This section of the Draft EIR analyzes geologic or seismic-related factors that could affect development or restrict use of the project site. This section of the Draft EIR is primarily based on the *Preliminary Geologic, Geotechnical, Hydrogeologic, Erosion, Drainage and Environmental Phase I Assessment, Proposed Ferrini Ranch Subdivision, Monterey County, California,* prepared by Kleinfelder (July 14, 2008). As recommended in the preliminary analysis, Soil Surveys prepared the *Geotechnical Investigation for Proposed Residential Subdivision Off Highway 68 Between San Benancio Road and River Road Near Salinas, California,* for the property including additional subsurface investigations to assess the landslide potential in several specific areas identified in the Kleinfelder report. The geologic, geotechnical, soils, and erosion sections of this assessment are summarized herein. The two reports are included as **Appendix E** of the Draft EIR.

3.5.1 ENVIRONMENTAL SETTING

GEOLOGY

The project site is located in the northern portion of the Sierra de Salinas range in the Coast Ranges Geomorphic Province and southeast of the former Fort Ord military reservation. The project site is situated in the El Toro Valley, which is a geomorphic lowland in the Coast Ranges Geomorphic Province. The Coast Ranges Geomorphic Province is a discontinuous series of northwest–southeast-trending mountain ranges, ridges, and intervening valleys characterized by complex folding and faulting. The general geologic setting of the project site and vicinity is shown in **Figure 3.5-1**, which is a portion of Geologic Map of the Spreckels 7.5-Minute Quadrangle, Monterey County, California.

The geologic structures within the Coast Ranges Geomorphic Province are greatly influenced by the San Andreas fault system. This right-lateral, strike-slip fault system extends from the Gulf of California in Mexico to Cape Mendocino in northern California and is a portion of the boundary between the North American and Pacific tectonic plates. The Salinian block is a major geologic feature of the Central Coast Ranges and is located between the San Andreas fault and the Sur-Nacimiento fault zone. It comprises Cretaceous Age (approximately 140 to 65 million years old) granitic high-grade metamorphic rock. Overlying the Salinian block are Cretaceous and Tertiary (approximately 65 to 1.6 million years old) blocks comprising marine and continental sedimentary rocks and Tertiary volcanic rocks. The inland valleys, including Salinas Valley and El Toro, are filled with unconsolidated to semi-consolidated alluvium (stream channel and over-bank deposits) of Quaternary age (approximately the last 1.6 million years).

The geology of the project site consists of deformed sedimentary bedrock overlain by various types of younger surficial deposits. The rolling hillsides that dominant the eastern portions of the property are underlain by marine and non-marine sedimentary bedrock units that are broadly folded and steeply inclined in some areas. These bedrock units include the Miocene Monterey Formation and Santa Margarita Sandstone and Plio-Pleistocene continental deposits, and are mantled by soil and localized deposits of landslide debris. The adjoining hillside drainages are underlain by Holocene alluvium and older floodplain deposits. Pleistocene terrace deposits underlie the elevated plains on the project site and are located along the north side of El Toro Creek and the south side of the Salinas River. The distribution of surficial deposits and bedrock on the project site is shown in **Figures 3.5-2a** and **Figure 3.5-2b**. Descriptions of the various geologic units underlying the project site provided below.

Surficial Units

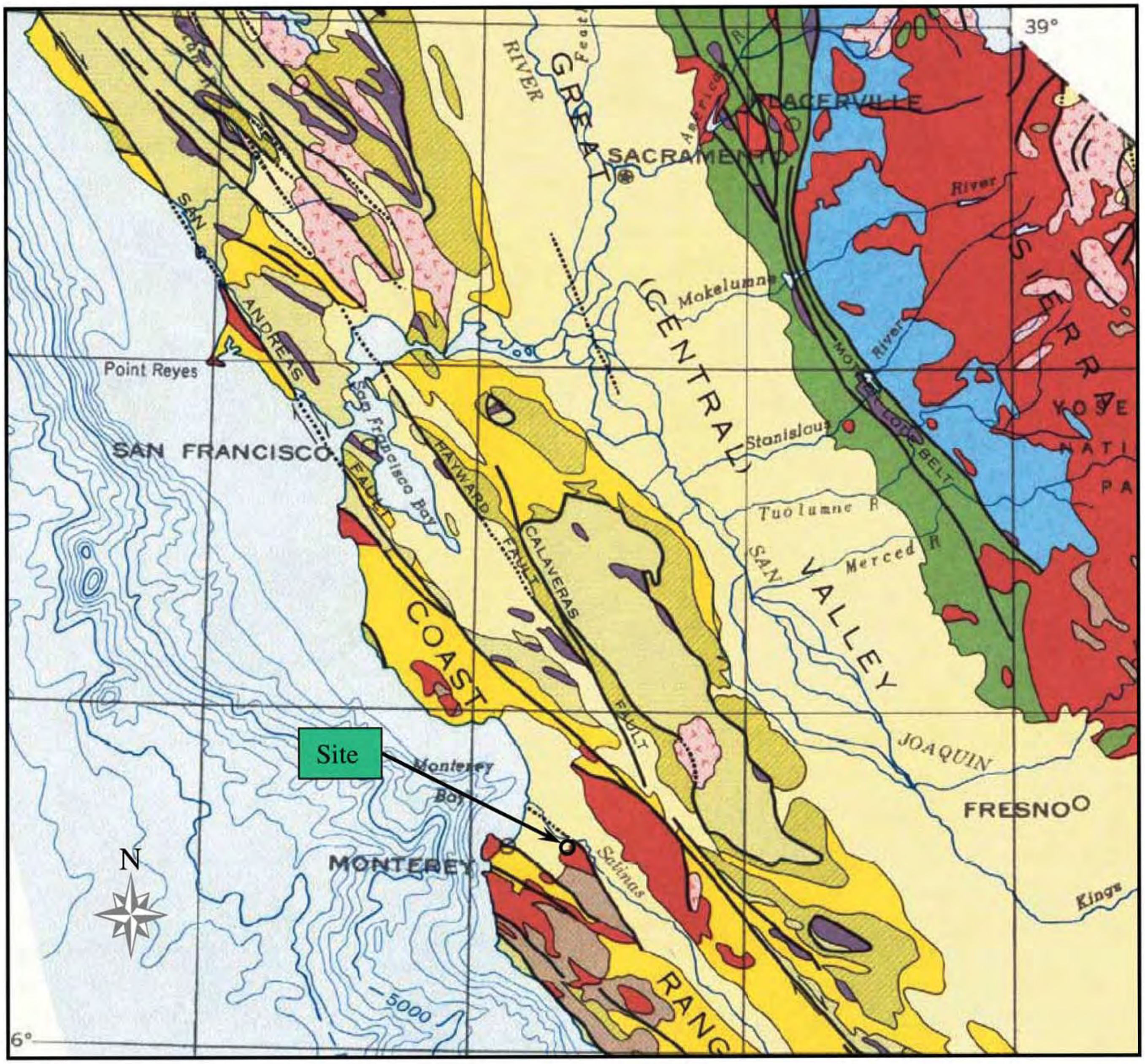
Alluvium (Qal – Holocene) – Alluvium is composed of unconsolidated layers of dark brown silty sand and sandy silt with occasional lenses of gravel and silty clay. Gravel is typically fine-grained and composed of subangular granitic rock clasts. Alluvium deposits are found at the bottom of hillside drainages and the main flat-lying areas along the western portion of the project site.

Colluvium (Qcol – Holocene) – Colluvium deposits comprise unconsolidated mixtures of silt, sand, and gravel and range from a few feet to 20 feet in thickness. These deposits are found along the base of slopes and within swales in the hillside areas of the project site.

Older Floodplain Deposits (Qof – Holocene) – Older floodplain deposits comprise unconsolidated layers of yellowish-brown well-graded sand and sandy gravel. Gravel is subrounded to rounded and composed of primarily granitic rock clasts with a minor amount of shale. These deposits are generally found in the eastern portion of the property within the main flat-lying area adjacent to State Route 68.

Terrace Deposits (Qt – Pleistocene) – Terrace deposits comprise weakly consolidated layers of brown to dark brown sandy clay with variable amounts of silt and gravel. The upper portions of the deposits contain carbonate accumulation and blocky soil structure. Gravel is typically fine-grained and composed of subangular granitic rock and shale clasts. These deposits are found along the elevated plains west of River Road.

