there are mapped landslides within the foothills on the southern portion of the Development Areas; based on field exploration conducted by ENGEO (2013), the landslides observed are relatively shallow slumps or earthflows, which could become unstable during grading. Some improvements would be located in these hillside portions of the Development Areas such as the water tanks, pipelines, and access roads, which would be at risk for damage related to soil creep and landslides. In addition, the Development Areas where the proposed resort hotel and neighborhood commercial uses would be located within or adjacent to areas identified as being susceptible to landslides, as shown in Figure 4.6-4. Recycled water irrigation, if used on sloped lands, would be applied at agronomic rates in accordance with permit requirements, reducing the potential for slope instability resulting from over-irrigation. Nevertheless, impacts from landslide potential could be significant without mitigation incorporated.

Mitigation Measures. The following mitigation measures are required in order to reduce impacts from landslide hazards to a less than significant level.

GEO-3(a) **Slope Stability Analysis.** As applicable, prior to issuance of a grading permit, further slope analysis shall be conducted once 40-scale grading plans are available. The analysis shall confirm landslide stability in proximity to grading limits, cut slopes, slope rebuilds and planned taller fill slopes. If it is determined that shallow landslides and slope instability may occur related to the specific development proposed, then measures as identified in the slope analysis shall be incorporated into the Project design. These mitigation measures for shallow landslides and slope instability may include, without limitation, avoiding placement of structures in or downslope of slide areas, removing the landslide debris to bedrock and replacing it with engineered fill, buttressing the toes of landslides with engineered fill, and constructing keyways, debris benches, and/or landslide buffer/catchment areas with surface and subsurface drainage. Depending upon the type and heights of graded slopes, toe keyways may be recommended.

GEO-3(b) **Soil Creep.** Improvements that will be located in the hillside portions of the Project Site shall be designed to mitigate the potential for adverse impacts from soil creep. Unless analysis by the Geotechnical Engineer on final grading plans determines otherwise, the proposed water tank shall be relocated to the west along the ridgeline to minimize design and corrective grading impacts, which the applicant has confirmed would be acceptable and consistent with the overall site plan and Specific Plan. The

water tank shall be constructed entirely on bedrock cut, or otherwise designed and constructed to avoid a cut-fill transition condition during tank construction. Also, a supplemental subsurface exploration for the tank site, the resort hotel site, and the neighborhood commercial areas shall be performed and a report prepared to provide design-level recommendations and confirm slope stability and bedrock rippability. Remedial and/or structural measures shall be shown on the final 40-scale plans and after detailed slope stability analyses have been performed and reviewed and approved by the County of San Benito Public Works Department.

GEO-3(c) **Setbacks.** Wall and building slope setbacks are variable depending on slope height and soil conditions and shall follow CBC and CRC requirements at a minimum. Additional slope setbacks shall be implemented where natural drainage channels could create slope instabilities unless repaired/mitigated. Specific setback recommendations from the ENGEO March 2013 and August 2013 geotechnical reports shall be implemented by the Project, as well as any additional setback recommendations made as part of the site-specific studies required by other mitigation measures in Section 4.6, *Geology and Soils*, of this SEIR. The County of San Benito shall review and approve all wall and building slope setbacks prior to issuance of a grading permit.

GEO-3(d) **Debris Benches**. Debris benches shall be created at the interface between the open space hillside and the residential lots. Unless site-specific supplemental studies approved by the County of San Benito for final 40-scale plans conclude otherwise, this shall include a minimum debris bench of 50 feet below hillside areas containing unmitigated landslides and a minimum debris bench of 25 feet below hillside areas with no mapped landslides or for mitigated landslide areas. A road may be considered part of the debris bench, but a backyard shall not.

Significance After Mitigation. Impacts related to landslides would be mitigated to a less than significant level with incorporation of the mitigation included in the ENGEO geotechnical reports (included as Appendix E) and herein.

Impact GEO-4 The construction and operation of the proposed Project could result in soil erosion or loss of topsoil. Impacts would be Class II, *significant but mitigable*. [Threshold number 2]

According to the NRCS soils mapping for the Project Site, the Project Site is underlain by twenty total soil types, of which six have severe to very severe erosion potential. The Development Areas are underlain by seven predominant soils, of which one has moderate erosion potential (Diablo Clay 9-15% slopes) and one has severe erosion potential (Diablo Clay 15-30% slopes)

(refer to Table 4.6-1 and Figure 4.6-2). As shown in Figure 4.6-2, these soils are concentrated in northeastern and central portions of the Project Site.

Structures and facilities constructed on these soils could be exposed to hazards related to erosion. The operation of the Project could also result in localized increases in erosion due to the introduction of new physical elements and impervious surfaces. Refer to Section 4.9, *Hydrology and Water Quality*, for a detailed discussion of this impact and required mitigation measures.

Implementation of a NPDES-compliant Stormwater Pollution Prevention Plan (SWPPP), as required by the Clean Water Act, mitigation measures HWQ-1(a) through HWQ-1(d) in Section 4.9, *Hydrology and Water Quality*, mitigation measure AQ-1(a) (Dust Control Measures) in Section 4.3, *Air Quality*, and mitigation measures BIO-1(a) (Pre-construction Survey and Tree Protection Plan) in Section 4.4, *Biological Resources,* would reduce potential impacts related to soil erosion. In addition, Chapter 19.17 of the San Benito County Code (Grading Ordinance) which requires that all areas disturbed in connection with grading-related activities shall be consistently maintained to control erosion. The proposed Project would be required to submit an erosion control plan and drainage plan to the County for its approval prior to issuance of a grading permit. For the above reasons, impacts would therefore be less than significant with mitigation incorporated.

