Appendix D: Geotechnical Investigation Report

Preliminary Geotechnical Investigation Report
San Ramon City Center Project
Bishop Ranch
San Ramon, California

Prepared for

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Our professional services have been performed using that degree of care and skill ordinarily exercised, under similar circumstances, by reputable geotechnical consultants practicing in this or similar localities. No other warranty, expressed or implied, is made as to the professional advice included in this report. If any of the project information provided to MACTEC has changed, we should be notified so that we may amend our recommendations as necessary.

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1.0 INTRODUCTION AND PROJECT OBJECTIVES

1.1. Introduction

Pursuant to a request by Sunset Development Company (Sunset), MACTEC Engineering and Consulting, Inc. (MACTEC) performed a Preliminary Geotechnical Investigation for the proposed San Ramon City Center development in the Bishop Ranch area of San Ramon, California (see Site Location and Vicinity Map, Plate 1-1). Our services were provided in general accordance with MACTEC's Revised Proposal for Preliminary Geotechnical Investigation (PROP06BAYA.125, dated January 24, 2007). Our services were authorized, on January 26, 2007, by Mr. Peter Oswald of Sunset.

MACTEC evaluated subsurface soil and groundwater conditions at the project site through review of previous geotechnical reports. The existing documents contained the results of field explorations, laboratory testing, engineering analyses, and design recommendations for previous development projects at or near the project site. From these documents, we developed geotechnical conclusions and preliminary recommendations for planning and of the proposed development.

The sections which follow in this report present our project understanding, objectives, completed scope of services, findings and conclusions, and preliminary geotechnical recommendations. This report does not address environmental issues related to hazardous wastes at the site. However, we do understand that the report will be used as part of the environmental impact assessment for the project.

1.2. Project Understanding

Project information has been obtained from Messrs. Oswald, Senior Vice President, Director-Government Affairs, with Sunset, and Mr. Gabe Ciccone, Vice President - Construction for Sunset; Mr. Jason Brandman of Michael Brandman Associates (MBA); and Ms. Kristen Salinas of RBF Consulting (RBF). Based upon the information provided, we understand that the City Center Project will be a multi-use development, as shown on the Site Plans, Plates 1-2 and 1-3, and will include the following:

Parcel Designation	Planned Use	Building Details
Bishop Ranch 1A	Class A Office	700,000 square foot (sf); 7-story steel frame
Bishop Ranch 2 and 3A	Residential	403 condominium units; 8-story steel frame
Bishop Ranch 3A	Hotel	200 rooms
Bishop Ranch 2 and 3A	Retail	600,000 sf
Bishop Ranch 1B	City Hall	100,000 sf
Bishop Ranch 1B	Parking	300 spaces; 3-level garage
Bishop Ranch 1	Parking	Two, 3- to 4-level concrete garages

1.3. Objectives and Completed Scope of Services

The purpose of our preliminary geotechnical investigation was to evaluate the anticipated subsurface conditions in the various project parcels and to identify geotechnical issues that should be considered during project planning, design and construction. In completion of the objectives, we performed the following tasks:

- Reviewed field and laboratory data from previous reports so that the subsurface conditions and geotechnical issues for the project could be determined. Reviewed surface conditions and areas of existing pavements and hardscaping using existing aerial photography provided by outside vendors.

- Reviewed preliminary documents for the development to understand the types of construction being considered.

- Interpreted geology, seismicity, and geotechnical conditions of the site. Evaluated the potential for geologic hazards at the site.

- Developed preliminary geotechnical recommendations for project planning and preliminary design.

- Prepared this Preliminary Geotechnical Investigation Report, summarizing our findings, presenting geologic hazard mitigation options, and preliminary earthwork and foundation design criteria. Recommendations for future geotechnical investigations during project design are also presented.

2.0 DATA REVIEWED

We reviewed previous geotechnical reports for the project site and vicinity, several of which were prepared by MACTEC (when known as Harding Lawson Associates, HLA). The reports reviewed included the following:

HLA, 1982. *Soil Investigation, Bollinger Business Center, Bishop Ranch, San Ramon, California*; prepared for Sunset Development Company; HLA Project 8294,009.03; dated April 6, 1982.

HLA, 1986. *Geotechnical Investigation, Bishop Ranch 1 Development, Bishop Ranch Business Park, San Ramon, California*; prepared for Sunset Development Company; HLA Project 8294,019.03; dated October 6, 1986.

HLA, 1986. *Geotechnical Investigation, Bishop Ranch 1 Development, Bishop Ranch Business Park, San Ramon, California*; prepared for Sunset Development Company; HLA Project 8294,019.03; dated October 6, 1986.

HLA, 2000. *Geotechnical Investigation, Bishop Ranch 1 Development, San Ramon, California*; prepared for Sunset Development Company; HLA Project 50044.1; dated May 15, 2000.

ENGEO, 2001. *Preliminary Geotechnical Exploration, San Ramon City Center, San Ramon, California*; prepared for City of San Ramon, California; ENGEO Project 5172.001.01; dated March 29, 2001.

Kleinfelder, 2005. *Geotechnical Investigation at Chevron/Texaco Campus Lots 16, 20 and 21 of the Bishop Ranch Business Park, San Ramon, California*; prepared for Watry Design; Kleinfelder Project 53512/Geo; dated June 9, 2005.

Other reviewed literature included California Geological Survey (CGS, formerly known as the California Division of Mines and Geology [CDMG]) documents and webpages, and California Building Code documents.

We reviewed the following project information:

Ground Floor Plan, San Ramon City Center, San Ramon, California, prepared by Sunset Development Company, dated January 25, 2007.

Conceptual Lower Level Plan (-10), San Ramon City Center, San Ramon, California, prepared by Sunset Development Company, dated January 26, 2007.

3.0 SITE AND SUBSURFACE CONDITIONS

3.1. General Site Description

The following section summarizes the current site surface conditions. The site location and parcel limits are shown on the Site Location and Vicinity Map (Plate 1-1), and on the Site Plans (Plates 1-2 and 1-3).

Parcel 1 includes an at-grade, asphalt-paved parking area, with minimal landscape areas. The parcel is bounded on the (nominal) north side by the by open space of Parcel 1A. The Bishop Ranch One East access roadway bounds the east and south sides of Parcel 1. The Bishop Ranch One access roadway bounds the west side. Multi-story office structures are located on the adjacent land to the west.

Parcel 1A includes a vacant, relatively flat-lying open space. Ground cover includes uncultivated, annual and perennial vegetation, with some shrubbery. Trees generally parallel the parcel bounds. Bollinger Canyon Road bounds the north side of Parcel 1A. The Bishop Ranch One East access roadway bounds the east edge. Parcel 1 is located to the south. The Bishop Ranch One access roadway bounds the west edge.

Parcel 1B includes an at-grade, asphalt-paved parking area, with minimal landscape areas. Trees generally parallel the parcel bounds. Bollinger Canyon Road bounds the north edge. The Bishop Ranch One access roadway bounds the east edge. At-grade, asphalt-paved parking areas are located immediately south and west of Parcel 1B.

Parcel 2 includes four, multi-story structures, with an interior, turf-courtyard landscaped area. The parcel perimeter includes generally flat-lying, at-grade, asphalt-paved parking areas, with landscape islands. The parcel is bounded on the north by Bishop Drive, on the east by Camino Ramon, on the south by Bollinger Canyon Road, and on the west by Sunset Drive. Multi-story structures are located west of Sunset Drive.

Parcel 3A includes a vacant, relatively flat-lying open space. Ground cover includes uncultivated, annual and perennial vegetation, with some shrubbery. Trees generally parallel the parcel bounds. A shallow drainage ditch is near portions of the perimeter. The parcel is bound on the south by Bollinger Canyon Road, on the west north by Camino Ramon, on the east by the Iron horse Trail, and on the north by a multi-story parking structure.

3.2. Geologic Setting

The site is located within the San Ramon Valley, a portion of the California Coastal Ranges geomorphic province (*California Geomorphic Provinces, Note 36, California Geological Survey*, revised *December 2002*). In general, the geologic structure and topography are characteristic of the San Francisco Bay Area. This region is generally defined by northwest-trending ridges and valleys that generally parallel the geologic structures, including the major fault systems. The San Ramon Valley fill includes quaternary-aged alluvium up to approximately 300 feet in thickness. The valley is drained by both North and South San Ramon Creeks that are actively cutting into the alluvial surface soils. Tertiary-aged sedimentary rocks comprise surrounding slopes and underlying valley geology.

3.3. Subsurface Conditions

The subsurface conditions at the site are presented graphically on Cross-Sections (Plates 3-1 through 3-4), which summarize boring and cone penetration test (CPT) data from previous geotechnical investigations at and near the site. Copies of boring and CPT logs from the previous reports are given in Appendix A. Copies of laboratory test data from the previous reports are included in Appendix B.

The subsurface conditions in the project area are interpreted to be relatively uniform. Expansive clay soils blanket most of the site and extend to at least 5 feet below the ground surface, and to as much as 10 feet in some locations. The ENGEO (*2001*) report indicated that fill soil had been placed within areas of the current Parcels 1A and 3A. The fill soil was reported to have been excavated from nearby parcels during construction activities. Detailed vertical and lateral extent of the fill soil, its composition and placement condition, could not be ascertained form the available data.

The stiff-to-hard, expansive clay surface soils overlie moderately compressible silts and clays to depths extending to about 30 feet to 40 feet below grade. Deeper soils are relatively strong alluvial sands, silts, and clays to the depths explored (about 75 feet maximum).

Groundwater has been encountered as shallow as 7 feet below the site grade during previous exploration, but has varied to as deep as 20 feet in some locations during drilling.

4.0 GEOLOGIC HAZARDS

The following sections provide our interpretation of potential geologic hazards that may be encountered at the site. The geologic hazards at the site are primarily earthquake related. The site is in an area of high seismicity, as is all of the San Francisco Bay Area, with a significant potential for strong ground shaking during an earthquake. In addition to the primary ground shaking seismic concern, secondary concerns include liquefaction phenomenon and densification conditions. However, damage to structures as a result of actual fault movement is considered unlikely as no faults are known to traverse the site.

Although the site could be subjected to strong ground shaking in the event of an earthquake, it is our opinion that the effects of ground shaking can be mitigated by proper engineering design and construction in conformance with current building codes and good engineering practices.

4.1. Faulting

The numerous faults in Northern California include active, potentially active, and inactive faults. The criteria for these major groups are based on criteria developed by the California Geological Survey (previously the California Division of Mines and Geology) for the Alquist-Priolo Earthquake Fault Zoning Program (*Hart, 1999*). By definition, an active fault is one that has had surface displacement within Holocene time (about the last 11,000 years). A potentially active fault is a fault that has demonstrated surface displacement of Quaternary age deposits (last 1.6 million years). Inactive faults have not moved in the last 1.6 million years.

The site is not within a currently-established Alquist-Priolo Earthquake Fault Zone for surface rupture hazards. The nearest active faults are the Calalveras fault, located about 0.6 miles to the west, and the Concord-Green Valley fault, located about 8 miles northeast.

Based on the available geologic data, active or potentially active faults with the potential for surface fault rupture are not known to be located directly beneath or projecting toward the site. Therefore, the potential for surface rupture due to fault plane displacement propagating to the surface at the site during the design life of the project is considered low.

4.2. Seismicity

The most significant geologic hazard affecting the site is strong ground shaking resulting from earthquakes on active faults near the site. The following table lists significant seismic sources and their characteristics.

Fault	Distance from Site (kilometers)	Direction from Site	Slip Rate (mm/yr)	Maximum Moment Magnitude
Calaveras	1	WSW	6	6.8
Concord – Green Valley	14	N	6	6.9
Hayward	15	WSW	9	7.1
Greenville	16	NE	2	6.9
Great Valley	27	ENE	1.5	6.7
San Andreas	44	WSW	24	7.9

Fault	Distance from Site (kilometers)	Direction from Site	Slip Rate (mm/yr)	Maximum Moment Magnitude
Monte Vista - Shannon	45	SW	0.4	6.5
Rodgers Creek	49	NW	9	7.0
San Gregorio	54	WSW	5	7.3
West Napa	67	NNW	1	6.5
Sargent	72	S	3	6.8
Ortigalita	80	SE	1	6.9
Point Reyes	95	WNW	0.3	6.8

Based on a review of the local soil and geologic conditions, seismic design criteria in accordance with Chapter 16A of the California Building Code (*CBC, 2001*) are interpreted as follows:

Categorization/Coefficient	Design Value
Nearest recognized seismic source	Calaveras Fault
Distance to fault	1 km
Maximum Moment Magnitude	6.8
Slip Rate (mm/year):	6
Soil Profile Type (Table 16A-J)	S_D
Seismic Zone (Figure 16A-2)	4
Seismic Zone Factor, Z (Table 16A-I)	0.4
Seismic Source (fault) Type (Table 16A-U)	B
Near Source Factor, N_a (Table 16A-S)	1.3
Near Source Factor, N_v (Table 16A-T)	1.6
Seismic Coefficient, C_a (Table 16A-Q)	0.572
Seismic Coefficient, C_v (Table 16A-R)	1.024

Peak Ground Accelerations at the site are estimated to be as follows:

Probability of Occurrence	Peak Ground Acceleration
5% in 50 years	0.78g
10% in 50 years	0.62g

4.3. Liquefaction and Densification

Soil liquefaction is a phenomenon in which saturated (submerged) cohesionless soils are subjected to a temporary loss of strength as a result of the build up of excess pore water pressure during cyclic shaking induced by earthquakes. In the process, the soil acquires a mobility that can result in horizontal and vertical movements. The effect of liquefaction on settlement of structures can be significant. Liquefaction potential is greatest where the ground water level is shallow, and submerged loose, uniformly-graded, clean, fine sands occur within a depth of about 15 meters (50 feet) or less below the ground.

The reviewed reports indicated some saturated sand layers and lenses are present below the site. The reports indicate the sand units are relatively thin, discontinuous, and contain appreciable concentrations of fine-grain material components. It is our interpretation that liquefaction potential at the sites is limited and that settlement caused by liquefaction would be relatively small.

Densification of unsaturated sandy soils subjected to earthquake loading can cause settlement at the ground surface. However, because most sand layers below the site contain appreciable fine-grained component percentages, tend to be relatively dense, and appear to be interbedded with fine grained layers, it is our interpretation that settlement caused by soil densification would be relatively small.

5.0 CONCLUSIONS AND PRELIMINARY RECOMMENDATIONS

5.1. General

From a geotechnical engineering standpoint, it is our opinion that the site is suitable for development as described in our project understanding. Prior building construction in the Bishop Ranch area has utilized foundation systems ranging from spread footings to driven concrete piles, depending on structural loads and building tolerances for settlements.

The following site conditions should be considered during project planning.

- The surficial silty clay soils exhibit moderate expansion potential. The soil is anticipated to shrink and swell with fluctuations in moisture content. To assist in mitigating potential expansion/shrinkage associated with moisture content variation, it is our opinion that soil moisture conditioning and select (non-expansive) fill blankets should be integrated into design and construction. Alternatively, expansive soils could be stabilized by lime treatment, which would reduce the quantity of select fill needed to be imported for the development.

- Some project areas (in particular Parcels 1A and 3A) may have received soil imported from nearby parcels undergoing development. These stockpiled material should be categorized, geotechnically, as an undocumented fill. The vertical and lateral extents, in-place relative density, and engineering characteristics are not known. It is our opinion that such soil, where identified, could need to be removed and recompacted or disposed offsite.

- The silts and clays underlying the upper surface soils are relatively compressible under moderate to heavy structural loads. Some building structural loads, if supported by shallow spread footings, could settle excessively. Building settlements can be reduced by using pile foundations that extend into the stronger alluvial soils below depths of 30 to 40 feet below the ground surface. Based on the documents reviewed, we note that existing structures generally exceeding three stories in height have been founded on driven pre-cast concrete piles.

- Groundwater levels could lie within 10 feet of the ground surface and could affect the design and construction of basements.

The following paragraphs of this report section present preliminary geotechnical recommendations for planning of the development.

5.2. Earthwork and Excavation

5.2.1. Building Site Preparation and Grading

In areas to be graded, the ground surface should be stripped of vegetation, soils containing organic matter, and other deleterious material (i.e., demolition debris, etc.). Existing footings, slabs, and utilities should be removed from the planned building areas. Existing soil should be removed from planned structure footprints to a depth of at least 18 inches below the base of interior slab-on-grade floors. Excavation limits should extend a minimum of 5 feet horizontally beyond each structure footprint.

Subgrade soils exposed by stripping, demolition fill removal, and excavations should be scarified to a minimum depth of 8 inches, moisture conditioned to 2 to 4 percent over Optimum Moisture Content (for clay soils), and compacted to at least 90 percent Relative Compaction[1].

Loose and/or soft soils exposed at the excavation bases should be completely removed and replaced with compacted (engineered) fill. Following subgrade preparation, the ground surface should be kept moist to avoid excessive moisture loss.

Engineered (non-expansive) fill material, placed to achieve final site grades or to underlay concrete slabs-on-grade and asphalt pavements, should have the following characteristics:

- Be predominantly granular;
- Be free of organic material and inorganic debris;
- Contain less than 20 percent fines (material passing the Number 200 sieve);
- Have a Liquid Limit of less than 40;
- Have a Plasticity Index of less than 15, and;
- Contain no rocks or clods larger than 4 inches in greatest dimension.

In our opinion, the on-site surficial clay soils will not be acceptable for reuse as engineered fill below slab areas or structures, unless treated with lime. Existing fill soils should be tested to determine their in-situ compaction (if desired to be left in place) and suitability for excavation and reuse as engineered fill. Excavated onsite soils soil could be used in landscape areas or other areas where their expansive potential will not be detrimental.

If imported soil is used as engineered fill, the import material should conform to the above requirements. Fill material samples should be submitted to the geotechnical engineer prior to use for testing to establish that the proposed material meets the above criteria. Crushed concrete from demolition activities could also be reused as engineered fill, provided it meets the criteria listed above.

Engineered fill should be placed in thin layers not exceeding 8 inches in uncompacted thickness, moisture conditioned to near optimum moisture content, and compacted to at least 90 percent relative compaction.

We recommend that exterior concrete flatwork and sidewalks be underlain by at least 12 inches of nonexpansive fill to minimize shrink/swell movement associated with expansive clay subgrades. Excavation limits should extend a minimum of 3 feet horizontally beyond the flatwork limits. Fill material, conforming to the above criteria, should be moisture conditioned to near Optimum Moisture Content, and compacted to at least 90 percent Relative Compaction. Alternatively, exterior concrete flatwork and sidewalks can be placed over a 4-inch-thick base course layer overlying properly moisture conditioned and compacted subgrade soils. However, more maintenance may be required because of the possible shrink/swell movements of the clay subgrade associated with this option.

We recommend that permanent cut and fill slopes be graded at inclinations of 2:1 (H:V) or flatter.

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[1] Relative Compaction refers to the in-place dry density of soil expressed as a percentage of the maximum dry density of the same material, as determined by the ASTM D1557 laboratory compaction procedure. Optimum Moisture Content is the water content that corresponds to the maximum dry density.

It is significant to note that the clay soils at the site will be difficult to work during wet weather, particularly during the winter rainy season. The preferred approach to grading is typically to conduct earthwork during dry, warm weather when the clay soils are generally dry and firm.

5.2.2. Temporary Excavations

Temporary excavations must comply with current requirements of Cal-OSHA. Additionally, all cuts deeper than five feet should be sloped or shored. It is our opinion that temporary excavations can be sloped at 1(H):1(V) or flatter; however, it is the responsibility of the contractor to maintain safe and stable slopes or design and provide shoring during construction.

Excavations deeper than seven feet below the ground surface could encounter groundwater. Although groundwater inflows might not be large, because of the generally fine-grained nature of the site soils, the groundwater should be removed from the excavations to prevent softening of the excavation base to and to enable proper compaction of the subgrade and subsequent fill layers.

5.2.3. Utility Trench Backfills

We recommend that utility conduit and pipe bedding material consist of sand with less than 10 percent fines. The bedding should extend from the bottom of the trench to 1 foot above the top of the pipe. Sand bedding should be placed in a trench free of standing water and mechanically compacted to at least 90 percent relative compaction.

Trench backfill above the pipe bedding should meet the criteria for engineered fill, as described above, in areas where settlement of the trench backfill would be a concern. In landscape areas, onsite soils could be used as backfill, but some long-term settlement should be anticipated. Trench backfill should be placed in uniform layers not exceeding 8 inches in loose thickness, moisture-conditioned to near-optimum moisture content (2 to 4 percent above Optimum for clay soils), and then compacted to at least 90 percent Relative Compaction. Jetting or water flooding should not be permitted for any backfill compaction.

5.3. Foundations

5.3.1. Driven Piles

Because of the relatively compressible nature of the clays and silts, to depths of 30 to 40 feet, preliminary planning should be based on the use of pile foundations to provide adequate foundation support and to control building settlements within tolerable ranges.

Based on past experience at Bishop Ranch, we anticipate that pile capacities will be developed primarily from skin friction along pile shafts. Pre-stressed concrete piles (12-inch square), in lengths ranging from 30 to 60 feet, have been used successfully in the past. For these lengths, allowable axial capacities in compression will range from about 50 tons to 100 tons. Allowable axial capacities in tension will range from about 25 tons to 55 tons.

The allowable compressive (downward) capacities given above are for service loading cases (dead load plus sustained live loads) and include a 2.0 factor of safety. To estimate the allowable compressive capacities under seismic loading conditions, the compression values can be increased by one-third (1.5 factor of safety).

The allowable tension (upward) capacities given above are for short-term loading cases (wind or seismic loads) and include a 1.5 factor of safety. The buoyant weight of the piles can be added to the soil capacity to evaluate total uplift resistance.

The pile capacities are based on an assumed 4-foot-deep pile cap with the pile cap top at approximately two feet below finished grade elevation. For pile groups with pile spacing of at least three pile widths center-to-center, a group efficiency of 1.0 may be assumed for estimating axial capacity for both static and seismic conditions.

Resistance to short-term lateral loads on piles can be provided by passive soil pressure against the pile cap and grade beams, using allowable passive pressures equivalent to a fluid weighing 300 pounds per cubic foot. Passive pressures should be disregarded for the upper 12 inches of foundation depth, unless confined by a concrete slab or pavement. Lateral resistance can also be obtained from pile bending. However, load-resistance calculations (p-y analyses) are quite project specific and should be performed during final design.

Settlement analyses should be performed once the structural design loads and foundation system geometry are defined for each building. However, it typical settlements of pile-supported buildings (of the type anticipated for this project) would be less than one inch.

5.3.2. Alternative Pile Types

Other pile types can be considered during final design. Based on current construction practices in the Bay Area, alternative pile types could include drilled, cast-in-place, concrete piers; and auger, cast-in-place (ACIP) concrete piles. The lengths and capacity of these alternative pile types would be similar to driven concrete piles, but they would have different costs and installation pros and cons (i.e., less noise during installation, but more difficulty with groundwater (drilled piers) and excavated soil disposal (both drilled piers and ACIP piles).

5.3.3. Miscellaneous Footing Foundations

For light structures and miscellaneous building appurtenances, having a relatively light loads, or heavier structures with relatively large settlement tolerances, shallow foundations could be used. Shallow spread footings or mat foundations should be founded at least 30 inches below the lowest adjacent ground surface on moisture-conditioned, compacted native soils and/or compacted engineered fill. Footings/mats located adjacent to utility trenches should have their bearing surfaces situated below an imaginary 1½:1 (horizontal to vertical) plane projected upward from the bottom of the adjacent utility trench.

Footings/mats conforming to the above requirements could be designed using allowable bearing pressures of no greater than 3,000 pounds per square foot (psf) for dead loads; 3,500 psf for dead plus sustained long term live loads; and 4,500 psf for total loads, including wind or seismic forces. These values are net allowable bearing capacities (the weight of the footing can be neglected).

Settlement analyses can be performed once the structural design loads and foundation system geometry are more clearly defined.

Resistance to lateral loads can be derived from passive resistance acting on the faces of foundation elements oriented perpendicular to the direction of loading and friction acting between the base of the foundations and the supporting subgrade. We recommend using an equivalent fluid pressure of 300 pounds per cubic foot (pcf) to compute passive resistance. The upper 12 inches of embedment should be ignored for passive resistance calculations except where the ground is paved or covered by a slab or pavement. A friction coefficient of 0.3 applied to dead loads can be used to compute base friction. The above values include a factor of safety of 1.5.

Resistance to uplift loads can be provided by the dead load of the structure and weight of the footing plus any soil cover.

5.4. Concrete Slabs-on-Grade

In areas where floor wetness would be undesirable, 4 inches of free draining gravel should be placed beneath the floor slab to serve as a capillary barrier between the subgrade soil and the slab. In order to reduce vapor transmission through the slab, an impermeable membrane should be placed over the gravel. The membrane should be covered with 2 inches of sand or have adequate thickness to protect it during construction.

5.5. Asphalt Pavements

Based on prior report findings and conclusions, we suggest the following preliminary flexible pavement structural section thicknesses.

Traffic Index	Asphalt Cement Thickness (inches)	Class 2[(1)] Aggregate Base Thickness (inches)	Class 2[(1)] Aggregate Subbase Thickness (inches)
4	2.0	8.5	–
	2.0	4.0	6.0
5	2.5	11.0	–
	2.5	6.0	6.0
6	3.0	14.0	--
	3.0	7.0	8.0

(1) Caltrans designation

The above pavement thicknesses are based on an assumed R-value of 5 for the clay subgrade soils. We anticipate that a Traffic Index of 4.0 could be used for parking areas with lower traffic loads and frequencies, while Traffic Indexes of 5.0 and 6.0 would be applicable to occasional to regular heavier traffic loadings and frequencies associated with entry/access roads and truck loading areas, respectively.

Soil subgrades in asphalt-paved areas should be smooth and nonyielding. The upper six-inches should be moisture conditioned, as necessary, to greater than Optimum Moisture Content and compacted to at least 95 percent relative compaction The subgrade should not be allowed to dry out prior to pavement construction. If soft, unstable, or saturated soils are encountered, the questionable soil should be excavated and replaced with subbase material or aggregate base material. The aggregate base and subbase should conform to the criteria specified for Class 2 Aggregate Base and Subbase in the current, adopted Caltrans Standard Specifications. The Subbase and Aggregate Base courses should be moisture conditioned to slightly above optimum moisture content and compacted to at least 95 percent relative compaction prior to placement of the Asphalt Concrete.

5.6. Soil Corrosion Potential

Soil resistivity is a measure of a soil's ability to conduct electrical current. Resistivity is usually related to the soluble salts concentrations in the soil. Low resistivity values generally indicate more corrosive potential. Another factor influencing corrosion potential is pH. Values in the acidic range (pH less than 7.0) indicate environments more conducive to metals and concrete corrosion. Previous soil test results have indicated near surface clay soils have relatively low resistivity values and are considered corrosive to very corrosive when in contact with metallic improvements. pH values are generally in the neutral range (near 7.0).

Sulfate and chloride concentrations in soil can also have a corrosive effect on buried utilities and foundation elements. Sulfates are increasingly corrosive to ferrous metals at concentrations above 1,000 milligrams per kilogram (mg/kg) and to concrete above 2,000 mg/kg. In addition to a chemical corrosion attack, highly concentrated sulfates can exhibit physical degradation on concrete. Chloride does not demonstrate physical concrete degradation. Previous soil test results at the site have indicated negligible ferrous-metals and concrete corrosion potential due to sulfate and chloride concentrations.

It is our opinion that the near-surface soils at the site have a corrosive to very corrosive potential to ferrous metals contained within buried reinforced concrete elements and utilities. Because of potential soil corrosion affects on reinforced concrete elements and utilities, we recommend that ferrous elements be shielded from soil exposure. We also recommend that any imported fill material be tested for corrosion potential before being used.

6.0 GEOTECHNICAL ENGINEERING SERVICES DURING FINAL DESIGN AND CONSTRUCTION

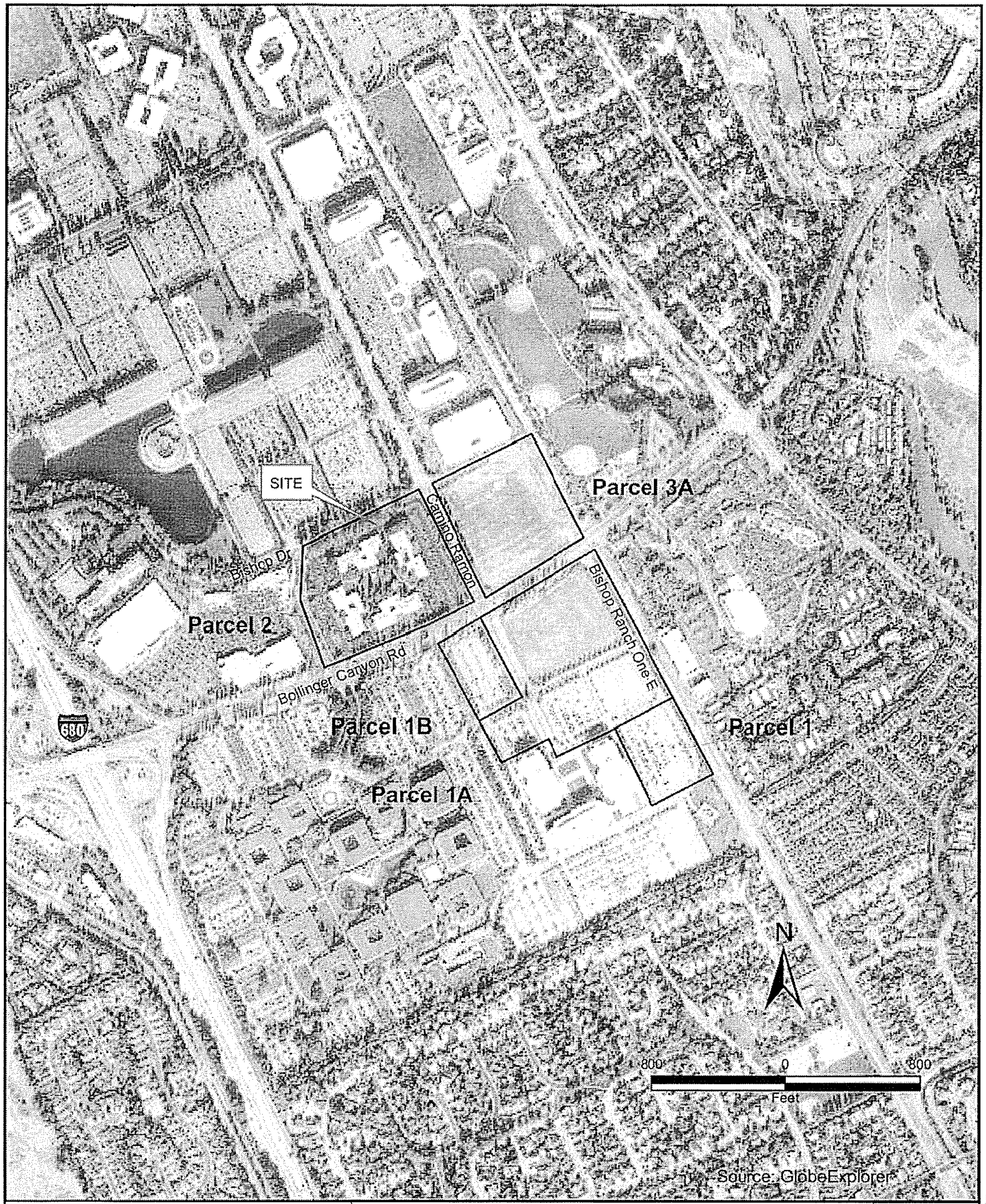
This report has been prepared for planning of the project. During design, additional geotechnical engineering should be performed to meet the specific needs of the various elements of the project. We recommend that additional subsurface investigations be performed if appropriate to confirm or augment the site data available from previous investigations and/or to support the design requirements of the project teams. Additional investigations could be needed for the following:

- To determine the subsurface conditions in areas that have not been previously explored,
- To investigate the nature and extent of stockpiled soils (undocumented fills) on a parcel,
- To obtain deeper soil data to support the analysis of longer and higher-capacity piles than have been used in the past, and
- To obtain current information on depths to groundwater for buildings that will have full-depth basements.

During construction, the project geotechnical engineer should review and/or observe and perform quality control testing of the following work items:

- Site preparation,
- Excavations and installation of temporary support systems,
- Foundation excavations,
- Subgrade compaction,
- Fill and backfill compaction,
- Utility trench bedding and backfill compaction, and
- Foundation installation.

PLATES



Source: GlobeExplorer

MACTEC

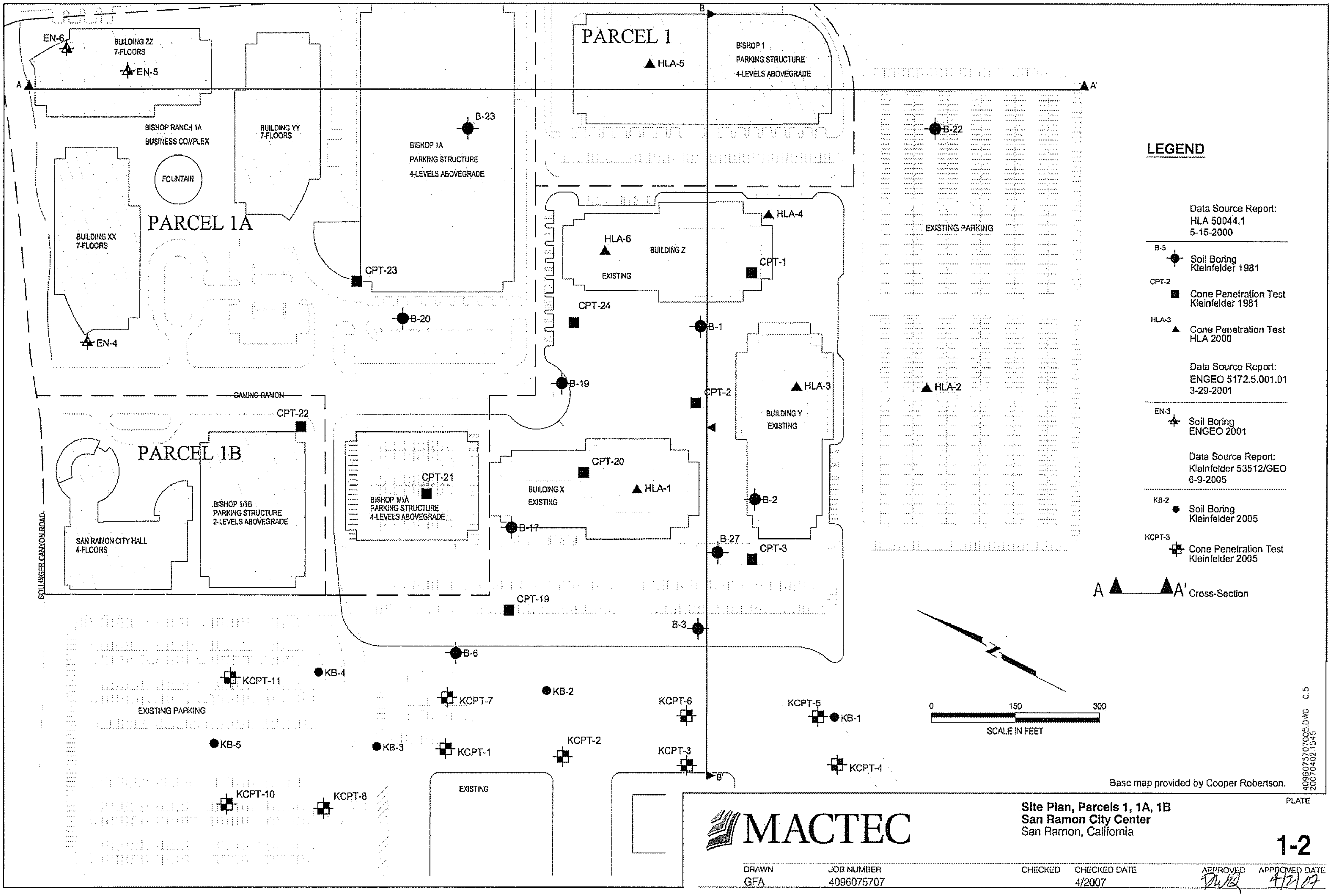
Site Location and Vicinity Map

San Ramon City Center
San Ramon, California

PLATE 1-1

DRAWN	JOB NUMBER	CHECKED	CHECKED DATE	APPROVED	APPROVED DATE
GFA	4096075707 05		4/2007	PWR	4/2/07

BR_Figure1.mxd - 4/02/07



Base map provided by Cooper Robertson.

4096075707005.DWG 0.5
20070402.1545

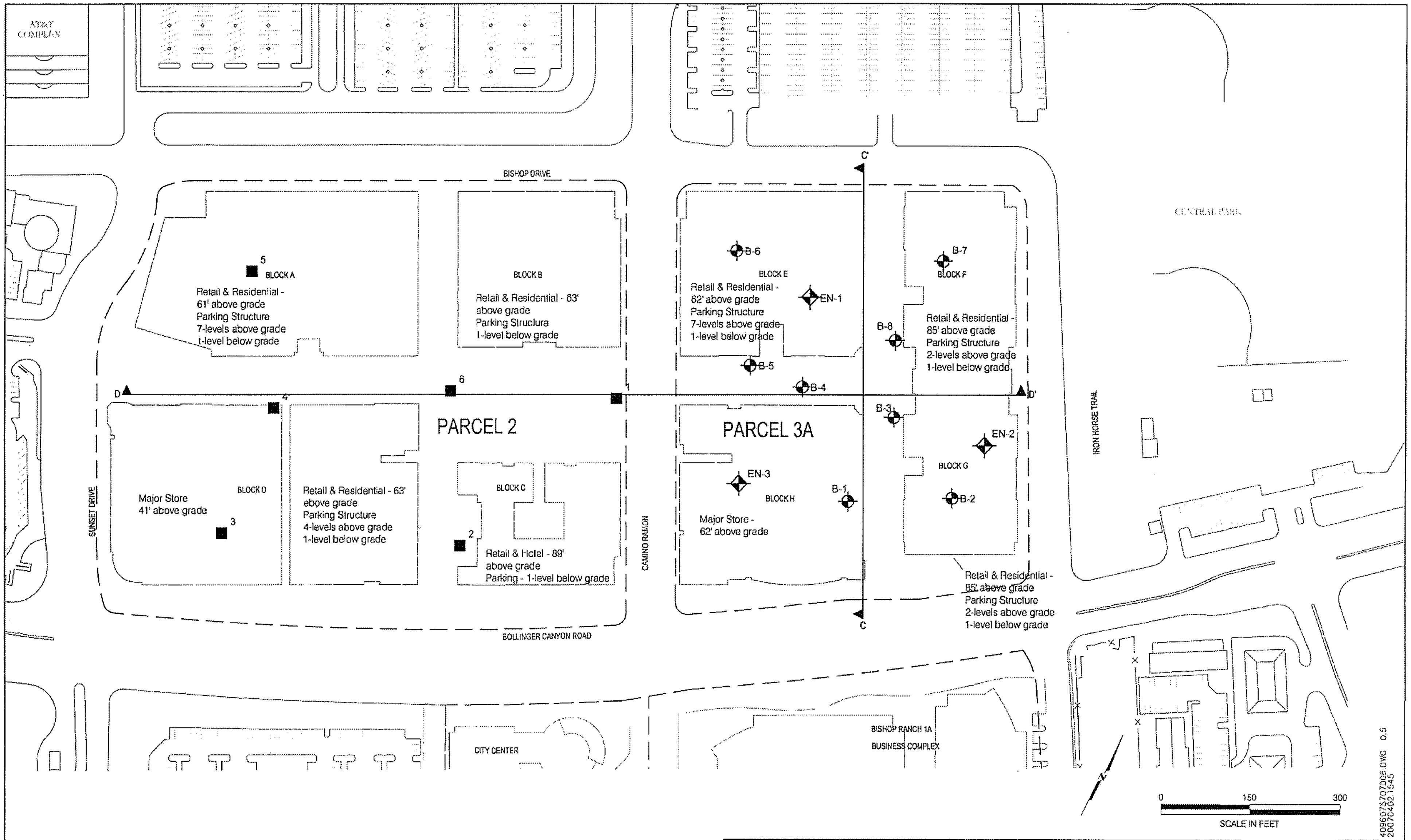
MACTEC

Site Plan, Parcels 1, 1A, 1B
San Ramon City Center
San Ramon, California

PLATE

1-2

DRAWN	JOB NUMBER	CHECKED	CHECKED DATE	APPROVED	APPROVED DATE
GFA	4096075707		4/2007	DWB	4/2/07



LEGEND

B-5 ⊕ Data Source Report: HLA 8294.019.03 10-6-86 HLA Soil Boring

EN-3 ⊕ Data Source Report: ENGEO 5172.5.001.01 3-29-2001 ENGEO Soil Boring

2 ■ Data Source Report: HLA 8294,009.03 4-6-82 HLA Soil Boring

D ▲——▲ D' Cross-Section

Base map provided by Cooper Robertson.

