GEOLOGIC AND GEOTECHNICAL ENGINEERING REPORT,
PROPOSED MALIBU MEMORIAL CEMETERY,
Tentative Tract Map 69653,
4000 Malibu Canyon Road,
Malibu, California

for

Green Acres, LLC

January 23, 2015
W.O. 6489

GeoSoils Consultants Inc.
GREEN ACRES, LLC
22837 Pacific Coast Highway, Suite 775
Malibu, California 90265

Attention: Mr. Bruce McBride

Subject: Geologic and Geotechnical Engineering Report, Proposed Malibu Memorial Cemetery, Tentative Tract Map 69653, 4000 Malibu Canyon Road, Malibu, California

Dear Mr. McBride:

As requested, GeoSoils Consultants, Inc. (GSC) has prepared this report for the proposed development for the subject site. The proposed development is shown on Plate 1, Geologic Map. The purpose of this report is to provide geotechnical engineering conclusions and recommendations relative to the newly proposed cemetery design.

GSC has prepared previous reports for the subject site, which addressed a different development concept. The previous development concept addressed in the referenced reports consisted of a hotel and associated structures. All geologic and geotechnical data from the previous studies are included in this report. The referenced geologic and geotechnical reports for the previous development concept were submitted to and approved by the City of Malibu. A copy of the approval letter is attached.

**SCOPE OF SERVICES**

Our scope of services consisted of reviewing the referenced reports, transferring available geologic data from the referenced reports, and updating previous/drafting new cross sections for the current development plan.

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Our scope of services during the previous study included excavating, logging, and sampling of numerous borings and test pits across the site. In addition, laboratory testing and engineering analyses were included in the previous reports and have been revised accordingly herein. All previous boring and test pit logs, was well laboratory test results are included in this report.

PROPOSED DEVELOPMENT

Proposed development of the site will consist of grading to create cemetery property. Access to the site is via Malibu Canyon Road along the west side of the site. One structure is proposed in the center of the site, along with retaining walls, street and parking areas, and hardscape and landscape areas. The plans were prepared by Psomas Engineering and are included herein as Plate 1, Geologic Map. Site grading will include cut/fill operations to create level internment areas, street grades, and other site improvements. Retaining walls to a maximum height of approximately 11 feet are proposed within the development. Grading of the site will consist of flattening the steeper slope areas along the northern and eastern parts of the site to a gradient of 3.2:1. This grading eliminates the slope stability issues previously addressed along the subject slopes.

A series of buried crypts are proposed at the northern slope area on the site, as shown on Section A-A' of the civil drawing (Plate 1). Temporary excavations up to approximately 25 feet high are proposed to provide access to the buried crypts. Slope gradients of 2:1 are proposed between retaining walls in this area.

PREVIOUS STUDIES

Previous studies have been performed on the subject property by GeoSoils Consultants, Inc. (GSC), Leighton and Associates, Inc. (LA) and by Van Beveren and Butelo, Inc. (VBB) (references). GSC excavated, sampled and logged four hollow stem auger borings. Logs of the borings are included in Appendix A, and laboratory data is included in Appendix B. The work by LA included excavating, sampling, and logging of 21 bucket auger borings.

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The locations of the borings are shown on Plate 1 and copies of the boring logs are included in Appendix C. In addition, LA excavated numerous fault trenches across the site. Based on the trenching, Leighton and Associates established a fault setback zone in the southern end of the property for a portion of the Malibu Coast Fault.

Van Beveren and Butelos, Inc. were the last consultant to work on the subject project prior to GSC. VBB excavated, sampled, and logged 8 bucket auger borings across the site. The locations of the borings are shown on Plate 1 and copies of the boring logs and laboratory test results are included in Appendix D.

VBB also excavated trenches across the previously established setback zone by Leighton and Associates. The trench exposed non-marine terrace deposits, which were determined to be continuous and unbroken by faults. The soils within the trenches were observed and dated by Dr. Ron Shlemon. Dr. Shlemon determined that the age of the unbroken sediments were at least 100K years old, and may be as old as 200K. Since these sediments are not affected by fault offset, the previously setback zone was eliminated by VBB. The report by VBB was ultimately approved by the City of Malibu.

Following geotechnical approval from the City of Malibu, GSC performed additional studies on the site in conjunction with In-Situ Engineering, Inc. for the purposes of onsite waste water disposal (References 10 through 17). These reports were also submitted to the City of Malibu for review; however, since the intended use of the site has now changed, these reports are no longer applicable to the project. Subsurface data compiled during OWTS testing can be found in the referenced reports.

As stated above, GeoSoils Consultants, Inc. has reviewed the referenced reports by the previous consultants that have worked on the site. We accept their results and accept geotechnical responsibility for the subject property.
SUMMARY OF GEOLOGIC CONDITIONS

The geologic conditions on the site are discussed in detail in the referenced reports. In summary, the site is underlain by both marine and non-marine terrace deposits, which overlie bedrock of the Monterey, Trancus, Conejo Vocanics, Vasqueros, and Sespe Formations. The terrace deposits underlie the majority of the site and consist of interbedded silts, clays and sands, with occasional gravel and cobbles. Based on review of Appendix D of the VBB report, the terrace deposits on the site are at least 100K years old, and may be as old as 200K years.

Although the reports by LA indicate many different bedrock types on the site, only the Sespe, Vaqueros and a small area of Conejo Vocanics are exposed at the surface. Other bedrock types were encountered in the borings by LA. Geologic structure in the rock, where observed in the borings by the previous consultants, generally dips to the north at steep angles and is favorable relative to the existing slopes and proposed development. However, the bedding is highly variable and dips steeply to the south at the southeastern part of the site. Due to the thickness of the overlying terrace deposits, the structure within the bedrock has little, if any, affect on the proposed development.

A landslide is located along the eastern part of the site. Borings drilled by Leighton and Associates indicates that the base of the landslide extends well below the existing ground surface to the east of the site and is covered with older alluvium. A smaller landslide is mapped at the bottom of the slope along the eastern side of the site, and is well outside the limits of grading.

SEISMICITY

Seismic Design Parameters

Although there are no active faults on or in close proximity to the property, the property, as with all of Southern California, is located in a region subject to periodic earthquake-induced ground shaking. Planned improvements should incorporate earthquake-resistant design. Seismic design criteria are presented in the following section.
Seismic Design Parameters

The following are the seismic design parameters for the subject site based on the 2013 California Building Code (CBC), Section 1613.

<table>
<thead>
<tr>
<th>Site Class Definition (Table 1613.5.2)</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mapped Spectral Response Acceleration Parameter, Sa (Figure 1613.5(3) for 0.2 second)</td>
<td>2.341</td>
</tr>
<tr>
<td>Mapped Spectral Response Acceleration Parameter, Ss (Figure 1613.5(4) for 1.0 second)</td>
<td>0.834</td>
</tr>
<tr>
<td>Site Coefficient Fg (Table 1613.5.3(1) short period)</td>
<td>1.0</td>
</tr>
<tr>
<td>Site Coefficient Fb (Table 1613.5.3(2) 1-second period)</td>
<td>1.5</td>
</tr>
<tr>
<td>Adjusted Maximum Considered Earthquake Spectral Response Acceleration Parameter SNS (Eq. 16-37)</td>
<td>2.341</td>
</tr>
<tr>
<td>Adjusted Maximum Considered Earthquake Spectral Response Acceleration Parameter SNS (Eq. 16-38)</td>
<td>1.252</td>
</tr>
<tr>
<td>Design Spectral Response Acceleration Parameter, SD2 (Eq. 16-39)</td>
<td>1.561</td>
</tr>
<tr>
<td>Design Spectral Response Acceleration Parameter, SD1 (Eq. 16-40)</td>
<td>0.834</td>
</tr>
</tbody>
</table>

Notes:
1. Site Class Designation: Class D is recommended based on subsurface condition.
2. Sa, Ss, and SDs are spectral response accelerations for the period of 0.2 second.
3. S1, SMD, and SD1 are spectral response accelerations for the period of 1.0 second.

Conformance to the above criteria for seismic design does not constitute any guarantee or assurance that significant structural damage or ground failure will not occur if a maximum level earthquake occurs. The primary goal of seismic design is to protect life and not to avoid all damage, since such design may be economically prohibitive.

Seismic Hazards

Liquefaction

There are no state-designated liquefaction hazard zones on the site. Underlying material consists of terrace deposits and bedrock and is therefore not subject to liquefaction.

Earthquake-Induced Landslide Zones

Based on review of the Seismic Hazard Zone map for the Malibu Beach Quadrangle, the slope areas on the site are located within zones of potential seismic slope instability. As a result, previous slope stability analyses were performed for the slope along Pacific Coast Highway and the results are included in GSC report dated January 27, 2012 (Section J-J').
SLOPE STABILITY

Slope stability analyses have been performed as part of previous studies. The analyses were based on laboratory test results obtained from previous geologic exploration. The site is generally surrounded by descending natural slopes. Proposed grading, as discussed above, will result in final slopes at gradients of 3.2:1. The existing cut slope along the north side of Pacific Coast Highway will remain as is. Stability analyses were previously performed for the slope along the north side of Pacific Coast Highway and the results indicated factors of safety above minimum code values. The results of the analyses were presented in Appendix A of the GSC report dated January 27, 2012.

A series of buried crypts are proposed at the northern slope area on the site, as shown on Section A-A’ of the civil drawing (Plate 1). Temporary excavations up to approximately 25 feet high are proposed to provide access to the buried crypts. Slope gradients of 2:1 are proposed between retaining walls in this area.

CONCLUSIONS

It is our professional opinion that proposed development is feasible from a geologic and civil engineering viewpoint. Safe and stable development of this land can be accomplished as long as the recommendations included within this report are incorporated into final tract design and implemented during final grading and construction. Final design and construction should be performed according to City Code and Permits. Most earth materials on the parcel will excavate with moderate to heavy duty ripping using heavy duty grading equipment. Excavated material will produce good quality fill.

“111” STATEMENT

It is GSC’s opinion that the building site will be safe from the hazards of landslide, settlement or slippage. Furthermore, the finished development will not adversely affect the stability of the adjacent properties nor be adversely affected by adjacent properties.
RECOMMENDATIONS

1. **Removals/Reprocessing**

   The on site soils are suitable for structural support, provided that the following recommendations are followed. The upper 5 feet of the terrace deposits on the site are generally loose and should be removed down to competent terrace deposits in areas of proposed structures located within the central part of the site. In addition, all previously placed fault trench backfill shall be removed and recompacted. The removals should extend a minimum distance of five feet beyond the building footprints, or a distance equal to the depth of fill placement, whichever is greater. In areas of proposed hardscape, a minimum removal depth of two to three feet is recommended. Removals are not considered necessary in areas of the site to be used as cemetery sites. The proposed grading operation will result in removal of surficial soil along the northern part of the site. As a result, proposed retaining walls in this area may be founded in dense terrace deposits.

   Two landslides are located along the eastern part of the site. Both landslides should be removed during grading. Since the slides extend off-site to the east, removals of the slides should start at the property line and follow a 1:1 project toward the development, as shown on Section 5-5'.

   An erosion gully is located on the existing cut slope above Pacific Coast Highway. Their gully should be repaired in accordance with Cross-Section 6-6'.

2. **Subdrains**

   1. Subdrain systems should be provided in the fill areas at the northern portion of the site and stabilization fills prior to fill placement (see Figure 1).
METHOD 1

SOIL-SLOPEWASH

ALLUVIUM REMOVED TO BEDROCK

BEDROCK OR FIRM FORMATION MATERIAL

CANYON PERFORATED PIPE (SCHEDULE 40 OR 35 SDR P.V.C.) OR EQUIVALENT PLACED IN 9 CUBIC FEET OF GRAVEL PER FOOT OF DRAIN

METHOD 2

SOIL-SLOPEWASH

ALLUVIUM REMOVED TO BEDROCK

BEDROCK OR FIRM FORMATION MATERIAL

CANYON PERFORATED PIPE (SCHEDULE 40 OR 35 SDR P.V.C.) OR EQUIVALENT PLACED IN 9 CUBIC FEET OF GRAVEL PER FOOT OF DRAIN

GRAVEL TO CONFORM TO STATE OF CALIFORNIA DEPT. OF PUBLIC WORKS STANDARD SPECIFICATIONS FOR CLASS 2 PERMEABLE MATERIAL AS ALTERNATE 3/4" GRAVEL MAY BE USED SURROUNDED WITH GEOTEXTILE FILTER FABRIC APPROVED BY THE GEOTECHNICAL ENGINEER. (NOTE: CITY OF LOS ANGELES DOES NOT ALLOW GEOTEXTILE FABRIC WRAP AROUND SUBDRAIN SYSTEMS.)

LONGITUDINAL SECTION

PERFORATED PIPE & GRAVEL THROUGH BEDROCK

CONCRETE CUT-OFF AT TRANSITION FROM BEDROCK TO FILL

SOLID PIPE WITH NO GRAVEL THROUGH COMPACTED FILL

MINIMUM 2% FLOWLINE GRADE TO OUTLET END

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GEOTECHNICAL•GEOL OGC•ENVIRONMENTAL

CANYON SUBDRAIN DESIGN & CONSTRUCTION METHODS

DATE 12/2014  W.O. NO. 6489

Geotechnical•Geologic•Environmental  FIGURE 1
2. Filter material should be Class 2 permeable filter, or No. 2 and No. 3 concrete aggregate gradations per standard specifications for Public Works construction, or approved equivalent, inspected and tested to verify its suitability. The filter should be clean with a wide range of sizes.

3. Subdrain pipe material should consist of PVC Schedule 40 or D-2729 or an equivalent recommended by the Geotechnical Engineer. "Accordion" type pipe and similar products are not acceptable for use as subdrains or backdrains on this project.

4. Subdrains should be placed in all canyon bottoms. During grading, the Engineering Geologist should evaluate the necessity of additional drain placement.

5. All subdrainage system should be inspected by the Engineering Geologist.

### Slopes

#### Fill Slopes

A. Fill slopes are proposed at a maximum slope ratio of 3.2:1 (horizontal:vertical) between benches, to a maximum anticipated height of approximately 90 feet.

B. Fill slopes should be built in accordance with recommendations included in the Grading Guidelines section of this report.

#### Cut Slopes

The following recommendations apply to proposed cut slopes.

A. All permanent major cut slopes are planned at a gradient of 3.2:1 or flatter.

B. Cut slopes exposing terrace deposits should not be affected by rock structure. The terrace units are rather massive and bedding is only
represented by lineation of sand to gravel-sized particles. No true bedding planes exist in the terrace deposits (Qt).

**FOUNDATION RECOMMENDATIONS**

Foundation recommendations in this report are considered preliminary. Final foundation design recommendations should be determined at the completion of grading, based on expansion and chemical testing determined on final grade samples. For convenience, the following preliminary foundation recommendations may be used. These recommendations should be finalized at the end of future final pad and street grading.

Conventional and post-tensioned foundations may be used on the site. All foundations should meet current City of Malibu setback requirements.

**Foundation Criteria**

1. An allowable soil bearing pressure of 1,500 pounds per square foot, including dead and real live loads, can be utilized for design of conventional foundations into compacted fill or terrace deposits. The above bearing value may be increased by one-third when considering short duration seismic or wind loads. Footings are recommended to be continuous and should have a minimum width of 18 inches and a minimum embedment depth of 18 inches for one and two story structures.

   The allowable bearing value may be increased by 20 percent for each additional foot below the minimum 18 inches depth recommended, plus 7 percent for each additional foot wider than the minimum 18 inches width recommended up to a maximum value of 3,000 pounds per square foot.
2. A friction coefficient for concrete on compacted soil/terrace deposits of 0.3 and a lateral (passive) bearing value of 200 pounds per square foot, per foot of depth, may be employed to resist lateral loads. When combining passive pressure and frictional resistance, the passive pressure component should be reduced by one-third. For design of isolated piles, the allowable passive pressure may be increased by 100 percent (see Table A for other conventional foundation recommendations).

3. In order to minimize the potential effects of seismic activity, expansive soils, secondary settlement and hydroconsolidation or hydrocompression, we recommend the following alternative foundation systems, i.e., post-tensioned slab foundations, be used.

Post-Tensioned Slab Foundation

Anticipated surficial differential movement across the building pad areas included in this report in the form of settlement or heave could be in the order of 1 to 2 inches. These post-tensioned slabs should be designed in accordance with the recommendations of either the California Foundation Slab Method or Post-Tensioning Institute. The slabs should be designed for at least one inch of surficial differential movement (i.e., at least 1 inch in a 30-foot span) for low expansion index (EI) soil, and at least two inches of surficial differential movement for medium EI soil. Based on review of laboratory data for the on-site materials, the average soil modulus of subgrade reaction, K, to be used for design is 100 pounds per cubic inch. Specific recommendations for the design of California Foundation Slab and Post Tension Institute methods are presented below.

A surface bearing value of 1,000 pounds per square foot can also be used in design.
1. **California Foundation Slab (Spanability) Method**

   It is recommended that slabs be designed for a free span of 15 feet regardless of the expansion index of the soil. From a soil expansion/shrinkage standpoint, a common contributing factor to distress of structures using post-tensioned slabs is fluctuation of moisture in soils underlying the perimeter of the slab, compared to the center, causing a "dishing" or "arching" of the slabs. To mitigate this possibility, a combination of soil presaturation and construction of a perimeter "cut off" wall should be employed.

   All slab foundation areas should be moisture conditioned to at least optimum moisture, but no more than 5 percent above optimum moisture for a depth of at least 12 inches below subgrade low EI soil, and 18 inches for medium EI soil. A continuous perimeter curtain wall should extend to a depth of at least 12 inches below exterior grade for low EI soil, and 18 inches for medium EI soil to preserve this moisture. The cut-off walls may be integrated into the slab design or independent of the slab and should be a minimum of 6 (six) inches wide.

2. **Post-Tensioning Institute Method**

   Post-tensioned slabs should have sufficient stiffness to resist excessive bending due to non-uniform swell and shrinkage of subgrade soils. The differential movement can occur at the corner, edge, or center of slab. The potential for differential uplift can be evaluated using design specifications of the Post-Tensioning Institute. The following table presents suggested minimum coefficients to be used in the Post-Tensioning Institute design method.

<table>
<thead>
<tr>
<th>Suggested Coefficients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thornthwaite Moisture Index</td>
</tr>
<tr>
<td>Depth to Constant Soil Suction</td>
</tr>
<tr>
<td>Constant Soil Suction: (pf)</td>
</tr>
</tbody>
</table>

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The coefficients are considered minimums and may not be adequate to represent worst case conditions such as adverse drainage, excess watering, and/or improper landscaping and maintenance. The above parameters are applicable provided structures have gutters and downspouts, yard drains, and positive drainage is maintained away from structure perimeters. Also, the values may not be adequate if the soils below the foundation become saturated or dry such that shrinkage occurs. The parameters are provided with the expectation that subgrade soils below the foundations are maintained in a relatively uniform moisture condition. Responsible irrigation of landscaping adjacent to the foundation must be practiced since over-irrigation of landscaping can cause problems. Therefore, it is important that information regarding drainage, site maintenance, settlements and affects of expansive soils be considered.

Based on the above parameters, the following values were obtained from the Pct Tensioning Institute Design manual. If a stiffer slab is desired, higher values of $y_m$ may be warranted.

<table>
<thead>
<tr>
<th>Expansion Index of Soil Subgrade</th>
<th>Low El</th>
<th>Medium El</th>
</tr>
</thead>
<tbody>
<tr>
<td>$e_m$ center lift</td>
<td>9.0 feet</td>
<td>8.5 feet</td>
</tr>
<tr>
<td>$e_m$ edge lift</td>
<td>4.7 feet</td>
<td>4.5 feet</td>
</tr>
<tr>
<td>$Y_m$ center lift</td>
<td>0.34 inch</td>
<td>0.56 inch</td>
</tr>
<tr>
<td>$Y_m$ edge lift</td>
<td>0.48 inch</td>
<td>0.77 inch</td>
</tr>
</tbody>
</table>

Deepened footings/edges around the slab perimeter must be used as indicated above to minimize non-uniform surface moisture migration (from an outside source) beneath the slab. An edge depth of at least 12 inches should be considered for low El soil and 18 inches for medium El soil. The bottom of the deepened footing/edge should be designed to resist tension, using cable or reinforcement per the Structural Engineer.
Retaining Walls

The following recommendations should be followed for retaining wall design and construction:

The equivalent fluid pressures recommended are based on the assumption of a uniform backfill and no build-up of hydrostatic pressure behind the wall. To prevent the build-up of lateral soil pressures in excess of the recommended design pressures, overcompaction of the fill behind the wall should be avoided. This can be accomplished by placement of the backfill above a 45-degree plane projected upward from the base of the wall, in lifts not exceeding eight inches in loose depth and compacting with hand-operated or small, self-propelled vibrating plates. (Note: Placement of free-draining material in this zone could also prevent the build-up of lateral soils pressures). All walls must conform to City of Malibu Building Code setback requirements.