Landslide Deposits (Qmf, Qls – Quaternary) – Landslide deposits comprise unconsolidated layers of sandy silt with fine- to coarse-grained sand and variable amounts of clay and gravel. These shallow earth flow and debris flow deposits, commonly called mudflows (Qmf), range from 1 to 5 feet in thickness and are at the lower portions of many of the slopes and bottom of hillside drainages. Some are shallow while others are deep-seated. The most prominent deep-seated landslide (Qls) was identified in the western portion of the project site at the location of proposed Lots #80 through #85, covering an area of approximately 5 acres. Lots #32 through #35 and Lots #103 through #105 also show evidence of historic landslides. Other significant landslide deposits were identified adjacent to proposed Lots #22, #23, #32 through #35, #48, and #131 through #133. These lots were further evaluated by Soil Survey via test hole logs and laboratory tests to determine specific design-level specifications that may be required. Other unidentified landslides may be present on the property.



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SCALE MILES

EXPLANATION
of units in SF Bay Area

- Cenozoic nonmarine
- Cenozoic marine
- Late Mesozoic shelf and slope
- Late Mesozoic of the Franciscan Formation
- Mesozoic Granitic rocks
- Mesozoic Ultramafic rocks
- Pre-Cenozoic rocks
- Fault, dotted where concealed, arrows indicate direction of movement

Source: Klienfelder Inc, 2006

T:_CS\Work\Monterey, County of\Ferrini Ranch\Figures\Section 2-1\Figure 3.5-1.ai, April 2007

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FIGURE 3.5-1
REGIONAL GEOLOGY MAP

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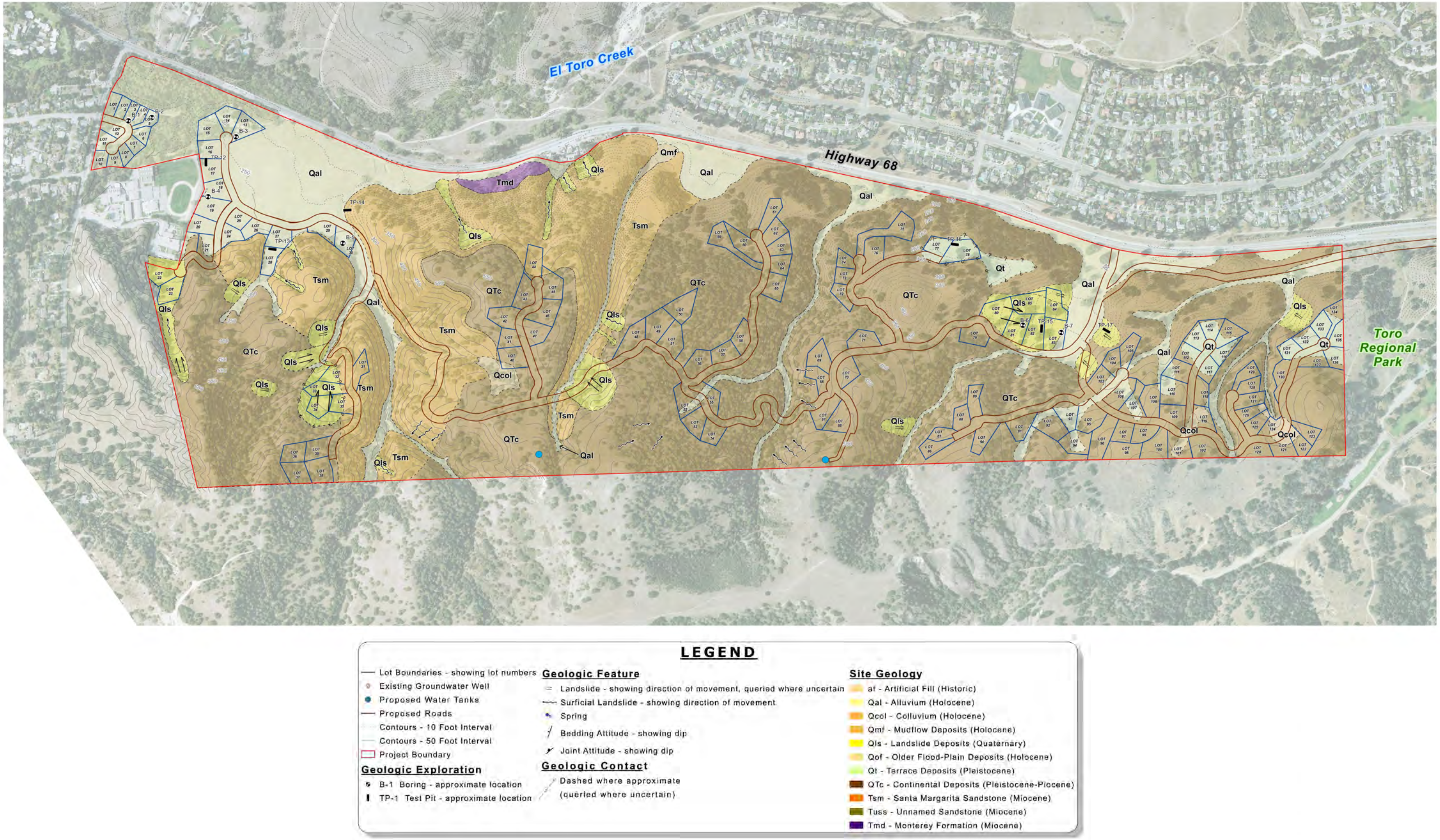

Source: Kleinfelder Inc., 2006

T:_CS\Work\Monterey, County of\Ferrini Ranch\Figures\Section 3-1\Figure 3.5-2a.ai, April 2007

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FIGURE 3.5-2A

GEOLOGIC SITE MAP - WESTERN PARCEL

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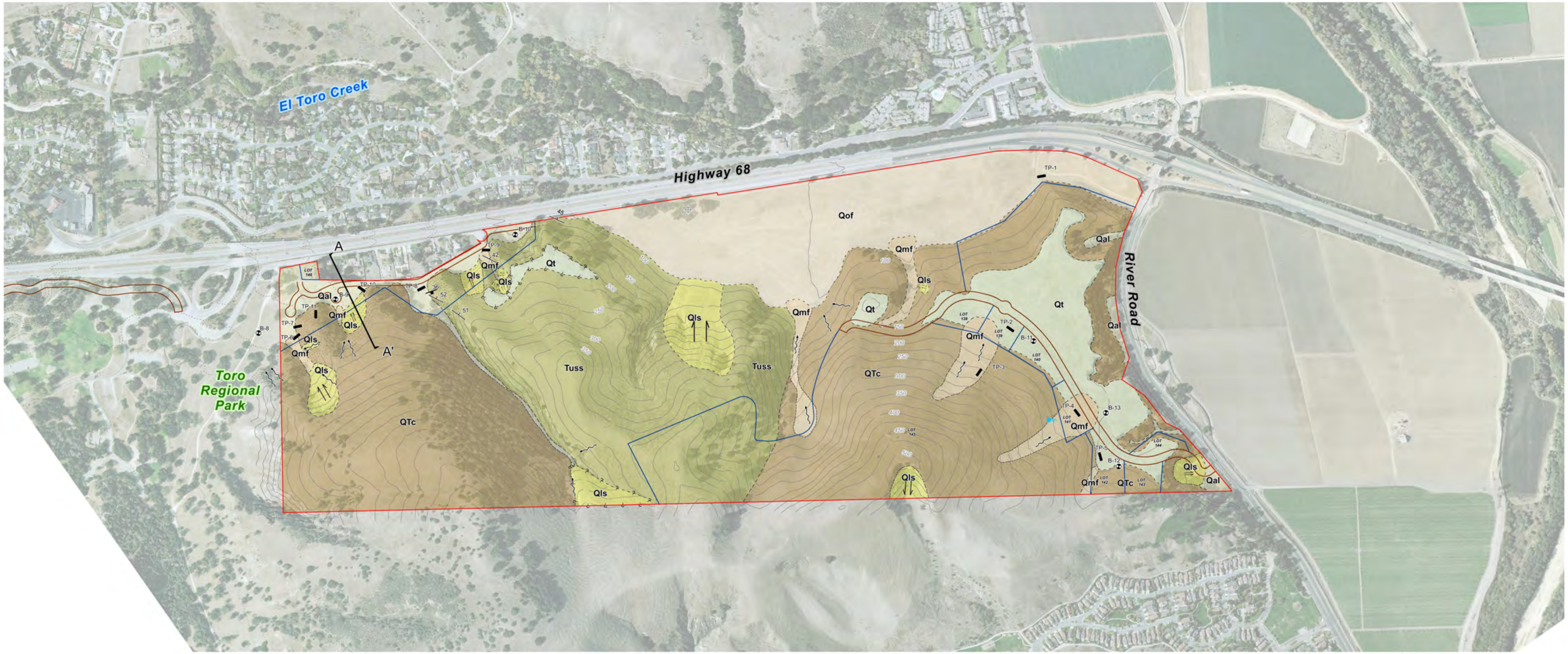

