ENGINEERING GEOLOGY REVIEW
CANTINAS RANCH, LYNCH CANYON ROAD, APN: 080-062-038, LAKE NACIMIENTO AREA, SAN LUIS OBISPO COUNTY, CALIFORNIA

PROJECT SL07503-1

Prepared for

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1.0 INTRODUCTION

As requested, representatives of GeoSolutions, Inc. completed an Engineering Geology Review for the property located at Cantinas Ranch off Lynch Canyon Road, APN: 080-062-038, in the Lake Nacimiento area of San Luis Obispo County, California. Figure 1 is an Area Location Map and Figure 2 (see page 4) is an aerial view of the property. Plate 1A, 1B and 1C is a Site Engineering Geologic Map that depicts local geologic conditions. Plate 2, Site Cross Sections, presents interpretive sections through the property. Plates 3A and 4A, Regional Geologic Maps (Burch, 1971 and Dibblee, 2006), depict geologic conditions in the vicinity of the property. Plates 3B and 4B present Geologic Explanations. Plate 5A, Regional Fault Map (Jennings, 1994), depicts fault locations in the vicinity of the site. Plates 5B and 5C present the Fault Explanations. Plate 6A, Historical Seismicity Map and Plate 6B, Historical Seismicity List depict significant historical earthquakes in the region. Plate 7A, 7B and 7C are aerial photographs in the vicinity of the Site (Golden State Aerial Surveys, November 11, 2002). Plate 8, Landslide Hazards Map (San Luis Obispo County Department of Planning and Building, 1999) depicts the County of San Luis Obispo landslide hazard potential in the vicinity of the Site. Plate 9A and 9B are the Flood Insurance Rate Map and Explanations showing the location of the 100-year flood zone in the vicinity of the Site (FEMA, 1985). Plate 10A and 10B, Geologic Study Area Map depicts the location of the site within a geologic study area (San Luis Obispo County Planning Department, 2003). The signing Certified Engineering Geologist conducted geological reconnaissance mapping on October 20, 2010. This report discusses geologic conditions observed at the Site and provides engineering geologic recommendations regarding proposed development. This report was prepared in accordance with San Luis Obispo County Department of Planning and Building Land Use Ordinance Section 23.07.084 and Guidelines for Engineering Geology Reports, December 2004.

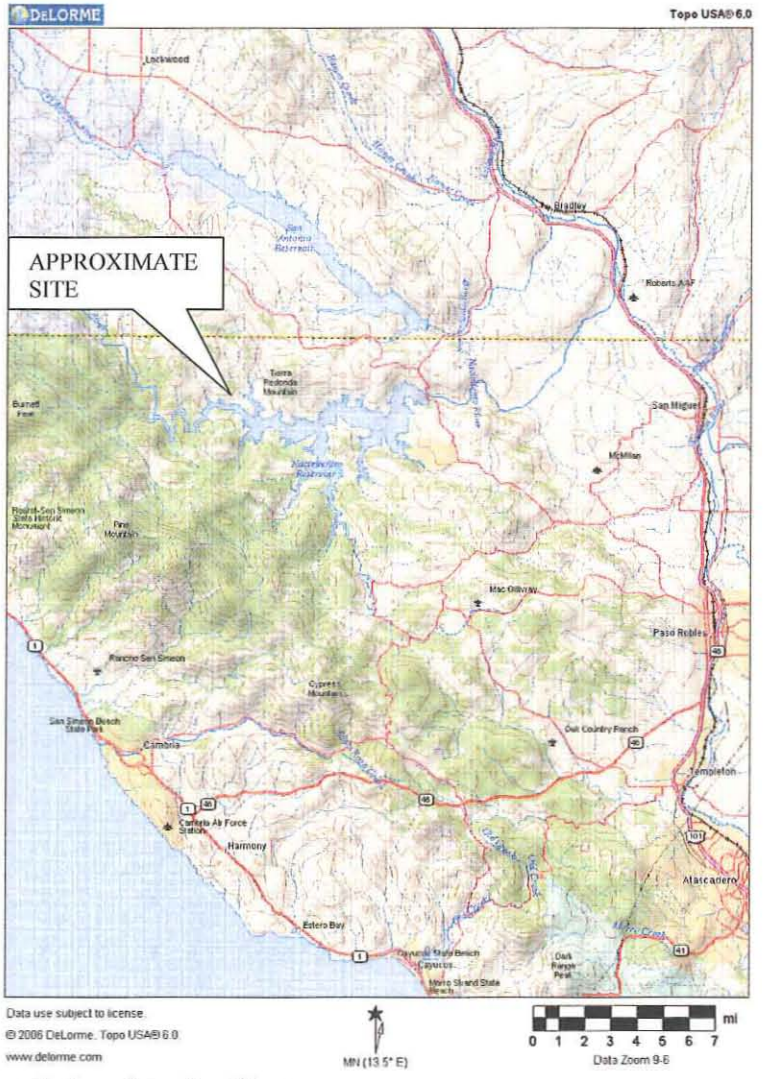

Figure 1: Area Location Map

2.0 CONCLUSIONS

The proposed building sites at the development appear geologically suitable provided that the recommendations provided herein are implemented. General geologic conditions were observed and the following conclusions are made:

2.1 Geologic Conditions

Formational units of Alluvial Deposits and Vaqueros Sandstone (Qal and Tvq on Plates 1A, 1B, 1C, 2, 3A, and 4A) were encountered within exploratory borings, trenches and observed during site reconnaissance mapping. Field observations of surface materials at the property varied from light brown silty SAND (SM) to dark brown sandy SILT and CLAY (ML) termed colluvium (Qc) and alluvium (Qal). A total of 6 borings were drilled and 9 trenches were excavated to determine the depth to formational units and determine the characteristics of the formational material. Based upon observations made during the field investigations, excavation may be by conventional grading equipment although hard rock may be encountered locally.

2.2 Landslides and Liquefaction

No landslide hazard was observed on or in the vicinity of the proposed development. Slopes are primarily composed of Vaqueros Sandstone covered with a thin veneer of colluvium. Burch, 1971 and Dibblee, 2006 have not mapped a landslide in the vicinity of the Site (Plate 3A and 4A). In the proposed building areas, slopes appear stable and no surface slumps were observed on native slopes. The potential for slope instability to affect the proposed development area is considered low. The liquefaction hazard at the Site is considered low due to the presence of near surface formational units on the slopes, the relative density of the in-situ soils, and the presence of significant clay content within the alluvial deposits.

2.3 Seismic

The potential for ground rupture at the Site during ground shaking is considered low. The closest known Holocene age fault is the San Simeon fault located approximately 13.0 miles southwest of the Site (Jennings, 1994). The Design Basis Earthquake Ground Motion for the Site is 0.29g, which is the earthquake with a 2 percent chance of being exceeded in 50 years. Burch, 1971 mapped a splay of the Nacimiento Fault Zone approximately 0.5 mile southwest of the existing Lake Shack area and Dibblee, 2006 mapped a splay of the Nacimiento Fault Zone approximately 4.5 miles west of the existing Lake Shack area. The potential for ridge-top shattering or ridge-top spreading is considered low due to the development areas not being located on ridge tops.

2.4 Seismically Induced Hazards

The potential for a tsunami to affect the Site is low due to elevation. Flooding associated with a seismic event is considered low due to the absence of a body of water upslope of the property. There is a low potential for seismically induced settlement at the Site based upon the shallow depth to Vaqueros Sandstone (Tvq) units. There appears to be a low potential for slope failure at the project site based upon the depth and character of Vaqueros Sandstone (Tvq) units.

2.5 Groundwater, Drainage, and Flooding

Surface drainage flows approximately south toward the main body of Lake Nacimiento and north toward a finger extending off the main body of the lake. Rill or gully erosion was not observed at the property except in the main stream channels. Drainage outfall from concentrated drainage should be directed away from proposed structures. No springs or seeps were observed at the project. No evidence of

shallow groundwater was observed within the borings and trenches at the Site. Periods of localized perching of groundwater within the high porosity near surface soils during periods of rainfall may be anticipated. The project is located within or near the 100-year flood zone based on Federal Emergency Management Agency flood zone maps (Plate 9A).

2.6 Asbestos and Radon

The potential for naturally occurring asbestos is low due to the absence of regionally present Franciscan Complex formational units or other units that contain ultra-mafic type rocks. The potential for radon or other hazardous gases is low due to the absence of Monterey Formation units and other regionally present radon gas producing formations.

3.0 RECOMMENDATIONS

The following are recommended for implementation at the Site.

1. It is recommended that numerical slope stability analyses be conducted on soil or rock slopes excavated steeper than 2-to-1 (horizontal to vertical). In areas mapped within competent Vaqueros Sandstone units in the subsurface, un-retained rock cuts with slopes up to 1.5-to-1 (horizontal to vertical) may be considered under the supervision of the Engineering Geologist or Soil Engineer after determining rock quality and performing a stability analysis at that particular location. Locally steeper slopes may be allowed depending on further study and slope stability analysis.

2. Fill slopes designed or constructed steeper than California Building Code requirements (2-to-1 horizontal to vertical) should be evaluated by a numerical slope stability analysis completed by the project soils engineer.

3. Concentrated surface drainage should be directed away from all constructed slopes. Drainage outfall should be toward established drainages. Proper slope protection and maintenance should help minimize slope erosion. In particular, periodic maintenance and repair of all slopes and drainage outlets should be performed. Surface drainage gradients should be planned to prevent ponding and promote drainage of surface water away from building foundations, edges of pavements and sidewalks or natural or man-made slopes.

4. Rock rip-rap is recommended for concentrated drainage outfall locations that do not discharge onto paved or exposed rock surfaces. It is recommended that geotextile fabric (Enkamat 7010 or similar) be placed underneath the rip-rap and installed per the manufacturer's recommendations.

5. Seepage is anticipated along the interface of the surface colluvial materials and underlying formational units during periods of localized groundwater perching. Seepage within formational units should also be anticipated during this same time period. Surface drainage facilities (graded swales, gutters, positive grades, etc) are recommended at the base of cut slopes that allow surfacing water to be transferred away from the base of the slope. The project designer is recommended to offer specific design criteria for mitigation of water drainage behind walls and other areas of the site. This is especially imperative upslope of retaining walls for residences. Material such as Akwadrain or Ameridrain or equivalent should to be installed on the wall per manufacturer's specifications. A contractor experienced in this type of installation should be consulted for this work. Drainage from the subsurface should not be connected into conduit from surface drains and should not connect to downspout drainage pipes.

6. Conventional grading equipment may be used for excavations.

7. Gutters are recommended to be installed along all sloped rooflines. Gutter downspouts should not allow concentrated drainage to discharge near structure foundations but rather should convey the water in solid piping toward drainage facilities. Downspouts should not be connected to subsurface drainage conduit.

8. Excavation, fill, and construction activities should be in accordance with appropriate codes and ordinances of the County of San Luis Obispo. In addition, unusual subsurface conditions encountered during grading such as springs or fill material should be brought to the attention of the Engineering Geologist and Soils Engineer.

9. It is recommended that the Soils Engineer comment on the potential for corrosive soils at the Site.

10. It is recommended that recommendations within the Soils Engineering Report be incorporated into design.

11. It is recommended that compliance with local septic disposal regulations be incorporated into design.

12. It is recommended that the Engineering Geologist review the site grading-plan prior to construction.

4.0 SITE DESCRIPTION

Cantinas Ranch is a proposed organizational camp consisting of camping lodges, mission, chapel, stables, and associated roadways. The ranch is approximately 560 acres in area with Lynch Canyon Road providing access through the property. Lake Nacimiento forms the southern boundary of the property.

Figure 2: Aerial View of the Site.

The parcel is irregular in shape with Lynch Canyon Road forming the northern property boundary of the development and Lake Nacimiento forming the southern boundary. The portion of property proposed for the resort complex will hereafter be referred to as the "Site." Site coordinates are approximately 35.757613 latitude and -121.011508 longitude. The signing Certified Engineering Geologist conducted site reconnaissance on October 20, 2010.

5.0 PURPOSE AND SCOPE

The purpose of this investigation was to evaluate engineering geologic hazards at the Site and to develop conclusions and recommendations regarding site development. The scope of this investigation consisted of:

1. A review of available published and unpublished geologic data, geotechnical publications, maps, reports and aerial photographs pertinent to the project Site.

2. A field study consisting of site reconnaissance and subsurface investigation to verify soil and geologic conditions.

3. A review of regional faulting and seismicity hazards.

4. A review of landslide potential, surface and groundwater conditions, and liquefaction hazards.

5. Development of recommendations for site preparation.

6. Preparation of this report that summarizes our findings, conclusions, and recommendations regarding engineering geology aspects of the project.

6.0 ENGINEERING GEOLOGY INVESTIGATION

6.1 Regional Geology

The site is located in the vicinity of the San Luis Range of the Coast Range Geomorphic Province of California. The Coast Ranges lie between the Pacific Ocean and the Sacramento-San Joaquin Valley and trend northwesterly along the California Coast for approximately 600 miles between Santa Maria and the Oregon border.

The Site lies within a geologic terrain unit known as the Salinian block (Burch and Durham, 1970). The block is characterized by a basement of Cretaceous age (145 to 65 million years before present) Granitic rock. The block is bounded by the San Andreas Fault Zone located approximately 25.5 miles to the northeast and the Nacimiento Fault Zone approximately 0.5 miles to the southwest. The San Andreas Fault Zone has noted significant displacement within the last two million years and are considered Quaternary active, while no Quaternary movement has been reported along the Nacimiento Fault and is therefore considered to be not Quaternary active (Jennings, 1994).

6.2 Local Geology

Locally, the site is located within Vaqueros Sandstone (Tvq). Plates 3A and 4A are Regional Geologic Maps of the general vicinity of the Site and Plates 3B and 4B provide descriptions of these Regional Geologic Maps (Burch, 1971 and Dibblee, 2006). Burch, 1971 mapped the specific site as within Miocene age (23.8-11.2 million years before present {mybp}) Middle and Lower Miocene Deposits (Tl). Burch, 1971 states, "The unit designated as middle and lower Miocene sedimentary deposits includes rocks of the Tierra Redonda and Vaqueros Formation (p. A3). Dibblee, 2006 mapped the specific site as within lower Miocene age (23.8-16.4 million years before present {mybp}) Vaqueros Formation units (Tvq), and Pleistocene age (1.8 million years before present {mybp} to 10,000 years before present) Older Surficial Sediments units (Qoa). Our subsurface trenching and drilling exploration of the area encountered units of the Vaqueros Sandstone (Tvq). Information derived from the subsurface exploration was used to classify subsurface soil and formational units and to supplement geologic mapping. Plate 1A, 1B and 1C depict the location of the borings and trenches.

6.2.1 Surficial Units

Light brown silty SAND (SM) to dark brown sandy SILT and CLAY (ML) was observed as surficial deposits along slopes of the property and within borings, which is termed colluvium (Qc). Boring logs identified approximately 1 to 13 feet of surficial colluvium. Dibblee, 2006 describes the Older Surficial Sediments (Qoa) as "Dissected alluvial gravel sand and clay, weakly indurated." Older Surficial Sediments (Qoa) at the site were observed to vary from dark brown sandy CLAY (CL) to light brown silty SAND (SM).

6.2.2 Formational Units

Plate 1A, 1B and 1C, Site Engineering Geology Map, depicts the proposed development and vicinity as within Older Alluvial deposits (Qal) and Vaqueros Sandstone (Tvq). Plate 2 presents cross sections through the property. Burch, 1971 and Dibblee, 2006 map the site as within Older Alluvial Deposits and Vaqueros Sandstone at the site.

Burch, 1971 (p. A3) describes the Middle and Lower Miocene Deposits (Tl) as "The rocks consist chiefly of sandstone, commonly fossiliferous; conglomerate and mudstone are locally abundant. Well-indurated calcareous sandstones commonly alternate with friable partly calcareous or silty sandstones." Dibblee, 2006 maps and describes the Vaqueros Sandstone (Tvq) at the property as "light gray to light brown, semi-friable, thick bedded to massive, medium to coarse grained, locally cross-bedded, arkosic, locally fossiliferous." For simplicity of discussion, the Middle and Lower Miocene Deposits described as (Tl) by Burch, 1971 will be referred to as Vaqueros Sandstone (Tvq).

During the subsurface exploration phase of the field investigation, a total of 6 borings were drilled and 9 trenches were excavated to determine the depth to formational units and determine the quality of the formational material. Graphic representations of boring and trench logs are presented in Appendix B. Plate 1A, 1B and 1C depicts Vaqueros Sandstone (Tvq) throughout the property with colluvial (Qc) cover and older alluvial deposits (Qoa). Rock and fracture descriptors are within Appendix B. Previously excavated test pits and water wells logs excavated or drilled are also presented in Appendix B.

6.3 Surface and Groundwater Conditions

Surface drainage flows approximately south toward the main body of Lake Nacimiento and north toward a finger extending off the main body of the lake. Rill or gully erosion was not observed at the property except in the main stream channels. These conditions reflect the short period of high velocity discharge within these features. Proposed improvements should neither contribute nor mitigate conditions. Drainage outfall from concentrated drainage should be directed away from proposed structures. No springs or seeps were observed at the project. No evidence of groundwater was observed within the borings and trenches at the Site. Short periods of localized groundwater perching within near surface colluvium or top soil should be anticipated during the wet winter months. Period of occurance would reflect the relative amount and duration of rainfall.

7.0 LANDSLIDES

The San Luis Obispo County Safety Element maps the property within a no data zone (San Luis Obispo County Department of Planning and Building, 1999). Landslides were not observed in the immediate vicinity of the proposed development. Burch, 1971 and Dibblee, 2006 have not mapped a landslide in the vicinity the Site and no surficial slumping was observed at the site. Plate 7A, 7B and 7C, depicts aerial photographs in the vicinity of the Site (Golden State Aerial Surveys, November 11, 2002). No evidence of landslides were observed on the photographs in the vicinity of the proposed developments. Due to the presence of near surface Vaqueros

Sandstone units and Older Alluvial Deposits, the landslide potential in the vicinity of the proposed development is considered low.

8.0 FLOODING AND SEVERE EROSION

The site is located within or near the 100-year flood zone based on Federal Emergency Management Agency flood zone maps (Plate 9A).

9.0 ON-SITE SEPTIC SYSTEMS

Percolation testing was performed at the site during the concurrent Percolation Testing Report (GeoSolutions, Inc., December 20, 2010). It is recommended that compliance with local septic disposal regulations be incorporated into design.

10.0 HYDROCOLLAPSE OF ALLUVIAL FAN SOILS

The potential for hydrocollapse of soils is low due to absence of fanglomerate and alluvial soils that typically cause such conditions. The shallow depth to Vaqueros Sandstone and the competent nature of the underlying formation units further serve to reduce this potential.

11.0 REGIONAL FAULTING AND SEISMICITY

Similar to the surrounding areas, the Site may be affected by moderate to major earthquakes centered on one of the known large, active faults listed in Table 1 below. Moment magnitudes are expressed, although any significant event on these faults could result in moderate to severe ground shaking at the subject site. The potential for ground failure of any portion of the Site during ground shaking is considered low.

Table 1: Active Faults Near the Subject Property

Closest Active Faults to Site	Approximate Distance (miles)	Closest Active Portion Distance (miles)	Moment Magnitude (Mw)
Hosgri/San Simeon Fault	13.0	13.0	7.0
Los Osos Fault	31.0	36.0	7.5
San Andreas Fault	31.0	31.0	8.0

The closest known Holocene age fault is the San Simeon fault located approximately 13.0 miles southwest of the Site. The San Andreas Fault is the most likely active fault to produce ground shaking at the Site. Plate 6A, Historical Seismicity Map and Plate 6B, Historical Seismicity List depicts significant historical earthquakes in the region.

11.1 Ridgetop Shattering

Obvious evidence of ridge-top spreading, shattered ground, sharply defined scarps, side hill benches, shallow depressions, fissures, sackung, or linear troughs were not apparent during the site investigation. Based on the absence of these features and the low relief topography, the potential for ridgetop shattering is considered low.

The potential for ground failure at the Site resulting from a fault crossing the site is considered low due to the absence of a known fault trending across the property. Ground shaking from off-site faults may cause failure of loose soil or rocks on slopes.

11.2 Nacimiento Fault Zone

A splay of the Nacimiento Fault Zone is assumed to be located southwest of the Site. It is a major block boundary within this area of the California Coast Range. The Nacimiento fault is interpreted to be a zone of Cretaceous subduction with possible strike slip movement, as granitic basement lies on one side and Franciscan basement lies on the other side. However the lack of recent geomorphic features normally associated with active strike-slip faults suggests that the fault has been inactive during the Holocene time last 10,000 years. The Nacimiento is not a single master break of specific age, but rather a complexity of branching and discontinuous faults of diverse orientations, movements and ages (Hart, 1976). Burch, 1971 mapped a splay of the Nacimiento Fault Zone approximately 0.5 mile southwest of the existing Lake Shack area and Dibblee, 2006 mapped at splay of the Nacimiento Fault Zone approximately 4.5 miles west of the existing Lake Shack area.

11.3 Structural Building Design Parameters – 2007 CBC

According to section 1613 of the 2007 CBC (CBSC, 2007), all structures and portions of structures should be designed to resist the effects of seismic loadings caused by earthquake ground motions in accordance with the *Minimum Design Loads for Buildings and Other Structures* (ASCE7) (ASCE, 2006). ASCE7 considers the most severe earthquake ground motion to be the ground motion caused by the Maximum Considered Earthquake (MCE) (ASCE, 2006). The MCE can be defined as an earthquake having a two percent chance of being exceeded in 50 years. A probabilistic seismic hazard analysis was performed in order to estimate the horizontal ground motion acceleration (a_{max}) produced at the Site during the MCE. The probabilistic seismic hazard evaluation for the Site was performed using the computer program FRISKSP (Blake, 2000). The program FRISKSP is based on an earlier computer program, FRISK (McGuire, 1978), which was modified for the probabilistic estimations of seismic hazards using three-dimensional earthquake sources.

The a_{max} of the Site depends on several factors, which include the distance of the Site from known active faults, the expected magnitude of the MCE, and the Site soil profile characteristics. The computer program FRISKSP produces a Probability of Exceedance Chart using latitude and longitude coordinates of the Site, a database of known active faults, and a specified attenuation curve that is representative of the soil characteristics at the Site. The a_{max} of the Site can be determined from this Probability of Exceedance Chart.

In order to perform the seismic hazard analysis, an attenuation curve was chosen based on the Site soil profile classification, which was determined from data gathered during the field investigation. As per section 1613.5.5 of the 2007 CBC (CBSC, 2007), the Site soil profile classification is determined by the average soil properties in the upper 100 feet of the Site profile. Based on the depth of Unnamed Formation units, the Site was defined as Site Class C, Soft rock profile per Table 1613.5.2 of the 2007 CBC (CBSC, 2007). Due to this site profile classification, the seismic hazard analysis was performed using the Horiz. - NEHRP C attenuation relation by Boore et al., 1997. Using this attenuation relation, this analysis produced an a_{max} of 0.38g for the Site. See Appendix A for the latitude and longitude data used in this analysis and for the Probability of Exceedance Chart.