1. **Conventional (Yielding) Retaining Walls**

   All recommendations for active lateral earth pressures contained herein assume that the anticipated retaining structures are in tight contact with the competent materials that they are supposed to support. The earth support system must be sufficiently stiff to hold horizontal movements in the soil to less that one percent of the height of the vertical face, but should be free-standing to the point that they yield at the top at least 0.1 percent of the height of the wall.

2. **Earth Pressure on Conventional Retaining Walls**

   The earth pressures of walls retaining self-draining, granular materials, compacted fill or undisturbed bedrock material shall be assumed equal to that exerted by an equivalent fluid having a density not less than shown in the following table:
3. **Restraint (Non-Yielding) Walls**

Earth pressures will be greater on walls where yielding at the top of the wall is limited to less than 1/1000 the height of the wall either by stiffness (i.e., return walls, etc.) or structural floor network prior to backfilling. Utilizing the recommended backfill compaction of 90 percent Modified Proctor Density per ASTM D-1557-12, we recommend the following equivalent fluid density for non-yielding walls:

<table>
<thead>
<tr>
<th>Backfill Slope (Horizontal to Vertical)</th>
<th>Equivalent Fluid Density (pcf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>45</td>
</tr>
<tr>
<td>5:1</td>
<td>46</td>
</tr>
<tr>
<td>4:1</td>
<td>47</td>
</tr>
<tr>
<td>3:1</td>
<td>48</td>
</tr>
<tr>
<td>2:1</td>
<td>50</td>
</tr>
</tbody>
</table>

4. **Wall Seismicity**

The current seismic design criteria for this project is as follows:

From NavFac: \[ P_e = \frac{3}{8} \gamma H^2 K_n \]

\[ K_n = 0.2 \]

\[ \gamma = 120 \text{ pcf} \]

\[ P_e = \frac{3}{8}(120 \text{ pcf})(0.2)H^2 = 9H^2 \]

\[ P_e \text{ acts at } 0.6H \text{ above the wall base.} \]

5. **General**

a. Any anticipated, superimposed loading (i.e., upper retaining walls, other structures, etc.) shall be considered in the wall design per Figures 11 and 12 of the NavFac manual.
b. If water is allowed to saturate the backfill, the lateral pressure could exceed the active pressure recommended. Clayey or expansive soils should not be used for backfilling behind retaining walls.

c. A vertical component equal to one-third of the horizontal force so obtained may be assumed at the plane of application of force.

The depth of the retained earth shall be the vertical distance below the ground surface, measured at the wall face for stem design or measured at the heel of the footing for overturning and sliding.

d. The walls should be constructed with a minimum 4-inch perforated drainpipe in a gravel envelope at the bottom and behind the wall. A one-foot thick zone of crushed gravel should be placed behind the wall to within two feet of the surface. On-site soil may be used for the remainder of the backfill and should be compacted to 90 percent relative compaction as determined by ASTM Test Designation D-1557-12. All proposed subterranean walls should be waterproofed and back drained (see Figure 2).

e. A concrete-lined swale is recommended to be placed behind retaining walls that can intercept surface runoff from upslope areas. This surface runoff shall be transferred to an approved drainage channel via non-erosive drainage devices.

Deepened Foundation

Deepened foundations may be to meet slope setback requirements for structures located along the top of slopes. The piles should be designed by the Project Structural Engineer.

Setback Requirements: Structures adjacent to slopes shall meet the City of Malibu setback requirements.

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BACKFILLED WALL

NOTE NO. 1 - IF WET CONDITIONS RENDER ON-SITE SOIL UNSUITABLE FOR REQUIRED DEGREE OF COMPACTION, BACKFILL THE ZONE SHOWN ABOVE WITH FREE DRAINING GRANULAR SOIL WITH NOT MORE THAN 5% (BY WEIGHT) MINUS 3/4" PORTION PASSING NO. 200 SIEVE (BY WET SIEVING) WITH NO PLASTIC FINES.

NOTE NO. 2 - FREE DRAINING GRANULAR MATERIAL BENEATH FLOOR SLAB SHOULD BE HYDRAULICALLY CONNECTED TO THE FOOTING DRAIN.
Pile Type: In our opinion, support for the proposed structure may be derived from drilled cast-in-place, reinforced concrete piles (i.e., caissons) designed for frictional resistance.

Bearing Soils and Tip Depths: We recommend that all piles extend a sufficient depth to develop adequate compressive, uplift, and lateral capacity. We recommend that all piles extend a minimum depth of 5 feet below the required setback requirement plane into the underlying terrace deposits. The pile loading for the proposed structures was not available at the time of report submittal; therefore, anticipated pile depths cannot be estimated and should be reviewed by GSC prior to construction.

Pile Capacity - Compressive Frictional Resistance: An allowable frictional resistance of 600 pounds per square foot, per foot of depth into competent terrace deposits should be used for pile design.

Pile Capacity - Lateral (Preliminary): Lateral loads, which may be imposed on the piles by wind or seismic forces, are resisted primarily by the horizontal bearing support of soils adjacent to the pile shafts. The lateral capacity of a pile depends on its length, stiffness in the direction of loading, and degree of fixity at the head, as well as on the adjacent soil properties.

For preliminary design purposes, the passive earth pressures for terrace material may be computed as an equivalent fluid having a density of 200 pounds per cubic foot (pcf), with a maximum earth pressure of 2,000 pounds per square foot (psf). The lateral capacity of each individual pile is a function of the length and diameter; therefore, once the structural engineer has determined the required pile loading for the proposed structures, the lateral pile capacities should be reevaluated by GSC.
Pile Strength: The allowable pile capacities are derived from the supporting strength of the soil, which could exceed the structural strength of the pile itself, therefore, the structural strength of the pile should be considered to pre-empt the allowable soil bearing capacity. The project structural engineer should verify that the compressive and tensile strength of the concrete pile could accommodate the recommended capacities.

Estimated Settlements: We estimate that total post-construction settlements of pile-supported structural elements will not exceed \( \frac{1}{2} \) inch. Differential settlements between adjacent piles could approach \( \frac{3}{4} \) inch.

Additional Lateral Resistance: Besides the aforementioned lateral resistance provided by the pile shafts, additional resistance is provided by passive earth pressure acting against other embedded structural elements. We recommend using the values shown in Table I for allowable passive pressure (equivalent fluid weight) and coefficient of friction, which is in addition to the passive lateral pressure. The above values may be increased by one-third for short duration wind and seismic forces.

When combining passive pressure and frictional resistance the passive component should be reduced by one-third. For design of isolated piles, the allowable passive pressure may be increased by 100 percent.

<table>
<thead>
<tr>
<th>Soil Type</th>
<th>Allowable Passive Pressure (pcf)</th>
<th>Maximum Allowable Passive Pressure (psf/ft)</th>
<th>Coefficient of Friction (Concrete/soil)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terrace Deposits</td>
<td>200</td>
<td>2000</td>
<td>0.30</td>
</tr>
</tbody>
</table>

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**Surface Water Control:** All surface water should be collected and conducted to the street or approved watercourse via non-erosive devices.

**Inspection - General:** We recommend that the Geotechnical Engineer or Geologist be present in the field during construction to confirm the soil conditions prior to steel and concrete placement. The City Inspector should also observe the excavation.

**Concrete Placement:** In lieu of removing standing water in the pile excavation prior to placing concrete (i.e., pumping water), the concrete may be placed by the tremmie method to displace collected water. The solid tremmie tube shall be long enough to reach to bottom of the excavation. When concrete is being placed, the solid tremmie tube must be kept full of concrete at all times, with the lower end emersed in the concrete just deposited. The concrete shall at no time be placed through the water.

When water is present at the bottom of the drilled pile holes to a depth of 3 inches or more, a concrete mix with strength of 1,000 pounds per square inch over the design strength, shall be tremmied up from the bottom. An admixture that reduces the problem of segregation of paste/aggregates and dilution of paste shall be included.

**Drilling Safety:** The following drilling safety guidelines should be followed during pile installation:

- It is the Contractor's responsibility to provide a safe working area during drilling operations;
- The Geotechnical Engineer should observe all excavations to verify that the caissons are founded at the required depth and recommended bearing material;

GeoSoils Consultants Inc.
• All drilled piles should be adequately covered if the excavation is not poured immediately after excavation.

**GRADING GUIDELINES**

These specifications present the usual and minimum requirements for grading operations performed under the control of GeoSoils Consultants, Inc.

No deviation from these specifications *would* be allowed, except where specifically superseded in the preliminary geology and geotechnical report, or in other written communication signed by the Geotechnical Engineer or Engineering Geologist.

1. **General**
   
   A. The Geotechnical Engineer and Engineering Geologist is the Owner's or Builder's representative on the project. For the purpose of these specifications, supervision by the Geotechnical Engineer or Engineering Geologist includes that inspection performed by any person or persons employed by, and responsible to, the licensed Geotechnical Engineer or Engineering Geologist signing the Geotechnical report.

   B. All clearing, site preparation or earthwork performed on the project *should* be conducted by the Contractor under the observation of the Geotechnical Engineer or Engineering Geologist.

   C. It is the Contractor's responsibility to prepare the ground surface to receive the fills to the satisfaction of the Geotechnical Engineer or Engineering Geologist and to place, spread, mix, water, and compact the fill in accordance with the specifications of the Geotechnical Engineer or Engineering Geologist. The Contractor *should* also remove all material considered unsatisfactory by the Geotechnical Engineer or Engineering Geologist.
D. It is also the Contractor's responsibility to have suitable and sufficient compaction equipment on the jobsite to handle the amount of fill being placed. If necessary, excavation equipment would be shut down to permit completion of compaction. Sufficient watering apparatus would also be provided by the Contractor, with due consideration for the fill material, rate of placement and time of year.

E. A final report should be issued by the Geotechnical Engineer and Engineering Geologist attesting to the Contractor's conformance with these specifications.

F. At all times, safety will have precedence over production work. All municipal, State, and Osha Safety guidelines should be allowed beneath unshored vertical cuts, within unshored trenches with vertical walls in excess of four feet high, or in any unsafe working environment. If an unsafe job condition is noted by a GeoSoils Consultants, Inc. representative, it would be brought to the attention of the Grading Contractor's foreman, the on-site developer's representative, or both. Once this condition is noted, it should be corrected as soon as possible, or work related to the unsafe condition may be terminated.

2. Site Preparation

A. All vegetation and deleterious material, such as rubbish, should be disposed of off-site. This removal must be conducted prior to placing fill.

B. The Contractor should locate all subsurface features (i.e. sewage disposal systems, basements, pipelines, wells, etc.) on the site, or on the grading plan, to the best of his knowledge prior to preparing the ground surface.
C. Soil or rock materials determined by the Geotechnical Engineer as being unsuitable for placement in compacted fills should be removed and wasted from the site. Any material incorporated as a part of a compacted fill must be approved by the Geotechnical Engineer.

D. After the ground surface to receive fill has been cleared, it should be scarified, disced, or bladed by the Contractor until it is uniform and free from ruts, hollows, hummocks or other uneven features which may prevent uniform compaction.

The scarified ground surface should then be brought to at least optimum moisture, but not more than 120 percent of optimum moisture, mixed as required, and compacted as specified. If the scarified zone is greater than 12 inches in depth, the excess should be removed and placed in lifts restricted to 6 to 8 inches.

Prior to placing fill, the ground surface to receive fill should be inspected and approved by the Geotechnical Engineer.

E. Any underground structures such as cesspools, cisterns, mining shafts, tunnels, septic tanks, wells, pipelines or other not located prior to grading are to be removed or treated in a manner prescribed by the Geotechnical Engineer.

3. **Compacted Fills**

A. Material imported or excavated on the property may be utilized in the fill, provided such material has been determined to be suitable by the Geotechnical Engineer. Roots, tree branches and other deleterious matter missed during clearing should be removed from the fill as directed by the Geotechnical Engineer.
B. Unless otherwise prohibited by the governing code, rock, brick, concrete, or asphalt fragments less than six inches in diameter may be utilized in the fill, provided:

1. they are not placed in concentrated pockets;
2. there is a sufficient percentage of fine-grained material to surround the rocks;
3. the distribution of the rocks is supervised by the Geotechnical Engineer.

C. Rocks greater than six inches in diameter should be taken off-site, or placed in accordance with the recommendations of the Geotechnical Engineer in fill areas designated as suitable for rock disposal.

D. Material that is spongy, subject to decay, or otherwise considered unsuitable should not be used in the compacted fill.

E. Representative samples of materials to be utilized as compacted fill should be analyzed in the laboratory by the Geotechnical Engineer to determine their physical properties. If any material other than that previously tested is encountered during grading, the appropriate analysis of this material should be conducted by the Geotechnical Engineer as soon as possible.

F. Material used in the compacting process should be evenly spread in thin lifts not to exceed 6 to 8 inches in thickness, watered, processed and compacted to obtain a uniformly dense layer. The fill should be placed and compacted on a horizontal plane, unless otherwise approved by the Geotechnical Engineer. This includes material placed for slope repairs, and utility trench backfills on slope areas.
G. Each layer should be compacted to at least a minimum of 90 percent of the maximum density in compliance with the testing method specified by the controlling governmental agency (in general, ASTM D-1557-12 would be used). For all fills greater than 40 feet in vertical thickness, the portion of the fill below a depth of 40 feet should be placed at a relative compaction of at least 95 percent.

If compaction to a lesser percentage is authorized by the controlling governmental agency because of a specific land use or geotechnical condition, the area to receive fill compacted to less than 90 percent should either be delineated on the grading plan or appropriate reference made to the area in the geotechnical report.

H. All fill must be brought to a moisture content of at least optimum moisture, but should not exceed 120 percent of optimum moisture. If excessive moisture in the fill results in failing tests or an unacceptable "pumping" condition, then the fill should be allowed to dry until the moisture content is within the necessary range to meet above compaction requirements, or should be removed or reworked until acceptable conditions are obtained.

I. If the moisture content or relative compaction varies from that required by the Geotechnical Engineer, the Contractor should rework the fill until it is in accordance with the requirements of the Geotechnical Engineer. If a compaction test indicates that the fill meets or exceeds the minimum required relative compaction but is below optimum moisture content, then the fill should be reworked until it meets the moisture content requirements.
J. All fills should be keyed and benched through all topsoils, slopewash, alluvium or creep affected or other unsuitable materials, into sound bedrock or firm material where the slope receiving fill is steeper than a ratio of five horizontal to vertical (i.e., in accordance with the recommendations of the Geotechnical Engineer). The standard acceptable bench height is four feet into suitable material.

K. The key for sidehill fills should be a minimum of 20 feet within bedrock or firm materials, unless otherwise specified by the Geotechnical Engineer.

L. Drainage terraces and subdrainage devices should be constructed in compliance with the ordinances of the controlling governmental agency, or with the recommendations of the Geotechnical Engineer and Engineering Geologist.

M. The Contractor will be required to obtain a minimum relative compaction of 90 percent out to the finish slope face of all fill slopes. This may be achieved by either overbuilding the slope a minimum of five feet, and cutting back to the compacted core, or by direct compaction of the slope face with suitable equipment, or by any other procedure which produces the required compaction.

If a method other than overbuilding and cutting back to the compacted core is to be employed, slope tests would be made by the Geotechnical Engineer during construction of the slopes to determine if the required compaction is being achieved. Each day the Contractor will receive a copy of the Geotechnical Engineer's "Daily Field Engineering Report" which will indicate the results of field density tests for that day. Where failing tests occur or
other field problems arise, the Contractor may be notified of such conditions by written communication from the Geotechnical Engineer in the form of a conference memorandum, to avoid any misunderstanding arising from oral communication.

If the method of achieving the required slope compaction selected by the Contractor fails to produce the necessary results, the Contractor should rework or rebuild such slopes until the required degree of compaction is obtained, at no additional cost to the Owner or Geotechnical Engineer.

N. All fill slopes should be planted or protected from erosion by methods specified in the geotechnical report, or required by the controlling governmental agency.

O. Fill-over-cut slopes should be properly keyed through topsoil, colluvium or creep material into firm materials, and the transition should be stripped of all soil prior to placing fill. The fill portion of the slope should be founded on a key to be determined by the Geotechnical Engineer.

4. **Cut Slopes**

A. The Engineering Geologist should observe all cut slopes excavated in rock, lithified, or formation material at vertical intervals not exceeding ten feet.

B. If any conditions not anticipated in the preliminary report such as perched water, seepage, lenticular or confined strata of a potentially adverse nature, unfavorably inclined bedding, joints or faults planes, or areas of unstable material are encountered during grading, these conditions should be analyzed by the Engineering Geologist and Geotechnical Engineer, and recommendations should be made to treat these problems.
C. Cut slopes that face in the same direction as the prevailing drainage should be protected by a non-erosive interceptor swale placed at the top of the slope.

D. Unless otherwise specified in the geotechnical and geological report, no cut slopes should be excavated higher or steeper than that allowed by the ordinances of controlling governmental agencies.

E. Drainage terraces should be constructed in compliance with the ordinances of controlling governmental agencies, or with the recommendations of the Geotechnical Engineer or Engineering Geologist.

5. **Grading Control**

A. Inspection of the fill placement should be provided by the Geotechnical Engineer during the progress of grading.

B. In general, density tests should be made at intervals not exceeding two vertical feet of fill height or every 500 to 1000 cubic yards of fill placed. These criteria will vary depending on soil conditions and the size of the job. In any event, an adequate number of field density tests should be made to verify that the required compaction is being achieved.

C. Density tests should also be made on the surface material to receive fill as required by the Geotechnical Engineer.
D. All cleanout, processed ground to receive fill, key excavations, subdrains and rock disposal should be inspected by the Geotechnical Engineer prior to placing any fill. It should be the Contractor's responsibility to notify the Geotechnical Engineer when such areas are ready for inspection.

In most jurisdictions, these items must also be inspected by a representative of the controlling governmental agency prior to fill placement.

6. Construction Considerations

A. Erosion control measures, when necessary, should be provided by the Contractor during grading and prior to the completion and construction of permanent drainage controls.

B. Upon completion of grading and termination of inspections by the Geotechnical Engineer, no further filling or excavating, including that necessary for footings, foundations, large tree wells, retaining walls, or other features should be performed without observation of the Geotechnical Engineer or Engineering Geologist.

C. Care should be taken by the Contractor during final grading to preserve any berms, drainage terraces, interceptor swales, or other devices of a permanent nature on or adjacent to the property.

Temporary Excavation

Where the necessary space is available, temporary unsurcharged embankments may be sloped back without shoring. The slope should not be cut steeper than the following gradient:
<table>
<thead>
<tr>
<th>Height</th>
<th>Temporary Gradient (Horizontal:Vertical)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 5'</td>
<td>Near-Vertical</td>
</tr>
<tr>
<td>&gt;5'</td>
<td>1:1</td>
</tr>
</tbody>
</table>

In areas where soils with little or no binder are encountered, shoring or flatter excavation slopes shall be made.

These recommended temporary excavations do not preclude local raveling or sloughing.

All applicable requirements of the California Construction and General Industry Safety Orders, the Occupational Safety and Health Act, and the Construction Safety Act should be met.

Where sloped embankments are used, the top of the slope should be barricaded to prevent equipment and heavy storage loads within five feet of the top of the slope. If the temporary construction embankments are to be maintained for long periods, berms should be constructed along the top of the slope to prevent runoff water from eroding the slope faces.

Our personnel should observe the soils exposed in the temporary backcut slopes during excavation so that modifications of the slopes can be made if variations in the soil conditions occur.

**Drainage/Landscape Maintenance**

Water should not be allowed to pond or seep into the ground, or flow over slopes in a concentrated manner. Roof gutters and yard drains should be provided. Pad drainage should be directed toward the street or any approved watercourse area swale via non-erosive channel, pipe and/or dispersion devices.

Surface water should not be allowed to drain towards a descending slope, as it may locally have an adverse affect on surficial slope stability. Likewise, over watering should also be avoided near slope areas, as it too may have a deleterious effect of surficial slope stability.
LIMITATIONS

The findings and recommendations of this report were prepared in accordance with generally accepted professional geotechnical engineering principles and practice for the City of Malibu at this time. We make no other warranty, either express or implied. The conclusions and recommendations contained in this report are based on site conditions disclosed in our subsurface investigation and the referenced reports. However, soil/rock conditions can vary significantly between borings, test pits, and natural outcrops, therefore, further refinements of our recommendations contained herein may be necessary due to changes in the building plans or what is encountered during site grading.

