# GEOLOGIC HAZARDS
# AND BLUFF RETREAT STUDY
# RAGGED POINT INN AND RESORT EXPANSION
# 19019 STATE HIGHWAY 1
# SAN LUIS OBISPO COUNTY, CALIFORNIA

October 2, 2014

Prepared for

Mr. James Ramey

Prepared by

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October 1, 2014

FILE NO.: SL-17052-GB

Mr. James Ramey
Ragged Point Inn
P.O. Box 110
San Simeon, California 93452

PROJECT: RAGGED POINT INN AND RESORT EXPANSION
19019 STATE HIGHWAY 1
SAN LUIS OBISPO COUNTY, CALIFORNIA

SUBJECT: Geologic Hazards and Bluff Retreat Study

REF.: Proposal to Provide a Geologic Hazards and Bluff Retreat Study, 19019 Highway 1, Ragged Point, San Luis Obispo County, California, by Earth Systems Pacific, dated June 25, 2014, Doc. No. 1406-199.PRP

Dear Mr. Ramey:

In accordance with your authorization of the referenced proposal, this study has been prepared to evaluate the current geologic bluff conditions, and determine the rate at which the bluff has eroded based on historical aerial photographs prior to the placement of the existing seawall. This study includes the results of our site reconnaissance, research, sea wave run-up and bluff retreat analysis. Three bound copies of this report and one electronic e-mail copy are provided for your use.

We appreciate the opportunity to have provided services for your project. If you have any questions regarding this report, or need additional services, please do not hesitate to contact the undersigned.

Sincerely,

Earth Systems Pacific

PROFESSIONAL GEOLOGIST
RICHARD T. GORMAN
No. CEG 1325
CERTIFIED
ENGINEERING
GEOLOGIST
STATE OF CALIFORNIA

Richard T. Gorman, CEG
Associate Geologist

Doc. No.: 1409-111.GEO/nf

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## 1.0 INTRODUCTION

### Proposed Development and Site Setting

The Ragged Point Inn is located at 19019 State Highway 1, San Luis Obispo County, California (see the Vicinity Map in Appendix A). We understand that the proposed project will consist of the remodeling of the existing inn and construction of several new additions. Several phases are planned. The first phase will involve demolition of existing structures and the remodel/conversion of existing building space for new uses. The second phase will involve the construction of a new employee housing complex, an Operations and Maintenance (O&M) building, a remodel/addition to an existing residence/garage, and a remodel/addition to the hotel reception building/resort business office. During a third phase, a new 20 to 24 unit resort complex will be built, along with a hospitality services building and terrace, a day spa and gymnasium, a convenience store, a fast food preparation/service building, public restrooms, an expanded patio and garden, and additional parking areas for automobiles and motorcycles. The fourth phase will consist of the remodel and renovation of two existing one-story motel buildings. A Site Plan showing the various project phases can be found in Appendix A.

The site is located on the top of an approximately 300-foot high bluff that descends to the Pacific Ocean. The ocean bluff consists of a broad west-trending ridge that is bounded to the east by State Highway 1. The top of the ridge is essentially flat; the Ragged Point Inn and Resort sits on this flat ridge top

### Purpose and Scope of Work

The purpose of this study was to evaluate the on-site geologic structure and geomorphology that would influence bluff erosion and bluff stability. This study encompassed the following work:

- Review of geologic maps, topographic maps and reports pertinent to the area
- Field mapping of features observable at the ground surface on the site and in the bluff face
- Subsurface investigation
- Laboratory testing
- Slope stability analysis
- Bluff erosion/retreat analysis
- Preparation of this report

For our study we were provided with a topographic survey map of the property, prepared by Dakos Land Surveys Inc., dated September 2014. This map was used for the bluff erosion/retreat analysis, bluff stability analysis, as well as the Boring Location/Engineering Geologic Site Map.

The site has been designated by the County of San Luis Obispo as a Geologic Study Area (GSA). For GSA sites, an engineering geology report is required to fulfill the requirements of the San Luis Obispo County Planning and Building Department, San Luis Obispo County Land Use Ordinance (LUO) 22.14.070, and San Luis Obispo County Coastal Zone Land Use Ordinance (CZLUO). A map of the site and surrounding GSA is included in Appendix A.

## 2.0 INVESTIGATION METHODOLOGY AND LABORATORY TESTING

### Site Reconnaissance and Literature Review

Site reconnaissance was conducted to observe the current geologic condition of the bluff face with respect to erosion, geologic structure, and bluff stability. A review of previously published geologic reports and geologic maps pertinent to the project site was also performed.

### Subsurface Investigation

On August 19, 2014, three borings were drilled in the vicinity of the employee housing and operations service yard. They were drilled to a maximum depth of 11 feet below the existing ground surface. The borings were drilled using a Mobile Drill Model B-53 truck-mounted drill rig, equipped with a 6-inch outside diameter hollow stem auger. The approximate locations of the borings are shown on the Boring Location/Engineering Geologic Site Map in Appendix A

Soils encountered in the borings were categorized and logged in general accordance with the Unified Soil Classification System and ASTM D 2488-09a. Where bedrock was encountered, its properties were described based upon observation of the spoils and the effort required to drill into the bedrock. As the borings were drilled, samples were taken using a ring-lined barrel sampler (ASTM D 3550-01/07, with shoe similar to D 2937-04). Logs of the borings can be found in Appendix A. A Boring Log Legend is also included in Appendix A. In reviewing the boring log legend, the reader should recognize that the legend is intended as a guideline only, and there are a number of conditions that may influence the soil characteristics as observed during drilling. These include, but are not limited to, the presence of cobbles or boulders, cementation, variations in soil moisture, presence of groundwater, and other factors. Consequently, the logger must exercise judgment in interpreting soil characteristics, possibly resulting in soil descriptions that vary somewhat from the legend.

**Laboratory Testing**

Two ring samples obtained from the borings were tested for unit weight and moisture (ASTM D 2937-10, as modified for ring liners). Direct shear testing (ASTM D 3080/D 3080M-11, as modified for consolidated, undrained conditions) was also performed on the two ring samples. The laboratory test results are presented in Appendix A.

## 3.0 GEOLOGY

**Geologic Setting**

The ridge top upon which the project site is located is a well developed and preserved marine terrace platform. According to the geologic map of the San Simeon-Piedras Blancas Region by Hall (1976), the site is underlain by bedrock of the Franciscan mélange and capped by terrace deposits (see the Geologic Map in Appendix B). Observations of bluff exposures along the ridge and subsurface exploration are consistent with the geologic map. The northeast part of the bluff, in the vicinity of the employee housing and operations service yard, has approximately 9 to 10 feet of marine terrace deposits underlain by Cretaceous greywacke sandstone and metavolcanic bedrock, both of the Franciscan mélange. The remaining bluff exposes less than 5 feet of marine terrace deposits. These marine sediments were deposited in ocean tidal zones thousands of years ago. They extend landward until truncated by the southwestern foot of the Santa Lucia Mountains.

The geologic units at the site are depicted on the Geologic Map, Appendix B.

**Geologic Units**

Topsoil and Marine Terrace Deposits

The topsoil encountered in the borings was 2.5 to 3.5 feet thick and consisted of a loose to medium dense clayey sand. The topsoil was underlain by marine terrace deposits. The marine terrace deposits consisted of stiff to very stiff sandy lean clay with a trace of fine to coarse gravel, and medium dense to dense clayey sand with gravel. These soils are only present in the upper part of the bluff.

Franciscan Mélange

The bedrock units exposed in the bluff consists of moderately hard, greywacke sandstone and metavolcanic bedrock. Joints and fracturing were observed in the exposed bedrock; however, no evidence of gross slope instability was observed. In the borings, metavolcanic rock was encountered at depths of 7 to 10 feet.

**Groundwater and Springs**

Groundwater was not encountered in any of the borings to the maximum depth explored of 11 feet. During the site reconnaissance, no springs flowing along the marine terrace\bedrock contact were observed in the bluff face or elsewhere on the site.

**Faulting**

The Hosgri-San Simeon and San Andreas faults are the most significant regional active faults within a 65-mile radius of the site; movement on either of these faults could affect the existing and proposed development during its anticipated lifespan. The San Simeon fault is approximately 5 miles west of the site, and it is the closest known active fault. It is also closest mapped fault, regardless of activity, to the site (see Historical Earthquake/Fault Map in Appendix B).

## 4.0 SEISMICITY-SEISMIC HAZARDS

**Earthquake History**

The historic seismicity in the region of the site was researched using EQSEARCH (Blake, updated 2012). EQSEARCH is a computer program that performs automated searches of a custom catalog of historical Central California earthquakes. As the program searches the catalog, it computes the epicentral distance from the selected site to each of the earthquakes within the specified search area. The epicentral distances should be considered estimates, particularly for earthquake data prior to 1932, when modern instruments were first used to record earthquake data. The parameters used for the search consisted of earthquake Richter magnitudes ranging from 5.0 to 9.0 that occurred within a 65-mile radius of the site from 1800 to December 2012. The site coordinates used in this search are latitude 35.7807 degrees north and longitude 121.3301 degrees west. The Historical Earthquake/Fault Map in Appendix B depicts faults within the general region of the project, as well as historical earthquake epicenters and their magnitudes.

Results of the search indicated that fifty-four earthquakes have occurred within the search parameters; this information is summarized on the Historical Earthquake/Fault Map and in the EQSEARCH data results file in Appendix B.

Using the Boore and others (1997) method of analysis for Site Class "C," very dense soil/soft rock sites per ASCE 7-10 (2013) in the EQSEARCH program, the highest peak horizontal ground acceleration estimated to have occurred at the site from those historical earthquakes is 0.16g.

This ground acceleration was from the 1991 earthquake centered approximately 3 miles east of the site. This earthquake is also the closest earthquake that occurred to the site during the above time period. The 2003 6.5-magnitude San Simeon earthquake produced an estimated ground acceleration of 0.14g at the site. Its epicenter was approximately 14 miles to the southeast.

**Seismic Hazards**

Design Acceleration Parameters

The site is in a region of generally high seismicity and has the potential to experience strong ground shaking from earthquakes on regional or local causative faults. To characterize the seismicity at the site and to provide seismic design parameters for the architect/engineer, a General Procedure Ground Motion Analysis was performed to calculate the ground motions at the site. The ground motions were obtained from the United States Geological Survey Earthquake Hazards Program website (USGS 2014) using the 2013 ASCE 7-10 Standard Analysis Method, for Site Class "C" (very dense soil/soft rock sites). The results of this analysis are presented in the following table.

**SUMMARY OF DESIGN RESPONSE ACCELERATION PARAMETERS**

| Mapped Spectral Response Acceleration for Site Class B | | Site Coefficients for Site Class C | | Adjusted MCE Spectral Response Accelerations for Site Class C | | Design Spectral Response Accelerations for Site Class C | |
|---|---|---|---|---|---|---|---|
| Seismic Parameter | Value (g) | Site Coefficient | Value | Seismic Parameter | Value (g) | Seismic Parameter | Value (g) |
| $S_S$ | 1.570 | $F_a$ | 1.000 | $S_{MS}$ | 1.570 | $S_{DS}$ | 1.046 |
| $S_1$ | 0.595 | $F_v$ | 1.300 | $S_{M1}$ | 0.773 | $S_{D1}$ | 0.515 |
| Peak Mean Ground Acceleration ($PGA_M$) : 0.696 g | | | | | | | |

Surface Ground Rupture

The site is not in a State Earthquake Fault Zone, and there are no mapped faults crossing the site. The closest *active* fault to the site is the San Simeon Fault, located 5 miles west. The San Simeon Fault is also the closest fault to the site, regardless of activity. Because surface ground rupture requires the presence of a fault, the potential for surface fault rupture to occur at the site is considered to be very low.

Liquefaction and Lateral Spreading

Due to the shallow depth to bedrock, the potential for liquefaction and seismically induced lateral spreading at the site is essentially nonexistent.