According to section 11.2 of ASCE7 (ASCE, 2006) and section 1613 of the 2007 CBC (CBSC, 2007), buildings and structures should be specifically proportioned to resist Design Earthquake Ground Motions (Design a_{max}). ASCE7 defines the Design a_{max} as "the earthquake ground motions that are two-thirds of the corresponding MCE ground motions" (ASCE, 2006, p. 109). Therefore, the **Design a_{max} for the Site is 0.29g**, which is equal to two-thirds of the a_{max} for the Site.

Site coordinates of 35.758254 degrees north latitude and -121.009930 degrees west longitude and a search radius of 100 miles were used in the probabilistic seismic hazard analysis.

11.4 Structural Building Design Parameters

Structural building design parameters within Chapter 16 of the 2007 CBC (CBSC, 2007) and sections 11.4.3 and 11.4.4 of ASCE7 (ASCE, 2006) are dependent upon several factors, which include site soil profile characteristics and the locations and characteristics of faults near the Site. As described in section 11.4 of this report, the Site soil profile classification was determined to be Site Class C. This Site soil profile classification and the latitude and longitude coordinates for the Site were used to determine the structural building design parameters.

Spectral Response Accelerations and Site Coefficients were obtained from the Seismic Hazard Curves and Uniform Hazard Response Spectra, Earthquake Ground Motion Tool computer application (USGS, 2007); this program is available from the United States Geological Survey website (USGS, 2008). This computer program utilizes the methods developed in the 1997, 2000, and 2003 editions of the NEHRP Recommended Provisions for Seismic Regulations for New Buildings and Other Structures and user-inputted Site latitude and longitude coordinates to calculate seismic design parameters and response spectra (both for period and displacement), for Site Classifications A through E. Analysis of the Design Spectral Response Acceleration Parameters for the Site and of the Occupancy Category for the proposed structure assign to this project a **Seismic Design Category of D** per Tables 1613.3.5.6(1) and 1613.3.5.6(2) of the 2007 CBC (CBSC, 2007).

Table 2: 2007 California Building Code, Chapter 16, Structural Design Parameters

Site Class - Soil Profile Type	C – Soft Rock
Mapped Spectral Response Accelerations and Site Coefficients	$S_S = 1.087$, $S_1 = 0.424$ $F_a = 1.0$, $F_v = 1.376$
Adjusted Maximum Considered Earthquake Spectral Response Accelerations	$S_{MS} = S_S*F_a = 1.087*1.0 = 1.087$ $S_{M1} = S_1*F_V = 0.424*1.376 = 0.583$
Design Spectral Response Acceleration Parameters	$S_{DS} = 2/3(S_{MS}) = 2/3(0.764) = 0.724$ $S_{D1} = 2/3(S_{M1}) = 2/3(0.412) = 0.389$
Occupancy Category (from Table 1604.5, 2007 CBC)	II
Seismic Design Category – Short Period Accel. (from Table 1613.5.6(1), 2007 CBC)	D
Seismic Design Category – Long Period Accel. (from Table 1613.5.6(2), 2007 CBC)	D

11.5 Design Response Spectra – 2007 CBC

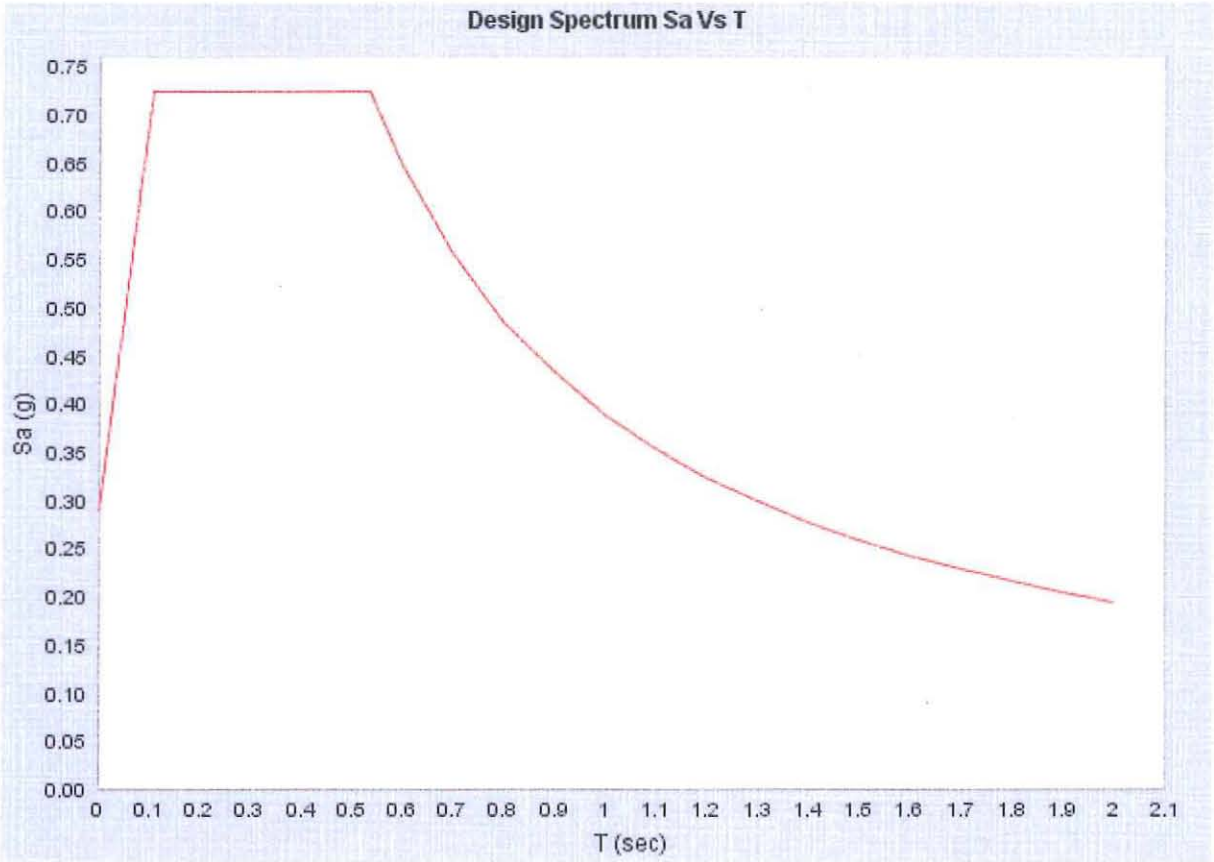

Figure 4: Design Response Spectra – 2007 CBC

According to the 2007 CBC, a representation of Site ground motion having a 2 percent probability of being exceeded in a 50-year period (probabilistic MCE or maximum considered earthquake) should be used in the design of structures to resist lateral forces caused by ground motion at the Site. An elastic design response spectrum constructed according to Chapter 16 of the 2007 CBC can be used for these design purposes. A design response spectrum, constructed for the Site using the Seismic Hazard Curves and Uniform Hazard Response Spectra computer program (USGS, 2007) in accordance with the 2007 CBC (CBSC, 2007) procedures outlined in Chapter 16, is shown in Figure 4: Design Response Spectra.

11.6 Ground Surface Rupture Due to Faulting

The Alquist-Priolo Earthquake Fault Zoning Act of 1972 requires that the California State Geologist establish Earthquake Fault Zones around the surface traces of active faults and to issue appropriate maps. The closest Earthquake Fault Zone is on a section of the San Simeon fault located approximately 13.0 miles southwest of the Site (Jennings, 1994). The subject site is not located within an Earthquake Fault Zone.

11.7 Seismically Induced Water Waves and Flooding

Tsunamis and seiches are two types of water waves that are generated by earthquake events. Tsunamis are broad-wavelength ocean waves and seiches are standing waves within confined bodies of water, typically reservoirs. The potential for a tsunami to affect the Site is low due to the distance to the Pacific Ocean. The Final Environment Impact Report for the Nacimiento Water Project states, "Studies of true seiches are limited, but a 1968 study by McGarr and Vorhis (as cited by Envicom 1975) of seiches

induced by the 1964 Alaskan earthquake indicates that the largest recorded wave heights did not exceed 1.2 feet. This measurement is less than wave heights expected from wind-induced waves; therefore, seiches are not considered an important concern in SLO County (Envicom 1975)" (Marine Research Specialists, December 2003). In addition, the proposed development is located along a finger of Lake Nacimiento and at the entrance to the narrow section of the main body of water; therefore the seiche potential for the proposed development is low.

11.8 Seismically Induced Settlement and Slope Failure

There is a low potential for seismically induced settlement at the Site based upon the depth to Vaqueros Sandstone (Tvq) units. There appears to be a low potential for slope failure at the project site based upon the depth and character of Vaqueros Sandstone (Tvq) units. Stability of colluvial deposits along cut slopes is recommended to be determined by the Soils Engineer.

12.0 LIQUEFACTION ANALYSIS

The liquefaction potential at the Site is considered low due to the presence of near-surface, Vaqueros Sandstone (Tvq) material and the presence of clay in the colluvium. The San Luis Obispo County Safety Element maps the property within no data for the potential liquefaction hazard zone (San Luis Obispo County Department of Planning and Building, 1999).

13.0 GEOLOGIC HAZARDS

13.1 Expansive Soils

Soils were classified as medium expansion (expansion index up to 58).

13.2 Corrosive Soils

The potential, if any, for corrosive soils are recommended to be determined by the Soil Engineer.

13.3 Naturally Occurring Asbestos

The potential for naturally occurring asbestos is low due to the absence of the regionally present Franciscan Complex formational units and other known formations that contain ultra-mafic type rocks such as serpentinite.

13.4 Radon and Other Hazardous Gases

The potential for radon or other hazardous gases is low due to the absence of the regionally present Monterey Formation units and other known radon gas producing formations on site.

14.0 SUBSIDENCE

Causes of significant land subsidence in California include compaction and decreased void space as a result of reduced pore pressure due to de-watering or withdrawal of oil and gas; hydro-compaction of dry, loose, clayey soils; and oxidation of organic material and subsequent compaction of remaining soil material. Recommendations have been provided for the soils engineer to assess the potential for settlement at the proposed building locations.

15.0 VOLCANIC ERUPTION

Volcanism in California is typically associated with the Cascade Ranges Geomorphic Province in northern California, and the Basin and Range Province on the eastern side of the Sierra Nevada Mountains. Prevailing

westerly winds would reduce the chance of ash fallout in the central California coastal area from volcanic activity on the eastern side of the Sierra Nevada. Other hazards generally related to volcanism are not pertinent to the subject site.

16.0 ADDITIONAL SERVICES

The recommendations contained in this report are based on exploratory borings/trenches and on the continuity of the sub-surface conditions encountered. It is assumed that GeoSolutions, Inc. will be retained to perform the following services:

1. Consultation during plan development.

2. Plan review of final grading and drainage documents prior to construction.

3. Additionally, construction observation by the Project Engineering Geologist and Soils Engineer may be necessary to verify sub-surface conditions during excavation activities.

17.0 LIMITATIONS

1. The recommendations contained in this report are based on Site reconnaissance; review of sub-surface data, and partly on certain plans, information, and data provided to us. Any changes in those plans, information and data will render our recommendations invalid unless we are commissioned to review the changes and to make any necessary modifications and/or additions to recommendations.

2. This report is issued with the understanding that it is the responsibility of the owner or his/her representative to ensure that the information in this report be incorporated into the project plans and recommendations contained herein be brought to the attention of the architect. The owner or his/ her representative is responsible to ensure that the necessary steps are taken to verify that the contractor and subcontractors comply with recommendations in the field.

3. Our recommendations have been made in accordance with the principles and practices generally employed by the engineering professions. This is in lieu of all other warranties, expressed or implied. Reference is made to our Agreement for Professional Services, which contains additional limitations concerning this project.

4. Any person concerned with this project who observes conditions or features of the Site or surrounding area that are different from those described in this report should report them immediately to this office for evaluation as part of an additional scope of work. Should additional evidence become available in the future that would indicate the need for additional study, this firm should be contacted.

5. As of the present date, the findings of this report are valid for the property studied. With the passage of time, changes in the conditions of a property can occur whether they are due to natural processes or to the works of man on this or adjacent properties. Therefore, this report should not be relied upon after a period of one (1) year without our review nor should it be used or is it applicable for any properties other than those studied. However many events such as floods, earthquakes, grading of the adjacent properties and building and municipal code changes could render sections of this report invalid in less than 1 year.

END OF TEXT

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PLATES

Plate 1A, 1B, 1C - Site Engineering Geologic Map

Plate 2 – Site Cross Sections

Plate 3A, 3B - Regional Geologic Map, Burch, 1971 and Geologic Explanations

Plate 4A, 4B - Regional Geologic Map, Dibblee, 2006 and Geologic Explanations

Plate 5A, 5B, 5C – Regional Fault Map, Jennings, 1994 and Explanations

Plate 6A, 6B – Historical Seismicity Map and Historical Seismicity List

Plate 7A, 7B, 7C – Aerial Photograph, Golden State Aerial Surveys, November 11, 2002

Plate 8 – Landslide Hazards Map, San Luis Obispo County Department of Building and Planning, 1999

Plate 9A, 9B – Flood Insurance Rate Map, FEMA, 1985 and Explanation

Plate 10A, 10B – Geologic Study Area Map and Explanations, San Luis Obispo County Department of Building and Planning, 2003

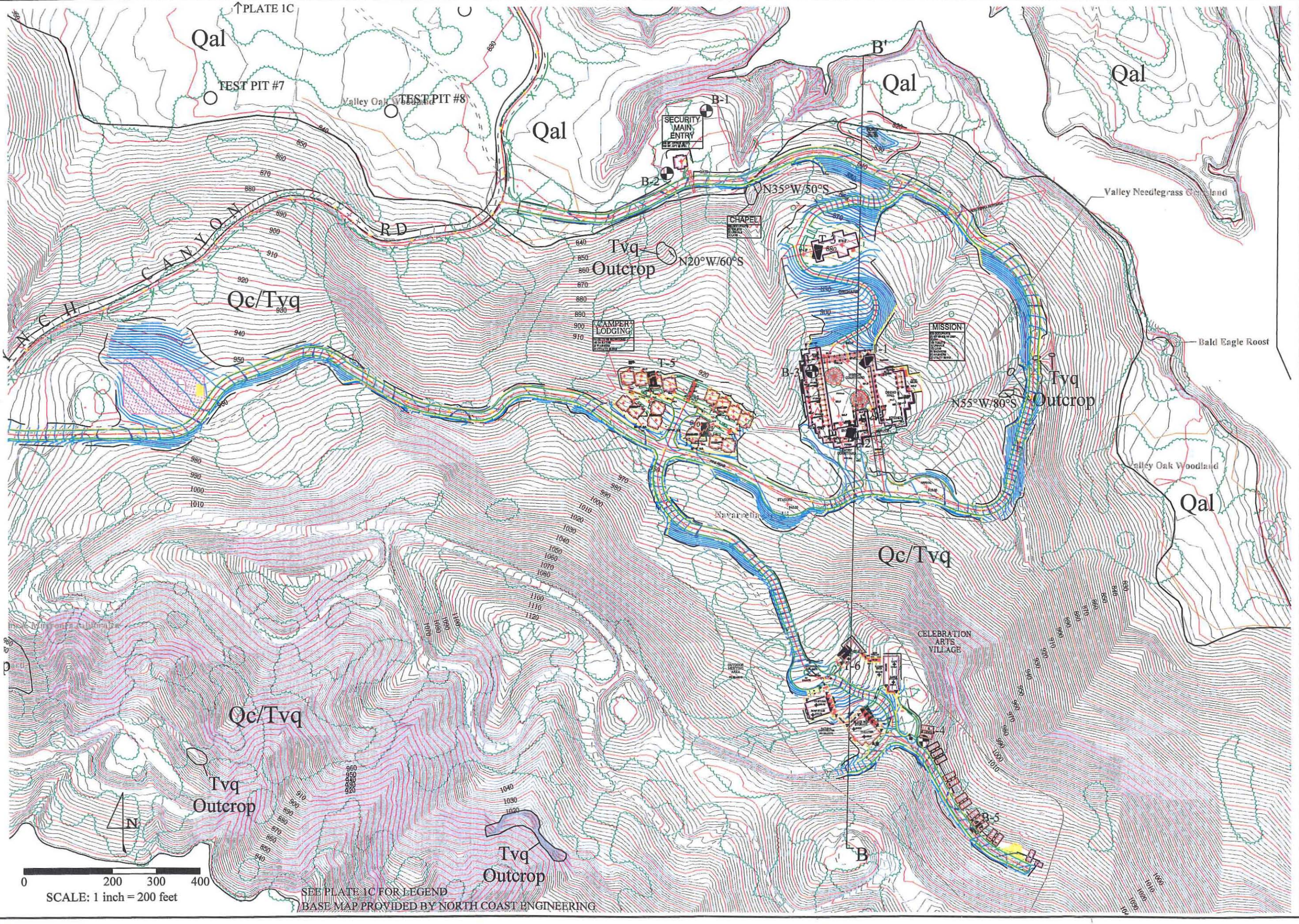

PLATE 1A

PROJECT SL07503-1

SITE ENGINEERING GEOLOGY MAP

CANTINAS RANCH, LYNCH CANYON ROAD,
LAKE NACIMIENTO AREA, SAN LUIS OBISPO COUNTY, CALIFORNIA

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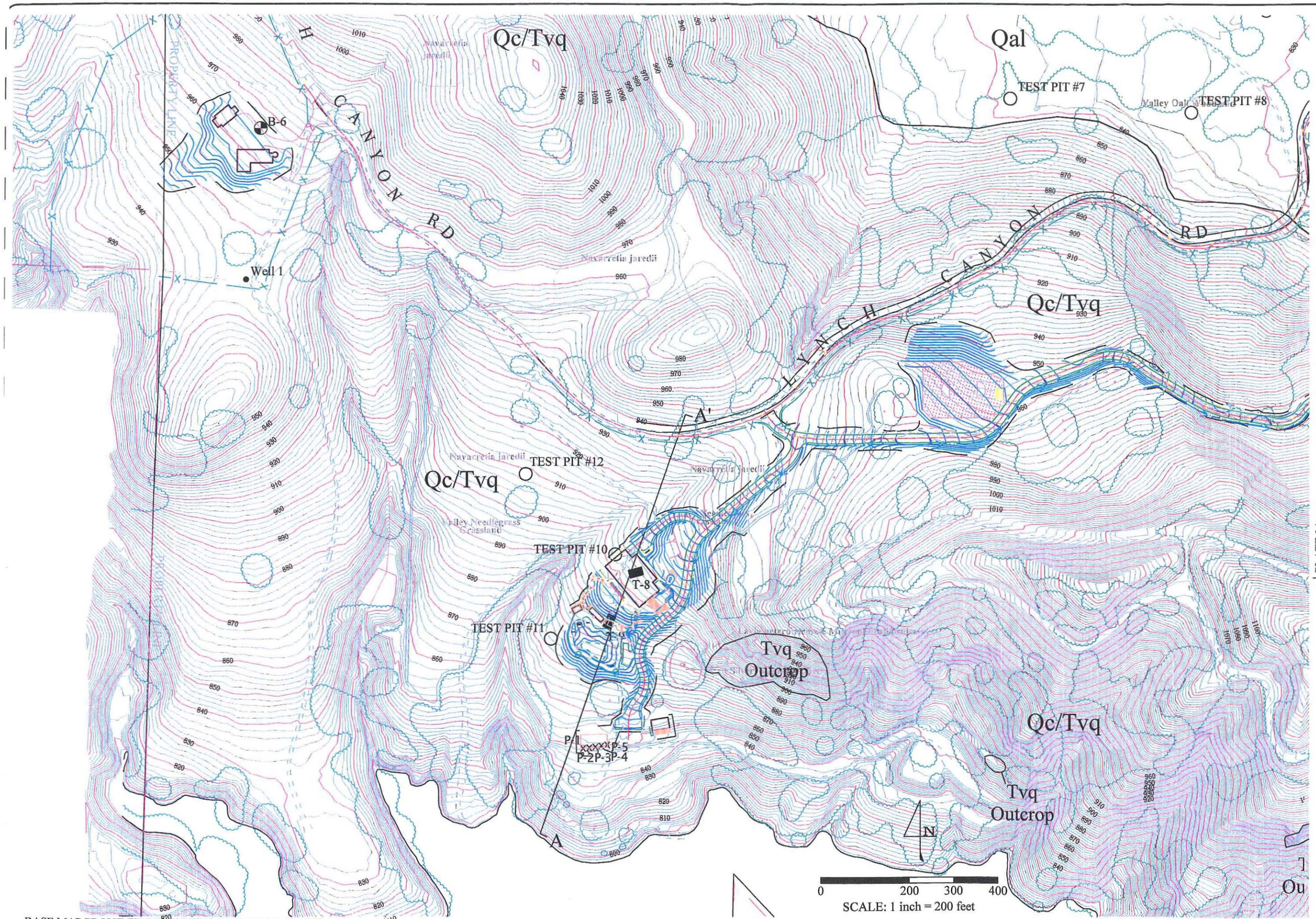

BASE MAP PROVIDED BY NORTH COAST ENGINEERING

PLATE 1B

PROJECT SL07503-1

SITE ENGINEERING GEOLOGY MAP

CANTINAS RANCH, LYNCH CANYON ROAD,
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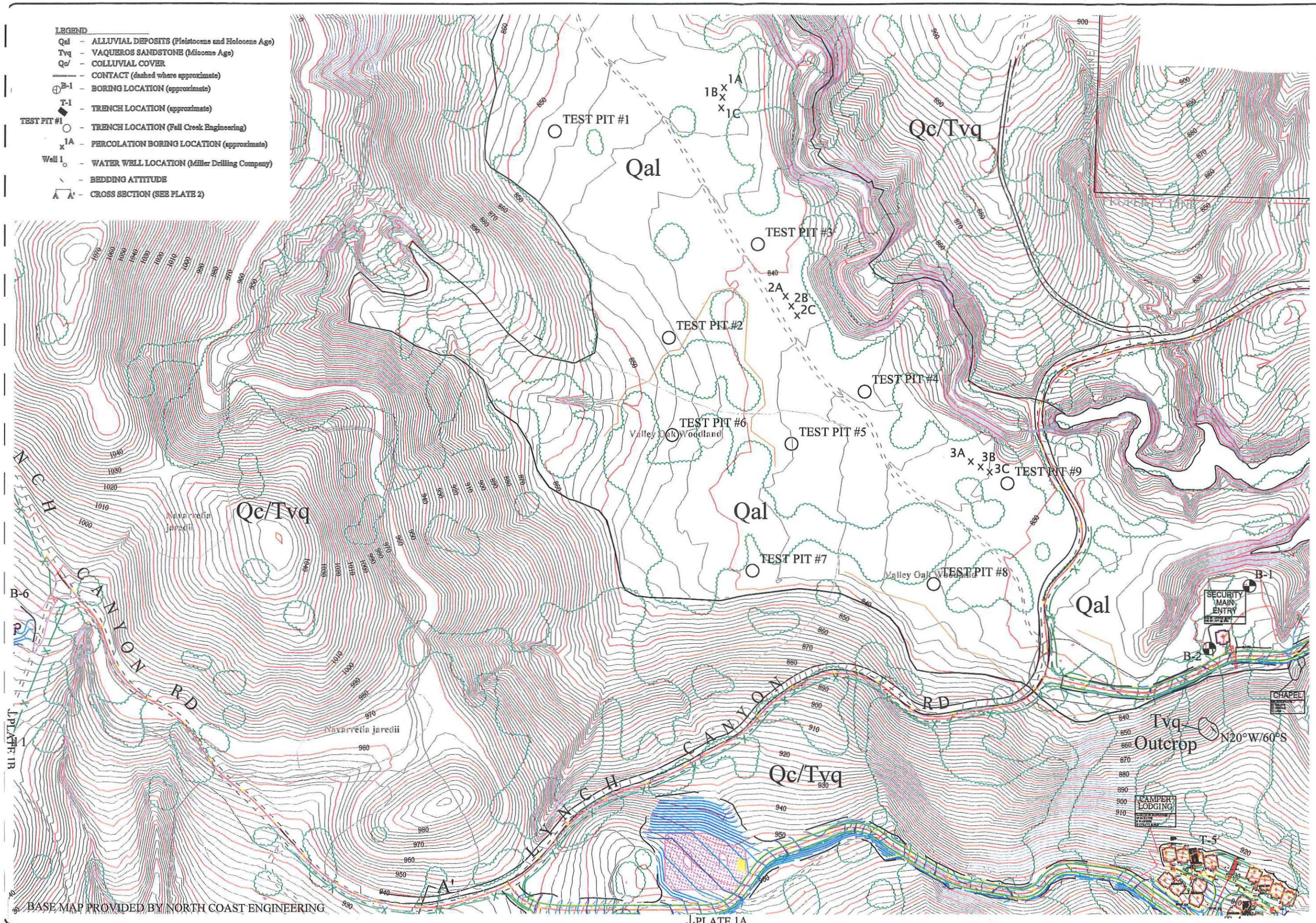