The recommendations provided in this report are applicable for preliminary development planning for the subject project provided that surface water will be kept from infiltrating into the subgrade adjacent to the house foundation systems. This may include, but not be limited to rain water, roof water, landscape water and/or leaky plumbing. The site is to be fine graded at the completion of construction to include positive drainage away from the structures and roof water will be collected via gutters, downspouts, and transported to the street in buried drainpipes.

Since our investigation was based on the site conditions observed, selective laboratory testing, and engineering analysis, the conclusions and recommendations contained herein are professional opinions. Further, these opinions have been derived in accordance with standard engineering practices, and no warranty is expressed or implied.

If the conditions encountered during grading are not consistent with the findings presented in this report, or if proposed construction is moved from the location investigated, this office shall be notified immediately so that the condition or change can be evaluated and appropriate action taken.
CLOSURE

We appreciate this opportunity to be of continued service to you. If you have any questions regarding the content of this report or any other aspects of the project, please do not hesitate to contact us.

Very truly yours,

GEOSOILS CONSULTANTS, INC.

KAREN L. MILLER
GE 2257

RUDY F. RUBERT
CEG 1708

GEORGE C. EDWARDS
Staff Geologist

KLM.RFR.GCE.W.G&G Eng Rpt, Prop Malibu Memorial Cemetery

Encl: References
- City of Malibu Approval Letter dated June 7, 2012
- Plate 1, Geologic Map
- Plate 2, Geologic Cross-Sections
- Table A, Foundation and Slab Recommendations
- Appendix A, Field Exploration Procedures
  - Plates A-1 through A-10, Boring Logs
- Appendix B, Laboratory Test Procedures and Results
  - Plates SH-1 through SH-13, Shear Test Diagrams
  - Plates C-1 through C-6, Consolidation Diagrams
- Appendix C, Boring Logs and Laboratory Test Results by Leighton and Associates
- Appendix D, Boring Logs and Laboratory Test Results by Van Beveren and Butelo
- Appendix E, Temporary Slope Stability Analyses

cc: (5) Addressee

GeoSoils Consultants Inc.
REFERENCES

1. Association of Engineering Geologist dated 1982, "Geologic Maps, Santa Monica Mountains, Los Angeles, California", compiled by the City of Los Angeles.

2. California Code of Regulations, Title 14, Article 10, Section 3721, Seismic Hazards Mapping, Division of Mines and Geology.


7. Dibblee, T.W., 1993, "Geologic Map of the Malibu Beach Quadrangle, Los Angeles County, California"


REFERENCES (cont’d)


15. GeoSoils Consultants, Inc., dated May 6, 2013, “Response to City of Malibu Geotechnical and Hydrogeologic Review Sheet dated April 26, 2013, Regarding Onsite Wastewater Treatment System (OWTS), Rancho Malibu Resort, Tentative Tract Map 69653, 4000 Malibu Canyon Road, Malibu, California”


REFERENCES (cont'd)

19. Leighton and Associates, Inc., dated February 6, 1990, “Response to Geologic and Geotechnical Engineering Review Sheets (Grading Plan Check No. 1811), By the Department of Public Works, Land Development Division, For Rancho Malibu Hotel, 3930 Malibu Canyon Road, Malibu, California”


GEOTECHNICAL REVIEW SHEET

Date: June 7, 2012
Project Information
Site Address: 4000 Malibu Canyon Road
Lot/Tract/PM #: n/a
Applicant/Contact: Bruce McBride, bmcbride@pda-11c.net
Contact Phone #: Fred Gaines, fgaines@gaineslaw.com
Project Type: Rancho Malibu Resort Development

Review Log #: 3276
Planning #: CDP 11-028
BPC/GPC #: Planner: Stefanie Edmondson

Submittal Information
Consultant(s)/Report Date(s): GeoSoils Consultants, Inc. (Miller, GE 2257; Ruberti, CEG 1708):
(5-21-12, 1-27-12, 9-15-11)
5-21-12, 1-27-12, 9-15-11
Van Beveren & Butelo, Inc. (Butelo, CEG 1315; Langhaar, RGE 2647):
9-27-07
Roy J. Shlemon & Associates, Inc. September 2007 (Included as
Appendix D in the referenced Van Beveren & Butelo report)
Hotel plans prepared by Hill Glazier Studio dated May 19, 2011.

References reviewed by the Consultant:
Leighton and Associates, Inc.: 3-28-90, 2-6-90, 8-4-89

Previous Reviews:
5-7-12, 10-18-11, Geotechnical Review Referral Sheet dated 6-21-11, 10-
21-07; Ref: Los Angeles County reviews dated 3-6-90, 3-1-90, 12-8-89,
11-29-89

Review Findings
Coastal Development Permit Review
☒ APPROVED from a geotechnical perspective.
☐ NOT APPROVED from a geotechnical perspective. The listed ‘Review Comments’ shall be
addressed prior to approval.

Building/Grading Plan-Check Stage Review
☒ Awaiting Building plan check submittal. Please respond to the listed ‘Building Plan-Check Stage
Review Comments’ AND review and incorporate the attached ‘Geotechnical Notes for Building Plan
Check’ into the plans.
☐ APPROVED from a geotechnical perspective. Please review the attached ‘Geotechnical Notes for
Building Plan Check’ and incorporate into Building Plan-Check submittals.

Guidelines for geotechnical reports (dated February 2002) are available on the City of Malibu web site:
http://www.d.malibu.ca.us/index.cfm?FuseAction=nav&navid=30
Fugro Project #: 3399.001
NOT APPROVED from a geotechnical perspective. The listed ‘Building Plan-Check Stage Review Comments’ shall be addressed prior to Building Plan Check Stage approval.

Remarks

The referenced response report was reviewed by the City from a geotechnical perspective. The project comprises a new hotel resort, consisting of a 167,062 square foot 3-story main hotel building with a basement (includes a spa and fitness center), a 165,259 square foot parking structure, swimming pool/spa, 21 individual casitas totaling 177,736 square feet, retail and surface parking, access roads, drives, and fire lanes, storm drains and utilities, retaining walls, and landscaping/flatwork. Grading will consist of 54,000 yards of R & R; 156,700 yards of exempt understructure grading; 5,120 yards of exempt safety grading for the fire department; and 50,380 yards of non-exempt grading. 189,760 yards will be exported. Shoring will be required for the basement and parking structure excavations.

The applicants have submitted an application for a new OWTS to City geotechnical/hydrogeologic staffs for review. Comments will be provided by City staff in a separate review letter.

NOTICE: Applicants shall be required to submit all Geotechnical reports reviewed by City Geotechnical Staff for this specific proposed project as a searchable PDF file on a CD at the time of Building Plan Check application.

Building Plan-Check Stage Review Comments:

1. Please show the Stream Terrace Deposits on Cross-Sections C, D, and G. Are the stream terrace deposits displaced across the landslide?

2. Please depict limits and depths of over-excavation and structural fill to be placed on the grading plan, and cross sectional view of the proposed building area. Cut and fill yardages are to be indicated on the cover sheet of the plans.

3. Two sets of final grading, OWTS, swimming pool, and foundation plans for the proposed hotel, parking structure, and casitas (APPROVED BY BUILDING AND SAFETY) incorporating the Project Geotechnical Consultant’s recommendations and items in this review sheet must be reviewed and wet stamped and manually signed by the Project Engineering Geologist and Project Geotechnical Engineer. City geotechnical staff will review the plans for conformance with the Project Geotechnical Consultants’ recommendations and items in this review sheet over the counter at City Hall on Mondays through Thursdays between 8 AM and 10 AM.

Please direct questions regarding this review sheet to City Geotechnical staff listed below.

Engineering Geology Review by:

Christopher Dean, C.E.G. #1751, Exp. 9-30-12
Engineering Geology Reviewer (310-456-2489, x306)

Date: 6/11/12

Geotechnical Engineering Review by:

Kenneth Clements, G.E. # 2010, Exp. 6-30-14
Geotechnical Engineering Reviewer (805-563-8909)
Email: kclements@fugro.com

June 7, 2012

This review sheet was prepared by City Geotechnical Staff contracted with Fugro as an agent of the City of Malibu.

FUGRO CONSULTANTS, INC.
4820 McGrath Street, Suite 100
Ventura, California 93003-7776
(805) 660-7000 (Ventura office)
(310) 456-2489, x306 (City of Malibu)
## TABLE A

**FOUNDATION AND SLAB RECOMMENDATIONS**

**ONE AND TWO-STORY RESIDENTIAL BUILDINGS**

<table>
<thead>
<tr>
<th></th>
<th>Expansion Index 0-50 Low Expansion</th>
<th>Expansion Index 61-90 Medium Expansion</th>
<th>Expansion Index 91-130 High Expansion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-Story Footings</td>
<td>All footings 12&quot; deep. Four No. 4 bars, two top and two bottom; footings continuous.</td>
<td>Exterior footings 18&quot; deep. Interior footings 15&quot; deep. Four No. 4 bars, two top and two bottom; footings continuous.</td>
<td>Exterior footings 24&quot; deep. Interior footings 18&quot; deep. Four No. 4 bars: two top and two bottom. Footings continuous.</td>
</tr>
<tr>
<td>2-Story Footings</td>
<td>All footings 18&quot; deep; continuous. Four No. 4 bars, two top and two bottom.</td>
<td>All footings 18&quot; deep; continuous. Four No. 4 bars, two top and two bottom.</td>
<td>All footings 24&quot; deep; continuous. Four No. 4 bars: two top and two bottom.</td>
</tr>
<tr>
<td>Garage Door Grade Beam</td>
<td>12&quot; deep. Four No. 4 bars, two top and two bottom.</td>
<td>18&quot; deep. Four No. 4 bars, two top and two bottom.</td>
<td>24&quot; deep. Four No. 4 bars: two top and two bottom.</td>
</tr>
<tr>
<td>Living Area Floor Slabs</td>
<td>4&quot; thick. No. 4 bars at 16&quot; both ways at mid-height. Six mil Visqueen vapor barrier sandwiched between, 1&quot; sand layers.</td>
<td>4&quot; thick. No. 4 bars at 16&quot; both ways at mid-height. Slab steel should be dowelled into exterior footings. Six mil Visqueen vapor barrier sandwiched between, 2&quot; sand layers.</td>
<td>4&quot; thick. No. 4 bars at 16&quot; both ways at mid-height. Six mil Visqueen vapor barrier sandwiched between two, 2&quot; sand layers. Slab steel should be dowelled into exterior footings.</td>
</tr>
<tr>
<td>Garage Floor Slabs</td>
<td>4&quot; thick. No. 4 bars at 16&quot; both ways at mid-height and ½ slabs. Isolate from stem wall footings. No moisture barrier required. 2&quot; sand base required.</td>
<td>4&quot; thick. No. 4 bars at 16&quot; both ways at mid-height and ½ slabs. Isolate from stem wall footings. No moisture barrier required. 4&quot; sand base required.</td>
<td>4&quot; thick. No. 4 bars at 16&quot; both ways at mid-height and ½ slabs. Isolate from stem wall footings. No moisture barrier required. 4&quot; sand base required.</td>
</tr>
<tr>
<td>Pre-soaking of Living Area and Garage Slab Soils</td>
<td>No pre-soaking required. Pre-moisten soil prior to pouring concrete.</td>
<td>Soak 18&quot; depth to 5½ above optimum moisture content.</td>
<td>Soak to 24&quot; depth to 5% above optimum moisture content.</td>
</tr>
</tbody>
</table>

**Note:**

An allowable soil bearing value of 1500 pounds per square foot, including dead and live loads, may be used for design of footings and foundation founded at the recommended depths. All footings should have a minimum width of 16 inches and should be continuous. A friction coefficient for concrete on natural and compacted soil of 0.4, and a lateral soils bearing value of 280 pounds per square foot, per foot of depth, may be employed to resist lateral loads. When combining passive pressure and frictional resistance, the passive pressure component should be reduced by one third.

If wire mesh is provided for slabs under Medium and High expansion soils, then No. 3 bars at 24" on center dowels should be provided in exterior footings and bent 3' into slabs. The bent bars are not allowed between floating slabs and footings.
APPENDIX A

FIELD EXPLORATION PROCEDURES
APPENDIX A

FIELD EXPLORATION PROCEDURES

Our exploratory borings were drilled with a truck-mounted drill rig operated by an independent drilling company working under subcontract to GSC. Four borings were drilled (designated B-1-11 through B-4-11) utilizing an 8-inch diameter hollow stem auger drill rig. Samples were obtained via the California ring sampler.

A geologist from our firm continuously observed the borings and classified the soils encountered by visual examination in accordance with the Unified Soil Classification System, and collected representative soil samples. Ring samples were obtained by driving a ring sampler with the Kelly bar. Soil samples were retained in a series of brass rings, each having an inside diameter of 2.36 (6.0 centimeter) and a height of 1.00 inch (2.54 centimeter). The ring samples were stored in close-fitting, moisture-tight containers and later transported to our laboratory for further visual examination and testing, as deemed necessary. After the boring was completed, the borehole was backfilled with soil cuttings.

The enclosed *Boring Logs* describes the vertical sequence of soils and materials encountered in each boring, based primarily on our field classifications and supported by our subsequent laboratory examination and testing. Where a soil contact was observed to be gradational, our log indicates the average contact depth. Where a soil type changed between sample intervals, we inferred the contact depth. Our log also graphically indicates the blow count, sample type, sample number, and approximate depth of each soil sample obtained from the borings, as well as any laboratory tests performed on these soil samples. If any groundwater was encountered in a borehole, the approximate groundwater depth is depicted on the boring log.
BORING LOGS
<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Sample Type</th>
<th>Blows/6 in.</th>
<th>Geotechnical Description</th>
<th>Moisture Content (%)</th>
<th>Dry Density (pcf)</th>
<th>Other Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-2'</td>
<td>Alluvium</td>
<td>50</td>
<td>Gray-brown, silty SAND, scattered gravel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-38'</td>
<td>Terrace</td>
<td>34/50</td>
<td>@ 10', Orange-brown, very fine to medium SAND, slightly moist, dense @ 10-20', Occasional pebble-cobbles</td>
<td>5.3</td>
<td>106.6</td>
<td>Cons</td>
</tr>
<tr>
<td>20'</td>
<td></td>
<td>50</td>
<td>@ 20', Orange-brown, very fine to medium SAND, slightly moist, dense</td>
<td>3.3</td>
<td>117.2</td>
<td>DS</td>
</tr>
</tbody>
</table>

**Legend**
- Standard Penetration Test
- California Ring
- Rock Core
- Bulk Sample
- Shelby Tube
- Water Seepage
- Groundwater

**Geotechnical Description**
- **0-2': Alluvium (Qai)**
  - Gray-brown, silty SAND, scattered gravel
- **2-38': Terrace (Qt)**
  - @ 10', Orange-brown, very fine to medium SAND, slightly moist, dense
  - @ 10-20', Occasional pebble-cobbles

**GeoSoils Consultants, Inc.**
Geotechnical + Geologic + Environmental
**GEOTECHNICAL DESCRIPTION**

<table>
<thead>
<tr>
<th>DEPTH (FT)</th>
<th>SAMPLE TYPE</th>
<th>BLOWS/6 IN.</th>
<th>OTHER TESTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-2'</td>
<td>ALLUVIUM (Qal)</td>
<td>Light brown, very fine to medium, sandy SILT, dry, loose</td>
<td></td>
</tr>
<tr>
<td>2-60'</td>
<td>TERRACE (Qt)</td>
<td>23/24/25, Orange-brown, very fine to medium SAND with gravel, slightly moist to dry (rock in sampler tip)</td>
<td></td>
</tr>
<tr>
<td>30/32/45</td>
<td></td>
<td>3.1</td>
<td></td>
</tr>
<tr>
<td>50 for 5''</td>
<td></td>
<td>5.0</td>
<td>122.3</td>
</tr>
<tr>
<td>50 for 3''</td>
<td></td>
<td>6.0</td>
<td></td>
</tr>
<tr>
<td>20'</td>
<td></td>
<td>20', No recovery</td>
<td></td>
</tr>
</tbody>
</table>

**LEGEND**

- Standard Penetration Test
- California Ring
- Rock Core
- Bulk Sample
- Shelby Tube
- Water Seepage
- Groundwater

**SIEVE:** GRAIN SIZE ANALYSIS
**MAX:** MAXIMUM DRY DENSITY
**DS:** DIRECT SHEAR
**CONS:** CONSOLIDATION
**HYDR:** HYDROMETER ANALYSIS
**EXPAN:** EXPANSION INDEX
**CHEM:** CHEMICAL TESTS

**GeoSoils Consultants, Inc.**
GEOTECHNICAL * GEOLOGIC * ENVIRONMENTAL
<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Sample Type</th>
<th>Blows/6 in.</th>
<th>Description</th>
<th>Moisture Content (%)</th>
<th>Dry Density (pcf)</th>
<th>Other Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>18/15/20</td>
<td></td>
<td></td>
<td>@ 30', Red-brown, slightly silty, very fine to coarse SAND, moist, dense</td>
<td>10.9</td>
<td>120.6</td>
<td>DS</td>
</tr>
<tr>
<td>18/33/45</td>
<td></td>
<td></td>
<td>@ 40', Red-brown, slightly silty, very fine to coarse SAND, moist, dense</td>
<td>7.0</td>
<td>130.0</td>
<td></td>
</tr>
<tr>
<td>33/50</td>
<td></td>
<td></td>
<td>@ 50', Red-brown, silty, very fine to medium SAND, minor clay, moist, dense</td>
<td>8.2</td>
<td>120.8</td>
<td></td>
</tr>
</tbody>
</table>
### Geotechnical Boring Log

**Project Name:** Green Acres  
**W.O. No.:** 6439  
**Drilling Company:** Choice  
**Date Started:** 9-6-11  
**Boring No.:** B-211  
**Sheet 3 of 3**  
**Type of Drill Rig:** LAR  
**Logged By:** RLC  
**Hammer Weight (Lbs):** 140  
**Drop (in):** 30  
**Ground Elevation (ft):**

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Sample Type</th>
<th>Blows/6 in</th>
<th>Moisture Content (%)</th>
<th>Dry Density (pcf)</th>
<th>Other Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>21/37/50 for 5&quot;</td>
<td>@ 60', Orange-brown, very fine to very coarse SAND, moist, slightly cemented, dense</td>
<td>7.8</td>
<td>123.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T.D. @ 60'</td>
<td>Nc groundwater</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Geotechnical Description**

---

**Legend**
- Standard Penetration Test
- California Ring Test
- Shelby Tube
- Water Seepage
- Groundwater
- SIEVE: Grain Size Analysis
- MAX: Maximum Dry Density
- DS: Direct Shear
- CONS: Consolidation
- HYDR: Hydrometer Analysis
- EXPAN: Expansion Index
- CHEM: Chemical Tests

**Plate A-5**

**GeoSoils Consultants, Inc.:**
Geotechnical • Geologic • Environmental
## GEOTECHNICAL BORING LOG

**PROJECT NAME:** Green Acres  
**W.O. NO.:** 6489  
**DATE STARTED:** 9-8-11  
**BORING NO.:** B-3-11  
**LOGGED BY:** RLC  
**TYPE OF DRILL RIG:** LAR  
**DRILLING METHOD:** Hollow Stem  
**DIAMETER OF HOLE:** 8  
**HAMMER WEIGHT (LBS):** 140  
**DROP (IN):** 30  
**GROUND ELEVATION (FT):**  
**GW ELEVATION:**  

### GEOTECHNICAL DESCRIPTION

<table>
<thead>
<tr>
<th>DEPTH (FT)</th>
<th>SAMPLE TYPE</th>
<th>BLOWS/6 IN.</th>
<th>MOISTURE CONTENT (%)</th>
<th>DRY DENSITY (pcf)</th>
<th>OTHER TESTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-2'</td>
<td>ALLUVIUM (Qai)</td>
<td>Gray-brown, sandy SILT, dry, loose</td>
<td>6.6</td>
<td>124.4</td>
<td>Cons</td>
</tr>
<tr>
<td>2-60'</td>
<td>TERRACE (Qt)</td>
<td>@ 5', Red-brown, silty, fine to medium SAND, scattered, very small gravel, slightly moist to moist, dense</td>
<td>7.3</td>
<td>123.7</td>
<td>Cons</td>
</tr>
<tr>
<td>15</td>
<td></td>
<td>@ 15', No recovery</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>20</td>
<td>50 for 5''</td>
<td>@ 20', Orange-brown, silty, very fine to medium SAND, moist, dense</td>
<td>6.8</td>
<td>120.5</td>
<td>---</td>
</tr>
<tr>
<td>25</td>
<td>35/50</td>
<td>@ 25', Orange-brown, silty, very fine to medium SAND, moist, dense</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