Tsunamis

Hazardous tsunamis along the California coastline can be caused by vertical displacement of submarine faults or by submarine landslides. Tsunamis along the central California coast are relatively rare, and only a few such events are well documented. One of these occurred on November 4, 1927, when a major earthquake occurred off the coast of Point Arguello. The earthquake, known as the "Lompoc Earthquake," produced a tsunami that reached a height of 6 feet above mean high tide level along the coast of San Luis Obispo County (Lander et. al, 1993).

Due to the gradual shallowing of the ocean toward the coast in south-central and southern California, tsunami waves originating from distant earthquakes on the coast of Japan, Alaska, and Hawaii have historically only produced a few feet of rise above the tide.

The existing Ragged Point Inn buildings and the proposed new development are situated on a well developed and preserved marine terrace platform that is at an approximate elevation of 308 feet above mean sea level. Therefore, it is our opinion, that the potential for the site to be flooded by a tsunami event is nil.

**Naturally Occurring Asbestos**

Asbestos can occur naturally in certain rock formations, such as those that include serpentinite or ultramafic rock. At this site, the Franciscan Mélange is present, underlying marine terrace deposits and topsoil. The Franciscan Mélange is a mixed-rock unit that, in the borings and the bluff, consists of sandstone and metavolcanic rock. These are not asbestos-bearing rock units. However, there is a potential for other rock types that may be asbestos-bearing, i.e. serpentinite or ultramafic rock, to be present in other parts of the site.

If excavation into Franciscan Mélange bedrock is planned, an engineering geologist should be consulted prior to proceeding with the excavations.

### Radon and Other Hazardous Gases

According to Special Report 208, by the California Geological Survey (Churchill 2008) radon is most commonly found in areas of San Luis Obispo County that are underlain by bedrock of the Monterey and Santa Margarita Formations. According to this report, the project site is in an area of low radon potential due to the profile of topsoil and marine terrace deposits underlain by Franciscan Mélange rock units, which are not typically associated with radon. Consequently, the potential for radon gas to affect the project is considered to be low.

## 5.0 BLUFF STABILITY

### Franciscan Mélange

During our site reconnaissance, no evidence of recent bluff failures was observed in the bedrock portion of the bluff. The greywacke sandstone and metavolcanic bedrock are grossly stable due to their strength and massive bedding characteristics. Discontinuities within the bluff face, i.e. joints and fracturing, can cause localized differential erosion.

### Marine Terrace Deposits and Topsoil

The marine terrace deposits and topsoil are also considered to be grossly stable. As they are in the upper part of the bluff above the bedrock, they are not subject to wave-induced erosion. Along the top of the bluff, they are susceptible to erosion due to surface runoff and, when saturated, have a moderate potential for shallow slump-type failures. No slumping was observed, however, at the time of our site reconnaissance.

### Slope Stability Analysis

The gross stability of the marine terrace deposits and topsoil exposed in the bluff face was analyzed. The Modified Bishop Method of Slices option in the software program SLIDE 6.0 was used. The geology and geometry of the bluff was based on Cross Section A-A', which is shown in the slope stability plot (Appendix C). This section extends through the bluff on the northeast side of the site, in the vicinity of the employee housing and operations service yard. This cross section was selected as it represents the greatest thickness of topsoil and marine terrace deposits. The location of Cross Section A-A' is shown on the Boring Location/Engineering Geologic Site Map in Appendix A.

To simulate the accelerations produced by an earthquake, a horizontal seismic acceleration of 0.15g was used in the pseudostatic stability analysis. This acceleration is recommended by the California Division of Mines and Geology (CDMG) in Special Publication 117 (2008) and "Recommended Procedures for Implementation of Division of Mines and Geology, Special Publication 117: Guidelines for Analyzing and Mitigating Landslide Hazards in California" (Blake, et al, 2002).

The soil strengths and unit weights used in the analyses were obtained from direct shear and bulk density tests performed on ring samples of the marine terrace deposits and topsoil obtained during the field exploration. The bedrock strength and unit weight were estimated using the Rock Slope Engineering publication by Hoek & Bray (2001). The strength and unit weights used are shown on the following table.

**SOIL STRENGTH TABLE 1**

| Boring Number and Depth | Geologic Unit | Unit Weight (pcf) | Peak Cohesion (psf) | Peak Angle of Internal Friction (deg.) |
|---|---|---|---|---|
| B-1 @ 2-2.5' | Topsoil (Clayey Sand) | 103.8 | 545 | 32 |
| B-1 @ 4.0-4.5' | Marine Terrace Deposits (Sandy Lean Clay) | 130.4 | 928 | 29 |
| Estimated | Bedrock | 125 | 1200 | 40 |

The common minimum standard factors of safety for a slope to be considered stable are 1.5 for static conditions and 1.1 for seismic (pseudostatic) conditions. The results of the slope stability analysis indicated that for Cross Section A-A', the bluff is grossly stable, with factors of safety of 5.53 under static conditions and 4.12 under seismic conditions. These are well above the 1.5 for static conditions and 1.1 for seismic conditions generally required for the slope to be considered grossly stable. The Slope Stability Plot is presented in Appendix C.

## 6.0 OCEAN BLUFF EROSION RETREAT ANALYSIS

To estimate the site specific bluff erosion retreat rate for the site, analyses of historical aerial photographs was conducted. Stereoscopic vertical aerial photographs of the site by Caltrans 06_SLO 1-89 & 90, dated 1970 and Golden State Aerial GS 2966-1-1 & 2, dated 1996 were used for the analysis. These photographs were analyzed in combination with the Topographic map by Dakos Land Surveys Inc., 2014.

Stereographic interpretation of the aerial photographs was conducted using manual and digital/computer stereo-scope techniques to assess the bluff top conditions and to specifically identify the edge of the bluff (see the 1970 Bluff Top Photograph and 1996 Bluff Top Photograph in Appendix C). The edge of the bluff top was plotted on both photographs;

however, on the 1996 photographs the bluff top line could not be plotted on the up-coast (north) side of the bluff due to the presence of trees along the bluff's edge. The 1970 and the 1996 bluff edges were compared with the 2014 bluff top line plotted on the topographic map. The bluff top lines on both older photographs and the current bluff top line shown on the topographic map are nearly identical, indicating that very little erosion has occurred during the last 44 years.

## 7.0 CONCLUSIONS AND RECOMMENDATIONS

### Slope Stability

The results of the slope stability analysis indicated that the bluff is grossly stable, with factors of safety well above the generally accepted standard of 1.5 for static conditions and 1.1 for seismic conditions. The stable condition of the bluff was corroborated by observations made during our site reconnaissance. Consequently, in our opinion, no special building setback to accommodate the potential for slope instability is necessary at this site.

### 100-Year Building Bluff Top Setback

There was no evidence that significant erosion has occurred in the last 44 years. This is based upon a comparison of the 1970, 1996 and 2014 bluff top edges. Consequently, the bluff retreat rate of 1 inch per year as presented in the referenced Geologic Bluff Study report by Earth Systems Consultants Northern California (1997) is still considered valid and appropriate for the site. Based on this long-term average bluff retreat rate of 1.0 inch per year, it is estimated that the bluff will retreat 8.3 feet from the currently identified top-of-bluff during the anticipated 100-year design life of the structure. The California Coastal Commission requires that additional 10 feet be added to the building setback to account for unforeseeable episodic bluff erosion events. This would result a total setback of 18.3 feet. The County of San Luis Obispo Planning Area Standards, however, require that all new buildings be set back a minimum distance of 25 feet from the top of the bluff. A 25-foot setback from the 2014 top-of-bluff line is shown on the Boring Location/Engineering Geologic Site Map in Appendix A.

### Bluff Top Erosion

To reduce the potential for erosion of the topsoil and marine terrace deposits along the top of the bluff, surface water runoff should be controlled and prevented from flowing over the top of the bluff.

**Seismic Hazards**

Due to the presence of shallow sandstone and metavolcanic underlying the site, the potential for seismically induced lateral spreading and liquefaction on the site is essentially nonexistent. Surface rupture is the displacement and cracking of the ground surface that occurs along a fault trace during an earthquake. Unlike seismically-induced ground shaking, which can affect a wide geographic area, surface rupture is confined to the area very near the fault. There are no mapped active faults immediately adjacent to or crossing the site. In view of this, the potential for surface fault rupture to occur at the site is considered to be low.

As the existing Ragged Point Inn buildings and the proposed new development are situated on a well developed and preserved marine terrace platform that is at an approximate elevation of 308 feet above mean sea level, it is our opinion, that the potential for the site to be flooded by a tsunami event is nil.

## 8.0 CLOSURE

This report is valid for conditions as they exist at this time for the type of development described in the "Introduction" section of this report. The study was intended to be performed in a manner consistent with the level of care and skill ordinarily exercised by members of the profession currently practicing in the locality of this project under similar conditions. No other representation, warranty, or guarantee, is either expressed or implied.

If changes with respect to project type or location become necessary, or if items not addressed in this report are incorporated into plans, this firm shall be notified for modifications to this report.

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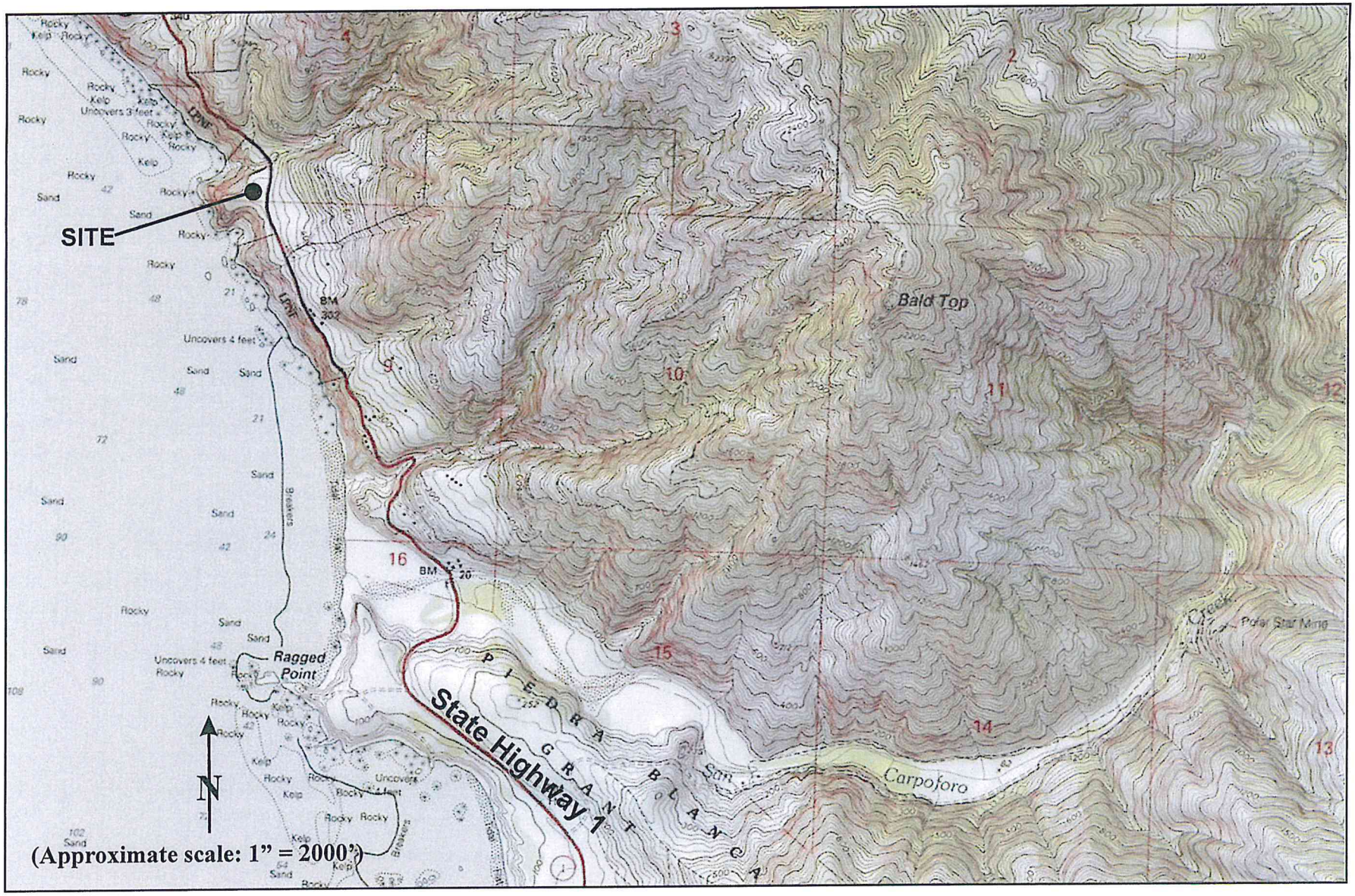
## APPENDIX A