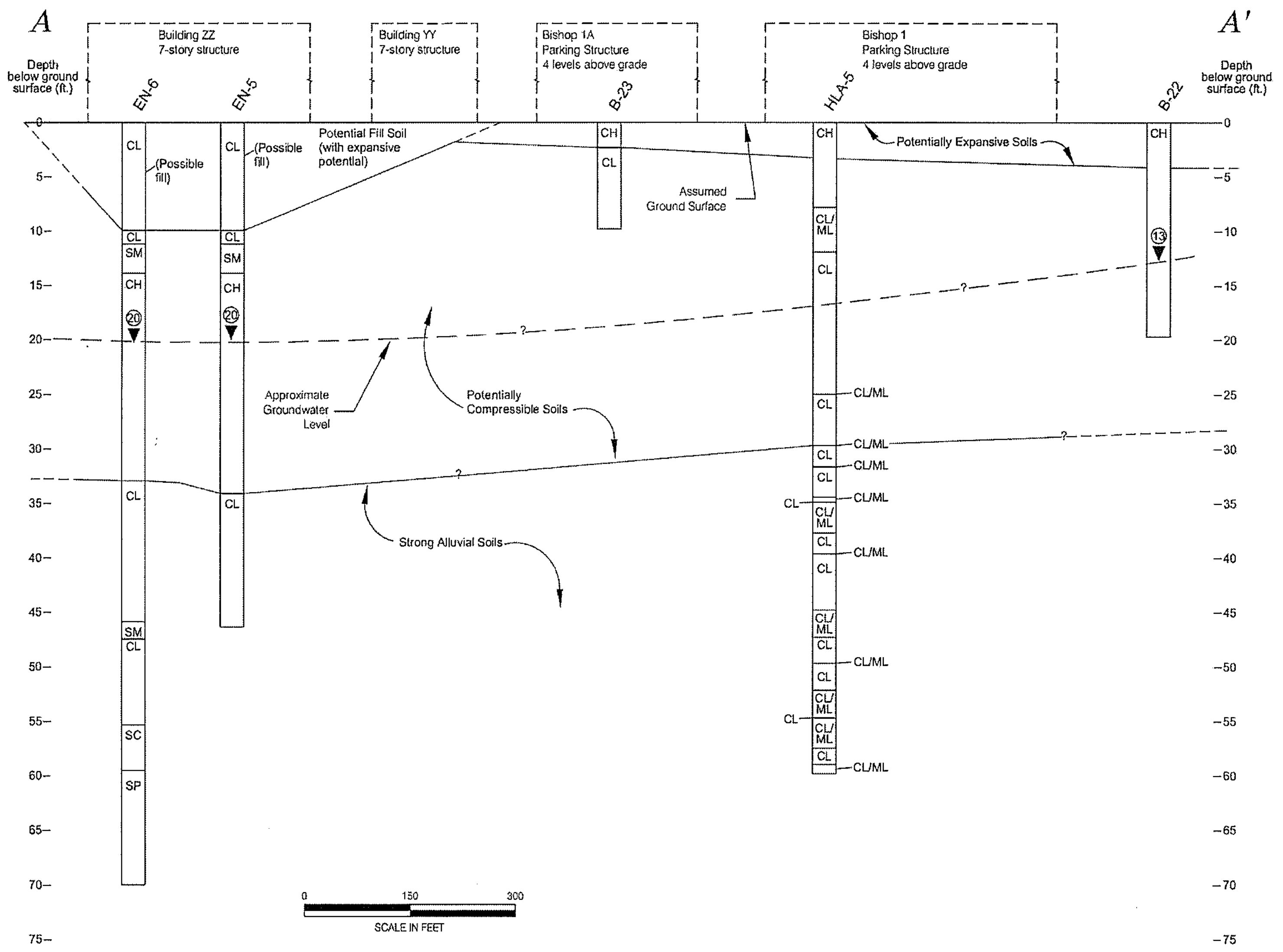
MACTEC

Site Plan, Parcels 2 and 3A
San Ramon City Center
San Ramon, California

PLATE

1-3

DRAWN	JOB NUMBER	CHECKED	CHECKED DATE	APPROVED	APPROVED DATE
GFA	4096075707		4/2007	DMG	4/2/07



Legend:

㉑ ▼ Depth to water during drilling (feet)

Notes:

Lithology from Unified Soil Classification System:

CL = Fat Clay
CH = Lean Clay
ML = Silt
SM = Silty Sand
SP = Poorly - Graded Sand
SC = Clayey Sand

4096075707001.DWG 0.5
20070402.1545

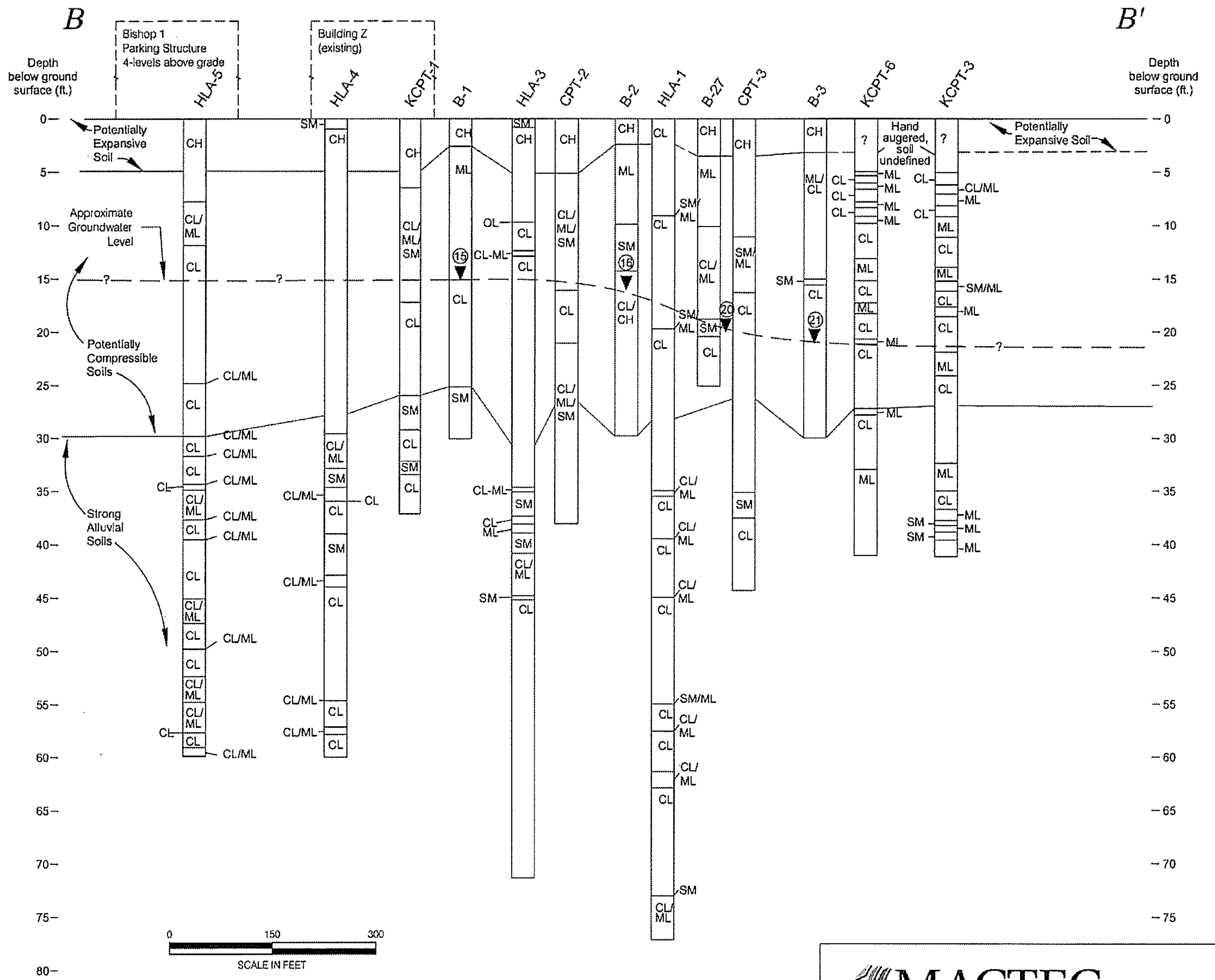
MACTEC

Cross Section A-A'
San Ramon City Center
San Ramon, California

PLATE

3-1

DRAWN	JOB NUMBER	CHECKED	CHECKED DATE	APPROVED	APPROVED DATE
GFA	4096075707		4/2007	OHG	4/2/07



Legend:

㉑ ▼ Depth to water during drilling (feet)

Notes:

Lithology from Unified Soil Classification System:

CL = Fat Clay
CH = Lean Clay
ML = Silt
SM = Silty Sand
SP = Poorly - Graded Sand
SC = Clayey Sand

4096075707002.DWG 1.0
20070402.1457

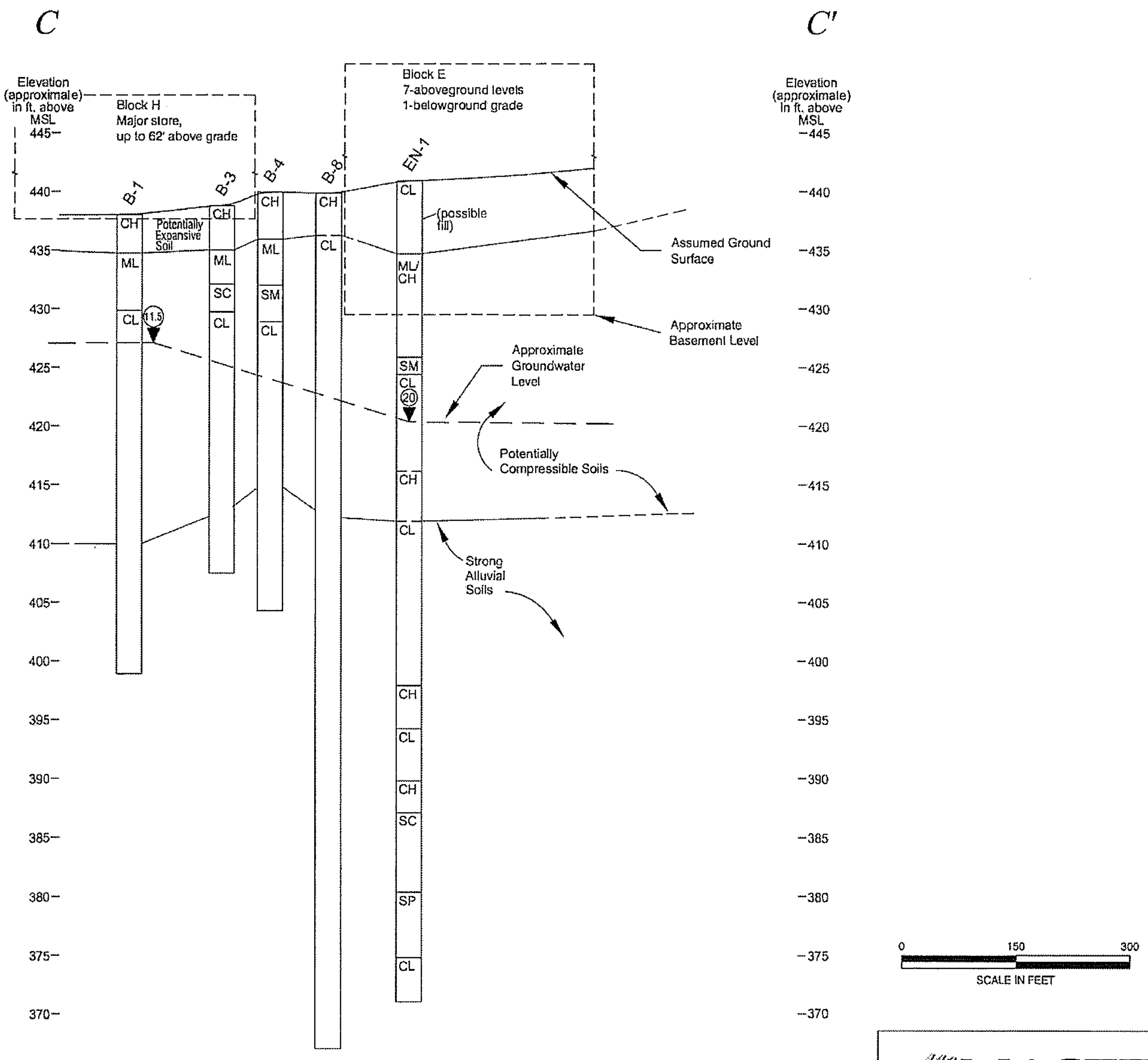
MACTEC

Cross Section B-B'
San Ramon City Center
San Ramon, California

PLATE

3-2

DRAWN	JOB NUMBER	CHECKED	CHECKED DATE	APPROVED	APPROVED DATE
GFA	4096075707		4/2007	DNG	4/2/07



Legend

⑳ ▼ Depth to water during drilling (feet)

Notes:

Lithology from Unified Soil Classification System:

CL = Fat Clay
CH = Lean Clay
ML = Silt
SM = Silty Sand
SP = Poorly - Graded Sand
SC = Clayey Sand

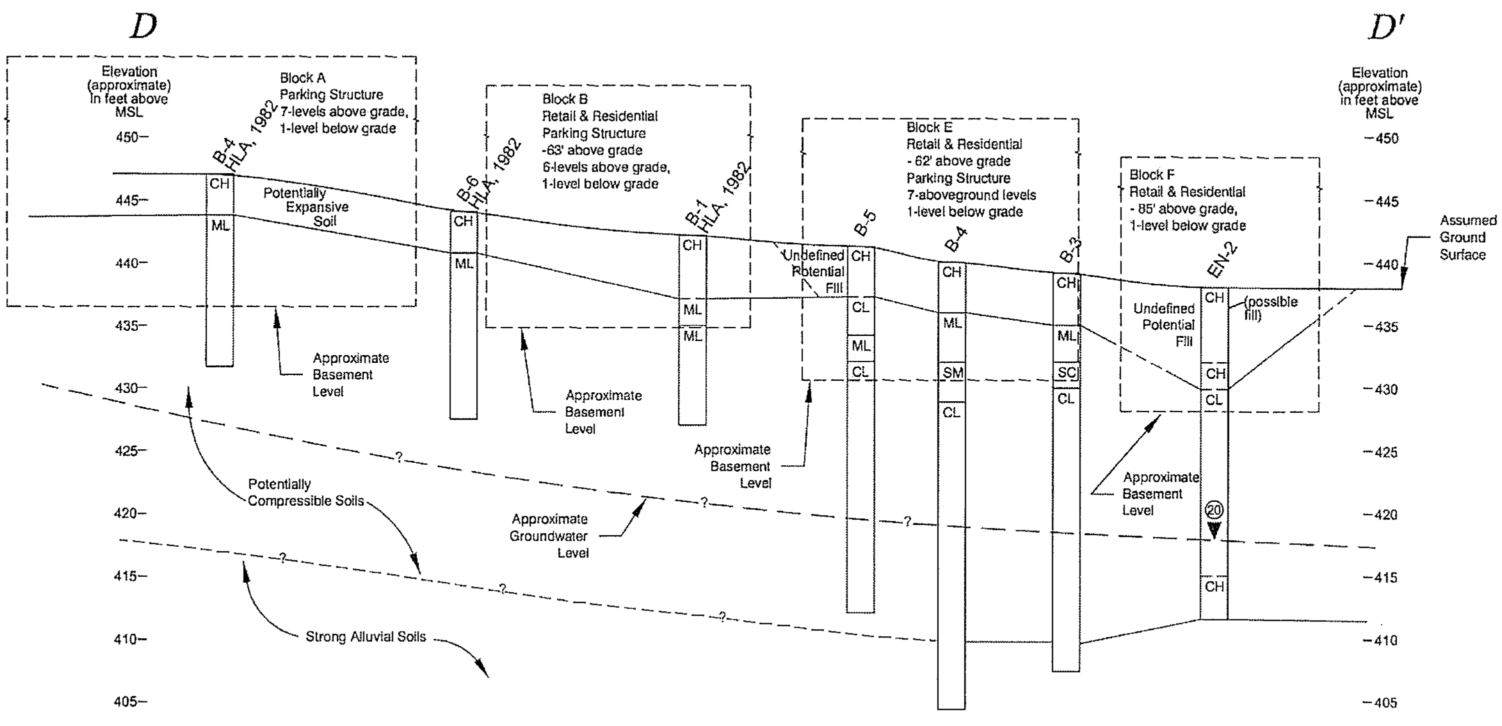
4096075707003.DWG 1.0
20070402.1537

MACTEC

Cross Section C-C'
San Ramon City Center
San Ramon, California

PLATE
3-3

DRAWN	JOB NUMBER	CHECKED	CHECKED DATE	APPROVED	APPROVED DATE
GFA	4096075707		4/2007	DNR	4/2/07



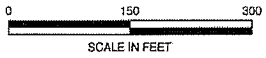
Legend

⑳ ▼ Depth to water during drilling (feet)

Notes:

Lithology from Unified Soil Classification System:

CL = Fat Clay
CH = Lean Clay
ML = Silt
SM = Silty Sand
SP = Poorly - Graded Sand
SC = Clayey Sand



MACTEC

Cross Section D-D'
Bishop Ranch
San Ramon City Center

FIGURE
3-4

DRAWN	JOB NUMBER	CHECKED	CHECKED DATE	APPROVED	APPROVED DATE
GFA	4096075707		4/2007		4/2/07

4096075707004.DWG 1.0
20070402.1558

APPENDIX A

BORING LOGS FROM PRIOR INVESTIGATIONS

Geotechnical Investigation at Chevron/Texaco Campus Lots 16, 20 and 21 of the Bishop Ranch Business Park, San Ramon, California, prepared for Watry Design, prepared by Kleinfelder, Inc., Kleinfelder Project 53512/Geo, dated June 9, 2005

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS		LTR	ID	DESCRIPTION
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY	GW	░	Well-graded gravels or gravel with sand, little or no fines.
		GP	░	Poorly-graded gravels or gravel with sand, little or no fines.
		GM	▥	Silty gravels, silty gravel with sand mixture.
		GC	▨	Clayey gravels, clayey gravel with sand mixture.
	SAND AND SANDY	SW	░	Well-graded sands or gravelly sands, little or no fines.
		SP	░	Poorly-graded sands or gravelly sands, little or no fines.
		SM	▥	Silty sand.
		SC	▨	Clayey sand.

MAJOR DIVISIONS		LTR	ID	DESCRIPTION
FINE GRAINED SOILS	SILTS AND CLAYS	ML	▥	Inorganic silts and very fine sands, rock flour or clayey silts with slight plasticity.
		CL	▨	Inorganic lean clays of low to medium plasticity, gravelly clays, sandy clays, silty clays.
		OL	▥	Organic silts and organic silt-clays of low plasticity.
	SILTS AND CLAYS	MH	▥	Inorganic elastic silts, micaceous or diatomaceous or silty soils.
		CH	▨	Inorganic fat clays (high plasticity).
		OH	▨	Organic clays of medium high to high plasticity.
HIGHLY ORGANIC SOILS		Pt	⁂	Peat and other highly organic soils.

◩	Standard Penetration Split Spoon Sampler 2.0 inch O.D., 1.4 inch I.D.
■	Modified California Sampler 2.5 inch O.D., 2.0 inch I.D.
☒	Bulk Sample
▐	California Sampler, 3.0 inch O.D., 2.5 inch I.D.
┃	Shelby Tube 3.0 inch O.D.

▽ 0745, 5/31	Approximate water level first observed in boring. Time recorded in reference to a 24 hour clock.
▼ 0800, 5/31	Approximate water level observed in boring following drilling

PEN	Pocket Penetrometer reading, in tsf
TV:Su	Torvane shear strength, in ksf

LL	LIQUID LIMIT	TX	TRIAXIAL SHEAR
PI	PLASTICITY INDEX	CONSOL	CONSOLIDATION
%-#200	SIEVE ANALYSIS (#200 SCREEN)	R-Value	RESISTANCE VALUE
DS	DIRECT SHEAR	SE	SAND EQUIVALENT
C	COHESION (PSF)	EI	EXPANSION INDEX
PHI	FRICTION ANGLE	FS	FREE SWELL (U.S.B.R.)

Notes: Blow counts represent the number of blows a 140-pound hammer falling 30 inches required to drive a sampler through the last 12 inches of an 18 inch penetration, unless otherwise noted.

The lines separating strata on the logs represent approximate boundaries only. The actual transition may be gradual. No warranty is provided as to the continuity of soil strata between borings. Logs represent the soil section observed at the boring location on the date of drilling only.

KLEINFELDER

PROJECT NO. 53512-GEO

BORING LOG LEGEND

CHEVRON/TEXACO INVESTIGATION
CHEVRON-TEXACO WAY
SAN RAMON, CALIFORNIA

PLATE

A-1

6/7/05 5:03:49 PM

Date Completed:	2/5/05	*Drilling method:*	6" Hollow Stem Auger
Logged By:	J. Allen	*Hammer Wt:*	140 lbs., 30" drop
Total Depth:	42.0 ft	*Notes:*	

	FIELD		LABORATORY					
Depth,ft	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength tsf	Other Tests	Pen, tsf	DESCRIPTION *Surface Elevation:* Estimated 425 feet (MSL)
								ASPHALT - approximately 2 inches thick
								SILTY CLAY (CL) - brown, low to medium plasticity
								GRAVELLY SILTY CLAY (CH) - gray, high plasticity (Fill) - hand augered to 3 feet bgs
								FAT CLAY (CH) - black, high plasticity, very stiff, moist
5		25	99	24	1.9 @ 12.6%		2.5	
			97	26		LL=52; PI=34		
		36						**SILTY LEAN CLAY (CL)** - light brown, medium plasticity, hard, moist
			08:45 2/5/05	09:17 2/5/05				
10		18				LL=0; PI=0 Passing -#200=48%		**SILTY SAND (SM)** - light brown, medium dense, wet
		13						**SAND (SW)** - brown, hard, dense, wet, medium to coarse grained
15			87	33				**FAT CLAY (CH)** - light brown to gray brown, slight plasticity, stiff, moist
		1.0tsf					3.0	
20			92	27		Consolidation See Plate B-1		
								FAT CLAY (Continued)
25		15						- green-gray
								- dark gray-brown
30								

KLEINFELDER

LOG OF BORING NO. KB-1

CHEVRON/TEXACO INVESTIGATION
CHEVRON-TEXACO WAY
SAN RAMON, CALIFORNIA

PLATE **A-2**

PROJECT NO. *53512-GEO*

Depth, ft	FIELD Sample	 Blows/ft	LABORATORY Dry Density pcf	 Moisture Content %	 Compress. Strength tsf	 Other Tests	Pen, tsf	DESCRIPTION
								(Continued from previous plate)
	■	300psi						
35								- mottled black-blue-gray
	■	35	96	28			2.0	
40								**WELL-GRADED SAND with GRAVEL (SW)** - greenish brown, dense, weakly cemented, medium to coarse grained sand, angular gravel
	■	41						
								Boring terminated at approximately 42 feet below ground surface. Note: The compressive strength indicated is the maximum achieved from an unconfined compression test with the associated strain noted.
45								
50								
55								
60								

KLEINFELDER

PROJECT NO. 53512-GEO

LOG OF BORING NO. KB-1

CHEVRON/TEXACO INVESTIGATION
CHEVRON-TEXACO WAY
SAN RAMON, CALIFORNIA

PLATE

A-2
(cont'd)

Date Completed: 2/5/05

Logged By: J. Allen

Total Depth: 41.5 ft

Drilling method: 6" Hollow Stem Auger

Hammer Wt: 140 lbs., 30" drop

Notes:

Depth,ft	FIELD		LABORATORY				Pen, tsf	DESCRIPTION
	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength tsf	Other Tests		*Surface Elevation:* **Estimated 425 feet (MSL)**
								ASPHALT - approximately 2.5 inches thick
								AGGREGATE BASEROCK- approximately 6 inches thick
								SILTY CLAY (CL) - black, dry - hand augered to 3 feet bgs
	■	48	109	18			4.5	**SILTY SANDY CLAY (CL)** - light brown, plastic, hard, moist, fine grained sand
5	■	28						- sand seam **SANDY CLAY (CL)** - light brown, medium plasticity, moist, very fine grained sand
10	■	28	99	26				- sand seam **SANDY LEAN CLAY (CL)** - light brown, medium plasticity, stiff, wet
			▼ 12:22 2/5/05					
15	◣	18 ▽ 11:47 2/5/05				LL=38; PI=20 Passing -#200=83%		
20	■	29					1.0	**SILTY SANDY LEAN CLAY (CL)** - light brown, very stiff, moist
								LEAN CLAY (CL) - olive, medium to high plasticity, very stiff, moist **LEAN CLAY (Continued)**
25	■	26	92	31			2.0	
								FAT CLAY (CH) - dark greenish-gray, high plasticity, moist
30								

KLEINFELDER

PROJECT NO. 53512-GEO

LOG OF BORING NO. KB-2

CHEVRON/TEXACO INVESTIGATION
CHEVRON-TEXACO WAY
SAN RAMON, CALIFORNIA

PLATE

A-3

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6/9/05 3:27:12 PM

	FIELD		LABORATORY						
Depth,ft	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength tsf	Other Tests	Pen, tsf		DESCRIPTION *(Continued from previous plate)*
	■	300psi	101	21				▨	
35	■							▨	
			109	19				▨	**SANDY CLAY (CL)** - olive, medium plasticity, wet - sandy clay in cuttings
40	◣	31					2.3	░	**SAND (SP)** - brown, medium dense, wet, weakly cemented
									Boring terminated at 41.5 feet below ground surface.
45									
50									
55									
60									

KLEINFELDER

PROJECT NO. 53512-GEO

LOG OF BORING NO. KB-2

CHEVRON/TEXACO INVESTIGATION
CHEVRON-TEXACO WAY
SAN RAMON, CALIFORNIA

PLATE

A-3
(cont'd)

Date Completed: 2/5/05

Logged By: J. Allen

Total Depth: 41.5 ft

Drilling method: 6" Hollow Stem Auger

Hammer Wt: 140 lbs., 30" drop

Notes:

	FIELD		LABORATORY					DESCRIPTION
Depth,ft	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength tsf	Other Tests	Pen, tsf	*Surface Elevation:* **Estimated 425 feet (MSL)**
								ASPHALT - approximately 2 inches thick
								AGGREGATE BASEROCK- approximately 8 inches thick
								SILTY LEAN CLAY (CL) - black - hand augered to 3 feet bgs
		17	98	13		LL=26; PI=9	3.5	**CLAYEY SAND (SC)** - light brown, medium dense, moist, fine grained
5								
								SAND (SP) - light brown, medium dense, fine grained
		23						**SILTY LEAN CLAY (CL)** - medium plasticity, medium stiff, moist
10								
		20	108	22	2.3 @ 12.3%		3.3	**SILTY SANDY CLAY (CL)** - light brown, medium plasticity, stiff, moist - alternating thin layers of clay and sandy clay
		14:10 2/5/05	14:40 2/5/05					- soft
15								- wet
		300psi	88	28		Consolidation See Plate B-3	0.5	
20								
		17	99	29				**FAT CLAY (CH)** - dark green, high plasticity, stiff to very stiff, moist
25								
							4.5	- stiff
								SILTY LEAN CLAY (CL) - light brown, medium plasticity, stiff,
30								

KLEINFELDER

PROJECT NO. 53512-GEO

LOG OF BORING NO. KB-3

CHEVRON/TEXACO INVESTIGATION
CHEVRON-TEXACO WAY
SAN RAMON, CALIFORNIA

PLATE

A-4

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	FIELD		LABORATORY						DESCRIPTION
Depth,ft	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength tsf	Other Tests	Pen, tsf		*(Continued from previous plate)*
	■	21	92	32			0.75-1.0	▨	moist **Silty Lean Clay Continued**
35	■	35					2.0	▨	
40	■	30						▒	**SAND (SP)** - no recovery
									Boring terminated at 41.5 feet below ground surface. Note: The compressive strength indicated is the maximum achieved from an unconfined compression test with the associated strain noted.
45									
50									
55									
60									

KLEINFELDER

PROJECT NO. 53512-GEO

LOG OF BORING NO. KB-3

CHEVRON/TEXACO INVESTIGATION
CHEVRON-TEXACO WAY
SAN RAMON, CALIFORNIA

PLATE

A-4
(cont'd)

Date Completed: 2/6/05
Logged By: J. Allen
Total Depth: 41.5 ft

Drilling method: 6" Hollow Stem Auger
Hammer Wt: 140 lbs., 30" drop
Notes:

Depth,ft	FIELD Sample	FIELD Blows/ft	LABORATORY Dry Density pcf	LABORATORY Moisture Content %	LABORATORY Compress. Strength tsf	LABORATORY Other Tests	Pen, tsf	DESCRIPTION Surface Elevation: Estimated 425 feet (MSL)
								ASPHALT - approximately 3.5 inches thick
								AGGREGATE BASEROCK- approximately 12 inches thick
								SILTY SANDY CLAY (CL) - dark brown, medium plasticity, moist - hand augered to 3 feet bgs
		19	101	24	1.8 @ 5.1%		2.5	
5								
			95	24				
		20						**SANDY CLAY (CL)** - dark brown, slight plasticity, stiff, moist
10								
		30				Passing -#200=64%	3.0	- very stiff
		13	08:38 2/6/05	09:00 2/6/05		LL=37; PI=20		**SILTY LEAN CLAY (CL)** - brown, medium to high plasticity, stiff, moist
15								- no recovery
20								**FAT CLAY (CH)** - dark greenish brown, high plasticity, stiff, moist
		30						- no recovery
25								
		300-320psi	93	28		Consolidation Test. See Plate B-4		
30								

KLEINFELDER

PROJECT NO. 53512-GEO

LOG OF BORING NO. KB-4

CHEVRON/TEXACO INVESTIGATION
CHEVRON-TEXACO WAY
SAN RAMON, CALIFORNIA

PLATE
A-5

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	FIELD		LABORATORY						DESCRIPTION
Depth,ft	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength tsf	Other Tests	Pen, tsf		*(Continued from previous plate)*
	■	39						▨	- no recovery, slipped out after sampling **Fat Clay Continued**
35								▨	**CLAYEY SAND (SC)** - brown, medium dense, very moist
	■	34	104	26				▒	**SILTY SAND (SM)** - brown, medium dense, moist, fine grained sand with silt
40	◣	28						▒	
									Boring terminated at 41.5 feet below ground surface.
45									
50									
55									
60									

KLEINFELDER

PROJECT NO. 53512-GEO

LOG OF BORING NO. KB-4

CHEVRON/TEXACO INVESTIGATION
CHEVRON-TEXACO WAY
SAN RAMON, CALIFORNIA

PLATE

A-5
(cont'd)

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6/9/05 2:48:36 PM

Date Completed: 2/6/05

Logged By: J. Allen

Total Depth: 36.5 ft

Drilling method: 6" Hollow Stem Auger

Hammer Wt: 140 lbs., 30" drop

Notes:

Depth,ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Compress. Strength tsf	LABORATORY: Other Tests	Pen, tsf	DESCRIPTION Surface Elevation: **Estimated 430 feet (MSL)**
								ASPHALT - approximately 2 inches thick
								AGGREGATE BASEROCK- approximately 8 inches thick
						R-Value Test R<5		**SILTY LEAN CLAY (CL)** - dark brown, medium plasticity, moist
5		12	97	25				**CLAYEY SAND (SC)** - brown, loose, moist
								SILTY LEAN CLAY (CL) - brown, medium plasticity, stiff, moist
10		23 ▽ 11:13 2/6/05	▼ 12:30 2/6/05			LL=35; PI=19 Passing -#200=60%		**SANDY CLAY (CL)** - brown, low plasticity, very stiff, moist to wet
15			93	32				**SILTY SANDY CLAY (CL)** - brown, very sift, moist
		19					0.5	**SAND (SP)** - brown, dense, moist, fine grained
								SILTY LEAN CLAY (CL) - brown, medium plasticity
20		20						**SAND (SP)** - coarse
25		300psi 400psi	101	23	1.7 @ 14.9%			**FAT CLAY (CH)** - greenish gray, high plasticity, stiff, moist
30								

LOG OF BORING NO. KB-5

CHEVRON/TEXACO INVESTIGATION
CHEVRON-TEXACO WAY
SAN RAMON, CALIFORNIA

	FIELD		LABORATORY						DESCRIPTION
Depth,ft	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength tsf	Other Tests	Pen, tsf		(Continued from previous plate)
	■	300psi 350psi 400psi 600psi	104	23		Consolidation Test. See Plate B-5		▨	**Fat Clay Continued** - very stiff
35	■							▨	
									Boring terminated at 36.5 feet below ground surface. Note: The compressive strength indicated is the maximum achieved from an unconfined compression test with the associated strain noted.
40									
45									
50									
55									
60									

KLEINFELDER

PROJECT NO. 53512-GEO

LOG OF BORING NO. KB-5

CHEVRON/TEXACO INVESTIGATION
CHEVRON-TEXACO WAY
SAN RAMON, CALIFORNIA

PLATE

A-6
(cont'd)

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6/8/05 2:50:16 PM

Date Completed: 2/6/05

Logged By: J. Allen

Total Depth: 41.5 ft

Drilling method: 6" Hollow Stem Auger

Hammer Wt: 140 lbs., 30" drop

Notes:

Surface Elevation: Estimated 435 feet (MSL)

Depth,ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Compress. Strength tsf	LABORATORY: Other Tests	Pen, tsf	DESCRIPTION
								ASPHALT - approximately 2 inches thick
								AGGREGATE BASEROCK- approximately 9 inches thick
			97	23				**SILTY to SANDY CLAY (CL)** - brown, plastic, moist - hand augered to 3 feet bgs
		19					2.0	**CLAYEY SAND (SC)** - brown, loose to medium dense, moist
5		11						**SANDY CLAY (CL)** - brown, medium stiff, moist
10		7	14:45 2/6/05					**LEAN CLAY (CL)** - brown, medium plasticity, soft to medium stiff, moist
		5	82 15:00 2/6/05	24			0.8	**SANDY CLAY (CL)** - medium plasticity, soft, wet
15		12				LL=30; PI=13		**SILTY LEAN CLAY (CL)** - olive-brown, medium plasticity, stiff
20		200psi 200psi 300psi 300psi 400psi	112	28		Consolidation Test. See Plate B-6		
25		32					2.5	- very stiff
								CLAYEY SAND (SC) - olive-brown, dense, moist
30								

KLEINFELDER

PROJECT NO. 53512-GEO

LOG OF BORING NO. KB-6

CHEVRON/TEXACO INVESTIGATION
CHEVRON-TEXACO WAY
SAN RAMON, CALIFORNIA

PLATE A-7

Depth,ft	FIELD		LABORATORY				Pen, tsf	DESCRIPTION
	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength tsf	Other Tests		*(Continued from previous plate)*
	■	32	113	17			1.8	**SILTY LEAN CLAY (CL)** - dark olive, medium plasticity, very stiff, moist
35	■	34					1.8	**SANDY CLAY (CL)** - dark olive-gray, medium plasticity, stiff, moist
40	■	59	109	20				**CLAYEY GRAVEL (GC) to CLAYEY SAND (SC)** - slight plasticity, dense, moist
								Boring terminated at 41.5 feet below ground surface.
45								
50								
55								
60								

KLEINFELDER

PROJECT NO. 53512-GEO

LOG OF BORING NO. KB-6

CHEVRON/TEXACO INVESTIGATION
CHEVRON-TEXACO WAY
SAN RAMON, CALIFORNIA

PLATE

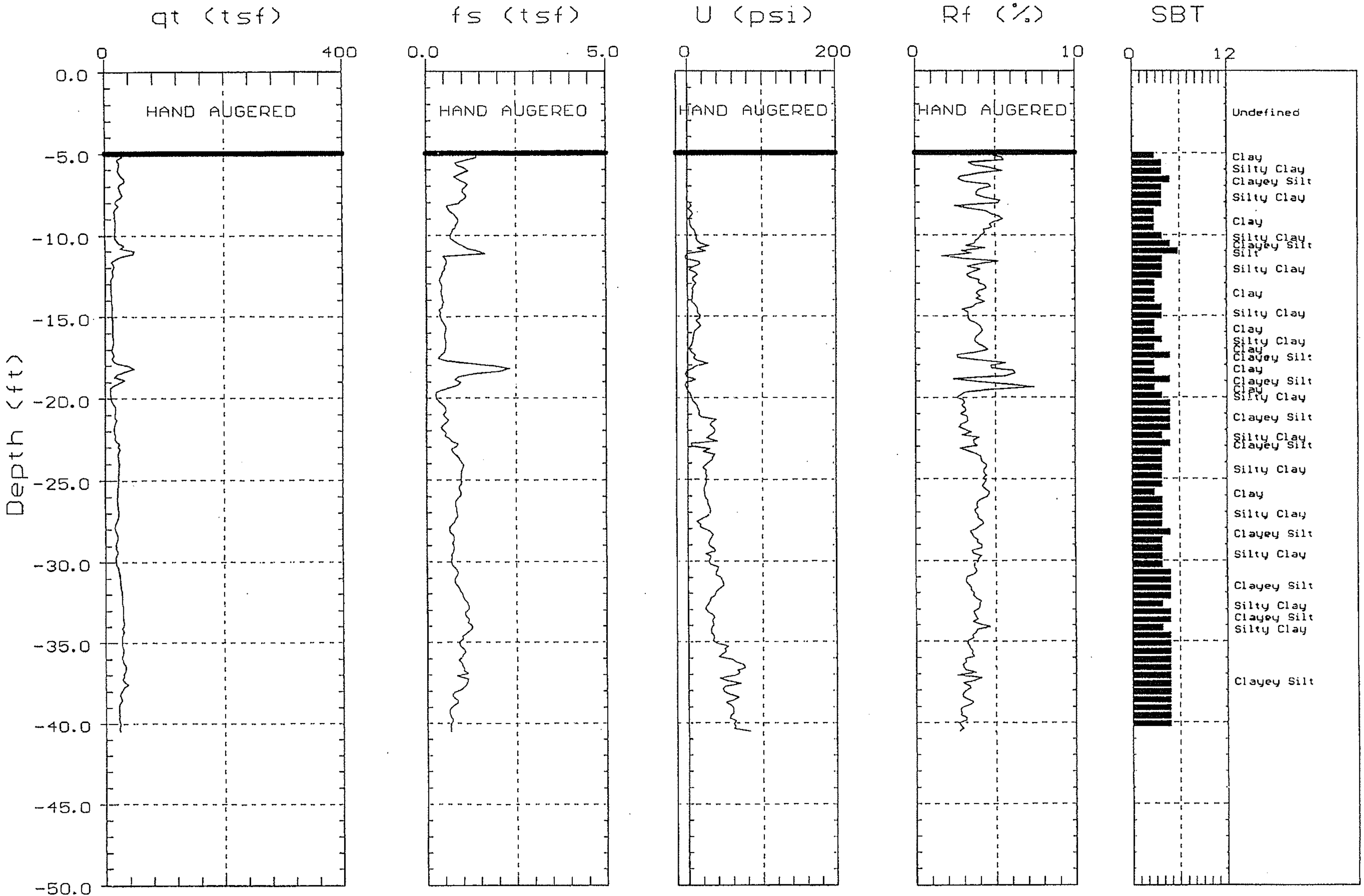
A-7
(cont'd)

GREGG

KLEINFELDER

Site: CHEVRON
Location: CPT-01

Engineer: R. ELLIS
Date: 02:19:05 08:57



Max. Depth: 40.52 (ft)
Depth Inc.: 0.164 (ft)

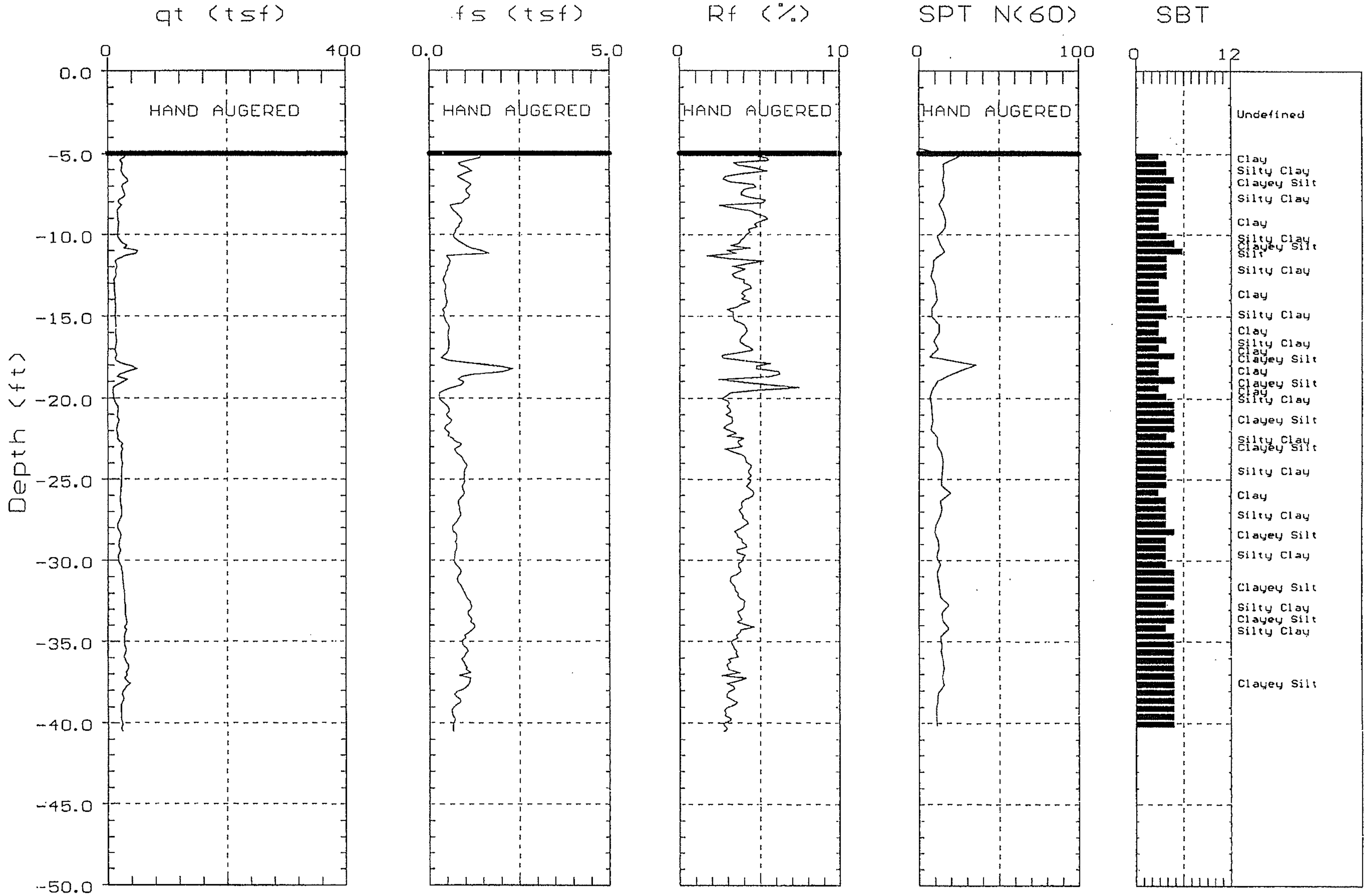
SBT: Soil Behavior Type (Robertson 1990)

GREGG

KLEINFELDER

Site: CHEVRON
Location: CPT-01

Engineer: R. ELLIS
Date: 02:19:05 08:57



Max. Depth: 40.52 (ft)
Depth Inc.: 0.164 (ft)

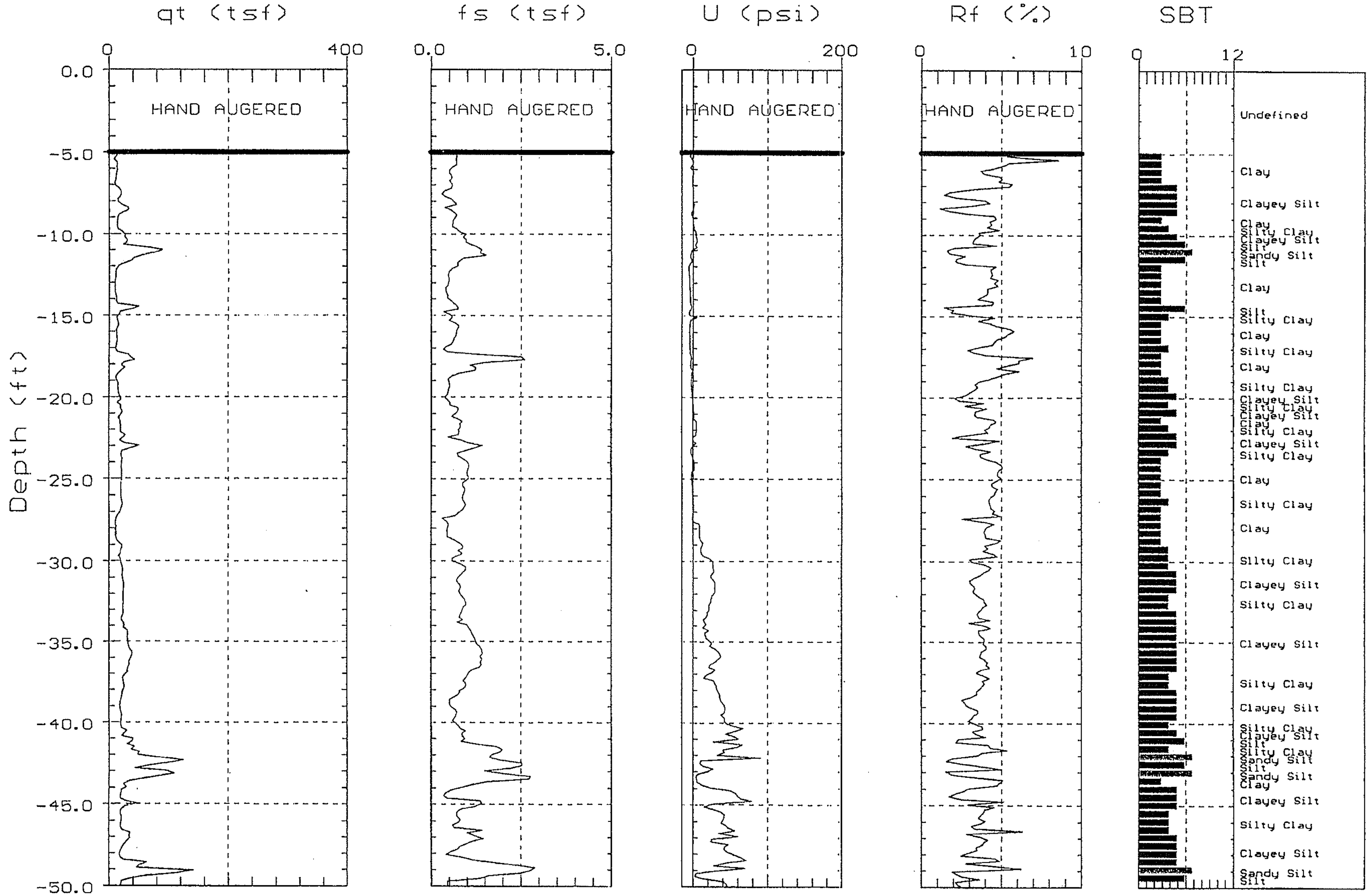
SBT: Soil Behavior Type (Robertson 1990)