### LEGEND

- **Standard Penetration Test**
- **California Ring**
- **Rock Core**
- **Bulk Sample**
- **Shelby Tube**
- **Water Seepage**
- **Groundwater**

**GeoSoils Consultants, Inc.**
**GEOTECHNICAL • GEOLOGIC • ENVIRONMENTAL**

**PLATE A-6**
<table>
<thead>
<tr>
<th>DEPTH (FT)</th>
<th>SAMPLE TYPE</th>
<th>BLOWS/6 IN</th>
<th>MOISTURE CONTENT (%)</th>
<th>DRY DENSITY (pcf)</th>
<th>OTHER TESTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>29/32/44</td>
<td></td>
<td>4.1</td>
<td>123.3</td>
<td>Cons DS</td>
</tr>
<tr>
<td>45</td>
<td>26/50 for 5&quot;</td>
<td>@ 45, Light brown, very fine to medium SAND, moist, dense</td>
<td>3.3</td>
<td>106.2</td>
<td></td>
</tr>
<tr>
<td>55</td>
<td>36/37/50 for 2&quot;</td>
<td>@ 55, Light to medium brown, very fine to medium SAND, caliche veins, moist, dense</td>
<td>7.8</td>
<td>118.6</td>
<td>DS</td>
</tr>
</tbody>
</table>

**LEGEND**
- Standard Penetration Test
- California Ring
- Rock Core
- Bulk Sample

**SIEVE:** GRAIN SIZE ANALYSIS
**MAX:** MAXIMUM DRY DENSITY
**DS:** DIRECT SHEAR
**CONS:** CONSOLIDATION
**HYDR:** HYDROMETER ANALYSIS
**EXPAN:** EXPANSION INDEX
**CHEM:** CHEMICAL TESTS

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PLATE A-7
# GEOTECHNICAL BORING LOG

**PROJECT NAME**  Green Acres  
**DRILLING COMPANY**  Choice  
**DATE STARTED**  9-8-11  
**W.O. NO.**  6489  
**BORING NO.**  B-3-11  
**TYPE OF DRILL RIG**  LAR  
**LOGGED BY**  RLC  
**DRILLING METHOD**  Hollow Stem  
**HAMMER WEIGHT (LBS)**  140  
**DIAMETER OF HOLE**  8  
**DROP (IN)**  30  
**GROUND ELEVATION (FT)**  

## BORING LOCATION:

<table>
<thead>
<tr>
<th>DEPTH (FT)</th>
<th>SAMPLE TYPE</th>
<th>BLOWS/6 IN.</th>
<th><strong>GEOTECHNICAL DESCRIPTION</strong></th>
<th>MOISTURE CONTENT (%)</th>
<th>DRY DENSITY (lb/ft³)</th>
<th>OTHER TESTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>65</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>70</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>80</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>85</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- 50 for 3" @ 60', No recovery
- T.D. @ 60'
- No groundwater

---

## LEGEND

- Standard Penetration Test
- California Ring
- Rock Core
- Bulk Sample

- Shelby Tube
- Water Seepage
- Groundwater

- SIEVE: GRAIN SIZE ANALYSIS
- MAX: MAXIMUM DRY DENSITY
- DS: DIRECT SHEAR
- CONS: CONSOLIDATION
- HYDR: HYDROMETER ANALYSIS
- EXPAN: EXPANSION INDEX
- CHEM: CHEMICAL TESTS

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**PLATE A-8**
## Geotechnical Boring Log

**Project Name:** Green Acres  
**W.O. No.:** 6439  
**Drilling Company:** Choice  
**Date Started:** 9-8-11  
**Boring No.:** B-4-11  
**Logged By:** RLC  
**Sheet:** 1 of 2  
**Hammer Weight (Lbs):** 140  
**Drop (In):** 30  
**Ground Elevation (ft):**  
**Boring Location:**

### Geotechnical Description

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Sample Type</th>
<th>Blows/6 in.</th>
<th>Moisture Content (%)</th>
<th>Dry Density (pcf)</th>
<th>Other Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5'</td>
<td>ALLUVIUM (Qal)</td>
<td>5-30' BEDROCK: Vaqueros Formation</td>
<td>6.7</td>
<td>118.0</td>
<td>Max Expansivity</td>
</tr>
<tr>
<td></td>
<td>Medium brown-gray, silty SAND, dry to slightly moist, slightly dense</td>
<td>@ 5', Orange-gray, silty, fine SANDSTONE, moist, dense</td>
<td>17.5</td>
<td>104.6</td>
<td>DS</td>
</tr>
<tr>
<td>10-15'</td>
<td>15/17/18</td>
<td>13/18/25</td>
<td>33/36/49</td>
<td>@ 10', Orange-gray, sandy SILTSTONE to silty SANDSTONE, moist, dense</td>
<td>10.3</td>
</tr>
<tr>
<td>15-20'</td>
<td>@ 15', Brown-gray, silty SANDSTONE, carbonate veins, slightly cemented, moist, dense</td>
<td>@ 20', Gray-black, silty, fine SANDSTONE, carbonate veins, moderate cement, moist, dense</td>
<td>9.5</td>
<td>113.6</td>
<td>DS</td>
</tr>
<tr>
<td>20-25'</td>
<td>@ 25', Gray-green, very fine to medium SANDSTONE, small gravel, carbonate deposits, moderate cement, moist, very dense</td>
<td>9.1</td>
<td>111.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Legend:**
- Standard Penetration Test
- California Ring Test
- Shelby Tube
- Water Seepage
- Groundwater

**Sieve:** Grain Size Analysis  
**Max:** Maximum Dry Density  
**DS:** Direct Shear  
**Cons:** Consolidation  
**Hydr:** Hydrometer Analysis  
**Exp:** Expansion Index  
**Chem:** Chemical Tests  

---

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Geotechnical • Geologic • Environmental
<table>
<thead>
<tr>
<th>DEPTH (FT)</th>
<th>SAMPLE TYPE</th>
<th>BLOWS/6 IN.</th>
<th>GEOTEchnical DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>50 for 4&quot;</td>
<td>@ 30', Gray-green, very fine to medium SANDSTONE, small gravel, carbonate deposits, moderate cement, moist, very dense</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>50 for 4&quot;</td>
<td>T.D. @ 30', No groundwater</td>
<td></td>
</tr>
</tbody>
</table>

**LEGEND**
- Standard Penetration Test
- California Ring
- Rock Core
- Bulk Sample
- Shelby Tube
- Water Seepage
- Groundwater

**SIEVE:** GRAIN SIZE ANALYSIS
**MAX:** MAXIMUM DRY DENSITY
**DS:** DIRECT SHEAR
**CONS:** CONSOLIDATION
**HYDR:** HYDROMETER ANALYSIS
**EXPAN:** EXPANSION INDEX
**CHEM:** CHEMICAL TESTS
APPENDIX B

LABORATORY TEST PROCEDURES AND RESULTS
APPENDIX B

LABORATORY TEST PROCEDURES AND RESULTS

Moisture-Density

The field moisture content and dry unit weights were determined for each undisturbed ring sample obtained from our subsurface exploration. Once the dry unit weights had been determined, in-place densities of underlying soil profile were estimated. In those cases where ring samples were obtained, the moisture content and dry unit weights are presented on the Boring Logs B-1 through B-4.

Compaction Tests

Compaction tests were performed to determine to moisture density relationships of the typical surficial soils encountered on the site. The laboratory standard used was in accordance with ASTM Test Designation D-1557-02. A summary of the compaction test results is shown in Table B-1.

<table>
<thead>
<tr>
<th>Boring No. And Sample Depth</th>
<th>Description</th>
<th>Maximum Dry Density (psf)</th>
<th>Optimum Moisture (%)</th>
<th>Expansion Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-2 @ 5'</td>
<td>Reddish Brown, clayey, sandy SILT with gravel</td>
<td>125.5</td>
<td>11.0</td>
<td>Medium</td>
</tr>
<tr>
<td>B-3 @ 8-10&quot;</td>
<td>Reddish brown, clayey, sandy SILT with gravel</td>
<td>124.0</td>
<td>11.0</td>
<td>Medium</td>
</tr>
<tr>
<td>B-4 @ 5-10'</td>
<td>Brown, slightly sandy, clayey SILT with gravel</td>
<td>117.0</td>
<td>15.5</td>
<td>Medium</td>
</tr>
</tbody>
</table>

Direct Shear Tests

Shear tests were performed in a strain-control type Direct Shear Machine. The samples were sheared under varying confining loads in order to determine the Coulomb shear strength parameters: cohesion (c), and angle of internal friction (ϕ) for peak and residual strength conditions. The samples were tested in an artificially saturated condition. The
Appendix B

results are plotted and a linear approximation is drawn of the failure curve. Results are shown on the Shear Test Diagrams included with these appendices, as Plates SH-1 through SH-13. Shear tests performed on undisturbed ring samples are presented on Plates SH-1 to SH-10. Shear tests were performed on samples remolded to 90 percent relative compaction and the results are shown in Plates SH-11 through SH-13.

Consolidation Test

Consolidation tests were performed on selected ring samples to develop data for settlement studies. The tests were performed primarily on materials which would be considered to be most susceptible to consolidation under increased loading. Loads were applied to the sample in several increments in geometric progression, and the resulting deformation was recorded at selected time intervals. Porous stones were placed in contact with the top and bottom of each specimen to permit the release and addition of pore fluid. Inundation of the sample was performed at an approximate load one ton per square foot. Results of the consolidation test are shown on Plates C-1 through C-6.

Expansion Index Tests

To determine the expansion potential of the on-site soils, expansion index tests were performed. The results are included in the above table.
LABORATORY RESULTS
Shear Test Diagram

Peak
C(psf): 400 Phi (degrees): 39.0

Reshear
C(psf): 0 Phi (degrees): 36.0

Undisturbed Natural Shear-Saturated
Orange-brown, silty, very fine to fine SAND, w/ some coarse sand.
18.5% Saturated Moisture Content
Shear Test Diagram

Peak
C(psf): 320  Phi (degrees): 35.5

Reshear
C(psf): 50  Phi (degrees): 31.5

Undisturbed Natural Shear-Saturated

Light orange-brown, very fine to fine SAND.

21.9% Saturated Moisture Content
Shear Test Diagram
Peak
C(psf): 0  Phi (degrees): 57.0

Reshears
C(psf): 0  Phi (degrees): 52.5

Undisturbed Natural Shear-Saturated

Red-brown, silty, very fine to coarse SAND, w/ rock fragments.

18.7% Saturated Moisture Content
Shear Test Diagram

Peak
C(psf): 800  Phi (degrees): 40.0

Reshear
C(psf): 500  Phi (degrees): 30.0

Undisturbed Natural Shear-Saturated
Orange-brown, silty, sandy CLAY.
19.9% Saturated Moisture Content
Shear Test Diagram

Peak
C( psf): 860  Phi (degrees): 22.0

Reshear
C( psf): 750  Phi (degrees): 22.0

Undisturbed Natural Shear-Saturated
Orange-brown, sandy, slightly clayey SILT.
19.6% Saturated Moisture Content

Sample: B-3 @ 20.0'
Shear Test Diagram

Peak
C(psf): 0  Phi (degrees): 51.5

Reshear
C(psf): 0  Phi (degrees): 45.0

Undisturbed Natural Shear-Saturated
Orange-brown, silty, very fine to coarse SAND.

17.3% Saturated Moisture Content
Shear Test Diagram

Peak
C(ksf): 150  Phi (degrees): 42.5

Reshear
C(ksf): 150  Phi (degrees): 33.5

Undisturbed Natural Shear-Saturated
Orange-brown, sandy SILT.
17.1% Saturated Moisture Content
Shear Test Diagram

Peak
C(psf): 2580  Phi (degrees): 7.5

Reshear
C(psf): 690  Phi (degrees): 7.0

Normal Pressure (kpsf)
Shearing Strength (kpsf)

Direct Shear, Peak / Reshear Speed: .001 in./min.

○ Peak Values ○ Reshear Values

Undisturbed Natural Shear-Saturated
Orange-brown / green-brown, silty CLAY.
27.2% Saturated Moisture Content
Shear Test Diagram
Peak
C(psf): 850  Phi (degrees): 26.0

Reshear
C(psf): 600  Phi (degrees): 25.5

Undisturbed Natural Shear-Saturated
Brown, sandy SILT, w/ rock fragments.
25.0% Saturated Moisture Content
Shear Test Diagram

Peak
C(psf): 310  Phi (degrees): 41.5

Reshear
C(psf): 210  Phi (degrees): 41.5

Undisturbed Natural Shear-Saturated
Brown, sandy SILT, w/ rock fragments.
23.2% Saturated Moisture Content
Shear Test Diagram

Peak
C(psf): 170  Phi (degrees): 29.0

Reshear
C(psf): 170  Phi (degrees): 22.5

Sample Remolded to 90% Relative Density, Saturated.
Rem. Dry Density = 113.0 PCF

Red-brown, clayey, sandy SILT.

MAX: 126.5 PCF: 11.0%

17.7% Saturated Moisture Content
6469.11
Shear Test Diagram

Peak
C(psf): 170  Phi (degrees): 27.0

Reshear
C(psf): 120  Phi (degrees): 25.0

Direct Shear, Peak / Reshear Speed: .001 in./min.

Sample Remolded to 90% Relative Density, Saturated.
Remolded Dry Density = 111.8 PCF
Orange-brown, clayey, sandy SILT.
MAX: 124.0  PCF: 11.0%
15.6% Saturated Moisture Content
0490.12
Shear Test Diagram

Peak
C (psf): 320  Phi (degrees): 34.0

Reshear
C (psf): 300  Phi (degrees): 31.0

Sample Remolded to 90% Relative Density, Saturated.
Rem. Dry Density = 105.3 PCF
Brown, slightly sandy, clayey, sandy SILT.

MAX: 117  PCF: 15.5%
23.6% Saturated Moisture Content
6489.13
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Geotechnical Engineering * Engineering Geology

Load (tsf)

Water Added @ 1.0 tsf

Percent Consolidation

Consolidation Diagram

B-1 @ 10.0'
Orange-brown, sandy SILT.

C6489.1

Plate C-1
GeoSoils Consultants, Inc.
Geotechnical Engineering * Engineering Geology

Date of Test: 9/11

Load (tsf)

Percent Consolidation

Water Added @ 1.0 tsf

Sample (in.)
Height: 1.00  Diameter: 2.36

Moisture (%)
Before: 7.3  After: 13.8

Consolidation Diagram

B-3 @ 20.0'
Orange-brown, sandy, slightly clayey SILT.
GeoSoils Consultants, Inc.
Geotechnical Engineering * Engineering Geology

Consolidation Diagram

B-3 @ 35.0'
Orange-brown, silty, fine SAND.

Water Added @ 1.0 tsf
APPENDIX C

BORING LOGS AND LABORATORY TEST RESULTS

BY LEIGHTON AND ASSOCIATES
APPENDIX B

SUMMARY LOGS OF EXPLORATORY EXCAVATIONS

Boreholes B-1 through B-6, Inclusive

Type: 24" diameter bucket-auger
Contractor: Roy Brothers Drilling
Location: Refer to Revised Geologic Map

B-1 Drilled: 12/12/84. Elevation top of hole: 169'± (3' below natural grade).

0-28' Nonmarine terrace deposits: clayey to silty, fine- to medium-grained sand; rusty brown, damp to moist; some caliche stringers.

28'-38' Probable marine terrace deposits: pebbly medium- to coarse-grained sand; light brown, dry to damp; loose and caving. Hole cased from 8' to 38.5'.

38'-51' Monterey Formation: siliceous silty sandstone and silty claystone; gray, brown, iron-stained fracture surfaces, moist, some caliche and sheared clay surfaces. Bedding attitudes: N45E, 60SE @ 39.5°; N45E, 81SE @ 45°. Bulk sample obtained from 30' depth.

Total depth: 51'; no ground water encountered.

B-2 Drilled: 12/14/84. Elevation top of hole: 133'

0-2' Soil zone: fine- to medium-grained sandy clay, clayey sand; medium brown, moist.

2'-5' Probable marine terrace deposits: gravelly clayey sand; orange-brown, with some rounded cobbles.

5'-15' Monterey Formation: interbedded silty fine to medium-grained sandstone and cherty siliceous siltstone, light to dark brown, very fractured, locally weathered. Bedding attitudes: N57E, 62SE @ 6.5°; N52E 68SE @ 10°. Bulk sample obtained from 13' depth.

Total depth: 15'; no ground water or caving.

B-3 Drilled: 12/17/84. Elevation top of hole: 223'

0-19' Nonmarine terrace deposits: clayey fine sand, sandy clay, with some gravel and sandstone fragments @ 14.5'; light brown to red-brown, moist to very moist.

19'-30.5' Volcanic bedrock: clayey sandy silt with less weathered fragments of basaltic rock fragments; dark brown, olive-greenish brown, moist to very moist. Probable mixture of volcanic rock and sandstone. Boring not downhole logged due to seepage @ 23' and caving. Bulk sample obtained from 28' depth.

Total depth: 30.5'

B-1
B-4 Drilled: 1/28/85. Elevation top of hole: 176'  

0-2' Soil zone: Clayey sand, with some gravel and cobbles, dark brown, loose, porous, moist, abundant roots.  

2.44' Terrace deposits (nonmarine, grading to marine near base): sandy clay, reddish brown, mottled with dark brown; medium-grained sand with cobbles, loose, very friable @ depth; caving (hole cased from 4.5' to 45').  

44.60' Monterey Formation: interbedded clayey and siliceous siltstone; dark gray, black, highly fractured, broken, crudely bedded, with orange-brown iron staining and calcite veins along fractures. Some slickensides along bedding. Bedding/joint attitudes: JN36W, 81N @ 46°; BN36E, 70N @ 45°; JN36W, 685; BN64E, 73N @ 52°; BN88E, 76N @ 55°.  

Total depth: 60'. Water ponding at bottom of hole.  

B-5 Drilled: 2/6/85. Elevation top of hole: 183.5'  

0-45' Nonmarine terrace deposits: clayey sand, with horizontal layers or lenses of gravel and cobbles; brown to orange-brown, slightly porous, damp. Finer-grained sand, loose and friable below 15'.  

45-55.5' Probable marine terrace deposits: clayey sand; brown to orange-brown, with iron-stain mottling, loose and caving below 45' (hole cased from 14' to 54.5').  

55.5-81' Bedrock (probable Conejo* volcanics): sandy siltstone, siliceous siltstone, clayey siltstone; gray, brown, firm, damp, locally very hard (brecciated siliceous shale). Extensively sheared from 73'-79' on east side of hole; in massive clayey siltstone, with gypsum and calcite veins. Petroliferous odor below 73'. Minor seepage at 55.5'. Bulk samples obtained from 66' to 71' depth.  

Total depth: 81'  

B-6 Drilled: 2/23/85. Elevation top of hole: 206'  

0.58' Nonmarine terrace deposits: clayey to silty sand, with some gravel-size rock fragments; tan to rusty brown, slightly moist to moist, moderately dense.  

58-70' Probable marine terrace deposits: relatively cleaner, less moist sand than above, contains some gravel and cobbles; hole cased from 29.5' to 70' due to caving in marine terrace section.  

70-80' Bedrock (probable Conejo* volcanics): clayey siltstone, silty claystone and minor silty sandstone; dark gray, black, light gray (sandy stringers), slightly moist, massive, generally sheared. Boring not downhole logged; bulk sample of bedrock obtained. No apparent ground water encountered.  