PLATE 1C

PROJECT SL07503-1

SITE ENGINEERING GEOLOGY MAP

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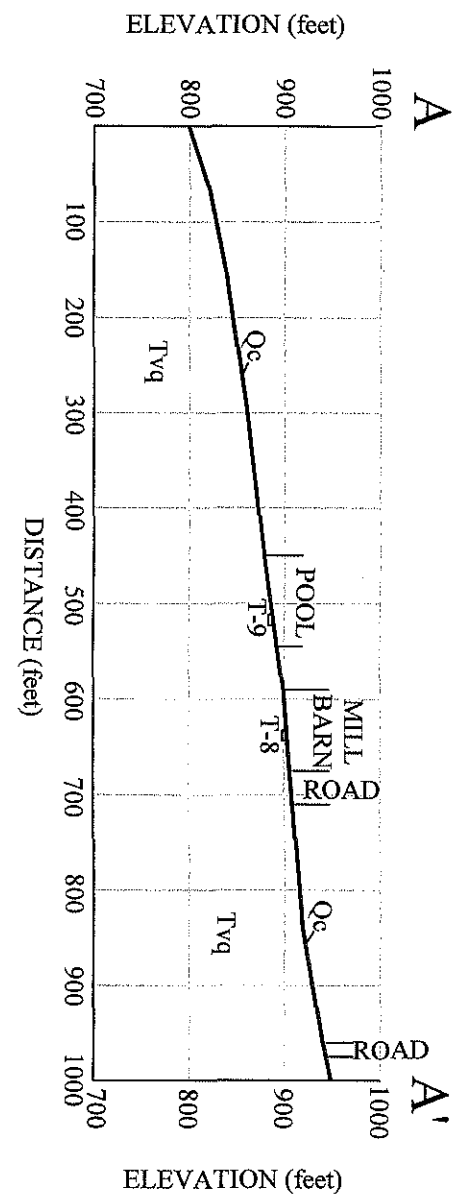

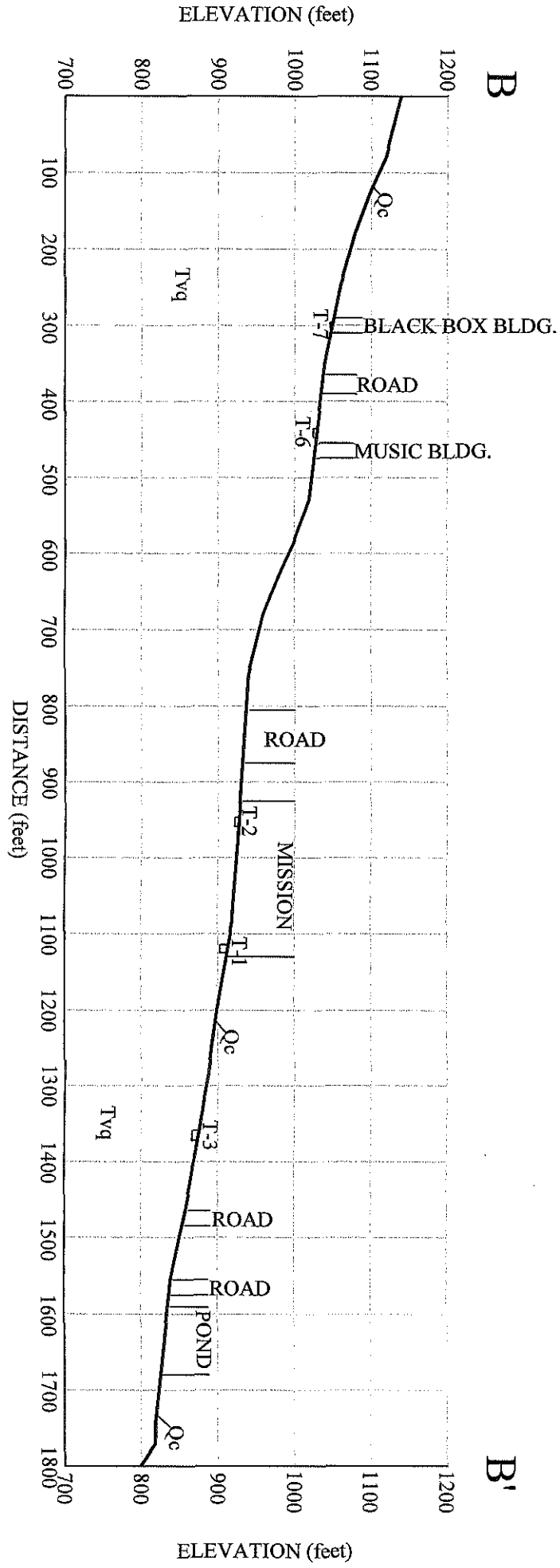

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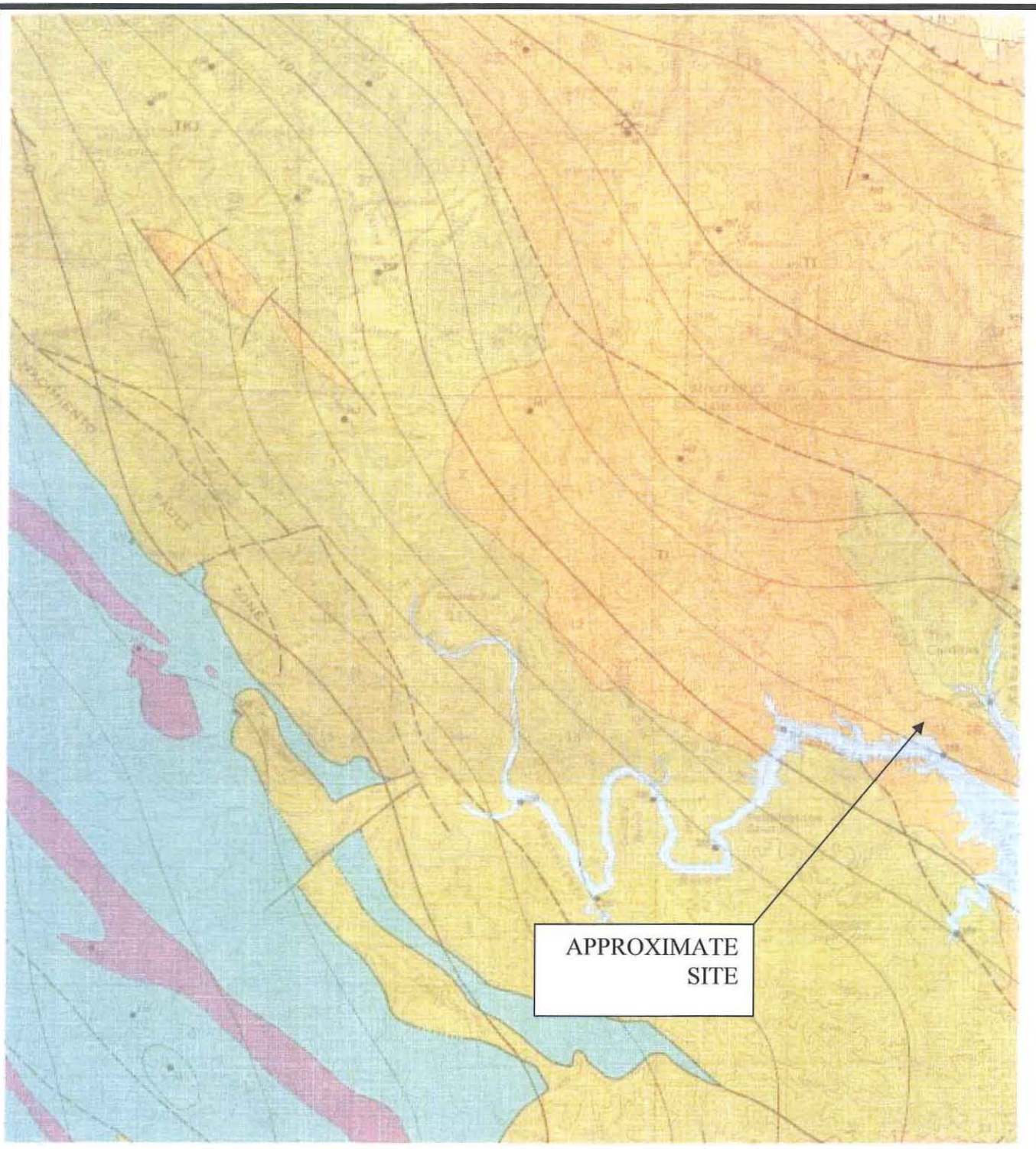
SITE CROSS SECTIONS

CANTINAS RANCH, LYNCH CANYON ROAD,
LAKE NACIMIENTO AREA,SAN LUIS OBISPO COUNTY, CALIFORNIA

PLATE
2

PROJECT
SL07503-1



COMPLETE BOUGUER GRAVITY AND GENERALIZED GEOLOGIC MAP OF THE CAPE SAN MARTIN
BRYSON, PIEDRAS BLANCAS, AND SAN SIMEON QUADRANGLES, CALIFORNIA

SEE PLATE 3B FOR EXPLANATIONS

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REGIONAL GEOLOGIC MAP

CANTINAS RANCH, LYNCH CANYON ROAD,
LAKE NACIMIENTO AREA,
SAN LUIS OBISPO COUNTY, CALIFORNIA

PLATE
3A

PROJECT NO:
SL07503-1

E X P L A N A T I O N

SUPERBASEMENT SEDIMENTARY ROCKS

Pleistocene and Holocene	Qs	Surficial deposits	QUATERNARY
Pliocene and Pleistocene(?)	QT	Paso Robles Formation	TERTIARY AND QUATERNARY(?)
Pliocene	Tp	Pancho Rico Formation	TERTIARY
Miocene	Tm	Monterey Shale	TERTIARY
Miocene	Tv	Volcanic rocks	TERTIARY
Miocene	Tl	Middle and lower Miocene deposits	TERTIARY
Jurassic, Cretaceous, and Paleocene	TKJ	Paleocene and upper Mesozoic deposits	JURASSIC, CRETACEOUS, AND TERTIARY

BASEMENT ROCKS

i	Intrusive rocks	TERTIARY
gr	Granitic rocks	CRETACEOUS
fr	Franciscan Formation	JURASSIC AND CRETACEOUS
mm	Metamorphic rocks	PALEOZOIC OR MESOZOIC
um	Ultramafic rocks	

Contact
Dashed where approximately located; dotted where concealed

Fault
Dashed where approximately located; dotted where concealed; querried where doubtful

Thrust fault
Sawteeth on upper plate

Anticline
Showing crestline

Syncline
Showing troughline

17
Exploratory well
Number refers to that in table in text

20
Lines of equal Bouguer anomaly, in milligals
Contour interval 2 milligals

320
Gravity station and number

CAM88
Gravity base and designation

A — A′
Location of gravity and structure profiles in figure 2

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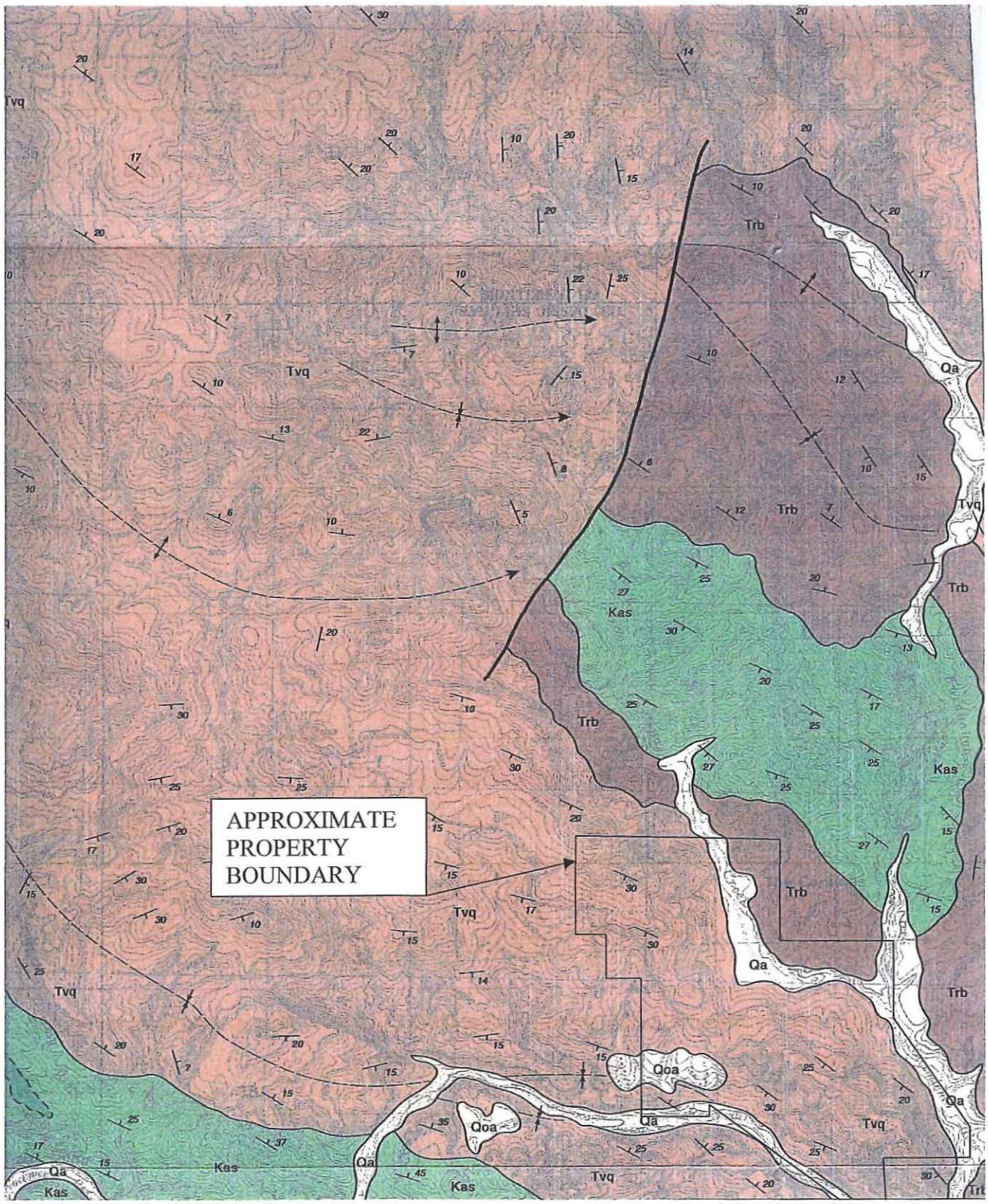
GEOLOGIC EXPLANATIONS

CANTINAS RANCH, LYNCH CANYON ROAD
LAKE NACIMIENTO AREA
SAN LUIS OBISPO COUNTY, CALIFORNIA

PLATE
3B

PROJECT NO:
SL07503-1



SEE PLATE 4B FOR GEOLOGIC EXPLANATIONS

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REGIONAL GEOLOGIC MAP

DIBBLEE, 2006
CANTINAS RANCH, LYNCH CANYON ROAD,
LAKE NACIMIENTO AREA,
SAN LUIS OBISPO COUNTY, CALIFORNIA

PLATE
4A

PROJECT NO:
SL07503-1

BRYSON MAP (DF-223)

LEGEND

Qa / Qg

SURFICIAL SEDIMENTS

Qg *Alluvial sand and gravel of major stream channels*
Qa *Alluvial sand and gravel of valley areas*

Qls

LANDSLIDE DEBRIS

Qls *Rock rubble; most too small to map, only one mapped in southwest area*

Qoa

OLDER SURFICIAL SEDIMENTS

Qoa *Dissected alluvial gravel sand and clay, weakly indurated*

— *UNCONFORMITY* —

QTp

PASO ROBLES FORMATION

Valley sediments weakly indurated; age, Pleistocene, possibly latest Pliocene

QTp *Alluvial pebble gravel/conglomerate, of mostly siliceous shale detritus (from Monterey Shale) and minor sandstone and Franciscan detritus, in sandy to clayey matrix, crudely bedded, commonly cross-bedded*

Tpd

PANCHO RICO FORMATION

(Buttle Diatomite member of Monterey Formation of Mandra, 1963), marine biogenic; age, upper Miocene

Tpd *Diatomite, white, soft, punky, semi laminated, gradational downward into* **Tm**

Tm
Tml
Tmc

MONTEREY SHALE

Marine biogenic moderately lithified; age, late & middle Miocene

Tm *Siliceous shale, brown weathers white, thin, platy, porcelaneous, locally cherty; Mohnian Stage, upper Miocene*
Tml *Lower part (Sandholdt Member of Durham, 1974), shale, cream-white to tan, thin-bedded, semi-siliceous, platy to soft fissile to silty, includes thin layers and nodules of light gray to yellow-tan dolomite; contains locally abundant foraminifera micro shells and fish scales; age, middle Miocene (Luisian and Relizian Stages – Durham, 1968)*
Tmc *Claystone, (included in Sandholdt Member by Durham, 1974) gray, soft, weathered to clay soil; age, Relizian-Saucesian Stages, mid to lower Miocene*

Tvt
Tvq

VAQUEROS SANDSTONE

(Tierra Redonda Formation of Durham, 1968), marine clastic, moderatly lithified; age, early Miocene (Saucesian? Stage)

Tvt *Tierra Redonda Member (of Durham, 1968, 1974), sandstone, similar to* **Tvq**, *but locally calcareous and hard; age, Relizian-Saucesian stage*
Tvq *Vaqueros Sandstone, light gray to light brown, semi-friable, thick bedded to massive, medium to coarse grained, locally cross-bedded, arkosic, locally fossiliferous; age, Saucesian-Zemorrian stage.*

Trb

RED BEDS

(Berry Formation of Thorup, 1943) Terrestrial clastic, sublithified; exposed only in southeast area; age, early Miocene-Oligocene

Trb *Sandstone, light gray to pink-gray, bedded, medium to locally coarse grained to pebbly, arkosic, includes thin layers of greenish to red claystone and some conglomerate*

— *UNCONFORMITY* —

Kas
Kag

UNNAMED SANDSTONE

(Atascadero Formation of Fairbanks, 1904), Marine clastic, lithified; age, late Cretaceous, mostly Maastrichtian but age range Danian to Santonian (Seiders, 1989) from microfauna; mapped as unnamed formation, upper Cretaceous-Paleocene by Durham, 1968, 1974; in Burnett Peak quadrangle to west divided by Seiders, 1989, into El Piocho Formation (NE of Nacimiento River), Shut-in, Italian Flat, and Steve Creek Formations (SW of Nacimiento River) as fault-bounded units of unknown stratigraphic order; series structurally overlies Franciscan Assemblage along Nacimiento River

Kas *Sandstone, light gray to light brown, thick-bedded, semi-hard, coherent, locally cross-bedded and pebbly, arkosic, micaceous, includes lenses of cobble conglomerate of meta-andesitic volcanic and plutonic rocks and thin lenses of micaceous claystone (not mapped) and conglomerate* **(Kag)** *in area southwest of Nacimiento River*
Kag *Conglomerate of cobbles of hard plutonic rocks, porphyritic meta-volcanic rocks, few of quartzite, no Franciscan detritus, in arkosic sandstone matrix; occurs as lenses or facies in sandstone* **(Kas)**, *only a few mapped*

sp

SERPENTINE

Hydrothermally metamorphosed from ultramafic rocks, such as peridotite, intrusive into Franciscan Assemblage; age, later Jurassic-Cretaceous

sp *Antigorite (hydrous magnesium silicate), blue-greenish gray, massive, amorphous, with specks of magnetite; severely fractured with slickensided surfaces from expansion during metamorphism*

fm

FRANCISCAN ASSEMBLAGE

Sub-metamorphosed eugeosynclinal sedimentary and mafic volcanic rocks; age, Cretaceous and Jurassic

fm *Melange (mixture) of tectonic fragments of graywacke, greenstone (metabasalt), chert, blueschist, and serpentinite in pervasively sheared matrix of dark gray claystone*

GEOLOGIC SYMBOLS

not all symbols shown on each map

FORMATION CONTACT *dashed where inferred or indefinite dotted where concealed*

MEMBER CONTACT *between units of a formation* ····· **Prominent bed**

CONTACT BETWEEN SURFICIAL SEDIMENTS *located only approximately in places*

FAULT: *Dashed where indefinite or inferred, dotted where concealed, queried where existence is doubtful. Parallel arrows indicate inferred relative lateral movement. Relative vertical movement is shown by U/D (U=upthrown side, D=downthrown side). Short arrow indicates dip of fault plane. Sawteeth are on upper plate of low angle thrust fault.*

U / D — 25 — ?