Vicinity Map
Site Plan Description of Project Element
Geologic Study Area Map
Boring Location and Engineering Geologic Site Map (Map Pocket)
Boring Log Legend
Boring Logs
Laboratory Test Results




Reference: Extracted from USGS Topo Maps, Burro Mountain Quadrangle, 1972

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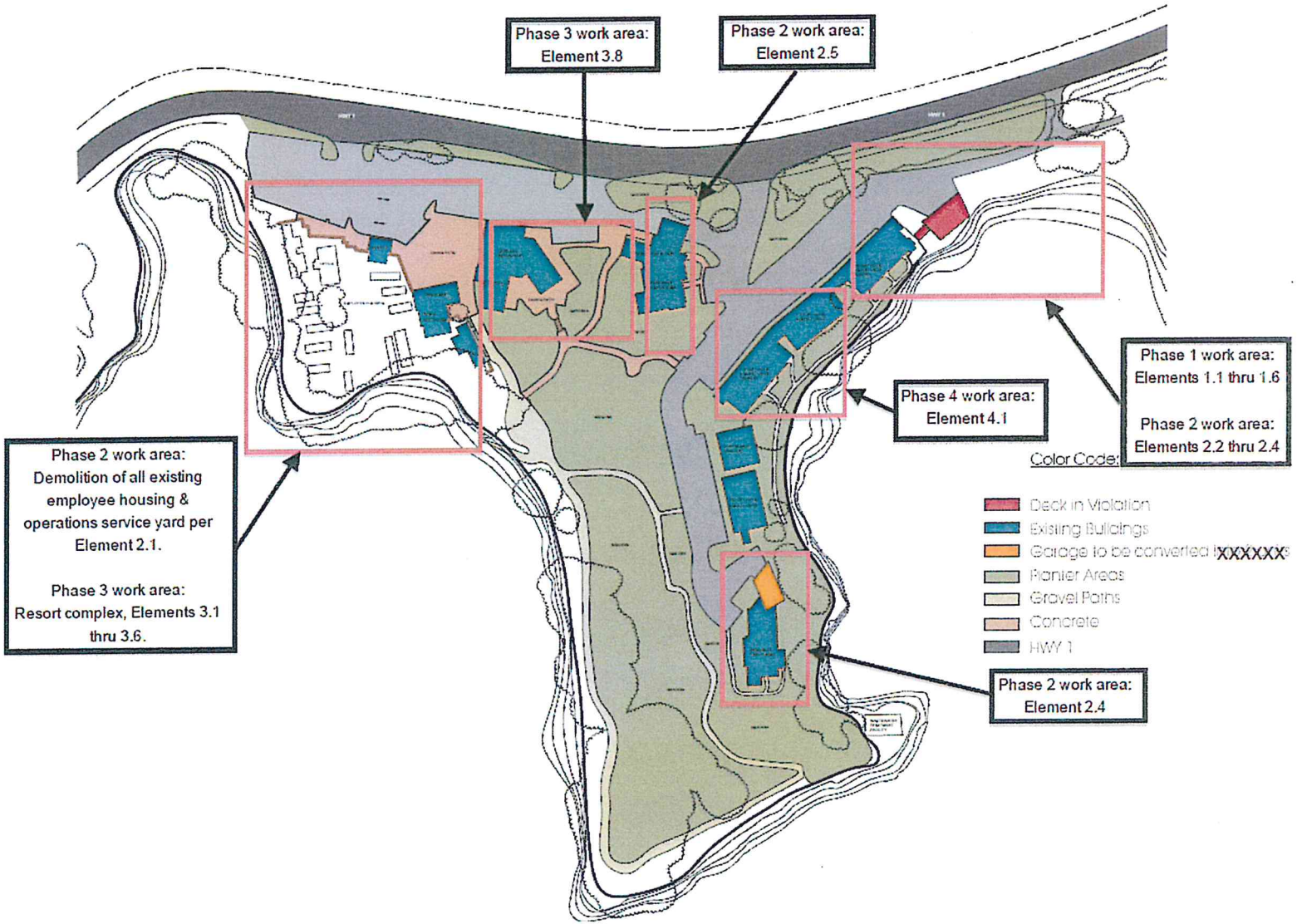
**Vicinity Map**

RAGGED POINT INN & RESORT EXPANSION
19019 State Highway 1
San Luis Obispo County, California

**Date**
September 2014
**Project No.**
SL-17329-GA
**Drafted by:**
R.G.




REF.: Site Description Plan was prepared by Richard LeGros, Architect, 2013

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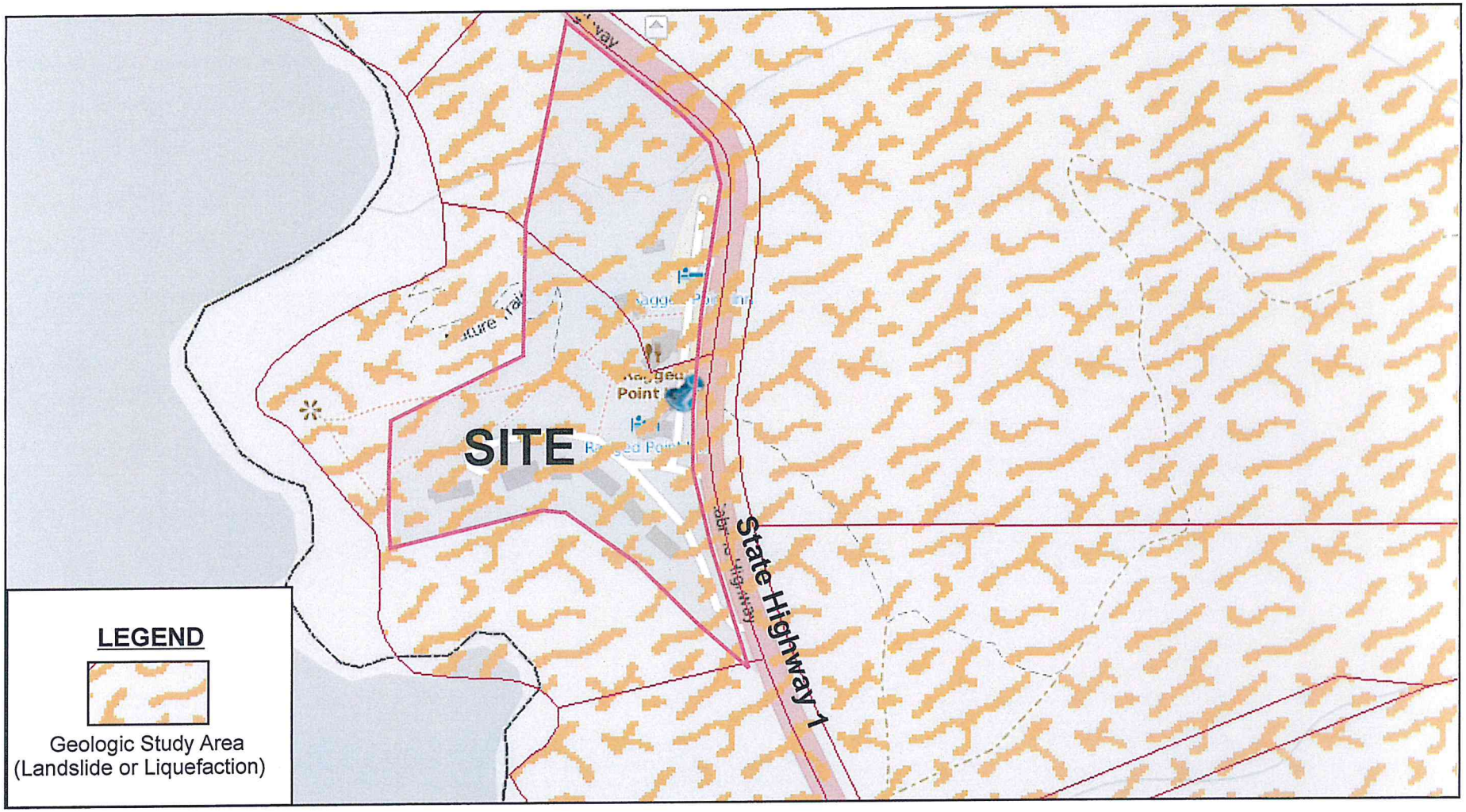
**Site Plan Description of Project Element**

RAGGED POINT INN & RESORT EXPANSION
19019 State Highway 1
San Luis Obispo County, California

**Date**
September 2014
**Project No.**
SL-17052-GB
**Drafted by:**
R.G.




REF.: SLO County Geologic Study Area Database, 2014

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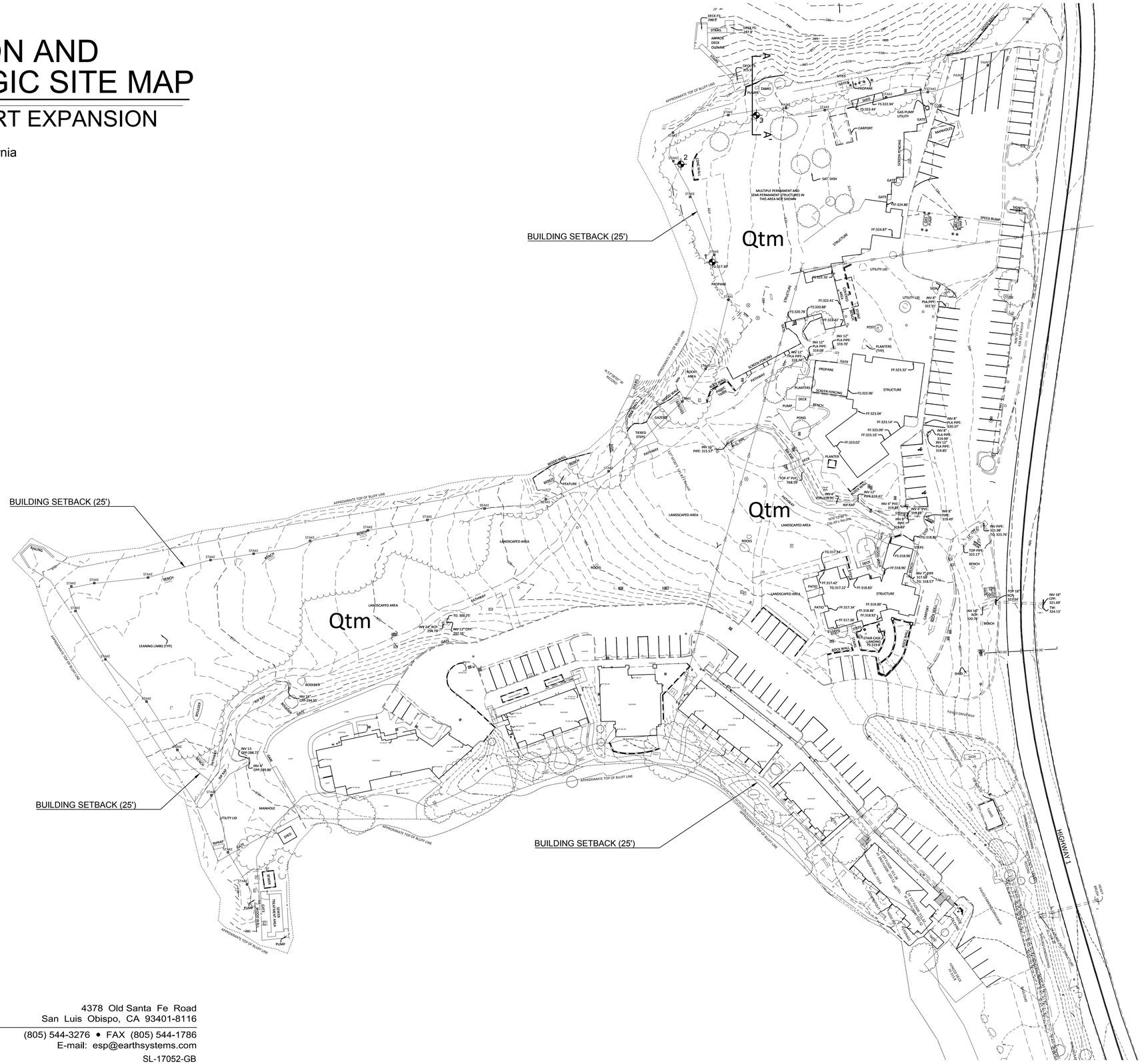
**San Luis Obispo County**
**Geologic Study Area Map**
RAGGED POINT INN & RESORT EXPANSION
19019 State Highway 1
San Luis Obispo County, California