LEGEND

- Lot Boundaries - showing lot numbers
- Existing Groundwater Well
- Proposed Water Tanks
- Proposed Roads
- Contours - 10 Foot Interval
- Contours - 50 Foot Interval
- Project Boundary

Geologic Exploration

- B-1 Boring - approximate location
- TP-1 Test Pit - approximate location
- Geologic Cross-Section

Geologic Feature

- Landslide - showing direction of movement, queried where uncertain
- Surficial Landslide - showing direction of movement
- Spring
- Bedding Attitude - showing dip
- Joint Attitude - showing dip

Geologic Contact

- Dashed where approximate
- Queried where uncertain

Site Geology

- af - Artificial Fill (Historic)
- Qal - Alluvium (Holocene)
- Qcol - Colluvium (Holocene)
- Qmf - Mudflow Deposits (Holocene)
- Qls - Landslide Deposits (Quaternary)
- Qof - Older Flood-Plain Deposits (Holocene)
- Qt - Terrace Deposits (Pleistocene)
- QTc - Continental Deposits (Pleistocene-Piocene)
- Tsm - Santa Margarita Sandstone (Miocene)
- Tuss - Unnamed Sandstone (Miocene)
- Tmd - Monterey Formation (Miocene)

Source: Klienfelder Inc., 2006

T:_CS\Work\Monterey, County of\Ferrini Ranch\Figures\Section 3-5\Figure 3.5-2b.ai, July 2007

NOT TO SCALE

FIGURE 3.5-2B
GEOLOGIC SITE MAP - EASTERN PARCEL

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<u>Bedrock</u>

Continental deposits (QTc – Pleistocene-Pliocene) – Continental deposits, also referred to as Paso Robles Formation, comprise non-marine semi-consolidated beds of silt, fine- to coarse-grained sand, and gravel. Gravel clasts are subrounded and are composed of granitic and shale rocks. Duripan horizons within the continental deposits form prominent ledges on some of the hillsides. Landslides are commonly found below these horizons. Continental deposits are found throughout the project site.

Santa Margarita Sandstone (Tsm – Miocene) – Santa Margarita sandstone consists of marine silt fine-grained sandstone that is massive to thickly bedded and moderately fractured. Impressions of marine shells are commonly observed in these deposits. This formation is found in the western parcel of the project site and overlies the Monterey Formation.

Monterey Formation (Tmd – Miocene) – The Monterey Formation consists of diatomaceous sandy siltstone that is very thickly bedded to laminated. This formation is found in the northern portion of the western parcel.

Unnamed sandstone (Tuss – Miocene) – This unit is similar to the Santa Margarita Sandstone and is composed of silty fine-grained micaceous sand and appears massive to thickly bedded. This unit is found in the northern portion of the eastern parcel.

FAULTS AND SEISMIC HAZARDS

Regional Faulting

The project site is located in the seismically active Monterey Bay region, but outside of the Alquist-Priolo Earthquake Fault Zone established by the Alquist-Priolo Earthquake Fault Zoning Act of 1972. This region lies west of the San Andreas fault system, which has created predominantly northwest–southeast-trending geologic structure and topographic features. The San Andreas fault system constitutes the boundary between the Pacific and North American tectonic plates, and active faults are abundant in the region. "Active" faults are those faults that have experienced seismic activity since roughly 1800 or exhibit evidence of surface displacement during the Holocene time. A "sufficiently active" fault shows evidence of Holocene surface displacement along one or more of its segments and branches. A "well-defined" fault is a fault whose trace is clearly detectable by a trained geologist as a physical feature at or just below the ground surface. **Figure 3.5-3** shows the locations of the active, sufficiently active, and well-defined faults in the vicinity of the project site.

No known active faults were identified on the project site. The San Andreas (Pajaro) fault is the closest active fault to the project site and is located approximately 17 miles northeast of the project site. The maximum expected magnitude of an earthquake for this segment is 7.9. Other significant faults in the vicinity of the project site include the Reliz-Rinconada fault, which is located approximately 0.3 miles from the project site and has a potential maximum magnitude of 7.5; the Monterey-Tularcitos fault, which is located approximately 6 miles from the project site and has a potential maximum magnitude of 7.3; the Zayante-

Vergeles fault, which is located approximately 14 miles from the project site and has a potential maximum magnitude of 7.0; the San Gregorio fault, which is located approximately 15 miles from the project site and has a potential maximum magnitude of 7.4; and the Calaveras fault, which is located approximately 21 miles from the project site and has a potential maximum magnitude of 6.9. In addition, the Harper fault, an inactive fault, is located a few miles south of the project site, in Toro County Park. A major seismic event at these or other nearby faults may cause substantial ground shaking at the project site.

Ground Failure

Seismically induced ground failure is a result of strong ground motions generated by earthquakes. These types of failures include liquefaction, lateral spreading, dynamic compaction, and seismically induced landslides.

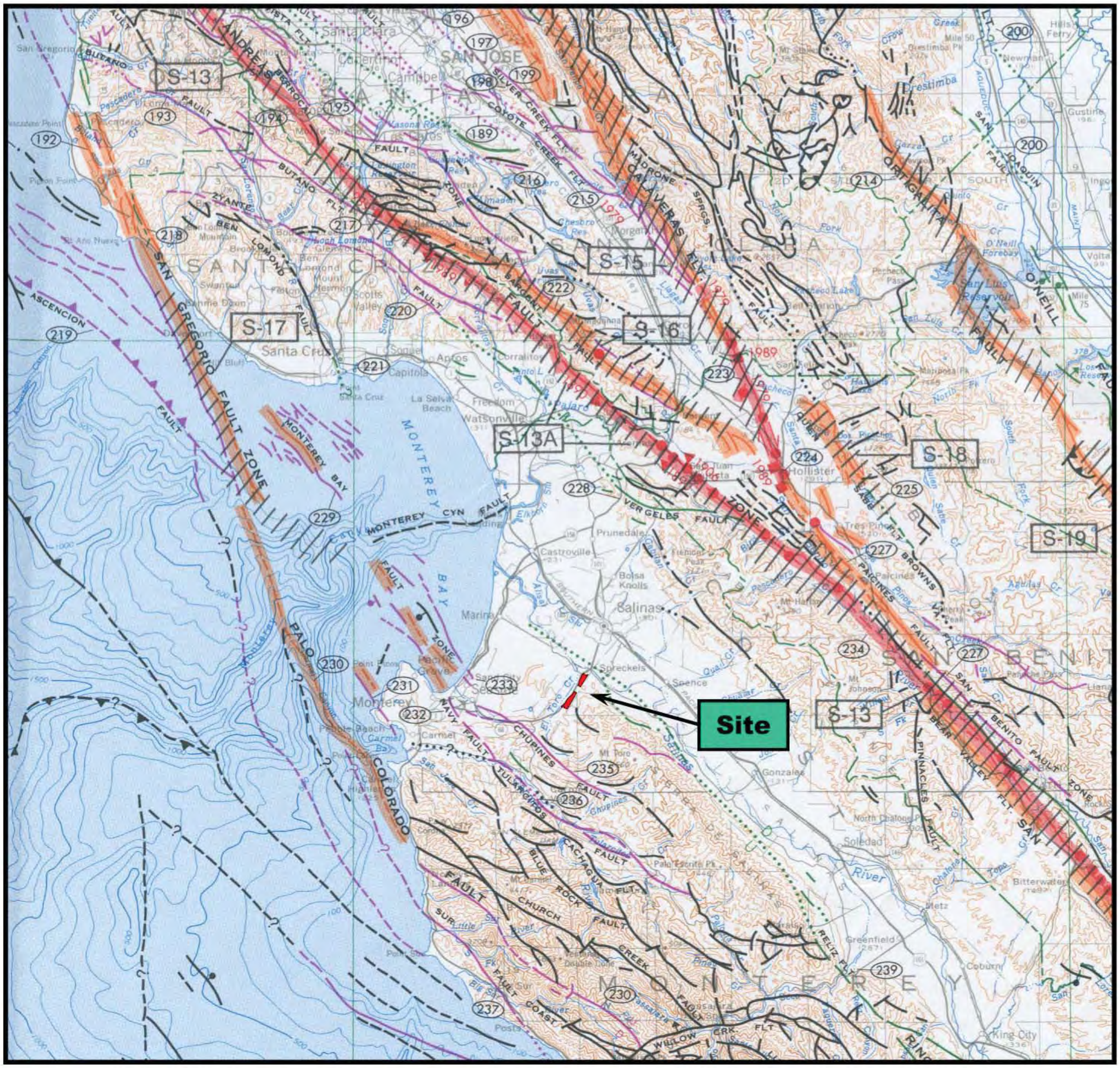
Liquefaction

Soil liquefaction occurs where saturated, cohesionless, or granular soils undergo a substantial loss in strength due to excess build-up of water pressure within the pores during cyclic loading such as earthquakes. Due to the loss of strength, soils gain mobility that can result in significant deformation, including both horizontal and vertical movement where the liquefied soil is not confined. Intensity and duration of seismic shaking, soil characteristics, overburden pressure, and depth to water are all primary factors affecting the occurrence of liquefaction. Soils most susceptible to liquefaction are saturated, loose, clean, uniformly graded, Holocene age, and fine-grained sand deposits. Silts and silty sands have also been proven to be susceptible to liquefaction or partial liquefaction. The occurrence of liquefaction is generally limited to soils within 50 feet of the ground surface.