Total depth: 80'  

* Reclassified as Monterey Formation (current report)
SILTY SAND: Yellow-brown, slightly moist, dense, fine- to medium-grained, subangular sandstone fragments (ARTIFICIAL FILL)

Ø 5.0' - clayey, yellow-brown mottled with dark brown, dense

Ø 9.0' - medium brown, siltier

Ø10.0' - few reddish brown siltstone fragments, dense

Ø12.0' - moist

Ø15.0' - Silty Sand, as above, dense

Ø19.0' - thin bed of dark brown clayey sand

Ø20.0' - Silty Sand, yellow-brown, mottled with dark brown clayey sand, dense

Ø22.0' - few volcanic fragments

SANDY SILTY CLAY: Medium-brown with some dark brown mottling, moist, firm, small sandstone, siltstone and volcanic fragments (ARTIFICIAL FILL)
GEOTECHNICAL DESCRIPTION

SANDY SILTY CLAY: Mottled medium and dark brownish-gray, moist, firm, plastic, few sandstone, siltstone and fewer volcanic fragments

032.0' - increasing dark brownish-gray

033.0' - medium-brown, sandstone fragments

035.0' - Sandy Silty Clay, medium-brown, firm

040.0' - increased amount of sandstone fragments, some green volcanic fragments, very firm

CLAYEY SILTY SAND: Medium yellow-brown, moist, dense, medium- to coarse-grained (probable soil zone)

SANDSTONE: Yellow-gray, mottled greenish-gray and orange, moist, firm, coarse-grained, few pebbles, clayey matrix, few roots (SESPE FORMATION)

048.5' - maroon siltstone bed, thin

049.0' - hard, light yellow-brown, massive

NOTES: Total Depth = 55.0'
No caving
No seepage
### Geotechnical Description

**Logged by:** DGS  
**Sampled by:** DGS

<table>
<thead>
<tr>
<th>Depth (Feet)</th>
<th>Graphic Log</th>
<th>Attitudes</th>
<th>Tube Sample No.</th>
<th>Blows per Foot</th>
<th>Dry Density (pcf)</th>
<th>Moisture Content (%)</th>
<th>Soil Class (U.S.C.S.)</th>
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</table>

- **010.0' - Silty Sand, as above**
- **015.0' - Silty Sand, as above**
- **018.0' - moist, irregular, discontinuous, small iron stained joints**
- **020.0' - Silty Sand, as above**
- **022.0' - coarse sand, less silty**
- **025.0' - Silty Sand, as above**
**GEOTECHNICAL DESCRIPTION**

<table>
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<th>Graphic Log</th>
<th>Attitudes</th>
<th>Tube Sample No.</th>
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<th>Dry Densitypcf</th>
<th>Moisture Content%</th>
<th>Soil Class</th>
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<td>48.3</td>
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<td>73.8</td>
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</table>

**SILTY SAND:** Orange-brown, moist, dense, slightly cemented, few rounded pebbles, porous, friable, sand medium-grained, poorly sorted (TERRACE DEPOSITS, NON-MARINE)

- 033.0': pebble lens, abundant rounded pebbles, mostly sandstone, few quartzite
- 035.0': Silty Sand, as above

- 039.0': carbonate stringers

**SAND:** Light yellow-tan, slightly moist, loose, fine to medium-grained, well sorted, unconsolidated small shell fragments (TERRACE DEPOSITS, MARINE)

(continued 1/25/89 with drilling mud, due to caving)

- 051.0': rounded pebbles and cobbles

**SILTSTONE:** Light tan to light purple-gray, moist, hard, silicified, fractured, limonite stains on fractures and bedding planes (MONTEREY FORMATION)

- 056.0': diatomaceous

**NOTE:** Total depth - 58.0'
- No seepage
- Caving 45-50'
- Dip in Monterey Formation from unoriented core
# Geotechnical Boring Log

**Date:** 1/10/89  
**Drill Hole No.:** B-9  
**Project:** EA/ Malibu  
**Drilling Co.:** Tri-Valley Drilling  
**Hole Diameter:** 24"  
**Drive Weight:** 2600 lbs.-25' ; 1600 lbs.-45'; 800 lbs.-69'  
**Drop:** 12 in.  
**Elevation Top of Hole:** 244'  
**Ref. or Datum:** See Geotechnical Map, Plate 1

## Geotechnical Description

<table>
<thead>
<tr>
<th>Depth (feet)</th>
<th>Logged by</th>
<th>Sampled by</th>
<th>Soil Class (U.S.C.S.)</th>
<th>Soil Attitude</th>
<th>Blows per foot</th>
<th>Density (pcf)</th>
<th>Moisture Content (%)</th>
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<td>DGS</td>
<td>ML</td>
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<td>94.6</td>
<td>18.8</td>
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<td>SANDY CLAYEY SILT:</td>
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<td></td>
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<td></td>
<td>Dark medium-brown, moist to slightly moist, firm, porous, rootlets (SOIL)</td>
<td>@ 2.0' - yellowish orange-brown, very firm, few gypsum crystals approx. 1&quot; thick</td>
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<td></td>
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<td></td>
<td>Contact approximately 5', very gradational</td>
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<td>10</td>
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<td></td>
<td>SILTSTONE: Yellowish-orange-brown, slightly moist, very firm, very sheared, highly weathered, random small polished surfaces, gypsum (VAQUEROS FORMATION)</td>
<td>@ 8.0' - volcanic bedding (hard to distinguish), irregular, discontinuous, light brown, clayey, crumbly, 2&quot; to 3&quot; thick limonite staining</td>
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<td>15</td>
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<td>@11.0' - very sheared, striations on random surfaces</td>
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<tr>
<td>16.0'</td>
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<td>@12.0' - increasing gypsum</td>
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<td>@13-17' - mineralized zone, 4&quot; to 5&quot; thick dark limonite staining, abundant gypsum, jarosite</td>
<td>@13.5' - striations more regular, plunging 20°, N8W</td>
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<td></td>
<td>@16.0' - surrounding siltstone gray mottled with orange limonite stain, regular pattern of elongated blotches oriented approximately vertical</td>
<td>@16.5' - bedding not detected, striations on joints</td>
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**Notes:** Total Depth - 21.0'  
No caving  
No seepage  
Downhole logged to total depth
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<th>Attitudes</th>
<th>Tube Sample No.</th>
<th>Blows per Foot</th>
<th>Dry Density PCF</th>
<th>Moisture Content, %</th>
<th>Soil Class (U.S.C.S.)</th>
<th>Geotechnical Description</th>
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<td>SI1</td>
<td>SILTY SAND: First 4' dark brown, below 4' orange-brown, slightly moist, very dense, porous, slightly cemented, few rounded pebbles and cobbles, friable, sand poorly sorted (TERRACE DEPOSITS, NON-MARINE)</td>
</tr>
<tr>
<td>0'</td>
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<td>BAG</td>
<td>1</td>
<td>113</td>
<td>8.0</td>
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<td></td>
<td>@ 9.0' - abundant rounded cobbles and pebbles</td>
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<tr>
<td>10'</td>
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<td></td>
<td>2</td>
<td>9</td>
<td>113</td>
<td>0.9</td>
<td></td>
<td>@10.0' - sandier, light orange-brown</td>
</tr>
<tr>
<td>15'</td>
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<td>10</td>
<td>113</td>
<td>5.6</td>
<td></td>
<td>@13.0' - less pebbles</td>
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<tr>
<td>20'</td>
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<td></td>
<td>4</td>
<td>8</td>
<td>111</td>
<td>5.6</td>
<td></td>
<td>@15.0' - Silty Sand, orange-brown (as above)</td>
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<tr>
<td>25'</td>
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<td>5</td>
<td>6</td>
<td>110</td>
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<td></td>
<td>@20.0' - Silty Sand, as above</td>
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<tr>
<td>30'</td>
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<td>6</td>
<td>13</td>
<td>107</td>
<td>6.0</td>
<td></td>
<td>@25.0' - Silty Sand, more pebbles</td>
</tr>
<tr>
<td>Depth</td>
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<td>Attitudes</td>
<td>Tube Sample No.</td>
<td>Blows Per Foot</td>
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<td>116</td>
<td>5.7</td>
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<td>SILTY SAND: Orange-brown, slightly moist, dense, fine- to medium-grained, slightly cemented, porous, scattered rounded pebbles, friable</td>
<td>DGS</td>
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<td>21</td>
<td>103</td>
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<td>SAND: Yellow-brown, moist, loose, fine- to medium-grained, well sorted, sparse shell fragments (TERRACE DEPOSITS, MARINE)</td>
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<td>45</td>
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<td>041.0' - gravelly</td>
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**NOTES:**
- Total Depth - 46.0'
- Caving at bottom
- No seepage
## Geotechnical Boring Log

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<th>Dry Density (pcf)</th>
<th>Moisture Content (%)</th>
<th>Soil Class (U.S.C.S.)</th>
<th>Geotechnical Description</th>
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<td>GRAVELLY CLAYEY SAND: Medium-brown, top 2' dark brown, slightly moist, very dense, abundant rounded pebbles, carbonate stringers (TERRACE DEPOSITS, NON-MARINE)</td>
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<td>SILTY SAND: Orange-brown, slightly moist, cense, slightly cemented, porous, few scattered rounded cobbles and pebbles</td>
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<td>Θ7-9' - abundant cobbles, few subangular</td>
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<td>Θ10.0' - siltier</td>
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<td>Θ12.5' - sand bed, 5&quot; thick, fine-grained</td>
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<td>Θ15.5'-17.0' - sandier, few angular cobbles at top of bed</td>
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<td>26.0' - sandstone boulder</td>
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<td>26.0'-30.0' - sand and gravel, moderately loose, caving</td>
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<td>SIbY SAND: Orange-brown, slightly moist, dense, slightly cemented, porous, friable, rounded pebbles and cobbles, fine- to coarse-grained, poorly sorted</td>
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<td>033.0' - siltier</td>
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<td>035.0' - Silty Sand, as above</td>
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<td>040.0' - sand and pebble bed</td>
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<td>043.0' - moist</td>
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<td>045.0' - Silty Sand, moist</td>
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**NOTE:**
- Total Depth - 51.0'
- Caving from 26.0' to approx. 30.0'
- Downhole logged to 26.0'
- No seepage
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<tr>
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<th>Attitudes</th>
<th>Tube Sample No.</th>
<th>Blows Per Foot</th>
<th>Dry Density Pcf</th>
<th>Moisture Content, %</th>
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<td>Ø10.0' - Silty Sand, as above</td>
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<td>Ø25.0' - Silty Sand, few pebbles</td>
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<td>Attitudes</td>
<td>Tube</td>
<td>Sample No.</td>
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<td>Moisture Content (%)</td>
<td>Soil Class.</td>
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<td>SILTY SAND: Orange-brown, moist, dense, porous, slightly cemented, friable</td>
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<td>939.0' - Sandstone boulder, more silt, darker</td>
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<td>940.0' - Silty Sand, siltier, darker</td>
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<td>945.0' - Silty Sand, orangish-brown</td>
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</tbody>
</table>

- 947.0' - sandier, light orange-brown, more pebbles, sand, poorly sorted

- 950.0' - Silty Sand, orange-brown

- 952.0' - caliche stringers

- 958.0' - Sandstone boulder

See Geotechnical Map, Plate 1
# Geotechnical Description

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Graphic Log</th>
<th>Attitudes</th>
<th>Tube Sample</th>
<th>Blows Per Foot</th>
<th>Dry Density (pcf)</th>
<th>Moisture Content (%)</th>
<th>Soil Class. (A.S.T.M.)</th>
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<th>Sampled by</th>
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</tbody>
</table>

**Silty Sand:** Orange-brown, slightly moist, dense, porous, slightly cemented, rounded pebbles, few cobbles, friable

063.0' - Sandstone boulder

065.0' - Silty Sand, as above

**Sand:** Light yellow-brown, slightly moist, loose, unconsolidated, fine-medium-grained, well sorted, shell fragments (TERRACE DEPOSITS, MARINE)

(1/25/89 - continue with drilling mud)

074.0' - abundant magnetite

078.0' - rounded pebbles, few cobbles

080.0' - abundant cobbles

**Siltstone:** Dark greenish-gray, slightly moist, very firm, fissile, small striated surfaces (VAQUEROS FORMATION)

082.0' - reddish-brown translucent mineral coatings on surfaces, possible pyrite mineralization

083.0' - Siltstone/Claystone - very sheared

**Note:**

Total Depth - 85.0'

Caving from 72.0' to 80.0'

No seepage
<table>
<thead>
<tr>
<th>Depth</th>
<th>Graphic Log</th>
<th>Attitudes</th>
<th>Tube Sample</th>
<th>Blows Per Foot</th>
<th>Dry Density PCF</th>
<th>Moisture Content %</th>
<th>Soil Class, ID</th>
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<td>Silt, as above</td>
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<td>10</td>
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<td>BAG</td>
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<td>114</td>
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<td>Silt, as above</td>
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<td>114</td>
<td>12.2</td>
<td>SM</td>
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</tbody>
</table>

- **010.0'** - Silt, as above
- **015.0'** - coarse-grained sand, some silt
- **015.0'-18.0'** - gravelly sand
- **019.0'** - moist
- **020.0'** - Silt, fine- to medium-grained, moist
- **025.0'** - Silt, as above
- **030.0'** - sandier, coarser

**Geotechnical Description**

Silty sand, orange-brown, (top 6" medium-brown), slightly moist, dense, porous, slightly cemented, fine- to coarse-grained, poorly sorted, friable, rounded pebbles, few cobbles (TERRACE DEPOSITS, NON-MARINE)
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<thead>
<tr>
<th>Depth (Feet)</th>
<th>Graphic Log</th>
<th>Attitudes</th>
<th>Tube Sample No.</th>
<th>Blocks per Foot</th>
<th>Dry Density (pcf)</th>
<th>Moisture Content (%)</th>
<th>Soil Class</th>
<th>Description</th>
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<td>SM</td>
<td>SILTY SAND: Orange-brown, slightly moist, dense, slightly cemented, porous, friable (TERRACE DEPOSITS, NON-MARINE)</td>
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<tr>
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<td></td>
<td>9</td>
<td>113.5</td>
<td>8.3</td>
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<td></td>
<td>@3.0' - few small pebbles</td>
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<td>20</td>
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<td></td>
<td>12</td>
<td>110.8</td>
<td>14.2</td>
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<td></td>
<td>@6.0' - very dense</td>
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<td>@11.0' - very porous, small root casts</td>
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<td>@15.0' - streaks of black MnO mineralization, old root casts mineralized</td>
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## Drill Hole Description

### GEOTECHNICAL DESCRIPTION

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<th>Dry Density (pcf)</th>
<th>Moisture Content (%)</th>
<th>Soil Class (U.S.C.S.)</th>
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<td></td>
<td>SAND: Light orange-brown, slightly moist, slightly firm, loose with depth, fine-grained, well sorted (TERRACE DEPOSITS, MARINE)</td>
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<td></td>
<td>033.0' - light yellow-brown, very loose, few small shell fragments</td>
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<td>037.0' - caving, continue with mud</td>
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<td></td>
<td>038.0' - rounded pebbles, few cobbles</td>
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<td>SILTSTONE: Very light tan, light greenish-gray, light purple gray, slightly moist, hard, thin-beded, limonite stains along bedding and fractures, silicified, cherty (MONTEREY FORMATION)</td>
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<td>042.0' - diatomaceous, small striated surfaces</td>
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**NOTE:**
- Total Depth - 44.0'
- Caving at 37.0'
- No seepage
- Dips in Monterey Formation from unoriented core samples
### GEO TECHNICAL DESCRIPTION

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<td>SP</td>
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</tbody>
</table>

**SILTY SAND**: Orange-brown, slightly moist, very dense, slightly cemented, friable, porous, few small pebbles (TERRACE DEPOSITS, NON-MARINE)

- @ 8.0' - sandier, more pebbles
- @10.0' - less pebbles
- @18.0' - more moisture
- @21.0' - siltier
- @26.0' - sandier

**SAND**: Light orange-brown to light yellow-brown, moist, loose, few shell fragments, fine-grained, well-sorted (TERRACE DEPOSITS, MARINE)
**GEOTECHNICAL BORING LOG**

**DATE:** 1/26/89  
**PROJECT:** EAI/Malibu  
**DRILL HOLE NO.:** B-15  
**DRILLING CO.:** Tri-Valley Drilling  
**HOLE DIAMETER:** 24"  
**ELEVATION TOP OF HOLE:**  
**REF. OR DATUM:** See Geotechnical Map, Plate 1  
**DRIVE WEIGHT:** 2600 lbs.-25'; 1600 lbs.-45'; 800 lbs.-69'  
**DROP:** 12 IN  
**TYPE OF RIG:** Bucket Auger  
**PROJECT NO.:** 3831025-04  
**SHEET:** 2 OF 2

**GEOTECHNICAL DESCRIPTION**

<table>
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<th>Depth (FT)</th>
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<th>Attitudes</th>
<th>Tube Sample No.</th>
<th>Blows Per Foot</th>
<th>Dry Density (pcf)</th>
<th>Moisture Content (%)</th>
<th>Soil Class (U.S.C.S.)</th>
<th>Logged by</th>
<th>Sampled by</th>
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<td>SAND: Light yellow-brown, moist, loose, medium-grained, well-sorted</td>
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<td>034.0' - rounded pebbles and cobbles</td>
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<td>036.0' - wet, many cobbles, seepage on south side</td>
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<td>74.8</td>
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<td>SILTSTONE: Greenish-gray, purple-brown, orange, moist, very firm, very sheared, limonite stains, undulating polished surfaces (VAQUEROS FORMATION)</td>
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<td>42.3</td>
<td>039.0' - consistently dark brown</td>
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<td>34.4</td>
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</tbody>
</table>

**NOTE:** Total Depth - 42.0'  
No caving  
Seepage at 36.0'
GEOTECHNICAL DESCRIPTION

SM SILTY SAND: Orange-brown, top 2.5' dark orange-brown, slightly moist, dense, slightly cemented, friable, porous, few pebbles (TERRACE DEPOSITS, NON-MARINE)

Ø 4.0' - sandstone pebbles

Ø 9.0' - few cobbles, light orange-brown, sandier

Ø 14.0' - pebbles, few cobbles

Ø 19.0' - siltier, root clasts with carbonate

Ø 24.0' - more moisture
<table>
<thead>
<tr>
<th>Depth Feet</th>
<th>Graphic Log</th>
<th>Attitudes</th>
<th>Tube Sample No.</th>
<th>Blows Per Foot</th>
<th>Dry Density PCF</th>
<th>Moisture Content, %</th>
<th>Soil Classification (U.S.C.S.)</th>
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<td>Silty Sand: Orange-brown, moist, dense, slightly cemented, friable, porous</td>
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<td>SP</td>
<td>Sand: Light yellow-brown, moist, loose, fine-grained, well sorted (Terrace Deposits, Marine)</td>
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<td>044.0' - few pebbles, abundant shell fragments</td>
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<td>044.5' - cobbles</td>
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<td></td>
<td>5</td>
<td>16</td>
<td>73.9</td>
<td>47.0</td>
<td></td>
<td>Claystone: Greenish-gray, orange, moist, plastic, stiff, undulating polished surfaces, minor black mineralization. Very sheared, polished surfaces. Laboratory Classified as MH (Monterey Formation)</td>
</tr>
<tr>
<td>50</td>
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<td></td>
<td>6</td>
<td>26</td>
<td>74.7</td>
<td>46.6</td>
<td></td>
<td>Siltystone: Light purplish-gray, moist, hard, silicified, sheared, fractured</td>
</tr>
<tr>
<td>50 for 9°</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>75.1 47.5</td>
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<td>50 for 5°</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>124.4 12.7</td>
</tr>
</tbody>
</table>

**NOTE:** Total Depth = 51.0'.
- Caving from 39.0' to 44.0'.
- No seepage.
- Dip in Monterey Formation from unoriented cores.
**GEOTECHNICAL DESCRIPTION**