FOLDS: *overturned* — **ANTICLINE** — **SYNCLINE**

arrow on axial trace of fold indicates direction of plunge; dotted where concealed by surficial sediments

Strike and dip of sedimentary rocks — 18 *inclined* — 20 *inclined (approximate)* — 80 *overturned* — *horizontal* — *vertical*

Strike and dip of metamorphic or igneous rock foliation or flow banding or compositional layers — 75 *inclined* — *inclined (approximate)* — *vertical* — 80 *overturned*

OTHER SYMBOLS: *Direction of landslide movement* — *outline of water bodies shown on map* — *water well* — *oil well* — *springs*

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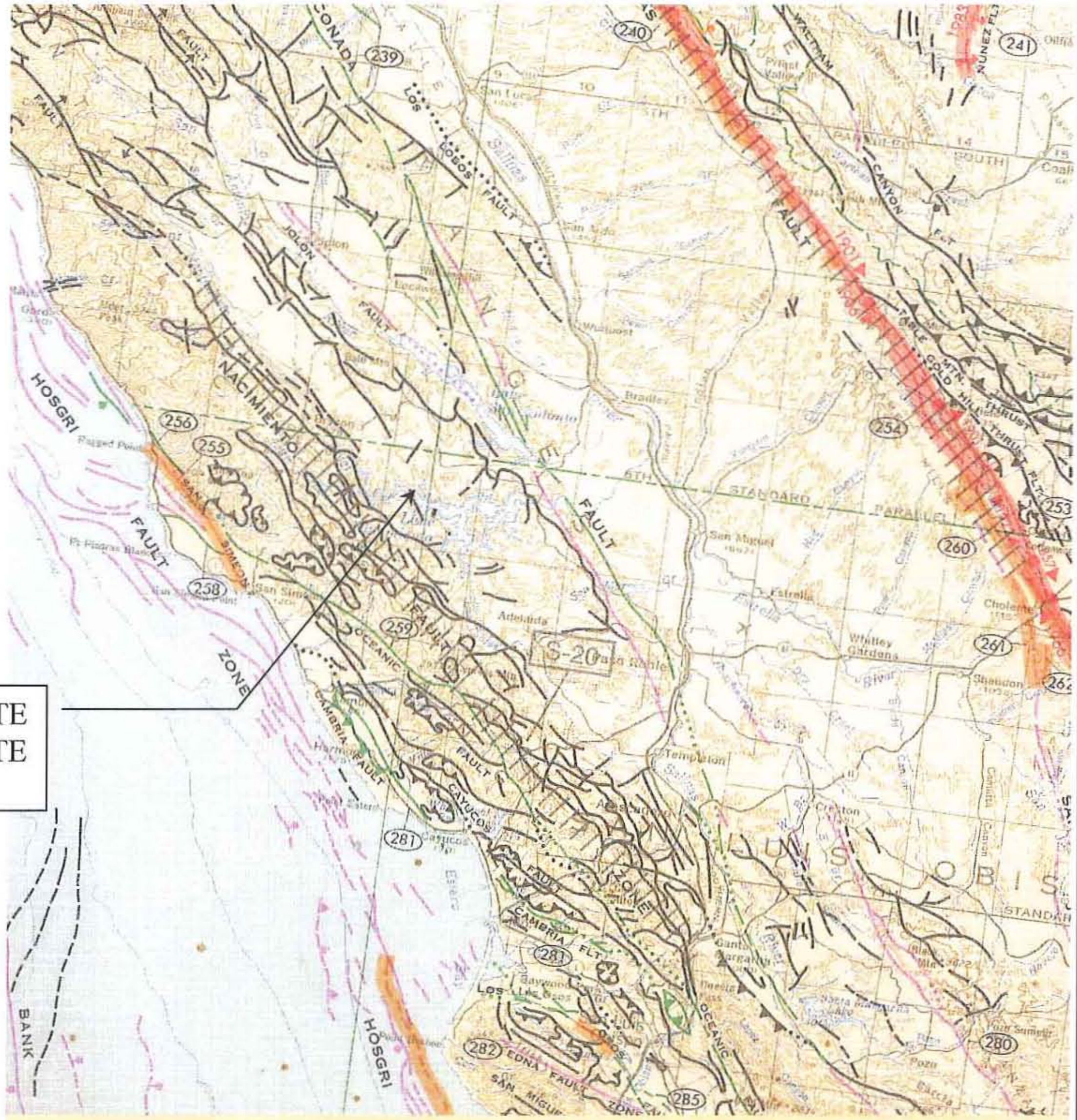
GEOLOGIC EXPLANATIONS

CANTINAS RANCH, LYNCH CANYON ROAD,
LAKE NACIMIENTO AREA,
SAN LUIS OBISPO COUNTY, CALIFORNIA

PLATE
4B

PROJECT NO:
SL07503-1

APPROXIMATE SITE



NORTH

SCALE 1:750,000
(1 INCH EQUALS APPROXIMATELY 12 MILES)

10 0 10 20 30 40 50 Miles

10 0 10 20 30 40 50 60 Kilometers

GRAPHICS BY ROSS MARTIN

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JENNINGS, 1994, SEE PLATE 5B AND 5C FOR EXPLANATIONS

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REGIONAL FAULT MAP

CANTINAS RANCH, LYNCH CANYON ROAD
LAKE NACIMIENTO AREA
SAN LUIS OBISPO COUNTY, CALIFORNIA

PLATE
5A

PROJECT NO:
SL07503-1

Geologic Time Scale			Years Before Present (Approx.)	Fault Symbol	Recency of Movement	DESCRIPTION: ON LAND	DESCRIPTION: OFFSHORE
Quaternary	Late Quaternary	Historic				Displacement during historic time (e.g. San Andreas fault 1906). Includes areas of known fault creep.	
		Holocene	200			Displacement during Holocene time.	Fault offsets seafloor sediments or strata of Holocene age.
		Pleistocene	10,000			Faults showing evidence of displacement during late Quaternary time. Undivided Quaternary faults – most faults in this category show evidence of displacement during the last 1,600,000 years; possible exceptions are faults which displace rocks of undifferentiated Plio-Pleistocene age. Late Cenozoic faults within the Sierra Nevada, including parts of, but not restricted to, the Foothills fault system. These faults may have been active in Quaternary time.	Fault cuts strata of Pleistocene age.
	Early Quaternary		700,000				Fault cuts strata of Quaternary age.
Pre-Quaternary			1,600,000			Faults without recognized Quaternary displacement or showing evidence of no displacement during Quaternary time. Not necessarily inactive. Pre-Quaternary faults not shown in Nevada and Oregon.	Fault cuts strata of Pliocene or older age.
			4.5 billion (Age of earth)				

EXPLANATION

Fault traces on land are indicated by solid lines where well located, by dashed lines where approximately located or inferred, and by dotted lines where concealed by younger rocks or by lakes or bays. Fault traces are queried where continuation or existence is uncertain. Concealed faults in the Great Valley are based on maps of selected subsurface horizons, so locations shown are approximate and may indicate structural trend only. All offshore faults based on seismic reflection profile records are shown as solid lines where well defined, dashed where inferred, queried where uncertain.

FAULT CLASSIFICATION COLOR CODE
(Indicating Recency of Movement)

Fault along which historic (last 200 years) displacement has occurred and is associated with one or more of the following:

(a) a recorded earthquake with surface rupture. (Also included are some well-defined surface breaks caused by ground shaking during earthquakes, e.g. extensive ground breakage, not on the White Wolf fault, caused by the Arvin-Tehachapi earthquake of 1952). The date of the associated earthquake is indicated. Where repeated surface ruptures on the same fault have occurred, only the date of the latest movement may be indicated, especially if earlier reports are not well documented as to location of ground breaks.

(b) fault creep slippage – slow ground displacement usually without accompanying earthquakes.

(c) displaced survey lines.

Pink band added to emphasize location of historic fault displacement.

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REGIONAL FAULT EXPLANATIONS

CANTINAS RANCH, LYNCH CANYON ROAD
LAKE NACIMIENTO AREA
SAN LUIS OBISPO COUNTY, CALIFORNIA

PLATE
5B

PROJECT NO:
SL07503-1

SPECIAL NOTATIONS

A triangle to the right or left of the date indicates termination point of observed surface displacement.

1951 ▶ ◀ 1951

Date bracketed by triangles indicates local fault break.

No triangle by date indicates an intermediate point along fault break. 1906

Dot on fault indicates location where fault creep slippage has been observed and recorded.

Square on fault indicates where fault creep slippage has occurred that has been triggered by an earthquake on some other fault. Date of causative earthquake indicated. Squares to right and left of date indicate terminal points between which triggered creep slippage has occurred (creep either continuous or intermittent between these end points). 1968 1969 1968

Holocene fault displacement (during past 10,000 years) without historic record. Geomorphic evidence for Holocene faulting includes sag ponds, scarps showing little erosion, or the following features in Holocene age deposits: offset stream courses, linear scarps, shutter ridges, and triangular faceted spurs. Recency of faulting offshore is based on the interpreted age of the youngest strata displaced by faulting. Pale orange band added to emphasize location of Holocene fault displacement.

Late Quaternary fault displacement (during past 700,000 years). Geomorphic evidence similar to that described for Holocene faults except features are less distinct. Faulting may be younger, but lack of younger overlying deposits precludes more accurate age classification.

Quaternary fault (age undifferentiated). Most faults of this category show evidence of displacement sometime during the past 1.6 million years; possible exceptions are faults which displace rocks of undifferentiated Plio-Pleistocene age. Unnumbered Quaternary faults were based on Fault Map of California, 1975. See Bulletin 201, Appendix D for source data.

Late Cenozoic faults within the Sierra Nevada including, but not restricted to, the Foothills fault system. Faults show stratigraphic and/or geomorphic evidence for displacement of late Miocene and Pliocene deposits. By analogy, late Cenozoic faults in this system that have been investigated in detail may have been active in Quaternary time. (Data from PG&E, 1993).

Pre-Quaternary fault (older than 1.6 million years) or fault without recognized Quaternary displacement. Some faults are shown in this category because the source of mapping used was of reconnaissance nature, or was not done with the object of dating fault displacements. Faults in this category are not necessarily inactive.

S-25

Fault segment associated with a significant linear trend of accurately located earthquake epicenters (magnitude 0.2 or greater). Generally aligned along strike slip faults having Quaternary displacement, but not necessarily with historic surface rupture. Lack of seismic activity along any fault is no indication that the fault may not be active in the future (e.g. San Andreas fault north of San Francisco). Epicenter data are derived from closely spaced seismic stations and include either continuing microseismicity or aftershocks associated with relatively large earthquakes.

Aligned seismicity on fault segments are referenced in Appendices C and E .

ADDITIONAL FAULT SYMBOLS

U
D

U = Upthrown side (relative or apparent)
D = Downthrown side (relative or apparent)

Bar and ball on downthrown side (used where space is limited).

Arrows along fault indicate relative or apparent direction of lateral movement.

Arrow on fault indicates direction of dip.

Low angle fault (barbs on upper plate). Fault surface generally dips less than 45° but locally may have been subsequently steepened. On offshore faults, barbs simply indicate a reverse fault regardless of steepness of dip.

OTHER SYMBOLS

529

Numbers refer to annotations listed in the Appendices of the accompanying report. Annotations include fault name, age of fault movement, and pertinent references including Earthquake Fault Zone maps where a fault has been zoned by the Alquist-Priolo Earthquake Fault Zoning Act. This Act requires the State Geologist to delineate zones to encompass all potentially and recently active faults.

Cinder cone and other types of volcanoes. Most were active in Pleistocene time, some are Holocene, a few are historic.

21 8

Number in box or circle refers to Table 4 (Recent Volcanic Eruptions) in accompanying report. (Box refers to California, circle to Nevada.)

(1786 A.D.) = Date of historic volcanic eruption.

(9,500 B.P.) = Eruption occurrence in years before present (B.P.).

★ (0.5 m.y.) = Age of volcanic flow or eruption in million years (m.y.).

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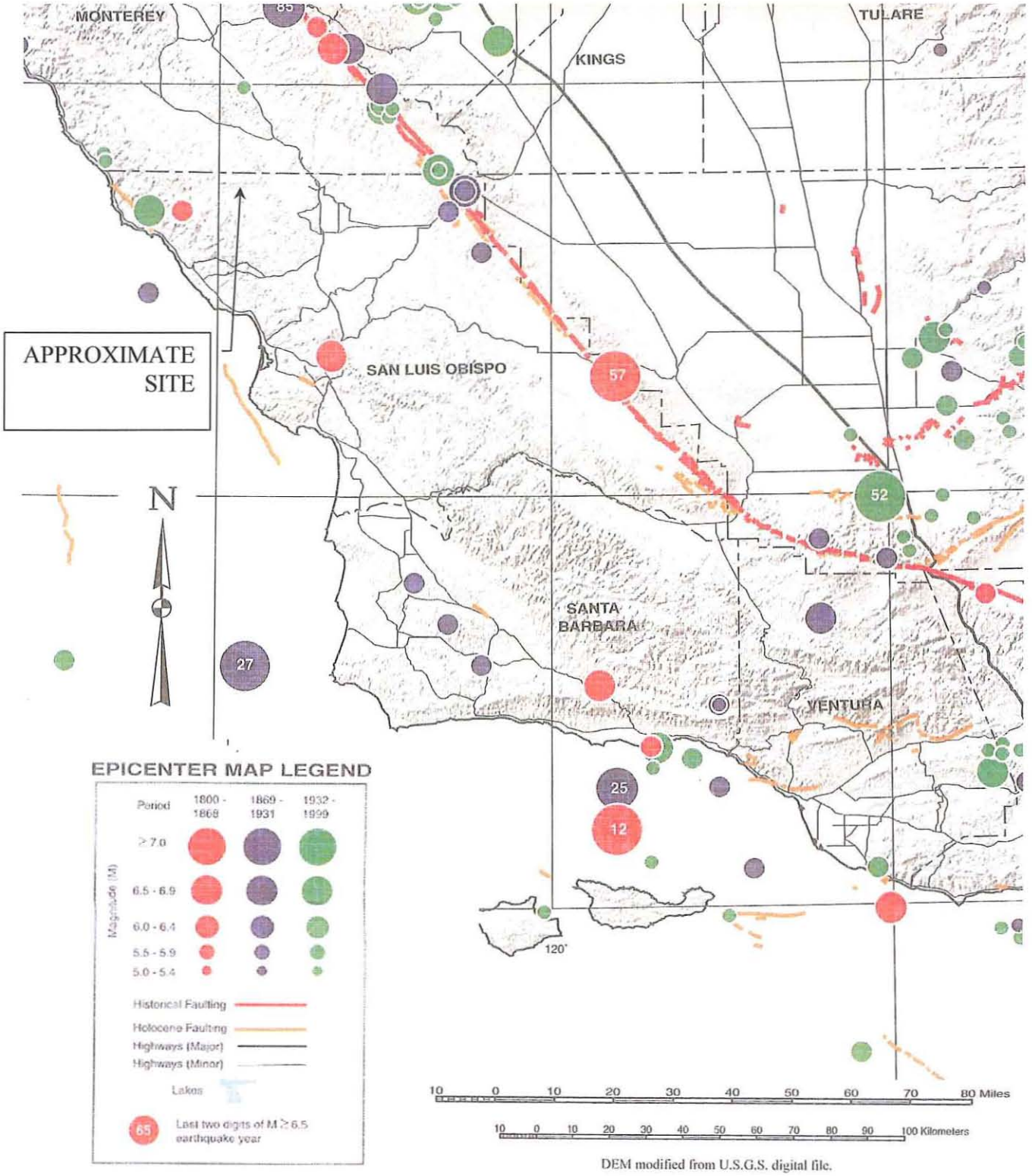
REGIONAL FAULT EXPLANATIONS

CANTINAS RANCH, LYNCH CANYON ROAD
LAKE NACIMIENTO AREA
SAN LUIS OBISPO COUNTY, CALIFORNIA

PLATE
5C

PROJECT NO:
SL07503-1



DEM modified from U.S.G.S. digital file.

T. TOPPOZADA, D BRANUM, M PETERSEN, C HALLSTROM, C. CRAMER, M. REICHLE, 2000

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HISTORICAL SEISMICITY MAP

CANTINAS RANCH, LYNCH CANYON ROAD
LAKE NACIMIENTO AREA
SAN LUIS OBISPO COUNTY, CALIFORNIA

PLATE
6A

PROJECT NO:
SL07503-1

Significant Earthquakes That May Have Affected the Site in the Last 200 Years

DATE			TIME (GMT)	LATITUDE		LONGITUDE		MAG	LOCATION
Year	mth	day	hr	(N)		(W)			
1812	12	21	19:00	34	12.00	119	54.00	7.0	Santa Barbara Channel
1830	?	?		35	3	120	6	5.0	San Luis Obispo area (?)
1853	2	1		35	6	121	1	5.0	San Simeon area (?)
1857	1	9	16:00	35	42.00	120	18.00	8.25	Great Fort Tejon earthquake
1866	7	15	06:30	37	30.00	121	18.00	6.0	W. San Joaquin Valley
1881	2	2	00:11	36	0.	120	30.00	5.75	Parkfield
1881	4	10	10:00	37	24.00	121	24.00	6.0	W. San Joaquin Valley
1882	3	6	21:45	36	54	121	12.	5.75	Hollister
1883	9	5	12:30	34	12.00	119	54.00	6.25	Santa Barbara Channel
1885	3	31		36	7	121	3	5.5	San Andreas Fault (?)
1885	4	2		36	8	121	4	5.4	San Andreas Fault (?)
1885	4	12		36	4	121	0	6.2	San Andreas Fault (?)
1892	4	21	17:43	38	30.00	121	54.00	6.25	Winters
1892	11	13		36	8	121	5	5.5	San Andreas Fault (?)
1892	11	13	12:45	36	48.00	121	30.00	5.75	Hollister
1897	6	20	20:14	37	0.	121	30.00	6.25	Gilroy
1899	7	22		34	2	117	4	5.5	San Andreas Fault (?)
1899	7	22		34	3	117	5	6.5	San Andreas Fault (?)
1901	3	3	07:45	36	0.	120	30.00	6.4	Parkfield
1901	3	3		36	0	120	5	5.5	Parkfield Area
1902	7	28		34	75	120	33	5.4	Los Alamos area
1902	12	12		34	76	120	37	5.0	Los Alamos area
1906	4	18	13:12	37	42.00	122	30.00	8.25	Great 1906 earthquake
1907	9	20		34	2	117	1	6.0	San Andreas Fault (?)
1910	3	11	06:52	36	54.00	121	48.00	5.8	Watsonville
1910	12	31		36	8	121	4	5.0	Hollister Area
1913	10	20		35	12	120	58	5.0	Arroyo Grande area
1915	1	20		34	73	120	23	5.8	Los Alamos area
1916	8	6		36	7	121	3	5.5	Paicines area
1916	10	23	02:44	34	54.00	118	54.00	5.3	Tejon Pass region
1916	10	23		34	6	118	9	6.0	Tejon Pass Area
1916	10	23		34	7	119	0	5.5	Tejon Pass Area
1916	12	1		35	18	120	73	5.0	Avila area
1917	7	9		35	25	120	48	5.0	Lopez Canyon area
1919	2	16		35	0	119	0	5.0	Tejon Pass Area
1922	3	10	11:21	6	0.	120	30.00	6.3	Parkfield
1922	3	10		35	75	120	25	6.5	Cholame Valley Area
1922	8	18		35	75	120	3	5.0	Cholame Valley Area
1925	6	29	14:42	34	18.00	119	48.00	6.3	Santa Barbara
1926	7	25		36	6	120	8	5.0	Idria area
1926	12	27		36	2	120	3	5.0	Coalinga area
1927	11	4	13:50	34	42.00	120	48.00	7.3	SW of Lompoc
1932	2	26		36	0	121	0	5.0	San Ardo area
1934	6	8	04:47	36	0	120	30.00	6.0	Parkfield
1934	6	5		35	80	120	33	5.0	Parkfield Area
1934	6	8		35	80	120	33	6.0	Parkfield Area
1934	12	24		35	93	120	48	5.0	Parkfield Area
1939	6	24		36	80	121	45	5.5	Hollister Area
1939	9	21		34	87	118	93	5.2	Cuddy Valley Area
1939	12	28		35	80	120	33	5.0	Parkfield Area

DATE			TIME (GMT)	LATITUDE		LONGITUDE		MAG	LOCATION
Year	mth	day	hr	(N)		(W)			
1941	7	1	07:50	34	22.00	119	35.00	5.9	Carpenteria
1951	7	29		36	58	121	18	5.0	Southeast of Mulberry
1952	7	21	11:52	35	0.	119	1.00	7.7	Kern County earthquake
1952	11	22	07:46	35	44.00	121	12.00	6.0	Bryson
1955	11	02		35	96	120	92	5.1	San Ardo area
1956	11	16		35	95	120	47	5.0	Southwest of Coalinga
1960	1	20		36	78	121	43	5.0	South of Hollister
1966	6	28	04:26	36	0.	120	30.00	6.0	Parkfield
1966	6	28		120	50			5.1	Parkfield Sequence
1966	6	28		35	95	120	50	5.5	Parkfield Sequence
1970	9	12		34	27	117	54	5.4	Lytle Creek Area
1971	2	9	14:00	34	25.00	118	24.00	6.5	San Fernando
1972	2	24		36	58	121	21	5.0	Southeast of Hollister
1980	5	29		34	94	120	78	2.1	Orcutt Frontal Fault
1981	9	4	15:50	33	40.00	119	7.00	5.9	N. of Santa Barbara Island
1982	10	25		36	32	120	52	5.4	New Idria area
1983	5	2	23:42	36	14.00	120	19.00	6.5	Coalinga
1983	7	22	00:23	36	14.00	120	25.00	5.7	Coalinga
1983	8	29		35	84	121	34	5.4	San Simeon area
1984	1	23		36	35	121	91	5.2	Point Sur area
1984	4	24	21:15	37	19.00	121	39.00	6.1	Morgan Hill
1985	8	4	12:10	36	8.00	120	10.00	5.9	North Kettleman Hills
1989	10	18	00:04	37	2.19	121	52.98	7.1	Loma Prieta
2003	12	22	19:16	35	41.98	121	5.84	6.5	San Simeon
2004	09	28	10:15	35	8.15	120	3.74	6.0	Parkfield

S:\Misc Drawings\Geology\locallargefaults.doc

San Luis Obispo County Department of Planning and Building, December 1999) Safety Element