GREGG

KLEINFELDER

Site: CHEVRON
Location: CPT-02

Engineer: R. ELLIS
Date: 02:19:05 10:01



Max. Depth: 50.03 (ft)
Depth Inc.: 0.164 (ft)

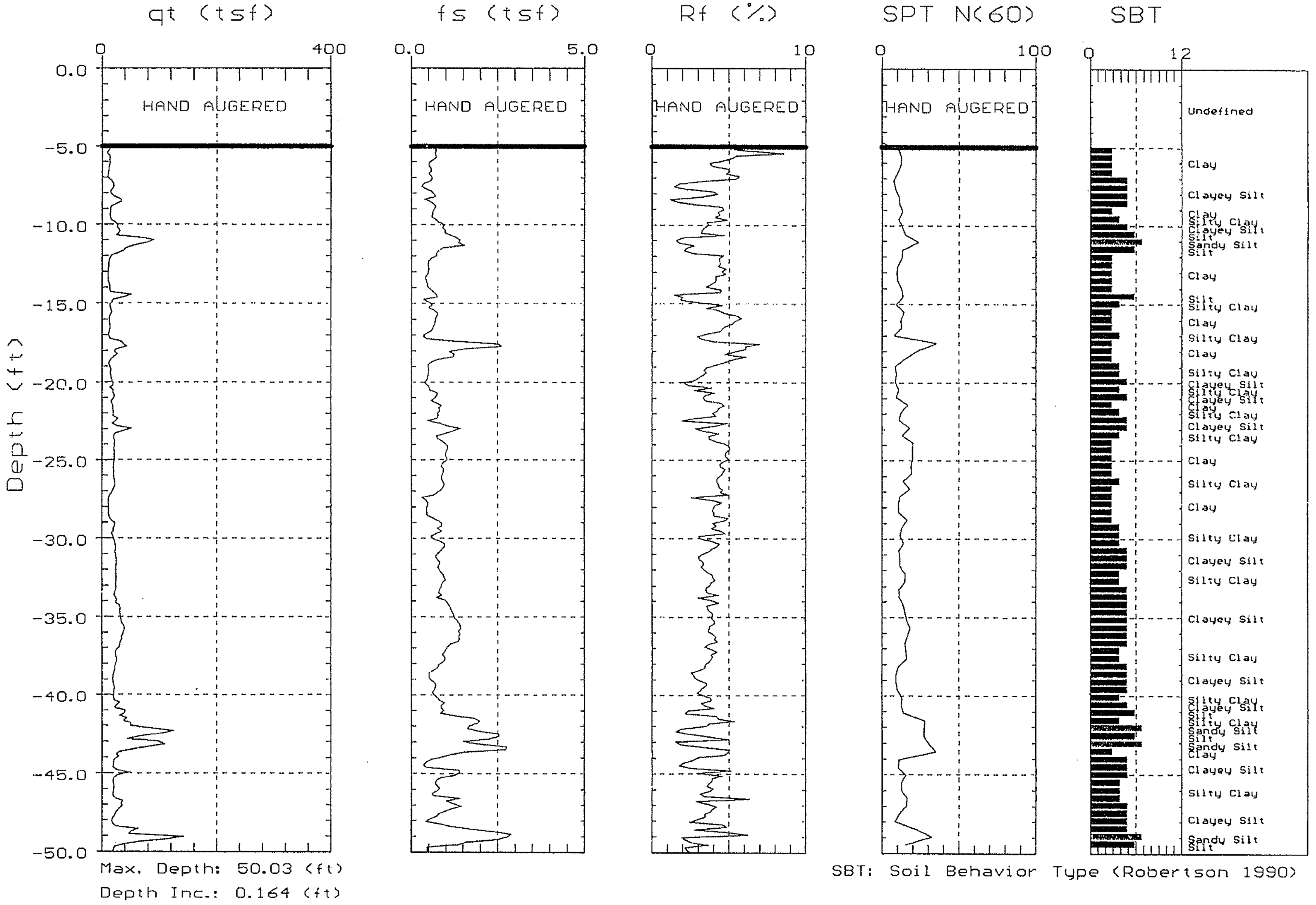
SBT: Soil Behavior Type (Robertson 1990)

GREGG

KLEINFELDER

Site: CHEVRON
Location: CPT-02

Engineer: R. ELLIS
Date: 02:19:05 10:01



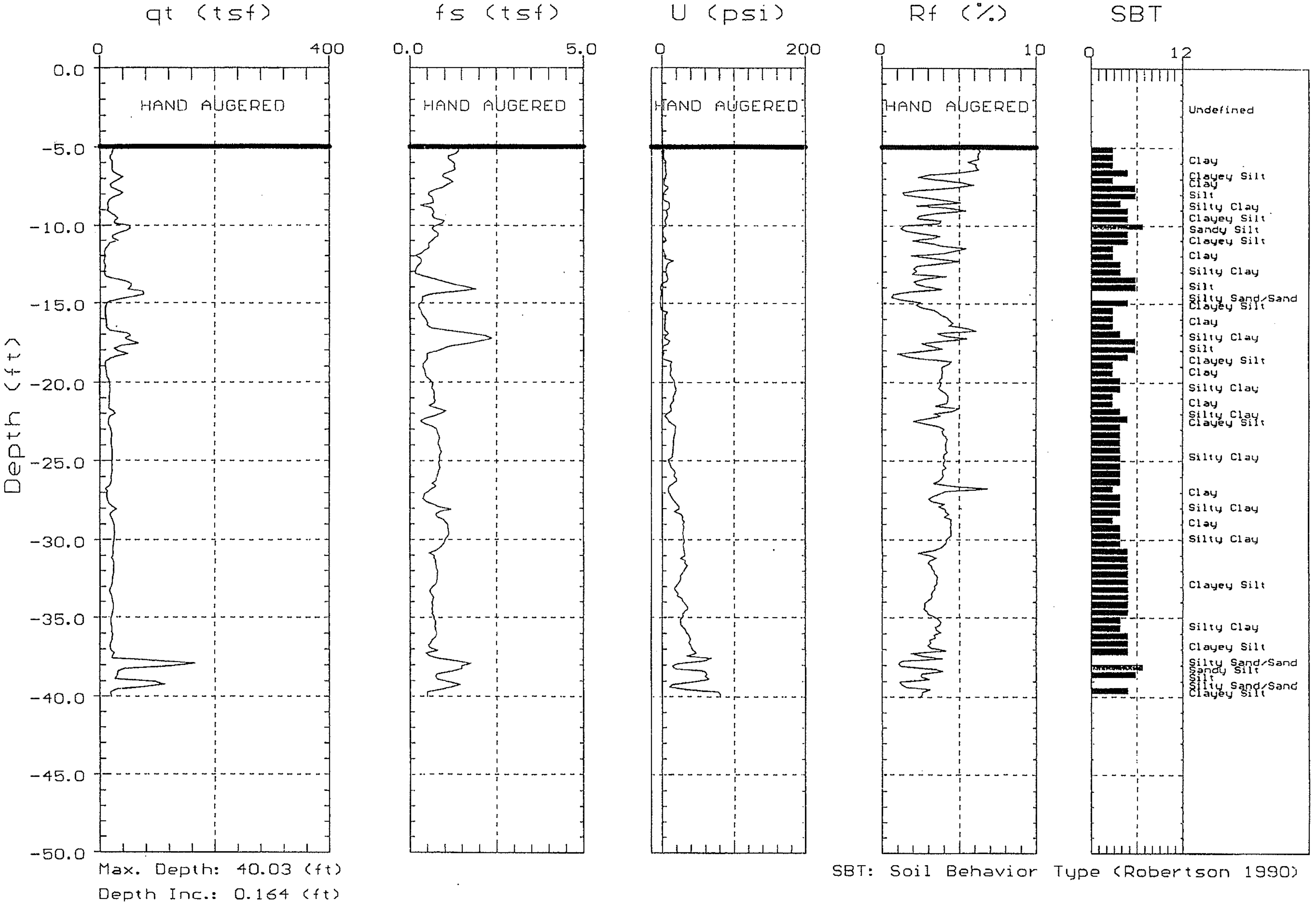
SBT: Soil Behavior Type (Robertson 1990)

GREGG

KLEINFELDER

Site: CHEVRON
Location: CPT-03

Engineer: R. ELLIS
Date: 02:19:05 10:48



Max. Depth: 40.03 (ft)
Depth Inc.: 0.164 (ft)

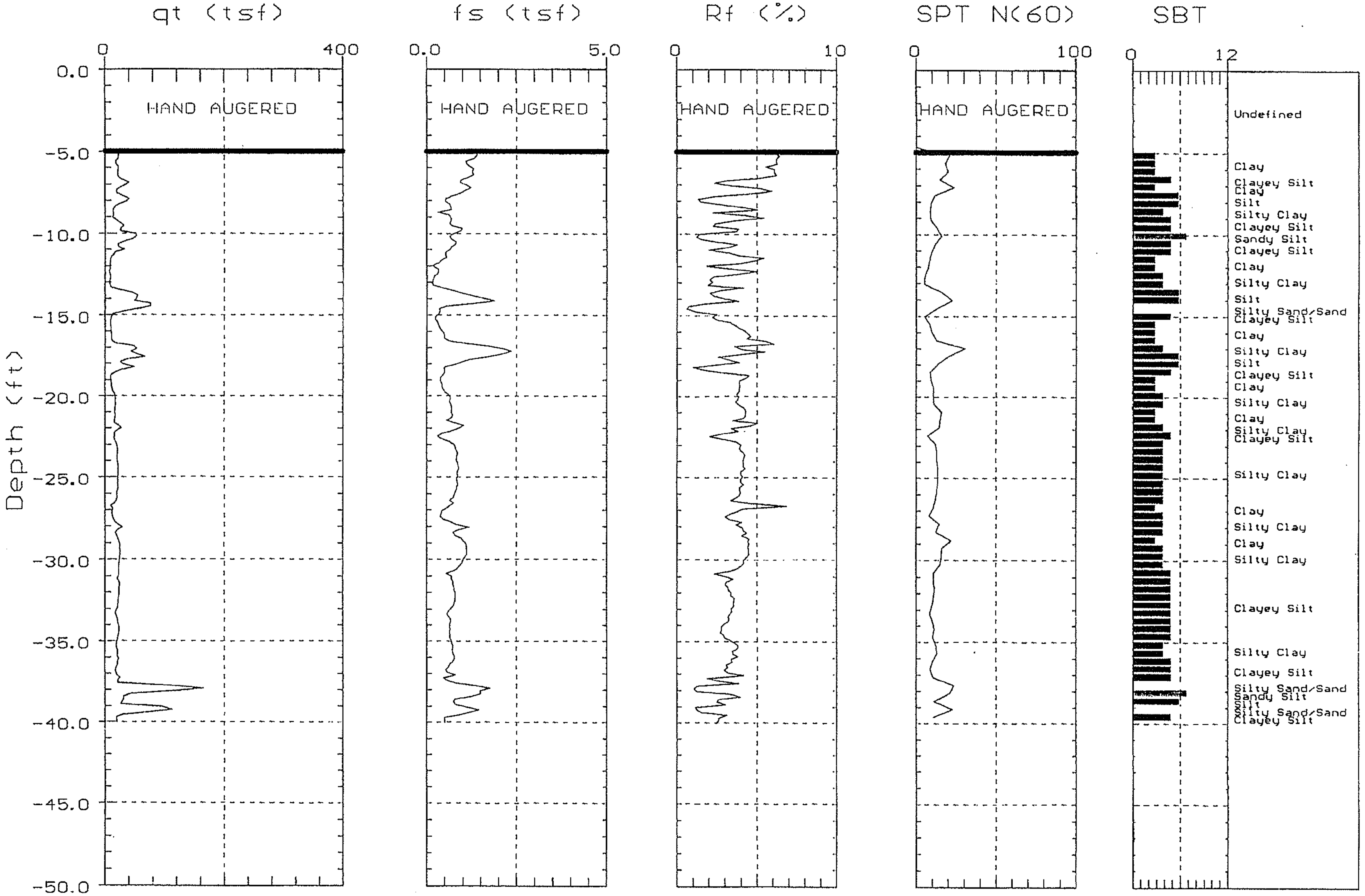
SBT: Soil Behavior Type (Robertson 1990)

GREGG

KLEINFELDER

Site: CHEVRON
Location: CPT-03

Engineer: R. ELLIS
Date: 02:19:05 10:48



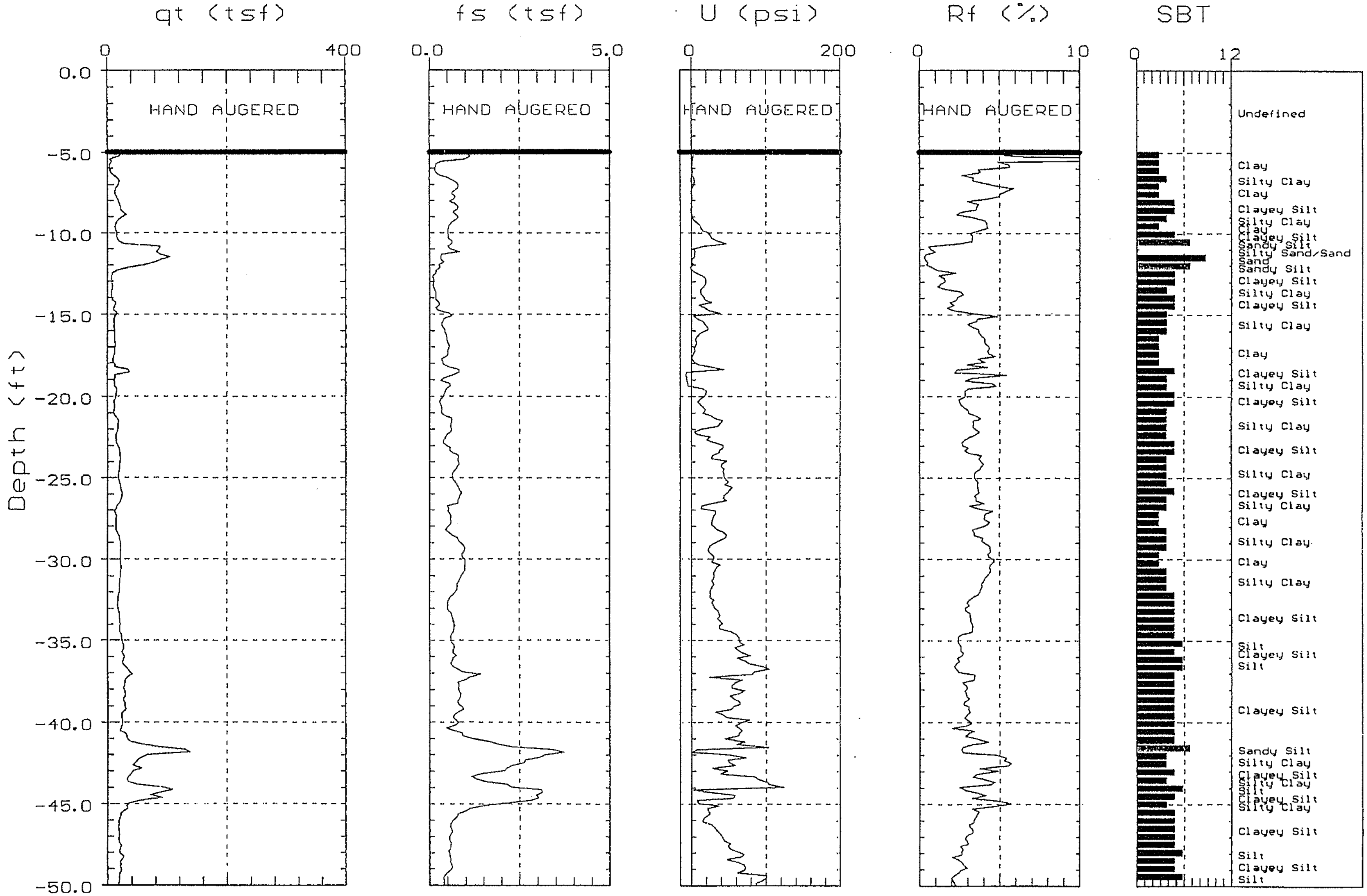
Max. Depth: 40.03 (ft)
Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

KLEINFELDER

Site: CHEVRON
Location: CPT-04

Engineer: R. ELLIS
Date: 02:19:05 11:32



Max. Depth: 50.03 (ft)
Depth Inc.: 0.164 (ft)

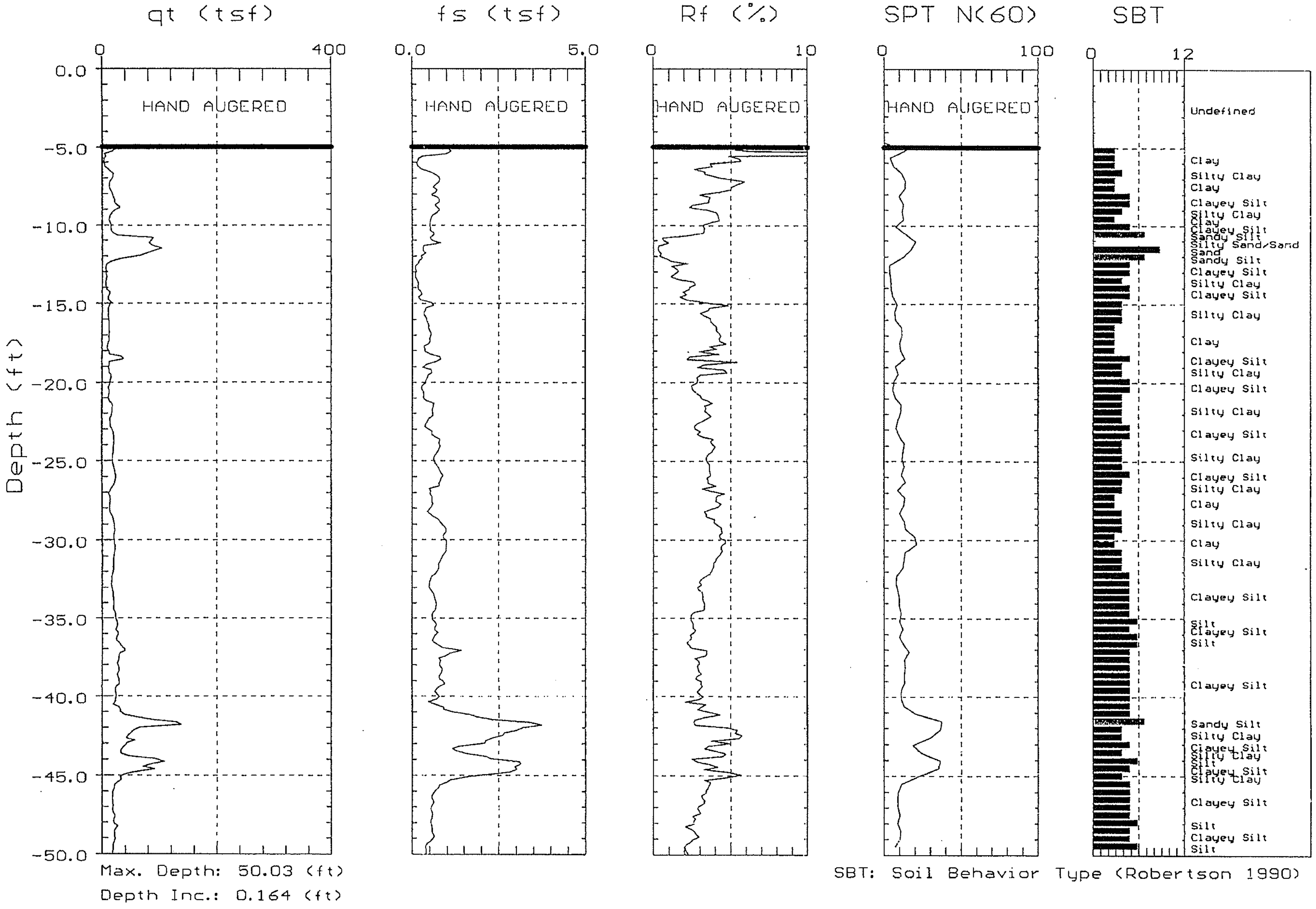
SBT: Soil Behavior Type (Robertson 1990)

GREGG

KLEINFELDER

Site: CHEVRON
Location: CPT-04

Engineer: R. ELLIS
Date: 02:19:05   11:32



Max. Depth: 50.03 (ft)
Depth Inc.: 0.164 (ft)

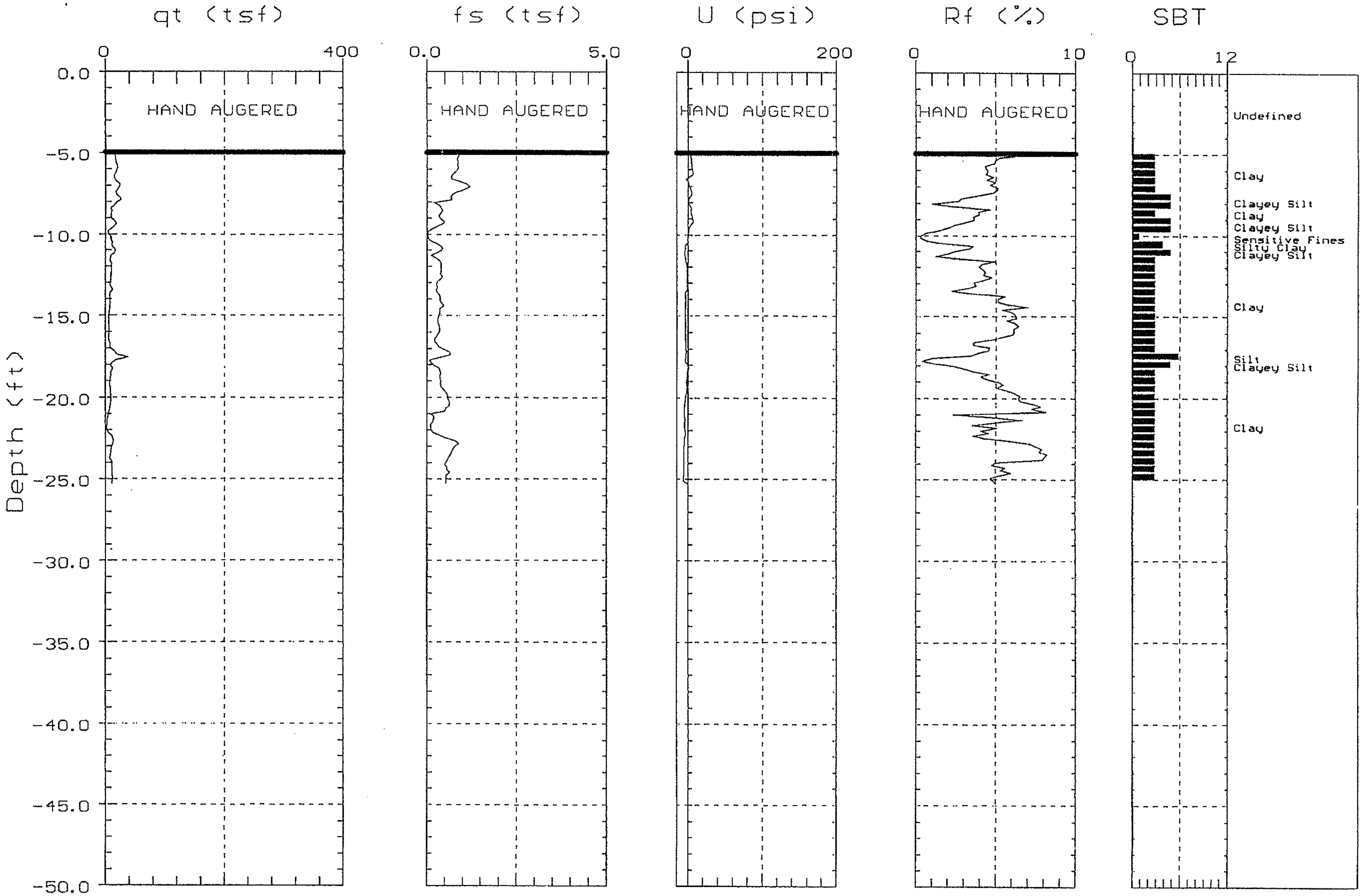
SBT: Soil Behavior Type (Robertson 1990)

GREGG

KLEINFELDER

Site: CHEVRON
Location: CPT-05

Engineer: R. ELLIS
Date: 02:19:05 12:35



Max. Depth: 25.26 (ft)
Depth Inc.: 0.164 (ft)

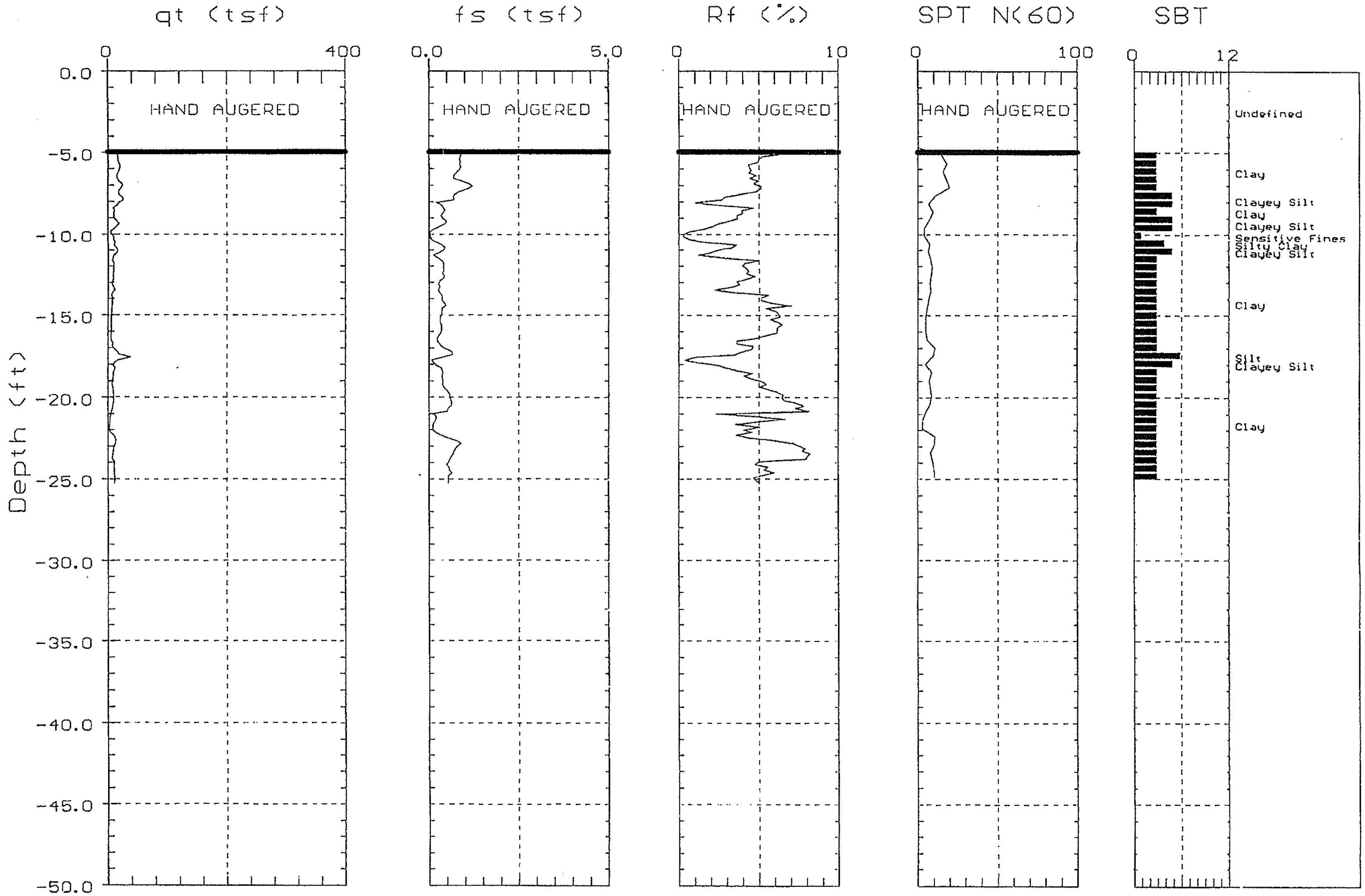
SBT: Soil Behavior Type (Robertson 1990)

GREGG

KLEINFELDER

Site: CHEVRON
Location: CPT-05

Engineer: R. ELLIS
Date: 02:19:05 12:35



Max. Depth: 25.26 (ft)
Depth Inc.: 0.164 (ft)

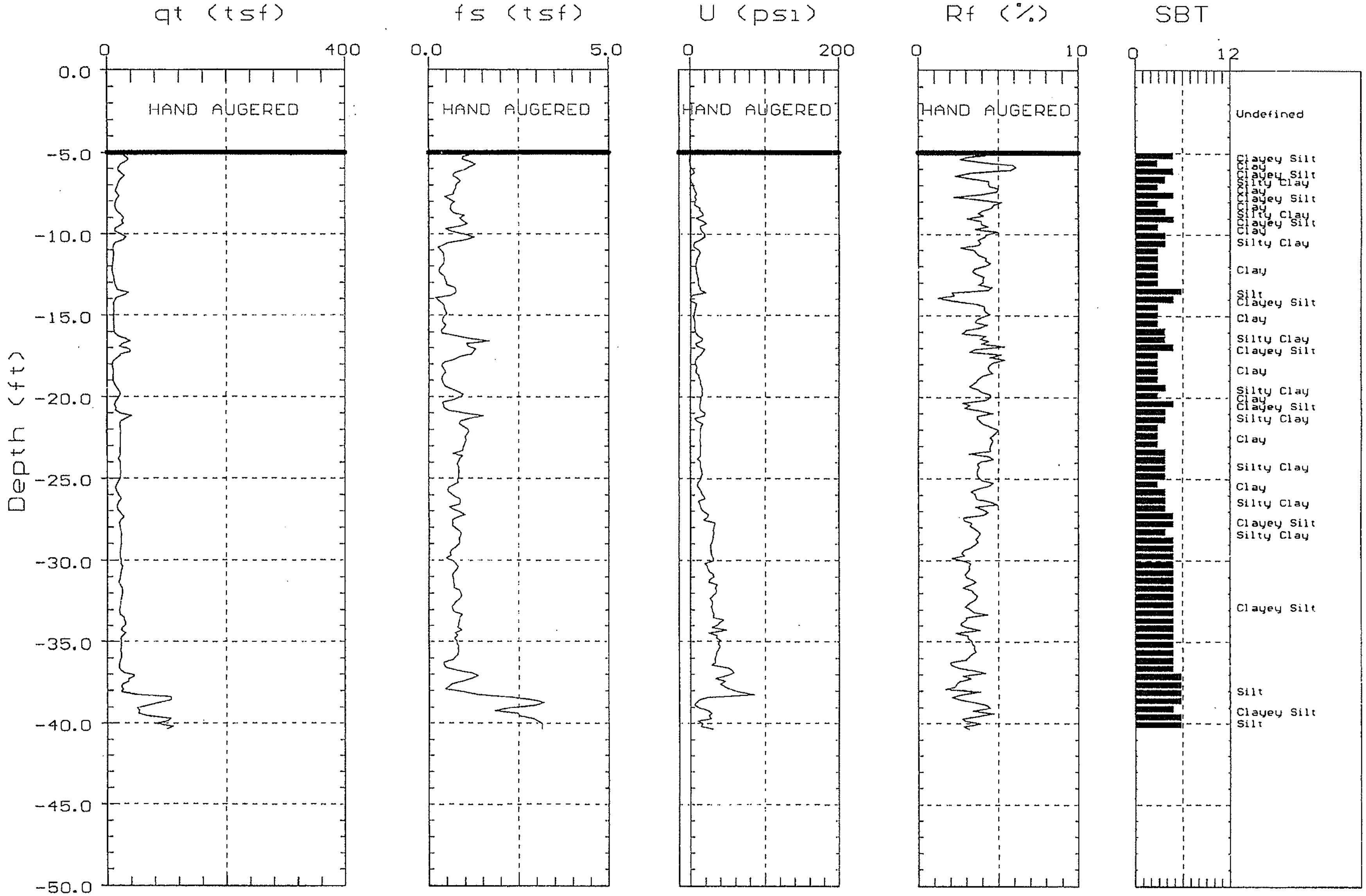
SBT: Soil Behavior Type (Robertson 1990)

GREGG

KLEINFELDER

Site: CHEVRON
Location: CPT-06

Engineer: R. ELLIS
Date: 02:19:05 14:03



Max. Depth: 40.35 (ft)
Depth Inc.: 0.164 (ft)

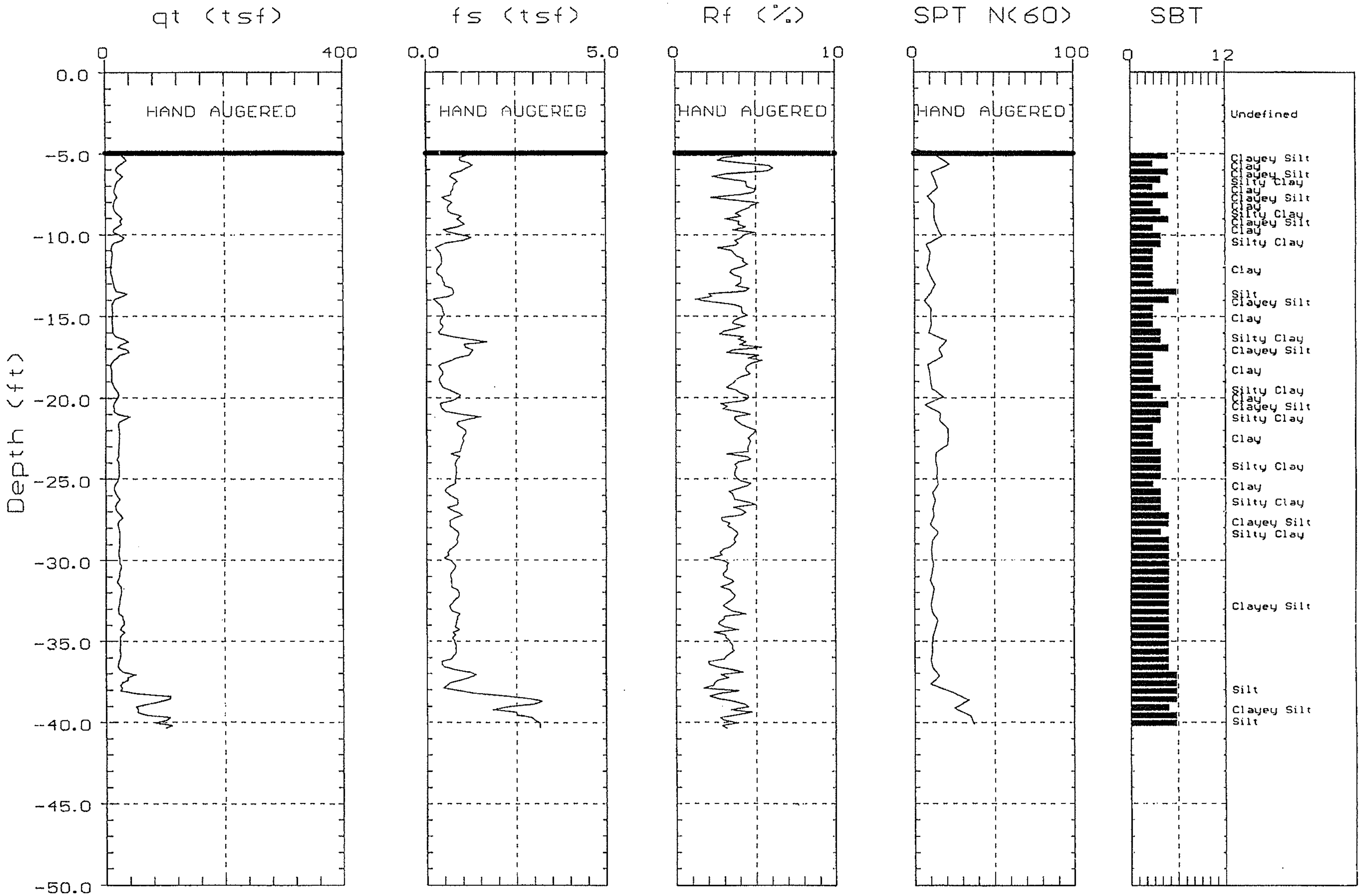
SBT: Soil Behavior Type (Robertson 1990)

GREGG

KLEINFELDER

Site: CHEVRON
Location: CPT-06

Engineer: R. ELLIS
Date: 02:19:05 14:03



Max. Depth: 40.35 (ft)
Depth Inc.: 0.164 (ft)

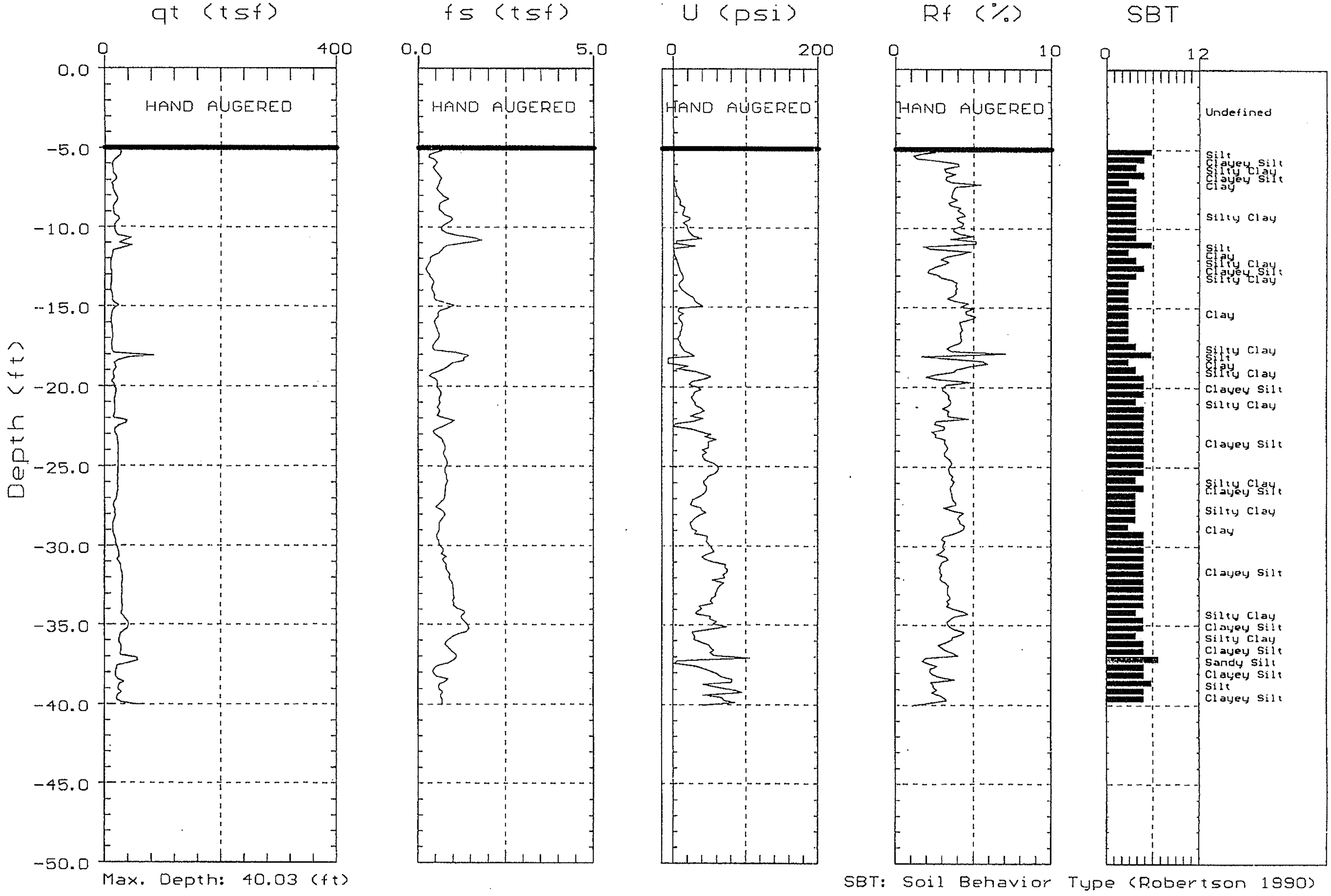
SBT: Soil Behavior Type (Robertson 1990)

GREGG

KLEINFELDER

Site: CHEVRON
Location: CPT-07

Engineer: R. ELLIS
Date: 02:19:05 14:51



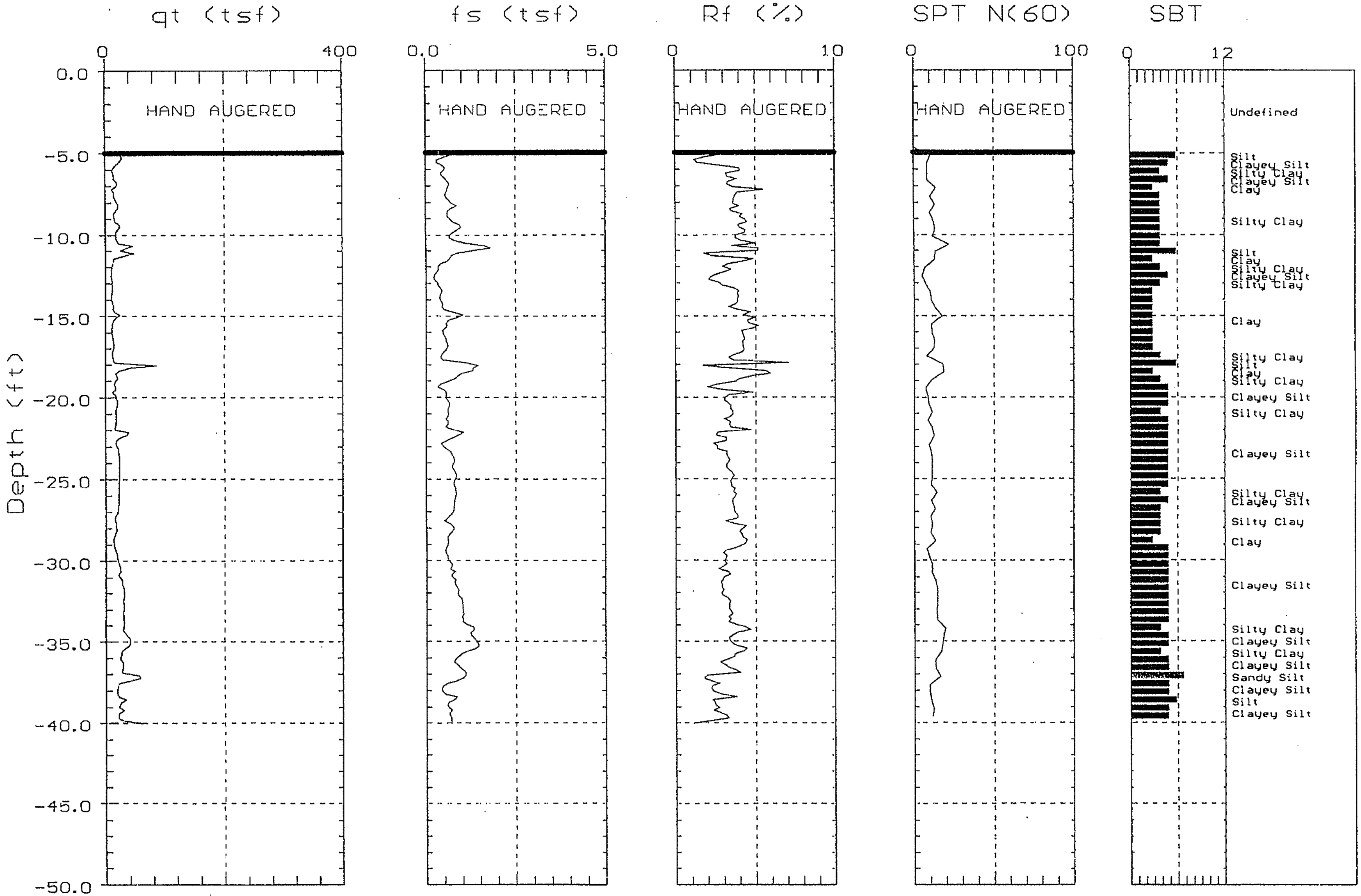
Max. Depth: 40.03 (ft)
Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG | **KLEINFELDER**