**Date**
September 2014
**Project No.**
SL-17052-GB
**Drafted by:**
R.G.

# BORING LOCATION AND ENGINEERING GEOLOGIC SITE MAP

## RAGGED POINT INN & RESORT EXPANSION

19019 State Highway 1
San Luis Obispo County, California




### LEGEND

- Boring Location (Approx.)
- Cross Section
- Qtm — Marine Terrace Deposits (Late Pleistocene)

Topographic Map by Dakos Land Surveys, Inc., dated September 2014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October 2, 2014 QF SL-17052-GB

RAGGED POINT INN-100214borings.dwg

Earth Systems Pacific

# BORING LOG LEGEND

| SAMPLE / SUBSURFACE WATER SYMBOLS | GRAPH. SYMBOL |
|---|---|
| CALIFORNIA MODIFIED | |
| STANDARD PENETRATION TEST (SPT) | |
| SHELBY TUBE | |
| BULK | |
| SUBSURFACE WATER DURING DRILLING | |
| SUBSURFACE WATER AFTER DRILLING | |

## SOIL CLASSIFICATION SYSTEM

| MAJOR DIVISIONS | GROUP SYMBOL | TYPICAL DESCRIPTIONS | GRAPH. SYMBOL |
|---|---|---|---|
| COARSE GRAINED SOILS — MORE THAN HALF OF MATERIAL IS TESTED OR JUDGED TO BE LARGER THAN #200 SIEVE SIZE | GW | WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES | |
| | GP | POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES | |
| | GM | SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES, NON-PLASTIC FINES | |
| | GC | CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES, PLASTIC FINES | |
| | SW | WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES | |
| | SP | POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES | |
| | SM | SILTY SANDS, SAND-SILT MIXTURES, NON-PLASTIC FINES | |
| | SC | CLAYEY SANDS, SAND-CLAY MIXTURES, PLASTIC FINES | |
| FINE GRAINED SOILS — HALF OR MORE OF MATERIAL IS TESTED OR JUDGED TO BE SMALLER THAN #200 SIEVE SIZE | ML | INORGANIC SILTS AND VERY FINE SANDS, SILTY, CLAYEY FINE SANDS, CLAYEY SILTS WITH SLIGHT PLASTICITY | |
| | CL | INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS | |
| | OL | ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY | |
| | MH | INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY, SILTY SOILS, ELASTIC SILTS | |
| | CH | INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS | |
| | OH | ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS | |
| | PT | PEAT AND OTHER HIGHLY ORGANIC SOILS | |

## OBSERVED MOISTURE CONDITION

| DRY | SLIGHTLY MOIST | MOIST | VERY MOIST | WET |
|---|---|---|---|---|
| LITTLE/NO MOISTURE | JUDGED BELOW OPTIMUM | JUDGED ABOUT OPTIMUM | JUDGED OVER OPTIMUM | SATURATED |

## TYPICAL CONSISTENCY

| COARSE GRAINED SOILS | | | FINE GRAINED SOILS | | |
|---|---|---|---|---|---|
| BLOWS/FOOT | | DESCRIPTIVE TERM | BLOWS/FOOT | | DESCRIPTIVE TERM |
| SPT | CA SAMPLER | | SPT | CA SAMPLER | |
| 0-10 | 0-16 | LOOSE | 0-2 | 0-3 | VERY SOFT |
| 11-30 | 17-50 | MEDIUM DENSE | 3-4 | 4-7 | SOFT |
| 31-50 | 51-83 | DENSE | 5-8 | 8-13 | MEDIUM STIFF |
| OVER 50 | OVER 83 | VERY DENSE | 9-15 | 14-25 | STIFF |
| | | | 16-30 | 26-50 | VERY STIFF |
| | | | OVER 30 | OVER 50 | HARD |

## GRAIN SIZES

| U.S. STANDARD SERIES SIEVE | | | | CLEAR SQUARE SIEVE OPENING | | |
|---|---|---|---|---|---|---|
| # 200 | # 40 | # 10 | # 4 | 3/4" | 3" | 12" |

| SILT & CLAY | SAND | | | GRAVEL | | COBBLES | BOULDERS |
|---|---|---|---|---|---|---|---|
| | FINE | MEDIUM | COARSE | FINE | COARSE | | |

## TYPICAL ROCK HARDNESS

| MAJOR DIVISIONS | TYPICAL DESCRIPTIONS |
|---|---|
| EXTREMELY HARD | CORE, FRAGMENT, OR EXPOSURE CANNOT BE SCRATCHED WITH KNIFE OR SHARP PICK; CAN ONLY BE CHIPPED WITH REPEATED HEAVY HAMMER BLOWS |
| VERY HARD | CANNOT BE SCRATCHED WITH KNIFE OR SHARP PICK; CORE OR FRAGMENT BREAKS WITH REPEATED HEAVY HAMMER BLOWS |
| HARD | CAN BE SCRATCHED WITH KNIFE OR SHARP PICK WITH DIFFICULTY (HEAVY PRESSURE); HEAVY HAMMER BLOW REQUIRED TO BREAK SPECIMEN |
| MODERATELY HARD | CAN BE GROOVED 1/16 INCH DEEP BY KNIFE OR SHARP PICK WITH MODERATE OR HEAVY PRESSURE; CORE OR FRAGMENT BREAKS WITH LIGHT HAMMER BLOW OR HEAVY MANUAL PRESSURE |
| 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 |
| VERY SOFT | CAN BE READILY INDENTED, GROOVED OR GOUGED WITH FINGERNAIL, OR CARVED WITH KNIFE; BREAKS WITH LIGHT MANUAL PRESSURE |

## TYPICAL ROCK WEATHERING

| MAJOR DIVISIONS | TYPICAL DESCRIPTIONS |
|---|---|
| FRESH | NO DISCOLORATION, NOT OXIDIZED |
| SLIGHTLY WEATHERED | DISCOLORATION OR OXIDATION IS LIMITED TO SURFACE OF, OR SHORT DISTANCE FROM; SOME FRACTURES PRESENT; FELDSPAR CRYSTALS ARE DULL |
| MODERATELY WEATHERED | DISCOLORATION OR OXIDATION EXTENDS FROM FRACTURES, USUALLY THROUGHOUT; Fe-Mg MINERALS ARE "RUSTY"; FELDSPAR CRYSTALS ARE "CLOUDY" |
| INTENSELY WEATHERED | DISCOLORATION OR OXIDATION THROUGHOUT; FELDSPAR AND Fe-Mg MINERALS ARE ALTERED TO CLAY TO SOME EXTENT OR CHEMICAL ALTERATION PRODUCES IN SITU DISAGGREGATION |
| DECOMPOSED | DISCOLORATION OR OXIDATION THROUGHOUT, BUT RESISTANT MINERALS SUCH AS QUARTZ MAY BE UNALTERED; FELDSPAR AND Fe-Mg MINERALS ARE COMPLETELY ALTERED TO CLAY |

drafting/masters/Boring Log Legend091608.dwg

# Earth Systems Pacific

## Boring No. 1



LOGGED BY: R. Wagner
DRILL RIG: Mobile B-53
AUGER TYPE: 6" Hollow Stem Auger

JOB NO.: SL-17052-GB
DATE: 08/19/14

**RAGGED POINT INN & RESORT EXPANSION**
**19019 State Highway 1**
**San Luis Obispo County, California**

| DEPTH (feet) | USCS CLASS | SYMBOL | SOIL DESCRIPTION | SAMPLE DATA: INTERVAL (feet) | SAMPLE TYPE | DRY DENSITY (pcf) | MOISTURE (%) | BLOWS PER 6 IN. |
|---|---|---|---|---|---|---|---|---|
| 0 | | | 12.0" AGGREGATE BASE | | | | | |
| 1 | SC | | CLAYEY SAND: dark brown, loose, moist, trace silt, some fine to medium roots (Topsoil) | 1.0 - 2.5 | Ring | 94.3 | 10.1 | 4 9 24 |
| 2 | | | medium dense | | | | | |
| 3 | SC | | | 3.0 - 4.5 | Ring | | | 8 14 22 |
| 4 | | | CLAYEY SAND: light orange brown, medium dense, moist (Marine Terrace Deposits) | | | | | |
| 5 | CL | | SANDY LEAN CLAY: brown to orange brown, very stiff, moist, trace fine to coarse gravel | 5.0 - 6.5 | Ring | | | 8 15 22 |
| 6 | | | | 4.5 - 7.0 | Grab | | | |
| 7 | | | METAVOLCANIC ROCK: gray/orange brown mottled, soft, moist, weathered (Franciscan Melange) | | | | | |
| 8 | | | | | | | | |
| 9 | | | moderately hard | 9.0 - 9.5 | SPT | No Return | | 50/2.0" |
| 10 | | | End of Boring @ 9.5' due to refusal<br>No subsurface water encountered | | | | | |
| 11 | | | | | | | | |
| 12 | | | | | | | | |
| 13 | | | | | | | | |
| 14 | | | | | | | | |
| 15 | | | | | | | | |
| 16 | | | | | | | | |
| 17 | | | | | | | | |
| 18 | | | | | | | | |
| 19 | | | | | | | | |
| 20 | | | | | | | | |
| 21 | | | | | | | | |
| 22 | | | | | | | | |
| 23 | | | | | | | | |
| 24 | | | | | | | | |
| 25 | | | | | | | | |
| 26 | | | | | | | | |

LEGEND: Ring Sample ◯ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

# Earth Systems Pacific

## Boring No. 2



LOGGED BY: R. Wagner
DRILL RIG: Mobile B-53
AUGER TYPE: 6" Hollow Stem Auger

JOB NO.: SL-17052-GB
DATE: 08/19/14

**RAGGED POINT INN & RESORT EXPANSION**
**19019 State Highway 1**
**San Luis Obispo County, California**

| DEPTH (feet) | USCS CLASS | SYMBOL | SOIL DESCRIPTION | SAMPLE DATA: INTERVAL (feet) | SAMPLE TYPE | DRY DENSITY (pcf) | MOISTURE (%) | BLOWS PER 6 IN. |
|---|---|---|---|---|---|---|---|---|
| 0 | | | 12.0" AGGREGATE BASE | | | | | |
| 1 | SC | | CLAYEY SAND: brown, loose, moist, trace silt, some fine to medium roots (Topsoil) | 1.0 - 3.0 | Grab | | | 13 |
| 2 | | | | 3.0 - 4.5 | Ring | 112.0 | 16.5 | 19 26 |
| 3 | CL | | SANDY LEAN CLAY: orange brown, very stiff, moist, trace fine to coarse gravel (Marine Terrace Deposits) | 5.0 - 6.5 | Ring | | | 11 36 40 |
| 4 | | | | | | | | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |
| 7 | | | | | | | | |
| 8 | | | | | | | | |
| 9 | | | METAVOLCANIC ROCK: gray/orange brown mottled, moderately hard, moist, weathered (Franciscan Melange) | 9.5 - 10.0 | SPT | | | 50/3.0" |
| 10 | | | End of Boring @ 10.0' due to refusal<br>No subsurface water encountered | | | | | |
| 11 | | | | | | | | |
| 12 | | | | | | | | |
| 13 | | | | | | | | |
| 14 | | | | | | | | |
| 15 | | | | | | | | |
| 16 | | | | | | | | |
| 17 | | | | | | | | |
| 18 | | | | | | | | |
| 19 | | | | | | | | |
| 20 | | | | | | | | |
| 21 | | | | | | | | |
| 22 | | | | | | | | |
| 23 | | | | | | | | |
| 24 | | | | | | | | |
| 25 | | | | | | | | |
| 26 | | | | | | | | |