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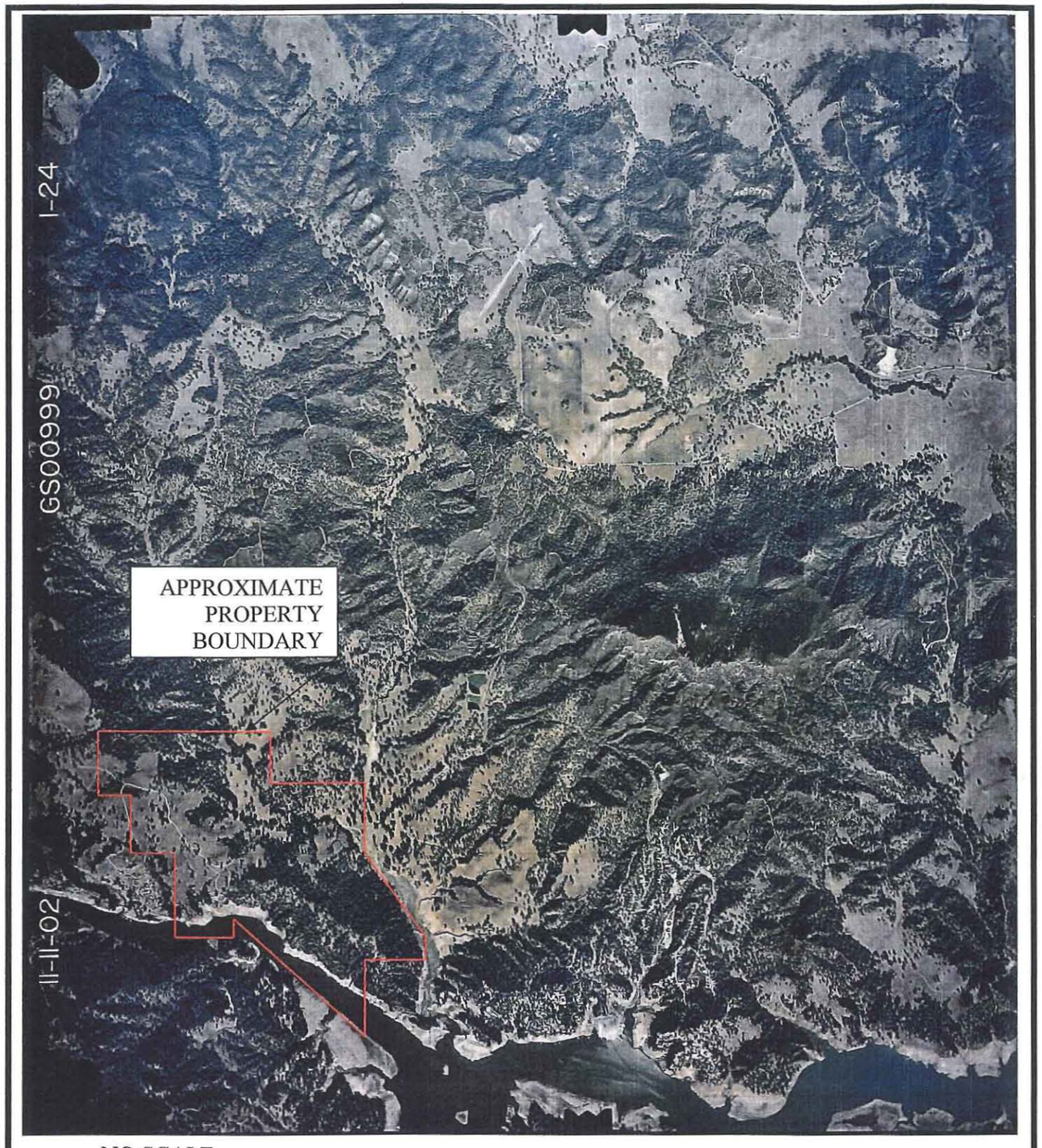
HISTORICAL SEISMCITY LIST

CANTINAS RANCH, LYNCH CANYON ROAD
LAKE NACIMIENTO AREA
SAN LUIS OBISPO COUNTY, CALIFORNIA

PLATE
6B

PROJECT NO:
SL07503-1



NO SCALE

NORTH

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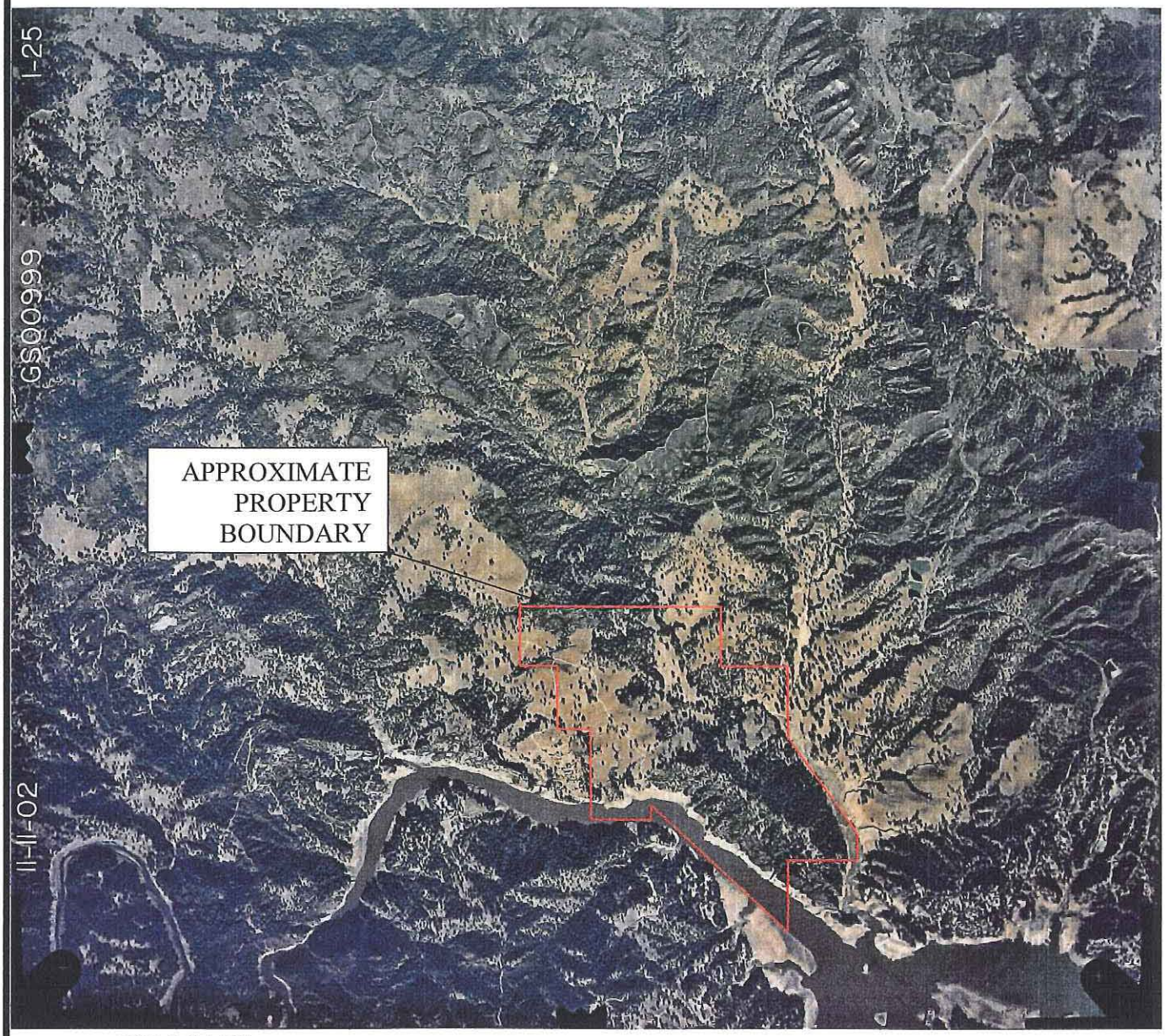
AERIAL PHOTOGRAPH
GOLDEN STATE AERIAL SURVEYS, 2002
CANTINAS RANCH, LAKE NACIMIENTO AREA,
SAN LUIS OBISPO COUNTY, CALIFORNIA

PLATE
7A

PROJECT NO:
SL07503-1



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AERIAL PHOTOGRAPH

GOLDEN STATE AERIAL SURVEYS, 2002
CANTINAS RANCH, LAKE NACIMIENTO AREA,
SAN LUIS OBISPO COUNTY, CALIFORNIA

PLATE
7B

PROJECT NO:
SL07503-1

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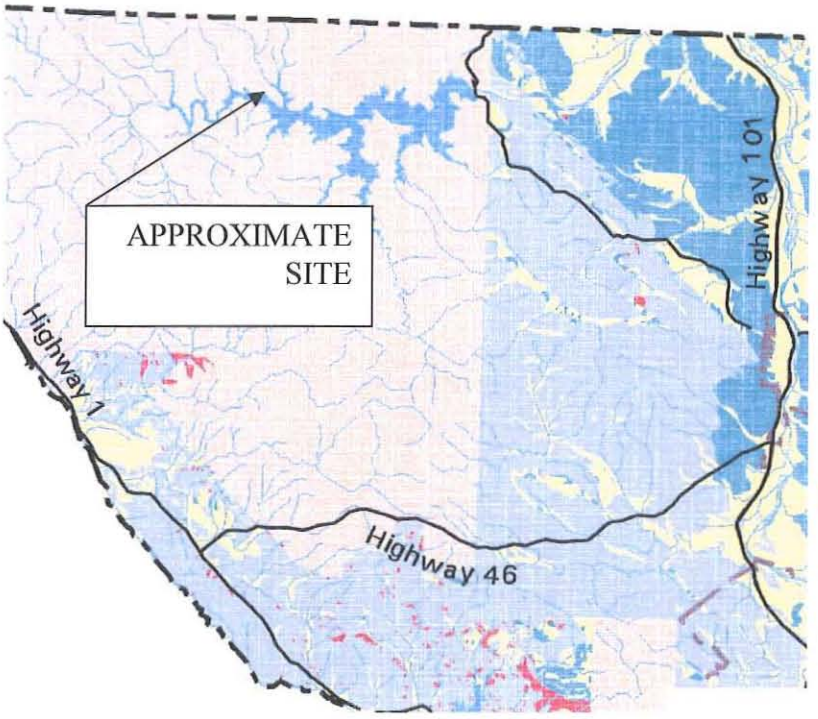
AERIAL PHOTOGRAPH

GOLDEN STATE AERIAL SURVEYS, 2002
CANTINAS RANCH, LAKE NACIMIENTO AREA,
SAN LUIS OBISPO COUNTY, CALIFORNIA

PLATE
7C

PROJECT NO:
SL07503-1



County Boundary
City Boundaries
Highways
Rivers, Lakes, and Streams

LANDSLIDE POTENTIAL

Very High
Existing Mapped Landslide
(Qls, Qlsa)

High Potential
Franciscan and Other Potentially Unstable Rocks (KJfme, KJfmv, KJt, KJfg, Tm, s, Tr, KJs, K) and/or Slope Gradient > 50%

Moderate Potential
Formations Known to Have Localized Areas of Instability (QTp, Ka, K) and/or Slope Gradient > 20%

Low Potential
Slope Gradient < 20%

No Landslide Data

SCALE: 1" = 50000'

0' 50000' 100000'

N W E S

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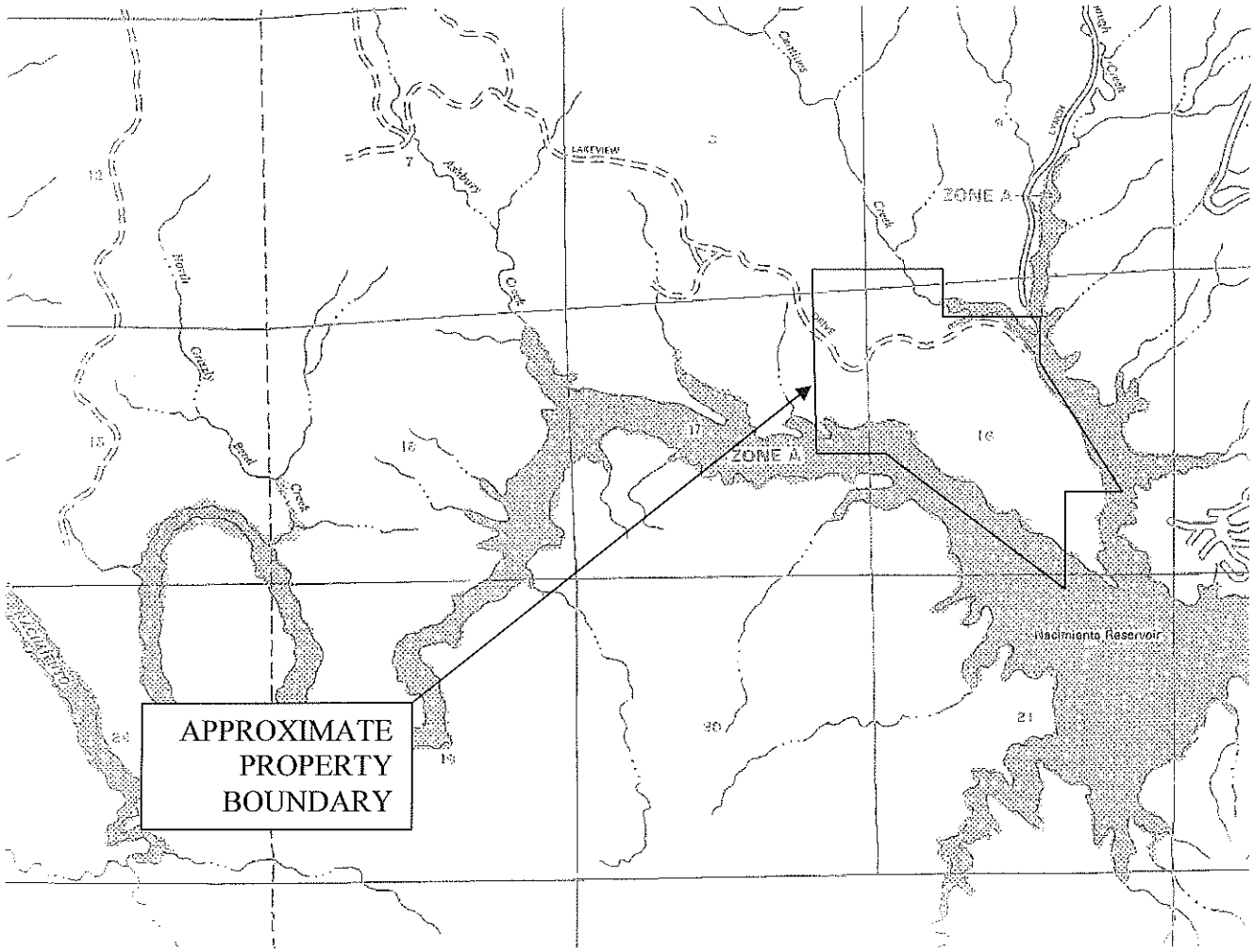
LANDSLIDE HAZARDS MAP

COUNTY OF SAN LUIS OBISPO DEPARTMENT OF BUILDING AND PLANNING, 1999
CANTINAS RANCH, LYNCH CANYON ROAD
LAKE NACIMIENTO AREA
SAN LUIS OBISPO COUNTY, CALIFORNIA

PLATE
8

PROJECT NO:
SL07503-1



NOT TO SCALE

NORTH

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FLOOD INSURANCE RATE MAP

FEDERAL EMERGENCY MANAGEMENT AGENCY, 1985
CANTINAS RANCH, LAKE NACIMIENTO AREA,
SAN LUIS OBISPO COUNTY, CALIFORNIA

PLATE
9A

PROJECT NO:
SL07503-1

KEY TO MAP

500-Year Flood Boundary	ZONE B
100-Year Flood Boundary	
Zone Designations	ZONE A1 / ZONE A5
100-Year Flood Boundary	
500-Year Flood Boundary	ZONE B
Base Flood Elevation Line With Elevation In Feet**	513
Base Flood Elevation in Feet Where Uniform Within Zone**	(EL 987)
Elevation Reference Mark	RM7×
Zone D Boundary	
River Mile	•M1.5

**Referenced to the National Geodetic Vertical Datum of 1929

EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
AO	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet, base flood elevations are shown, but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

NOTES TO USER

Certain areas not in the special flood hazard areas (zones A and V) may be protected by flood control structures.

This map is for flood insurance purposes only; it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas.

Coastal base flood elevations apply only landward of the shoreline shown on this map.

For adjoining map panels, see separately printed Index To Map Panels.

INITIAL IDENTIFICATION:
JANUARY 3, 1975

FLOOD HAZARD BOUNDARY MAP REVISIONS:
NOVEMBER 22, 1977

FLOOD INSURANCE RATE MAP EFFECTIVE:
JULY 5, 1982

FLOOD INSURANCE RATE MAP REVISIONS:
Map revised July 18, 1985 to change flood plain boundaries, zone designations, base flood elevations, corporate limits, scale, cultural features, or map format.

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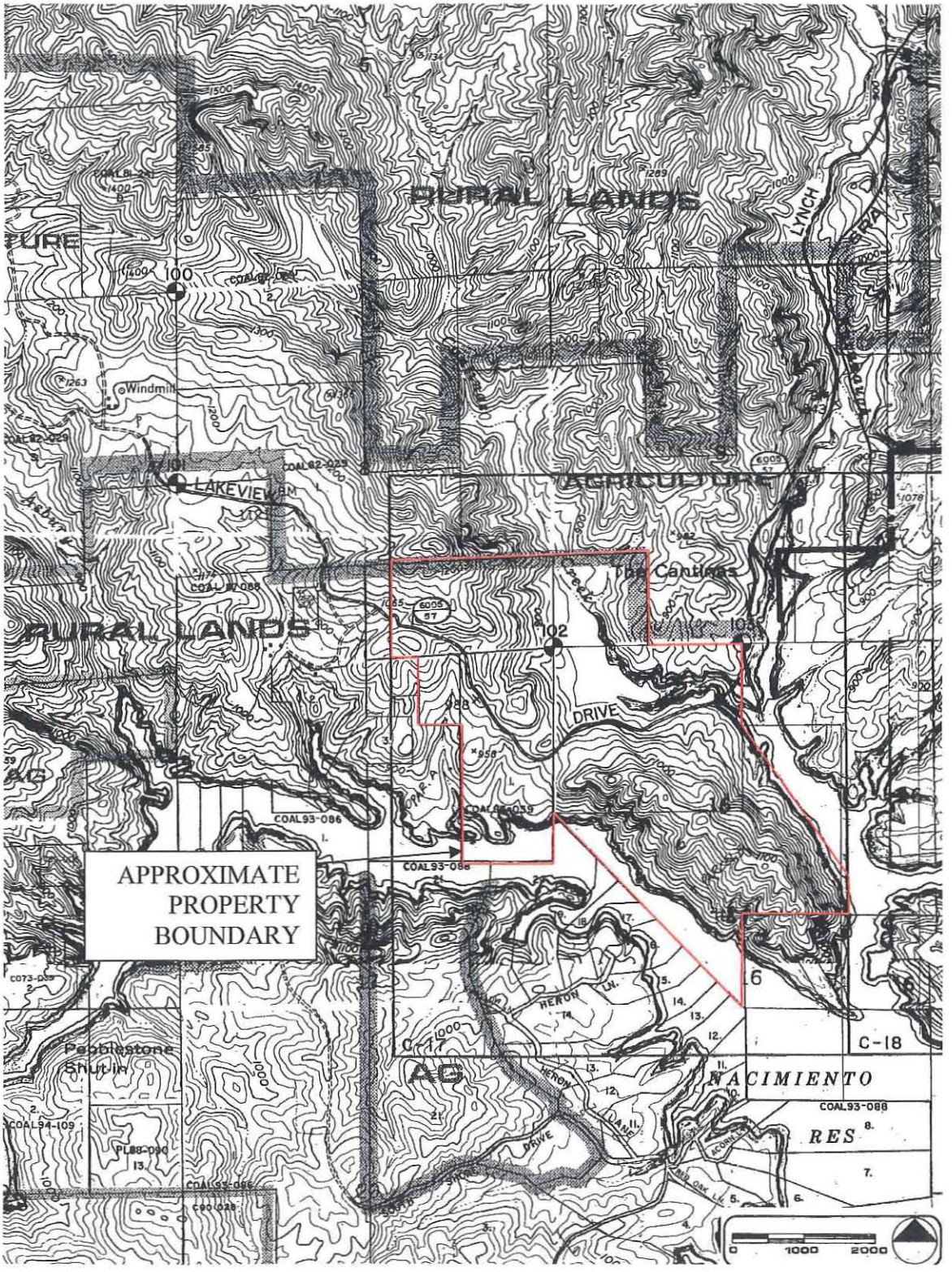
FLOOD INSURANCE EXPLANATIONS

FEDERAL EMERGENCY MANAGEMENT AGENCY, 1985
CANTINAS RANCH, LAKE NACIMIENTO AREA,
SAN LUIS OBISPO COUNTY, CALIFORNIA

PLATE
9B

PROJECT NO:
SL07503-1



San Luis Obispo County Department of Building and Planning, 2003

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GEOLOGIC STUDY AREA MAP

CANTINAS RANCH, LYNCH CANYON ROAD,
LAKE NACIMIENTO AREA,
SAN LUIS OBISPO COUNTY, CALIFORNIA

PLATE
10A

PROJECT NO:
SL07503-1

LEGEND

LAND USE CATEGORIES

- AG AGRICULTURE
- RL RURAL LANDS
- REC RECREATION
- RR RESIDENTIAL RURAL
- RS RESIDENTIAL SUBURBAN
- RSF RESIDENTIAL SINGLE FAMILY
- RMF RESIDENTIAL MULTI-FAMILY
- OP OFFICE & PROFESSIONAL
- CR COMMERCIAL RETAIL
- CS COMMERCIAL SERVICE
- IND INDUSTRIAL
- PF PUBLIC FACILITIES
- OS OPEN SPACE

BOUNDARIES

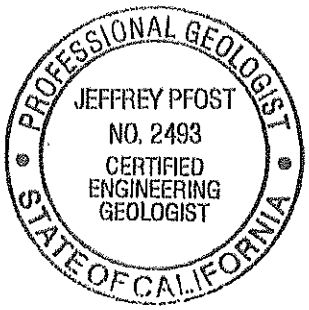
- LAND USE CATEGORY LINE
- URL - URBAN RESERVE LINE
- USL - URBAN SERVICE LINE
- VRL - VILLAGE RESERVE LINE
- CBD - CENTRAL BUSINESS DISTRICT
- COASTAL ZONE LINE
- PLANNING AREA

COMBINING DESIGNATIONS

- AR AIRPORT REVIEW AREA
- GS GEOLOGIC STUDY AREA
- FH FLOOD HAZARD
- EX ENERGY & EXTRACTIVE AREA
- H HISTORIC
- V VISITOR SERVING AREA
- LCP LOCAL COASTAL PLAN
- ARCHAEOLOGICALLY SENSITIVE AREAS
- SRA SENSITIVE RESOURCE AREA
- SRA's THAT ARE ALSO ENVIRONMENTALLY SENSITIVE HABITATS
- TH TERRESTRIAL HABITAT
- COASTAL STREAMS AND RIPARIAN VEGETATION
- WETLANDS
- * MARINE HABITAT

PROPOSED PUBLIC FACILITIES

- HS HIGH SCHOOL
- JHS JUNIOR HIGH SCHOOL
- E ELEMENTARY SCHOOL
- PARK
- POLICE OR PUBLIC SAFETY FACILITY STATION
- R PROPOSED RESERVOIR
- WT WATER TREATMENT FACILITIES
- ST SEWAGE TREATMENT FACILITIES
- SW SOLID WASTE FACILITIES
- GF GOVERNMENT FACILITY
- L LIBRARY



San Luis Obispo County Department of Building and Planning, 2003

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GEOLOGIC STUDY AREA EXPLANATIONS