Site: CHEVRON
Location: CPT-07

Engineer: R. ELLIS
Date: 02:19:05 14:51



Max. Depth: 40.03 (ft)
Depth Inc.: 0.164 (ft)

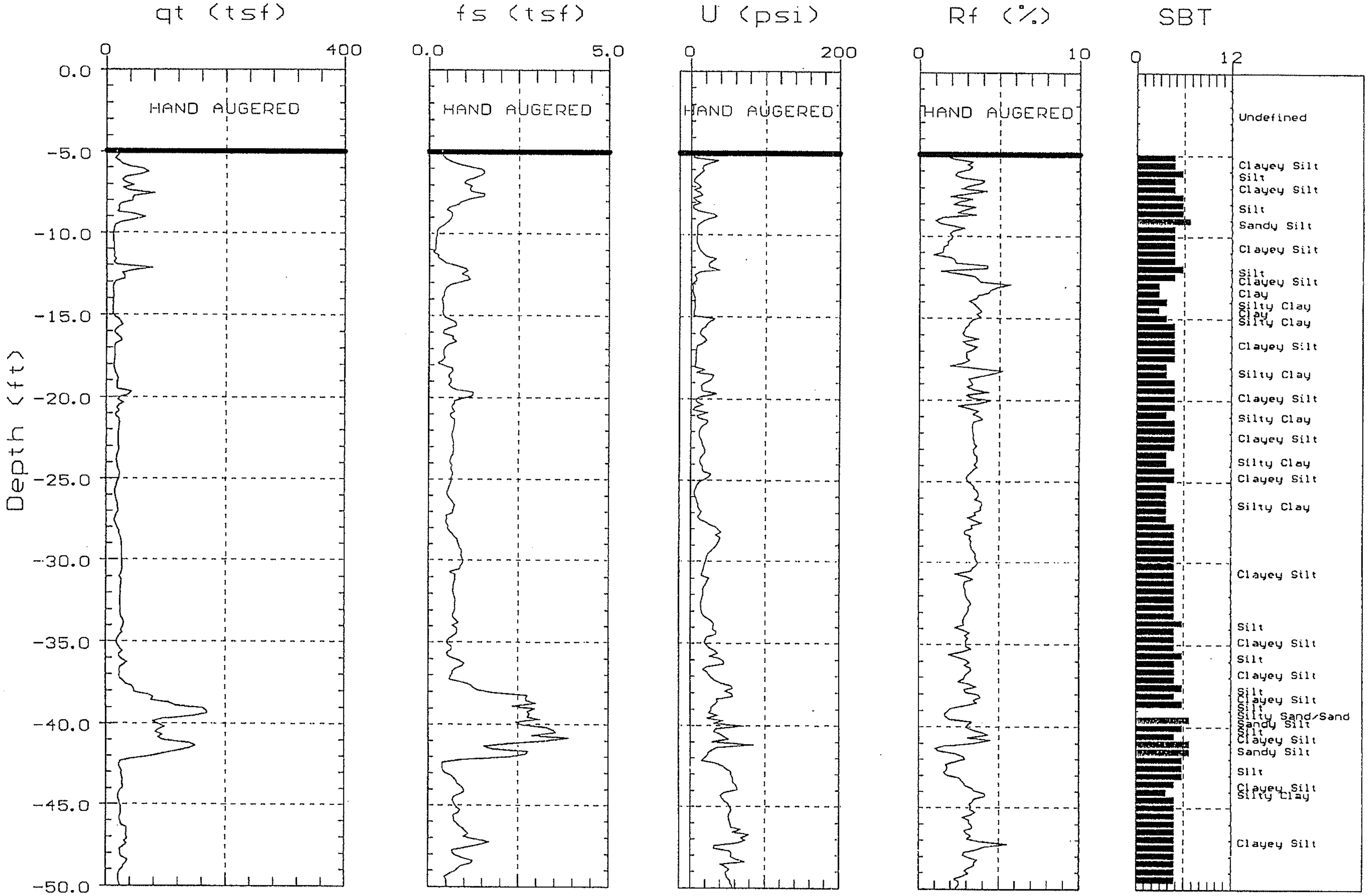
SBT: Soil Behavior Type (Robertson 1990)

GREGG

KLEINFELDER

Site: CHEVRON
Location: CPT-08

Engineer: R. ELLIS
Date: 02:19:05 17:29



Max. Depth: 50.03 (ft)
Depth Inc.: 0.164 (ft)

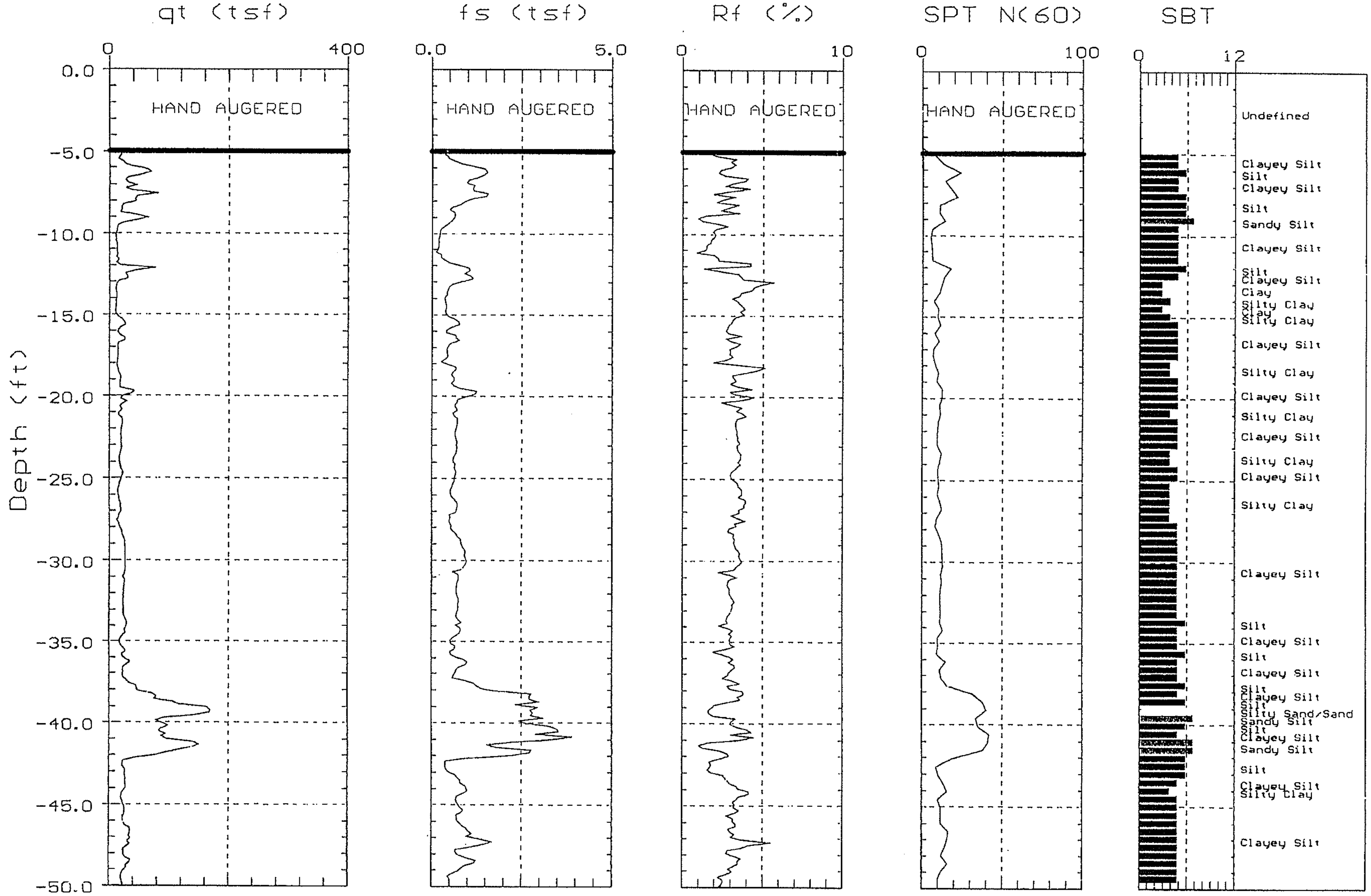
SBT: Soil Behavior Type (Robertson 1990)

GREGG

KLEINFELDER

Site: CHEVRON
Location: CPT-08

Engineer: R. ELLIS
Date: 02:19:05 17:29



Max. Depth: 50.03 (ft)
Depth Inc.: 0.164 (ft)

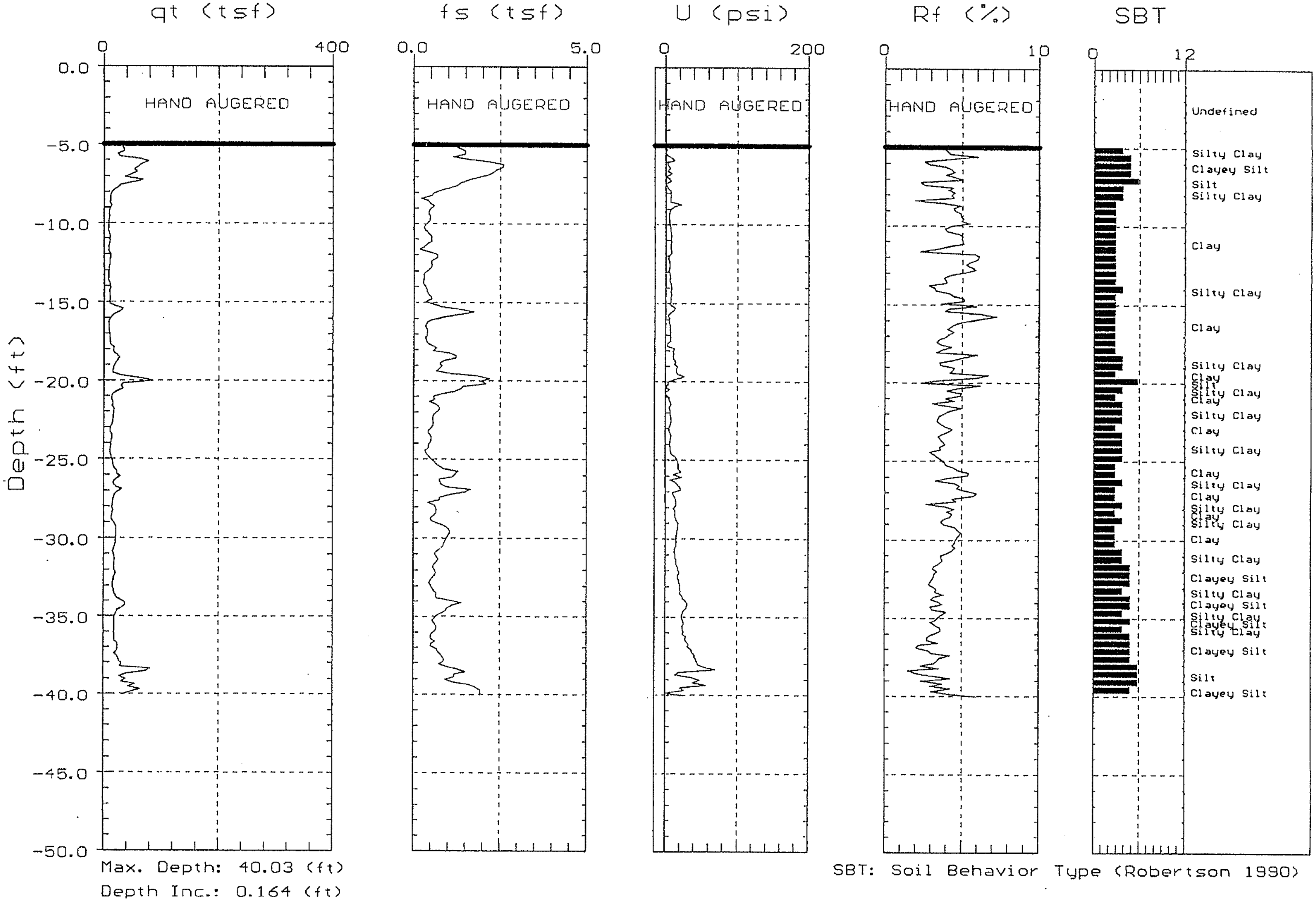
SBT: Soil Behavior Type (Robertson 1990)

GREGG

KLEINFELDER

Site: CHEVRON
Location: CPT-09

Engineer: R. ELLIS
Date: 02:19:05 18:15



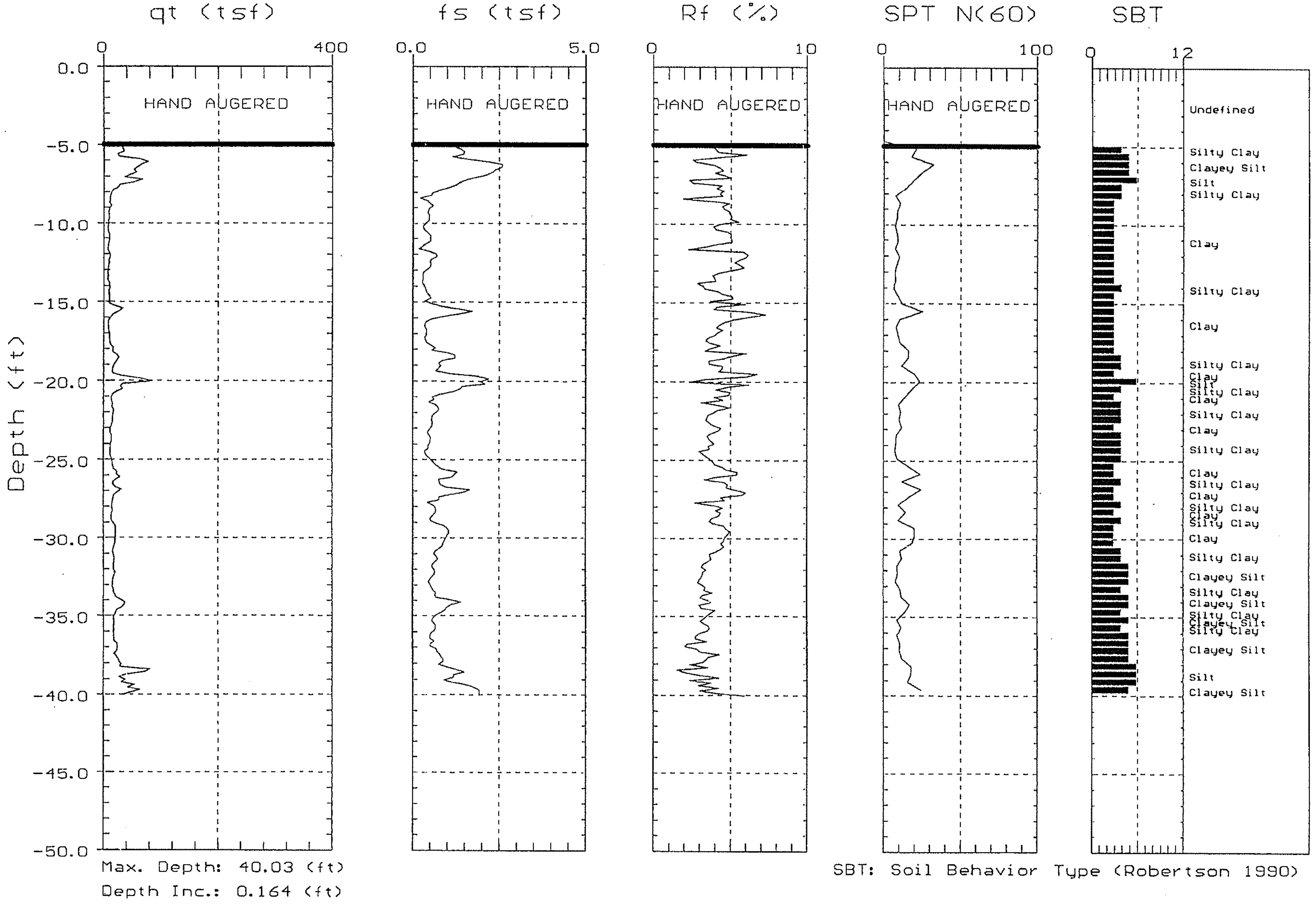
Max. Depth: 40.03 (ft)
Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG | **KLEINFELDER**

Site: CHEVRON
Location: CPT-09

Engineer: R. ELLIS
Date: 02:19:05 18:15

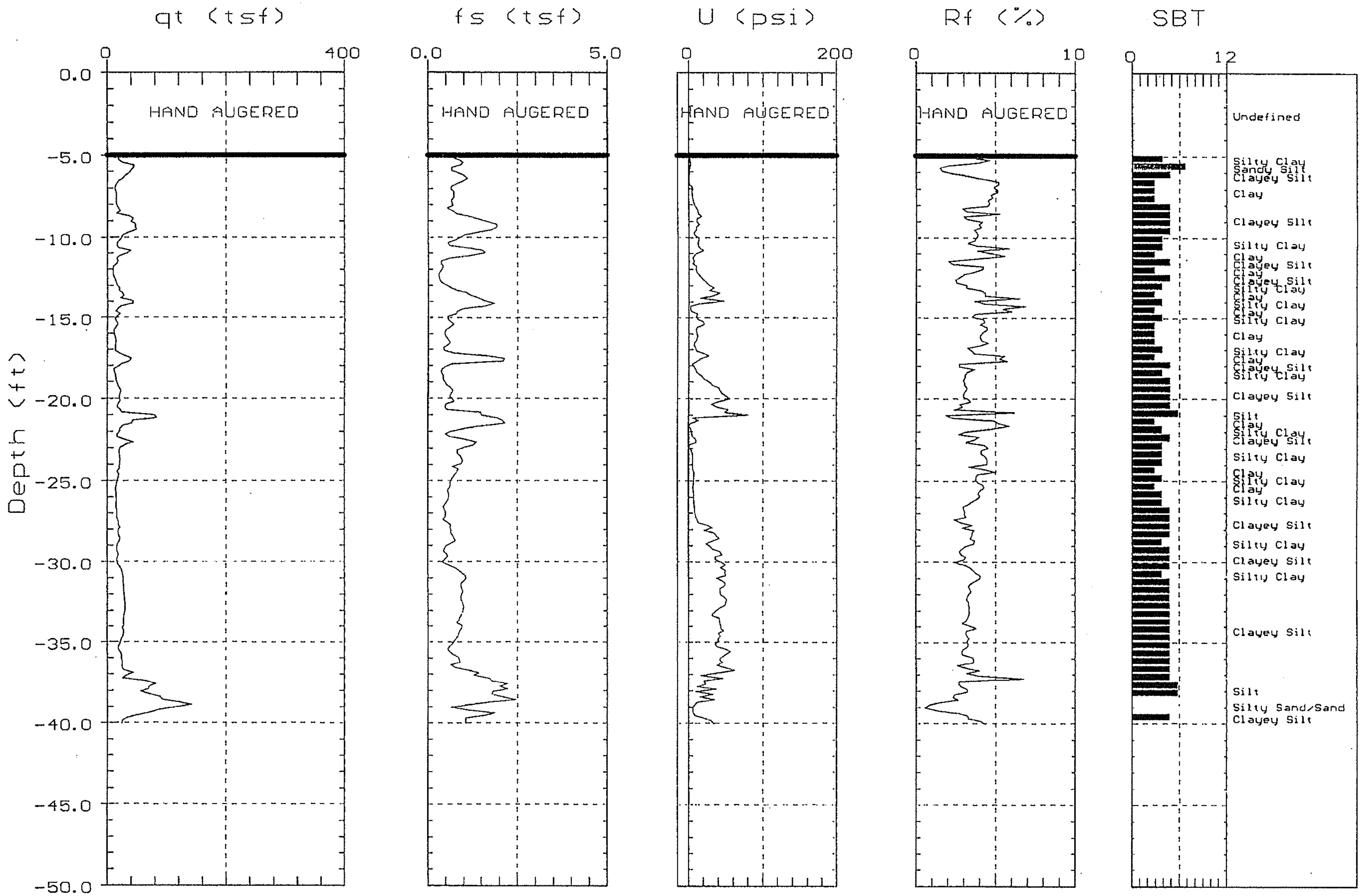


GREGG

KLEINFELDER

Site: CHEVRON
Location: CPT-10

Engineer: R. ELLIS
Date: 02:19:05 15:49



Max. Depth: 40.03 (ft)
Depth Inc.: 0.164 (ft)

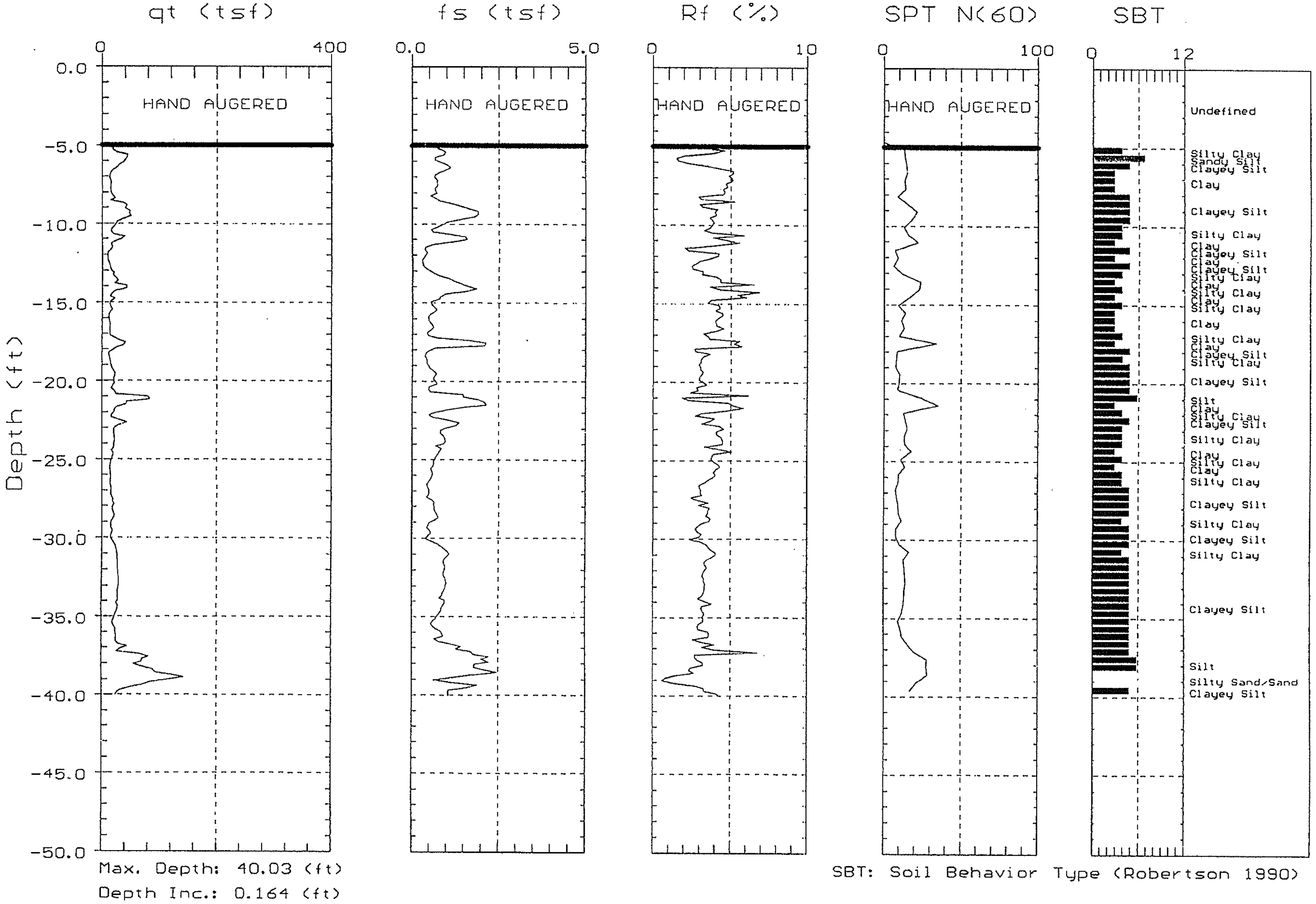
SBT: Soil Behavior Type (Robertson 1990)

GREGG

KLEINFELDER

Site: CHEVRON
Location: CPT-10

Engineer: R. ELLIS
Date: 02:19:05 15:49



Max. Depth: 40.03 (ft)
Depth Inc.: 0.164 (ft)

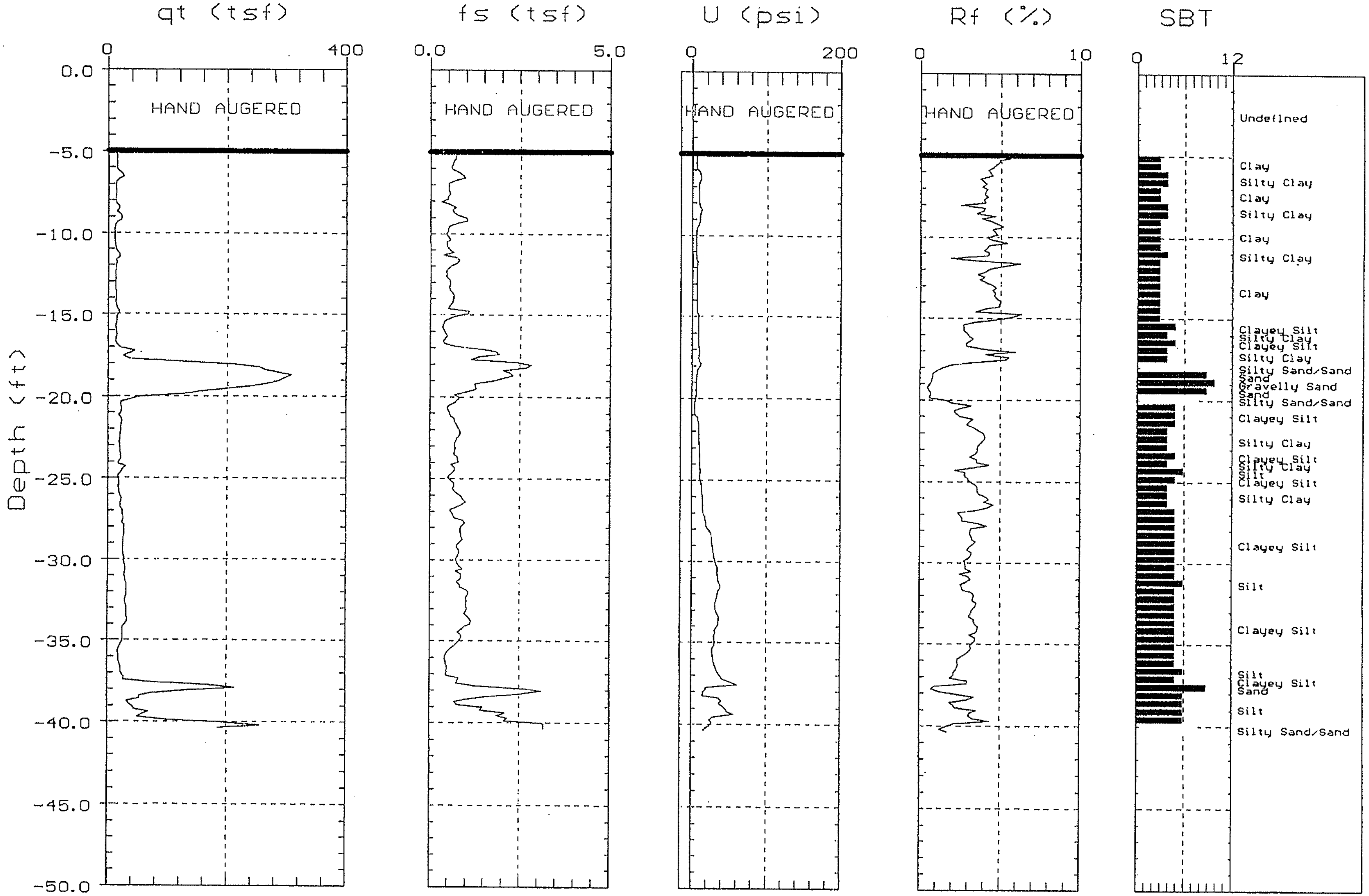
SBT: Soil Behavior Type (Robertson 1990)

GREGG

KLEINFELDER

Site: CHEVRON
Location: CPT-11

Engineer: R. ELLIS
Date: 02:19:05 16:33



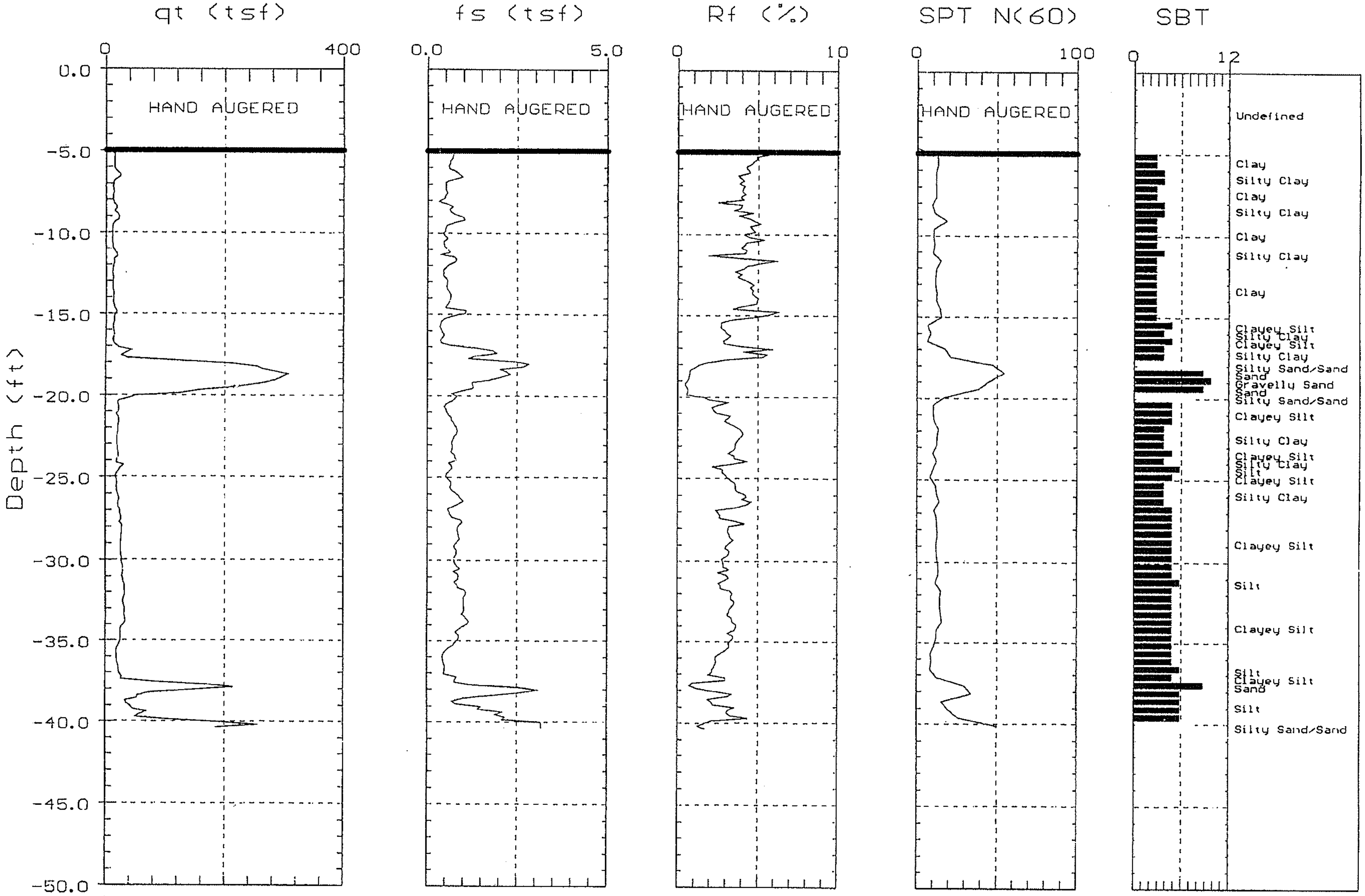
Max. Depth: 40.35 (ft)
Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

KLEINFELDER

Site: CHEVRON
Location: CPT-11

Engineer: R. ELLIS
Date: 02:19:05 16:33



Max. Depth: 40.35 (ft)
Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

Preliminary Geotechnical Exploration, San Ramon City Center, San Ramon, California, prepared for City of San Ramon, California, prepared by ENGEO Incorporated, ENGEO Project 5172.001.01, dated March 29, 2001

DATE OF BORING: January 22, 2001

SURFACE ELEVATION: Approx. 441 feet (134 meters)

DEPTH (FEET)	DEPTH (METERS)	SAMPLE NUMBER	LOG, LOCATION AND TYPE OF SAMPLE	DESCRIPTION	BLOWS/FT.	qu UNCON STRENGTH (TSF) *FIELD PENET. APPROX.	IN PLACE DRY UNIT WEIGHT (PCF)	IN PLACE MOIST. CONTENT % DRY WEIGHT
0								
				SILTY CLAY with sand (CL), black, very stiff, moist, with trace pebbles, and metallic debris. (Fill?)				
	1	1-1			34	2.0*		
5								
				With trace wood debris. SILTY CLAY (CL), black, stiff to very stiff, moist. (Fill?)				
	2	1-2			30	1.9	98.8	25.6
				SILTY CLAY (CL/CH), light olive with white mottling, very stiff, moist.				
10	3							
		1-3			43	3.0*	100.2	24.3
	4							
15								
	5	1-4		SILTY to CLAYEY SAND (SM), brown, medium dense, moist.	25			
20	6			∇				
				SILTY CLAY with sand (CL), yellowish brown, very stiff, wet.				
		1-5			18			
	7							
25				SILTY CLAY (CH), dark olive grey, very stiff, very moist to wet.				
	8	1-6			18	2.5*		
30	9							
		1-7		SILTY CLAY with sand (CL), dark greyish brown, trace carbonates, very stiff, very moist.	35	2.8	103.0	24.4
	10							
35				SILTY CLAY with sand (CL), grey with black mottling, very stiff, wet, trace medium sand and organics.				
	11	1-8			23			
40	12							
				SANDY CLAY (CL), grey, very stiff, very moist.				
		1-9			19			
	13							

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SAN RAMON CITY CENTER
SAN RAMON, CALIFORNIA

BORING NO.: B-1
DATE: March 2001
PROJ. NO.: 5172.5.001.01
CHECKED BY Mr

FIGURE NO. 6

MET 5172.GPJ 3/30/01

DATE OF BORING: January 22, 2001

SURFACE ELEVATION: Approx. 441 feet (134 meters)

SAMPLE NUMBER	DESCRIPTION	BLOWS/FT.	qu UNCON STRENGTH (TSF) *FIELD PENET. APPROX.	IN PLACE DRY UNIT WEIGHT (PCF)	IN PLACE MOIST. CONTENT % DRY WEIGHT
1-10	SILTY CLAY (CH), brown and olive, very stiff, very moist, with very thin layers of clayey sand.	48	4.5*	105.8	22.9
	SANDY CLAY (CL), light olive, very stiff, moist to wet, trace charcoal.		2.0*		
1-11	SILTY CLAY (CH), olive and white mottled, very stiff, moist to wet.	32	3.0*		
1-12	CLAYEY SAND (SC), greyish brown, medium dense, medium grained, local lenses of gravelly sand.	15			19.4
1-13	GRAVELLY SAND (SP), greyish brown, very dense, wet, pebbles up to ¾ inch in diameter, with clayey pockets.	54/6"			12.7
	SILTY CLAY (CL), light olive, very stiff, wet.				

Bottom of boring at approximately at 70 feet.
Ground water encountered at 20 feet during drilling.

DEPTH (FEET)	DEPTH (METERS)
45	14
50	15
	16
55	17
	18
60	19
65	20
	21
70	22
75	23
	24
80	25
85	26

MET 5172.GPJ 3/30/01

ENGEO
INCORPORATED

SAN RAMON CITY CENTER
SAN RAMON, CALIFORNIA

BORING NO.: B-1
DATE: March 2001
PROJ. NO.: 5172.5.001.01
CHECKED BY MT

FIGURE NO. 6

DATE OF BORING: January 22, 2001

SURFACE ELEVATION: Approx. 438 feet (134 meters)

DEPTH (FEET)	DEPTH (METERS)	SAMPLE NUMBER	LOG, LOCATION AND TYPE OF SAMPLE	DESCRIPTION	BLOWS/FT.	qu UNCON STRENGTH (TSF) *FIELD PENET. APPROX.	IN PLACE DRY UNIT WEIGHT (PCF)	IN PLACE MOIST. CONTENT % DRY WEIGHT
0			▨	SILTY CLAY (CH), black, hard, dry to moist, trace pebbles, and fine roots. (Fill?)				
	1	2-1	■		43	+4.5*	113.5	13.2
5	2	2-2	■	SILTY CLAY (CH), olive, hard, moist.	41	+4.5*		
10	3		▨	SANDY CLAY (CL), olive brown with white mottling, stiff, very moist.				
		2-3	■		15	2.0*	98.9	24.3
15	4		▨	SILTY CLAY (CL), olive brown, stiff, very moist, trace fine sand and pebbles.				
	5	2-4	■		22	1.5*		
20	6		▨	∇				
		2-5	▨	SILTY CLAY (CL), olive, very stiff, wet, trace carbonates.	14			25.8
25	7		▨	SILTY CLAY (CH), olive grey, very stiff, wet.				
	8	2-6	▨		16			
				Bottom of boring at approximately 26½ feet. Ground water encountered at 20 feet during drilling.				
30	9							

MET 5172.GPJ 3/30/01

ENGEO
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SAN RAMON CITY CENTER
SAN RAMON, CALIFORNIA

BORING NO.: B-2
DATE: March 2001
PROJ. NO.: 5172.5.001.01
CHECKED BY MT

FIGURE NO. 7

DATE OF BORING: January 22, 2001

SURFACE ELEVATION: Approx. 442 feet (135 meters)

DEPTH (FEET)	DEPTH (METERS)	SAMPLE NUMBER	LOG, LOCATION AND TYPE OF SAMPLE	DESCRIPTION	BLOWS/FT.	qu UNCON STRENGTH (TSF) *FIELD PENET. APPROX.	IN PLACE DRY UNIT WEIGHT (PCF)	IN PLACE MOIST. CONTENT % DRY WEIGHT
0				SILTY CLAY (CH), black, hard, dry to moist.				
	1	3-1			53	+4.5*		
5								
	2	3-2		SILTY CLAY (CH), black, moist, very stiff.	31	3.0*	103.1	21.7
				SILTY CLAY (CL), light olive brown with white mottling, very stiff, moist.				
10	3							
		3-3			29	4.0*		
	4			Increased silt, grades to stiff.				
15								
	5	3-4		SILTY CLAY (CL), light olive brown, medium stiff, very moist, some carbonates, with very fine sand.	18	0.7	96.2	26.5
				∇				
20	6							
		3-5		SILTY CLAY (CL), light olive brown, stiff, moist.	14			
	7							
25				SANDY CLAY/CLAYEY SAND (CL/SC), light olive brown, very stiff, very moist.				
		3-6			14			28.4
	8			SILTY CLAY (CH), dark grey, very stiff, very moist.				
				Bottom of boring at approximately 26½ feet. Ground water encountered at 18 feet during drilling.				
30	9							

MET 5172.GPJ 3/10/01

ENGEO INCORPORATED	SAN RAMON CITY CENTER SAN RAMON, CALIFORNIA	BORING NO.: B-3 DATE: March 2001 PROJ. NO.: 5172.5.001.01 CHECKED BY Mr	FIGURE NO. 8

DATE OF BORING: January 22, 2001

SURFACE ELEVATION: Approx. feet (meters)

DEPTH (FEET)	DEPTH (METERS)	SAMPLE NUMBER	LOG, LOCATION AND TYPE OF SAMPLE	DESCRIPTION	BLOWS/FT.	qu UNCON STRENGTH (TSF) *FIELD PENET. APPROX.	IN PLACE DRY UNIT WEIGHT (PCF)	IN PLACE MOIST. CONTENT % DRY WEIGHT
0								
	1	4-1		SILTY CLAY (CH), black, damp, hard, with sand and some wood debris. (Fill)	39	+4.5*	106.8	15.8
5				SILTY CLAY (CL), greyish brown, abundant carbonates, hard, damp.				
	2	4-2			26	4.5*	99.0	11.4
				SILTY SAND (SM), light olive, medium dense, damp.				
				SANDY CLAY (CL), olive, very stiff, moist.				
10	3							
		4-3			27	3.5*		
	4							
15				▽				
	5	4-4		SILTY CLAY (CL), olive brown, stiff, very moist to wet, trace carbonates.	15	1.5*	90.4	31.3
				SILTY CLAY (CH), dark grey, very stiff, wet.				
20	6							
		4-5			18			
				SANDY CLAY (CL), olive brown, stiff, wet.				
	7							
				SILTY CLAY (CH), light olive brown, very stiff, wet, trace carbonates.				
25								
	8	4-6			12			28.8
				Bottom of boring at approximately $26^{1}/_{2}$ feet. Ground water encountered at 15 feet during drilling.				
30	9							

MET 5172.GPJ 3/30/01

ENGEO
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SAN RAMON CITY CENTER
SAN RAMON, CALIFORNIA

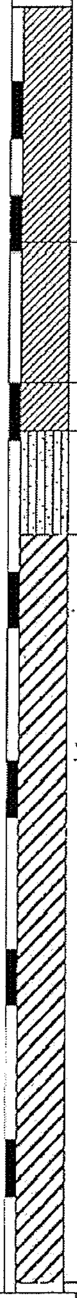
BORING NO.: B-4
DATE: March 2001
PROJ. NO.: 5172.5.001.01
CHECKED BY mr

FIGURE NO. 9

DATE OF BORING: January 22, 2001

SURFACE ELEVATION: Approx. feet (meters)

LOG, LOCATION AND TYPE OF SAMPLE



DEPTH (FEET)	DEPTH (METERS)	SAMPLE NUMBER	DESCRIPTION	BLOWS/FT.	qu UNCON STRENGTH (TSF) *FIELD PENET. APPROX.	IN PLACE	
						DRY UNIT WEIGHT (PCF)	MOIST. CONTENT % DRY WEIGHT
0			SILTY CLAY (CL), black, very stiff, dry to moist, with trace hay and other debris. (Fill)				
	1	5-1		28	+4.5*	101.2	16.2
5							
	2	5-2-1 5-2-2	SANDY CLAY with gravel (CL), light brown, moist, hard, poorly sorted. (Fill?)	30			
10	3		SILTY CLAY (CL), light brown, very stiff, moist.				
		5-3	SILTY SAND (SM), olive brown, medium dense, moist.	43	2.0*	112.0	15.5
	4						
15			SILTY CLAY (CH), greyish brown with black mottling, stiff, wet, trace charcoal.				
	5	5-4		16	2.0*	93.0	30.8
20	6		▽				
		5-5	Mottling changes to white.	23	3.0*		
	7						
			SILTY CLAY (CH), olive grey, very stiff, very moist.				
25	8	5-6		26	2.0	94.0	29.9
30	9						
		5-7		29	3.0*		
	10						

MET 5172.GPJ 3/30/01

ENGEO
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SAN RAMON CITY CENTER
SAN RAMON, CALIFORNIA

BORING NO.: B-5
DATE: March 2001
PROJ. NO.: 5172.5.001.01
CHECKED BY

FIGURE NO. 10

DATE OF BORING: January 22, 2001

SURFACE ELEVATION: Approx. feet (meters)

DEPTH (FEET)	DEPTH (METERS)	SAMPLE NUMBER	LOG, LOCATION AND TYPE OF SAMPLE	DESCRIPTION	BLOWS/FT.	qu UNCON STRENGTH (TSF) *FIELD PENET. APPROX.	IN PLACE DRY UNIT WEIGHT (PCF)	IN PLACE MOIST. CONTENT % DRY WEIGHT
35			▨	SANDY CLAY (CL), olive brown, hard, moist, some rust stains.				
	11	5-8	▨		56	4.0*	114.2	17.9
	12		▨					
40			▨	Trace charcoal.				
		5-9	▨		50	4.0*		
	13		▨					
45			▨	SILTY CLAY (CL), olive brown, very stiff, very moist, with trace carbonates, fine sand.				
	14	5-10	▨		26	2.5*	100.7	25.6
				Bottom of boring at approximately 46½ feet. Ground water encountered at 20 feet during drilling.				
	15							
50								
	16							
55								
	17							
	18							
60								
	19							
65								
	20							

MET 5172.GPJ 3/30/01

ENGEO
INCORPORATED

SAN RAMON CITY CENTER
SAN RAMON, CALIFORNIA

BORING NO.: B-5
DATE: March 2001
PROJ. NO.: 5172.5.001.01
CHECKED BY

FIGURE NO.
10

DATE OF BORING: January 29, 2001

SURFACE ELEVATION: Approx. feet (meters)

DEPTH (FEET)	DEPTH (METERS)	SAMPLE NUMBER	LOG, LOCATION AND TYPE OF SAMPLE	DESCRIPTION	BLOWS/FT.	qu UNCON STRENGTH (TSF) *FIELD PENET. APPROX.	IN PLACE DRY UNIT WEIGHT (PCF)	IN PLACE MOIST. CONTENT % DRY WEIGHT
0				SILTY CLAY (CL), black, very stiff, dry to moist, with trace hay and other debris. (Fill)				
	1							
5	2			SANDY CLAY with gravel (CL), light brown, hard, moist, poorly sorted. (Fill?)				
10	3			SILTY CLAY (CL), light brown, stiff, moist.				
				SILTY SAND (SM), olive brown, medium dense, moist.				
	4							
15				SILTY CLAY (CH), greyish brown with black mottling, stiff, wet, trace charcoal.				
	5							
20	6			▽				
	7							
25				SILTY CLAY (CH), olive grey, very stiff, very moist.				
	8							
				Grades to very stiff.				
30	9							
	10							
35				SANDY CLAY (CL), olive brown, hard, moist.				
	11							
40	12							
	13							
45				SILTY CLAY (CL), olive brown, very stiff, very moist, with trace carbonate.				
	14			SILTY SAND (SM), olive brown, dense, wet, medium grained.				
				SILTY CLAY (CL), light olive brown, very stiff, wet.				
	15							

MET 5172.GPJ 3/30/01

ENGEO
INCORPORATED

SAN RAMON CITY CENTER
SAN RAMON, CALIFORNIA

BORING NO.: B-6
DATE: March 2001
PROJ. NO.: 5172.5.001.01
CHECKED BY mr

FIGURE NO. 11

DATE OF BORING: January 29, 2001

SURFACE ELEVATION: Approx. feet (meters)

DEPTH (FEET)	DEPTH (METERS)	SAMPLE NUMBER	LOG, LOCATION AND TYPE OF SAMPLE	DESCRIPTION	BLOWS/FT.	qu UNCON STRENGTH (TSF) *FIELD PENET. APPROX.	IN PLACE DRY UNIT WEIGHT (PCF)	IN PLACE MOIST. CONTENT % DRY WEIGHT
50	16	6-1	■ ▨	SILTY CLAY with sand (CL), light olive brown, very stiff, wet, some chunks of carbonates, minor rust stains.	27	3.0*	99.5	26.4
55	17	6-2	■ ▧	CLAYEY SAND with gravel (SC), brown, very dense, wet.	50/6"		126.1	12.6
60 65	18 19 20 21		░	GRAVELLY SAND (SP), greyish brown, very dense, wet.				
70 75 80 85 90 95	22 23 24 25 26 27 28 29 30			Bottom of boring at approximately 70 feet. Ground water encountered at 20 feet during drilling.				