According to the geologic and geotechnical assessment prepared for the project, regional studies have identified the alluvial soils at the project site as having a high potential for liquefaction. Subsequent subsurface investigation conducted by Kleinfelder confirmed that the alluvial soils do have the potential to liquefy in localized areas where relatively loose soil materials are saturated. Alluvial soils are present in the bottom of the hillside drainages and the main flat-lying areas along the western portion of the site. However, further subsurface investigations by Soil Surveys did not encounter any groundwater in deep test holes; therefore, the potential risk for occurrence of damaging liquefaction is considered low.

Lateral Spreading, Dynamic Compaction, and Seismic Settlement

Lateral spreading is a potential hazard commonly associated with liquefaction where extensional ground cracking and settlement occur as a response to lateral migration of liquefied subsurface materials beneath a slope, or even beneath level ground if an open topographic face is nearby.



LEGEND

- Fault with historic movement
- Fault with within last 10,000 years
- Faults with movement older than 10,000 years or undifferentiated

Source: Kleinfelder Inc., 2006

T:_CS\Work\Monterey, County of\Ferrini Ranch\Figures\Section 3-5\Figure 3.5-3 - Regional Fault Map.ai, April 2007

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SCALE IN MILES

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FIGURE 3.5-3
REGIONAL FAULT MAP

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Another type of seismically induced ground failure that can occur as a result of seismic shaking is dynamic compaction or seismic settlement. Such occurrences typically occur in unsaturated loose granular soils or uncompacted fill. The potential impact of dynamic compaction is settlement of the ground surface. According to the geologic and geotechnical investigation prepared by Kleinfelder, the potential for lateral spreading and dynamic compaction is considered low; however, the potential should be addressed during future design-level studies. Soil Surveys conducted additional soil boring investigations to determine specific lot requirements, and the low risk of lateral spreading was confirmed.

Landslides

Landslide debris is a rough mixture of unconsolidated, heterogeneous deposits of moderately to poorly sorted silt, sand, and angular rock fragments also deposited by down-slope mass movement but driven by the weight of the mass. An older landslide formed more than 11,000 years ago may be considered dormant, whereas a landslide formed during Holocene time may still be subject to movement depending on present conditions and disturbance of the area. Landslides from both eras exist on the project site. The locations of existing landslides on the project site were presented previously in **Figure 3.5-2a** and **Figure 3.5-2b**.

Landslides identified on the project site include both shallow and deep-seated type deposits. Shallow landslides are commonly referred to as mudflows and are typically smaller than deep-seated landslides and fast moving. They can damage and bury structures that are caught in their path. Structures located at the base of hillsides and the mouth of hillside drainages are susceptible to damage from such shallow landslides. The larger deep-seated type of landslide is relatively slow moving and often incorporates up to 10 feet or more of the underlying slope. Structures located within the limits of and adjacent to deep-seated landslides can sustain varying amounts of damage depending on the rate and amount of movement. Factors often cited for contributing to the activation of landslides, other than seismic ground shaking, include long periods of intense rainfall, rises in groundwater levels, lack of slope maintenance, and poor control of surficial drainage. A detailed site investigation of landslide deposits was conducted by Soil Surveys.

SOILS

The project site contains 17 different soil series as shown in **Table 3.5-1**.

TABLE 3.5-1
SOIL PROPERTIES AND CHARACTERISTICS

SOIL MAP UNIT	SOIL SERIES	APPROXIMATE ACREAGE	PERCENTAGE OF PROJECT SITE	EROSION RATING	SHRINK-SWELL POTENTIAL
AkF	Arnold loamy sand, 15 to 50 percent slopes	308	35.4	Moderate	Low
Am	Arnold-San Andreas complex, 50 to 75 percent slopes	24	2.8	Very Severe	Low
Ba	Badland, 2 to 75 percent slopes	25	2.9	Rutting - Severe	Null
CaE	Chamise shaly loam, 15 to 30 percent slopes	24	2.8	Moderate	Low to Moderate
CaF	Chamise shaly loam, 30 to 50 percent slopes	18	2.1	Severe	Low to Moderate
EaA	Elder sandy loam, 0 to 2 percent slopes	47	5.4	Slight	Low
GhC	Gloria sandy loam, 2 to 9 percent slopes	10	1.2	Slight	Low to High
GkB	Gorgonio sandy loam, 0 to 5 percent slopes	58	6.7	Slight	Low
Pr	Psamments and fluvents, occasionally flooded, 0 to 5 percent slopes	6	0.7	Rutting - Slight	Low
Ps	Psamments and fluvents, frequently flooded, 0 to 5 percent slopes	5	0.6	Rutting - Slight	Low
ScG	San Andreas fine sandy loam, 30 to 75 percent slopes	28	3.2	Very Severe	Low
SdF	San Benito clay loam,30 to 50 percent slopes	32	3.7	Severe	Moderate
ShC	Santa Ynez fine sandy loam, 2 to 9 percent slopes	21	2.4	Slight	Low to High
ShD	Santa Ynez fine sandy loam, 9 to 15 percent slopes	10	1.1	Moderate	Low to High
ShE	Santa Ynez fine sandy loam, 15 to 30 percent slopes	251	28.9	Moderate	Low to High
TbB	Tujunga fine sand, 0 to 5 percent slopes	1	0.1	Slight	Low
Xd	Xerorthents, dissected, 50 to 65 percent slopes	17	1.9	Severe	Null

Source: Kleinfelder 2008

Approximately 35 percent of the project site comprises Arnold loamy sand, 15 to 30 percent slopes, and approximately 29 percent of the project site comprises Santa Ynez fine sandy loam, 15 to 30 percent slopes. The characteristics of these two dominant soil series are described below.

Arnold loamy sand, 15 to 50 percent slopes – This soil occurs on foothills and mountains and has the following characteristics: runoff is rapid, permeability is rapid, and the erosion hazard is high to very high.

Santa Ynez fine sandy loam, 15 to 30 percent slopes – This soil occurs on steep slopes found along terraces and low hills and has the following characteristics: runoff is medium, permeability is very slow, and the erosion hazard is moderate. This soil is primarily used for range or pasture.

Erosion

Fourteen of the 17 soil series located on the project site are rated for susceptibility to erosion. These soils are rated as slight, moderate, severe, or very severe. A rating of slight indicates that erosion is unlikely to occur under ordinary conditions; a moderate rating indicates that some erosion is likely to occur and that erosion-control measures may be needed; a severe rating indicates that erosion is very likely to occur and that erosion-control measures, including revegetation of bare areas, are advised; and a very severe rating indicates that significant erosion is expected to occur, loss of soil productivity and off-site damage are likely, and implementation of erosion-control measures is costly and generally impractical. **Table 3.5-1** and **Figure 3.5-4** summarize the erosion ratings for each soil series. The Arnold-San Andreas complex, 50 to 75 percent slopes (Am), Chamise shaly loam, 30 to 50 percent slopes (CaF), San Andreas fine sandy loam, 30 to 75 percent slopes (ScG), San Benito clay loam, 30 to 50 percent slopes (SdF), and Xerorthents, dissected, 50 to 65 percent slopes (Xd) have erosion hazard ratings of severe or very severe.

The three soil series not rated for susceptibility to erosion are Badlands, 2 to 75 percent slopes (Ba); Psamments and fluvents, occasionally flooded, 0 to 5 percent slopes (Pr); and Psamments and fluvents, frequently flooded, 0 to 5 percent slopes (Ps). These soil series are rated for soil-rutting hazard, which can occur as a result of the operation of heavy equipment during site development. Soil rutting hazards are rated as slight, moderate, or severe. The Badlands, 2 to 75 percent slopes (Ba), soil series is severely subject to deep rill erosion and rutting.

Expansive Soils

Expansive soils shrink and swell with moisture content. This shrink-swell feature of expansive soils can cause distress and damage to structures. The shrink-swell potential of the soils on the project site is summarized in **Table 3.5-1**.