LEGEND: Ring Sample ◯ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

# Earth Systems Pacific

## Boring No. 3



LOGGED BY: R. Wagner
DRILL RIG: Mobile B-53
AUGER TYPE: 6" Hollow Stem Auger

JOB NO.: SL-17052-GB
DATE: 08/19/14

**RAGGED POINT INN & RESORT EXPANSION**
**19019 State Highway 1**
**San Luis Obispo County, California**

| DEPTH (feet) | USCS CLASS | SYMBOL | SOIL DESCRIPTION | SAMPLE DATA: INTERVAL (feet) | SAMPLE TYPE | DRY DENSITY (pcf) | MOISTURE (%) | BLOWS PER 6 IN. |
|---|---|---|---|---|---|---|---|---|
| 0 | | | 12.0" AGGREGATE BASE | | | | | |
| 1 | SC | | CLAYEY SAND: dark brown, loose, moist, trace silt, some fine to medium roots (Topsoil) | | | | | |
| 2 | | | | | | | | |
| 3 | CL | | SANDY LEAN CLAY: brown, stiff, moist (Marine Terrace Deposits) | 3.0 - 4.0 | ■ | | | 14<br>50/4.5" |
| 4 | | | orange brown, hard, trace fine to coarse gravel | | | | | |
| 5 | | | | 5.0 - 6.0 | ■ | | | 21<br>50/5.5" |
| 6 | | | | 4.0 - 8.0 | ○ | | | |
| 7 | | | | | | | | |
| 8 | | | | | | | | |
| 9 | | | CLAYEY SAND WITH GRAVEL: orange brown, dense, moist | | | | | |
| 10 | | | | 10.0 - 11.0 | ● | | | 29<br>50/2.0" |
| 11 | | | METAVOLCANIC ROCK: gray/orange brown mottled, soft, moist, weathered (Franciscan Melange) | | | | | |
| 12 | | | End of Boring @ 11.0' due to refusal<br>No subsurface water encountered | | | | | |
| 13 | | | | | | | | |
| 14 | | | | | | | | |
| 15 | | | | | | | | |
| 16 | | | | | | | | |
| 17 | | | | | | | | |
| 18 | | | | | | | | |
| 19 | | | | | | | | |
| 20 | | | | | | | | |
| 21 | | | | | | | | |
| 22 | | | | | | | | |
| 23 | | | | | | | | |
| 24 | | | | | | | | |
| 25 | | | | | | | | |
| 26 | | | | | | | | |

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Ragged Point Inn

SL-17052-GB

## BULK DENSITY TEST RESULTS

ASTM D 2937-10 (modified for ring liners)

September 2, 2014

| BORING NO. | DEPTH feet | MOISTURE CONTENT, % | WET DENSITY, pcf | DRY DENSITY, pcf |
|---|---|---|---|---|
| 1 | 2.0 - 2.5 | 10.1 | 103.8 | 94.3 |
| 2 | 4.0 - 4.5 | 16.5 | 130.4 | 112.0 |

Ragged Point Inn

SL-17052-GB

## DIRECT SHEAR

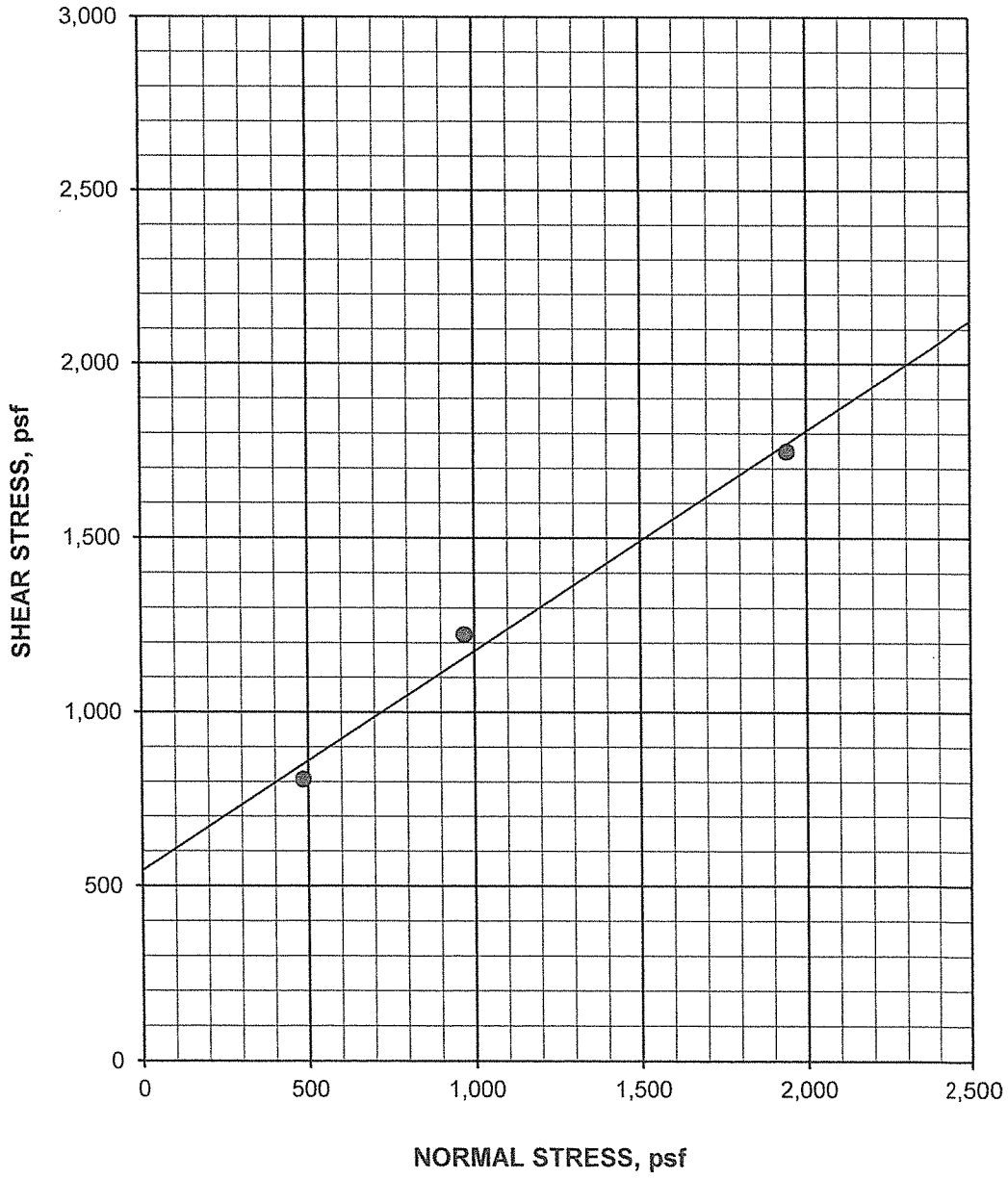
**ASTM D 3080/D3080M-11 (modified for consolidated, undrained conditions)**

September 2, 2014

Boring #1 @ 2.0 - 2.5'
Clayey Sand (SC)
Ring sample, saturated

INITIAL DRY DENSITY: 81.0 pcf
INITIAL MOISTURE CONTENT: 10.1 %
PEAK SHEAR ANGLE (Ø): 32°
COHESION (C): 545 psf

### SHEAR vs. NORMAL STRESS



## DIRECT SHEAR continued

ASTM D 3080/D3080M-11 (modified for consolidated, undrained conditions)

Boring #1 @ 2.0 - 2.5'

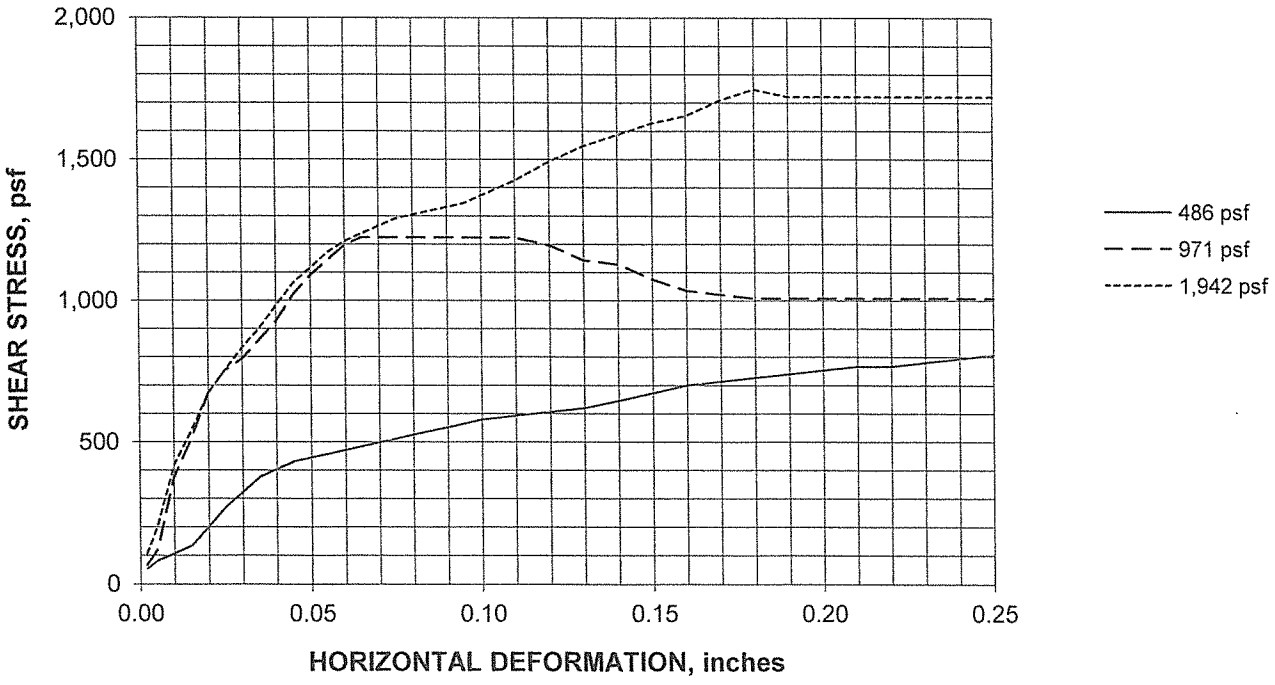
September 2, 2014

Clayey Sand (SC)

Ring sample, saturated

SPECIFIC GRAVITY: 2.65 (assumed)

| SAMPLE NO.: | 1 | 2 | 3 | AVERAGE |
|---|---|---|---|---|
| **INITIAL** | | | | |
| WATER CONTENT, % | 10.1 | 10.1 | 10.1 | 10.1 |
| DRY DENSITY, pcf | 77.4 | 78.7 | 87.1 | 81.0 |
| SATURATION, % | 23.5 | 24.3 | 29.8 | 25.9 |
| VOID RATIO | 1.137 | 1.102 | 0.899 | 1.046 |
| DIAMETER, inches | 2.410 | 2.410 | 2.410 | |
| HEIGHT, inches | 1.00 | 1.00 | 1.00 | |
| **AT TEST** | | | | |
| WATER CONTENT, % | 56.0 | 53.3 | 40.8 | |
| DRY DENSITY, pcf | 78.3 | 82.8 | 92.2 | |
| SATURATION, % | 100.0 | 100.0 | 100.0 | |
| VOID RATIO | 1.112 | 0.997 | 0.793 | |
| HEIGHT, inches | 0.99 | 0.95 | 0.94 | |