MET 5172.GPJ 3/30/01

ENGEO
INCORPORATED

SAN RAMON CITY CENTER

SAN RAMON, CALIFORNIA

BORING NO.: B-6

DATE: March 2001

PROJ. NO.: 5172.5.001.01

CHECKED BY

FIGURE NO. 11

Geotechnical Investigation, Bishop Ranch 1 Development, San Ramon, California, prepared for Sunset Development Company, prepared by Harding Lawson Associates (HLA), HLA Project 50044.1, dated May 15, 2000

HOLGUIN, FAHAN & ASSOCIATES, INC.
ENVIRONMENTAL MANAGEMENT CONSULTANTS

RECEIVED
APR 24 2000
HARDING LAWSON

April 21, 2000

Mr. Ryan Shafer
Harding, Lawson and Associates, Inc.
383 Fourth St
Suite 300
Oakland, CA 94607

PROJECT NAME: CPT Testing at Bishop Ranch 1
PROJECT NO.: 50044.1

Dear Mr. Shafer:

Enclosed please find copies of the cone penetrometer testing (CPT) data for the above referenced project along with a copy of the corresponding invoice.

The cone penetrometer testing conducted for this project consisted of pushing an instrumented cone-tipped probe into the ground while simultaneously recording the resistance to penetration at the cone tip and along the friction sleeve.

The cone penetrometer testing described in this report was conducted in general accordance with the current ASTM specifications (ASTM D5778-95 and D3441-94) using an electronic cone penetrometer.

The CPT equipment operated by Holguin, Fahan & Associates, Inc. (HFA) consists of a cone assembly mounted at the end of a series of hollow sounding rods. A set of hydraulic rams is used to continuously push the cone and rods into the soil at a rate of 20-mm per second (approximately four feet per minute) while the cone tip resistance and sleeve friction resistance are recorded every 50-mm (approximately two inches) and stored in digital form. A specially designed all wheel drive 23-ton truck provides the required reaction weight for pushing the cone assembly and is also used to transport and house the test equipment.

The cone penetrometer assembly used for this project consists of a conical tip and a cylindrical friction sleeve. The conical tip has a 60° apex angle and a diameter of 35.6-mm (1.40-inch) resulting in a projected cross-sectional area of 10 cm^2 (1.5 square inches). The cylindrical friction sleeve is 133-mm (5.25-inch) in length and has an outside diameter of 35.8-mm (1.41-inch), resulting in a surface area of 150 cm^2 (23 square inches).

The interior of the cone penetrometer is instrumented with strain gauges that allow simultaneous measurement of cone tip and friction sleeve resistance during penetration. Continuous electric signals from the strain gauges are transmitted by a shielded cable in the sounding rods to the PC-based data acquisition hardware in the CPT truck. The sounding log is also displayed on a monitor.

ENVIRONMENTAL: SCIENTISTS • GEOLOGISTS • ENGINEERS
Contaminated Site Assessments • Phase I Audits • Site Remediation • Hazardous Waste Management

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The CPT data processing is performed using the truck mounted computer based data acquisition and presentation system. The computer generated graphical logs include cone resistance, friction resistance, friction ratio, and pore pressure ratio versus depth at a user selectable scale.

Soil behavior type interpretations are based on the following reference: Robertson, P.K. and Campanella, R.C., 1989, "Guidelines for Geotechnical Design using the Cone Penetrometer Test and CPT with Pore Pressure Measurement." Soil Mechanics series No. 120, Civil Engineering Department, University of British Columbia, Vancouver, B.C., V6T 1Z4, September 1989.

Interpretations and plotting has been done using HFA's proprietary data interpretation and presentation software. It is important to note that the data is not averaged. All interpretations are point interpretations at the corresponding depth listed.

It is also important to note that the soil behavior type correlations are based on a combination of theory, field research, research performed under laboratory conditions, and literature review. The information presented in the tabulated and/or graphical logs should, therefore, be viewed as a guideline rather than as precise measurements.

Some care is recommended when using the soil behavior type interpretations. If a tabulation depth happens to fall on a soil layer interface, or a seam of soil differing from the rest of the layer, the tabulated data can be misleading. The solution to this problem is the proper use of the graphical CPT logs. The tip and sleeve penetration resistance logs are the primary source of profile description; the soil behavior type logs are supplemental. The graphical logs of tip and sleeve resistance should be examined and layer boundaries delineated in accordance with the project requirements. The soil behavior type interpretations are only representative of the response of the soil to the large shear deformations imposed during cone penetration. This is not necessarily a prediction of grain size distribution. However, it has been found that the interpreted soil behavior types generally agree well with the soil types defined in accordance with the grain size distribution methods such as used in the Unified Soil Classification System.

Limitations

Holguin, Fahan & Associates, Inc. (HFA) presents the attached data in accordance with ASTM Standards D5778-95 and D3441-94 and generally accepted cone penetrometer testing practices and standards. The attached data further relates only to the specific project and location discussed in the data. Judgement may be required to verify the CPT soil behavior interpretations.

The "Client" may distribute this data or excerpts therefrom provided the following statement is prominently displayed and included with the distribution:

> "Neither CLIENT nor HFA make any guarantee or warranty, express or implied, regarding this data. THE USE OF THIS INFORMATION SHALL BE AT THE USER'S SOLE RISK REGARDLESS OF ANY FAULT OR NEGLIGENCE OF THE CLIENT OR HFA."

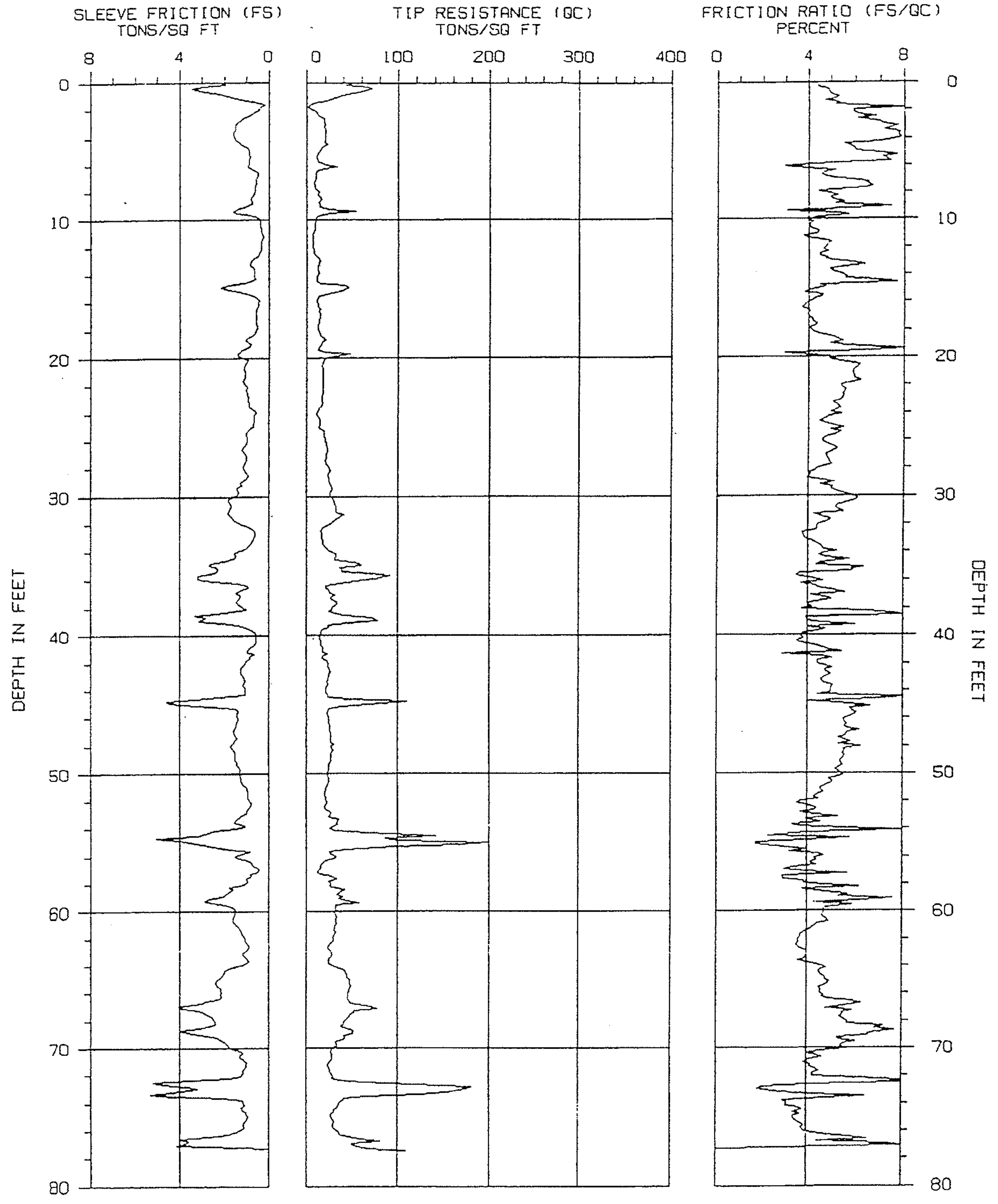
Please feel free to call if you have any questions.

Respectfully submitted,

Dick Carlton

Dick Carlton
CPT Operations Manager
Holguin, Fahan & Associates, Inc.

:DC\Enclosures



TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST

SOUNDING NUMBER: HLA-1

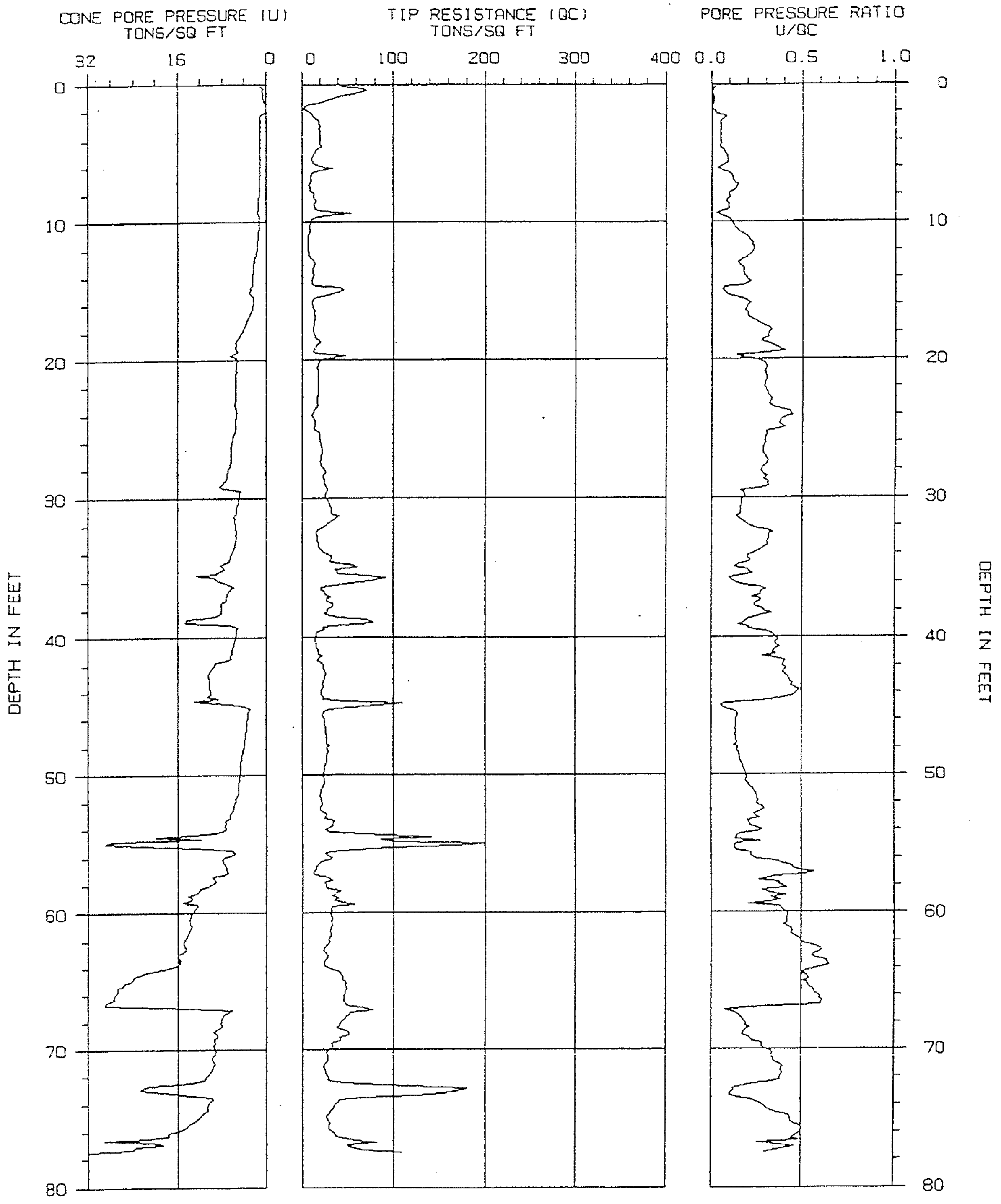
PROJECT NAME : HLA/BISHOP RH 1

PROJECT NUMBER : 50044.1

CONE/RIG : 491/BH.V0/R#4

DATE/TIME: 04-13-00 07:51

HFA



TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST	SOUNDING NUMBER: HLA-1

PROJECT NAME : HLA/BISHOP RH 1

PROJECT NUMBER : 50044.1

CONE/RIG : 491/BH.V0/R#4

DATE/TIME: 04-13-00 07:51

HFA

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***********************************************************************
*                                                                     *
*                         CPT INTERPRETATIONS                         *
*                                                                     *
*  SOUNDING : HLA-1                       PROJECT No.: 50044.1        *
*  PROJECT  : HLA/BISHOP RH 1             CONE/RIG : 491/BH,VO/R#4    *
*  DATE/TIME: 04-13-00 07:51                                          *
*                                                                     *
***********************************************************************
                                                             PAGE 1 of 4

DEPTH   DEPTH     TIP     FRICTION    SOIL BEHAVIOR TYPE      N(60)  N1(60)   Dr     Su       PHI
               RESISTANCE  RATIO
 (m)    (ft)     (tsf)     (%)                                                (%)   (tsf)  (Degrees)
-----   -----  ---------- --------  -------------------------  -----  ------   ---   -----  ---------
 .150     .49     71.51    4.83    *VERY STIFF FINE GRAINED      72    100
 .300     .98     35.48    5.29     CLAY                         35     57             2.1
 .450    1.48      9.71    5.33     CLAY                         10     16              .6
 .600    1.97      7.22    5.93     CLAY                          7     12              .5
 .750    2.46     14.49    6.82     CLAY                         14     23             1.0
 .900    2.95     20.46    7.10     CLAY                         20     33             1.4
1.050    3.44     20.78    7.18     CLAY                         21     33             1.4
1.200    3.94     19.89    7.86     CLAY                         20     32             1.3
1.350    4.43     22.88    5.53     CLAY                         23     37             1.3
1.500    4.92     14.36    6.02     CLAY                         14     23              .9
1.650    5.41     11.96    7.12     CLAY                         12     19              .8
1.800    5.91     21.54    4.12     CLAY to SILTY CLAY           14     23             1.4
1.950    6.40     11.75    5.15     CLAY                         12     19              .8
2.100    6.89     10.37    5.03     CLAY                         10     17              .7
2.250    7.38      9.09    6.47     CLAY                          9     14              .6
2.400    7.87     14.04    4.45     CLAY                         14     22              .9
2.550    8.37     15.70    4.95     CLAY                         16     24             1.0
2.700    8.86     14.74    5.16     CLAY                         15     22             1.0
2.850    9.35     53.47    3.02     SANDY SILT to CLAYEY SILT    21     32             3.5
3.000    9.84     10.75    4.39     CLAY                         11     16              .7
3.150   10.33      9.79    4.09     CLAY                         10     14              .6
3.300   10.83      8.37    4.44     CLAY                          8     12              .5
3.450   11.32      7.10    3.98     CLAY                          7     10              .4
3.600   11.81      6.99    4.86     CLAY                          7     10              .4
3.750   12.30      8.35    4.84     CLAY                          8     12              .5
3.900   12.80     13.43    4.86     CLAY                         13     18              .8
4.050   13.29     12.96    6.37     CLAY                         13     17              .8
4.200   13.78     13.24    5.04     CLAY                         13     18              .8
4.350   14.27     11.13    5.60     CLAY                         11     15              .7
4.500   14.76     40.94    4.51     CLAY to SILTY CLAY           27     36             2.4
4.650   15.26     28.66    3.82     CLAY to SILTY CLAY           19     25             1.9
4.800   15.75     11.60    4.28     CLAY                         12     15              .7
4.950   16.24     12.87    3.82     CLAY                         13     16              .8
5.100   16.73     14.68    4.03     CLAY                         15     18              .9
5.250   17.22     13.94    4.16     CLAY                         14     17              .9
5.400   17.72     12.30    4.33     CLAY                         12     15              .8
5.550   18.21     15.15    4.34     CLAY                         15     19              .9
5.700   18.70     20.14    5.27     CLAY                         20     24             1.1
5.850   19.19     15.11    5.65     CLAY                         15     18              .9
6.000   19.69     47.97    2.95     SANDY SILT to CLAYEY SILT    19     23             3.1
6.150   20.18     19.25    4.88     CLAY                         19     23             1.2
---------------------------------------------------