CANTINAS RANCH, LYNCH CANYON ROAD,
LAKE NACIMIENTO AREA,
SAN LUIS OBISPO COUNTY, CALIFORNIA

PLATE
10B

PROJECT NO:
SL07503-1

APPENDIX A

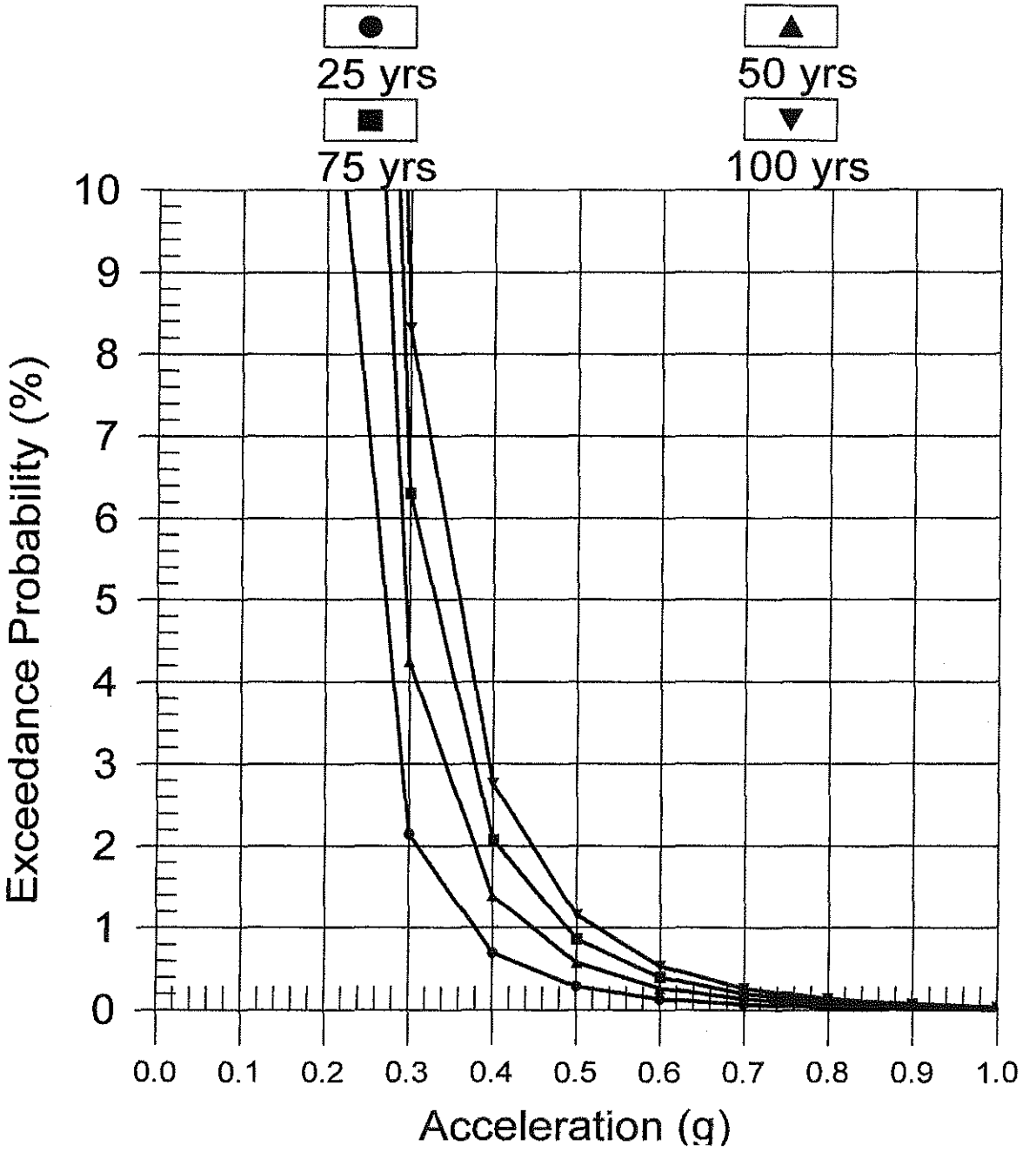
Probability of Exceedance Graph

Return Period vs. Acceleration Graph

Seismic Parameters

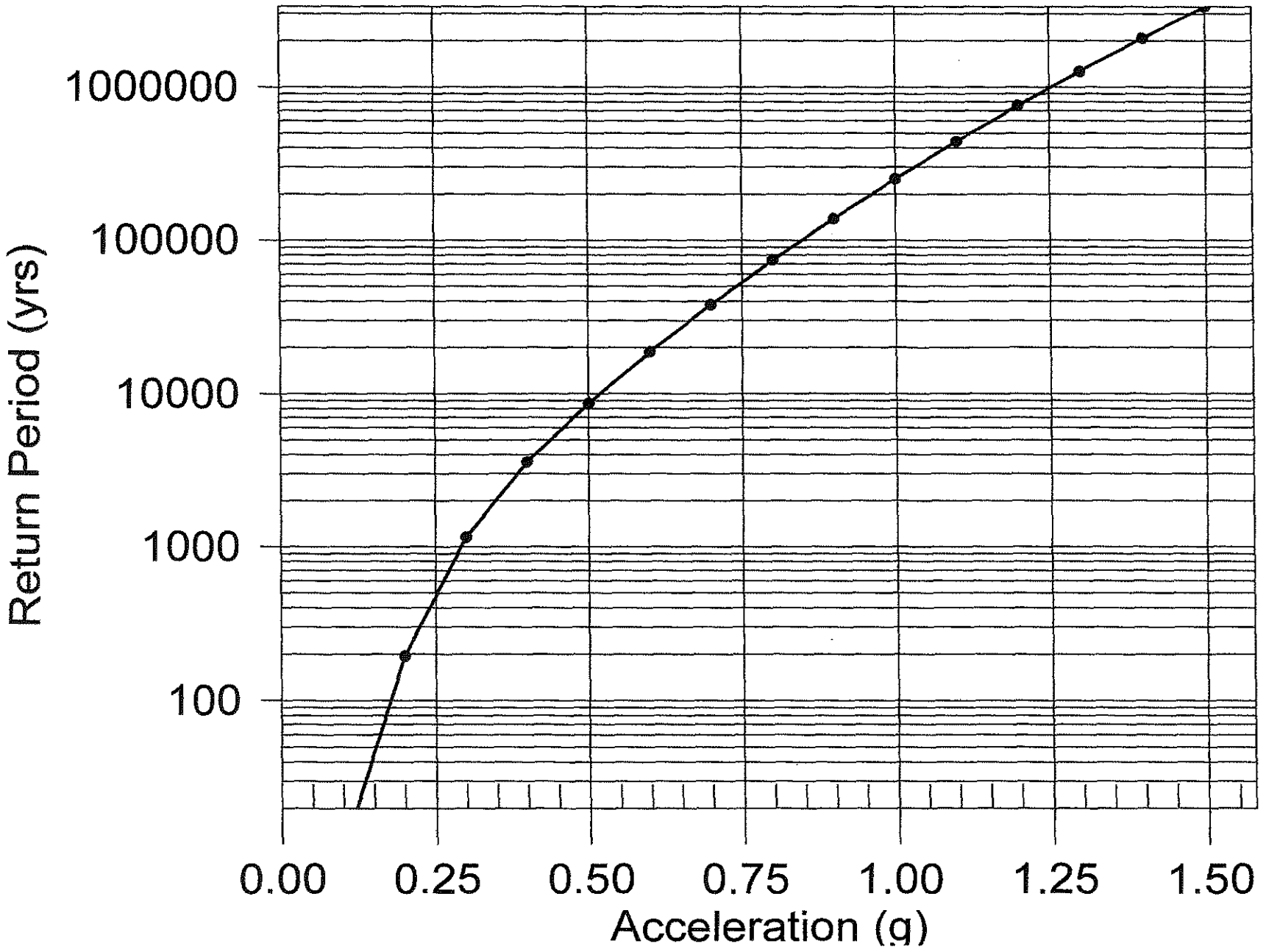
PROBABILITY OF EXCEEDANCE

BOORE ET AL(1997) NEHRP C (520)1



RETURN PERIOD vs. ACCELERATION

BOORE ET AL(1997) NEHRP C (520)1



Conterminous 48 States
2003 NEHRP Seismic Design Provisions
Latitude = 35.758254
Longitude = -121.00993
Spectral Response Accelerations Ss and S1
Ss and S1 = Mapped Spectral Acceleration Values
Site Class B - Fa = 1.0 ,Fv = 1.0
Data are based on a 0.009999999776482582 deg grid spacing

Period (sec)	Sa (g)
0.2	1.087 (Ss, Site Class B)
1.0	0.424 (S1, Site Class B)

Conterminous 48 States
2003 NEHRP Seismic Design Provisions
Latitude = 35.758254
Longitude = -121.00993
Spectral Response Accelerations SMs and SM1
SMs = Fa x Ss and SM1 = Fv x S1
Site Class C - Fa = 1.0 ,Fv = 1.376

Period (sec)	Sa (g)
0.2	1.087 (SMs, Site Class C)
1.0	0.583 (SM1, Site Class C)

Conterminous 48 States
2003 NEHRP Seismic Design Provisions
Latitude = 35.758254
Longitude = -121.00993
Design Spectral Response Accelerations SDs and SD1
SDs = 2/3 x SMs and SD1 = 2/3 x SM1
Site Class C - Fa = 1.0 ,Fv = 1.376

Period (sec)	Sa (g)
0.2	0.724 (SDs, Site Class C)
1.0	0.389 (SD1, Site Class C)

APPENDIX B

Boring Logs

Trench Logs

Percolation Boring Logs

Soil Test Pit Logs (Fall Creek Engineering, July 8, 2010)

Well Log (Miller Drilling Company, December 20, 1999)

Rock and Fracture Descriptors

GeoSolutions, Inc.

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2370 Skyway Drive, Suite 104
Santa Maria, CA 93455

BORING LOG

BORING NO. **B-1**

JOB NO. **SL07503-1**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Cantinas**	DRILL RIG:	**CME 55**
DRILLING LOCATION:	**Support Lodging**	HOLE DIAMETER:	**4 Inches**
DATE DRILLED:	**October 8, 2010**	SAMPLING METHOD:	**SPT and CA**
LOGGED BY:	**JAP**	HOLE ELEVATION:	**Not Recorded**

▼ Depth of Groundwater: **Not Encountered** Boring Terminated At: **25.0 Feet** Page 1 of 6

DEPTH	SOIL DESCRIPTION	USCS	LITHOLOGY	SAMPLE	BLOWS/ 12 IN	$(N_1)_{60}$	FRICTION ANGLE, (degrees)	COHESION, C (psf)	OPTIMUM WATER CONTENT (%)	MAXIMUM DRY DENSITY (pcf)	EXPANSION INDEX (EI)	FINES CONTENT (%)	PLASTICITY INDEX (PI)
0	SANDY SILT: dark gray, slightly moist (Qal)	ML											
-1													
-2				A SPT	12								
-3													
-4				CA	41								
-5													
-6													
-7													
-8	SILTY SAND: light brown, slightly moist (Qal)	SM											
-9				SPT	21								
-10				B									
-11													
-12													
-13													
-14				SPT	24								
-15													
-16													
-17													
-18													
-19				SPT	33								
-20													
-21													
-22													
-23													
-24				SPT	41								
-25													
-26													
-27													
-28													
-29													
-30													

GeoSolutions, Inc.

220 High Street, San Luis Obispo, CA 93401
2370 Skyway Drive, Suite 104
Santa Maria, CA 93455

BORING LOG

BORING NO. **B-2**

JOB NO. **SL07503-1**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Cantinas**	DRILL RIG:	**CME 55**
DRILLING LOCATION:	**Support Lodging**	HOLE DIAMETER:	**4 Inches**
DATE DRILLED:	**October 8, 2010**	SAMPLING METHOD:	**SPT and CA**
LOGGED BY:	**JAP**	HOLE ELEVATION:	**Not Recorded**

▼ Depth of Groundwater: **Not Encountered** Boring Terminated At: **25.0 Feet**

DEPTH	SOIL DESCRIPTION	USCS	LITHOLOGY	SAMPLE	BLOWS/ 12 IN	$(N_1)_{60}$	FRICTION ANGLE, (degrees)	COHESION, C (psf)	OPTIMUM WATER CONTENT (%)	MAXIMUM DRY DENSITY (pcf)	EXPANSION INDEX (EI)	FINES CONTENT (%)	PLASTICITY INDEX (PI)
0	SANDY SILT: dark brown, slightly moist (Qal)	ML											
-2				SPT	14								
-4				SPT	18								
-9				CA	40								
-14				SPT	31								
-15	SAND: light brown, with gravel, dry to slightly moist (Qal)	SM											
-25													

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BORING LOG

BORING NO. **B-3**

JOB NO. **SL07503-1**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Cantinas**	DRILL RIG:	**CME 55**
DRILLING LOCATION:	**Mission**	HOLE DIAMETER:	**4 Inches**
DATE DRILLED:	**October 8, 2010**	SAMPLING METHOD:	**SPT and CA**
LOGGED BY:	**JAP**	HOLE ELEVATION:	**Not Recorded**

▼ Depth of Groundwater: **Not Encountered** Boring Terminated At: **15.0 Feet**

DEPTH	SOIL DESCRIPTION	USCS	LITHOLOGY	SAMPLE	BLOWS/ 12 IN	$(N_1)_{60}$	FRICTION ANGLE, (degrees)	COHESION, C (psf)	OPTIMUM WATER CONTENT (%)	MAXIMUM DRY DENSITY (pcf)	EXPANSION INDEX (EI)	FINES CONTENT (%)	PLASTICITY INDEX (PI)
0	SILTY SAND: light brown, with gravel (Qc)	SM											
-1													
-2				C SPT	22								
-3													
-4				SPT	55								
-5													
-6	SILTY SAND: tan to white, silty sand to fine grained sandstone, dry, massive, slightly fractured, severly weathered in upper 3 feet to fresh, moderately soft to moderately hard (Tvq)	SM											
-7													
-8													
-9				CA	24								
-10													
-11													
-12													
-13													
-14				SPT	50/5"								
-15													
-16													
-17													
-18													
-19													
-20													
-21													
-22													
-23													
-24													
-25													
-26													
-27													
-28													
-29													
-30													

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BORING LOG

BORING NO. **B-4**

JOB NO. **SL07503-1**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Cantinas**	DRILL RIG:	**CME 55**
DRILLING LOCATION:	**Support Lodge**	HOLE DIAMETER:	**4 Inches**
DATE DRILLED:	**October 11, 2010**	SAMPLING METHOD:	**SPT**
LOGGED BY:	**JAP**	HOLE ELEVATION:	**Not Recorded**

▼ Depth of Groundwater: **Not Encountered** Boring Terminated At: **10.0 Feet**

DEPTH	SOIL DESCRIPTION	USCS	LITHOLOGY	SAMPLE	BLOWS/ 12 IN	$(N_1)_{60}$	FRICTION ANGLE, (degrees)	COHESION, C (psf)	OPTIMUM WATER CONTENT (%)	MAXIMUM DRY DENSITY (pcf)	EXPANSION INDEX (EI)	FINES CONTENT (%)	PLASTICITY INDEX (PI)
0	SILTY SAND: light brown, with gravel (Qc)	SC											
-1													
-2				SPT	12								
-3													
-4				SPT	18								
-5	SILTY SAND: tan to white, silty sand to fine grained sandstone, dry, massive, slightly fractured, severly weathered in upper 3 feet to fresh, moderately soft to moderately hard (Tvq)	SM											
-6													
-7													
-8													
-9				SPT	50/6"								
-10													
-11													
-12													
-13													
-14													
-15													
-16													
-17													
-18													
-19													
-20													
-21													
-22													
-23													
-24													
-25													
-26													
-27													
-28													
-29													
-30													

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BORING LOG

BORING NO. **B-5**

JOB NO. **SL07503-1**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Cantinas**	DRILL RIG:	**CME 55**
DRILLING LOCATION:	**Support Lodging**	HOLE DIAMETER:	**4 Inches**
DATE DRILLED:	**October 11, 2010**	SAMPLING METHOD:	**SPT**
LOGGED BY:	**JAP**	HOLE ELEVATION:	**Not Recorded**

▼ Depth of Groundwater: **Not Encountered** Boring Terminated At: **20.0 Feet**

DEPTH	SOIL DESCRIPTION	USCS	LITHOLOGY	SAMPLE	BLOWS/ 12 IN	$(N_1)_{60}$	FRICTION ANGLE, (degrees)	COHESION, C (psf)	OPTIMUM WATER CONTENT (%)	MAXIMUM DRY DENSITY (pcf)	EXPANSION INDEX (EI)	FINES CONTENT (%)	PLASTICITY INDEX (PI)
0	SANDY CLAY: dark brown, slightly moist, some gravel (Qc)	SC											
-1													
-2				SPT	18								
-3													
-4				SPT	21								
-5													
-6													
-7													
-8													
-9				SPT	31								
-10													
-11													
-12													
-13	SILTY SAND: tan to white, fine grained sandstone, moderately soft, massive, fresh, slightly fractured (Tvq)	SM											
-14				SPT	38								
-15													
-16													
-17													
-18													
-19				SPT	29								
-20													
-21													
-22													
-23													
-24													
-25													
-26													
-27													
-28													
-29													
-30													

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BORING LOG

BORING NO. **B-6**

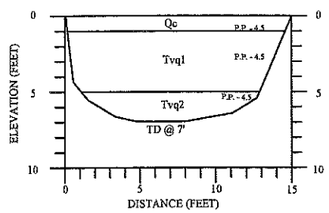
JOB NO. **SL07503-1**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Cantinas**	DRILL RIG:	**CME 55**
DRILLING LOCATION:	**Stables**	HOLE DIAMETER:	**4 Inches**
DATE DRILLED:	**October 11, 2010**	SAMPLING METHOD:	**SPT**
LOGGED BY:	**JAP**	HOLE ELEVATION:	**Not Recorded**

▼ Depth of Groundwater: **Not Encountered** Boring Terminated At: **5.0 Feet**

DEPTH	SOIL DESCRIPTION	USCS	LITHOLOGY	SAMPLE	BLOWS/ 12 IN	$(N_1)_{60}$	FRICTION ANGLE, (degrees)	COHESION, C (psf)	OPTIMUM WATER CONTENT (%)	MAXIMUM DRY DENSITY (pcf)	EXPANSION INDEX (EI)	FINES CONTENT (%)	PLASTICITY INDEX (PI)
0	SANDY CLAY: light gray, dry	SC											
-1				F									
-2	SILTY SAND: white, fine grained sandstone, moderately soft, massive, fresh, slightly fractured (Tvq)	SM		SPT	34								
-3													
-4				SPT	50/5"								
-5													
-6													
-7													
-8													
-9													
-10													
-11													
-12													
-13													
-14													
-15													
-16													
-17													
-18													
-19													
-20													
-21													
-22													
-23													
-24													
-25													
-26													
-27													
-28													
-29													
-30													

T-1

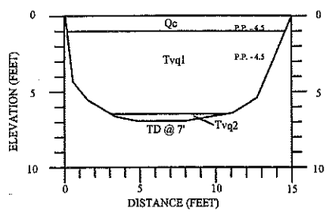


COLLUVIUM (Qc)
Sandy SILT, light gray, dry

VAQUEROS SANDSTONE (Tvq1)
Medium-Grained Sandstone to Claystone, light reddish brown to light gray, slightly moist, severely weathered, moderately soft, massive

VAQUEROS SANDSTONE (Tvq2)
Coarse-Grained Sandstone to Claystone, tan to white, S.S.- massive, moderate hard, fresh, Claystone - slight to moderately weathered, moderately soft, moderately fractured

T-2

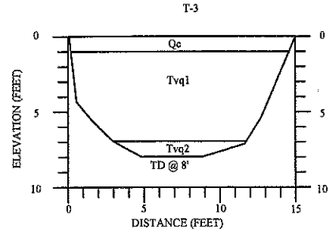


COLLUVIUM (Qc)
Sandy SILT, light gray, dry

VAQUEROS SANDSTONE (Tvq1)
Medium-Grained Sandstone to Claystone, yellowish brown, slightly moist, severely weathered, moderately soft, massive

VAQUEROS SANDSTONE (Tvq2)
Coarse-Grained Sandstone to Claystone, tan to white, S.S.- massive, moderate hard, fresh, Claystone - slight to moderately weathered, moderately soft, moderately fractured

T-3



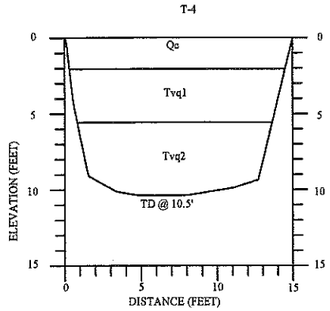
COLLUVIUM (Qc)
Sandy SILT, light gray, dry

VAQUEROS SANDSTONE (Tvq1)
Medium-Grained Sandstone to Claystone, yellowish brown, slightly moist, severely weathered, moderately soft, massive

VAQUEROS SANDSTONE (Tvq2)
Medium-Grained Sandstone, yellowish brown, massive, moderate hard, moderately weathered

P.P. = Pocket Pen

T-4

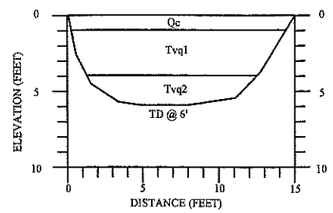


COLLUVIUM (Qc)
Sandy SILT, light gray, dry

VAQUEROS SANDSTONE (Tvq1)
Sandy CLAY, dark brown, dense, slightly moist, mottled

VAQUEROS SANDSTONE (Tvq2)
Medium-Grained Sandstone, tan to light gray, massive, moderately to severely weathered, moderately soft, roots throughout, some caliche

T-5

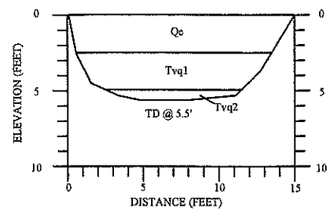


COLLUVIUM (Qc)
Sandy SILT, light gray, dry

VAQUEROS SANDSTONE (Tvq1)
Sandy CLAY, dark brown, dense, slightly moist, mottled

VAQUEROS SANDSTONE (Tvq2)
Siltstone, gray, massive, friable, fresh to slightly weathered, moderately hard

T-6

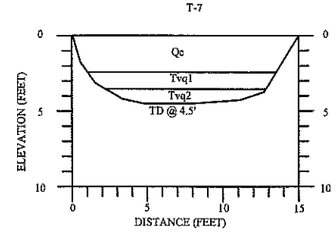


COLLUVIUM (Qc)
Sandy SILT, light brown, dry

VAQUEROS SANDSTONE (Tvq1)
Sandy CLAY, dark brown, dense, slightly moist, mottled

VAQUEROS SANDSTONE (Tvq2)
Sandstone, white to light gray, massive, slightly to moderately weathered, moderately soft

T-7

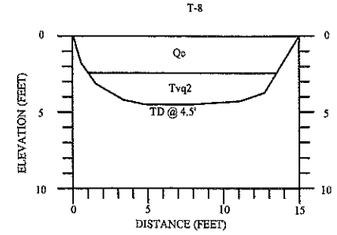


COLLUVIUM (Qc)
Sandy SILT, light gray, dry

VAQUEROS SANDSTONE (Tvq1)
Sandy CLAY, dark brown, dense, slightly moist, mottled

VAQUEROS SANDSTONE (Tvq2)
Siltstone, gray, massive, friable, fresh to slightly weathered, moderately hard