Ragged Point Inn

SL-17052-GB

## DIRECT SHEAR

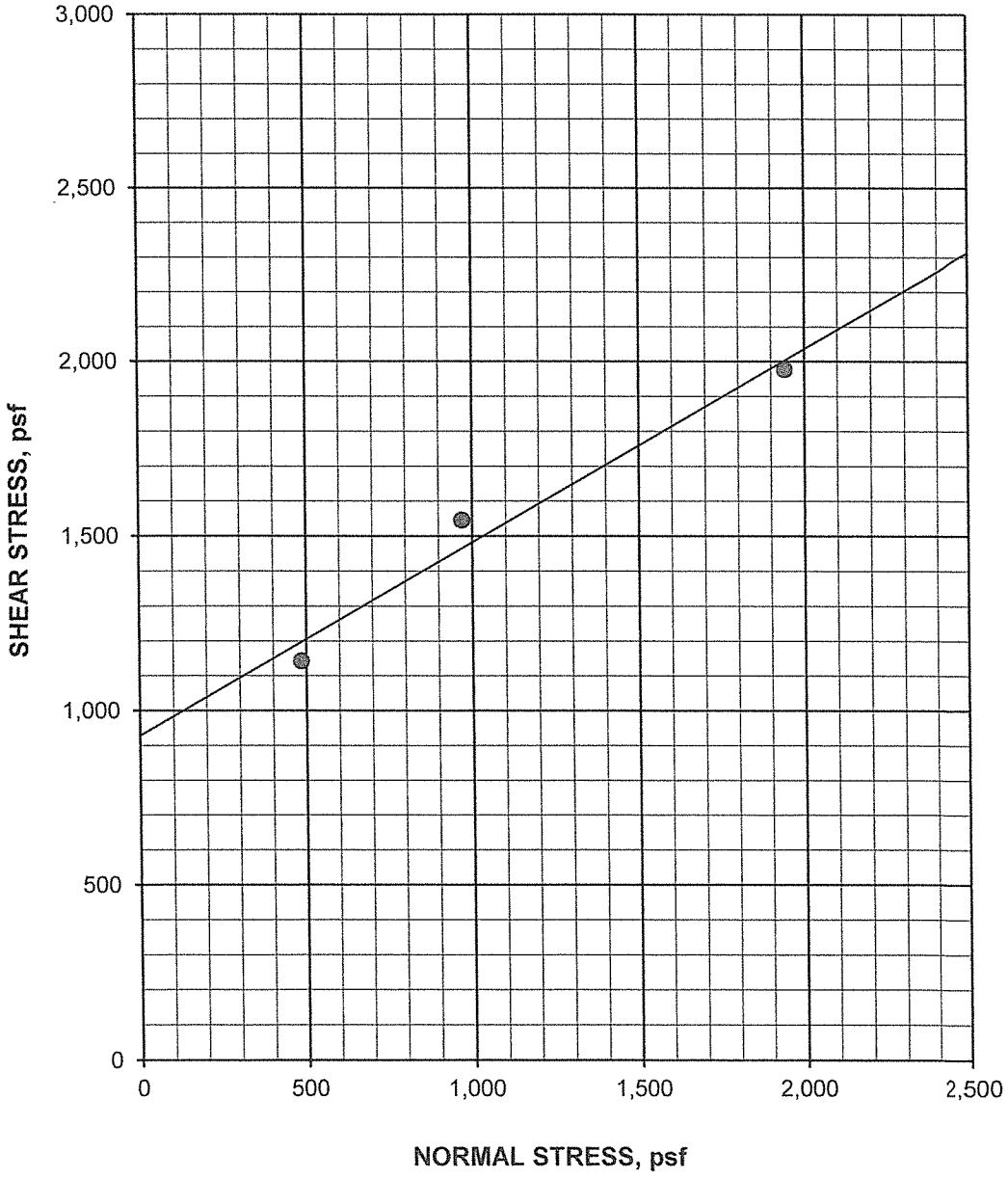
ASTM D 3080/D3080M-11 (modified for consolidated, undrained conditions)

September 2, 2014

Boring #2 @ 4.0 - 4.5'
Sandy Lean Clay (CL)
Ring sample, saturated

INITIAL DRY DENSITY: 110.0 pcf
INITIAL MOISTURE CONTENT: 16.5 %
PEAK SHEAR ANGLE (Ø): 29°
COHESION (C): 928 psf

### SHEAR vs. NORMAL STRESS



## DIRECT SHEAR continued

ASTM D 3080/D3080M-11 (modified for consolidated, undrained conditions)

Boring #2 @ 4.0 - 4.5'

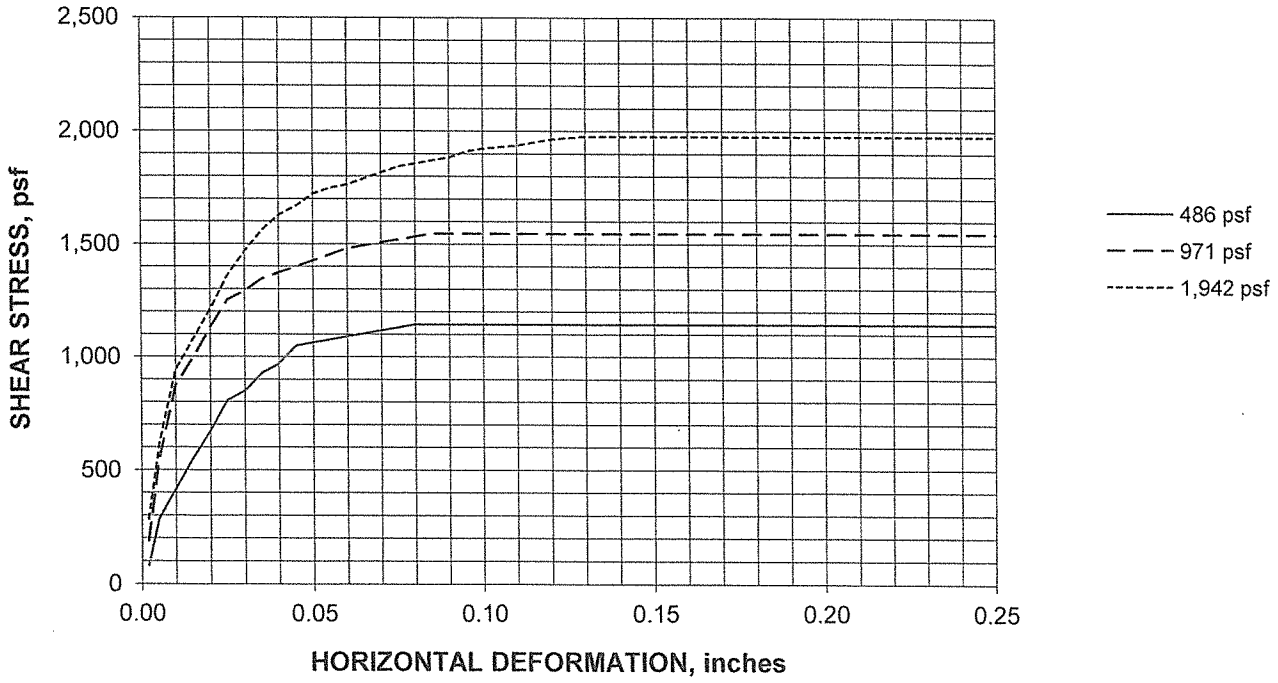
September 2, 2014

Sandy Lean Clay (CL)

Ring sample, saturated

SPECIFIC GRAVITY: 2.70 (assumed)

| SAMPLE NO.: | 1 | 2 | 3 | AVERAGE |
|---|---|---|---|---|
| **INITIAL** | | | | |
| WATER CONTENT, % | 16.5 | 16.5 | 16.5 | 16.5 |
| DRY DENSITY, pcf | 111.2 | 107.8 | 111.0 | 110.0 |
| SATURATION, % | 86.4 | 79.2 | 86.1 | 83.9 |
| VOID RATIO | 0.515 | 0.562 | 0.517 | 0.532 |
| DIAMETER, inches | 2.410 | 2.410 | 2.410 | |
| HEIGHT, inches | 1.00 | 1.00 | 1.00 | |
| **AT TEST** | | | | |
| WATER CONTENT, % | 25.9 | 24.9 | 29.1 | |
| DRY DENSITY, pcf | 111.7 | 112.2 | 118.5 | |
| SATURATION, % | 100.0 | 100.0 | 100.0 | |
| VOID RATIO | 0.508 | 0.501 | 0.422 | |
| HEIGHT, inches | 1.00 | 0.96 | 0.94 | |

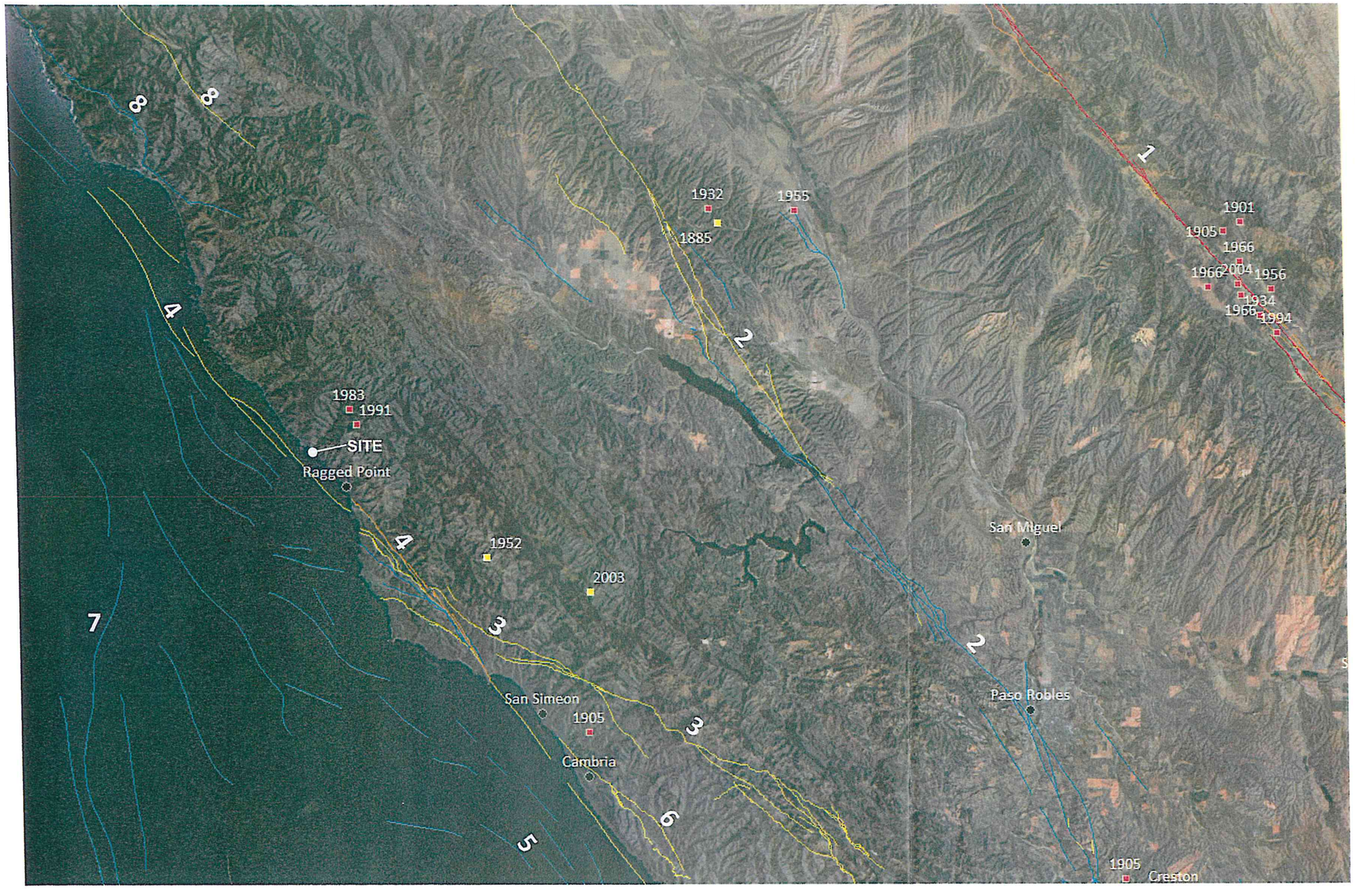


# APPENDIX B

Geologic Map
Historical Earthquake/Fault Map
EQSEARCH Data Results File

# HISTORICAL EARTHQUAKE/ FAULT MAP

RAGGED POINT INN & RESORT EXPANSION
19019 State Highway 1
San Luis Obispo County, California