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 110 pcf
ASSUMED DEPTH OF WATER TABLE =  7.5 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE
```

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.

SOUNDING : HLA-1

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
6.300	20.67	17.95	6.12	CLAY	18	21		1.1	
6.450	21.16	17.97	5.91	CLAY	18	21		1.1	
6.600	21.65	18.65	6.22	CLAY	19	22		1.0	
6.750	22.15	18.06	5.40	CLAY	18	21		1.1	
6.900	22.64	17.46	5.47	CLAY	17	20		1.1	
7.050	23.13	17.17	5.40	CLAY	17	19		1.1	
7.200	23.62	14.00	5.38	CLAY	14	16		.8	
7.350	24.11	11.92	5.43	CLAY	12	13		.7	
7.500	24.61	14.98	4.51	CLAY	15	17		.9	
7.650	25.10	15.02	5.50	CLAY	15	16		.9	
7.800	25.59	19.76	5.13	CLAY	20	22		1.2	
7.950	26.08	21.05	4.61	CLAY	21	23		1.3	
8.100	26.57	22.50	5.24	CLAY	23	24		1.2	
8.250	27.07	21.20	4.76	CLAY	21	23		1.3	
8.400	27.56	21.33	4.95	CLAY	21	23		1.3	
8.550	28.05	25.79	4.37	CLAY to SILTY CLAY	17	18		1.4	
8.700	28.54	23.24	4.09	CLAY to SILTY CLAY	15	16		1.4	
8.850	29.04	25.43	5.12	CLAY	25	26		1.4	
9.000	29.53	28.00	5.01	CLAY	28	29		1.6	
9.150	30.02	27.36	5.89	CLAY	27	28		1.5	
9.300	30.51	30.32	5.68	CLAY	30	31		1.7	
9.450	31.00	33.10	5.38	CLAY	33	34		1.8	
9.600	31.50	36.84	4.55	CLAY to SILTY CLAY	25	25		2.1	
9.750	31.99	26.30	4.48	CLAY to SILTY CLAY	18	18		1.4	
9.900	32.48	15.70	4.35	CLAY	16	16		.9	
10.050	32.97	17.38	3.84	CLAY to SILTY CLAY	12	11		1.0	
10.200	33.46	18.44	4.46	CLAY	18	18		1.1	
10.350	33.96	26.94	5.25	CLAY	27	26		1.5	
10.500	34.45	31.00	4.80	CLAY	31	30		1.7	
10.650	34.94	60.78	4.35	CLAYEY SILT to SILTY CLAY	30	29		3.5	
10.800	35.43	39.37	5.93	CLAY	39	38		2.2	
10.950	35.93	75.48	4.24	CLAYEY SILT to SILTY CLAY	38	36		4.3	
11.100	36.42	21.92	4.35	CLAY to SILTY CLAY	15	14		1.3	
11.250	36.91	26.02	5.62	CLAY	26	25		1.4	
11.400	37.40	27.62	5.02	CLAY	28	26		1.5	
11.550	37.89	27.83	4.18	CLAY to SILTY CLAY	19	17		1.5	
11.700	38.39	31.65	7.55	CLAY	32	30		1.7	
11.850	38.88	78.14	4.01	CLAYEY SILT to SILTY CLAY	39	36		4.5	
12.000	39.37	24.98	4.01	CLAY to SILTY CLAY	17	15		1.5	
12.150	39.86	15.81	3.78	CLAY to SILTY CLAY	11	10		.9	
12.300	40.35	16.49	3.52	CLAY to SILTY CLAY	11	10		1.0	
12.450	40.85	17.65	4.56	CLAY	18	16		1.0	
12.600	41.34	22.77	2.87	CLAYEY SILT to SILTY CLAY	11	10		1.4	
12.750	41.83	23.03	4.46	CLAY	23	21		1.4	
12.900	42.32	24.75	5.05	CLAY	25	22		1.3	
13.050	42.81	25.05	5.00	CLAY	25	22		1.3	
13.200	43.31	22.90	4.63	CLAY	23	20		1.4	
13.350	43.80	20.97	5.07	CLAY	21	19		1.1	
13.500	44.29	23.79	4.47	CLAY	24	21		1.4	
13.650	44.78	110.47	4.12	CLAYEY SILT to SILTY CLAY	55	48		6.4	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 110 pcf
ASSUMED DEPTH OF WATER TABLE = 7.5 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : HLA-1

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
13.800	45.28	25.64	5.83	CLAY	26	22		1.4	
13.950	45.77	23.62	6.03	CLAY	24	21		1.2	
14.100	46.26	25.26	5.58	CLAY	25	22		1.3	
14.250	46.75	26.05	5.78	CLAY	26	22		1.4	
14.400	47.24	26.77	5.62	CLAY	27	23		1.4	
14.550	47.74	26.68	5.87	CLAY	27	23		1.4	
14.700	48.23	29.06	5.55	CLAY	29	25		1.6	
14.850	48.72	27.17	5.59	CLAY	27	23		1.4	
15.000	49.21	26.36	5.42	CLAY	26	22		1.4	
15.150	49.70	24.47	5.18	CLAY	24	21		1.3	
15.300	50.20	23.56	5.55	CLAY	24	20		1.2	
15.450	50.69	23.28	5.07	CLAY	23	19		1.2	
15.600	51.18	21.07	4.57	CLAY	21	17		1.2	
15.750	51.67	21.29	4.29	CLAY to SILTY CLAY	14	12		1.2	
15.900	52.17	22.56	3.50	CLAYEY SILT to SILTY CLAY	11	9		1.3	
16.050	52.66	22.73	4.33	CLAY to SILTY CLAY	15	12		1.3	
16.200	53.15	24.43	5.36	CLAY	24	20		1.3	
16.350	53.64	35.20	3.35	CLAYEY SILT to SILTY CLAY	18	14		2.1	
16.500	54.13	31.82	7.94	CLAY	32	26		1.7	
16.650	54.63	87.12	5.81	*VERY STIFF FINE GRAINED	87	70			
16.800	55.12	167.90	1.75	SAND to SILTY SAND	42	34	76		40.5
16.950	55.61	25.94	3.21	CLAYEY SILT to SILTY CLAY	13	10		1.5	
17.100	56.10	31.23	4.32	CLAY to SILTY CLAY	21	17		1.7	
17.250	56.59	16.02	4.41	CLAY	16	13		.9	
17.400	57.09	12.32	3.98	CLAY	12	10		.6	
17.550	57.58	34.16	2.93	CLAYEY SILT to SILTY CLAY	17	13		2.1	
17.700	58.07	25.62	4.77	CLAY	26	20		1.3	
17.850	58.56	37.43	4.86	CLAY	37	29		2.0	
18.000	59.06	35.56	7.57	CLAY	36	28		1.9	
18.150	59.55	32.67	5.98	CLAY	33	25		1.7	
18.300	60.04	31.85	4.75	CLAY	32	25		1.7	
18.450	60.53	33.08	4.86	CLAY	33	26		1.8	
18.600	61.02	32.04	4.38	CLAY to SILTY CLAY	21	16		1.7	
18.750	61.52	32.12	3.88	CLAYEY SILT to SILTY CLAY	16	12		1.7	
18.900	62.01	30.00	3.60	CLAYEY SILT to SILTY CLAY	15	11		1.8	
19.050	62.50	24.64	3.51	CLAYEY SILT to SILTY CLAY	12	9		1.4	
19.200	62.99	28.19	4.01	CLAY to SILTY CLAY	19	14		1.6	
19.350	63.48	24.54	3.91	CLAY to SILTY CLAY	16	12		1.4	
19.500	63.98	29.42	4.63	CLAY to SILTY CLAY	20	15		1.5	
19.650	64.47	43.57	4.55	CLAY to SILTY CLAY	29	22		2.4	
19.800	64.96	47.95	4.82	CLAY to SILTY CLAY	32	24		2.6	
19.950	65.45	49.10	4.80	CLAY to SILTY CLAY	33	24		2.7	
20.100	65.94	46.29	4.57	CLAY to SILTY CLAY	31	23		2.5	
20.250	66.44	45.83	4.95	CLAY to SILTY CLAY	31	23		2.5	
20.400	66.93	71.89	5.60	*VERY STIFF FINE GRAINED	72	53			
20.550	67.42	52.13	5.51	CLAY	52	38		2.8	
20.700	67.91	43.89	5.67	CLAY	44	32		2.4	
20.850	68.41	37.88	7.26	CLAY	38	28		2.0	
21.000	68.90	51.75	6.61	CLAY	52	38		2.8	
21.150	69.39	41.00	5.38	CLAY	41	30		2.2	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 110 pcf
ASSUMED DEPTH OF WATER TABLE = 7.5 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : HLA-1

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
21.300	69.88	33.38	5.47	CLAY	33	24		1.7	
21.450	70.37	28.40	3.98	CLAY to SILTY CLAY	19	14		1.6	
21.600	70.87	27.64	4.20	CLAY to SILTY CLAY	18	13		1.4	
21.750	71.36	24.88	4.15	CLAY to SILTY CLAY	17	12		1.4	
21.900	71.85	26.79	4.26	CLAY to SILTY CLAY	18	13		1.3	
22.050	72.34	35.97	9.56	CLAY	36	26		1.9	
22.200	72.83	179.86	2.01	SILTY SAND to SANDY SILT	60	43	74		39.5
22.350	73.33	124.77	4.26	*VERY STIFF FINE GRAINED	100	89			
22.500	73.82	40.77	2.96	CLAYEY SILT to SILTY CLAY	20	14		2.4	
22.650	74.31	33.95	3.70	CLAYEY SILT to SILTY CLAY	17	12		2.0	
22.800	74.80	27.21	3.68	CLAYEY SILT to SILTY CLAY	14	10		1.5	
22.950	75.30	29.89	3.57	CLAYEY SILT to SILTY CLAY	15	10		1.7	
23.100	75.79	29.32	3.73	CLAYEY SILT to SILTY CLAY	15	10		1.7	
23.250	76.28	37.28	4.94	CLAY	37	26		1.9	
23.400	76.77	80.88	4.45	CLAYEY SILT to SILTY CLAY	40	28		4.5	
23.550	77.26	67.98	*****		0	0			.0

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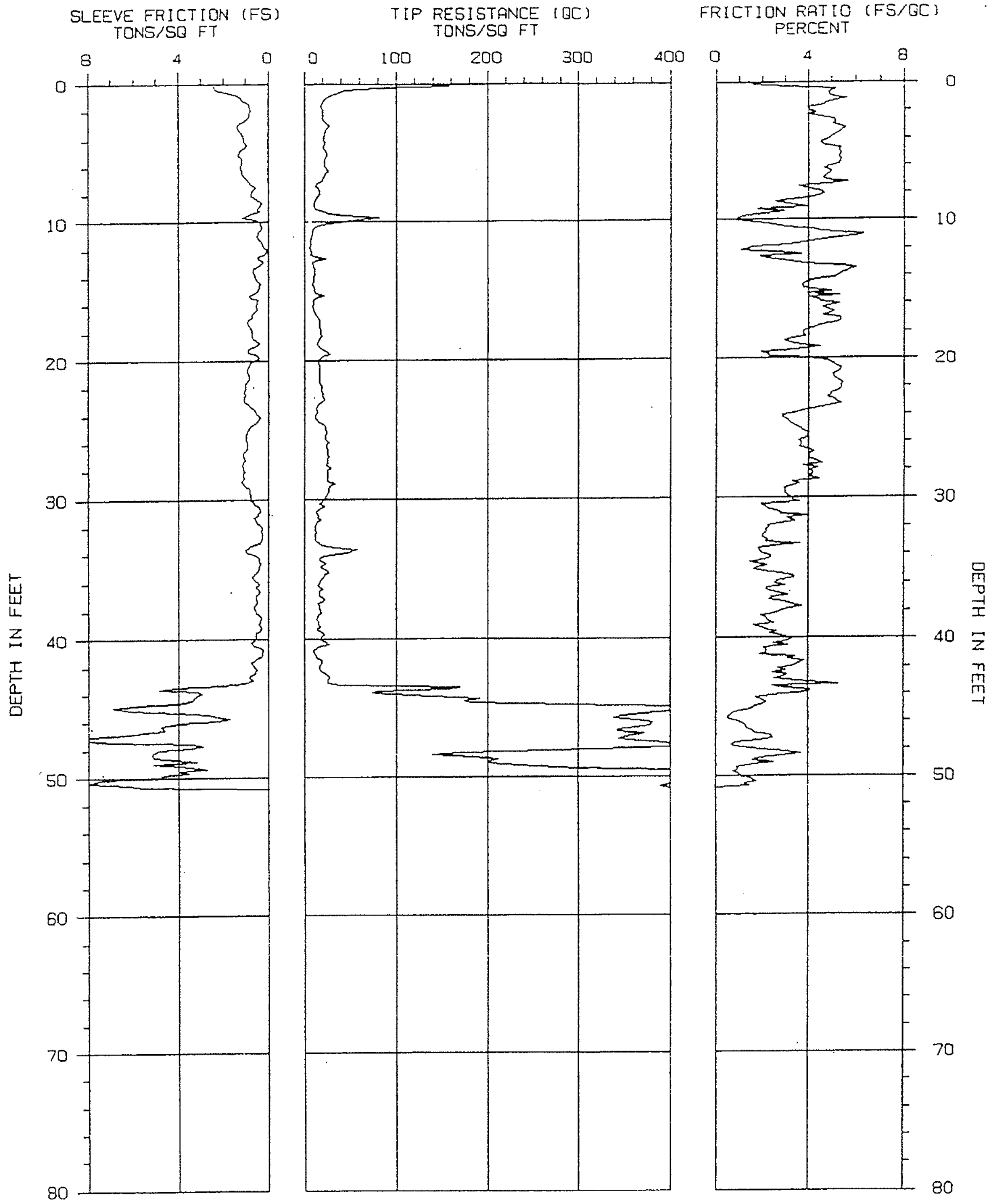
*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 110 pcf
ASSUMED DEPTH OF WATER TABLE = 7.5 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.



TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST SOUNDING NUMBER: HLA-2

PROJECT NAME : HLA/BISHOP RH 1
CONE/RIG : 491/BH.V0/R#4

PROJECT NUMBER : 50044.1
DATE/TIME: 04-12-00 07:36

HFA

CPT INTERPRETATIONS

SOUNDING : HLA-2
PROJECT : HLA/BISHOP RH 1
DATE/TIME: 04-12-00 07:36

PROJECT No.: 50044.1
CONE/RIG : 491/BH,VO/R#4

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
.150	.49	45.08	5.18	CLAY	45	72		2.7	
.300	.98	24.81	5.08	CLAY	25	40		1.5	
.450	1.48	18.84	4.76	CLAY	19	30		1.3	
.600	1.97	20.40	4.01	CLAY to SILTY CLAY	14	22		1.4	
.750	2.46	20.73	4.52	CLAY	21	33		1.4	
.900	2.95	27.43	5.02	CLAY	27	44		1.6	
1.050	3.44	22.90	5.41	CLAY	23	37		1.3	
1.200	3.94	22.05	4.94	CLAY	22	35		1.3	
1.350	4.43	21.52	4.53	CLAY	22	34		1.4	
1.500	4.92	24.79	5.27	CLAY	25	40		1.4	
1.650	5.41	22.99	5.30	CLAY	23	37		1.3	
1.800	5.91	23.01	5.30	CLAY	23	37		1.3	
1.950	6.40	24.28	4.95	CLAY	24	39		1.4	
2.100	6.89	20.10	4.61	CLAY	20	32		1.3	
2.250	7.38	12.83	4.84	CLAY	13	20		.8	
2.400	7.87	16.85	4.60	CLAY	17	26		1.1	
2.550	8.37	12.58	4.03	CLAY	13	19		.8	
2.700	8.86	12.00	3.06	CLAY to SILTY CLAY	8	12		.8	
2.850	9.35	25.85	2.93	CLAYEY SILT to SILTY CLAY	13	19		1.7	
3.000	9.84	58.27	.93	SILTY SAND to SANDY SILT	19	28	61		41.5
3.150	10.33	12.47	2.48	CLAYEY SILT to SILTY CLAY	6	9		1.0	
3.300	10.83	9.65	4.63	CLAY	10	14		.6	
3.450	11.32	6.95	4.99	CLAY	7	10		.4	
3.600	11.81	6.48	3.16	CLAY	6	9		.4	
3.750	12.30	7.24	2.68	CLAY to SILTY CLAY	5	7		.5	
3.900	12.80	13.00	2.17	CLAYEY SILT to SILTY CLAY	7	9		1.0	
4.050	13.29	10.96	5.47	CLAY	11	15		.7	
4.200	13.78	11.11	5.51	CLAY	11	15		.7	
4.350	14.27	10.16	4.33	CLAY	10	13		.6	
4.500	14.76	10.96	3.74	CLAY	11	14		.7	
4.650	15.26	21.16	3.97	CLAY to SILTY CLAY	14	18		1.4	
4.800	15.75	10.47	4.46	CLAY	10	13		.6	
4.950	16.24	10.92	4.60	CLAY	11	14		.7	
5.100	16.73	14.30	4.94	CLAY	14	18		.9	
5.250	17.22	17.51	5.33	CLAY	18	22		1.1	
5.400	17.72	17.80	4.33	CLAY	18	22		1.1	
5.550	18.21	18.76	3.80	CLAY to SILTY CLAY	13	15		1.2	
5.700	18.70	14.34	2.93	CLAY to SILTY CLAY	10	12		.9	
5.850	19.19	19.33	4.51	CLAY	19	23		1.2	
6.000	19.69	20.08	2.27	CLAYEY SILT to SILTY CLAY	10	12		1.5	
6.150	20.18	15.83	4.80	CLAY	16	19		1.0	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 110 pcf
ASSUMED DEPTH OF WATER TABLE = 7.5 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

Interpretations based on: Robertson and Campanella, 1989.

SOUNDING : HLA-2

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
6.300	20.67	17.06	5.36	CLAY	17	20		1.1	
6.450	21.16	17.02	5.02	CLAY	17	20		1.1	
6.600	21.65	18.50	5.40	CLAY	19	21		1.2	
6.750	22.15	19.31	5.36	CLAY	19	22		1.2	
6.900	22.64	21.27	4.93	CLAY	21	24		1.3	
7.050	23.13	17.14	5.15	CLAY	17	19		1.1	
7.200	23.62	14.34	4.16	CLAY	14	16		.9	
7.350	24.11	12.47	2.87	CLAY to SILTY CLAY	8	9		.7	
7.500	24.61	21.24	3.19	CLAYEY SILT to SILTY CLAY	11	12		1.3	
7.650	25.10	25.05	3.70	CLAY to SILTY CLAY	17	18		1.6	
7.800	25.59	24.22	3.97	CLAY to SILTY CLAY	16	18		1.5	
7.950	26.08	24.96	3.69	CLAY to SILTY CLAY	17	18		1.6	
8.100	26.57	25.71	4.10	CLAY to SILTY CLAY	17	18		1.6	
8.250	27.07	25.94	4.06	CLAY to SILTY CLAY	17	18		1.6	
8.400	27.56	24.88	4.60	CLAY	25	26		1.4	
8.550	28.05	26.15	4.05	CLAY to SILTY CLAY	17	18		1.6	
8.700	28.54	26.32	4.02	CLAY to SILTY CLAY	18	18		1.7	
8.850	29.04	28.66	3.61	CLAYEY SILT to SILTY CLAY	14	15		1.8	
9.000	29.53	26.51	3.00	CLAYEY SILT to SILTY CLAY	13	14		1.7	
9.150	30.02	22.50	3.29	CLAYEY SILT to SILTY CLAY	11	12		1.4	
9.300	30.51	22.26	1.96	SANDY SILT to CLAYEY SILT	9	9		1.6	
9.450	31.00	15.23	2.78	CLAYEY SILT to SILTY CLAY	8	8		.9	
9.600	31.50	17.91	3.07	CLAYEY SILT to SILTY CLAY	9	9		1.1	
9.750	31.99	12.11	2.25	CLAYEY SILT to SILTY CLAY	6	6		.8	
9.900	32.48	13.11	2.17	CLAYEY SILT to SILTY CLAY	7	7		.9	
10.050	32.97	14.11	2.21	CLAYEY SILT to SILTY CLAY	7	7		1.0	
10.200	33.46	33.27	2.51	SANDY SILT to CLAYEY SILT	13	13		2.1	
10.350	33.96	29.15	2.02	SANDY SILT to CLAYEY SILT	12	11		2.2	
10.500	34.45	18.74	2.03	CLAYEY SILT to SILTY CLAY	9	9		1.3	
10.650	34.94	21.92	1.80	SANDY SILT to CLAYEY SILT	9	8		1.6	
10.800	35.43	22.35	2.79	CLAYEY SILT to SILTY CLAY	11	11		1.4	
10.950	35.93	17.59	2.63	CLAYEY SILT to SILTY CLAY	9	8		1.0	
11.100	36.42	19.86	2.25	CLAYEY SILT to SILTY CLAY	10	9		1.4	
11.250	36.91	16.72	3.11	CLAYEY SILT to SILTY CLAY	8	8		1.0	
11.400	37.40	16.42	2.96	CLAYEY SILT to SILTY CLAY	8	8		1.0	
11.550	37.89	18.67	2.92	CLAYEY SILT to SILTY CLAY	9	9		1.1	
11.700	38.39	15.06	1.97	CLAYEY SILT to SILTY CLAY	8	7		1.0	
11.850	38.88	16.42	2.48	CLAYEY SILT to SILTY CLAY	8	8		1.0	
12.000	39.37	15.87	2.16	CLAYEY SILT to SILTY CLAY	8	7		1.1	
12.150	39.86	19.63	2.79	CLAYEY SILT to SILTY CLAY	10	9		1.2	
12.300	40.35	26.96	2.51	CLAYEY SILT to SILTY CLAY	13	12		1.6	
12.450	40.85	10.86	2.17	CLAYEY SILT to SILTY CLAY	5	5		.7	
12.600	41.34	13.53	3.41	CLAY to SILTY CLAY	9	8		.8	
12.750	41.83	17.91	3.60	CLAY to SILTY CLAY	12	11		1.0	
12.900	42.32	19.08	3.04	CLAYEY SILT to SILTY CLAY	10	9		1.1	
13.050	42.81	27.62	2.89	CLAYEY SILT to SILTY CLAY	14	12		1.7	
13.200	43.31	38.81	5.26	CLAY	39	35		2.1	
13.350	43.80	77.90	4.10	CLAYEY SILT to SILTY CLAY	39	34		4.4	
13.500	44.29	190.78	1.73	SAND to SILTY SAND	48	42	82		42.5
13.650	44.78	289.55	2.04	SAND to SILTY SAND	72	63	94		44.0

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 110 pcf
ASSUMED DEPTH OF WATER TABLE = 7.5 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

Interpretations based on: Robertson and Campanella, 1989.

SOUNDING : HLA-2

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
13.800	45.28	398.77	1.01	SAND	80	70	100		45.5
13.950	45.77	338.71	.51	GRAVELLY SAND to SAND	56	49	98		44.5
14.100	46.26	378.77	1.25	SAND	76	66	100		45.0
14.250	46.75	342.68	1.61	SAND to SILTY SAND	86	74	98		44.5
14.400	47.24	344.46	2.47	SILTY SAND to SANDY SILT	100	99	98		44.5
14.550	47.74	440.45	.66	GRAVELLY SAND to SAND	73	63	100		46.0
14.700	48.23	169.62	3.02	SANDY SILT to CLAYEY SILT	68	58		9.8	
14.850	48.72	211.45	1.93	SAND to SILTY SAND	53	45	84		42.5
15.000	49.21	233.10	1.67	SAND to SILTY SAND	58	49	86		43.0
15.150	49.70	467.87	.76	GRAVELLY SAND to SAND	78	66	100		46.0
15.300	50.20	494.86	1.51	SAND	99	83	100		46.0
15.450	50.69	389.23	1.43	SAND	78	65	100		45.0

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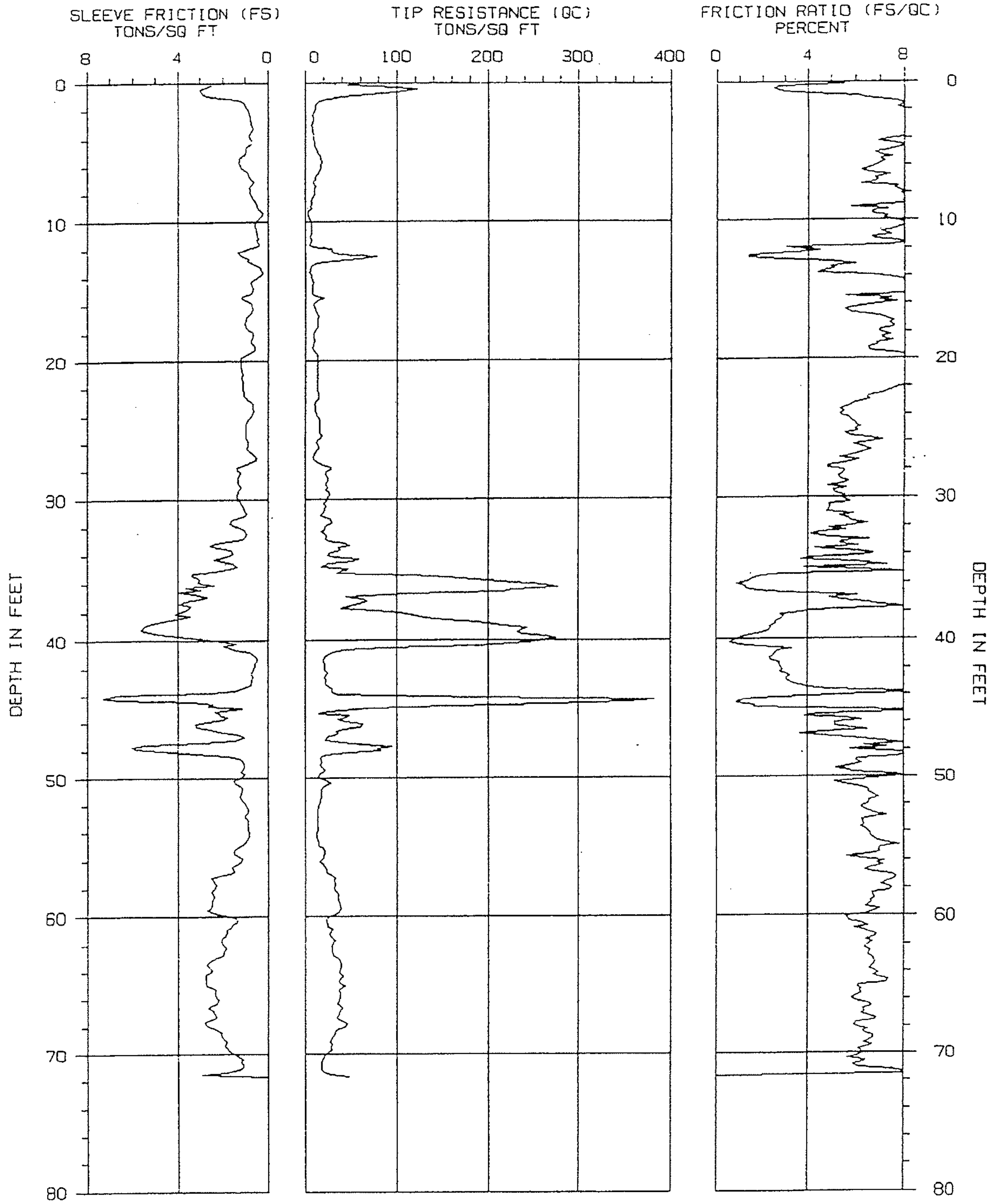
*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 110 pcf
ASSUMED DEPTH OF WATER TABLE = 7.5 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.



TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST

SOUNDING NUMBER: HLA-3

PROJECT NAME : HLA/BISHOP RH 1

CONE/RIG : 491/BH.V0/R#4

PROJECT NUMBER : 50044.1

DATE/TIME: 04-13-00 09:26

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F
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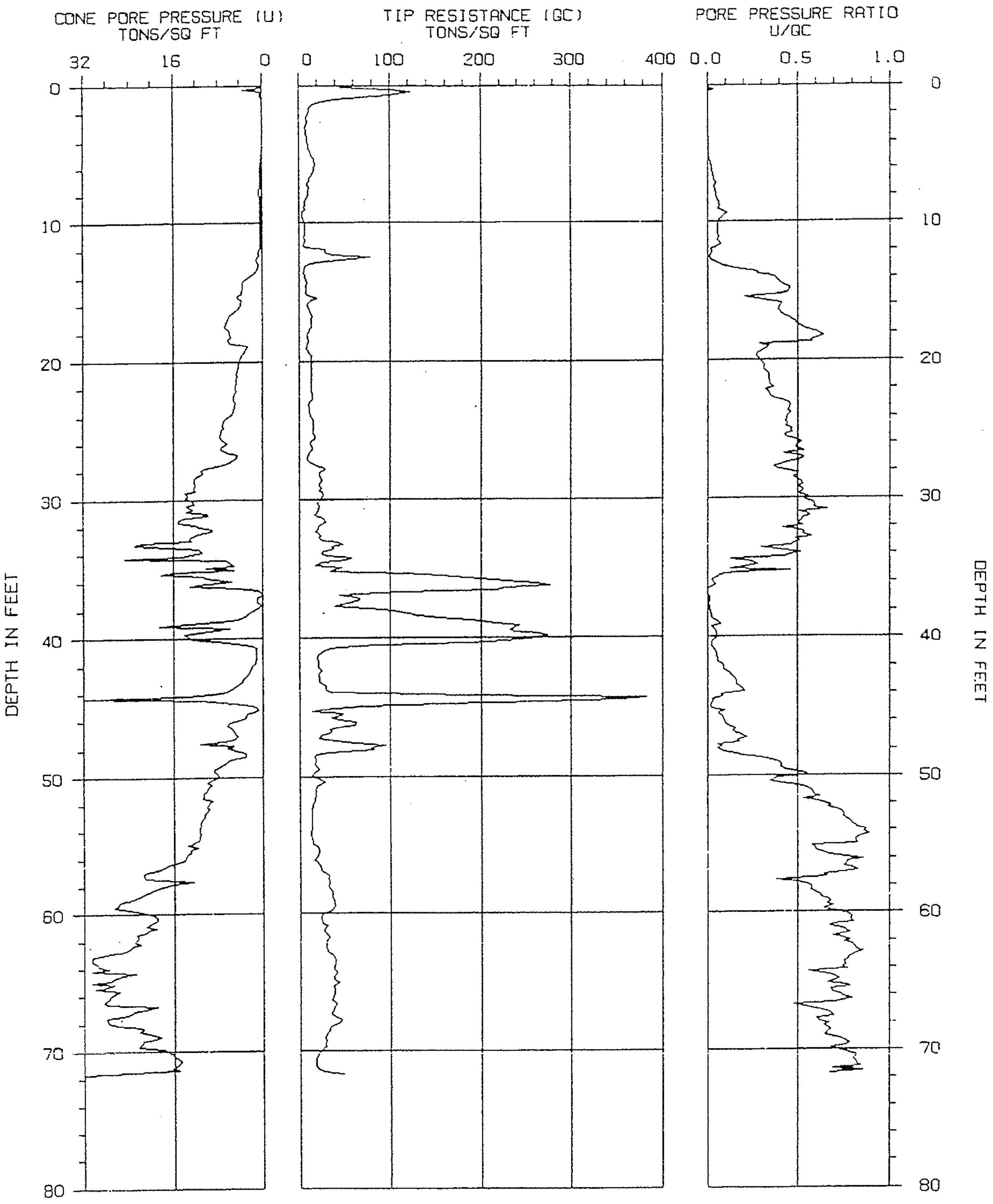


TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST

SOUNDING NUMBER: HLA-3

PROJECT NAME : HLA/BISHOP RH 1

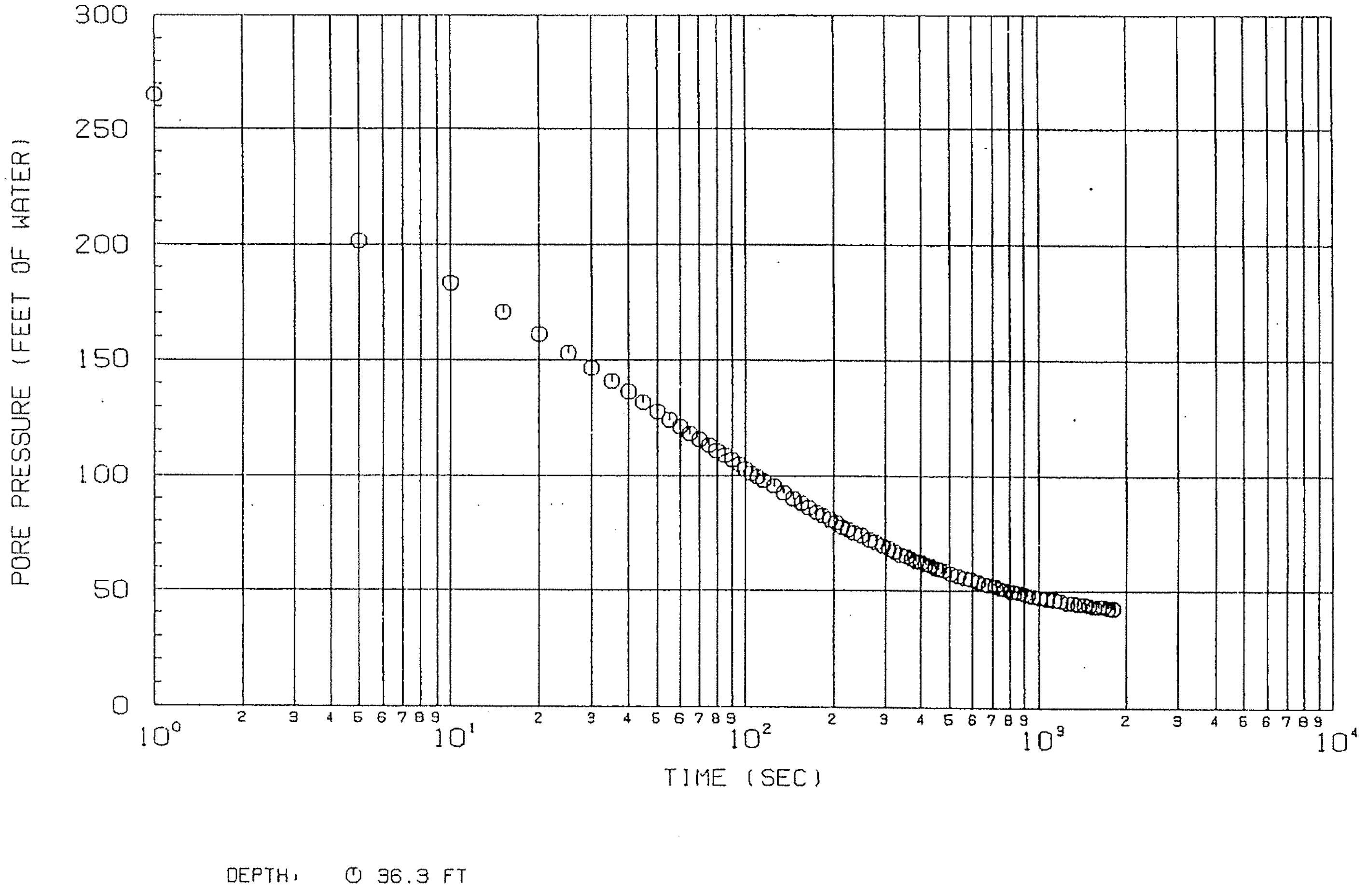
PROJECT NUMBER : 50044.1

CONE/RIG : 491/BH.V0/R□4

DATE/TIME: .04-13-00 09:26

HFA

PORE PRESSURE DISSIPATION CURVES



TIP-SENSING PIEZOMETRIC CPT

SOUNDING NUMBER: HLA-3

PROJECT NAME : HLA/BISHOP RH 1

PROJECT NUMBER : 50044.1

CONE/RIG : 491/BH.V0/R¤4

DATE/TIME: 04-13-00 09:26

H
F
A

CPT INTERPRETATIONS

SOUNDING : HLA-3
PROJECT : HLA/BISHOP RH 1
DATE/TIME: 04-13-00 09:26

PROJECT No.: 50044.1
CONE/RIG : 491/BH,VO/R#4

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
.150	.49	122.22	2.48	SILTY SAND to SANDY SILT	41	65	82		
.300	.98	40.17	6.15	CLAY	40	64		2.4	
.450	1.48	13.62	7.86	CLAY	14	22		.9	
.600	1.97	10.64	8.27	CLAY	11	17		.7	
.750	2.46	9.24	8.48	CLAY	9	15		.6	
.900	2.95	7.48	9.83	CLAY	7	12		.5	
1.050	3.44	8.52	8.29	CLAY	9	14		.6	
1.200	3.94	9.82	8.01	CLAY	10	16		.6	
1.350	4.43	10.56	7.54	CLAY	11	17		.7	
1.500	4.92	13.34	7.33	CLAY	13	21		.9	
1.650	5.41	17.36	7.52	CLAY	17	28		1.1	
1.800	5.91	17.59	6.94	CLAY	18	28		1.2	
1.950	6.40	14.89	6.24	CLAY	15	24		1.0	
2.100	6.89	11.17	6.79	CLAY	11	18		.7	
2.250	7.38	11.92	6.24	CLAY	12	19		.8	
2.400	7.87	10.13	7.97	CLAY	10	16		.6	
2.550	8.37	7.54	8.27	CLAY	8	11		.5	
2.700	8.86	5.99	8.31	CLAY	6	9		.4	
2.850	9.35	3.36	6.65	ORGANIC MATERIAL	3	5		.3	
3.000	9.84	6.08	7.13	CLAY	6	9		.4	
3.150	10.33	6.56	8.59	CLAY	7	9		.4	
3.300	10.83	7.03	7.08	CLAY	7	10		.4	
3.450	11.32	6.88	6.79	CLAY	7	10		.4	
3.600	11.81	7.84	7.52	CLAY	8	11		.5	
3.750	12.30	36.73	3.38	CLAYEY SILT to SILTY CLAY	18	25		2.4	
3.900	12.80	31.27	2.88	CLAYEY SILT to SILTY CLAY	16	21		2.0	
4.050	13.29	6.42	4.94	CLAY	6	9		.4	
4.200	13.78	6.84	4.40	CLAY	7	9		.4	
4.350	14.27	8.82	8.45	CLAY	9	12		.5	
4.500	14.76	7.73	8.51	CLAY	8	10		.5	
4.650	15.26	12.02	9.11	CLAY	12	16		.7	
4.800	15.75	11.43	6.93	CLAY	11	15		.7	
4.950	16.24	11.28	5.87	CLAY	11	14		.7	
5.100	16.73	14.36	6.21	CLAY	14	18		.9	
5.250	17.22	13.45	7.57	CLAY	13	17		.8	
5.400	17.72	11.54	7.56	CLAY	12	14		.7	
5.550	18.21	8.80	7.41	CLAY	9	11		.5	
5.700	18.70	9.88	7.49	CLAY	10	12		.6	
5.850	19.19	9.20	6.49	CLAY	9	11		.5	
6.000	19.69	14.21	8.09	CLAY	14	17		.9	
6.150	20.18	13.79	8.80	CLAY	14	16		.8	

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*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 110 pcf
ASSUMED DEPTH OF WATER TABLE = 7.5 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

Interpretations based on: Robertson and Campanella, 1989.

SOUNDING : HLA-3

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
6.300	20.67	14.19	8.11	CLAY	14	17		.9	
6.450	21.16	13.45	8.42	CLAY	13	16		.8	
6.600	21.65	13.83	8.03	CLAY	14	16		.8	
6.750	22.15	14.30	7.59	CLAY	14	16		.9	
6.900	22.64	14.70	6.54	CLAY	15	17		.9	
7.050	23.13	10.83	6.18	CLAY	11	12		.6	
7.200	23.62	12.00	5.32	CLAY	12	13		.7	
7.350	24.11	14.83	5.39	CLAY	15	16		.9	
7.500	24.61	16.29	5.94	CLAY	16	18		1.0	
7.650	25.10	16.02	5.97	CLAY	16	18		1.0	
7.800	25.59	17.19	5.73	CLAY	17	19		1.1	
7.950	26.08	13.38	6.56	CLAY	13	14		.8	
8.100	26.57	11.83	6.60	CLAY	12	13		.7	
8.250	27.07	9.07	5.77	CLAY	9	10		.5	
8.400	27.56	20.16	5.53	CLAY	20	21		1.1	
8.550	28.05	22.88	5.49	CLAY	23	24		1.3	
8.700	28.54	25.37	5.28	CLAY	25	27		1.4	
8.850	29.04	23.07	5.46	CLAY	23	24		1.3	
9.000	29.53	26.28	5.08	CLAY	26	27		1.5	
9.150	30.02	24.47	5.40	CLAY	24	25		1.3	
9.300	30.51	22.97	4.91	CLAY	23	23		1.3	
9.450	31.00	19.33	4.79	CLAY	19	20		1.2	
9.600	31.50	28.47	5.68	CLAY	28	29		1.6	
9.750	31.99	21.29	5.86	CLAY	21	21		1.1	
9.900	32.48	20.97	4.53	CLAY	21	21		1.3	
10.050	32.97	26.34	6.58	CLAY	26	26		1.4	
10.200	33.46	36.35	6.14	CLAY	36	36		2.0	
10.350	33.96	24.58	6.76	CLAY	25	24		1.3	
10.500	34.45	53.75	3.70	CLAYEY SILT to SILTY CLAY	27	26		3.1	
10.650	34.94	47.12	3.81	CLAYEY SILT to SILTY CLAY	24	23		2.7	
10.800	35.43	117.19	2.88	SANDY SILT to CLAYEY SILT	47	45		6.8	
10.950	35.93	228.06	1.36	SAND to SILTY SAND	57	55	89		44.0
11.100	36.42	226.68	1.32	SAND to SILTY SAND	57	54	89		44.0
11.250	36.91	44.49	6.09	CLAY	44	42		2.5	
11.400	37.40	59.57	6.53	CLAY	60	56		3.4	
11.550	37.89	93.75	4.11	CLAYEY SILT to SILTY CLAY	47	44		5.4	
11.700	38.39	131.34	2.92	SANDY SILT to CLAYEY SILT	53	49		7.6	
11.850	38.88	216.78	2.52	SILTY SAND to SANDY SILT	72	67	87		43.5
12.000	39.37	231.91	2.26	SILTY SAND to SANDY SILT	77	71	89		43.5
12.150	39.86	273.82	1.14	SAND	55	50	93		44.5
12.300	40.35	187.83	1.05	SAND	38	34	82		42.5
12.450	40.85	30.04	2.68	CLAYEY SILT to SILTY CLAY	15	14		1.9	
12.600	41.34	20.76	2.32	CLAYEY SILT to SILTY CLAY	10	9		1.2	