Logged by: DGS, TJ
Sampled by: DGS

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Graphics Log</th>
<th>Attitudes</th>
<th>Tube Sample No.</th>
<th>Blows per Foot</th>
<th>Dry Density (pcf)</th>
<th>Moisture Content (%)</th>
<th>Soil Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1</td>
<td>J: N35W, 26SW</td>
<td>J: N07E, 66NW</td>
<td>1</td>
<td>BAG</td>
<td></td>
<td></td>
<td>SM</td>
<td>Silty Sand: Reddish-brown, moist, dense, cobbles (ARTIFICIAL FILL)</td>
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<tr>
<td>0-1.5</td>
<td>J: N02E, 64NW</td>
<td>J: N07E, 25NW</td>
<td>3</td>
<td>10</td>
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<td></td>
<td></td>
<td>Tuff: Light yellow to white, mottled orange, slightly moist, very firm to hard, sheared, limonite stained of fractures, hydrothermally altered, gypsum crystals up to 2&quot; diameter, random polished surfaces (CONJJO VOLCANICS)</td>
</tr>
<tr>
<td>0-1.5</td>
<td>F: N64W, 44NW</td>
<td>F: N35W, 60NW</td>
<td>5</td>
<td>4</td>
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<td></td>
<td></td>
<td>@ 3.0' - joints polished</td>
</tr>
<tr>
<td>0-1.5</td>
<td>F: N64W, 44NW</td>
<td>F: N35W, 60NW</td>
<td>5</td>
<td>4</td>
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<td>@ 5.5' - discontinuous gypsum seam</td>
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<td>0-1.5</td>
<td>F: N65E, 50NW</td>
<td>F: N30E, 54NW</td>
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<td>BAG</td>
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<td></td>
<td></td>
<td>@ 6.5' - gypsum seam with limonite and polished surface</td>
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<tr>
<td>0-1.5</td>
<td>S: N08E, 70NW</td>
<td>S: N30E, 44NW</td>
<td>8</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td>@ 8.5' - large gypsum crystals with limonite</td>
</tr>
<tr>
<td>0-1.5</td>
<td>S: N08E, 70NW</td>
<td>S: N30E, 44NW</td>
<td>8</td>
<td>7</td>
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<td></td>
<td></td>
<td>@ 10.0' - hard, little limonite</td>
</tr>
<tr>
<td>0-1.5</td>
<td>S: N08E, 70NW</td>
<td>S: N30E, 44NW</td>
<td>8</td>
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<td></td>
<td></td>
<td></td>
<td>@ 11.0' - abundant limonite, joint with polished surface</td>
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<tr>
<td>0-1.5</td>
<td>S: N08E, 70NW</td>
<td>S: N30E, 44NW</td>
<td>8</td>
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<td></td>
<td></td>
<td></td>
<td>@ 15.0' - abundant limonite, random gypsum seams, 1/8&quot; thick inclusions of moist claystone, firm, hard cemented fragment</td>
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<tr>
<td>0-1.5</td>
<td>S: N08E, 70NW</td>
<td>S: N30E, 44NW</td>
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<td>@ 16.0' - probable fault contact (Fault B)</td>
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<td></td>
<td></td>
<td>Claystone: Bluish-gray, moist, firm, extremely sheared irregular sharp fault contact, undulating polished surfaces (East side approximately horizontal, West side approximately 45 degrees to the west) (TRANCAS FORMATION)</td>
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<td></td>
<td>@ 16.5' - striations</td>
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<td></td>
<td></td>
<td>@ 18.0' - discontinuous, siliceous zone, 1' thick, 1' long</td>
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<td></td>
<td></td>
<td>@ 20.0' - hard, some gypsum</td>
</tr>
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<td>S: N30E, 44NW</td>
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<td>7</td>
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<td></td>
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<td>@ 21.5' - plastic clay</td>
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<td>S: N30E, 44NW</td>
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<td></td>
<td></td>
<td>@ 024.0' - white mineralized zones 1/8&quot; thick</td>
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<td>0-1.5</td>
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<td>S: N30E, 44NW</td>
<td>8</td>
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<td></td>
<td></td>
<td>@ 25.0' - dark bluish-gray, moist, very firm, plastic</td>
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<td>S: N30E, 44NW</td>
<td>8</td>
<td>7</td>
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<td></td>
<td>@ 29.0' - hard, brittle, siliceous fragments</td>
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<tr>
<td>DEPTH</td>
<td>GRAPHIC LOG</td>
<td>ATTITUDES</td>
<td>TUBE SAMPLE NO.</td>
<td>BLOMS PER FOOT</td>
<td>DRY DENSITY PCF</td>
<td>MOISTURE CONTENT</td>
<td>SOIL CLASS. (U.S.C.S.)</td>
<td>GEOTECHNICAL DESCRIPTION</td>
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<td>9</td>
<td>9</td>
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<td></td>
<td></td>
<td><strong>CLAYSTONE:</strong> Dark bluish-gray, moist, very firm, plastic, very sheared</td>
</tr>
<tr>
<td>15</td>
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<td>10</td>
<td>6</td>
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<td>Ø33.0' - harder pieces in clayey matrix have polished surfaces</td>
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<td>40</td>
<td>S:N13W, 46SW</td>
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<td>Ø34.0' - fragments 1/8&quot; to 3&quot;</td>
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<tr>
<td>45</td>
<td>S:N5A, 36NW; J:N18W, 78SW</td>
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<td>Ø35.0' - light gray mineralization</td>
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<td>50</td>
<td>S:N82W, 74NE</td>
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<td>Ø37.0' - matrix contains pods of subrounded to subangular sandstone fragments 1&quot; to 1&quot;</td>
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<td>S:N38E, 33SE</td>
<td>59</td>
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<td>Ø45.0' - hard silicified bed, minor seepage on top, brittle, jointed</td>
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<tr>
<td>60</td>
<td>S:N12E, 48SE; S:N53E, 33NW</td>
<td>24</td>
<td>57</td>
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<td>Ø48.0' - polished shear</td>
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<td></td>
<td>Ø50.0' - thin siliceous zone</td>
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<td></td>
<td></td>
<td>Ø51.0' - harder, mottled with light gray mineralization</td>
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<td></td>
<td></td>
<td>Ø53.0' - thin siliceous zone</td>
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<td></td>
<td>Ø54.0' - polished surfaces, hard, less plastic</td>
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<td></td>
<td></td>
<td></td>
<td>Ø56.5' - thin siliceous zone, discontinuous</td>
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<tr>
<td>Depth (Ft)</td>
<td>Graphic Log</td>
<td>Attitudes</td>
<td>Tube Sample No.</td>
<td>Blows Per Foot</td>
<td>Dry Density PCF</td>
<td>Moisture Content (%)</td>
<td>Soil Class (R.I.S.C.S.)</td>
<td></td>
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<tr>
<td>60</td>
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<td>S:N20E, 01SE</td>
<td>16</td>
<td>23</td>
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<td>S:N8W, 90</td>
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<td>S:N58N, 68SN</td>
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<td>70</td>
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<td>S:N-S, 75E</td>
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<tr>
<td>75</td>
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<td>S:N15E, 70SN</td>
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<td>80</td>
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<td>S:N30E, 90</td>
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<td>S:N10E, 78SE</td>
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<td>85</td>
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<td>S:N75N, 68NE</td>
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<td>S:N62E, 60NW</td>
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</tr>
</tbody>
</table>

**Geotechnical Description**

CLAYSTONE: Dark bluish-gray, moist, very firm to hard, very sheared, slightly plastic to plastic, undulating polished surfaces.

- Ø64.0′ - some striations

- Ø68.5′-70.0′ - silica mineralization, discontinuous zone

- Ø72.5′ - rounded pebbles with polished surfaces, 3/4″ diameter

- Ø75.0′ - slightly plastic, prominent shear, near vertical, undulating

- Ø77.0′ - siliceous zone

- Ø82.0′ - moist, hard fragments in clay matrix

**Note:** Total Depth 86.5′

No casing

Minor seepage at 45.0′

Downhole logged to Total Depth.
<table>
<thead>
<tr>
<th>Depth</th>
<th>Graphic Log</th>
<th>Attitude</th>
<th>Tube Sampled</th>
<th>Blows/ft</th>
<th>Densitypcf</th>
<th>Moisture Content</th>
<th>Soil Class</th>
<th>Geotechnical Description</th>
</tr>
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<td></td>
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<td></td>
<td></td>
<td>SM</td>
<td>SILTY SAND: Orange-brown, slightly moist, very dense, scattered rounded pebbles and cobbles (LANDSLIDE DEBRIS)</td>
</tr>
<tr>
<td>14</td>
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<td></td>
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<td></td>
<td></td>
<td>Ø14.0' on west side and 19.0' on east side - shear</td>
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<tr>
<td>15</td>
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<td></td>
<td>Ø15.0' - east side of hole very sharp contact, roots growing along contact, striations</td>
</tr>
<tr>
<td>16</td>
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<td></td>
<td>Ø16.0' - MnO stain along shear approximately 1&quot; thick</td>
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<td>20</td>
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<td></td>
<td></td>
<td>TUFF: Yellowish-white, mottled-orange, slightly moist, very firm, sheared, altered, limonite, gypsum, spars MnO stain (CONEJO VOLCANICS/LANDSLIDE DEBRIS)</td>
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<tr>
<td>24</td>
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<td></td>
<td></td>
<td>Ø24.0' on west side of boring and 26.0' on east side - scattered gypsum crystals, polished surfaces, 6&quot; zone of inclusions of claystone above, 6&quot; zone of inclusions of tuff below</td>
</tr>
<tr>
<td>25</td>
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<td></td>
<td></td>
<td>CLAYSTONE: Bluish-gray, slightly moist, firm, slightly plastic, very sheared, pulverized (TRANCAS FORMATION/LANDSLIDE DEBRIS)</td>
</tr>
</tbody>
</table>

**NOTE:** Total Depth - 30.0'  
No caving  
No seepage  
Downhole logged to Total Depth
**Geotechnical Logging Log**

**Date:** 4/20/89  
**Drill Hole No.:** B-19  
**Project:** EAI/Malibu  
**Drilling Co.:** Tri-Valley Drilling  
**Type of Rig:** Bucket Auger  
**Hole Diameter:** 24"  
**Drive Weight:** 2550#-22.5'; 1550#-45.5'; 750#-67'; 1050#-87'; DROP 12 IN.  
**Elevation Top of Hole:** 215'  
**Ref. or Datum:** See Geotechnical Map, Plate 1  
**Sheet 1 of 3**  
**Project No.:** 3831025-04

### Geotechnical Description

<table>
<thead>
<tr>
<th>Depth (Ft)</th>
<th>Soil Class</th>
<th>Soil Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10.0'</td>
<td>SC</td>
<td>CLAYEY SAND: Medium-brown, moist, dense, root hairs, slightly porous, slightly plastic, fine-to medium-grained, rounded pebbles (COLLUVIAL SOIL)</td>
</tr>
<tr>
<td>0-12.0'</td>
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</tr>
<tr>
<td>0-14.0'</td>
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<tr>
<td>0-15.0'</td>
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<td></td>
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<tr>
<td>0-18.0'</td>
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</tr>
<tr>
<td>0-19.0'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10-20.0'</td>
<td>SP</td>
<td>SAND: Orangish-brown, moist, dense, very fine-grained, few angular cobbles</td>
</tr>
<tr>
<td>20-25.0'</td>
<td>SM</td>
<td>SILTY SAND: Orangish-brown, moist, medium- to coarse-grained, slightly cemented, friable</td>
</tr>
<tr>
<td>25-30.0'</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- 010.0' - dense, cemented, friable, occasional subangular to subrounded gravel to 1" |
- 012.0' - few subrounded cobbles |
- 014.0' - gravel and cobbly fine- to coarse grained sand, well sorted |
- 015.0' - medium brown, mottled with olive brown, few reddish-brown soft siltstone fragments |
- 018.0' - very moist, angular cobbles |
- 019.0' - orangish-brown |
- 021.0'-23.0' - numerous rounded gravels and cobbles |
- 025.0' - medium-brown, moist to very moist, fine- to medium-grained, slightly plastic |
- 029.0' - few angular sandstone cobbles
<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Graphic Log</th>
<th>Attitudes</th>
<th>Tube Sample No.</th>
<th>Blows per Foot</th>
<th>Dry Density (pcf)</th>
<th>Moisture Content (%)</th>
<th>Soil Class</th>
<th>Logged by</th>
<th>Sampled by</th>
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<td>30</td>
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</tr>
</tbody>
</table>

**Geotechnical Description**

- **SP**: Yellowish to orangish-brown, moist, dense, fine- to medium grained with some coarse sand and few gravel, slightly cemented, friable
- **SM**: Silty sand: Orangish-brown, moist, fine- to medium-grained
  - 034.0' - Yellowish-brown, fine-grained, slightly plastic
  - 036.0' - Medium- to coarse-grained sand
  - 038.0' - Well rounded gravel and cobbles
  - 039.0' - Medium-brown
  - 040.0' - Orangish-brown, moist, dense, fine- to medium grained, slightly cemented, friable
  - 040.5' - Dark orange-brown, fine-grained
  - 044.0' - Orange-brown, moist, fine- to medium-grained
  - 045.0' - Dark orange-brown, boulders and cobbles
  - 049.0' - Medium-brown, fine- to medium-grained
  - 050.0' - Light to medium orange-brown, moist, dense, fine- to coarse-grained, poorly sorted
  - 053.0' - Few cobbles
  - 054.0' - Dark orange-brown, fine- to medium-grained
  - 057.0' - Orange-brown, fine-grained
# Geotechnical Description

**Logged by**: CH, TJ  
**Sampled by**: CH

<table>
<thead>
<tr>
<th>Depth (feet)</th>
<th>Graphic Log</th>
<th>Attitudes</th>
<th>Tube Sample No.</th>
<th>Blows per Foot</th>
<th>Dry Density (pcf)</th>
<th>Moisture Content (%)</th>
<th>Soil Classification (U.S.C.S.)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td></td>
<td></td>
<td>7</td>
<td>16</td>
<td>33</td>
<td></td>
<td>SM</td>
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<tr>
<td>061.0'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Silty Sand; Orange-brown to medium-brown, moist, dense, fine- to medium-grained, carbonate stringers</td>
<td></td>
</tr>
<tr>
<td>062.0'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>063.0'</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>064.0'</td>
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<td></td>
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<tr>
<td>065.0'</td>
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</tr>
<tr>
<td>066.0'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>068.0'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Orange-brown, fine- to medium-grained soil</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td>8</td>
<td>11</td>
<td></td>
<td></td>
<td>SP</td>
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</tr>
<tr>
<td>075.0'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sand; Medium-brown, moist, loose, fine- to medium-grained (TERRACE DEPOSITS, MARINE)</td>
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<tr>
<td>080.0'</td>
<td></td>
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</tr>
<tr>
<td>85</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>086.0'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Hard, well-cemented</td>
<td></td>
</tr>
<tr>
<td>087.0'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Few pebbles and gravels</td>
<td></td>
</tr>
<tr>
<td>088.0'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2&quot; thick sheared dark gray to green-gray clayey siltstone bed</td>
<td></td>
</tr>
<tr>
<td>089.0'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Green-gray</td>
<td></td>
</tr>
<tr>
<td>90</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**NOTE:** Total Depth - 89.0'  
Caving @ 70.0'  
Drilling mud used below 75.0'
<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Graphic Log</th>
<th>Attitudes</th>
<th>Tube Sample No.</th>
<th>Blows Per Foot</th>
<th>Dry Densitypcf</th>
<th>Moisture Content (%)</th>
<th>Soil Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SM</td>
</tr>
<tr>
<td>10.0°</td>
<td>dense, fine- to medium-grained, slightly cemented, friable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.0°</td>
<td>some angular to rounded gravel and cobbles</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17.0°</td>
<td>fine-grained</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.0°</td>
<td>fine-grained sand, few cobbles, slightly porous, slightly plastic, few roots</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27.0°</td>
<td>carbonate stringers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depth Feet</td>
<td>Graphic Log</td>
<td>Attitudes</td>
<td>Tube Sample No.</td>
<td>Blows Per Foot</td>
<td>Dry Density PCF</td>
<td>Moisture Content, %</td>
<td>Soil Class (U.S.C.S.)</td>
</tr>
<tr>
<td>------------</td>
<td>-------------</td>
<td>-----------</td>
<td>----------------</td>
<td>----------------</td>
<td>-----------------</td>
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</tr>
<tr>
<td>4.5</td>
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<td>4</td>
<td>14</td>
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<td>SM</td>
</tr>
<tr>
<td>35.0'</td>
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<tr>
<td>40.0'</td>
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<tr>
<td>40.5'</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>52.0'</td>
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<td></td>
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<td></td>
<td></td>
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<td>SP</td>
</tr>
<tr>
<td>55.5</td>
<td></td>
<td></td>
<td>5</td>
<td>41</td>
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</tr>
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<td></td>
<td></td>
<td>6</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** Total Depth - 58.5'
Caving at 42.0'
No seepage
Drilling mud used below 42.0'
<table>
<thead>
<tr>
<th>Depth</th>
<th>GEOTECHNICAL DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>SANDY CLAYEY SILT: Dark-brown, moist, moderately firm, organics, roots and root hairs, occasional pebbles, carbonate stringers (COLLUVIAL SOIL)</td>
</tr>
<tr>
<td></td>
<td>03.5' - Irregular contact dipping 18 degrees east</td>
</tr>
<tr>
<td>5</td>
<td>SANDY SILT: Dark red-brown, slightly moist, dense, yellow, red and white mottling, roots, slightly porous, pebbles, cobbles (LANDSLIDE DEBRIS)</td>
</tr>
<tr>
<td></td>
<td>Ø 8.0' - 2' thick subhorizontal cobble zone</td>
</tr>
<tr>
<td></td>
<td>Ø 9.5' - 4' subhorizontal pebble bed</td>
</tr>
<tr>
<td>10</td>
<td>SILTY SAND: Dark red-brown, slightly moist, dense, pebbles and cobbles, slightly porous, roots</td>
</tr>
<tr>
<td></td>
<td>Ø15.0' - dark red-brown, yellow, and white mottling, dense, roots, 1' cobble bed</td>
</tr>
<tr>
<td></td>
<td>Ø16.0' - orange to medium-brown, slightly plastic</td>
</tr>
<tr>
<td>20</td>
<td>Ø20.0' - 6' medium- to coarse-grained, subhorizontal sand bed</td>
</tr>
<tr>
<td></td>
<td>Ø21.0' - orange-brown, fine-grained</td>
</tr>
<tr>
<td></td>
<td>Ø21.5' - 4' thick erosional channel bed, medium- to coarse sand with pebbles</td>
</tr>
<tr>
<td>25</td>
<td>Ø25.0' - yellow-brown, coarse grained, cemented, slightly friable, subhorizontal gradational contact</td>
</tr>
<tr>
<td></td>
<td>Ø27.0' - dark orange-brown, occasional pebbles</td>
</tr>
<tr>
<td>30</td>
<td>Ø28.0' - red-brown, moist, fine-grained, few gravel and cobbles, slightly plastic</td>
</tr>
</tbody>
</table>
## Geotechnical Description

<table>
<thead>
<tr>
<th>Depth (Ft)</th>
<th>Graphic Log</th>
<th>Attitude</th>
<th>Tube Sample</th>
<th>Blows Per Foot</th>
<th>Dry Density PCF</th>
<th>Moisture Content %</th>
<th>Soil Class</th>
<th>Geotechnical Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SM</td>
<td></td>
<td>Silty Sand: Red-brown, moist, moderately dense, fine-grained, slightly plastic, occasional rounded gravel and cobbles</td>
</tr>
<tr>
<td>34.0'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ø34.0' - numerous volcanic and quartzite pebbles in a coarse-grained sandy matrix, loose and friable to 37'</td>
</tr>
<tr>
<td>40.0-41.0'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Silty Sand: Yellow-brown to orange-brown, cobbles 6'' to 1'' thick</td>
</tr>
<tr>
<td>45.0'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Silty Sand: Yellow-brown volcanic tuff underlain by friable marine terrace sand, 6'' thick</td>
</tr>
<tr>
<td>50.0'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Siltystone: Nettled with discontinuous light grey sandstone lenses, numerous undulations polished surfaces (Trancas Formation/Landslide OEBKIS)</td>
</tr>
</tbody>
</table>

**NOTE:** Total Depth - 53.0'  
No seepage  
Caving from 43.0' to 45.0'  
Downhole logged to 48.0'
### Atterberg Limits Test Results

<table>
<thead>
<tr>
<th>Symbol</th>
<th>No.</th>
<th>Sample Location</th>
<th>Moisture (%)</th>
<th>LL (%)</th>
<th>PL (%)</th>
<th>PI (%)</th>
<th>U.S.C.S.</th>
</tr>
</thead>
<tbody>
<tr>
<td>●</td>
<td>11</td>
<td>B-7 @ 43' (Artificial fill)</td>
<td>--</td>
<td>31.7</td>
<td>17.3</td>
<td>14.4</td>
<td>CL</td>
</tr>
<tr>
<td>○</td>
<td>5</td>
<td>B-16 @ 47' (Claystone, Monterey Formation)</td>
<td>47.0</td>
<td>85.1</td>
<td>39.2</td>
<td>45.9</td>
<td>MH</td>
</tr>
</tbody>
</table>