Seven of the 14 soil series are susceptible to moderate to high shrink-swell potential. Chamise Shaly Loam, 15 to 30 percent slopes (CaE); Chamise shaly loam, 30 to 50 percent slopes (CaF); and San Benito clay loam, 30 to 50 percent slopes (SdF) have low to moderate shrink swell potential. Gloria sandy loam, 2 to 9 percent slopes (GhC); Santa Ynez fine sandy loam, 2 to 9 percent slopes (ShC); Santa Ynez fine sandy loam, 9 to 15 percent slopes (ShD); and Santa Ynez fine sandy loam, 15 to 30 percent slopes (ShE), have low to high shrink-swell potential.

3.5.2 REGULATORY SETTING

STATE

California and Uniform Building Code (Title 24)

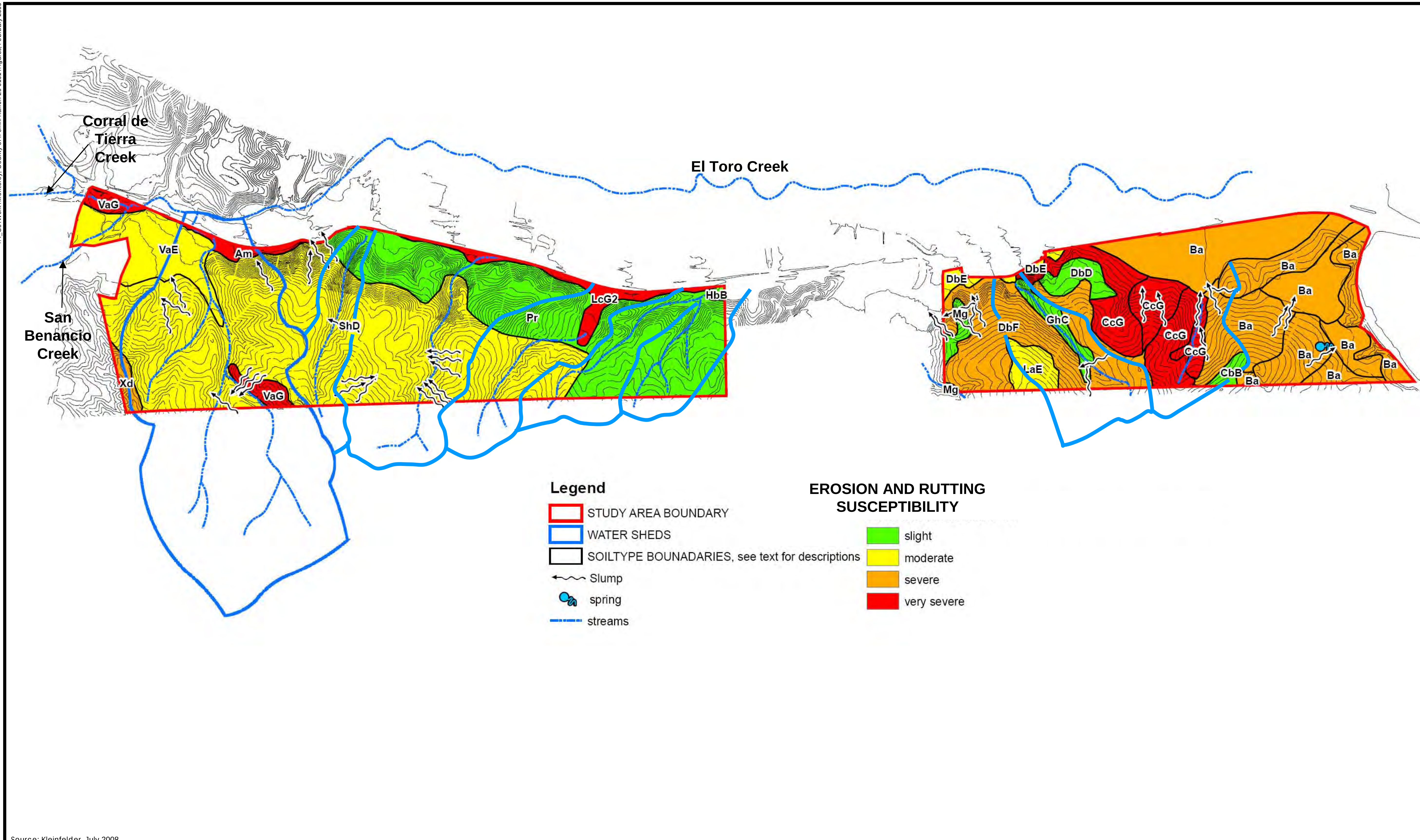
The California Building Code (Title 24) and the Uniform Building Code provide standards for testing and building construction, as well as safety measures for development in earthquake-prone areas. Table 16-J of the 1997 California Uniform Building Code (UBC) requires that a site be classified into one of five soil profile types. These soil profile types are based on the average shear wave velocity of the upper 30 meters, or Standard Penetration Test (SBT) blow counts, or undrained shear strength. Soil profile types of S_F require site-specific evaluation per UBC Section 1629.31.

Alquist-Priolo Special Studies Act

The Alquist-Priolo Earthquake Fault Zoning Act was passed in 1972 to mitigate the hazard of surface faulting to structures for human occupancy. This state law was a direct result of the 1971 San Fernando earthquake, which was associated with extensive surface fault ruptures that damaged numerous homes, commercial buildings, and other structures. The act only addresses the hazard of surface fault rupture and is not directed toward other earthquake hazards. The Seismic Hazards Mapping Act, passed in 1990, addresses non-surface fault rupture earthquake hazards, including liquefaction and seismically induced landslides.

The law requires the State Geologist to establish regulatory zones (known as Earthquake Fault Zones) around the surface traces of active faults and to issue appropriate maps. ["Earthquake Fault Zones" were called "Special Studies Zones" prior to January 1, 1994.] The maps are distributed to all affected cities, counties, and state agencies for their use in planning and controlling new or renewed construction. Local agencies must regulate most development projects within the zones. Projects include all land divisions and most structures for human occupancy. Single-family wood-frame and steel-frame dwellings up to two stories that are not part of a development of four units or more are exempt. However, local agencies can be more restrictive than state law requires.

Before a project can be permitted, cities and counties must require a geologic investigation to demonstrate that proposed buildings will not be constructed across active faults. A licensed geologist must prepare an evaluation and written report for a specific site. If an active fault is found, a structure for human occupancy cannot be placed over the trace of the fault and must be set back from the fault (generally 50 feet).



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Scale in Miles

Figure 3.5-4
Soils Map

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LOCAL

County of Monterey

Monterey County General Plan

Goals, objectives, and policies regarding environmental constraints to development, including seismic and other geologic hazards, are found in Chapter II of the *Monterey County General Plan* (1982). Goal 15 aims to "minimize loss of life, injury, damage to property, and economic and social dislocations resulting from seismic and other geologic hazards." Listed below are policies that achieve this goal:

Policies

3.1.1 Erosion control procedures shall be established and enforced for all private and public construction and grading projects.

3.2.2 Land having a prevailing slope above 30 percent shall require adequate special erosion control and construction techniques.

15.1.2 Faults classified as "potentially active" shall be treated the same as "active faults" until geotechnical information demonstrating that a fault is not "active" is accepted by the County.

15.1.3 The lands within one eighth mile of active or potentially active faults shall be treated as a fault zone until accepted geotechnical investigations indicate otherwise.

15.1.4 All new development and land divisions in designated high hazard zones shall provide a preliminary seismic and geologic hazard report which addresses the potential for surface ruptures, ground shaking, liquefaction and landslides before the application is considered complete. This report shall be completed by a registered geologist and conform to the standards of a preliminary report adopted by the County.

15.1.5 A detailed geological report shall be required for all standard subdivisions. In high hazard areas, this report shall be completed by a registered geologist, unless a waiver is granted, and conform to the standards of a detailed report adopted by the County.

15.1.8 The County should require a soils report on all building permits and grading permits within areas of known slope instability or where significant potential hazard has been identified.

15.1.11 For high hazard areas, the County should condition development permits based on the recommendations of a detailed geological investigation and soils report.

Toro Area Plan

Policies

3.2.4 Except in areas designated as medium or high density residential or in areas designated as commercial or industrial where residential use may be allowed, the following formula shall be used in the calculation of maximum possible residential density for individual parcels based upon slopes:

1. Those portions of parcels with cross-slope of between zero and 19.9 percent shall be assigned one building site per each one acres;
2. Those portions of parcels with a cross-slope of between 20 and 29.9 percent shall be assigned one building site per each two acres;
3. Those portions of parcels with a cross-slope of 30 percent or greater shall be assigned zero building sites;
4. The density for a particular parcel shall be computed by determining the cross-slope of the various portions of the parcel applying the assigned densities listed above according to the percent of cross-slope and by adding the densities derived from this process. The maximum density derived by the procedure shall be used as one of the factors in final determination of the actual density that shall be allowed on a parcel.