12.750	41.83	21.31	2.75	CLAYEY SILT to SILTY CLAY	11	10		1.3	
12.900	42.32	25.03	2.75	CLAYEY SILT to SILTY CLAY	13	11		1.5	
13.050	42.81	22.43	3.09	CLAYEY SILT to SILTY CLAY	11	10		1.3	
13.200	43.31	25.83	3.64	CLAYEY SILT to SILTY CLAY	13	11		1.6	
13.350	43.80	30.66	8.39	CLAY	31	27		1.7	
13.500	44.29	383.11	1.71	SAND to SILTY SAND	96	84	100		45.5
13.650	44.78	157.57	1.69	SAND to SILTY SAND	39	35	76		41.5

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*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 110 pcf
ASSUMED DEPTH OF WATER TABLE = 7.5 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
13.800	45.28	15.28	13.92	CLAY	15	13		.9	
13.950	45.77	35.48	5.61	CLAY	35	31		1.9	
14.100	46.26	60.99	5.14	CLAY to SILTY CLAY	41	35		3.4	
14.250	46.75	35.39	4.67	CLAY to SILTY CLAY	24	20		1.9	
14.400	47.24	23.11	6.31	CLAY	23	20		1.2	
14.550	47.74	94.31	6.37	*VERY STIFF FINE GRAINED	94	81			
14.700	48.23	32.91	9.74	CLAY	33	28		1.8	
14.850	48.72	18.70	6.08	CLAY	19	16		.9	
15.000	49.21	18.23	5.93	CLAY	18	15		1.0	
15.150	49.70	17.06	5.86	CLAY	17	14		1.0	
15.300	50.20	22.97	6.65	CLAY	23	19		1.2	
15.450	50.69	19.01	6.02	CLAY	19	16		1.0	
15.600	51.18	18.21	6.54	CLAY	18	15		1.0	
15.750	51.67	17.00	6.55	CLAY	17	14		.9	
15.900	52.17	14.64	6.27	CLAY	15	12		.8	
16.050	52.66	14.17	6.78	CLAY	14	12		.8	
16.200	53.15	14.26	6.26	CLAY	14	12		.8	
16.350	53.64	13.94	6.23	CLAY	14	11		.7	
16.500	54.13	13.04	6.61	CLAY	13	11		.7	
16.650	54.63	14.34	6.93	CLAY	14	12		.8	
16.800	55.12	20.16	7.07	CLAY	20	16		1.1	
16.950	55.61	20.88	6.60	CLAY	21	17		1.0	
17.100	56.10	16.51	7.22	CLAY	17	13		.9	
17.250	56.59	23.65	6.53	CLAY	24	19		1.2	
17.400	57.09	28.70	7.55	CLAY	29	23		1.5	
17.550	57.58	32.53	7.25	CLAY	33	26		1.7	
17.700	58.07	32.48	7.52	CLAY	32	26		1.7	
17.850	58.56	35.54	6.74	CLAY	36	28		1.9	
18.000	59.06	37.60	6.65	CLAY	38	29		2.0	
18.150	59.55	38.16	7.03	CLAY	38	30		2.1	
18.300	60.04	25.92	5.58	CLAY	26	20		1.3	
18.450	60.53	24.39	6.28	CLAY	24	19		1.2	
18.600	61.02	28.45	6.33	CLAY	28	22		1.5	
18.750	61.52	28.98	6.86	CLAY	29	22		1.5	
18.900	62.01	29.36	6.58	CLAY	29	22		1.5	
19.050	62.50	29.23	6.62	CLAY	29	22		1.5	
19.200	62.99	35.37	6.75	CLAY	35	27		1.9	
19.350	63.48	39.52	6.81	CLAY	40	30		2.1	
19.500	63.98	37.11	6.85	CLAY	37	28		2.0	
19.650	64.47	39.30	6.99	CLAY	39	30		2.1	
19.800	64.96	43.57	6.17	CLAY	44	33		2.4	
19.950	65.45	37.94	6.19	CLAY	38	28		2.0	
20.100	65.94	37.09	5.88	CLAY	37	28		2.0	
20.250	66.44	38.03	6.65	CLAY	38	28		2.0	
20.400	66.93	37.56	6.40	CLAY	38	28		2.0	
20.550	67.42	36.22	6.87	CLAY	36	27		1.9	
20.700	67.91	44.64	5.94	CLAY	45	33		2.4	
20.850	68.41	32.48	6.31	CLAY	32	24		1.7	
21.000	68.90	28.21	6.74	CLAY	28	21		1.4	
21.150	69.39	28.36	6.72	CLAY	28	21		1.4	

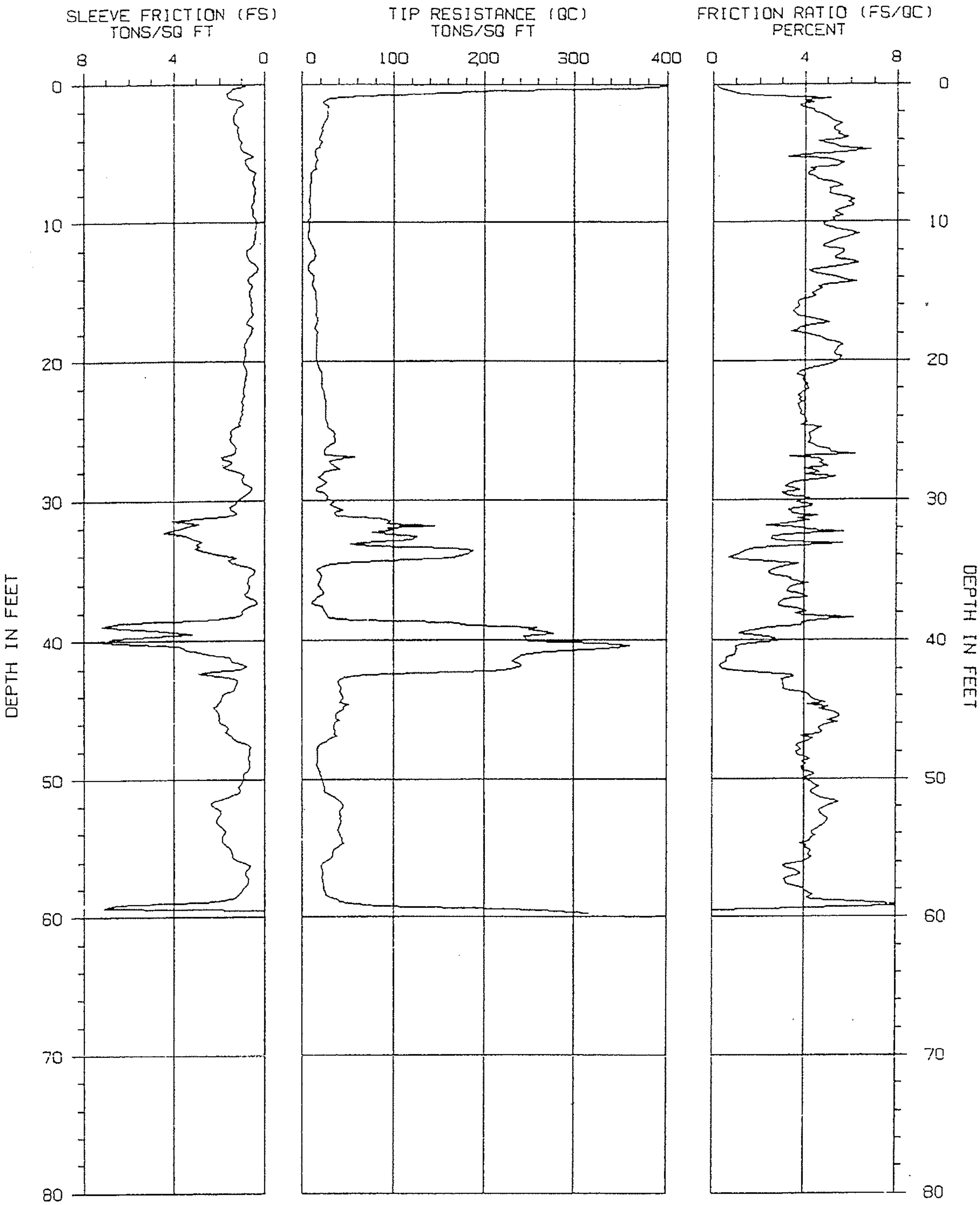
*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 110 pcf
ASSUMED DEPTH OF WATER TABLE = 7.5 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : HLA-3

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
21.300	69.88	26.26	6.27	CLAY	26	19		1.3	
21.450	70.37	19.38	5.69	CLAY	19	14		.9	
21.600	70.87	18.31	5.90	CLAY	18	13		1.0	
21.750	71.36	21.63	8.53	CLAY	22	16		1.2	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 110 pcf
ASSUMED DEPTH OF WATER TABLE = 7.5 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

Interpretations based on: Robertson and Campanella, 1989.



TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST SOUNDING NUMBER: HLA-4

PROJECT NAME : HLA/BISHOP RH 1 CONE/RIG :. 491/BH.VO/R#4

PROJECT NUMBER : 50044.1 DATE/TIME: 04-12-00 17:19

HFA

CPT INTERPRETATIONS

SOUNDING : HLA-4
PROJECT : HLA/BISHOP RH 1
DATE/TIME: 04-12-00 17:19

PROJECT No.: 50044.1
CONE/RIG : 491/BH,VO/R#4

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
.150	.49	218.69	.68	SAND	44	70	99		
.300	.98	30.72	5.12	CLAY	31	49		1.8	
.450	1.48	25.15	3.78	CLAY to SILTY CLAY	17	27		1.7	
.600	1.97	28.47	4.40	CLAY to SILTY CLAY	19	30		1.7	
.750	2.46	27.34	5.09	CLAY	27	44		1.6	
.900	2.95	22.43	5.41	CLAY	22	36		1.3	
1.050	3.44	21.75	5.51	CLAY	22	35		1.3	
1.200	3.94	19.74	5.56	CLAY	20	32		1.1	
1.350	4.43	19.82	5.38	CLAY	20	32		1.2	
1.500	4.92	14.34	5.63	CLAY	14	23		.9	
1.650	5.41	16.76	5.01	CLAY	17	27		1.1	
1.800	5.91	14.32	5.39	CLAY	14	23		.9	
1.950	6.40	9.92	4.13	CLAY	10	16		.6	
2.100	6.89	10.62	4.59	CLAY	11	17		.7	
2.250	7.38	8.77	5.64	CLAY	9	14		.6	
2.400	7.87	9.09	5.07	CLAY	9	14		.6	
2.550	8.37	7.90	6.13	CLAY	8	12		.5	
2.700	8.86	9.16	6.11	CLAY	9	13		.6	
2.850	9.35	9.56	5.46	CLAY	10	14		.6	
3.000	9.84	7.58	5.30	CLAY	8	11		.5	
3.150	10.33	7.99	5.14	CLAY	8	11		.5	
3.300	10.83	6.95	6.34	CLAY	7	10		.4	
3.450	11.32	9.07	5.31	CLAY	9	12		.6	
3.600	11.81	12.79	4.79	CLAY	13	17		.8	
3.750	12.30	14.55	5.49	CLAY	15	20		.9	
3.900	12.80	10.35	6.03	CLAY	10	14		.6	
4.050	13.29	6.69	4.80	CLAY	7	9		.4	
4.200	13.78	12.47	4.79	CLAY	12	16		.8	
4.350	14.27	11.11	6.22	CLAY	11	14		.7	
4.500	14.76	13.21	4.76	CLAY	13	17		.8	
4.650	15.26	15.00	4.49	CLAY	15	19		.9	
4.800	15.75	16.10	3.69	CLAY to SILTY CLAY	11	13		1.0	
4.950	16.24	16.10	3.55	CLAY to SILTY CLAY	11	13		1.0	
5.100	16.73	15.72	3.65	CLAY to SILTY CLAY	10	13		1.0	
5.250	17.22	15.66	5.07	CLAY	16	19		1.0	
5.400	17.72	15.08	3.76	CLAY to SILTY CLAY	10	12		.9	
5.550	18.21	15.93	4.56	CLAY	16	19		1.0	
5.700	18.70	16.15	5.49	CLAY	16	19		1.0	
5.850	19.19	15.78	5.44	CLAY	16	19		1.0	
6.000	19.69	15.70	5.60	CLAY	16	18		1.0	
6.150	20.18	17.38	5.32	CLAY	17	20		1.1	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 110 pcf
ASSUMED DEPTH OF WATER TABLE = 8.3 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

Interpretations based on: Robertson and Campanella, 1989.

SOUNDING : HLA-4

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
6.300	20.67	20.88	3.87	CLAY to SILTY CLAY	14	16		1.3	
6.450	21.16	21.27	3.95	CLAY to SILTY CLAY	14	16		1.3	
6.600	21.65	21.37	4.16	CLAY to SILTY CLAY	14	16		1.3	
6.750	22.15	23.39	4.01	CLAY to SILTY CLAY	16	18		1.5	
6.900	22.64	25.15	3.88	CLAY to SILTY CLAY	17	19		1.6	
7.050	23.13	25.75	3.68	CLAY to SILTY CLAY	17	19		1.6	
7.200	23.62	25.85	3.87	CLAY to SILTY CLAY	17	19		1.6	
7.350	24.11	26.07	4.00	CLAY to SILTY CLAY	17	19		1.6	
7.500	24.61	27.96	3.83	CLAY to SILTY CLAY	19	20		1.8	
7.650	25.10	34.74	4.36	CLAY to SILTY CLAY	23	25		2.0	
7.800	25.59	36.16	4.26	CLAY to SILTY CLAY	24	26		2.0	
7.950	26.08	29.87	4.45	CLAY to SILTY CLAY	20	21		1.7	
8.100	26.57	24.88	5.15	CLAY	25	26		1.4	
8.250	27.07	40.24	4.61	CLAY to SILTY CLAY	27	28		2.3	
8.400	27.56	35.76	5.03	CLAY	36	37		2.0	
8.550	28.05	22.54	4.61	CLAY	23	23		1.4	
8.700	28.54	20.69	4.84	CLAY	21	21		1.3	
8.850	29.04	18.59	3.17	CLAYEY SILT to SILTY CLAY	9	10		1.1	
9.000	29.53	24.69	3.05	CLAYEY SILT to SILTY CLAY	12	13		1.5	
9.150	30.02	30.74	3.92	CLAY to SILTY CLAY	20	21		1.9	
9.300	30.51	35.73	4.30	CLAY to SILTY CLAY	24	24		2.0	
9.450	31.00	36.03	3.46	CLAYEY SILT to SILTY CLAY	18	18		2.3	
9.600	31.50	96.56	4.21	CLAYEY SILT to SILTY CLAY	48	48		5.6	
9.750	31.99	93.12	3.89	CLAYEY SILT to SILTY CLAY	47	46		5.4	
9.900	32.48	96.15	3.84	CLAYEY SILT to SILTY CLAY	48	47		5.6	
10.050	32.97	82.30	3.35	SANDY SILT to CLAYEY SILT	33	32		4.7	
10.200	33.46	166.60	1.85	SILTY SAND to SANDY SILT	56	54	81		42.5
10.350	33.96	175.93	1.00	SAND	35	34	82		43.0
10.500	34.45	60.00	2.50	SANDY SILT to CLAYEY SILT	24	23		3.9	
10.650	34.94	17.00	2.67	CLAYEY SILT to SILTY CLAY	9	8		1.0	
10.800	35.43	21.48	2.80	CLAYEY SILT to SILTY CLAY	11	10		1.3	
10.950	35.93	18.25	4.19	CLAY	18	17		1.1	
11.100	36.42	21.41	3.30	CLAYEY SILT to SILTY CLAY	11	10		1.3	
11.250	36.91	16.93	4.14	CLAY	17	16		1.0	
11.400	37.40	11.81	2.84	CLAY to SILTY CLAY	8	7		.7	
11.550	37.89	24.56	4.08	CLAY to SILTY CLAY	16	15		1.5	
11.700	38.39	29.70	6.13	CLAY	30	27		1.6	
11.850	38.88	184.24	3.89	*SAND to CLAYEY SAND	92	85			
12.000	39.37	269.75	1.47	SAND to SILTY SAND	67	62	93		44.0
12.150	39.86	246.55	2.72	SILTY SAND to SANDY SILT	82	75	90		44.0
12.300	40.35	360.61	1.04	SAND	72	65	100		45.5
12.450	40.85	270.11	1.06	SAND	54	49	92		44.0
12.600	41.34	234.99	.63	SAND	47	42	88		43.5
12.750	41.83	241.98	.33	SAND	48	43	89		43.5
12.900	42.32	128.25	2.27	SILTY SAND to SANDY SILT	43	38	71		40.0
13.050	42.81	41.07	2.97	CLAYEY SILT to SILTY CLAY	21	18		2.6	
13.200	43.31	42.13	3.10	CLAYEY SILT to SILTY CLAY	21	19		2.6	
13.350	43.80	42.98	4.07	CLAYEY SILT to SILTY CLAY	21	19		2.4	
13.500	44.29	42.85	4.54	CLAY to SILTY CLAY	29	25		2.4	
13.650	44.78	44.83	5.05	CLAY	45	39		2.5	

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*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 110 pcf
ASSUMED DEPTH OF WATER TABLE = 8.3 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

Interpretations based on: Robertson and Campanella, 1989.

SOUNDING : HLA-4

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
13.800	45.28	37.48	5.47	CLAY	37	32		2.1	
13.950	45.77	40.51	5.03	CLAY	41	35		2.2	
14.100	46.26	34.67	4.61	CLAY to SILTY CLAY	23	20		1.9	
14.250	46.75	34.31	4.67	CLAY to SILTY CLAY	23	20		1.9	
14.400	47.24	26.62	4.12	CLAY to SILTY CLAY	18	15		1.6	
14.550	47.74	16.70	3.80	CLAY to SILTY CLAY	11	9		.9	
14.700	48.23	17.46	3.73	CLAY to SILTY CLAY	12	10		1.0	
14.850	48.72	17.48	3.92	CLAY to SILTY CLAY	12	10		1.0	
15.000	49.21	17.23	3.85	CLAY to SILTY CLAY	11	10		1.0	
15.150	49.70	20.88	4.45	CLAY	21	17		1.2	
15.300	50.20	22.56	4.32	CLAY to SILTY CLAY	15	12		1.3	
15.450	50.69	24.28	4.53	CLAY	24	20		1.3	
15.600	51.18	31.76	4.45	CLAY to SILTY CLAY	21	17		1.7	
15.750	51.67	42.45	5.49	CLAY	42	35		2.3	
15.900	52.17	44.00	4.78	CLAY to SILTY CLAY	29	24		2.4	
16.050	52.66	42.09	4.87	CLAY to SILTY CLAY	28	23		2.3	
16.200	53.15	42.81	4.99	CLAY	43	35		2.3	
16.350	53.64	39.05	4.59	CLAY to SILTY CLAY	26	21		2.1	
16.500	54.13	41.47	4.53	CLAY to SILTY CLAY	28	22		2.3	
16.650	54.63	45.93	3.85	CLAYEY SILT to SILTY CLAY	23	18		2.5	
16.800	55.12	35.10	4.23	CLAY to SILTY CLAY	23	19		1.9	
16.950	55.61	32.38	4.36	CLAY to SILTY CLAY	22	17		1.7	
17.100	56.10	22.73	3.57	CLAY to SILTY CLAY	15	12		1.3	
17.250	56.59	22.39	3.65	CLAY to SILTY CLAY	15	12		1.3	
17.400	57.09	21.69	3.40	CLAYEY SILT to SILTY CLAY	11	9		1.2	
17.550	57.58	23.67	3.27	CLAYEY SILT to SILTY CLAY	12	9		1.4	
17.700	58.07	24.96	3.99	CLAY to SILTY CLAY	17	13		1.5	
17.850	58.56	31.14	4.15	CLAY to SILTY CLAY	21	16		1.6	
18.000	59.06	59.17	9.80	CLAY	59	46		3.3	
18.150	59.55	262.82	*****		0	0			.0

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*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL

ASSUMED TOTAL UNIT WT = 110 pcf

ASSUMED DEPTH OF WATER TABLE = 8.3 ft

N(60) = EQUIVALENT SPT VALUE (60% Energy)

N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)

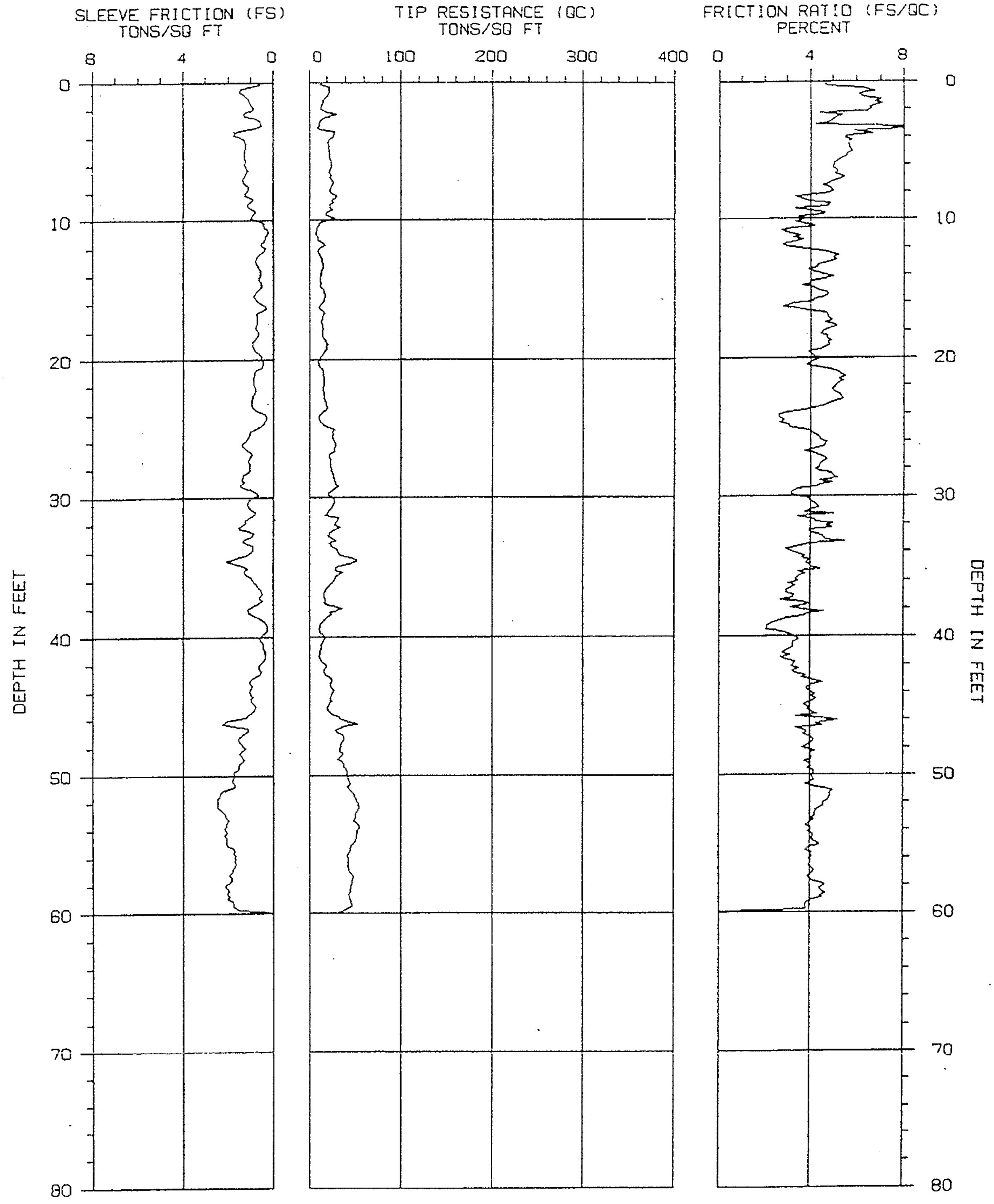
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY

Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH

PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.



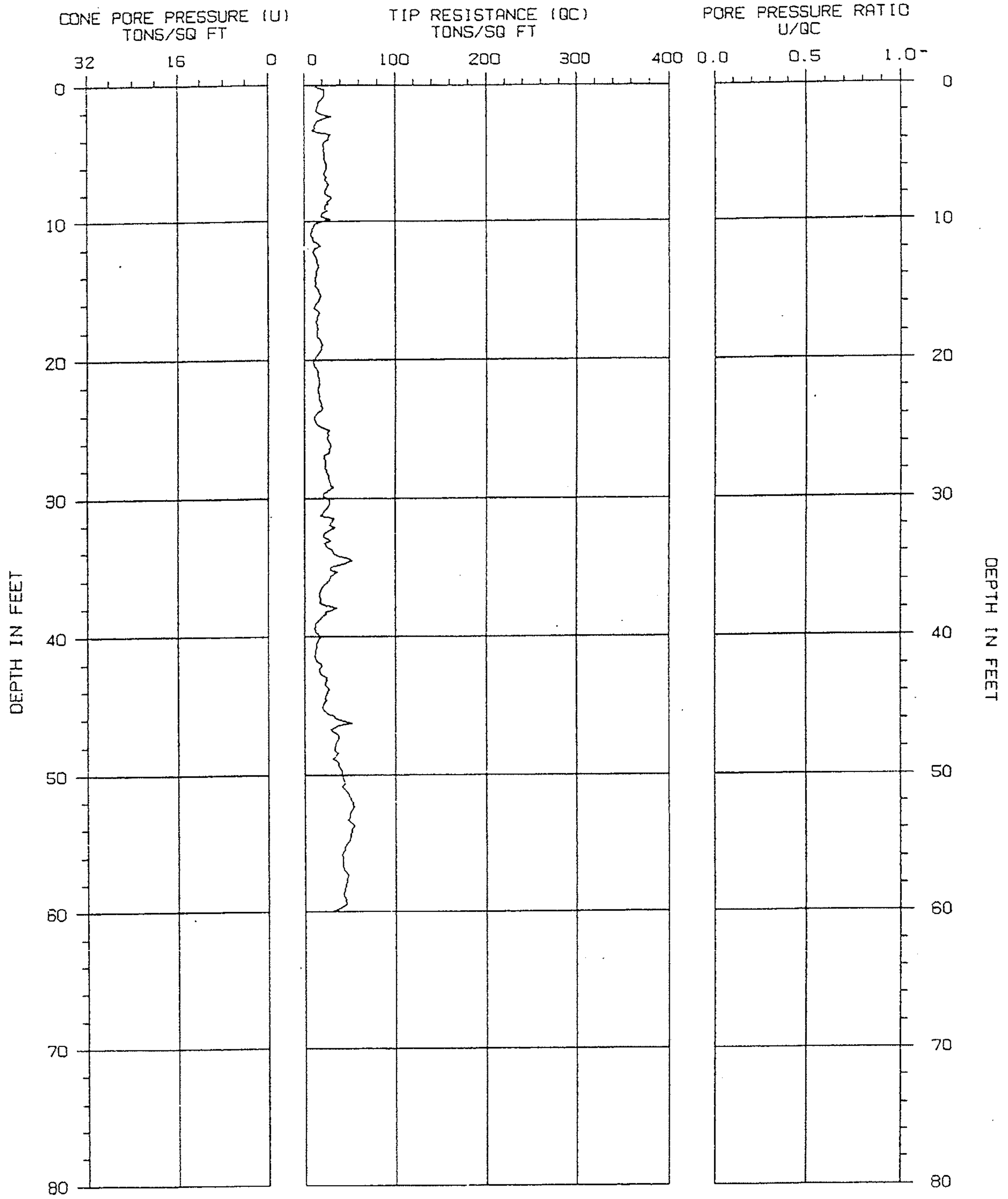
TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST

SOUNDING NUMBER: HLA-5

PROJECT NAME : HLA/BISHOP RH 1	CONE/RIG : 491/BH.VO/R#4
PROJECT NUMBER : 50044.1	DATE/TIME: 04-13-90 13:56

HFA



TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST

SOUNDING NUMBER: HLA-5

PROJECT NAME : HLA/BISHOP RH 1

PROJECT NUMBER : 50044.1

CONE/RIG : 491/BH.V0/R#4

DATE/TIME: 04-13-90 13:56

HFA

CPT INTERPRETATIONS

SOUNDING : HLA-5
PROJECT : HLA/BISHOP RH 1
DATE/TIME: 04-13-90 13:56

PROJECT No.: 50044.1
CONE/RIG : 491/BH,VO/R#4

PAGE 1 of 3

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
.150	.49	22.99	6.27	CLAY	23	37		1.4	
.300	.98	20.48	6.13	CLAY	20	33		1.2	
.450	1.48	15.47	6.76	CLAY	15	25		1.0	
.600	1.97	14.43	6.60	CLAY	14	23		1.0	
.750	2.46	23.11	5.40	CLAY	23	37		1.4	
.900	2.95	11.66	4.76	CLAY	12	19		.8	
1.050	3.44	15.30	8.44	CLAY	15	24		1.0	
1.200	3.94	26.94	5.55	CLAY	27	43		1.6	
1.350	4.43	22.03	5.60	CLAY	22	35		1.3	
1.500	4.92	22.20	5.74	CLAY	22	36		1.3	
1.650	5.41	23.11	5.56	CLAY	23	37		1.3	
1.800	5.91	25.30	5.05	CLAY	25	40		1.5	
1.950	6.40	22.99	5.10	CLAY	23	37		1.3	
2.100	6.89	23.92	5.48	CLAY	24	38		1.4	
2.250	7.38	25.39	4.80	CLAY	25	40		1.5	
2.400	7.87	23.71	5.00	CLAY	24	36		1.4	
2.550	8.37	29.40	3.34	CLAYEY SILT to SILTY CLAY	15	22		1.9	
2.700	8.86	24.03	4.83	CLAY	24	35		1.4	
2.850	9.35	20.01	4.03	CLAY to SILTY CLAY	13	19		1.3	
3.000	9.84	28.83	3.48	CLAYEY SILT to SILTY CLAY	14	20		1.9	
3.150	10.33	11.24	3.87	CLAY	11	16		.7	
3.300	10.83	8.54	2.75	CLAY to SILTY CLAY	6	8		.6	
3.450	11.32	10.37	3.25	CLAY to SILTY CLAY	7	9		.6	
3.600	11.81	18.57	2.82	CLAYEY SILT to SILTY CLAY	9	12		1.2	
3.750	12.30	11.51	4.60	CLAY	12	15		.7	
3.900	12.80	15.00	4.98	CLAY	15	20		1.0	
4.050	13.29	15.68	4.30	CLAY	16	20		1.0	
4.200	13.78	13.60	4.12	CLAY	14	18		.9	
4.350	14.27	13.13	4.60	CLAY	13	17		.8	
4.500	14.76	14.28	3.67	CLAY to SILTY CLAY	10	12		.9	
4.650	15.26	17.97	4.72	CLAY	18	23		1.1	
4.800	15.75	16.87	4.17	CLAY	17	21		1.1	
4.950	16.24	11.51	2.82	CLAY to SILTY CLAY	8	9		.7	
5.100	16.73	15.61	4.68	CLAY	16	19		1.0	
5.250	17.22	14.28	4.92	CLAY	14	17		.9	
5.400	17.72	15.49	5.10	CLAY	15	19		1.0	
5.550	18.21	14.47	4.45	CLAY	14	17		.9	
5.700	18.70	19.25	4.88	CLAY	19	23		1.2	
5.850	19.19	18.74	4.70	CLAY	19	22		1.2	
6.000	19.69	14.32	4.06	CLAY	14	17		.9	
6.150	20.18	10.88	4.23	CLAY	11	13		.7	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 110 pcf
ASSUMED DEPTH OF WATER TABLE = 8.8 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

Interpretations based on: Robertson and Campanella, 1989.

SOUNDING : HLA-5

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
6.300	20.67	15.11	4.46	CLAY	15	17		.9	
6.450	21.16	16.29	5.30	CLAY	16	18		1.0	
6.600	21.65	16.55	5.41	CLAY	17	19		1.0	
6.750	22.15	15.83	5.07	CLAY	16	18		1.0	
6.900	22.64	17.29	5.29	CLAY	17	19		1.1	
7.050	23.13	18.89	5.10	CLAY	19	21		1.2	
7.200	23.62	19.67	4.11	CLAY to SILTY CLAY	13	14		1.2	
7.350	24.11	11.71	2.64	CLAY to SILTY CLAY	8	8		.8	
7.500	24.61	14.74	2.65	CLAYEY SILT to SILTY CLAY	7	8		.9	
7.650	25.10	27.75	3.23	CLAYEY SILT to SILTY CLAY	14	15		1.8	
7.800	25.59	25.83	4.32	CLAY to SILTY CLAY	17	18		1.4	
7.950	26.08	29.64	4.71	CLAY	30	31		1.7	
8.100	26.57	28.53	4.11	CLAY to SILTY CLAY	19	20		1.6	
8.250	27.07	22.84	4.40	CLAY	23	24		1.4	
8.400	27.56	24.11	4.48	CLAY	24	25		1.5	
8.550	28.05	24.96	4.23	CLAY to SILTY CLAY	17	17		1.6	
8.700	28.54	27.13	4.97	CLAY	27	28		1.5	
8.850	29.04	29.66	4.92	CLAY	30	30		1.7	
9.000	29.53	26.49	3.43	CLAYEY SILT to SILTY CLAY	13	13		1.7	
9.150	30.02	26.64	3.47	CLAYEY SILT to SILTY CLAY	13	13		1.7	
9.300	30.51	27.26	4.17	CLAY to SILTY CLAY	18	18		1.5	
9.450	31.00	21.54	3.96	CLAY to SILTY CLAY	14	14		1.3	
9.600	31.50	32.14	3.44	CLAYEY SILT to SILTY CLAY	16	16		2.0	
9.750	31.99	27.62	4.99	CLAY	28	27		1.5	
9.900	32.48	26.24	3.98	CLAY to SILTY CLAY	17	17		1.6	
10.050	32.97	27.07	4.57	CLAY	27	26		1.5	
10.200	33.46	25.09	3.97	CLAY to SILTY CLAY	17	16		1.5	
10.350	33.96	32.57	3.15	CLAYEY SILT to SILTY CLAY	16	16		2.0	
10.500	34.45	48.97	3.64	CLAYEY SILT to SILTY CLAY	24	23		2.8	
10.650	34.94	33.57	3.96	CLAY to SILTY CLAY	22	21		1.9	
10.800	35.43	36.92	3.48	CLAYEY SILT to SILTY CLAY	18	17		2.3	
10.950	35.93	27.62	3.33	CLAYEY SILT to SILTY CLAY	14	13		1.7	
11.100	36.42	21.20	3.33	CLAYEY SILT to SILTY CLAY	11	10		1.3	
11.250	36.91	17.00	2.97	CLAYEY SILT to SILTY CLAY	9	8		1.0	
11.400	37.40	18.08	2.74	CLAYEY SILT to SILTY CLAY	9	8		1.1	
11.550	37.89	35.59	3.16	CLAYEY SILT to SILTY CLAY	18	16		2.2	
11.700	38.39	25.13	3.88	CLAY to SILTY CLAY	17	15		1.5	
11.850	38.88	14.64	2.55	CLAYEY SILT to SILTY CLAY	7	7		.8	
12.000	39.37	11.96	2.13	CLAYEY SILT to SILTY CLAY	6	5		.8	
12.150	39.86	16.36	3.10	CLAY to SILTY CLAY	11	10		.9	
12.300	40.35	14.89	3.29	CLAY to SILTY CLAY	10	9		.8	
12.450	40.85	13.28	3.23	CLAY to SILTY CLAY	9	8		.7	
12.600	41.34	11.96	3.11	CLAY to SILTY CLAY	8	7		.6	
12.750	41.83	14.74	3.33	CLAY to SILTY CLAY	10	9		.8	
12.900	42.32	17.53	3.51	CLAY to SILTY CLAY	12	10		1.0	
13.050	42.81	19.35	3.83	CLAY to SILTY CLAY	13	11		1.1	
13.200	43.31	23.65	4.52	CLAY	24	21		1.4	
13.350	43.80	26.51	3.88	CLAY to SILTY CLAY	18	15		1.6	
13.500	44.29	23.39	4.03	CLAY to SILTY CLAY	16	14		1.4	
13.650	44.78	22.94	3.96	CLAY to SILTY CLAY	15	13		1.4	

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*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 110 pcf
ASSUMED DEPTH OF WATER TABLE = 8.8 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : HLA-5

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
13.800	45.28	21.54	3.91	CLAY to SILTY CLAY	14	12		1.3	
13.950	45.77	33.93	3.37	CLAYEY SILT to SILTY CLAY	17	15		2.1	
14.100	46.26	52.77	4.27	CLAYEY SILT to SILTY CLAY	26	23		3.0	
14.250	46.75	29.57	3.76	CLAYEY SILT to SILTY CLAY	15	13		1.8	
14.400	47.24	38.64	4.03	CLAYEY SILT to SILTY CLAY	19	16		2.1	
14.550	47.74	35.18	3.98	CLAYEY SILT to SILTY CLAY	18	15		1.9	
14.700	48.23	33.29	4.22	CLAY to SILTY CLAY	22	19		1.8	
14.850	48.72	33.46	4.04	CLAY to SILTY CLAY	22	19		1.8	
15.000	49.21	38.24	3.92	CLAYEY SILT to SILTY CLAY	19	16		2.1	
15.150	49.70	41.17	4.20	CLAY to SILTY CLAY	27	23		2.3	
15.300	50.20	43.11	4.08	CLAYEY SILT to SILTY CLAY	22	18		2.4	
15.450	50.69	44.36	3.85	CLAYEY SILT to SILTY CLAY	22	18		2.4	
15.600	51.18	46.06	4.98	CLAY	46	38		2.5	
15.750	51.67	51.58	4.83	CLAY to SILTY CLAY	34	28		2.9	
15.900	52.17	53.94	4.58	CLAY to SILTY CLAY	36	29		3.0	
16.050	52.66	51.67	4.29	CLAYEY SILT to SILTY CLAY	26	21		2.9	
16.200	53.15	49.82	4.07	CLAYEY SILT to SILTY CLAY	25	20		2.8	
16.350	53.64	54.98	3.81	CLAYEY SILT to SILTY CLAY	27	22		3.1	
16.500	54.13	52.20	3.92	CLAYEY SILT to SILTY CLAY	26	21		2.9	
16.650	54.63	50.41	4.10	CLAYEY SILT to SILTY CLAY	25	20		2.8	
16.800	55.12	46.16	4.41	CLAY to SILTY CLAY	31	24		2.5	
16.950	55.61	42.60	4.11	CLAYEY SILT to SILTY CLAY	21	17		2.3	
17.100	56.10	42.87	3.95	CLAYEY SILT to SILTY CLAY	21	17		2.3	
17.250	56.59	43.11	3.97	CLAYEY SILT to SILTY CLAY	22	17		2.4	
17.400	57.09	45.63	4.14	CLAYEY SILT to SILTY CLAY	23	18		2.5	
17.550	57.58	46.61	3.99	CLAYEY SILT to SILTY CLAY	23	18		2.6	
17.700	58.07	46.40	4.61	CLAY to SILTY CLAY	31	24		2.5	