Mitigation Measures. Compliance with County of San Benito requirements for erosion control and grading would partially reduce impacts. In addition to implementation of mitigation measures HWQ-1(a) through HWQ-1(d), AQ-1(a) and BIO-1(a), the following mitigation measures are also required in order to reduce impacts related to erosion to a less than significant level:

GEO-4(a) **Debris and Stripping.** Debris or soft compressible soils shall be removed from any location to be graded, from areas to receive fill or structures, or those areas to serve as borrow. The depth of removal of such materials shall be determined by the Geotechnical Engineer or qualified representative in the field at the time of grading. Existing vegetation should be removed from areas to receive fill, or structures, or those areas to serve for borrow. Tree roots should be removed down to a depth of at least 3 feet below existing grade**.** The actual depths of tree root removal shall be determined by the Project Geotechnical Engineer's representative in the field to ensure that all debris or soft compressible soils at each specific construction site are removed. Strippings may be reserved for placement on graded slopes prior to installation of erosion control measures. After placement on graded slopes, any remaining strippings and organically contaminated soils which are not suitable for use as engineered fill may be used in approved open space areas or landscape areas subject to approval by the Landscape Architect. Otherwise, such soils should be removed from the Project Site or may selectively be blended with soil and placed in engineered fills outside street and pad areas. Any topsoil that would be retained for future use in landscape areas

should be stockpiled in areas where it would not interfere with grading operations.

GEO-4(b) **Erosion Control Mat/Blanket**. An erosion control mat or blanket shall be used for select slope face protection and lining of runoff channels during grading and construction. The use of erosion control mats or blankets shall be consistent with the Project's SWPPP prepared in compliance with National Pollutant Discharge Elimination System (NPDES) Construction General Permit 99-08-DWQ. The Contractor shall submit a manufacturer's certification that the erosion mat/blanket supplied meets the criteria specified.

Significance After Mitigation. Impacts related to erosion and loss of topsoil would be mitigated to a less than significant level with incorporation of the mitigation included in the ENGEO geotechnical reports and any future site-specific geotechnical reports, County regulations, and herein.

Impact GEO-5 Portions of the Project Site contain expansive soils, which could expose people or structures to potentially substantial adverse effects. Impacts would be Class II, *significant but mitigable*. [Threshold number 4]

Expansive soils have a clay content and mineralogy that renders them susceptible to volume increase upon absorption of water and volume decrease upon drying. Repeated cycles of wetting and drying of expansive soils can cause severe distress to roadways, foundations, and concrete flatwork. As described in Section 4.6.2(b) (Geologic Hazards), some of the on-site soils are expansive. Of the seven soils that underlay the majority of the Development Areas, five have high shrink-swell potential (refer to Table 4.6-1 and Figure 4.6-2). Structures and facilities constructed on these soils could be exposed to hazards related to expansive soils, including heaving and cracking of slabs-on-grade, pavements, and structures founded on shallow foundations. Impacts related to expansive soils would be potentially significant.

Mitigation Measures. Implementation of the following mitigation measure is required to reduce impacts resulting from expansive soils to a less than significant level.

GEO-5 **Structural Reinforcement.** During grading, exposed expansive soils where structures will be built shall be kept moist by occasional sprinkling. Structures shall be adequately supported on structural reinforced mat foundations that are designed to accommodate shrinking and swelling subgrade soils. If required by the geologic and geotechnical analysis, expansive soils either shall be removed and replaced with low-expansivity soils (the preferred approach), or an additional approach is that foundations shall be designed to accommodate movements caused by expansive soil, or expansive soils shall be conditions and treated to minimize expansivity.

Significance After Mitigation. Impacts related to expansive soils would be less than significant with mitigation incorporated.

c. Cumulative Impacts. Cumulative development in the County, based on a summary of projections in accordance with long-range general plan buildout of San Benito County and the cities of Hollister and San Juan Bautista (see Section 3.0, *Environmental Setting*), includes approximately 26,063 residents, 7,187 housing units, and approximately 3,346 employees (AMBAG, 2014). Such development would expose new residents and property to seismic and other geologic hazards that are inherent to the region as a whole. However, for purposes of this analysis, the geographic context of cumulative developments is limited given that seismic and soil issues tend to be site-specific in nature. It is anticipated that each cumulative development would be required to evaluate and mitigate, to the extent feasible, site specific geological and soils hazards that have been identified through preparation of required soils and geotechnical engineering studies for the particular site at issue, and would be required to adhere to the site-specific recommendations therein, in addition to adherence to existing local and state regulations including, without limitation, the California Building Codes and the County's Grading Ordinance, Building Regulations Ordinance, and Subdivision Design and Road Design Standards. Because the potential impacts associated with Project buildout can be mitigated to a less than significant level, and impacts from other cumulative projects would be addressed on a case-by-case basis (and such projects would be required to adhere to applicable standards and requirements designed to mitigate such impacts), the Project's contribution to any cumulative geology and soils impacts would not be cumulatively considerable.

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