Where an entire parcel would not be developable because of plan policies, an extremely low density of development should be allowed.

15.1.16 The Toro Seismic Hazards Map included in this report shall be used to delineate high seismic hazard areas addressed by the countywide General Plan. Areas shown as "moderately high, high, and very high hazard" shall be considered high hazard areas for the purpose of applying general plan policies in Toro. These maps may be revised as new accepted geotechnical investigations dictate.

16.2.11 Practices which contribute to siltation and flood hazards of Toro Creek shall be prohibited.

Monterey County Code

Regulations governing grading and erosion control are covered under two separate ordinances in Chapters 16.08 and 16.20 of the *Monterey County Code*. These ordinances incorporate and supplement regulations from the Monterey County Building Code, which addresses standards for all grading construction. These ordinances help to maintain safe grading conditions and erosion control that could otherwise have potentially harmful impacts to property, the public, and environmental health. Slope failure or bank collapses due to improper grading and erosion of sediment into waterways are two critical hazards.

Grading Ordinance

Chapter 16.08 of the *Monterey County Code* regulates grading activities involving more than 100 cubic yards of excavation and filling. Submittal requirements for a grading permit issued by the County include site plans, existing and proposed contour changes, an estimate of the volume of earth to be moved, and geotechnical soils reports. Projects involving grading activities over 5,000 cubic yards must include detailed plans signed by a state licensed civil engineer.

Chapter 21.64.230 details specific regulations for development on slopes in excess of 30 percent, including conformance with the grading ordinance and erosion control requirements. Specific geotechnical or engineering geologic investigation requirements include the following:

1) Presentation of data regarding the nature, distribution, and strength of existing soils.

2) Recommended grading procedures and design criteria for corrective measures when necessary, including buttress fills.

3) Examination and recommendations to maintain slope stability.

4) Description of the site geology of the site and the effect of geologic conditions on the proposed development.

5) Incorporation of approved report recommendations in the grading plans and specifications (Ord. 2535 110, 1979).

6) Completion of a liquefaction study, where applicable and the potential for liquefaction should there be:

    a. Shallow groundwater at 50 feet or less,

    b. Unconsolidated sandy alluvium, and

    c. Site within Seismic Zone 4.

Erosion Control Ordinance

Section 16.12 of the Monterey County Code aims to is to eliminate and prevent conditions of accelerated erosion that have led to, or could lead to, degradation of water quality, loss of fish habitat, damage to property, loss of topsoil or vegetation cover, disruption of water supply, increased danger from flooding.

Development within the planning area will be subject to the requirements of Section16.12 of the Monterey County Code. This ordinance requires submittal of an erosion control plan indicating proposed methods for the control of runoff, erosion, and sediment movement prior to permit issuance for building, grading, or land clearing. Section 16.12.80, states that No land clearing shall take place prior to approval of the erosion control plan.

3.5.3 IMPACTS AND MITIGATION MEASURES

STANDARDS OF SIGNIFICANCE

The following thresholds for measuring a project's environmental impacts are based on CEQA Guidelines and standards used by the County of Monterey. For the purposes of this Draft EIR, impacts are considered significant if the following could result from implementation of the proposed project:

1) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:

    a) 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;

    b) Strong seismic ground shaking;

    c) Seismic-related ground failure including liquefaction; or

    d) 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 an expansive soil, creating substantial risks to life or property.

5) Contribute significantly to any cumulative geological, soils, or seismicity impact.

METHODOLOGY

The following impact evaluation is largely based on information found in the *Monterey County General Plan* (Monterey County 1982), the *Toro Area Plan* (Monterey County 1983), and the findings and recommendations contained in the *Preliminary Geologic, Geotechnical, Hydrogeologic, Erosion, Drainage and Environmental Phase I Assessment, Proposed Ferrini Ranch Subdivision, Monterey County, California,* prepared by Kleinfelder (2008) and the *Geotechnical Investigation for Proposed Residential Subdivision Off Highway 68 Between San Benancio Road and River Road Near Salinas, California*, by Soil Surveys (2007). The Kleinfelder and Soil Surveys reports are included in **Appendix E**.

The field investigation performed for this Draft EIR consisted of digging exploratory pits and geotechnical test borings across the project site. The excavations and borings were used to verify and supplement information derived from published studies and aerial photographs. The geotechnical investigation prepared by Soil Systems included recommendations regarding ultimate design and construction of the proposed project.

PROJECT IMPACTS AND MITIGATION MEASURES

Exposure to Ground Rupture and Seismic Ground Shaking

Impact 3.5-1 Placement of new structures at the project site could result in potential structural damage and associated human safety hazards resulting from seismic ground shaking caused by earthquakes on nearby active and potentially active faults. This is considered to be a **potentially significant impact.**

The preliminary geological and geotechnical report was prepared by Kleinfelder in accordance with Policy 15.1.4 of the *Monterey County General Plan*, which requires that all new development and land divisions in designated high hazard zones provide a preliminary seismic and geologic hazard report that addresses the potential for surface ruptures, ground shaking, liquefaction, and landslides before the application is considered complete. According to the Kleinfelder report (2008), the project site will likely experience at least one moderate to severe earthquake (magnitude 5.0 to 7+) and associated seismic ground shaking during the lifetime of the proposed project. More frequent earthquakes of lower magnitude are more likely. As a result, the proposed project may be exposed to some structural damage and associated human safety hazards due to stronger shaking. This would be considered a **potentially significant impact**.

All structures in Monterey County, including the proposed project, are required to be designed in accordance with the latest edition of the California Building Code criteria for Seismic Zone IV. In addition, Policy 15.1.5 of the *Monterey County General Plan* requires that all standard subdivisions in high hazard areas have a registered geologist prepare a detailed geological report and conform to the standards of a detailed report adopted by the County. Furthermore, Policy 15.1.11 of the *Monterey County General Plan* requires that development permits within high hazard areas have conditions of approval based on the recommendations of a detailed geological investigation and soils report. Soil Surveys prepared a detailed geologic investigation and provided several recommendations to reduce potential impacts to less than significant. The following mitigation measure requires that lot-specific seismic coefficient recommendations be incorporated into the design, which would reduce this impact to a **less than significant** level.

Mitigation Measure

MM 3.5-1 Prior to issuance of building permits, the project applicant shall design buildings according to the most current California Building Code, as well as the seismic coefficients identified by Soil Surveys in the December 31, 2007, geotechnical investigation or any subsequent updates prepared for the project. All recommended specifications in Section X of Soil Surveys' geotechnical investigation shall be incorporated into the design and construction of the project in accordance with Policy 15.1.11 of the *Monterey County General Plan*.

During the course of construction, the project applicant shall contract with a qualified engineering geologist to be on-site during grading operations to make on-site remediation and recommendations as needed, and perform required tests, observations, and consultation as specified in the preliminary geologic and geotechnical report prepared by Kleinfelder and the geotechnical investigation prepared by Soil Surveys. Prior to final inspection, the project applicant shall provide certification from a qualified professional that all development has been constructed in accordance with all applicable geologic and geotechnical reports.

Implementation of mitigation measure **MM 3.5-1** would ensure that project-specific design-level specifications are followed for individual lots and that residential development at the project site is constructed in accordance with the most current California Building Code. Therefore, the seismic shaking impact associated with the proposed project would be reduced to a **less than significant** level.

Exposure to Landslides

Impact 3.5-2 Implementation of the proposed project may result in potential structural damage and associated human safety hazards resulting from slope-failure hazards such as landslides. This would be considered a **potentially significant impact.**

According to the *Toro Area Plan* (Monterey County 1983), geologic hazards such as landslides and erosion susceptibility at the project site are considered high. This is in part due to approximately 45 percent of the project site having slopes greater than 30 percent as shown in **Figures 3.5-5a** and **3.5-5b**. Areas with steep slopes are subject to relatively