## LEGEND

- Historic rupture (<200 years)
- Holocene fault (<10,000 years)
- Late Quaternary (<700,000 years)
- Quaternary fault (<1.6 million)

### HISTORICAL EARTHQUAKE MAGNITUDE

5.0 to 5.9 | 6.0 to 6.9 | 7.0 to 7.9

### FAULTS

| | | | |
|---|---|---|---|
| 1 | San Andreas | 5 | Hosgri |
| 2 | Rinconada | 6 | Cambria |
| 3 | Oceanic | 7 | Santa Lucia Bank |
| 4 | San Simeon | 8 | San Gregorio |

REFERENCES


Blake, T.F., EQSEARCH, 2000, updated 2010
Jennings, C.W. & Bryant, W.A., 2010


N

(Approximate Scale: 1" = 6 miles)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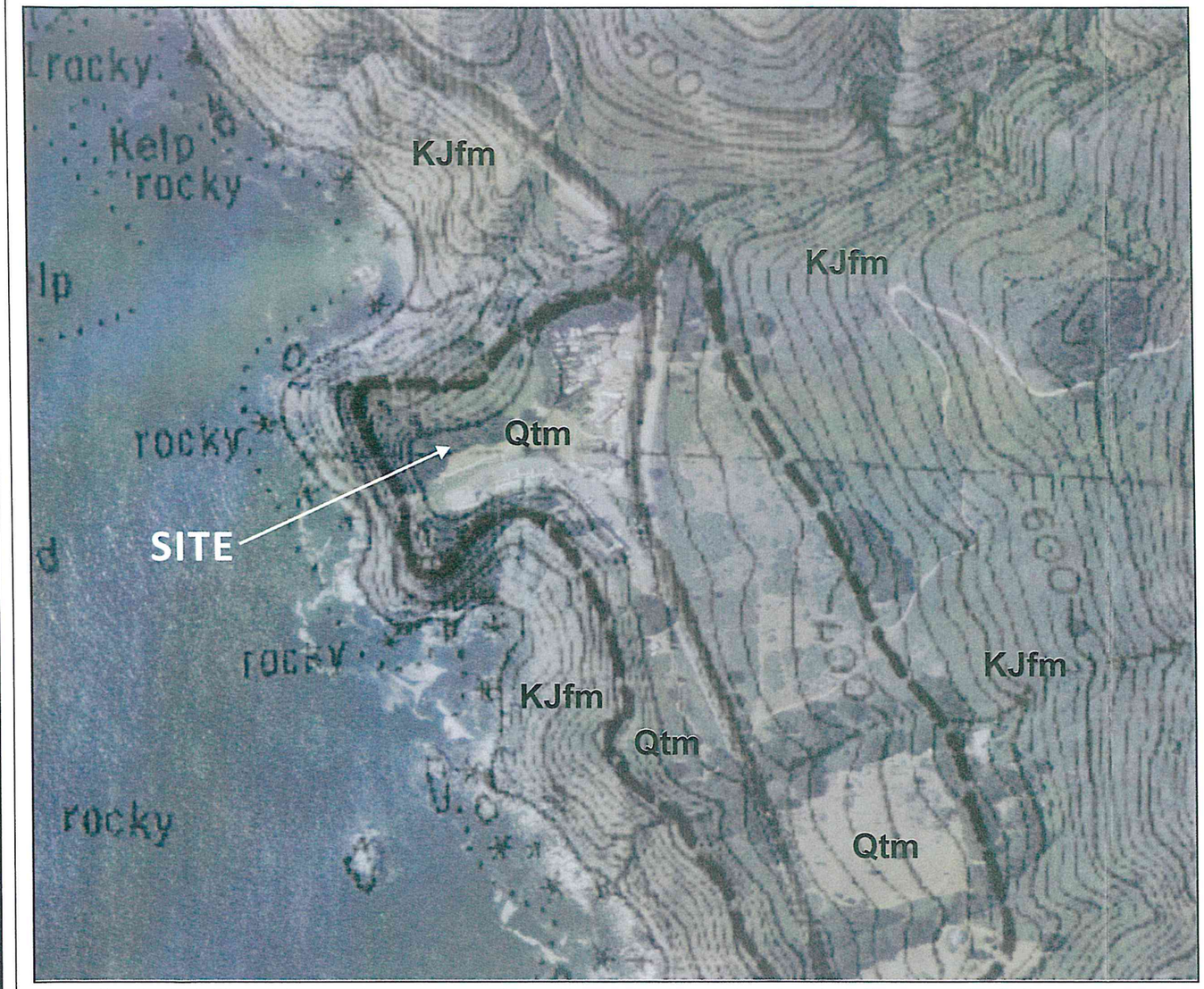
September 2014

SL -17052-GB

# GEOLOGIC MAP

RAGGED POINT INN & RESORT EXPANSION
19019 State Highway 1
San Luis Obispo County, California




REF.: Geologic Map of the San Simeon-Piedras Blancas Region, San Luis Obispo County, California, by Hall 1976

## EXPLANATION

### Geologic Units

**Qtm**

**Marine terrace deposits**
-loosely consolidated white to orangish brown sandstone and conglomerate.
Approx. 3 to 18 feet thick.
(Late Pleistocene)

**KJfm**

**Franciscan complex**
KJfm - Melange (me), graywacke, largely composed of sheared greenish black claystone, includes exotic clasts of graywacke (gw); metavolcanic rocks (mv) primarily basalt and diabase; and other rock.
(Cretaceous or Jurassic)

### Geologic Symbols

Contact
Dashed where approximately located or inferred

High-angle fault
Dashed where approximately located or inferred; dotted where concealed

Thrust or reverse fault
Dashed where approximately located or inferred; dotted where concealed. Saw-teeth on upper plate. Dip of fault plane between 30° and 80°

Anticline
Showing axis at surface. Dashed where approximately located; dotted where concealed

Syncline
Showing axis at surface. Dashed where approximately located; dotted where concealed

Horizontal 30 Inclined 90 Vertical
Strike and dip of beds

N

Approx. Scale: 1" = 400'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September 2014

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SL-17052-GB

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*    E Q S E A R C H    *
*                       *
*     Version 3.00      *
*                       *
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ESTIMATION OF
PEAK ACCELERATION FROM
CALIFORNIA EARTHQUAKE CATALOGS

JOB NUMBER: SL-17052-GB

DATE: 09-11-2014

JOB NAME: Ragged Point Inn

EARTHQUAKE-CATALOG-FILE NAME: ALLQUAKE.DAT

SITE COORDINATES:
SITE LATITUDE: 35.7807
SITE LONGITUDE: 121.3301

SEARCH DATES:
START DATE: 1800
END DATE: 2012

SEARCH RADIUS:
65.0 mi
104.6 km

ATTENUATION RELATION: 2) Boore et al. (1997) Horiz. - NEHRP C (520)
UNCERTAINTY (M=Median, S=Sigma): M Number of Sigmas: 0.0
ASSUMED SOURCE TYPE: DS [SS=Strike-slip, DS=Reverse-slip, BT=Blind-thrust]
SCOND: 0 Depth Source: A
Basement Depth: 5.00 km Campbell SSR: Campbell SHR:
COMPUTE PEAK HORIZONTAL ACCELERATION