#### Graph

- **LL (Liquid Limits), %**
- **PI (Plasticity Index), %**

- CL
- MH & OH
- ML & OL
- CL-ML

**Project No.:** 3831025-04  
**Project Name:** EAI/RANCHO MALIBU MESA  
**Date:** 8/78  
**Figure No.:** D-1
<table>
<thead>
<tr>
<th>SAMPLE LOCATION</th>
<th>SULFATE (PPM)</th>
<th>COMPACTED MOISTURE (%)</th>
<th>COMPACTED DRY DENSITY (pcf)</th>
<th>FINAL MOISTURE (%)</th>
<th>VOLUMETRIC SWELL (%)</th>
<th>EXPANSION INDEX</th>
<th>EXPANSIVE CLASSIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-9 @ 18'</td>
<td>6000</td>
<td>14.7</td>
<td>94.7</td>
<td>32.6</td>
<td>11.7</td>
<td>117</td>
<td>High</td>
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<tr>
<td>(Vagueros Formation)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-10 @ 4'-6'</td>
<td>180</td>
<td>8.5</td>
<td>115</td>
<td>16.3</td>
<td>1.1</td>
<td>11</td>
<td>Very Low</td>
</tr>
<tr>
<td>(Non-marine Terrace)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**TEST METHOD:** UBC Test Method 29-2

**EXPANSION INDEX AND SOLUBLE SULFATE TEST RESULTS**

Project No. 3831025-04  
Project Name EAI/RANCHO MALIBU MESA  
Date 8/89  
Figure No. D-2  

| 3020688 |
## GRADATION TEST RESULTS

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Sample Location</th>
<th>Sample No.</th>
<th>Field Moisture (L%)</th>
<th>LL (%)</th>
<th>PI (%)</th>
<th>Activity</th>
<th>P1/-2u</th>
<th>Cu</th>
<th>D10 (mm)</th>
<th>D50 (mm)</th>
<th>D60 (mm)</th>
<th>Percent Passing No. 200</th>
<th>Percent Finer than 2p</th>
<th>U.S.C.S.</th>
</tr>
</thead>
<tbody>
<tr>
<td>O</td>
<td>10' @ 25'</td>
<td>6</td>
<td>6.0</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>19.3</td>
<td>2.4</td>
<td>27</td>
<td>--</td>
<td>--</td>
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<td>--</td>
<td>SM</td>
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</table>

<table>
<thead>
<tr>
<th></th>
<th>Gravel</th>
<th>Coarse</th>
<th>Fine</th>
<th>Sand</th>
<th>Coarse</th>
<th>Medium</th>
<th>Fine</th>
<th>Silt</th>
<th>Clay</th>
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</thead>
<tbody>
<tr>
<td>Project No.</td>
<td>3831025-04</td>
<td></td>
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<tr>
<td>Project Name</td>
<td>EAI/RANCHO MALIBU MESA</td>
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<tr>
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<td>8/89</td>
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</table>
U.S. Standard Sieves

Percent Finer by Weight

Grain Size in Millimeters

<table>
<thead>
<tr>
<th>Grain Size in Millimeters</th>
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<tbody>
<tr>
<td>0.001</td>
</tr>
<tr>
<td>0.005</td>
</tr>
<tr>
<td>0.010</td>
</tr>
<tr>
<td>0.020</td>
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<tr>
<td>0.050</td>
</tr>
<tr>
<td>0.100</td>
</tr>
<tr>
<td>0.200</td>
</tr>
<tr>
<td>1.000</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Sample Location</th>
<th>Sample No.</th>
<th>Field Moisture (%)</th>
<th>LL (%)</th>
<th>PL (%)</th>
<th>Activity</th>
<th>PI/-2u</th>
<th>Cu</th>
<th>CC</th>
<th>D25</th>
<th>D60+</th>
<th>U.S.C.S.</th>
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<tbody>
<tr>
<td>O</td>
<td>B-11 35 (Qttn.)</td>
<td>8</td>
<td>8.8</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>73.3</td>
<td>6.5</td>
<td>27</td>
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</table>
Gradation Test Results

<table>
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<tr>
<th>Sample Location</th>
<th>Sample No.</th>
<th>Field Moisture (%)</th>
<th>LL (%)</th>
<th>PI (%)</th>
<th>Activity</th>
<th>Cu</th>
<th>(D&lt;sub&gt;30&lt;/sub&gt;)&lt;sup&gt;2&lt;/sup&gt;</th>
<th>Percent Passing No.200</th>
<th>Percent Finer than 2p</th>
<th>U.S.C.S.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-12 Qtn.</td>
<td>9</td>
<td>11.0</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>83.7</td>
<td>6.5</td>
<td>26</td>
<td>--</td>
<td>SM</td>
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### Gradation Test Results

<table>
<thead>
<tr>
<th>Coarse</th>
<th>Fine</th>
<th>Coarse</th>
<th>Medium</th>
<th>Fine</th>
<th>Silt</th>
<th>Clay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symbol</td>
<td>Sample Location</td>
<td>Sample No.</td>
<td>Field Moisture (%)</td>
<td>LL (%)</td>
<td>PI (%)</td>
<td>Activity PI/2a</td>
</tr>
<tr>
<td>G-13</td>
<td>1</td>
<td>2</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>307</td>
</tr>
<tr>
<td>(Qtn.)</td>
<td></td>
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</tr>
</tbody>
</table>
### Gradation Test Results

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Sample Location</th>
<th>Sample No.</th>
<th>Field Moisture (%)</th>
<th>LL (%)</th>
<th>PI (%)</th>
<th>Activity P1/2a</th>
<th>Cu (D)</th>
<th>Lc (D)</th>
<th>Percent Passing No. 200</th>
<th>Percent Finer than 2p</th>
<th>U.S.C.S.</th>
</tr>
</thead>
<tbody>
<tr>
<td>O</td>
<td>B-13 @ 17&quot;</td>
<td>5</td>
<td>--</td>
<td>--</td>
<td>--</td>
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<td>--</td>
<td>--</td>
<td>--</td>
<td>17.5</td>
<td>SN</td>
</tr>
<tr>
<td></td>
<td>(Qtn.)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Project No.** 3831025-04  
**Project Name** EAI/RANCHO MALIBU MESA  
**Date** 8/93
Sample Location: B-11 @ 10' (Qtn.)
Moisture Content:
    Before: 9.9
    After: 16.5
Dry Density: 110 pcf
Collapse: 0.32 %

CONSOLIDATION - PRESSURE CURVE

Project No. 3831025-04
Project Name EAI/RANCHO MALIBU MESA
Date 8/89 Figure No. D-10
Sample Location: B-12 @ 5' (0tn.)

Moisture Content:
- Before: 10.5
- After: 16.2

Dry Density: 119 pcf
Swell: 2.7%
Sample Location:
B-14 @ 15' (Qtn.)

Moisture Content:
Before: 10.7
After: 17.0

Dry Density: 114 pcf
Swell: 2.18 %
Sample Location:
B-16 @ 20' (Qtn.)

Moisture Content:
Before: 10.9
After: 14.8

Dry Density: 114 pcf
Swell: 0.37 %

CONSOLIDATION - PRESSURE CURVE

○ Indicates Sample at Field Moisture
● Indicates Sample After Saturation

Project No. 3831025-04
Project Name EAI/RANCHO MALIBU MESA
Date 8/89 Figure No. D-13
Soil Description: Silty sand (Qtn.)
Type of Sample:  
- [ ] Remolded to % Relative Compaction
- [X] Undisturbed
Loading Rate: 0.05 in./min.

<table>
<thead>
<tr>
<th>Sample Location</th>
<th>Symbol</th>
<th>Average Moisture Contents</th>
<th>Friction Angle</th>
<th>Cohesion</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-8 @ 15'</td>
<td>○</td>
<td>6.7 Before, 15.8 After</td>
<td>36°</td>
<td>10 (psf)</td>
<td>PEAK</td>
</tr>
<tr>
<td>B-8 @ 15'</td>
<td>●</td>
<td>6.7 Before, 15.8 After</td>
<td>33.5°</td>
<td>10</td>
<td>ULTIMATE</td>
</tr>
</tbody>
</table>

DIRECT SHEAR TEST RESULTS
Project No. 3831025-04
Project Name EAI/RANCHO MALIBU MESA
Date 8/89 Figure No. D-14
Soil Description: Silty sand (Qtn.)
Type of Sample: ☒ Undisturbed
Loading Rate: 0.05 in./min.

<table>
<thead>
<tr>
<th>Sample Location</th>
<th>Symbol</th>
<th>Average Moisture Contents</th>
<th>Friction Angle</th>
<th>Cohesion</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-13 @ 20'</td>
<td>○</td>
<td>15.9 Before, 18.8 After</td>
<td>35°</td>
<td>390 (psf)</td>
<td>PEAK</td>
</tr>
<tr>
<td>B-13 @ 20'</td>
<td>○</td>
<td>15.9 Before, 18.8 After</td>
<td>35°</td>
<td>100</td>
<td>ULTIMATE</td>
</tr>
</tbody>
</table>

Direct Shear Test Results

Project No. 3831025-04
Project Name EAI/RANCHO MALIBU MESA
Date 8/89 Figure No. D-16

3015 1088
Soil Description: Monterey Formation
Bedrock Claystone
Type of Sample: □ Remolded to ___ %
Relative Compaction
X Undisturbed
Loading Rate: 0.05 in./min.

DIRECT SHEAR TEST RESULTS

<table>
<thead>
<tr>
<th>Sample Location</th>
<th>Symbol</th>
<th>Average Moisture Contents</th>
<th>Friction Angle</th>
<th>Cohesion</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-16 @ 47'</td>
<td>O</td>
<td>51.3</td>
<td>44°</td>
<td>440 (psf)</td>
<td>PEAK</td>
</tr>
<tr>
<td>B-16 @ 47'</td>
<td>.</td>
<td>51.3</td>
<td>37°</td>
<td>30</td>
<td>ULTIMATE</td>
</tr>
</tbody>
</table>

Project No. 3831025-04
Project Name EAI/RANCHO MALIBU MESS
Date 8/89 Figure No. D-17 3015 1088
APPENDIX D

BORING LOGS AND LABORATORY TEST RESULTS

BY VAN BEVEREN AND BUTELO
# BORING 1

**Date Drilled:** June 27, 2007  
**Depth to Water:** Not Encountered  
**Equipment Used:** 24" Diameter Bucket  
**Driving Weight & Drop:** 2,600 pounds (0 to 25 feet)  
1,000 pounds (> 25 feet)

---

**SURFACE ELEVATION:** 210 feet MSL*

**TERRACE DEPOSITS**

SM - SILTY SAND - fine, porous, brown

- Trace clay, not porous, reddish brown  
  - [40% Passing No. 200 Sieve]
- Trace fine gravel  
- Trace cobble (up to 6" in size)  
- Yellowish brown  
- Reddish brown  

SP - SAND - fine, light yellowish brown  

- [3% Passing No. 200 Sieve]
- Some gravel and cobbles (up to 10" in size)

---

**END OF BORING AT 39 FEET.**

(Continued on next page)

---

**LOG OF BORING**
**BOURING 1**
(Continued)

Data Drilled: June 27, 2007
Equipment Used: 24" Diameter Bucket

Depth to Water: **Not Encountered**
Driving Weight & Drop:
- 2,000 pounds (0 to 25 feet)
- 1,000 pounds (> 25 feet)

---

**SURFACE ELEVATION:** 210 feet MSL*

**Notes:**

1. Fill not encountered.
2. Some caving from depths of 29 to 36 feet (up to 36 inches in diameter).
4. Boring backfilled with soil cuttings and tamped.

* Elevations refer to datum of reference survey; see Figure 2.

---

**LOG OF BORING**

![Diagram of boring log](image-url)
BOARING 2

Date Drilled: June 27, 2007

Equipment Used: 24" Diamecer Bucket

Depth to Water: Not Encountered

Driving Weight & Creep: 2,500 pounds (0 to 25 feet)
1,000 pounds (> 25 feet)

SURFACE ELEVATION: 215 feet MSL

215
7.4 113 9
6.6 117 10
210
4.6 87 8
7.2 108 8
205
3.2 122 16
200
7.5 101 7
195
12.3 117 5
190
7.2 114 5
185
5.2 101 11
180
7.9 117 8
175
7.5 101 7
170
5.2 101 11
165
7.9 117 8
160
5.2 101 11
155
7.5 101 7
150
5.2 101 11
145
7.9 117 8
140
5.2 101 11
135
7.5 101 7
130
5.2 101 11
125
7.9 117 8
120
5.2 101 11
115
7.5 101 7
110
5.2 101 11
105
7.9 117 8
100
5.2 101 11
95
7.5 101 7
90
5.2 101 11
85
7.9 117 8
80
5.2 101 11
75
7.5 101 7
70
5.2 101 11
65
7.9 117 8
60
5.2 101 11
55
7.5 101 7
50
5.2 101 11
40
7.9 117 8
(Continued on next page)

LOG OF BORING

FIGURE A-2.2a
**BORING 2**  
(Continued)

Data Drilled: June 27, 2007  
Equipment Used: 24" Diameter Bucket

<table>
<thead>
<tr>
<th>ELEVATION (ft)</th>
<th>DATA</th>
<th>DRY DENSITY</th>
<th>MOISTURE CONTENT</th>
<th>DENSITY</th>
<th>VOLUME</th>
<th>WEIGHT</th>
<th>COAST LOCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>175</td>
<td>0.9</td>
<td>101</td>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SURFACE ELEVATION:** 216 feet MSL*

**END OF BORING AT 41 FEET.**

**Notes:**

1. Fill not encountered.
2. Some casing from depths of 39 to 41 feet (up to 30 inches in diameter).
4. Boring backfilled with soil cuttings and tamped.

---

**LOG OF BORING**
BORING 3

Data Drilled: June 28, 2007
Equipment Used: 24" Diameter Bucket

Depth to Water:
Not Encountered

Driving Weight & Drop:
2,500 pounds (0 to 25 feet)
1,000 pounds (25 to 45 feet)
750 pounds (>45 feet)

SURFACE ELEVATION: 234 feet MSL*

FILL
SM - SILTY SAND

TERRACE DEPOSITS
SM - SILTY SAND - fine, reddish brown

trace clay

porous

not porous

slightly porous

[28% Passing No. 200 Sieve]

not porous, few gravel

[36% Passing No 200 Sieve]

(Continued on next page)

LOG OF BORING

FIGURE A-2.3a
**BOARING 3**

(Continued)

Date Drilled: June 28, 2007

Depth to Water: Not Encountered

Equipment Used: 24" Diameter Bucket

Driving Weight & Drops:
- 2,500 pounds (0 to 25 feet)
- 1,000 pounds (26 to 45 feet)
- 750 pounds (>45 feet)

<table>
<thead>
<tr>
<th>ELEVATION (ft)</th>
<th>Depth (ft)</th>
<th>Moisture</th>
<th>N Value</th>
<th>V-index</th>
<th>Weight Count</th>
<th>Samples Taken</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>119</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>125</td>
<td></td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>130</td>
<td></td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>135</td>
<td></td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>140</td>
<td></td>
<td>23</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SURFACE ELEVATION:** 234 feet MSL

**SP-SM - SAND -** fine, some silt, light yellowish brown

**END OF BORING AT 51 FEET.**

- **Notes:**
  1. Fill encountered to depth of 8 ft.
  2. No caving.
  4. Boring backfilled with soil cutting and tamped.

**LOG OF BORING**
**LOG OF BORING**

**BOURING 4**

Date Drilled: June 26, 2007

Equipment Used: 24" Diameter Bucket

Depth to Water: Not Encountered

Driving Weight & Drop: 2,400 pounds (0 to 25 feet)

1,000 pounds (> 25 feet)

**SURFACE ELEVATION:** 215 feet MSL*

**TERRACE DEPOSITS**

- **SM - SILTY SAND** - fine, light grayish brown
- Reddish brown
- Some round to subrounded cobbles to 4" in diameter
- Increased gravel up to 3/4" in diameter, slightly darker reddish brown
- Clayey sand layer 4" thick horizontal
- Wet and clayey in 2 foot thick zone
- Yellowish to reddish brown
- Layer of sandy gravel from 20 to 22 feet
- 8" diameter cobbles
- Trace clay, color orange to dark yellow brown

([core bucket used from 32 to 39 feet])

**END OF BORING AT 39 FEET.**

(Continued on next page)
**BOURING 4**  
(Continued)

- **Date Drilled:** June 28, 2007
- **Depth to Water:** Not Encountered
- **Equipment Used:** 24" Diameter Bucket
- **Driving Weight & Drop:** 2,500 pounds (0 to 25 feet)  
  1,020 pounds (> 25 feet)
- **Surface Elevation:** 215 feet MSL*

**Notes:**
1. Fill not encountered.
2. No caving.
4. Boring backfilled with soil cuttings and tamped.

---

**LOG OF BORING**

---

*The log of subsurface conditions shown herein applies only to the specific boring location and at the date indicated.*
BOURING 5

Date Drilled: June 29, 2007

Equipment Used: 24" Diameter Bucket

Depth to Water: Not Encountered

Driving Weight & Drop: 2,500 pounds (0 to 25 feet)
1,600 pounds (> 25 feet)

ELEVATION (feet)

SURFACE ELEVATION: 245 feet MSL

TERRACE DEPOSITS
SM - SILTY SAND - fine, some gravel (up to ¼" in size), reddish brown

few gravel, trace clay, porous

not porous

some gravel

END OF BORING AT 31 FEET.

Notes:
1. Fill not encountered.
2. No casing.
4. Boring backfilled with soil cutting and tamped.

LOG OF BORING

FIGURE A-2.5
**BORING 6**

**Date Drilled:** July 2, 2007  
**Equipment Used:** 24" Diameter Bucket  
**Depth to Water:** Not Encountered  
**Driving Weight & Drop:**  
- 2,500 pounds (0 to 25 feet)  
- 1,000 pounds (26 to 45 feet)  
- 750 pounds (>45 feet)

**SURFACE ELEVATION:** 252 feet MSL

**TERRACE DEPOSITS**  
- **SM - SILTY SAND** - fine, some gravel (up to ½" in size), reddish brown, 14" topsoil, porous in upper 14", rootlets
  
- gravel to 3/4'

- **some gravel (up to 1" diameter)**
  
  [27% Passing No. 200 Sieve]

- **porous, some clay**

- **CL - SANDY CLAY** - reddish brown, manganese stained
  
  cobbles to 4½" diameter, subangular to subrounded, rootlets

- **SM - SILTY SAND** - some clay, yellow brown to red brown

- **SC - CLAYEY SAND** - fine, reddish brown

- **SM - SILTY SAND** - fine, some gravel (up to 3" in size), reddish brown

(Continued on next page)

**LOG OF BORING**
LOG OF BORING

SURFACE ELEVATION: 252 feet MSL

- some clay, some gravel (up to 1/2" in size), mottled brown and dark brown

CL - SANDY CLAY - some gravel (up to 1/2" in size), mottled brown and dark brown

BEDROCK
- Conejo volcanics, weathered basalt, gray, friable
- Increasing sand

END OF BORING AT 61 FEET.

Notes:
1. Fill not encountered.
2. No caving.
4. Boring backfilled with soil cuttings and tamped.