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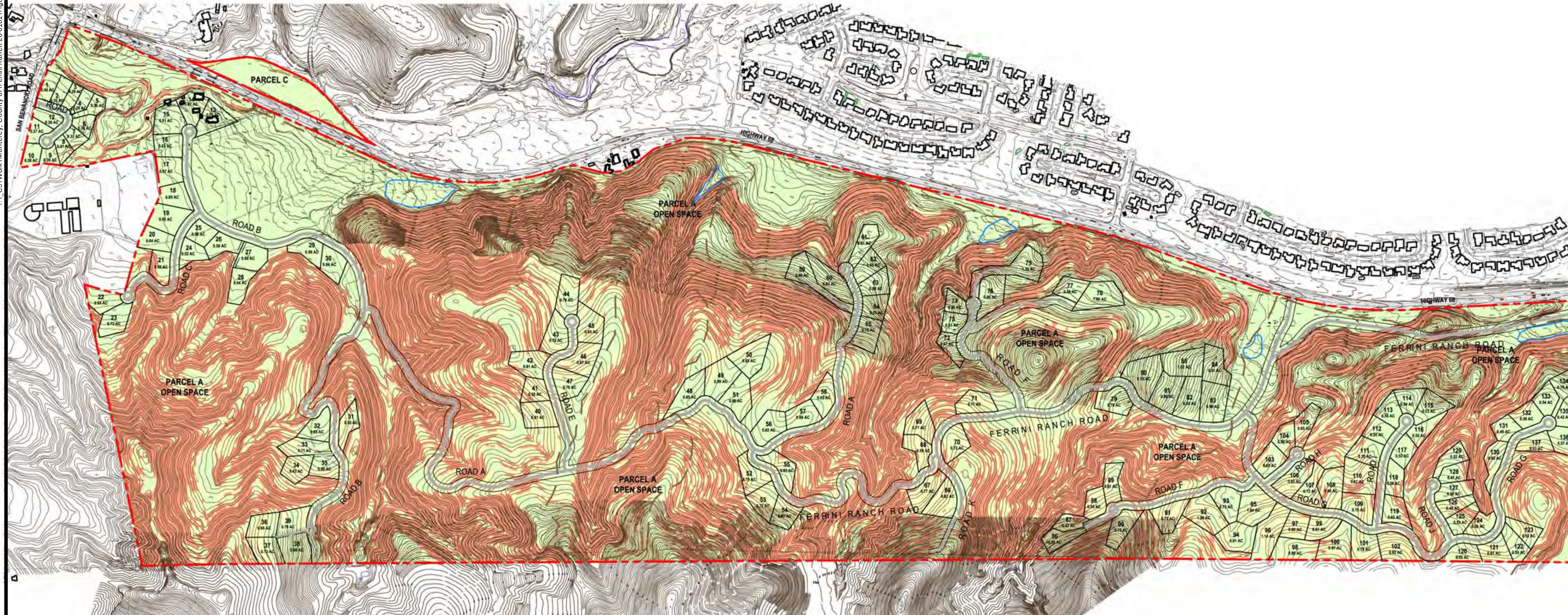

SLOPE ANALYSIS

Color	Range Beg.	Range End	Percent	Area
(green)	0.00%	19.9%	33.8	294.4 ac
(yellow)	20.0%	29.9%	21.5	186.7 ac
(orange)	30.0+%		44.7	388.7 ac
		Total:		869.8 ac

Source: Whitson Engineers, 2004

0 600 1200
Scale in Feet

FIGURE 3.5-5A
SLOPE DENSITY MAP - WESTERN PARCEL

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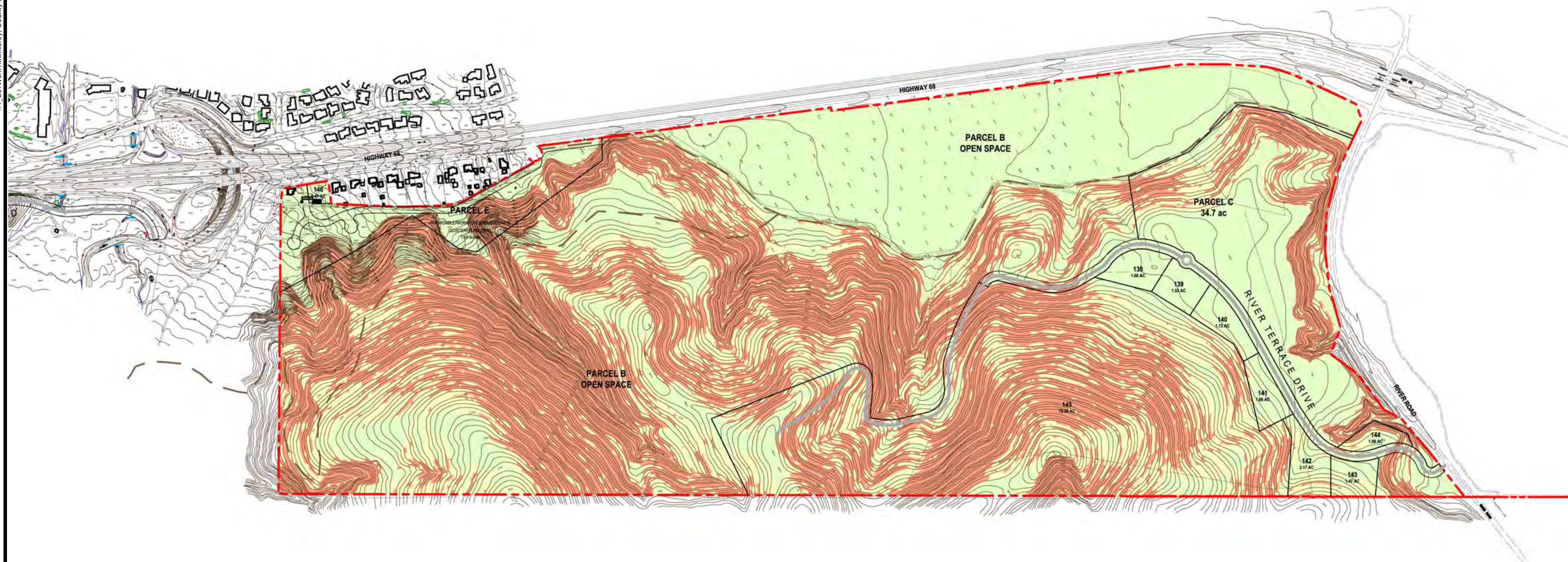

Source: Whitson Engineers, 2004

0 600 1200
Scale in Feet

Figure 3.5-5b
Slope Density Map - Eastern Parcel

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permanent alteration of the natural topography due to slope failure. Site disturbance in the vicinity of steep slopes may induce slope-failure hazards such as landslides and earth and debris flows, which could damage structures and pose human safety risks. The project site shows evidence of previous slope failures in the form of shallow and deep-seated landslides.

Steeper slope areas, including slopes over 30%, are primarily located within the open space parcels. Many of the landslides on the project site are classified as shallow earth flow and debris flow type deposits. The finer-grained earth flow deposits, or mudflows, fill the bottom of many of the hillside drainages. The potential for mudflows to occur during intense rainstorms is considered high for all of the slopes on the property. Several lots will require protection by debris flow walls including Lots #22 and #23, the small clustered lots adjacent to State Route 68, and Lots #138, #139, #141, and #142.

Deep-seated landslides on the project site are located in the areas of Lots #80 through #85, Lots #32 through #35, and Lots #103 through #105. The most prominent deep-seated landslide occurs in the vicinity of proposed Lots #80 through #85 and appears to involve movement of bedrock. However, based on the geomorphic aspects, this deep-seated landslide appears to be ancient (pre-Holocene, greater than 11,000 years old). The surface of the landslide is hummocky and may have undergone significant erosion based on the moderately slope. The middle and lower portions of the landslide appear to be underlain by relatively dense materials. Based observations by Kleinfelder, this landslide may be stable under the current site conditions, but could be reactivated by excessive grading or other conditions associated with development. Soil Surveys conducted further investigations of subsurface soil conditions and determined that Lots #80 through #85 do not appear to be located on a landslide, and if the shallow near-surface soil is a landslide deposit, it has been long stabilized. The mapped landslides upslope of the proposed small clustered lots are small landslides or debris flows; therefore, the buildings at the mouth of these small slides and debris flows will need to be protected by debris flow walls.

Slope failures such as landslides typically are the result of land disturbance in an area that is susceptible to landslides. The Monterey County Grading Ordinance dictates measures to ensure that land disturbance is kept at a minimum. If improper grading activities were to occur on the project site, exposure to landslides would be considered a **potentially significant impact.** The following mitigation measures would reduce exposure to landslides to a **less than significant level**.

<u>Mitigation Measures</u>

MM 3.5-2a Prior to issuance of building permits, all recommendations provided in the Soil Systems geotechnical investigation shall be incorporated into the design and construction of the project in accordance with Policy 15.1.11 of the *Monterey County General Plan*. Debris flow walls upslope of Lot #23 and the small clustered lots are required. A qualified professional shall evaluate final building site locations to determine if debris flow walls are required for Lots #23, #27, #28, #138, #139, #141, and #142.

MM 3.5-2b During grading activities, the project applicant shall contract with a qualified engineering geologist to observe soil conditions during rough grading operations on all lots and make remediation recommendations as necessary.

Mitigation measures **MM 3.5-2a** and **MM 3.5-2b** require design of debris flow walls, building site evaluation, and monitoring of rough grading operations, which would ensure that the exposure to landslides is minimized by implementing slope stability and energy dissipation measures as recommended by Soil Systems geotechnical investigation. As mitigated, the landslide impact associated with the proposed project would be reduced to a **less than significant** level.