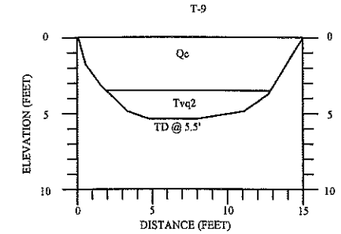
T-8



COLLUVIUM (Qc)
Sandy CLAY, light brown, dry to slightly moist

VAQUEROS SANDSTONE (Tvq2)
Medium- to Coarse-Grained Sandstone, white, massive, fresh to slightly weathered, moderately soft

T-9



COLLUVIUM (Qc)
Sandy CLAY, light grayish brown, dry to slightly moist, large expansion cracks

VAQUEROS SANDSTONE (Tvq2)
Claystone, dark grayish brown to reddish brown, friable, fresh to slightly weathered, moderately soft, caliche

LOGS
1

PROJECT
SL07503-1

TRENCH LOGS

CANTINAS RANCH, LYNCH CANYON ROAD,
LAKE NACIMIENTO AREA, SAN LUIS OBISPO COUNTY, CALIFORNIA

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PERCOLATION LOG

TRENCH NO. 1A
JOB NO. SL07503-2

PROJECT INFORMATION	EXCAVATION INFORMATION
PROJECT: **Cantinas**	EXCAVATION METHOD: **Backhoe**
TRENCHING LOCATION: **See Figure 2, Site Plan**	BUCKET SIZE: **24 Inches**
DATE EXCAVATED: **December 9, 2010**	SAMPLING METHOD: **None**
LOGGED BY: **JAP**	HOLE ELEVATION: **Not Recorded**

Depth of Groundwater: **Not Encountered** ExcavationTerminated At: **5.0 Feet**

DEPTH	SOIL DESCRIPTION	USCS	LITHOLOGY	ANNULAR MATERIAL DESCRIPTION	WELL CASING MATERIAL DESCRIPTION	WELL CROSS-SECTION
0	SILTY SAND: dark brown, slightly moist	SM		POORLY GRADED NO. 2/12 SAND	PVC SCREEN	
-4	SILTY SAND: light brown, slightly moist	SM				

0, -1, -2, -3, -4, -5, -6, -7, -8, -9, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -20

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PERCOLATION LOG

TRENCH NO. **1B**

JOB NO. **SL07503-2**

PROJECT INFORMATION	EXCAVATION INFORMATION
PROJECT: **Cantinas**	EXCAVATION METHOD: **Backhoe**
TRENCHING LOCATION: **See Figure 2, Site Plan**	BUCKET SIZE: **24 Inches**
DATE EXCAVATED: **December 9, 2010**	SAMPLING METHOD: **None**
LOGGED BY: **JAP**	HOLE ELEVATION: **Not Recorded**

Depth of Groundwater: **Not Encountered** ExcavationTerminated At: **10.0 Feet**

DEPTH	SOIL DESCRIPTION	USCS	LITHOLOGY	ANNULAR MATERIAL DESCRIPTION	WELL CASING MATERIAL DESCRIPTION	WELL CROSS-SECTION
0	SILTY SAND: dark brown, slightly moist	SM		POORLY GRADED NO. 2/12 SAND	PVC SCREEN	
-5	SILTY SAND: light brown, slightly moist	SM				

0, -1, -2, -3, -4, -5, -6, -7, -8, -9, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -20

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PERCOLATION LOG

TRENCH NO. **1C**

JOB NO. **SL07503-2**

PROJECT INFORMATION	EXCAVATION INFORMATION
PROJECT: **Cantinas**	EXCAVATION METHOD: **Backhoe**
TRENCHING LOCATION: **See Figure 2, Site Plan**	BUCKET SIZE: **24 Inches**
DATE EXCAVATED: **December 9, 2010**	SAMPLING METHOD: **None**
LOGGED BY: **JAP**	HOLE ELEVATION: **Not Recorded**

Depth of Groundwater: **Not Encountered** ExcavationTerminated At: **15.0 Feet**

DEPTH	SOIL DESCRIPTION	USCS	LITHOLOGY	ANNULAR MATERIAL DESCRIPTION	WELL CASING MATERIAL DESCRIPTION	WELL CROSS-SECTION
0	SILTY SAND: dark brown, slightly moist	SM		POORLY GRADED NO. 2/12 SAND	PVC SCREEN	
-4	SILTY SAND: light brown, slightly moist	SM				
-15						
-20						

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PERCOLATION LOG

TRENCH NO. **2A**
JOB NO. **SL07503-2**

PROJECT INFORMATION	EXCAVATION INFORMATION
PROJECT: **Cantinas**	EXCAVATION METHOD: **Backhoe**
TRENCHING LOCATION: **See Figure 2, Site Plan**	BUCKET SIZE: **24 Inches**
DATE EXCAVATED: **December 9, 2010**	SAMPLING METHOD: **None**
LOGGED BY: **JAP**	HOLE ELEVATION: **Not Recorded**

Depth of Groundwater: **Not Encountered** ExcavationTerminated At: **5.0 Feet**

DEPTH	SOIL DESCRIPTION	USCS	LITHOLOGY	ANNULAR MATERIAL DESCRIPTION	WELL CASING MATERIAL DESCRIPTION	WELL CROSS-SECTION
0	SILTY SAND: light brown, slightly moist	SM		POORLY GRADED NO. 2/12 SAND	PVC SCREEN	
-1						
-2						
-3						
-4						
-5						
-6						
-7						
-8						
-9						
-10						
-11						
-12						
-13						
-14						
-15						
-16						
-17						
-18						
-19						
-20						

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PERCOLATION LOG

TRENCH NO. **2B**

JOB NO. **SL07503-2**

PROJECT INFORMATION	EXCAVATION INFORMATION
PROJECT: **Cantinas**	EXCAVATION METHOD: **Backhoe**
TRENCHING LOCATION: **See Figure 2, Site Plan**	BUCKET SIZE: **24 Inches**
DATE EXCAVATED: **December 9, 2010**	SAMPLING METHOD: **None**
LOGGED BY: **JAP**	HOLE ELEVATION: **Not Recorded**

Depth of Groundwater: **Not Encountered** ExcavationTerminated At: **10.0 Feet**

DEPTH	SOIL DESCRIPTION	USCS	LITHOLOGY	ANNULAR MATERIAL DESCRIPTION	WELL CASING MATERIAL DESCRIPTION	WELL CROSS-SECTION
0	SILTY SAND: dark brown, slightly moist	SM		POORLY GRADED NO. 2/12 SAND	PVC SCREEN	
-1						
-2						
-3	SILTY SAND: light brown, slightly moist	SM				
-4						
-5						
-6						
-7						
-8						
-9						
-10						
-11						
-12						
-13						
-14						
-15						
-16						
-17						
-18						
-19						
-20						

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PERCOLATION LOG

TRENCH NO. 2C
JOB NO. SL07503-2

PROJECT INFORMATION	EXCAVATION INFORMATION
PROJECT: **Cantinas**	EXCAVATION METHOD: **Backhoe**
TRENCHING LOCATION: **See Figure 2, Site Plan**	BUCKET SIZE: **24 Inches**
DATE EXCAVATED: **December 9, 2010**	SAMPLING METHOD: **None**
LOGGED BY: **JAP**	HOLE ELEVATION: **Not Recorded**

Depth of Groundwater: **Not Encountered** ExcavationTerminated At: **15.0 Feet**

DEPTH	SOIL DESCRIPTION	USCS	LITHOLOGY	ANNULAR MATERIAL DESCRIPTION	WELL CASING MATERIAL DESCRIPTION	WELL CROSS-SECTION
0	SILTY SAND: dark brown, slightly moist	SM		POORLY GRADED NO. 2/12 SAND	PVC SCREEN	
-3	SILTY SAND: light brown, slightly moist	SM				
-15						

0, -1, -2, -3, -4, -5, -6, -7, -8, -9, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -20

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PERCOLATION LOG

TRENCH NO. 3A
JOB NO. SL07503-2

PROJECT INFORMATION	EXCAVATION INFORMATION
PROJECT: **Cantinas**	EXCAVATION METHOD: **Backhoe**
TRENCHING LOCATION: **See Figure 2, Site Plan**	BUCKET SIZE: **24 Inches**
DATE EXCAVATED: **December 9, 2010**	SAMPLING METHOD: **None**
LOGGED BY: **JAP**	HOLE ELEVATION: **Not Recorded**

Depth of Groundwater: **Not Encountered** ExcavationTerminated At: **5.0 Feet**

DEPTH	SOIL DESCRIPTION	USCS	LITHOLOGY	ANNULAR MATERIAL DESCRIPTION	WELL CASING MATERIAL DESCRIPTION	WELL CROSS-SECTION
0	SILTY SAND: light brown, slightly moist	SM		POORLY GRADED NO. 2/12 SAND	PVC SCREEN	
-1						
-2						
-3						
-4						
-5						
-6						
-7						
-8						
-9						
-10						
-11						
-12						
-13						
-14						
-15						
-16						
-17						
-18						
-19						
-20						

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PERCOLATION LOG

TRENCH NO. **3B**
JOB NO. **SL07503-2**

PROJECT INFORMATION	EXCAVATION INFORMATION
PROJECT: **Cantinas**	EXCAVATION METHOD: **Backhoe**
TRENCHING LOCATION: **See Figure 2, Site Plan**	BUCKET SIZE: **24 Inches**
DATE EXCAVATED: **December 9, 2010**	SAMPLING METHOD: **None**
LOGGED BY: **JAP**	HOLE ELEVATION: **Not Recorded**

Depth of Groundwater: **Not Encountered** ExcavationTerminated At: **10.0 Feet**

DEPTH	SOIL DESCRIPTION	USCS	LITHOLOGY	ANNULAR MATERIAL DESCRIPTION	WELL CASING MATERIAL DESCRIPTION	WELL CROSS-SECTION
0	SILTY SAND: light brown, slightly moist	SM		POORLY GRADED NO. 2/12 SAND	PVC SCREEN	
-1						
-2						
-3						
-4						
-5						
-6						
-7						
-8						
-9						
-10						
-11						
-12						
-13						
-14						
-15						
-16						
-17						
-18						
-19						
-20						

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PERCOLATION LOG

TRENCH NO. 3C

JOB NO. SL07503-2

PROJECT INFORMATION	EXCAVATION INFORMATION
PROJECT: **Cantinas**	EXCAVATION METHOD: **Backhoe**
TRENCHING LOCATION: **See Figure 2, Site Plan**	BUCKET SIZE: **24 Inches**
DATE EXCAVATED: **December 9, 2010**	SAMPLING METHOD: **None**
LOGGED BY: **JAP**	HOLE ELEVATION: **Not Recorded**

Depth of Groundwater: **Not Encountered** ExcavationTerminated At: **15.0 Feet**

DEPTH	SOIL DESCRIPTION	USCS	LITHOLOGY	ANNULAR MATERIAL DESCRIPTION	WELL CASING MATERIAL DESCRIPTION	WELL CROSS-SECTION
0	SILTY SAND: light brown, slightly moist	SM		POORLY GRADED NO. 2/12 SAND	PVC SCREEN	
-1						
-2						
-3						
-4						
-5						
-6						
-7						
-8						
-9						
-10						
-11						
-12						
-13						
-14						
-15						
-16						
-17						
-18						
-19						
-20						

GeoSolutions, Inc.

220 High Street

San Luis Obispo, CA 93401

PERCOLATION LOG

BORING NO. **P-1**

JOB NO. **SL07503-2**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Cantinas - Lake Shack**	DRILL RIG:	**CME 55**
DRILLING LOCATION:	**See Figure 2: Site Plan**	HOLE DIAMETER	**8 Inches**
DATE DRILLED:	**November 16, 2010**	SAMPLING METHOD	**None**
LOGGED BY:	**JAP**	HOLE ELEVATION:	**Not Recorded**

Depth of Groundwater: **Not Encountered** Boring Terminated At: **5.0 Feet**

DEPTH	SOIL DESCRIPTION	USCS	LITHOLOGY	ANNULAR MATERIAL DESCRIPTION	WELL CASING MATERIAL DESCRIPTION	WELL CROSS-SECTION
0	SILTY SAND: light brown, with gravel, dry	SM		POORLY GRADED NO. 2/12 SAND	PVC SCREEN	
-3	SILTY SAND: light yellowish brown, dry	SM				
-5						
-6						
-7						
-8						
-9						
-10						
-11						
-12						
-13						
-14						
-15						
-16						
-17						
-18						
-19						
-20						

GeoSolutions, Inc.

220 High Street

San Luis Obispo, CA 93401

PERCOLATION LOG

BORING NO. **P-2**

JOB NO. **SL07503-2**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Cantinas - Lake Shack**	DRILL RIG:	**CME 55**
DRILLING LOCATION:	**See Figure 2: Site Plan**	HOLE DIAMETER	**8 Inches**
DATE DRILLED:	**November 16, 2010**	SAMPLING METHOD	**None**
LOGGED BY:	**JAP**	HOLE ELEVATION:	**Not Recorded**

Depth of Groundwater: **Not Encountered** Boring Terminated At: **5.0 Feet**

DEPTH	SOIL DESCRIPTION	USCS	LITHOLOGY	ANNULAR MATERIAL DESCRIPTION	WELL CASING MATERIAL DESCRIPTION	WELL CROSS-SECTION
0	SILTY SAND: light brown, with gravel, dry	SM		POORLY GRADED NO. 2/12 SAND	PVC SCREEN	
-3	SILTY SAND: light yellowish brown, dry	SM				

0, -1, -2, -3, -4, -5, -6, -7, -8, -9, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -20

GeoSolutions, Inc.

220 High Street
San Luis Obispo, CA 93401

PERCOLATION LOG

BORING NO. P-3

JOB NO. SL07503-2

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Cantinas - Lake Shack**	DRILL RIG:	**CME 55**
DRILLING LOCATION:	**See Figure 2: Site Plan**	HOLE DIAMETER	**8 Inches**
DATE DRILLED:	**November 16, 2010**	SAMPLING METHOD	**None**
LOGGED BY:	**JAP**	HOLE ELEVATION:	**Not Recorded**

Depth of Groundwater: **Not Encountered** Boring Terminated At: **5.0 Feet**

DEPTH	SOIL DESCRIPTION	USCS	LITHOLOGY	ANNULAR MATERIAL DESCRIPTION	WELL CASING MATERIAL DESCRIPTION	WELL CROSS-SECTION
0	SILTY SAND: light brown, with gravel, dry	SM		POORLY GRADED NO. 2/12 SAND	PVC SCREEN	
-1						
-2						
-3						
-4	SILTY SAND: light yellowish brown, with gravel, dry	SM				
-5						
-6						
-7						
-8						
-9						
-10						
-11						
-12						
-13						
-14						
-15						
-16						
-17						
-18						
-19						
-20						

GeoSolutions, Inc.

220 High Street
San Luis Obispo, CA 93401

PERCOLATION LOG

BORING NO. **P-4**

JOB NO. **SL07503-2**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Cantinas - Lake Shack**	DRILL RIG:	**CME 55**
DRILLING LOCATION:	**See Figure 2: Site Plan**	HOLE DIAMETER	**8 Inches**
DATE DRILLED:	**November 16, 2010**	SAMPLING METHOD	**None**
LOGGED BY:	**JAP**	HOLE ELEVATION:	**Not Recorded**

Depth of Groundwater: **Not Encountered** Boring Terminated At: **5.0 Feet**

DEPTH	SOIL DESCRIPTION	USCS	LITHOLOGY	ANNULAR MATERIAL DESCRIPTION	WELL CASING MATERIAL DESCRIPTION	WELL CROSS-SECTION
0	SILTY SAND: dark brown, dry to slightly moist	SM		POORLY GRADED NO. 2/12 SAND	PVC SCREEN	
-3	SILTY SAND: light yellowish brown, dry	SM				
-5						
-6						
-7						
-8						
-9						
-10						
-11						
-12						
-13						
-14						
-15						
-16						
-17						
-18						
-19						
-20						

GeoSolutions, Inc.

220 High Street
San Luis Obispo, CA 93401

PERCOLATION LOG

BORING NO. P-5
JOB NO. SL07503-2

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Cantinas - Lake Shack**	DRILL RIG:	**CME 55**
DRILLING LOCATION:	**See Figure 2: Site Plan**	HOLE DIAMETER	**8 Inches**
DATE DRILLED:	**November 16, 2010**	SAMPLING METHOD	**None**
LOGGED BY:	**JAP**	HOLE ELEVATION:	**Not Recorded**

Depth of Groundwater: **Not Encountered** Boring Terminated At: **15.0 Feet**

DEPTH	SOIL DESCRIPTION	USCS	LITHOLOGY	ANNULAR MATERIAL DESCRIPTION	WELL CASING MATERIAL DESCRIPTION	WELL CROSS-SECTION
0	SILTY SAND: dark brown, with gravel, slightly moist	SM				
-4	SILTY SAND: light yellowish brown, dry	SM				
-10	SILTY SAND: white, dry	SM				
-15						
-20						

GeoSolutions, Inc.

220 High Street

San Luis Obispo, CA 93401

PERCOLATION LOG

BORING NO. P-6

JOB NO. SL07503-2

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Cantinas - Ranch Manager**	DRILL RIG:	**CME 55**
DRILLING LOCATION:	**See Figure 2: Site Plan**	HOLE DIAMETER	**8 Inches**
DATE DRILLED:	**November 16, 2010**	SAMPLING METHOD	**None**
LOGGED BY:	**JAP**	HOLE ELEVATION:	**Not Recorded**

Depth of Groundwater: **Not Encountered** Boring Terminated At: **5.0 Feet**

DEPTH	SOIL DESCRIPTION	USCS	LITHOLOGY	ANNULAR MATERIAL DESCRIPTION	WELL CASING MATERIAL DESCRIPTION	WELL CROSS-SECTION
0	SILTY SAND: light brown, with gravel, dry	SM		POORLY GRADED NO. 2/12 SAND	PVC SCREEN	
-3	SILTY SAND: light yellowish brown, dry	SM				
-5						
-6						
-7						
-8						
-9						
-10						
-11						
-12						
-13						
-14						
-15						
-16						
-17						
-18						
-19						
-20						

GeoSolutions, Inc.

220 High Street
San Luis Obispo, CA 93401

PERCOLATION LOG

BORING NO. **P-7**

JOB NO. **SL07503-2**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Cantinas - Ranch Manager**	DRILL RIG:	**CME 55**
DRILLING LOCATION:	**See Figure 2: Site Plan**	HOLE DIAMETER	**8 Inches**
DATE DRILLED:	**November 16, 2010**	SAMPLING METHOD	**None**
LOGGED BY:	**JAP**	HOLE ELEVATION:	**Not Recorded**

Depth of Groundwater: **Not Encountered** Boring Terminated At: **5.0 Feet**

DEPTH	SOIL DESCRIPTION	USCS	LITHOLOGY	ANNULAR MATERIAL DESCRIPTION	WELL CASING MATERIAL DESCRIPTION	WELL CROSS-SECTION
0	SILTY SAND: light brown, with gravel, dry	SM		POORLY GRADED NO. 2/12 SAND	PVC SCREEN	
-1						
-2						
-3						
-4						
-5						
-6						
-7						
-8						
-9						
-10						
-11						
-12						
-13						
-14						
-15						
-16						
-17						
-18						
-19						
-20						

GeoSolutions, Inc.

220 High Street
San Luis Obispo, CA 93401

PERCOLATION LOG

BORING NO. **P-8**

JOB NO. **SL07503-2**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Cantinas - Ranch Manager**	DRILL RIG:	**CME 55**
DRILLING LOCATION:	**See Figure 2: Site Plan**	HOLE DIAMETER	**8 Inches**
DATE DRILLED:	**November 16, 2010**	SAMPLING METHOD	**None**
LOGGED BY:	**JAP**	HOLE ELEVATION:	**Not Recorded**

Depth of Groundwater: **Not Encountered** Boring Terminated At: **5.0 Feet**

DEPTH	SOIL DESCRIPTION	USCS	LITHOLOGY	ANNULAR MATERIAL DESCRIPTION	WELL CASING MATERIAL DESCRIPTION	WELL CROSS-SECTION
0	SILTY SAND: light brown, dry	SM		POORLY GRADED NO. 2/12 SAND	PVC SCREEN	
-4	SILTY SAND: light yellowish brown, dry	SM				

0, -1, -2, -3, -4, -5, -6, -7, -8, -9, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -20

GeoSolutions, Inc.

220 High Street
San Luis Obispo, CA 93401

PERCOLATION LOG

BORING NO. **P-9**

JOB NO. **SL07503-2**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Cantinas - Ranch Manager**	DRILL RIG:	**CME 55**
DRILLING LOCATION:	**See Figure 2: Site Plan**	HOLE DIAMETER	**8 Inches**
DATE DRILLED:	**November 16, 2010**	SAMPLING METHOD	**None**
LOGGED BY:	**JAP**	HOLE ELEVATION:	**Not Recorded**

Depth of Groundwater: **Not Encountered** Boring Terminated At: **5.0 Feet**

DEPTH	SOIL DESCRIPTION	USCS	LITHOLOGY	ANNULAR MATERIAL DESCRIPTION	WELL CASING MATERIAL DESCRIPTION	WELL CROSS-SECTION
0	SILTY SAND: light brown, dry	SM		POORLY GRADED NO. 2/12 SAND	PVC SCREEN	
-1						
-2						
-3						
-4						
-5						
-6						
-7						
-8						
-9						
-10						
-11						
-12						
-13						
-14						
-15						
-16						
-17						
-18						
-19						
-20						

GeoSolutions, Inc.