FIGURE A-2.6b
### BORING 7

**Date Drilled:** July 4, 2007  
**Equipment Used:** 24" Diameter Bucket  
**Depth to Water:** Not Encountered  
**Driving Weight & Drop:**  
- 2,600 pounds (0 to 25 feet)  
- 1,000 pounds (26 to 45 feet)  
- 750 pounds (>45 feet)

**Surface Elevation:** 231 feet MSL

<table>
<thead>
<tr>
<th>Elevation (feet)</th>
<th>Depth (feet)</th>
<th>Moisture</th>
<th>N Value</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>230</td>
<td>7.3</td>
<td>121</td>
<td>10</td>
<td>Fill</td>
</tr>
<tr>
<td></td>
<td>8.6</td>
<td>109</td>
<td>5</td>
<td>Silty Sand - fine, abundant gravel and cobbles, greyish brown</td>
</tr>
<tr>
<td></td>
<td>3.8</td>
<td>104</td>
<td>6</td>
<td>Terrace Deposits</td>
</tr>
<tr>
<td></td>
<td>5.2</td>
<td>101</td>
<td>7</td>
<td>Silty Sand - fine, reddish brown</td>
</tr>
<tr>
<td></td>
<td>5.0</td>
<td>103</td>
<td>5</td>
<td>Some gravel (up to 1(\frac{1}{2})&quot; in size), slightly porous</td>
</tr>
<tr>
<td></td>
<td>5.7</td>
<td>112</td>
<td>7</td>
<td>Not porous</td>
</tr>
<tr>
<td></td>
<td>4.8</td>
<td>103</td>
<td>7</td>
<td>Some gravel (up to 5&quot; in size)</td>
</tr>
<tr>
<td></td>
<td>5.2</td>
<td>113</td>
<td>13</td>
<td>Porous</td>
</tr>
<tr>
<td></td>
<td>10.1</td>
<td>103</td>
<td>10</td>
<td>Not porous</td>
</tr>
</tbody>
</table>

(Continued on next page)

**LOG OF BORING**
**Boring 7**

(Continued)

<table>
<thead>
<tr>
<th>Date Drilled:</th>
<th>July 2, 2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment Used:</td>
<td>24&quot; Diameter Bucket</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Surface Elevation</th>
<th>231 feet MSL*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>150</td>
<td>4.2 116 11</td>
</tr>
<tr>
<td>185</td>
<td>6.4 104 13</td>
</tr>
<tr>
<td>160</td>
<td>2.8 103 21</td>
</tr>
<tr>
<td>175</td>
<td>7.0 98 26</td>
</tr>
<tr>
<td>170</td>
<td>5.8 102 16</td>
</tr>
</tbody>
</table>

**END OF BORING AT 61 FEET.**

**Notes:**

1. Fill soils encountered to a depth of 1 foot.
2. No caving.
4. Boring backfilled with soil cutting and tamped.

**LOG OF BORING**

**FIGURE A-2.7b**
**BOURING 8**

**Date Drilled:** July 6, 2007

**Equipment Used:** 24" Diameter Bucket

**Depth to Water:** Not Encountered

<table>
<thead>
<tr>
<th>Driving Weight &amp; Drop</th>
<th>pounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 25 feet</td>
<td>2,500</td>
</tr>
<tr>
<td>28 to 45 feet</td>
<td>1,000</td>
</tr>
<tr>
<td>&gt;45 feet</td>
<td>750</td>
</tr>
</tbody>
</table>

**SURFACE ELEVATION:** 184 feet MSL

**TERRACE DEPOSITS**

- **8'**
  - SM - Silty Sand - fine, some cobbles (up to 6" in size), reddish brown
  - no cobbles, some gravel (up to 1/4" in size)
  - slightly porous
- **13'**
  - some gravel (up to 1" in size)
  - not porous
- **13'**
  - slightly porous
  - not porous
- **14'**
  - some gravel (up to 1/8" in size)

(Continued on next page)

**LOG OF BORING**

FIGURE A-2.8a
Date Drilled: July 6, 2007
Equipment Used: 24" Diameter Bucket

<table>
<thead>
<tr>
<th>ELEVATION (ft)</th>
<th>DEPTH</th>
<th>MOISTURE</th>
<th>ATOMIZED</th>
<th>CONSISTENCY</th>
<th>BULK WEIGHT</th>
<th>BUCKETS TOTAL</th>
<th>BUCKET COUNT</th>
<th>BUCKET LOCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>130</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>135</td>
<td>55</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>140</td>
<td>45</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SURFACE ELEVATION:** 104 feet MSL

**END OF BORING AT 42 FEET.**

**Notes:**
1. Fill not encountered.
2. Gravels varying at 41 to 42 feet.
4. Boring backfilled with soil cutting and tamped.

**LOG OF BORING**
VALUES USED IN ANALYSES

\( c = 500 \text{ psf} \)
\( \phi = 35^\circ \)

NOTE: *** indicates sample was soaked to near saturation prior to testing.

<table>
<thead>
<tr>
<th>Specimen Identification</th>
<th>Classification</th>
<th>( c )</th>
<th>( \phi )</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Boring 1 at 10.5 feet</td>
<td>SILTY SAND</td>
<td>338</td>
<td>36</td>
</tr>
<tr>
<td>• Boring 1 at 20.5 feet</td>
<td>SILTY SAND</td>
<td>800</td>
<td>48</td>
</tr>
<tr>
<td>▲ Boring 3 at 7.5 feet</td>
<td>SILTY SAND</td>
<td>291</td>
<td>42</td>
</tr>
<tr>
<td>★ Boring 3 at 17.5 feet</td>
<td>SILTY SAND</td>
<td>2275</td>
<td>35</td>
</tr>
<tr>
<td>○ Boring 4 at 35.5 feet</td>
<td>SILTY SAND</td>
<td>1538</td>
<td>21</td>
</tr>
<tr>
<td>● Boring 5 at 20.5 feet</td>
<td>SILTY SAND</td>
<td>800</td>
<td>22</td>
</tr>
<tr>
<td>○ Boring 5 at 30.5 feet</td>
<td>SILTY SAND</td>
<td>-50</td>
<td>35</td>
</tr>
<tr>
<td>▲ Boring 6 at 40.5 feet</td>
<td>SANDY SILT</td>
<td>113</td>
<td>46</td>
</tr>
<tr>
<td>★ Boring 6 at 60.5 feet</td>
<td>WEATHERED BASALT</td>
<td>2675</td>
<td>21</td>
</tr>
<tr>
<td>● Boring 7 at 4.5 feet</td>
<td>SILTY SAND</td>
<td>16</td>
<td>47</td>
</tr>
</tbody>
</table>

DIRECT SHEAR TEST DATA
UNDISTURBED SAMPLES, PEAK STRENGTH

FIGURE A-4.1a
VALUES USED IN ANALYSES

- $c = 500$ psf
- $\phi = 36^\circ$

NOTE: "**" indicates sample was soaked to near saturation prior to testing.

<table>
<thead>
<tr>
<th>Specimen Identification</th>
<th>Classification</th>
<th>C</th>
<th>$\phi$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boring 3 at 2.5 feet</td>
<td>SILTY SAND</td>
<td>178</td>
<td>33</td>
</tr>
<tr>
<td>Boring 3 at 15.5 feet</td>
<td>SILTY SAND</td>
<td>713</td>
<td>28</td>
</tr>
</tbody>
</table>

DIRECT SHEAR TEST DATA

UNDISTURBED SAMPLES, PEAK STRENGTH

FIGURE A-4.1b
VALUES USED IN ANALYSES

\[ c = 250 \text{ psf} \]

\[ \phi = 40^\circ \]

NOTE: "**" indicates sample was soaked to near saturation prior to testing.

<table>
<thead>
<tr>
<th>Specimen Identification</th>
<th>Classification</th>
<th>c</th>
<th>(\phi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Boring 1 at 4 to 7 feet</td>
<td>SILTY SAND</td>
<td>127</td>
<td>50</td>
</tr>
<tr>
<td>□ Boring 5 at 13 to 15 feet</td>
<td>SILTY SAND</td>
<td>381</td>
<td>40</td>
</tr>
</tbody>
</table>

DIRECT SHEAR TEST DATA
REOMOLDED SAMPLES (90%), PEAK STRENGTH

FIGURE A-4.2
NOTE: Samples tested at field moisture content

<table>
<thead>
<tr>
<th>Specimen Identification</th>
<th>Classification</th>
<th>STRESS, ksf</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Boring 1 at 10.5 feet</td>
<td>SILTY SAND</td>
<td>* 5.54 ksf</td>
</tr>
<tr>
<td>● Boring 1 at 25.5 feet</td>
<td>SILTY SAND</td>
<td></td>
</tr>
</tbody>
</table>

CONSOLIDATION TEST DATA
NOTE: Samples tested at field moisture content

<table>
<thead>
<tr>
<th>Specimen Identification</th>
<th>Classification</th>
<th>Stress (ksf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ø Boring 2 at 3.5 feet</td>
<td>SILTY SAND</td>
<td>* 2.77 ksf</td>
</tr>
<tr>
<td>Δ Boring 3 at 17.5 feet</td>
<td>SILTY SAND</td>
<td></td>
</tr>
</tbody>
</table>

CONSOLIDATION TEST DATA
NOTE: Samples tested at field moisture content

<table>
<thead>
<tr>
<th>Specimen Identification</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Boring 3 at 30.5 feet</td>
<td>SILTY SAND</td>
</tr>
<tr>
<td>x Boring 4 at 2.5 feet</td>
<td>SILTY SAND</td>
</tr>
</tbody>
</table>

CONSOLIDATION TEST DATA
NOTE: Samples tested at field moisture content

<table>
<thead>
<tr>
<th>Specimen Identification</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Boring 1 at 4 to 7 feet</td>
<td>SILTY SAND</td>
</tr>
<tr>
<td>□ Boring 3 at 2 to 4 feet</td>
<td>SILTY SAND</td>
</tr>
</tbody>
</table>

* 2.77 ksf

CONSOLIDATION TEST DATA
Source of Material
Description of Material
Test Method

Boring 1 at 4 to 7 feet
SILTY SAND
ASTM D1557 Method A

TEST RESULTS
Maximum Dry Density 127.5 PCF
Optimum Water Content 9.5 %

Curves of 100% Saturation for Specific Gravity Equal to:
- 2.80
- 2.70
- 2.60

COMPACATION TEST DATA
Source of Material
SILTY SAND
Boring 3 at 2 to 4 feet
Description of Material
ASTM D1557 Method A
Test Method

TEST RESULTS
Maximum Dry Density 127.5 PCF
Optimum Water Content 9.5 %

Curves of 100% Saturation for Specific Gravity Equal to:
- 2.80
- 2.70
- 2.60

WATER CONTENT, %

DRY DENSITY, pcf

COMPACtion TEST DATA
TEST RESULTS

Maximum Dry Density 128 PCF
Optimum Water Content 9.0 %

Curves of 100% Saturation for Specific Gravity Equal to:

- 2.80
- 2.70
- 2.60

COMPACCTION TEST DATA
R - VALUE DATA SHEET

P.N. 07-023
Rancho Malibu

PROJECT NUMBER 34767 BORING NUMBER: B-1 @ 4'-7"

SAMPLE DESCRIPTION: Brown Sandy Clay

<table>
<thead>
<tr>
<th>Item</th>
<th>SPECIMEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mold Number</td>
<td>a b c</td>
</tr>
<tr>
<td>Water added, grams</td>
<td>4 5 6</td>
</tr>
<tr>
<td>Initial Test Water, %</td>
<td>11.2 13.2 17.6</td>
</tr>
<tr>
<td>Compact Gage Pressure, psi</td>
<td>120 50 30</td>
</tr>
<tr>
<td>Exudation Pressure, psi</td>
<td>562 390 141</td>
</tr>
<tr>
<td>Height Sample, Inches</td>
<td>2.38 2.59 2.64</td>
</tr>
<tr>
<td>Gross Weight Mold, grams</td>
<td>3059 3105 3118</td>
</tr>
<tr>
<td>Tare Weight Mold, grams</td>
<td>1977 1975 1976</td>
</tr>
<tr>
<td>Sample Wet Weight, grams</td>
<td>1082 1130 1142</td>
</tr>
<tr>
<td>Expansion, Inches x 10 exp-4</td>
<td>44 4 0</td>
</tr>
<tr>
<td>Stability 2,000 lbs (160psi)</td>
<td>22 / 52 52 / 117 70 / 155</td>
</tr>
<tr>
<td>Turns Displacement</td>
<td>3.72 3.78 4.47</td>
</tr>
<tr>
<td>R-Value Uncorrected</td>
<td>58 20 2</td>
</tr>
<tr>
<td>R-Value Corrected</td>
<td>55 21 2</td>
</tr>
<tr>
<td>Dry Density, pcf</td>
<td>123.9 116.8 111.4</td>
</tr>
</tbody>
</table>

DESIGN CALCULATION DATA

<table>
<thead>
<tr>
<th>Traffic Index</th>
<th>Assumed: 4.0</th>
<th>4.0</th>
<th>4.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>G.E. by Stability</td>
<td>0.46</td>
<td>0.81</td>
<td>1.00</td>
</tr>
<tr>
<td>G. E. by Expansion</td>
<td>1.47</td>
<td>0.13</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Equilibrium R-Value

| Exudation | 12 |

Equilibrium R-Value by EXUDATION

Gf = 1.25
0.0% Retained on the 3/4" Sieve.

REMARKS:

The data above is based upon processing and testing samples as received from the field. Test procedures in accordance with latest revisions to Department of Transportation, State of California, Materials & Research Test Method No. 301.

LaBelle - Marvin

FIGURE A-7.1
# R-VALUE DATA SHEET

**P.N. 07-023**  
Rancho Malibu

**BORING NUMBER:** B-5 @ 13'-15'

**SAMPLE DESCRIPTION:** Brown Sandy Clay

<table>
<thead>
<tr>
<th>Item</th>
<th>SPECIMEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mold Number</td>
<td>a</td>
</tr>
<tr>
<td>Water added, grams</td>
<td>7</td>
</tr>
<tr>
<td>Initial Test Water, %</td>
<td>14.7</td>
</tr>
<tr>
<td>Compact Gage Pressure, psi</td>
<td>75</td>
</tr>
<tr>
<td>Exudation Pressure, psi</td>
<td>456</td>
</tr>
<tr>
<td>Height Sample, Inches</td>
<td>2.43</td>
</tr>
<tr>
<td>Gross Weight Mold, grams</td>
<td>3061</td>
</tr>
<tr>
<td>Tare Weight Mold, grams</td>
<td>1968</td>
</tr>
<tr>
<td>Sample Wet Weight, grams</td>
<td>1093</td>
</tr>
<tr>
<td>Expansion, Inches x 10exp-4</td>
<td>40</td>
</tr>
<tr>
<td>Stability 2,000 lbs (160psi)</td>
<td>45 / 117</td>
</tr>
<tr>
<td>Turns Displacement</td>
<td>2.99</td>
</tr>
<tr>
<td>R-Value Uncorrected</td>
<td>24</td>
</tr>
<tr>
<td>R-Value Corrected</td>
<td>23</td>
</tr>
<tr>
<td>Dry Density, pcf</td>
<td>118.8</td>
</tr>
</tbody>
</table>

**DESIGN CALCULATION DATA**

<table>
<thead>
<tr>
<th>Traffic Index</th>
<th>Assumed:</th>
<th>4.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>G.E. by Stability</td>
<td>0.79</td>
<td>1.00</td>
</tr>
<tr>
<td>G. E. by Expansion</td>
<td>1.33</td>
<td>0.00</td>
</tr>
</tbody>
</table>

**Equilibrium R-Value**  
Examine & Checked: 7/17/07

**by EXUDATION**

- Gf = 1.25
- 0.0% Retained on the 3/4" Sieve.

**REMARKS:**

The data above is based upon processing and testing samples as received from the field. Test procedures in accordance with latest revisions to Department of Transportation, State of California, Materials & Research Test Method No. 301.

LaBelle • Marvin

FIGURE A-7.3
R-VALUE GRAPHICAL PRESENTATION

PROJECT NO. 34767
BORING NO. B-5013'-15'
DATE 7-17-07
TRAFFIC INDEX Assume 4.0
R-VALUE BY EXUDATION 12
R-VALUE BY EXPANSION

CROSS SECTIONS, LBS.
COMPACT.
0
100
200
300
400

14.0 16.0 18.0
% MOISTURE AT FABRICATION

COVER THICKNESS BY EXPANSION, FT.
0
10
20
30
40
50
60
70
80
90
100

1.0 2.0 3.0 4.0

COVER THICKNESS BY EXUDATION/EXUDATION, FT.
0
1.0
2.0
3.0
4.0

14.0 16.0 18.0
% MOISTURE

R-VALUE vs. EXUD. PRES.
EXUD. T vs. EXPAN. T
T by EXUDATION
T by EXPANSION

REMARKS
GF=1.25

LaBelle • Marvin
PROFESSIONAL PAVEMENT ENGINEERING
FIGURE A-7.4
July 23, 2007

Atlantic Consultants

Van Beveren & Butelco, Inc.
Attention: Victor Langley
708 W. Broadway, Suite 201
Glendale, CA 91204

Atlantic Job #: 2007-006

Subject: Soil Chemistry Analysis for Van Beveren & Butelco, Inc. Job #: 07-023
4 Samples: B-1@ 1-3', B-3@ 2-4', B-7@ 2-5', B-5@ 2-6', (Rancho Palms)

<table>
<thead>
<tr>
<th>Sample Number</th>
<th>As Rea'd Resistivity (ohm-mm)</th>
<th>Minimum Resistivity (ohm-mm)</th>
<th>pH</th>
<th>Sulfate %</th>
<th>Chloride %</th>
<th>(As Rea'd) Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-1</td>
<td>39,600</td>
<td>4,600</td>
<td>5.67</td>
<td>0.0044</td>
<td>0.0193</td>
<td>Medium Brown, moist</td>
</tr>
<tr>
<td>B-3</td>
<td>2,204</td>
<td>1,000</td>
<td>7.78</td>
<td>0.0130</td>
<td>0.0196</td>
<td>Medium Brown, moist</td>
</tr>
<tr>
<td>B-7</td>
<td>72,000</td>
<td>1,600</td>
<td>8.76</td>
<td>0.0092</td>
<td>0.0180</td>
<td>Light Brown, Gravelly dry</td>
</tr>
<tr>
<td>B-5</td>
<td>4,400</td>
<td>1,400</td>
<td>7.04</td>
<td>0.0353</td>
<td>0.0219</td>
<td>Medium Brown, moist</td>
</tr>
</tbody>
</table>

NOTE: Samples were analyzed in accordance with the following methods:
2. pH measured by potentiometric method using standard electrodes (Per Cal. Trans. 8043).
3. Chloride and sulfate were analyzed in accordance with EPA methods for chemical analysis for water and waste, No. 360 EPA-0025-76-020. Concentration by weight of dry soil.

CONCLUSIONS:

<table>
<thead>
<tr>
<th>Material</th>
<th>Corrosion Class</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>Negligible for Sulfate exposure and Chloride exposure, pH is neutral to basic. (U.S. Table 19-A-4)</td>
<td>Type II Portland cement for concrete with a maximum water cement ratio of 0.60 and a minimum of 3 inches of cover over steel reinforcement. It is suggested that a 6 mil polyethylene barrier be placed between concrete slabs and soil to reduce intrusion of moisture and chloride into the concrete slabs.</td>
</tr>
<tr>
<td>Steel</td>
<td>Moderately to Mildly Corrosive</td>
<td>Install corrosion monitoring and cathodic protection for buried ferrous metal piping. Provide electrical continuity along steel and ductile iron piping to facilitate the installation of corrosion monitoring and cathodic protection, if required in the future. Electrically isolate underground metal piping from above grade piping and other metallic structures. Use separate ground rods for grounding interior piping.</td>
</tr>
<tr>
<td>Copper Piping</td>
<td>Corrosive Not tested for Ammonia</td>
<td>Overhead pluming is the most effective method of corrosion control. Copper pipes should not be installed in soils, which may contain ammonia without cathodic protection. If copper pipes are installed below ground, the soils should be tested for ammonia and Keitel's nitrogen. Electrical isolation between hot and cold water lines and between buried copper and steel piping and structural steel should be maintained. If ammonia is present, coat and cathodically protect any buried copper piping.</td>
</tr>
</tbody>
</table>

FIGURE A-8.1
The test results and recommendations are based on the samples submitted, which may not be representative of overall site conditions. Additional sampling may be required to more fully characterize soil conditions.

Sincerely,

ATLANTIC CONSULTANTS, INC.

[Signature]

Keri M. Howell, P.E.
President
APPENDIX E

TEMPORARY STABILITY ANALYSES
APPENDIX E

TEMPORARY STABILITY ANALYSES

Soil Parameters: Soil properties used in our slope stability analyses, which include cohesion, friction angle, and unit weight, are shown on Table E-1 and were obtained from the referenced GSC reports. Shear test summaries for both peak and residual strength parameters were created for Certified Artificial Fill.

<table>
<thead>
<tr>
<th>Soil Description</th>
<th>Peak Values</th>
<th>Resheared Values</th>
<th>Unit Weight (pcf)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>c (psf)</td>
<td>φ (degrees)</td>
<td>c (psf)</td>
</tr>
<tr>
<td>Certified Artificial</td>
<td>200</td>
<td>27</td>
<td>150</td>
</tr>
<tr>
<td>Qalo</td>
<td>400</td>
<td>30</td>
<td>400</td>
</tr>
<tr>
<td>Qtn/Qtm</td>
<td>300</td>
<td>35</td>
<td>100</td>
</tr>
<tr>
<td>Bedrock</td>
<td>310</td>
<td>36.5</td>
<td>100</td>
</tr>
<tr>
<td>Slide Plane</td>
<td>395</td>
<td>16</td>
<td>395</td>
</tr>
</tbody>
</table>
FIG. 10.—F-CONTOURS FOR SLOPE 1:1

\[ H = 25 \text{ ft} \]
\[ \gamma = 130 \text{ psf} \]
\[ c = 300 \text{ psf} \]
\[ \phi = 35^\circ \]
\[ \frac{c}{\gamma H} = 0.9 \]

\[ F_S = 1.65 > 1.25 \]

OK