MINIMUM DEPTH VALUE (km): 0.0

EARTHQUAKE SEARCH RESULTS



| FILE CODE | LAT. NORTH | LONG. WEST | DATE | TIME (UTC) H M Sec | DEPTH (km) | QUAKE MAG. | SITE ACC. g | SITE MM INT. | APPROX. DISTANCE mi [km] |
|---|---|---|---|---|---|---|---|---|---|
| GSB | 35.8280 | 121.3230 | 09/17/1991 | 211029.3 | 8.0 | 5.10 | 0.164 | VIII | 3.3( 5.3) |
| BRK | 35.8400 | 121.3300 | 08/29/1983 | 101031.0 | 0.0 | 5.20 | 0.158 | VIII | 4.1( 6.6) |
| DMG | 35.7300 | 121.2000 | 11/22/1952 | 74637.0 | 0.0 | 6.00 | 0.163 | VIII | 8.1( 13.0) |
| GSG | 35.7060 | 121.1020 | 12/22/2003 | 191556.0 | 7.0 | 6.40 | 0.139 | VIII | 13.8( 22.2) |
| MGI | 35.6000 | 121.1000 | 02/01/1853 | 21 0 0.0 | 0.0 | 5.00 | 0.055 | VI | 17.9( 28.9) |
| DMG | 36.0000 | 121.0000 | 02/26/1932 | 1658 0.0 | 0.0 | 5.00 | 0.044 | VI | 23.9( 38.4) |
| DMG | 36.0000 | 120.9200 | 11/02/1955 | 1940 6.0 | 0.0 | 5.20 | 0.044 | VI | 27.5( 44.2) |
| PDB | 36.3110 | 120.8560 | 10/21/2012 | 065509.5 | 9.0 | 5.30 | 0.032 | V | 45.2( 72.7) |
| MGI | 35.5000 | 120.6000 | 01/01/1830 | 0 0 0.0 | 0.0 | 5.00 | 0.027 | V | 45.3( 72.9) |
| DMG | 35.9500 | 120.5300 | 06/29/1966 | 195325.9 | 0.0 | 5.00 | 0.026 | V | 46.3( 74.5) |
| DMG | 36.4500 | 121.2500 | 09/27/1938 | 1223 0.0 | 0.0 | 5.00 | 0.026 | V | 46.4( 74.7) |
| DMG | 36.4000 | 121.0000 | 04/12/1885 | 4 5 0.0 | 0.0 | 6.20 | 0.050 | VI | 46.6( 74.9) |
| GSB | 35.9530 | 120.5020 | 09/29/2004 | 171004.0 | 11.0 | 5.10 | 0.027 | V | 47.8( 77.0) |
| DMG | 35.9500 | 120.5000 | 06/28/1966 | 42613.4 | 0.0 | 5.50 | 0.033 | V | 47.9( 77.1) |
| DMG | 35.9700 | 120.5000 | 06/28/1966 | 4 856.2 | 0.0 | 5.10 | 0.027 | V | 48.2( 77.6) |
| MGI | 35.3000 | 120.7000 | 12/07/1906 | 640 0.0 | 0.0 | 5.90 | 0.041 | V | 48.5( 78.1) |
| DMG | 35.9300 | 120.4800 | 12/24/1934 | 1626 0.0 | 0.0 | 5.00 | 0.025 | V | 48.7( 78.3) |
| DMG | 36.0000 | 120.5000 | 03/03/1901 | 745 0.0 | 0.0 | 5.50 | 0.033 | V | 48.8( 78.6) |
| DMG | 36.0000 | 120.5000 | 02/02/1881 | 011 0.0 | 0.0 | 5.60 | 0.035 | V | 48.8( 78.6) |
| DMG | 36.2300 | 120.6500 | 02/05/1947 | 614 0.0 | 0.0 | 5.00 | 0.025 | V | 49.0( 78.9) |
| GSB | 35.9170 | 120.4650 | 12/20/1994 | 102747.2 | 8.0 | 5.00 | 0.025 | V | 49.3( 79.4) |
| DMG | 35.9500 | 120.4700 | 11/16/1956 | 323 9.0 | 0.0 | 5.00 | 0.025 | V | 49.5( 79.7) |
| GSB | 36.3630 | 121.9100 | 01/23/1984 | 065950.4 | 5.0 | 5.00 | 0.024 | V | 51.6( 83.1) |
| GSB | 36.3730 | 121.9070 | 01/23/1984 | 054019.7 | 7.0 | 5.40 | 0.030 | V | 52.0( 83.7) |
| T-A | 35.2500 | 120.6700 | 12/17/1852 | 0 0 0.0 | 0.0 | 5.70 | 0.035 | V | 52.1( 83.9) |
| T-A | 35.2500 | 120.6700 | 00/00/1830 | 0 0 0.0 | 0.0 | 5.70 | 0.035 | V | 52.1( 83.9) |
| MGI | 35.1700 | 120.7500 | 12/01/1916 | 2253 0.0 | 0.0 | 5.70 | 0.034 | V | 53.3( 85.8) |
| GSB | 35.8190 | 120.3640 | 09/28/2004 | 171524.2 | 8.0 | 6.00 | 0.040 | V | 54.2( 87.2) |
| DMG | 36.5780 | 121.2090 | 02/24/1972 | 155651.0 | 7.5 | 5.10 | 0.024 | V | 55.5( 89.2) |
| DMG | 36.5800 | 121.1800 | 07/29/1951 | 105345.0 | 0.0 | 5.00 | 0.023 | IV | 55.8( 89.8) |
| DMG | 35.8000 | 120.3300 | 06/08/1934 | 447 0.0 | 0.0 | 6.00 | 0.039 | V | 56.0( 90.2) |
| DMG | 35.8000 | 120.3300 | 06/08/1934 | 430 0.0 | 0.0 | 5.00 | 0.023 | IV | 56.0( 90.2) |
| DMG | 35.8000 | 120.3300 | 12/28/1939 | 121538.0 | 0.0 | 5.00 | 0.023 | IV | 56.0( 90.2) |
| DMG | 35.8000 | 120.3300 | 06/05/1934 | 2148 0.0 | 0.0 | 5.00 | 0.023 | IV | 56.0( 90.2) |
| DMG | 35.7500 | 120.3300 | 08/18/1922 | 512 0.0 | 0.0 | 5.00 | 0.023 | IV | 56.1( 90.2) |
| GSB | 36.6030 | 121.2010 | 04/23/1995 | 084136.6 | 7.0 | 5.00 | 0.022 | IV | 57.2( 92.1) |
| BRK | 36.2500 | 120.4700 | 06/11/1983 | 3 954.0 | 0.0 | 5.10 | 0.023 | IV | 57.9( 93.2) |
| MGI | 35.2500 | 120.5000 | 07/10/1917 | 045 0.0 | 0.0 | 5.30 | 0.026 | V | 59.3( 95.5) |
| MGI | 35.2500 | 120.5000 | 07/09/1917 | 2238 0.0 | 0.0 | 5.30 | 0.026 | V | 59.3( 95.5) |
| MGI | 35.2500 | 120.5000 | 07/10/1917 | 043 0.0 | 0.0 | 5.30 | 0.026 | V | 59.3( 95.5) |
| MGI | 35.2500 | 120.5000 | 07/09/1917 | 2222 0.0 | 0.0 | 5.00 | 0.022 | IV | 59.3( 95.5) |
| BRK | 36.2000 | 120.4000 | 07/22/1983 | 343 2.0 | 0.0 | 5.00 | 0.022 | IV | 59.5( 95.7) |
| BRK | 36.2200 | 120.4000 | 07/22/1983 | 23955.0 | 0.0 | 6.00 | 0.037 | V | 60.2( 96.8) |
| DMG | 35.7500 | 120.2500 | 03/10/1922 | 112120.0 | 0.0 | 6.50 | 0.047 | VI | 60.5( 97.4) |
| BRK | 36.2100 | 120.3800 | 07/25/1983 | 223140.0 | 0.0 | 5.10 | 0.023 | IV | 60.8( 97.8) |
| T-A | 36.6700 | 121.2500 | 04/01/1857 | 1135 0.0 | 0.0 | 5.00 | 0.021 | IV | 61.6( 99.1) |
| DMG | 36.6700 | 121.2500 | 08/06/1916 | 1938 0.0 | 0.0 | 5.50 | 0.028 | V | 61.6( 99.1) |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| BRK | 36.2600 | 120.4000 | 07/09/1983 | 74052.0 | 0.0 | 5.30 | 0.025 | V | 61.6( 99.1) |
| PAS | 36.2860 | 120.4130 | 10/25/1982 | 2226 4.0 | 6.0 | 5.60 | 0.029 | V | 62.0( 99.7) |
| DMG | 36.6800 | 121.3000 | 04/09/1961 | 72316.0 | 0.0 | 5.60 | 0.029 | V | 62.1(100.0) |
| DMG | 36.1700 | 120.3200 | 12/27/1926 | 919 0.0 | 0.0 | 5.00 | 0.021 | IV | 62.5(100.6) |
| DMG | 36.7000 | 121.3000 | 04/09/1961 | 72541.0 | 0.0 | 5.50 | 0.027 | V | 63.5(102.2) |
| DMG | 36.7000 | 121.3000 | 03/31/1885 | 756 0.0 | 0.0 | 5.50 | 0.027 | V | 63.5(102.2) |

EARTHQUAKE SEARCH RESULTS

Page 2

| FILE CODE | LAT. NORTH | LONG. WEST | DATE | TIME (UTC) H M Sec | DEPTH (km) | QUAKE MAG. | SITE ACC. g | SITE MM INT. | APPROX. DISTANCE mi [km] |
|---|---|---|---|---|---|---|---|---|---|
| DMG | 36.6000 | 120.8000 | 07/25/1926 | 175749.0 | 15.0 | 5.00 | 0.021 | IV | 63.8(102.7) |

**********

-END OF SEARCH- 54 EARTHQUAKES FOUND WITHIN THE SPECIFIED SEARCH AREA.

TIME PERIOD OF SEARCH: 1800 TO 2012

LENGTH OF SEARCH TIME: 213 years

THE EARTHQUAKE CLOSEST TO THE SITE IS ABOUT 3.3 MILES (5.3 km) AWAY.

LARGEST EARTHQUAKE MAGNITUDE FOUND IN THE SEARCH RADIUS: 6.5

LARGEST EARTHQUAKE SITE ACCELERATION FROM THIS SEARCH: 0.164 g

COEFFICIENTS FOR GUTENBERG & RICHTER RECURRENCE RELATION:
a-value= 1.364
b-value= 0.446
beta-value= 1.026

TABLE OF MAGNITUDES AND EXCEEDANCES:

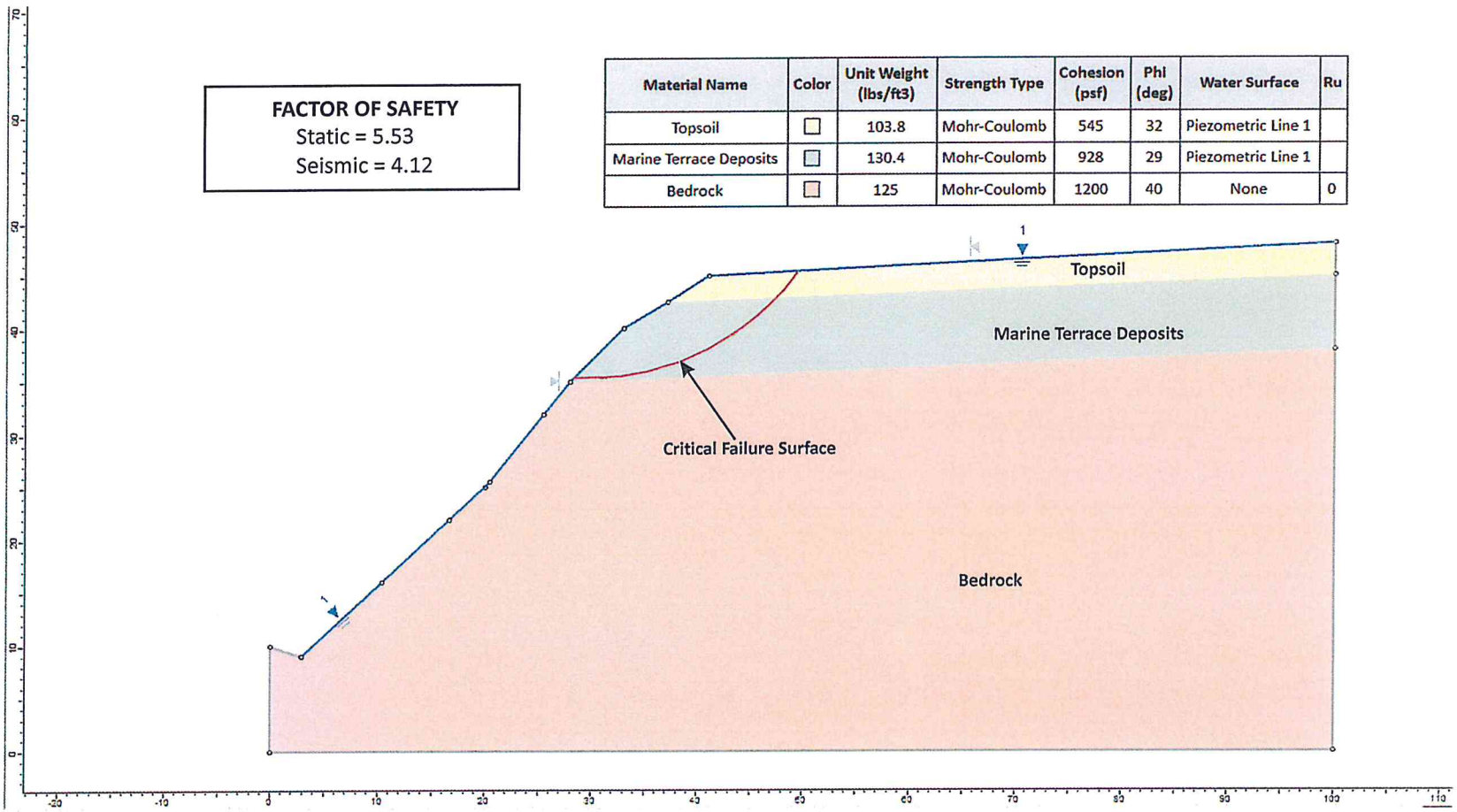
| Earthquake Magnitude | Number of Times Exceeded | Cumulative No. / Year |
|---|---|---|
| 4.0 | 54 | 0.25472 |
| 4.5 | 54 | 0.25472 |
| 5.0 | 54 | 0.25472 |
| 5.5 | 19 | 0.08962 |
| 6.0 | 7 | 0.03302 |
| 6.5 | 1 | 0.00472 |

## APPENDIX C

Slope Stability Plot
1970 Bluff Top Photograph
1996 Bluff Top Photograph

**FACTOR OF SAFETY**
Static = 5.53
Seismic = 4.12

| Material Name | Color | Unit Weight (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (deg) | Water Surface | Ru |
|---|---|---|---|---|---|---|---|
| Topsoil | | 103.8 | Mohr-Coulomb | 545 | 32 | Piezometric Line 1 | |
| Marine Terrace Deposits | | 130.4 | Mohr-Coulomb | 928 | 29 | Piezometric Line 1 | |
| Bedrock | | 125 | Mohr-Coulomb | 1200 | 40 | None | 0 |




Cross Section A-A'


**EARTH SYSTEMS PACIFIC**
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(805) 544-3276


**Slope Stability Plot**

RAGGED POINT INN & RESORT EXPANSION
19019 State Highway 1
San Luis Obispo County, California

**Date**
September 2014
**Project No.**
SL-17052-GB
**Drafted by:**
R.G.

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**1970 Bluff Top Photograph**

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**1996 Bluff Top Photograph**

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