220 High Street
San Luis Obispo, CA 93401

PERCOLATION LOG

BORING NO. **P-10**

JOB NO. **SL07503-2**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Cantinas - Ranch Manager**	DRILL RIG:	**CME 55**
DRILLING LOCATION:	**See Figure 2: Site Plan**	HOLE DIAMETER	**8 Inches**
DATE DRILLED:	**November 16, 2010**	SAMPLING METHOD	**None**
LOGGED BY:	**JAP**	HOLE ELEVATION:	**Not Recorded**

Depth of Groundwater: **Not Encountered** Boring Terminated At: **15.0 Feet**

DEPTH	SOIL DESCRIPTION	USCS	LITHOLOGY	ANNULAR MATERIAL DESCRIPTION	WELL CASING MATERIAL DESCRIPTION	WELL CROSS-SECTION
0	SILTY SAND: light brown, dry	SM				
-6	SILTY SAND: light yellowish brown, dry	SM				
-9	SILTY SAND: brown, moist	SM				
-15						
-20						

Soil Test Pit Logs

Cantinas Ranch
Lake Naciemento, San Luis Obispo, CA
Prepared by: Paul Myer, FCE

Notes: **Excavation occurred on July 8, 2010**
Pits excavated with a backhoe

Test Pit #1 **Location:** Upper Main Meadow (West Side)
Notes: Ripped Surface - 1 month prior / 18 inches ripped

Depth (ft)	Depth (in)	Soil Characteristics
0' to 2'	0" to 24"	dark clayey silt, some mottling, damp
2' to 11'	24" to 132"	light brn silty clay, low permeability, mottling in some block, very sticky and stiff
11' to 14'	132" to 168"	red sandy clay, damp
14' End	168"	No free water

Test Pit #2 **Location:** Mid North Meadow (Between two Oaks on West Side)

Depth (ft)	Depth (in)	Soil Characteristics
0' to 1.17'	0" to 14"	top soil, dark brn silty clay
1.17' to 9'	24" to 108"	tan silty clay, damp
9' to 14'	108" to 168"	light clayey sand, more permeable
14' End	168"	No free water

Test Pit #3 **Location:** Mid North Meadow (East Side, close to road)
Notes: Over 200' to Top of Bank

Depth (ft)	Depth (in)	Soil Characteristics
0' to 2.5'	0" to 30"	Drk sandy, clayey silt bank, damp
2.5' to 9'	30" to 108"	Lt golden sitly sand
9' to 13'	108" to 156"	Lt golden sitly sand
13' to 15'	156" to 180"	Lt golden fine sand with little clay
15' End	180"	No free water

Test Pit #4 **Location:** Mid South Meadow (East Side)
Notes: 200' to Top of Bank

Depth (ft)	Depth (in)	Soil Characteristics
0' to 2.5'	0" to 30"	Lt tan sandy silt, little clay
2.5' to 12'	30" to 144"	Lt golden sitly-sand, sandy-silt
12' to 14'	108" to 156"	Grey clean sand, damp
14' End	180"	Clean Sand, No free water

Test Pit #5 **Location:** Mid Meadow (South Central)
Notes: 200' to Top of Bank

Depth (ft)	Depth (in)	Soil Characteristics
0' to 2'	0" to 24"	Lt tan sandy silt with Mottling
2' to 8'	24" to 96"	Drk brn stiff silty clay
8' to 12'	96" to 144"	Lt tan sandy clay, some Mottling
12' to 15'	144" to 180"	Lt tan sandy, silty clay? (note "better" pointing to "silty")
15' End	180"	No free water

Test Pit #6	Location: Mid Meadow (SouthWest)	
Depth (ft)	**Depth (in)**	**Soil Characteristics**
0' to 2.5'	0" to 30"	Lt grey sandy silt, Roots
2.5' to 9'	30" to 108"	Lt golden sandy clay, damp
9' to 13'	108" to 156"	Drk stiff silty clay, Good Adobe
13' End	180"	Very stiff clay, No free water, Good Liner Material for Pond?

Test Pit #7	Location: Mid Meadow (SouthWest #2 at flank of hill)	
Depth (ft)	**Depth (in)**	**Soil Characteristics**
0' to 1.5'	0" to 18"	Lt tan sandy silt
1.5' to 10.5'	18" to 126"	Drk, stiff sandy, clay silt, Platy, some mottling
10.5' to 13'	126" to 156"	Weathered Sandstone
13' End	180"	No Water - Refusal

Test Pit #8	Location: South Meadow (West side under power lines)	
Depth (ft)	**Depth (in)**	**Soil Characteristics**
0' to 2'	0" to 24"	Drk brn sandy, clayey silt
2' to 6.5'	24" to 78"	Lt redish, tan sandy clay, damp, stiff
6.5' to 14'	78" to 168"	Lt golden sand-fine, bit of clay, silt
14' to 16'	168" to 192"	Lt grey sand, clean medium
16' End	180"	No Water

Test Pit #9	Location: South Meadow (East)	
Depth (ft)	**Depth (in)**	**Soil Characteristics**
0' to 1.5'	0" to 18"	Reddish blond fine sand and silt
1.5' to 13'	18" to 156"	Reddish blond sand with bit of silt, good material
13' End	180"	No Water - looks good

Test Pit #10	Location: Lake/Pool Area (South side High)	
Depth (ft)	**Depth (in)**	**Soil Characteristics**
0' to 2.67'	0" to 32"	Drk brn, stiff, hard clay
2.67' to 4'	32" to 48"	Sandstone
4' End	48"	No Water

Test Pit #11	Location: Lakeside (closest to existing house)	
Depth (ft)	**Depth (in)**	**Soil Characteristics**
0' to 2.5'	0" to 30"	Drk brn clay
2.5' to 7'	30" to 84"	Decomposed sandstone and consolidated sandstone
7' End	84"	Water

Test Pit #12	Location: Lake side (South towards staff housing)	
Depth (ft)	**Depth (in)**	**Soil Characteristics**
0' to 2'	0" to 24"	Drk brown clay
2' to 4'	24" to 48"	Red clay, very hard to dig, stiff
4' to 9.5'	78" to 114"	Reddish blond sandy clay, stiff
9.5' to 12'	114" to 144"	Decomposed sandstone
12' End	144"	Weather sandstone, still diggable, no water

STATE OF CALIFORNIA

WELL CONSTRUCTION REPORT

State Form 188

Page 1 of 1

Owner's Well No. 2

Date Work Began 11-30-99 Ended 12-1-99

Local Permit Agency San Luis Obispo County Health Dept

Permit No. 99-439 Permit Date 12-99

No. 529070

DWR USE ONLY — DO NOT FILL

STATE WELL NO./STATION NO.

LATITUDE LONGITUDE

APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DEPTH TO FIRST WATER 85' (Ft.) BELOW SURFACE

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION (Describe material, grain size, color, etc.)
0	3	Sandy loam
3	25	Soft brown sandstone
25	37	Blue sandstone
37	85	Blue shale
85	90	Blue sandstone tight
90	97	Blue & brown sandstone tight
97	110	Blue sandstone semi frac.
110	115	Blue & brown sandstone
115	142	Dark brown sandstone & shale semi fractured.

NOTE:
ANY PERSON REMOVING THE CAP FROM THIS WELL OTHER THAN MILLER DRILLING CO OR AUTHORIZED CONTRACTOR APPROVED BY US WILL VOID ALL STRUCTURAL WARRANTIES.

TOTAL DEPTH OF BORING 142 (Feet)

TOTAL DEPTH OF COMPLETED WELL 141 (Feet)

WELL OWNER

Name Newlin Hastings

Mailing Address 6880 Adelaida Road

City Paso Robles, Calif. 93446 State Zip

WELL LOCATION

Address Lynch Cyn Rd

City Paso Robles

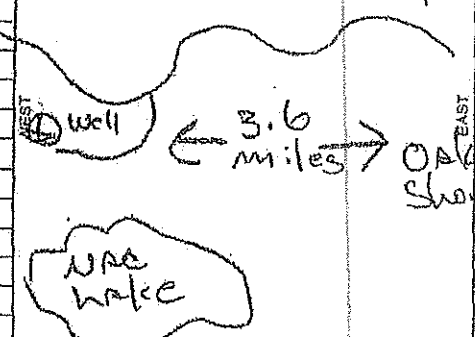
County San Luis Obispo

APN Book 080 Page 063 Parcel 030

Township 25S Range 9E Section 17

Latitude ___ DEG. ___ MIN. ___ SEC. NORTH Longitude ___ DEG. ___ MIN. ___ SEC. WEST

LOCATION SKETCH



Illustrate or Describe Distance of Well from Landmarks such as Roads, Buildings, Fences, Rivers, etc. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

X NEW WELL

MODIFICATION/REPAIR

___ Deepen

___ Other (Specify)

___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USE(S) (✓)

___ MONITORING

WATER SUPPLY

X Domestic

___ Public

___ Irrigation

___ Industrial

___ "TEST WELL"

___ CATHODIC PROTECTION

___ OTHER (Specify)

DRILLING METHOD Rotary FLUID Air

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH OF STATIC WATER LEVEL 42 (Ft.) & DATE MEASURED 12-1-99

ESTIMATED YIELD 20@140 (GPM) & TEST TYPE Blow test

TEST LENGTH ___ (Hrs.) TOTAL DRAWDOWN ___ (Ft.)

* May not be representative of a well's long-term yield.

CASING(S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL/GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	81	9 7/8	X				F480 PVC	5	.265	
81	141	9 7/8		X			F480 PVC	5	.265	.060

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE: CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	50	X			
50	141				Eye

ATTACHMENTS (✓)

___ Geologic Log

___ Well Construction Diagram

___ Geophysical Log(s)

___ Soil/Water Chemical Analyses

___ Other

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME Miller Drilling Company (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

ADDRESS 301 North Main Street CITY Templeton STATE Ca ZIP 93465

Signed [signature] Date 12-20-99 324634 RC

COMPLETE PUBLIC RECORD
WATER CODE 13752

Miller Drilling Co.
329 N. Main St.
Templeton, CA 93465
(805) 434-1888

Miller Drilling Co.

Contractors License No. 324634

PUMP TEST REPORT

Job# 17423

WELL OWNER: CAMP NACIMIENTO
BILLING ADDRESS: 2550 SKYLAR LANE
BRADLEY, CALIF 93426

Pump Set: 130' Well #: 5"PVC
Pump Size: 1 1/2 HP Well Depth: 141'
Testing Method: EXISTING PUMP
Perf Rec: 81-141
APN: COAL 87-088
LOCATION: LYNCH CANYON - WELL #2
PARCEL #3

Standing Level Before Test: 82.23

TESTING

TIME	PUMPING LEVEL	WATER CONDITION	WATER/BOWLS	GPM
START	0	CLEAR		
2	100.75	CLEAR		20
4	108.57	CLEAR		
6	110.79	CLEAR		
8	109.32	CLEAR		15
10	108.9	"		15
15	108.92	"		15
20	109.31	"		15
25	109.9	"		15
30	110.62	"		15
40	111.88	REDUCE VOLUME 13.5		15
50	108.95	CLEAR		13.5
60	109.32	"		13.5
80	110.81	REDUCE VOLUME 12.0		13.5
100	106.37	CLEAR		12
120	106.78	"		12
150	105.99	"		10.5
180	104.08	"		10.5
210	104.87	REDUCE VOLUME 9.0		10.5
240	99.18			9
270	99.2			9
		RECOVERY		
1 93.88	2 91.19	3 89.61	4 88.82	
5 88.25	6 88.00	7 87.59	8 87.42	
9 87.21	10 87.02	20 85.88		

STANDING LEVEL AFTER TEST:

FINAL TEST RESULTS: Produced: 9 GPM for 4 1/2 hours on: 1/5/2010

Miller Drilling Co.
329 N. Main St.
Templeton, CA 93465
(805) 434-1888

Miller Drilling Co.

Contractors License No. 324634

PUMP TEST REPORT

Job# 17423

WELL OWNER: CAMP NACIMIENTO
BILLING ADDRESS: 2550 SKYLAR LANE
BRADLEY, CALIF 93426

Pump Set: 80' Well #: 6" STEEL
Pump Size: 1/2 HP Well Depth: 101'
Testing Method: EXISTING PUMP
Perf Rec: NA
APN: CO06-0188 (060-061-023)
LOCATION: LYNCH CANYON - WELL #1
PARCEL #8

Standing Level Before Test: 44.00

TESTING

TIME	PUMPING LEVEL	WATER CONDITION	WATER/BOWLS	GPM
START				
2	51.19	CLEAR/NO ODOR		12.5
4	56.6	"		12
6	59.8	RUSTY/NO ODOR		11.5
8	62.2	"		11.5
10	64.45	"		11.3
15	66.21	"		11
20	66.51	"		11
25	66.68	"		11
30	66.59	"		11
40	66.65	"		11
50	66.72	"		11
60	66.56	"		11
80	66.35	"		11
100	66.73	CLEAR/NO ODOR		11
120	67.17	"		11
150	67.4	"		11
180	67.86	"		11
210	68.11	"		11
240	68.38	"		11
2	60	RECOVERY		
4	55			
6	52.16			
8	51			
10	50.45			
12	50.24			

STANDING LEVEL AFTER TEST:

FINAL TEST RESULTS: Produced: 11 GPM for 4 hours on: 1/5/2010

ROCK DESCRIPTORS

Weathering

W1	Fresh	Body of rock is not oxidized or discolored; fracture surfaces are not oxidized or discolored*; no separation of grain boundaries; no change of texture and no solutioning. Hammer rings when crystalline rocks are struck
W2	Slightly weathered to fresh**	
W3	Slightly weathered	Discoloration or oxidation is limited to surface of, or short distance from fractures; some feldspar crystals are dull; fracture surfaces have minor to complete discoloration or oxidation; no visible separation of grain boundaries; texture preserved and minor leaching of soluble minerals may be present. Hammer rings when crystalline rocks are struck, body of rock is not weakened by weathering.
W4	Moderately to slightly weathered**	
W5	Moderately weathered	Discoloration or oxidation extends from fractures, usually throughout body of rock; ferromagnesian minerals are "rusty," feldspar crystals are "cloudy"; all fracture surfaces are discolored or oxidized; partial opening of grain boundaries visible; texture generally preserved but soluble minerals may be mostly leached. Hammer does not ring when rock is struck, body of rock is slightly weakened.
W6	Intensely to moderately weathered**	
W7	Intensely weathered	Body of rock is discolored or oxidized throughout; all feldspars and ferromagnesian minerals are altered to clay to some extent. All surfaces are discolored or oxidized, surfaces friable; partial separation of grain boundaries; rock is friable; in situ disaggregation of granitics common in semi-arid regions; texture altered and leaching of soluble minerals may be complete. Rock has dull sound when struck with hammer; rock is weakened, usually can be broken with moderate to heavy manual pressure, or by light hammer blow without reference to planes or weakness.
W8	Very intensely weathered**	
W9	Decomposed	Body of rock is discolored or oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and ferromagnesian minerals are completely altered to clay; complete separation of grain boundaries (disaggregated), partial or complete remnant rock structure may be preserved, but resembles a soil.
*	Characteristics of fracture surfaces do not include directional weathering along shears or faults and their associated fracture zones; for example a shear that carries weathering to great depths in a fresh rock mass would not require the whole rock mass to be classified as weathered.	
**	Combination descriptors are used where equal distribution of both weathering characteristics are present over significant intervals or where characteristics noted are "in between" the diagnostic characteristics.	

Durability Index

D10	Rock specimen or exposure remains intact with no deleterious cracking after exposure longer than 1 year.
D11	Rock specimen or exposure develops hairline cracking on surfaces within 1 month, but no disaggregation within 1 year of exposure.
D12	Rock specimen or exposure develops hairline cracking on surfaces within 1 week, and/or disaggregation within 1 month of exposure.
D13	Specimen or exposure may develop hairline cracks in 1 day and displays pronounced separation of bedding and/or disaggregation within 1 week of exposure
D14	Specimen or exposure displays pronounced cracking and disaggregation within 1 day (24 hours) of exposure. Generally ravels and degrades to small fragments.

Bedding Foliation or Flow Texture

Massive	Greater than 10 ft (>3m)
Very thickly (bedded, foliated, or banded)	3 to 10 ft (1 to 3 m)
Thickly	1 to 3 ft (300 mm to 1 m)
Moderately	0.3 to 1 ft (100 to 300mm)
Thinly	0.1 to 0.3 ft (30 to 100mm)
Very thinly	0.03 [3/8 in] to 0.1 ft (10 to 30 mm)
Laminated (Intensely foliated or banded)	Less than 0.03 ft [3/8 in] (<10 mm)

Bedrock Hardness / Strength

H1	Extremely Hard	Core, fragment or exposure cannot be scratched with knife or sharp pick; can only be chipped with repeated heavy hammer blows
H2	Very Hard	Cannot be scratched with knife or sharp pick. Core or fragment breaks with repeated heavy hammer blows.
H3	Hard	Can be scratched with knife or pick with difficulty (heavy pressure). Heavy hammer blow required to break specimen.
H4	Moderately Hard	Can be scratched with knife or sharp pick with light or moderate pressure. Core or fragment breaks with moderate hammer blow.
H5	Moderately Soft	Can be grooved 1/16 in (2 mm) deep by knife or sharp pick with (moderate or heavy) pressure. Core or fragment breaks with light hammer blow or heavy manual pressure.
H6	Soft	Can be grooved or gouged easily by knife or sharp pick with light pressure, can be scratched with fingernail. Breaks with light to moderate manual pressure.
H7	Very Soft	Can be readily indented, grooved, or gouged with fingernail, or carved with a knife. Breaks with light manual pressure.

Note: Bedrock Units softer than H7, Very Soft, are described using USCS (soils) consistency descriptions.

GRAIN-SIZE SCALE (MM)

GRAVEL	BOULDER	>256
	COBBLE	64-256
	PEBBLE	4-64
	GRANULE	2-4
SAND	VERY COARSE SAND	1-2
	COARSE SAND	1/4-1
	MEDIUM SAND	1/4 - 1/2
	FINE SAND	1/8 -1/4
	VERY FINE SAND	1/16 – 1/8
MUD	COARSE SILT	1/32 1/16
	MEDIUM SILT	1/64 – 1/32
	FINE SILT	1/128 – 1/64
	VERY FINE SILT	1/256 –1/128
	CLAY	<1/256

Source: Wentworth, 1924

Contact

-Sharp

-Gradual

-Slickensides

U.S. Department of the Interior, 1998, *Engineering Geology Field Manual,* Bureau of Reclamation.

CONSISTENCY

CLAYS AND PLASTIC SILTS	STRENTH TON/SQ FT	BLOWS FOOT +
Very Soft	0-1/4	0-2
Soft	1/4-1/2	2-4
Firm	1/2-1	4-8
Stiff	1-2	8-16
Very Stiff	2-4	16-32
Hard	Over 4	Over 32

RELATIVE DENSITY

SANDS, GRAVELS AND NON-PLASTIC SILTS	BLOWS FOOT+
Very Loose	0-4
Loose	4-10
Medium Dense	10-30
Dense	30-50
Very Dense	Over 50

Format for the Description of Fractures

- Orientation
- Spacing
- Continuity
- Openness
- Fillings
  - Thickness
  - Composition
- Weathering/alteration
- Hardness
- Healing
- Surfaces
  - Roughness
  - Waviness
  - Weathering/alteration
  - Hardness
- Field index test results
- Moisture

Table 5-2. – Fracture spacing descriptors

Alpha-numeric descriptor	Joint or fracture spacing descriptor	True Spacing
SP1	Extremely widely spaced	Greater than 10 feet (ft) (<3m)
SP2	Very widely spaced	3 to 10 ft (1 to 3 m)
SP3	Widely spaced	1 to 3 ft (300 mm to 1 m)
SP4	Moderately spaced	0.3 to 1 ft (100 to 300 mm)
SP5	Closely spaced	0.1 to 0.3 ft (30 to 100 mm)
SP6	Very closely spaced	Less than 0.1 ft (<30 mm)

Table 5-3. – Fracture continuity descriptors

Alpha-numeric descriptor	Descriptor	Lengths
C1	Discontinuous	Less than 3 ft (>1 m)
C2	Slightly continuous	3 to 10 ft (1 to 3 m)
C3	Moderately continuous	10 to 30 ft (3 to 10 m)
C4	Highly continuous	30 to 100 ft (10 to 30 m)
C5	Very Continuous	Greater than 110 ft (>30 m)

Table 5-4. – Descriptors for recording fracture ends in joint surveys

Alpha-numeric descriptor	Criteria
E0	Zero ends leave the exposure (both ends of the fracture can be seen in the exposure).
E1	One end can be seen (one end of the fracture terminates in the exposure).
E2	Both ends cannot be observed (two fracture ends do not terminate in the exposure).

Table 5-5. – Fracture openness descriptors

Alpha-numeric descriptor	Descriptor	Openness
00	Tight	No visible separation
01	Slightly open	Less than 0.003 ft [1/32 inch (in)] (<1mm)
02	Moderately open	0.003 to 0.01 ft [1/32 in to 1/8 in] (1 to 3 mm)
03	Open	0.01 to 0.03 ft [1/8 to 3/8 in] (3 to 10 mm)
04	Moderately wide	0.03 ft [3/8 in] to 0.1 ft (10 to 30 mm)
05	Wide	Greater than 0.1 ft (>30 mm) (record actual openness)

Table 5-6. – Fracture filling thickness descriptors

Alpha-numeric descriptor	Descriptor	Thickness
T0	Clean	No film coating
T1	Very thin	Less than 0.003 ft [1/32 inch (in)] (<1mm)
T2	Moderately thin	0.003 to 0.01 ft [1/32 in to 1/8 in] (1 to 3 mm)
T3	Thin	0.01 to 0.03 ft [1/8 to 3/8 in] (3 to 10 mm)
T4	Moderately thick	0.03 ft [3/8 in] to 0.1 ft (10 to 30 mm)
T5	Thick	Greater than 0.1 ft (>30 mm) (record actual openness)

Table 5-7. – Fracture healing descriptors

Alpha-numeric descriptor	Descriptor	Criteria
HL0	Totally healed	Fracture is completely healed or recemented to a degree at least as hard as surrounding rock.
HL2	Moderately	Greater than 50 percent of fracture material, fracture surfaces, or healed filling is healed or recemented; and/or strength of healing agent is less hard than surrounding rock.
HL3	Partly healed	Less than 50 percent of fractured material, filling, or fracture surface is healed or recemented.
HL5	Not healed	Fracture surface, fracture zone, or filling is not healed or recemented; rock fragments or filling (if present) is held in place by its own angularity and/or cohesiveness.

Table 5-8. – Fracture roughness descriptors

Alpha-numeric descriptor	Descriptor	Criteria
R1	Stepped	Near-normal steps and ridges occur on the fracture surface.
R2	Rough	Large, angular asperities can be seen.
R3	Moderately rough	Asperities are clearly visible and fracture surface feels abrasive.
R4	Slightly rough	Small asperities on the fracture surface area are visible and can be felt.
R5	Smooth	No asperities, smooth to the touch.
R6	Polished	Extremely smooth and shiny.

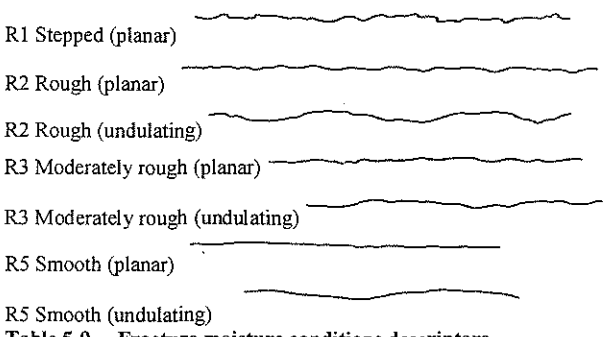


Table 5-9. – Fracture moisture conditions descriptors

Alpha-numeric descriptor	Criteria
M1	The fracture is dry, tight, or filling (where present) is of sufficient density or composition to impede water flow. Water flow along the fracture does not appear possible.
M2	The fracture is dry with no evidence of previous water flow. Water flow appears possible.
M3	The fracture is dry but shows evidence of water flow such as staining, leaching, and vegetation.
M4	The fracture filling (where present) is damp, but no free water is present.
M5	The fracture shows seepage and is wet with occasional drops of water.
M6	The fracture emits a continuous flow (estimate flow rate) under low pressure. Filling materials (where present) may show signs of leaching or piping.
M7	The fracture emits a continuous flow (estimate water flow) under moderate to high pressure. Water is squirting, and/or filling material (where present) may be substantially washed out.

U.S. Department of the Interior, 1998, *Engineering Geology Field Manual*, Bureau of Reclamation.