Exposure to Liquefaction and Lateral Spreading

Impact 3.5-3 Implementation of the proposed project may result in potential permanent structural damage and associated human safety hazards resulting from direct and indirect slope failure related to hazards such as liquefaction and lateral spreading. This would be considered a **less than significant impact.**

The occurrence of liquefaction is generally limited to soils located within approximately 50 feet of the ground surface. Liquefaction can result in a loss of bearing capacity and/or ground settlement, which can cause structural damage. Lateral spreading is a potential hazard commonly associated with liquefaction. Lateral spreading causes ground cracking and settlement in response to lateral movement of the liquefied subsurface caused by liquefaction. Soil Surveys conducted additional soil boring investigations to determine specific lot requirements, and the low risk of lateral spreading was confirmed. Design specifications required for individual lots, including removal and recompaction of surface soils, footing depth requirements, retention of native vegetation, and positive drainage away from buildings, would adequately protect future building sites. Impacts from exposure to liquefaction and lateral spreading are considered **less than significant**, and no specific mitigation measures are necessary.

Dynamic Compaction

Impact 3.5-4 Implementation of the proposed project may result in potential permanent structural damage and associated human safety hazards resulting from dynamic compaction. According to Kleinfelder, the potential for dynamic compact to occur during an earthquake is considered low. Therefore, this would be considered a **less than significant impact.**

Dynamic compaction occurs in unsaturated loose granular soil material or uncompacted fill soils, which results in ground settlement. According to Kleinfelder, the potential for dynamic compact to occur during an earthquake is considered low. Furthermore, implementation of mitigation measure **MM 3.5-1** would require specific design parameters for each lot, adherence to recommended specifications, and monitoring by a qualified professional during rough grading activities to ensure additional measures are not necessary. Therefore, exposure to dynamic compaction would be considered a **less than significant impact,** and no specific mitigation measures are necessary.

Short- and Long-Term Erosion

Impact 3.5-5 Implementation of the proposed project would result in temporary and permanent disturbance of highly erodible soils on steep slopes, thereby increasing the risk of accelerated erosion with impacts to water quality and the slope stability of erosion gullies on- and off-site. This would be considered a **potentially significant impact**.

The proposed project involves removal of vegetation and grading activities associated with the construction of roads, driveways, building pads, and associated infrastructure. It is estimated that the proposed project will include grading of approximately 265,700 cubic yards of material (240,390 cubic yards of cut and 225,310 cubic yards of fill) over approximately 92 acres. The main access roadway crosses a steep-sided ravine to the east of proposed Lots #40 and #47, then cuts across a steep active slide on the northeasterly side of the steep ravine. The loosening and exposure of soil makes it susceptible to erosion by rainfall and wind. The proposed project would also increase the amount of impervious surfaces, which may affect the natural drainage pattern on the project site. During unusually high rainfall over a short duration, excessive erosion may occur. In addition, According to WRA Environmental Consultants (WRA 2007a), several of the ephemeral drainage areas are degraded due to erosion and bank slumping related to the grazing activities on the project site. Soil particles may be carried by stormwater to receiving water bodies such as El Toro Creek located along State Route 68, resulting in sedimentation. The effects of increased sediment loading could include increased turbidity and reduced light penetration, reduction of light available for photosynthesis, clogging of gills and filters of fish and aquatic invertebrates, reduced spawning and juvenile fish survival, smothering of bottom-dwelling organisms, changes in substrate composition, and reduction in aesthetic values.

As noted by the presence of significant erosion gullies at the project site, the slopes and high erosion hazard ratings of the soil types on the project site increase the potential for erosion to occur once site preparation activities begin. Grading is required to be in accordance with the Monterey County Grading Ordinance and Erosion Control Ordinance**.** All plans are subject to review by the Monterey County Public Works Department and Monterey County Water Resources Agency. The removal and disturbance of soil during grading activities will directly affect the rate of erosion. Short- and long-term accelerated erosion on the project site would be considered a **potentially significant impact**. The following mitigation measures have been provided to reduce the potential for erosion to occur on the project site.

Mitigation Measures

MM 3.5-5a Prior to grading permit issuance for on- and off-site improvements, the project applicant shall contract with a registered engineer to prepare an erosion control plan and a stormwater pollution prevention plan (SWPPP) that documents best management practices (filters, traps, bio-filtration swales, etc.) to ensure that urban runoff contaminants and sediment are minimized during site preparation, construction, and post-construction periods. The SWPPP shall also address existing conditions and rehabilitate areas that would continue to contribute to the degradation of storm water. The erosion control plan and SWPPP shall incorporate best management practices (BMPs) consistent with the requirements of the National Pollution Discharge Prevention System and Section 16.12 of the Monterey County Code. The erosion and sediment control plan shall specify which erosion control measures necessary to control runoff will be in place during the rainy season (November 1 through April 15) and which measures shall be in place year-round. The SWPPP shall require ongoing maintenance of the year round BMPs to ensure peak efficiency. The SWPPP shall be consistent with the Central Coast Regional Water Quality Control Board standards.

MM 3.5-5b During roadway construction in the vicinity of the existing slide area east of proposed Lots #40-#47, a culvert shall be installed with engineered fill across the ravine.. No cut slopes shall be constructed into the slide, the side hill fill across the slide shall be keyed into the natural slope through the slide plane on the uphill side, and a retaining wall with a footing constructed below the slide plane shall be designed on the downhill side of the slide plane to support the roadway. All native vegetation along both sides of the roadway shall be preserved to the maximum extent feasible.

MM 3.5-5c Prior to issuance of building and/or grading permits, submitted plans shall show retention of native vegetation as much as possible around all building envelopes, roadways, and trails immediately adjacent to steep slopes to prevent erosion. All cut and fill slopes and other areas of disturbed ground shall be seeded with rye grass or landscaped with deep-rooted, drought-tolerant, soil-holding plants. Concentrated drainage shall be directed toward paved driveways or discharged onto rocked energy dissipaters within vegetated areas or adjacent natural drainage channels.

Implementation of mitigation measures **MM 3.5-5a** through **MM 3-5.5c** would reduce impacts from accelerated erosion to a **less than significant** level.

Expansive Soils

Impact 3.5-6 Implementation of the proposed project may result in potential permanent structural damage and associated human safety hazards resulting from expansive soils. This would be considered a **potentially significant impact.**

Near-surface soil was found to be non-plastic and non-expansive at most of the potential building sites tested by Soil Systems in the geotechnical investigation prepared for the project. No unsuitable soil conditions were found for foundation purposes at any of the lots, with the exception of four potential building sites. On Lots #138, #139, #141, and #80, the soil was found to be slightly to moderately expansive clayey sand or silty clay near the surface. As required by **MM 3.5-2b**, verification of adequate soil conditions for all lots would be required during grading operations. The following mitigation measure is required for the above-mentioned lots and for any other lots deemed necessary by the retained professional after evaluation of site conditions during grading operations.

<u>Mitigation Measure</u>

MM 3.5-6 Prior to issuance of building permits for Lots #138, #139, #141, and #80, and any additional lots determined necessary by the retained qualified professional, the following is required:

- Spread footings shall be constructed a minimum of 18 inches below finished inside pad soil grade, measured from the low side of the footing, for both one- and two-story portions of the new buildings, and continuous footings at all building sites shall be reinforced with a minimum of two #4 reinforcing bars placed near the bottom of the footing.

- Foundation excavations shall be flooded with 3 to 4 inches of water at least 24 hours prior to pouring concrete, and subgrade for building slabs and foundations shall be brought to the low plastic limit range of moisture for a depth of at least 8 inches prior to pouring concrete.

- Concrete floor slabs-on-grade shall be at least 5 inches thick and shall be reinforced with a minimum of #4 steel rebars placed 18 inches on center, both ways, at the sites having expansive near-surface soil conditions.

- No new tree or high–water-using shrub shall be placed within 15 feet of any building foundation.

- Any lawns and landscaped strips near the buildings shall be well watered and maintained after completion of the project

- Roof and site water shall be directed away from all building foundations; positive drainage shall be established away from the buildings toward driveways or down-slope of the buildings toward one of the adjacent drainage swales.

Adherence to recommended design specifications and implementation of mitigation measure **MM 3.5-6** would reduce impacts related to expansive soils to a **less than significant** level by incorporating specific design features and accepted methods of erosion control.

CUMULATIVE IMPACTS AND MITIGATION MEASURES

The proposed project will not combine with any other factors or projects and thus is not significant due to the localized, site-specific nature of geotechnical and seismic impacts. Therefore, **no significant cumulative impacts** are anticipated relative to geology or geologic hazards.

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