17.850	58.56	43.42	4.65	CLAY to SILTY CLAY	29	22		2.4	
18.000	59.06	45.40	4.12	CLAYEY SILT to SILTY CLAY	23	18		2.5	
18.150	59.55	45.87	3.84	CLAYEY SILT to SILTY CLAY	23	18		2.5	

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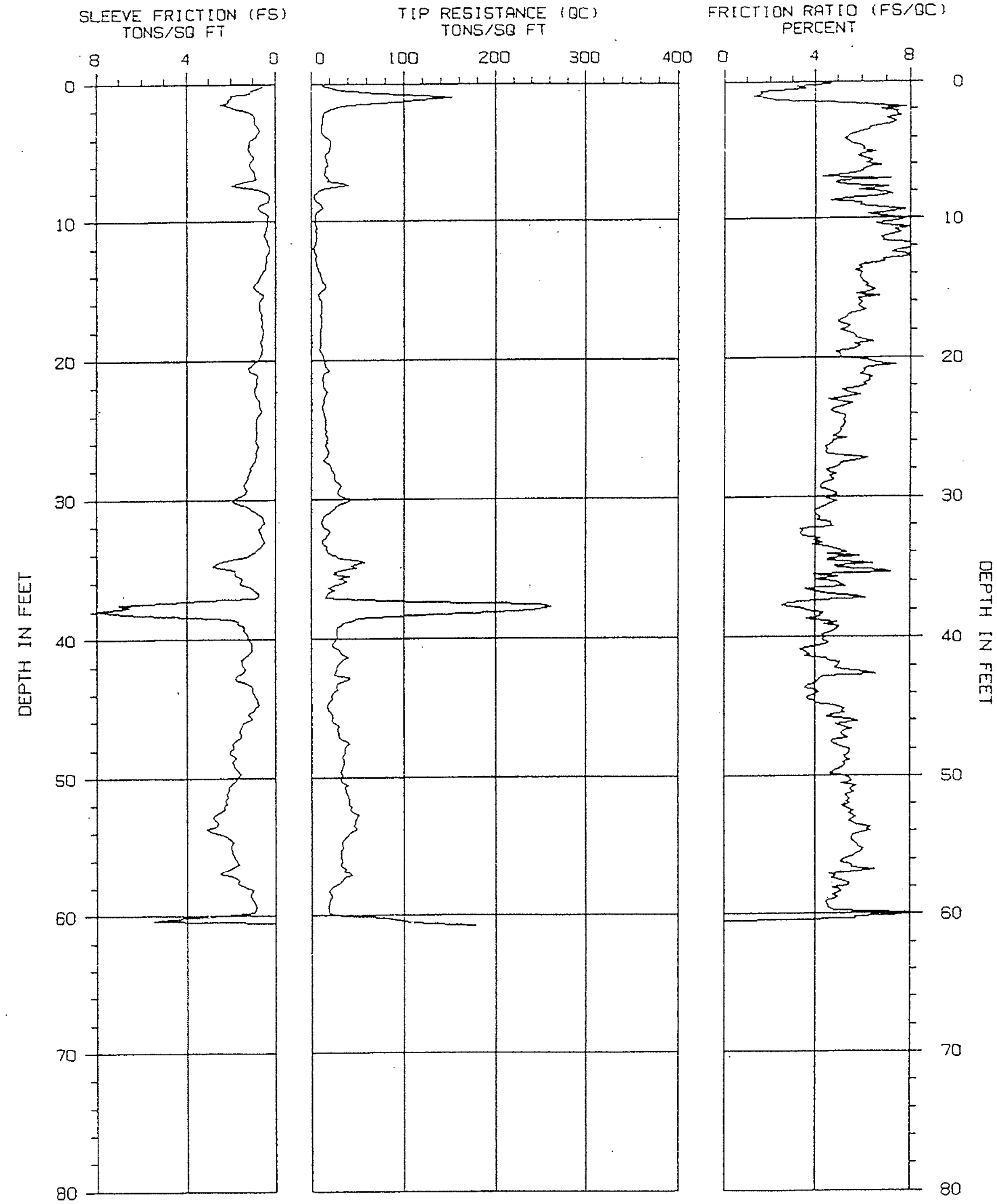
*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 110 pcf
ASSUMED DEPTH OF WATER TABLE = 8.8 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.



TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST

SOUNDING NUMBER: HLA-6

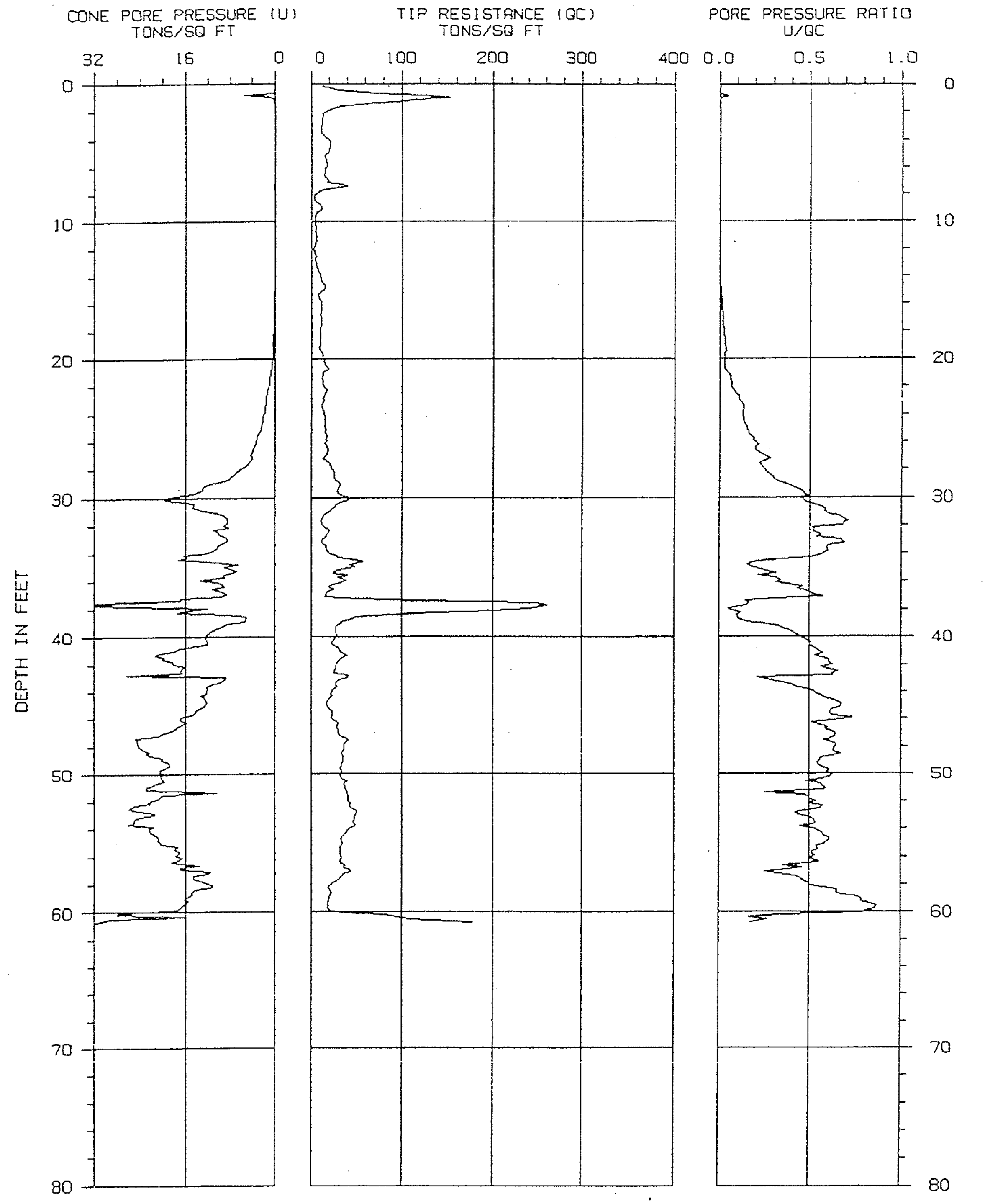
PROJECT NAME : HLA/BISHOP RH 1

CONE/RIG : 491/BH.V0/R#4

PROJECT NUMBER : 50044.1

DATE/TIME: 04-13-00 11:55

HFA



TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST SOUNDING NUMBER: HLA-6

PROJECT NAME : HLA/BISHOP RH 1	CONE/RIG : 491/BH.V0/R#4
PROJECT NUMBER : 50044.1	DATE/TIME: 04-13-00 11:55

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F
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CPT INTERPRETATIONS

SOUNDING : HLA-6
PROJECT : HLA/BISHOP RH 1
DATE/TIME: 04-13-00 11:55

PROJECT No.: 50044.1
CONE/RIG : 491/BH,VO/R#4

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
.150	.49	30.61	3.59	CLAYEY SILT to SILTY CLAY	15	24		2.0	
.300	.98	151.96	1.32	SAND to SILTY SAND	38	61	88		
.450	1.48	54.64	4.58	CLAY to SILTY CLAY	36	58		3.2	
.600	1.97	18.63	6.82	CLAY	19	30		1.2	
.750	2.46	12.51	7.59	CLAY	13	20		.8	
.900	2.95	11.83	7.27	CLAY	12	19		.8	
1.050	3.44	11.41	6.31	CLAY	11	18		.7	
1.200	3.94	19.31	5.44	CLAY	19	31		1.3	
1.350	4.43	21.67	5.49	CLAY	22	35		1.3	
1.500	4.92	19.33	6.05	CLAY	19	31		1.1	
1.650	5.41	16.89	5.80	CLAY	17	27		1.1	
1.800	5.91	18.23	6.20	CLAY	18	29		1.2	
1.950	6.40	16.17	6.06	CLAY	16	26		1.1	
2.100	6.89	19.46	4.32	CLAY	19	31		1.3	
2.250	7.38	40.39	4.88	CLAY to SILTY CLAY	27	42		2.4	
2.400	7.87	6.84	5.85	CLAY	7	10		.4	
2.550	8.37	4.02	6.47	CLAY	4	6		.2	
2.700	8.86	11.98	6.01	CLAY	12	17		.8	
2.850	9.35	6.42	7.79	CLAY	6	9		.4	
3.000	9.84	4.91	6.92	CLAY	5	7		.3	
3.150	10.33	5.48	6.57	CLAY	5	7		.3	
3.300	10.83	5.97	7.37	CLAY	6	8		.4	
3.450	11.32	6.05	6.78	CLAY	6	8		.4	
3.600	11.81	3.87	8.01	ORGANIC MATERIAL	4	5		.3	
3.750	12.30	4.42	7.47	CLAY	4	5		.2	
3.900	12.80	4.78	8.37	ORGANIC MATERIAL	5	6		.4	
4.050	13.29	7.35	6.12	CLAY	7	9		.4	
4.200	13.78	10.20	5.69	CLAY	10	12		.6	
4.350	14.27	13.00	5.92	CLAY	13	15		.8	
4.500	14.76	15.66	6.26	CLAY	16	18		1.0	
4.650	15.26	8.63	6.26	CLAY	9	10		.5	
4.800	15.75	11.47	5.84	CLAY	11	13		.7	
4.950	16.24	12.02	5.82	CLAY	12	14		.7	
5.100	16.73	10.92	5.86	CLAY	11	12		.7	
5.250	17.22	11.49	5.13	CLAY	11	13		.7	
5.400	17.72	10.81	5.46	CLAY	11	12		.7	
5.550	18.21	10.37	5.59	CLAY	10	11		.6	
5.700	18.70	10.73	6.06	CLAY	11	12		.6	
5.850	19.19	9.79	5.92	CLAY	10	11		.6	
6.000	19.69	13.41	5.07	CLAY	13	15		.8	
6.150	20.18	15.38	6.18	CLAY	15	17		1.0	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 110 pcf
ASSUMED DEPTH OF WATER TABLE = 12.3 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

Interpretations based on: Robertson and Campanella, 1989.

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
6.300	20.67	19.10	6.23	CLAY	19	20		1.1	
6.450	21.16	13.49	5.93	CLAY	13	14		.8	
6.600	21.65	13.32	6.31	CLAY	13	14		.8	
6.750	22.15	16.46	5.77	CLAY	16	17		1.0	
6.900	22.64	14.51	5.93	CLAY	15	15		.9	
7.050	23.13	14.17	5.08	CLAY	14	15		.9	
7.200	23.62	13.19	4.78	CLAY	13	14		.8	
7.350	24.11	15.44	5.31	CLAY	15	16		.9	
7.500	24.61	16.10	5.28	CLAY	16	16		1.0	
7.650	25.10	16.57	5.07	CLAY	17	17		1.0	
7.800	25.59	17.72	4.74	CLAY	18	18		1.1	
7.950	26.08	16.32	4.78	CLAY	16	16		1.0	
8.100	26.57	19.18	4.54	CLAY	19	19		1.2	
8.250	27.07	16.15	5.39	CLAY	16	16		1.0	
8.400	27.56	21.12	5.07	CLAY	21	21		1.2	
8.550	28.05	25.13	4.50	CLAY to SILTY CLAY	17	16		1.4	
8.700	28.54	26.47	4.65	CLAY	26	26		1.5	
8.850	29.04	32.27	4.37	CLAY to SILTY CLAY	22	21		1.8	
9.000	29.53	29.08	4.54	CLAY to SILTY CLAY	19	19		1.6	
9.150	30.02	44.15	4.35	CLAY to SILTY CLAY	29	28		2.5	
9.300	30.51	27.89	4.66	CLAY	28	26		1.5	
9.450	31.00	19.89	3.97	CLAY to SILTY CLAY	13	13		1.2	
9.600	31.50	12.56	4.22	CLAY	13	12		.7	
9.750	31.99	13.47	4.68	CLAY	13	13		.8	
9.900	32.48	19.59	3.47	CLAY to SILTY CLAY	13	12		1.2	
10.050	32.97	12.58	4.21	CLAY	13	12		.7	
10.200	33.46	17.29	3.88	CLAY to SILTY CLAY	12	11		1.0	
10.350	33.96	21.75	5.33	CLAY	22	20		1.2	
10.500	34.45	49.14	4.62	CLAY to SILTY CLAY	33	30		2.8	
10.650	34.94	49.46	4.85	CLAY to SILTY CLAY	33	30		2.8	
10.800	35.43	25.07	7.18	CLAY	25	23		1.4	
10.950	35.93	38.98	4.03	CLAYEY SILT to SILTY CLAY	19	18		2.2	
11.100	36.42	19.67	5.29	CLAY	20	18		1.2	
11.250	36.91	16.66	4.62	CLAY	17	15		1.0	
11.400	37.40	117.55	4.16	*VERY STIFF FINE GRAINED	100	100			
11.550	37.89	240.66	3.51	*SAND to CLAYEY SAND	100	100			
11.700	38.39	89.40	4.16	CLAYEY SILT to SILTY CLAY	45	39		5.1	
11.850	38.88	33.89	4.93	CLAY	34	30		1.9	
12.000	39.37	28.28	4.95	CLAY	28	25		1.5	
12.150	39.86	28.72	4.32	CLAY to SILTY CLAY	19	17		1.6	
12.300	40.35	23.69	4.56	CLAY	24	20		1.4	
12.450	40.85	31.59	3.32	CLAYEY SILT to SILTY CLAY	16	14		2.0	
12.600	41.34	40.03	3.55	CLAYEY SILT to SILTY CLAY	20	17		2.5	
12.750	41.83	30.06	5.06	CLAY	30	26		1.6	
12.900	42.32	27.55	5.23	CLAY	28	23		1.5	
13.050	42.81	41.38	4.35	CLAY to SILTY CLAY	28	23		2.3	
13.200	43.31	28.13	3.95	CLAY to SILTY CLAY	19	16		1.7	
13.350	43.80	25.45	4.05	CLAY to SILTY CLAY	17	14		1.5	
13.500	44.29	23.33	3.64	CLAY to SILTY CLAY	16	13		1.4	
13.650	44.78	18.63	4.03	CLAY to SILTY CLAY	12	10		1.1	

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*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 110 pcf
ASSUMED DEPTH OF WATER TABLE = 12.3 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : HLA-6

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
13.800	45.28	21.95	5.15	CLAY	22	18		1.1	
13.950	45.77	23.60	4.49	CLAY	24	19		1.4	
14.100	46.26	30.74	4.91	CLAY	31	25		1.7	
14.250	46.75	30.06	5.26	CLAY	30	25		1.6	
14.400	47.24	32.25	5.40	CLAY	32	26		1.7	
14.550	47.74	38.50	4.91	CLAY	39	31		2.1	
14.700	48.23	37.07	5.48	CLAY	37	30		2.0	
14.850	48.72	35.42	5.28	CLAY	35	29		1.9	
15.000	49.21	34.91	5.30	CLAY	35	28		1.9	
15.150	49.70	33.16	4.73	CLAY	33	27		1.8	
15.300	50.20	32.40	5.46	CLAY	32	26		1.7	
15.450	50.69	37.48	5.74	CLAY	37	30		2.0	
15.600	51.18	39.37	5.66	CLAY	39	31		2.2	
15.750	51.67	41.60	5.48	CLAY	42	33		2.3	
15.900	52.17	44.74	5.16	CLAY	45	35		2.5	
16.050	52.66	51.03	5.41	CLAY	51	40		2.8	
16.200	53.15	48.23	5.52	CLAY	48	38		2.7	
16.350	53.64	49.12	6.35	CLAY	49	38		2.7	
16.500	54.13	40.54	5.92	CLAY	41	31		2.2	
16.650	54.63	34.08	5.58	CLAY	34	26		1.8	
16.800	55.12	34.40	5.81	CLAY	34	26		1.8	
16.950	55.61	32.82	5.73	CLAY	33	25		1.8	
17.100	56.10	33.18	5.15	CLAY	33	25		1.8	
17.250	56.59	37.82	5.55	CLAY	38	29		2.0	
17.400	57.09	44.49	4.61	CLAY to SILTY CLAY	30	22		2.4	
17.550	57.58	31.78	5.29	CLAY	32	24		1.7	
17.700	58.07	21.86	4.76	CLAY	22	16		1.2	
17.850	58.56	22.82	4.78	CLAY	23	17		1.2	
18.000	59.06	20.44	4.50	CLAY	20	15		1.1	
18.150	59.55	18.91	4.60	CLAY	19	14		1.0	
18.300	60.04	34.29	8.78	CLAY	34	25		1.8	
18.450	60.53	109.39	*****		0	0			.0

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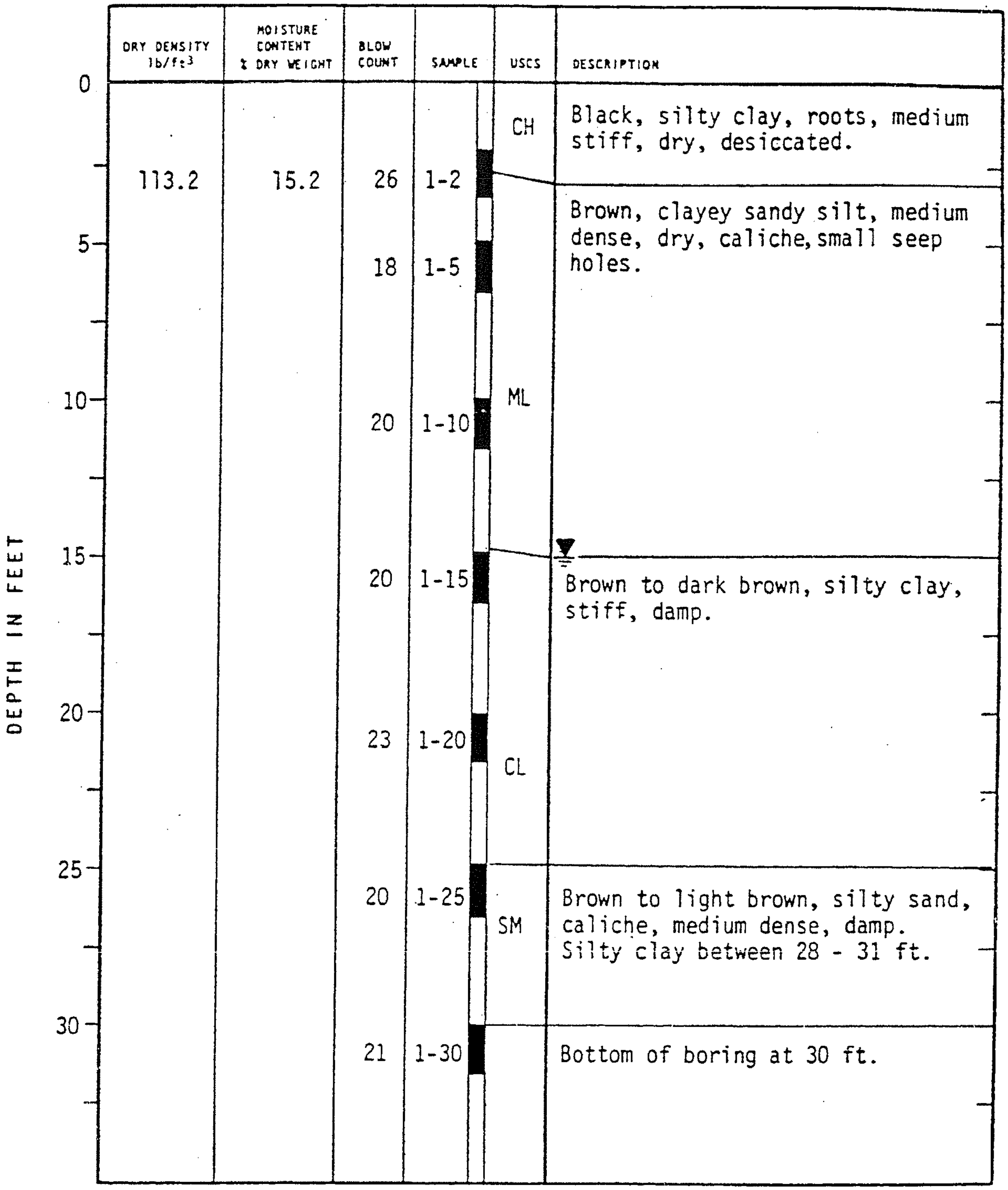
*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 110 pcf
ASSUMED DEPTH OF WATER TABLE = 12.3 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.



DEPTH IN FEET	DRY DENSITY lb/ft³	MOISTURE CONTENT % DRY WEIGHT	BLOW COUNT	SAMPLE	USCS	DESCRIPTION
0					CH	Black, silty clay, roots, medium stiff, dry, desiccated.
	113.2	15.2	26	1-2		Brown, clayey sandy silt, medium dense, dry, caliche, small seep holes.
5			18	1-5		
10			20	1-10	ML	
15			20	1-15		Brown to dark brown, silty clay, stiff, damp.
20			23	1-20	CL	
25			20	1-25	SM	Brown to light brown, silty sand, caliche, medium dense, damp. Silty clay between 28 - 31 ft.
30			21	1-30		Bottom of boring at 30 ft.

J.H. KLEINFELDER & ASSOCIATES
GEOTECHNICAL CONSULTANTS • MATERIALS TESTING

PREPARED BY: PLC DATE: 8/81

CHECKED BY: DCM DATE: 8/81

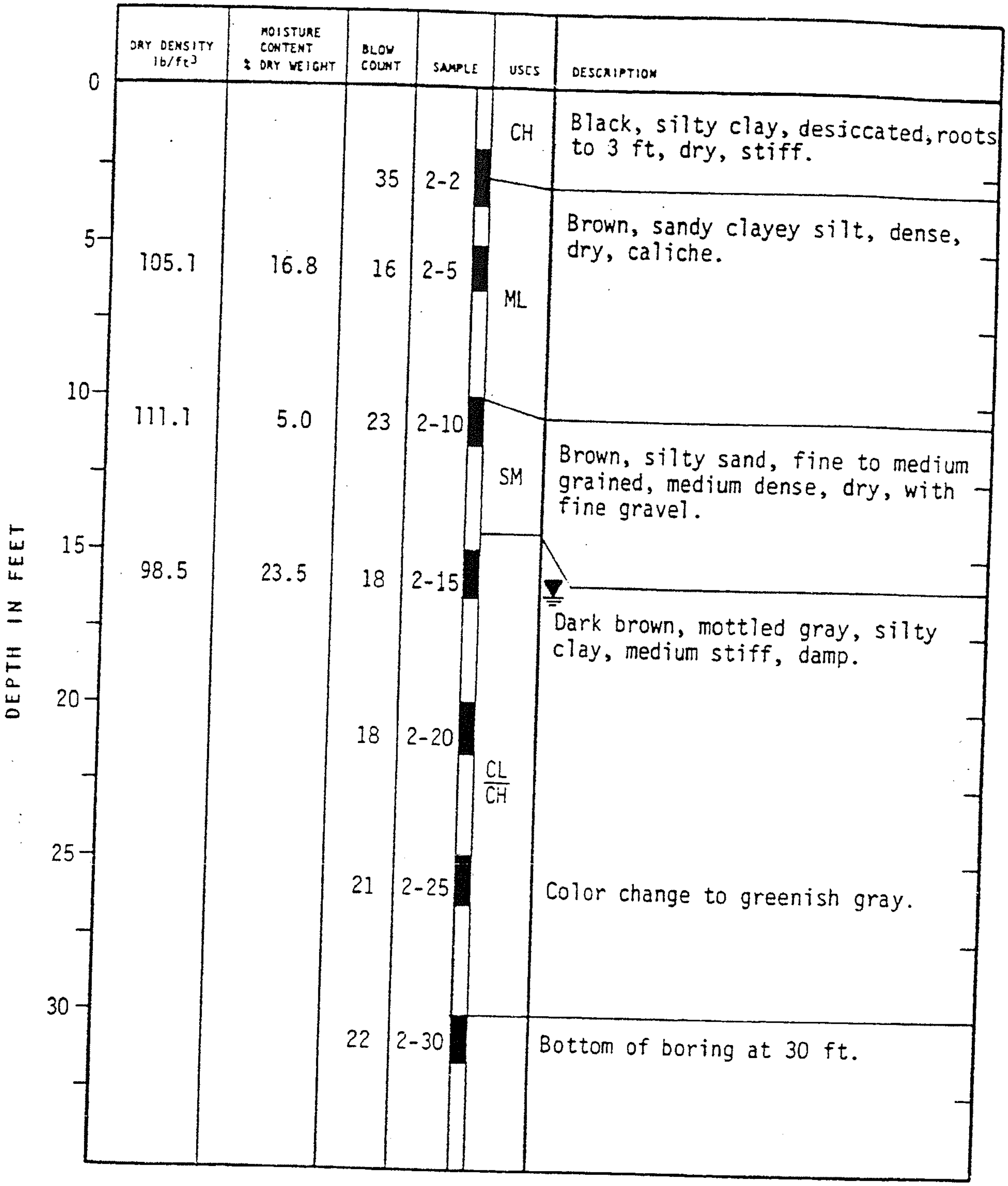
CHEVRON PARK
SAN RAMON, CALIFORNIA

LOG OF BORING NO. B-1

PROJECT NO. B-1109-1

PLATE

A-2



DRY DENSITY lb/ft³	MOISTURE CONTENT % DRY WEIGHT	BLOW COUNT	SAMPLE	USCS	DESCRIPTION
				CH	Black, silty clay, desiccated, roots to 3 ft, dry, stiff.
		35	2-2		
105.1	16.8	16	2-5	ML	Brown, sandy clayey silt, dense, dry, caliche.
111.1	5.0	23	2-10	SM	Brown, silty sand, fine to medium grained, medium dense, dry, with fine gravel.
98.5	23.5	18	2-15	CL CH	Dark brown, mottled gray, silty clay, medium stiff, damp.
		18	2-20		
		21	2-25		Color change to greenish gray.
		22	2-30		Bottom of boring at 30 ft.

J.H. KLEINFELDER & ASSOCIATES
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PREPARED BY: PLC DATE: 8/81
CHECKED BY: DCM DATE: 8/81

CHEVRON PARK
SAN RAMON, CALIFORNIA
LOG OF BORING NO. B-2

PROJECT NO. B-1109-1

PLATE
A-3

DEPTH IN FEET	DRY DENSITY lb/ft^3	MOISTURE CONTENT % DRY WEIGHT	BLOW COUNT	SAMPLE	USCS	DESCRIPTION
0					CH	Black, silty clay, dry, desiccated roots, stiff.
			26	3-2		
						Brown, clayey sandy silt, dry, caliche, medium dense.
5	95.3	17.6	16	3-2		
10			33	3-10	ML/CL	
15	87.4	9.3	18	3-15		Fine sand lenses with gravel at 15 ft.
						Black, silty clay, damp, medium stiff.
20			25	3-20	CL	▼ Color changes to dark brown.
25					CL	Brown, clayey sandy silt, moist, medium dense.
			21	3-25		
					CL	Black, silty clay, stiff, damp. Color changes to greenish gray.
30			18	3-30		Bottom of boring at 30 ft.

J.H. KLEINFELDER & ASSOCIATES
GEOTECHNICAL CONSULTANTS • MATERIALS TESTING

PREPARED BY: PLC DATE: 8/81
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CHEVRON PARK
SAN RAMON, CALIFORNIA

LOG OF BORING NO. B-3

PROJECT NO. B-1109-1

PLATE

A-4

DEPTH IN FEET	DRY DENSITY lb/ft³	MOISTURE CONTENT % DRY WEIGHT	BLOW COUNT	SAMPLE	USCS	DESCRIPTION
0					CH	Black, silty clay, dry, roots, desiccated, stiff.
	101.9	10.6	26	6-2		
5			30	6-5		Brown to light brown, clayey silt, medium dense, dry. 6 inches sand lense at 6 ft.
10			24	6-10	ML	
15	96.9	14.9	19	6-15		
						Brown to gray, silty clay, stiff, dry.
20			19	6-20		
					CL	▽
						Sand lenses at 24 ft.
25			20	6-25		Wet at 25½ ft.
30			18	6-30	CL	Dark gray, silty clay, stiff, moist.
						Bottom of boring at 30 ft.

J.H. KLEINFELDER & ASSOCIATES
GEOTECHNICAL CONSULTANTS • MATERIALS TESTING

PREPARED BY: PLC DATE: 8/81
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CHEVRON PARK
SAN RAMON, CALIFORNIA

LOG OF BORING NO. B-6

PROJECT NO. B-1109-1

PLATE A-7

DEPTH IN FEET	DRY DENSITY lb/ft³	MOISTURE CONTENT % DRY WEIGHT	BLOW COUNT	SAMPLE	USCS	DESCRIPTION
0					CL	Black, silty clay, desiccated, dry, stiff.
						Dark brown to brown, sandy clayey silt, caliche, stiff, dry.
5			19	17-5		
10	101.4	18.3	25	17-10	ML	
15			36	17-15		
						With pebbles.
					SC	▼ Brown, clayey sand, medium dense, wet.
20	91.3	30.4	16	17-20		
					CH CL	Dark grey, silty clay, medium stiff to stiff.
25	99.5	26.4	17	17-25		Color change to greyish brown.
30	110.3	19.0	40	17-30		
35						

J.H. KLEINFELDER & ASSOCIATES
GEOTECHNICAL CONSULTANTS • MATERIALS TESTING

PREPARED BY: PLC DATE: 8/81
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CHEVRON PARK
SAN RAMON, CALIFORNIA

LOG OF BORING NO. B-17

PROJECT NO. B-1109-1

PLATE
A-18

DEPTH IN FEET	DRY DENSITY lb/ft^3	MOISTURE CONTENT % DRY WEIGHT	BLOW COUNT	SAMPLE	USCS	DESCRIPTION
35			27	17-35		Brown, fine sand with trace of clay.
40			32	17-40	SM	Sand and gravel at 41-43 ft.
45			34	17-45		
50			38	17-50		Bottom of boring at 50 ft.

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GEOTECHNICAL CONSULTANTS • MATERIALS TESTING

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CHEVRON PARK
SAN RAMON, CALIFORNIA

LOG OF BORING NO. B-17 (con't)

PROJECT NO. B-1109-1

PLATE
A-18.1

DEPTH IN FEET	DRY DENSITY lb/ft³	MOISTURE CONTENT % DRY WEIGHT	BLOW COUNT	SAMPLE	USCS	DESCRIPTION
0					CH	Black, silty clay, stiff, dry, dessiccated.
						Brown, sandy clayey silt with pebbles, medium dense, dry.
5			11	19-5		
10			10	19-10		Sand at 10½-11½ ft. moist.
					ML	
15			18	19-15		▼
20			21	19-20		
						Dark brown, sity clay, medium stiff dry to damp.
25	108.0	20.5	19	19-25	CL	Color change to grey brown.
30			25	19-30		
					SM	Brown, clayey fine sand medium dense.
35						

J.H. KLEINFELDER & ASSOCIATES
GEOTECHNICAL CONSULTANTS • MATERIALS TESTING

PREPARED BY: PLC DATE: 8/81
CHECKED BY: DCM DATE: 8/81

CHEVRON PARK
SAN RAMON, CALIFORNIA

LOG OF BORING NO. B-19

PROJECT NO. B-1109-1

PLATE
A-20

DEPTH IN FEET	DRY DENSITY lb/ft³	MOISTURE CONTENT % DRY WEIGHT	BLOW COUNT	SAMPLE	USCS	DESCRIPTION
35			30	19-35	SM	Brown, fine sand and gravel, wet.
40						
45						
					GP	Brown, sand and gravel with clay.
50			37	19-50	CL	Grey-brown, sandy clay with gravel, stiff.
						Bottom of boring at 50 ft.

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GEOTECHNICAL CONSULTANTS • MATERIALS TESTING

PREPARED BY: PLC DATE: 8/81
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CHEVRON PARK
SAN RAMON, CALIFORNIA
LOG OF BORING NO. B-19 (con't)

PROJECT NO. B-1109-1

PLATE
A-20.1

DEPTH IN FEET	DRY DENSITY lb/ft³	MOISTURE CONTENT % DRY WEIGHT	BLOW COUNT	SAMPLE	USCS	DESCRIPTION
0					CH	Black, silty clay, stiff, roots, dry, desiccated.
			22	20-2		
5			21	20-5	ML	Brown, sandy clayey silt, dry dense, grading change to sandy silt/silty sand with fine gravel, caliche.
10			13	20-10		
15	97.1	24.4	15	20-15		
					CL	▼ Brown to dark brown, silty clay, medium stiff, damp.
20			20	20-20		
25			20	20-25	ML	Brown, sandy clay silt, damp to moist, medium dense.
30			17	20-30		Bottom of boring at 30 ft.

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CHEVRON PARK
SAN RAMON, CALIFORNIA

LOG OF BORING NO. B-20

PLATE A-21

PREPARED BY: PLC DATE: 8/81
CHECKED BY: DCM DATE: 8/81

PROJECT NO. B-1109-1

DEPTH IN FEET	DRY DENSITY lb/ft³	MOISTURE CONTENT % DRY WEIGHT	BLOW COUNT	SAMPLE	USCS	DESCRIPTION
0					CH	Black, silty clay, desiccated, dry, stiff.
				22-2		Brown, silty clay, caliche, medium stiff, dry.
5				22-5		
10	108.0	33.0		22-10	CH	Trace of sand.
						▼
15				22-15		Color change to dark brown with sand.
20				22-20		Bottom of boring at 20 ft.

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GEOTECHNICAL CONSULTANTS • MATERIALS TESTING

PREPARED BY: PLC DATE: 8/81
CHECKED BY: DCM DATE: 8/81

CHEVRON PARK
SAN RAMON, CALIFORNIA

LOG OF BORING NO. B-22

PROJECT NO. B-1109-1

PLATE
A-23

DEPTH IN FEET	DRY DENSITY lb/ft^3	MOISTURE CONTENT % DRY WEIGHT	BLOW COUNT	SAMPLE	USCS	DESCRIPTION
0				Bulk	CH	Black, silty clay, desiccated dry stiff.
					CL	Dark brown to brown, silty clay, stiff, trace of sand and pebbles below 8 ft.
5						
10						Bottom of boring at 10 ft. NFWE

J.H. KLEINFELDER & ASSOCIATES
GEOTECHNICAL CONSULTANTS • MATERIALS TESTING

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CHEVRON PARK
SAN RAMON, CALIFORNIA

LOG OF BORING NO. B-23

PROJECT NO. B-1109-1

PLATE
A-24

DEPTH IN FEET	DRY DENSITY lb/ft^3	MOISTURE CONTENT % DRY WEIGHT	BLOW COUNT	SAMPLE	USCS	DESCRIPTION
0				Bulk	CL	Black silty clay, dry, desiccated, caliche, stiff.
5					ML	Light brown, sandy clayey silt. caliche trace of gravel, dry.
10						Bottom of boring at 10 ft. NFWE

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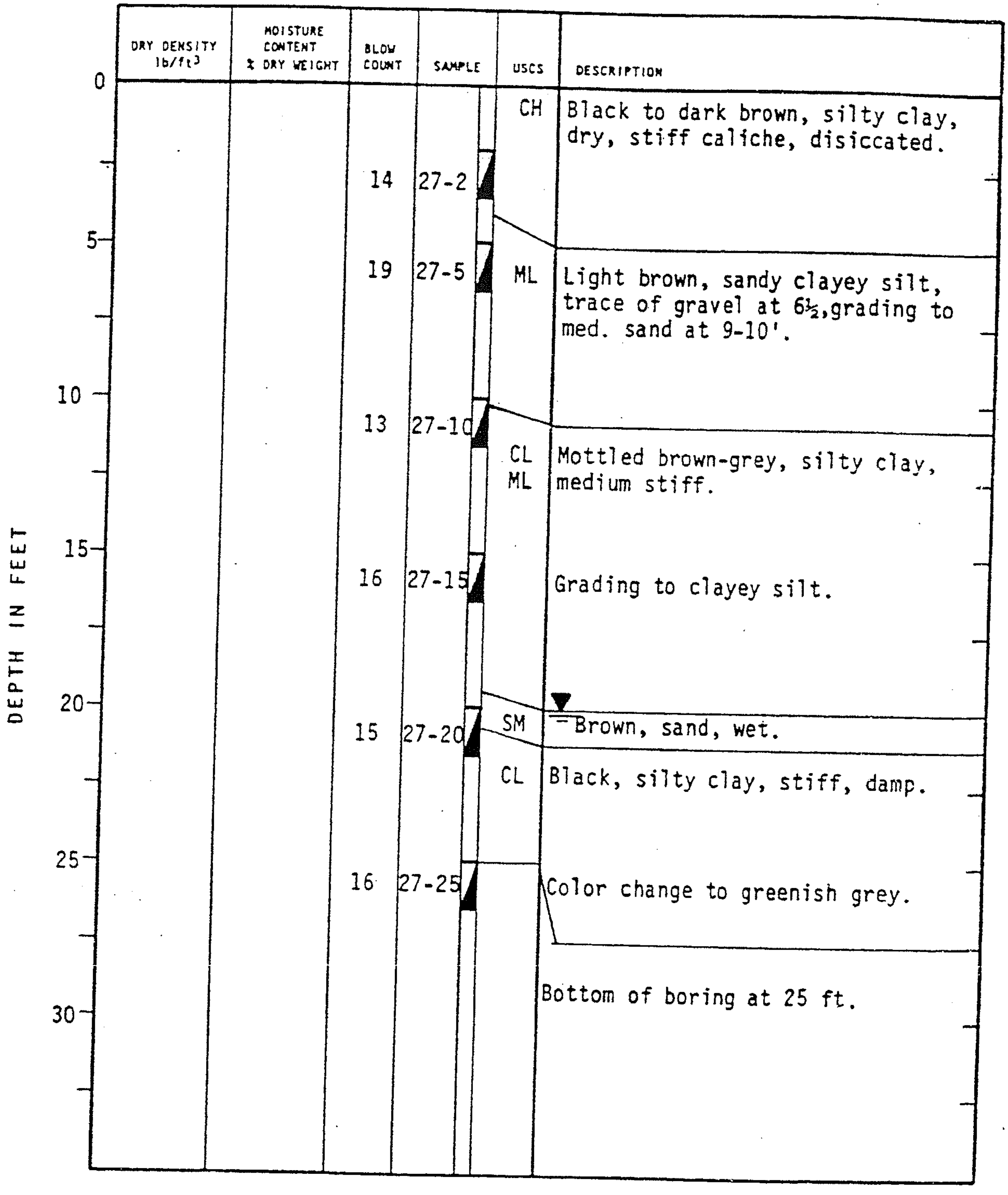
CHEVRON PARK
SAN RAMON, CALIFORNIA

LOG OF BORING NO. B-26

PLATE
A-27

PREPARED BY: PLC DATE: 8/81
CHECKED BY: DCM DATE: 8/81
PROJECT NO. B-1109-1



DEPTH IN FEET	DRY DENSITY lb/ft³	MOISTURE CONTENT % DRY WEIGHT	BLOW COUNT	SAMPLE	USCS	DESCRIPTION
0					CH	Black to dark brown, silty clay, dry, stiff caliche, disiccated.
			14	27-2		
5			19	27-5	ML	Light brown, sandy clayey silt, trace of gravel at 6½, grading to med. sand at 9-10'.
10			13	27-10	CL ML	Mottled brown-grey, silty clay, medium stiff.
15			16	27-15		Grading to clayey silt.
20			15	27-20	SM	▼ Brown, sand, wet.
					CL	Black, silty clay, stiff, damp.
25			16	27-25		Color change to greenish grey.
30						Bottom of boring at 25 ft.

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GEOTECHNICAL CONSULTANTS • MATERIALS TESTING

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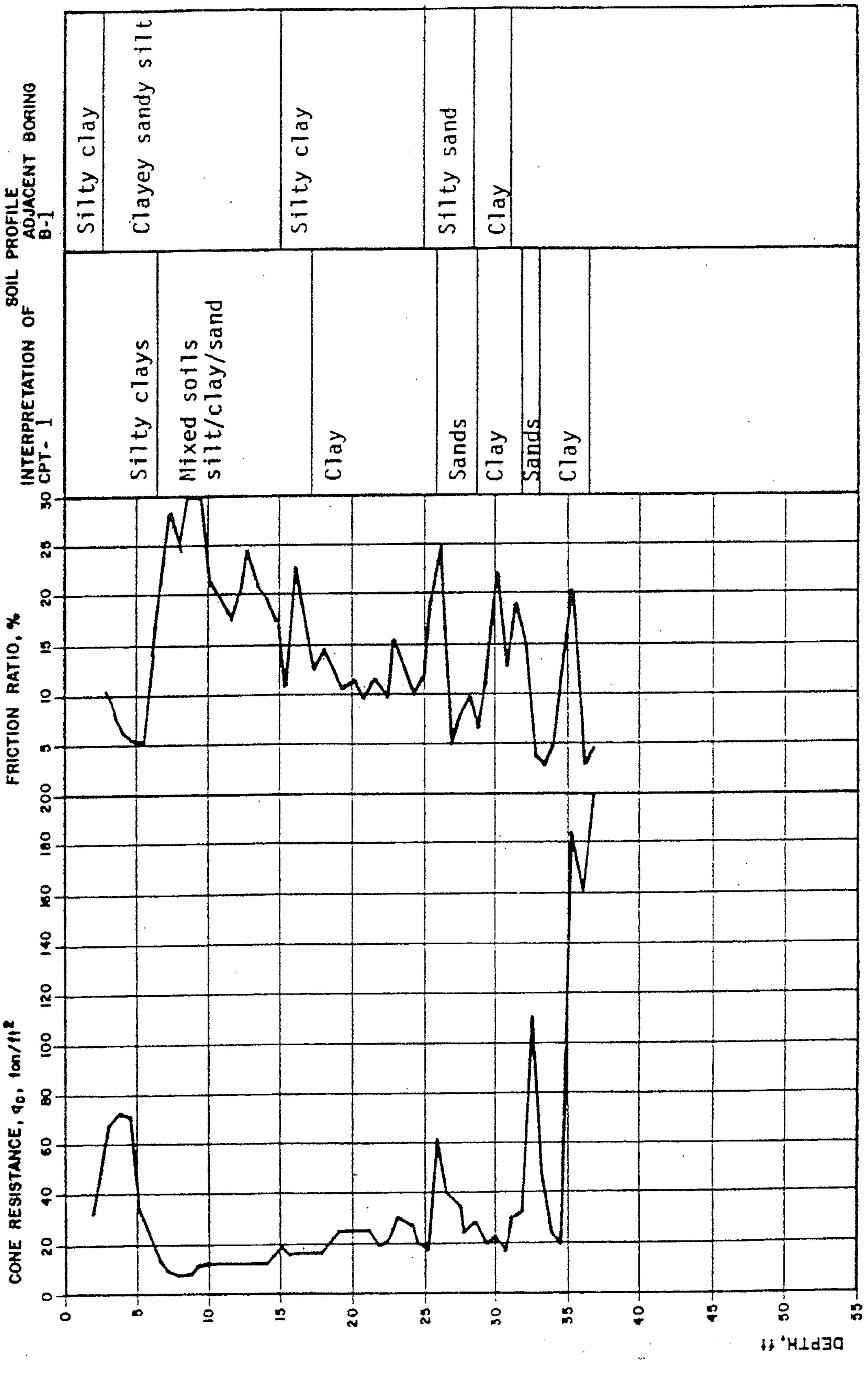
CHEVRON PARK
SAN RAMON, CALIFORNIA

LOG OF BORING NO. B-27

PROJECT NO. B-1109-1

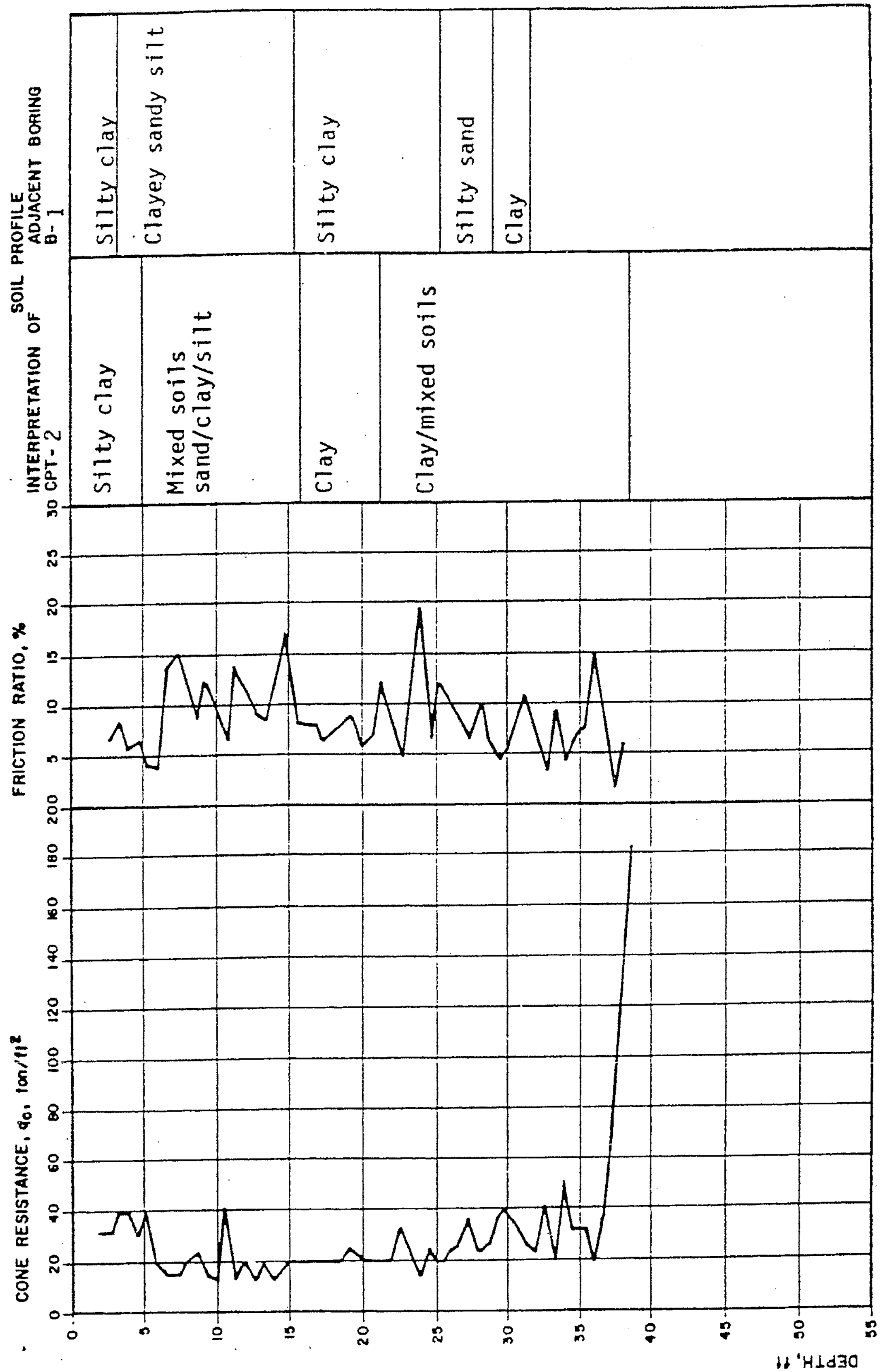
PLATE A-28



J.H. KLEINFELDER & ASSOCIATES GEOTECHNICAL CONSULTANTS • MATERIALS TESTING	CHEVRON PARK SAN RAMON, CALIFORNIA LOG OF CPT - 1
PREPARED BY: PLC DATE: 8/81	
CHECKED BY: DCM DATE: 8/81	PROJECT NO. B-1109-1

PLATE

B-3



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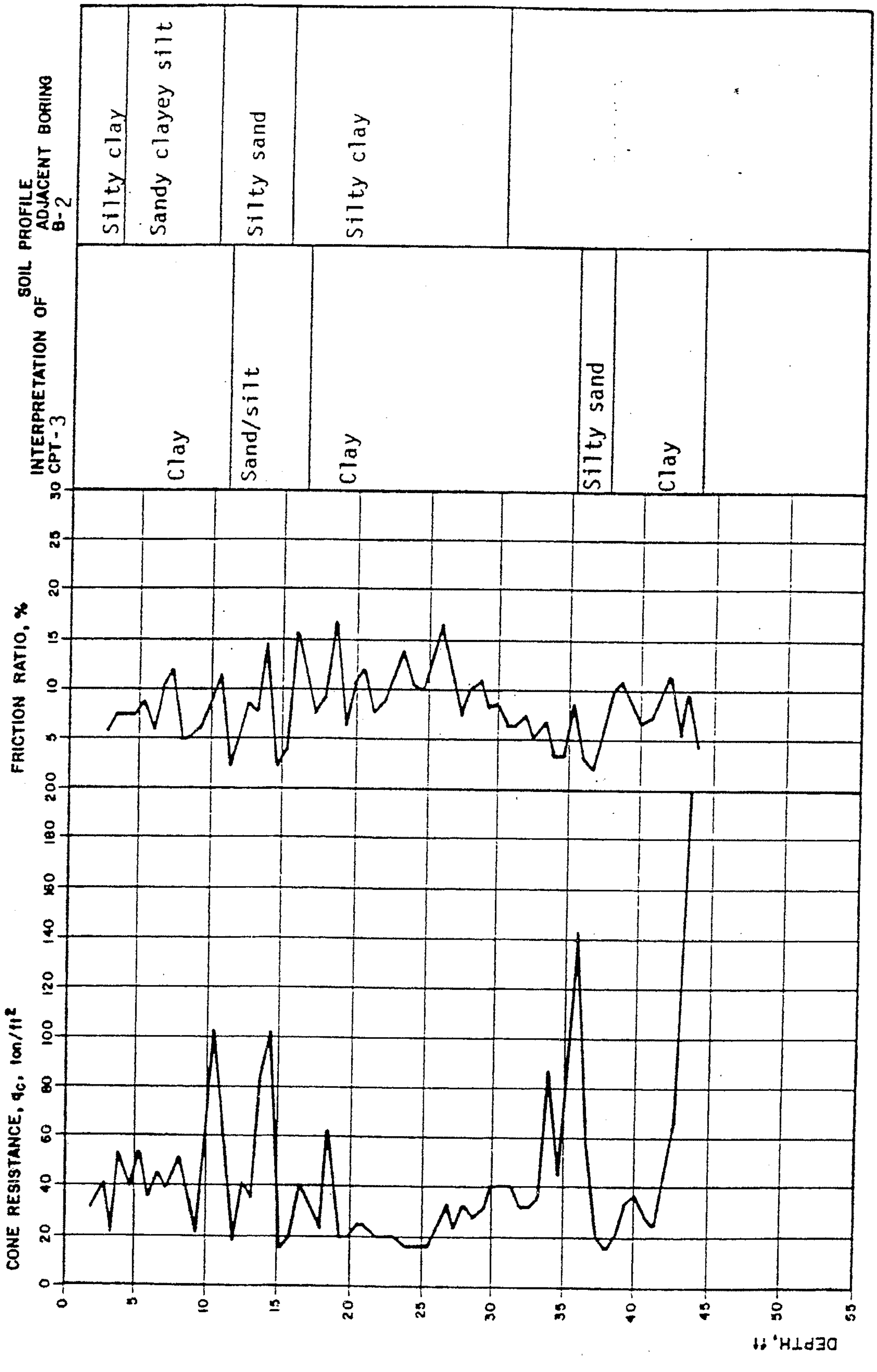
CHEVRON PARK
SAN RAMON, CALIFORNIA

LOG OF CPT - 2

PROJECT NO. B-1109-1

PLATE

B-4



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GEOTECHNICAL CONSULTANTS • MATERIALS TESTING

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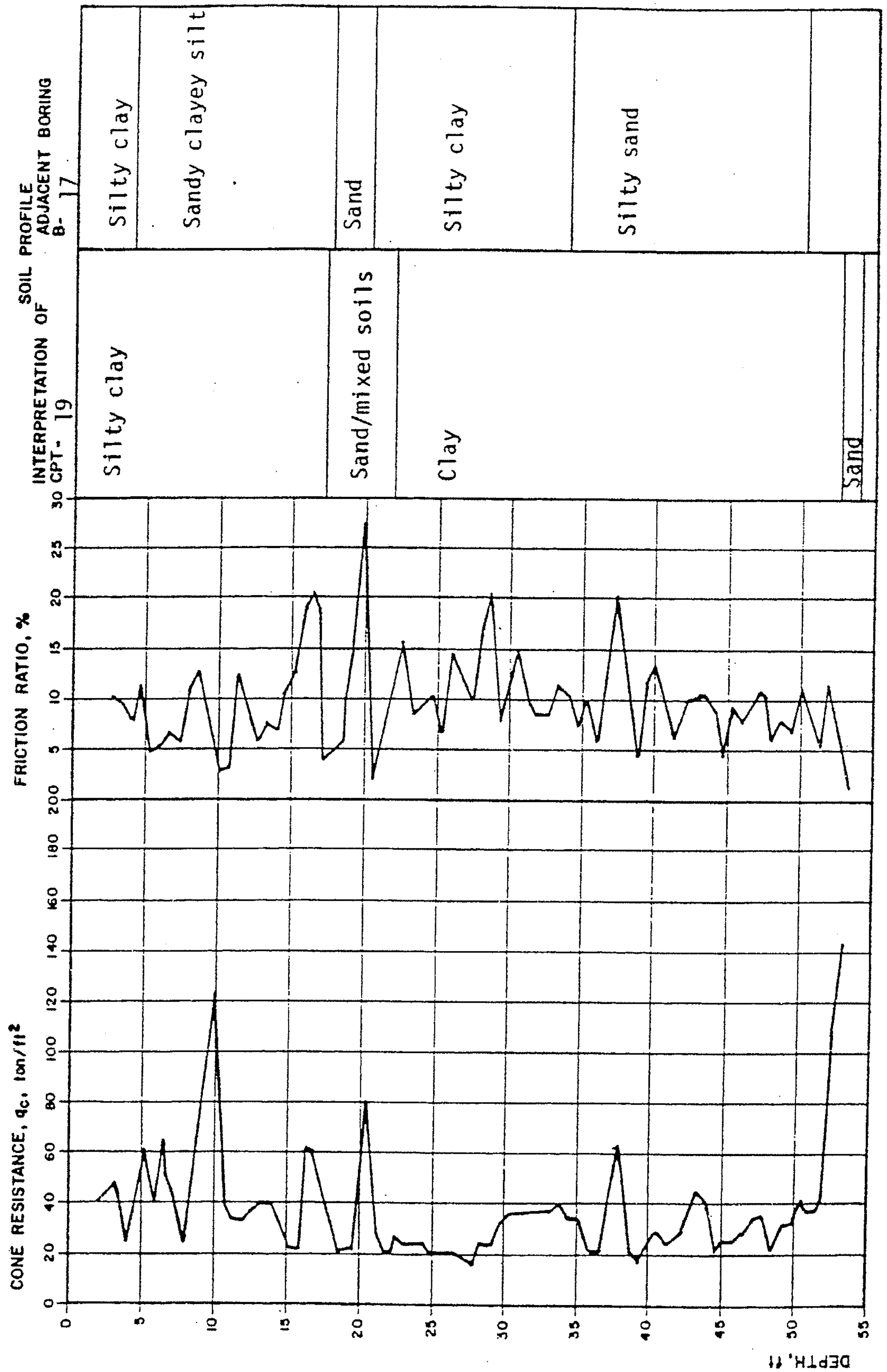
CHEVRON PARK
SAN RAMON, CALIFORNIA

LOG OF CPT - 3

PROJECT NO. B-1109-1

PLATE

B-5



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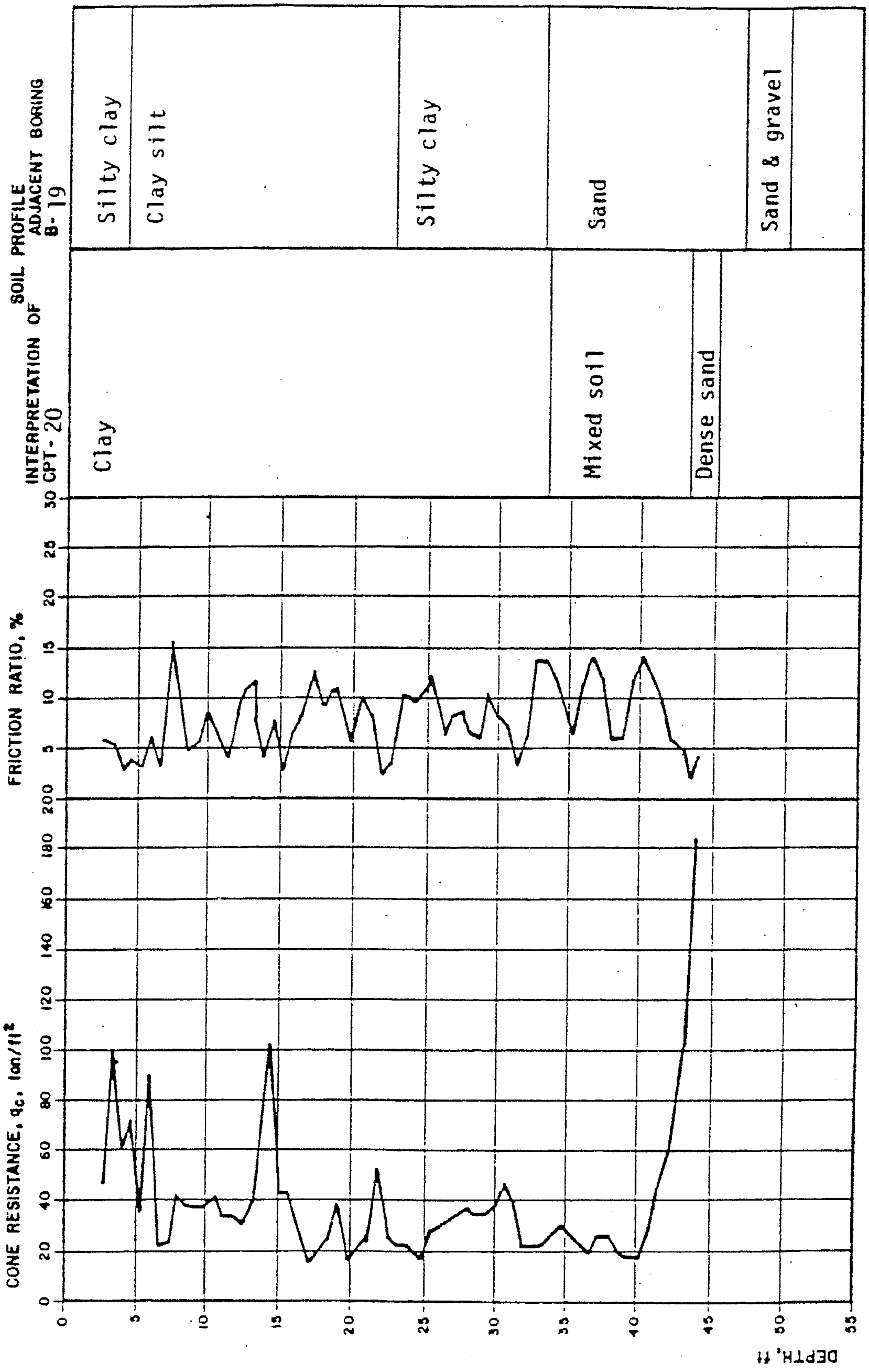
PREPARED BY: PLC DATE: 8/81
CHECKED BY: DCM DATE: 8/81

CHEVRON PARK
SAN RAMON, CALIFORNIA
LOG OF CPT-19

PROJECT NO. B-1109-1

PLATE
B-21



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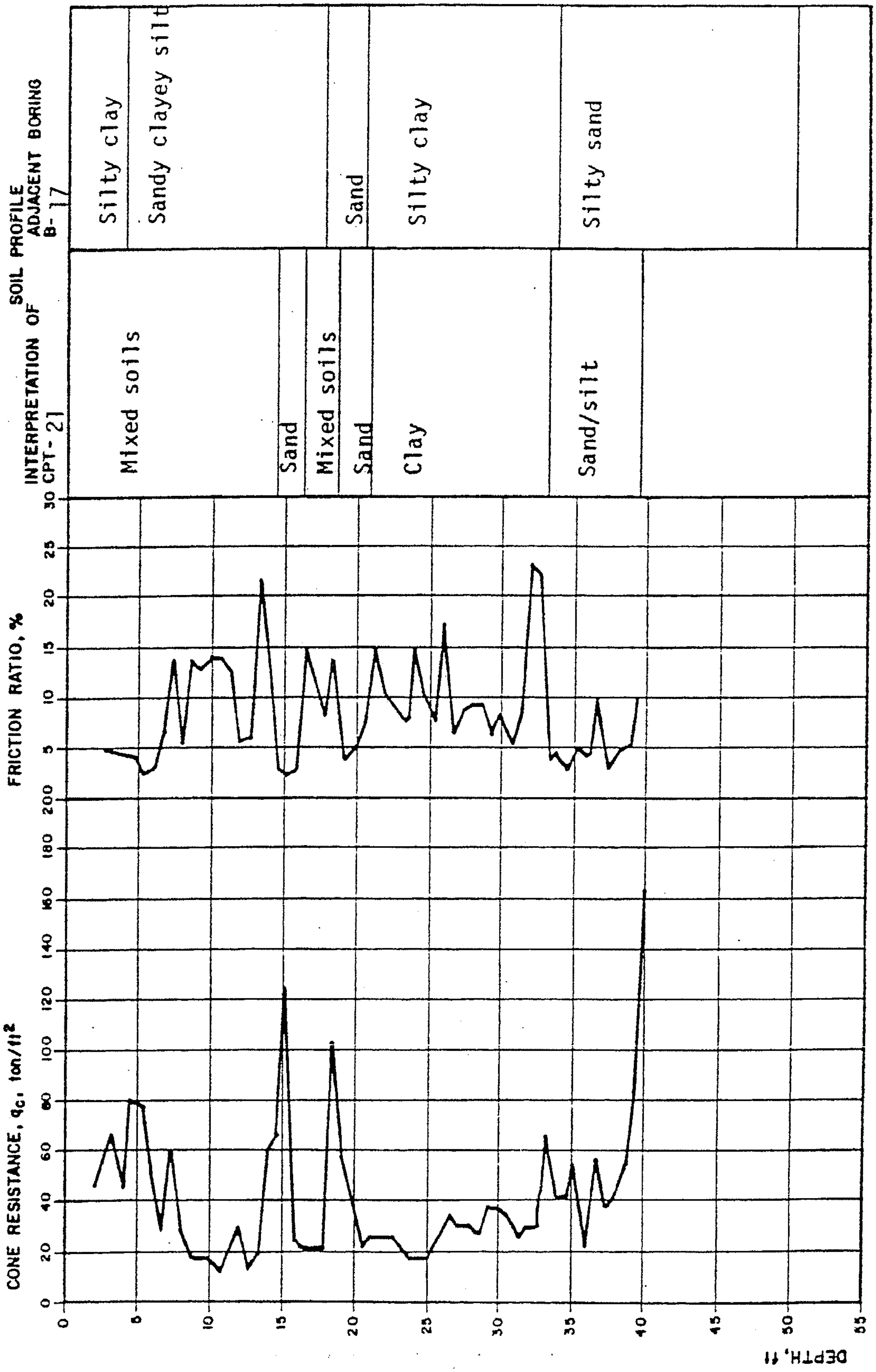
CHEVRON PARK
SAN RAMON, CALIFORNIA

LOG OF CPT-20

PROJECT NO. B-1109-1

PLATE

B-22



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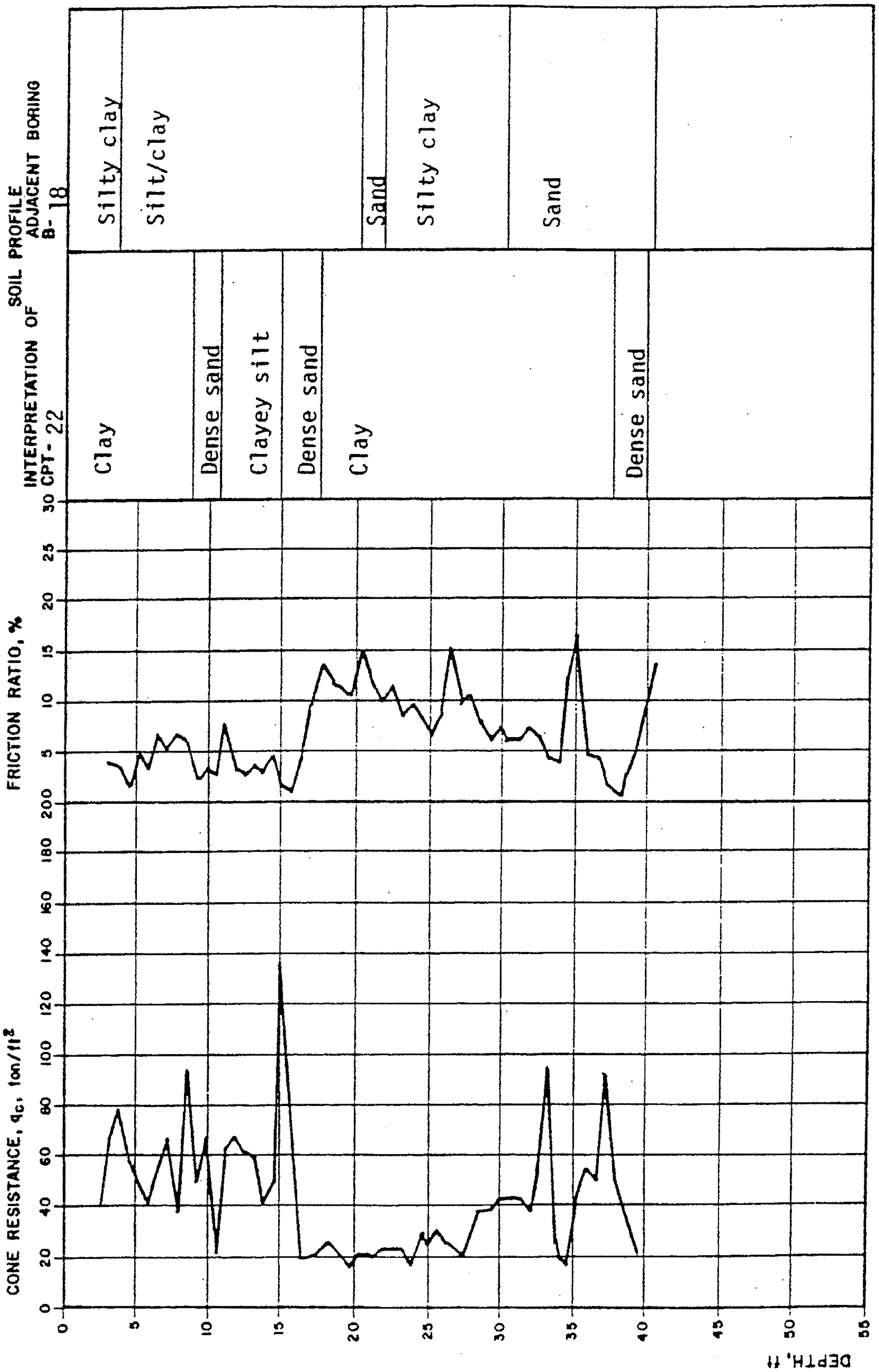
CHEVRON PARK
SAN RAMON, CALIFORNIA

LOG OF CPT-21

PROJECT NO. B-1109-1

PLATE
B-23



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CHECKED BY: DCM DATE: 8/81

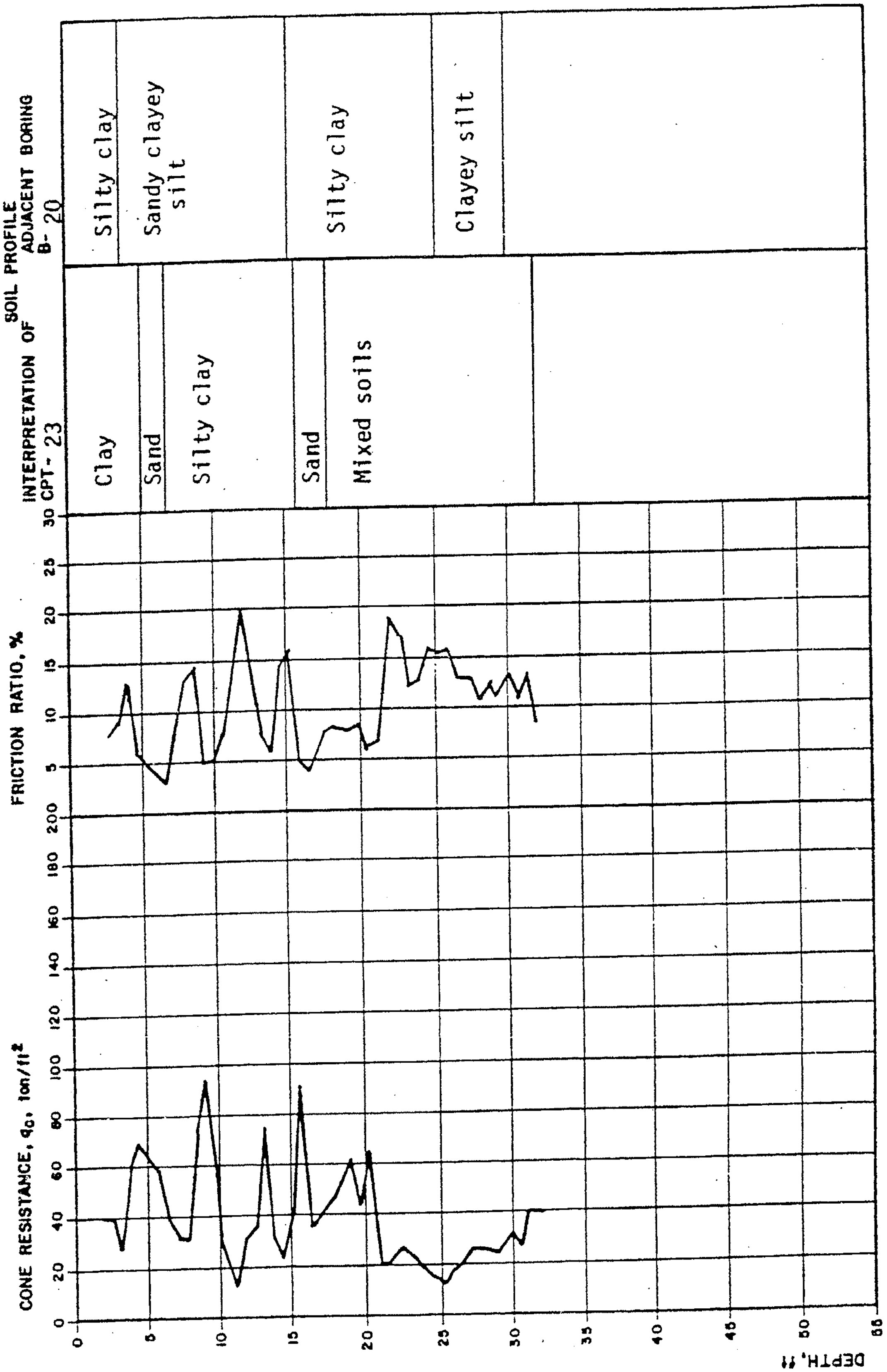
CHEVRON PARK
SAN RAMON, CALIFORNIA

LOG OF CPT - 22

PROJECT NO. B-1109-1

PLATE

B-24



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PREPARED BY: PLC DATE: 8/81
CHECKED BY: DCM DATE: 8/81

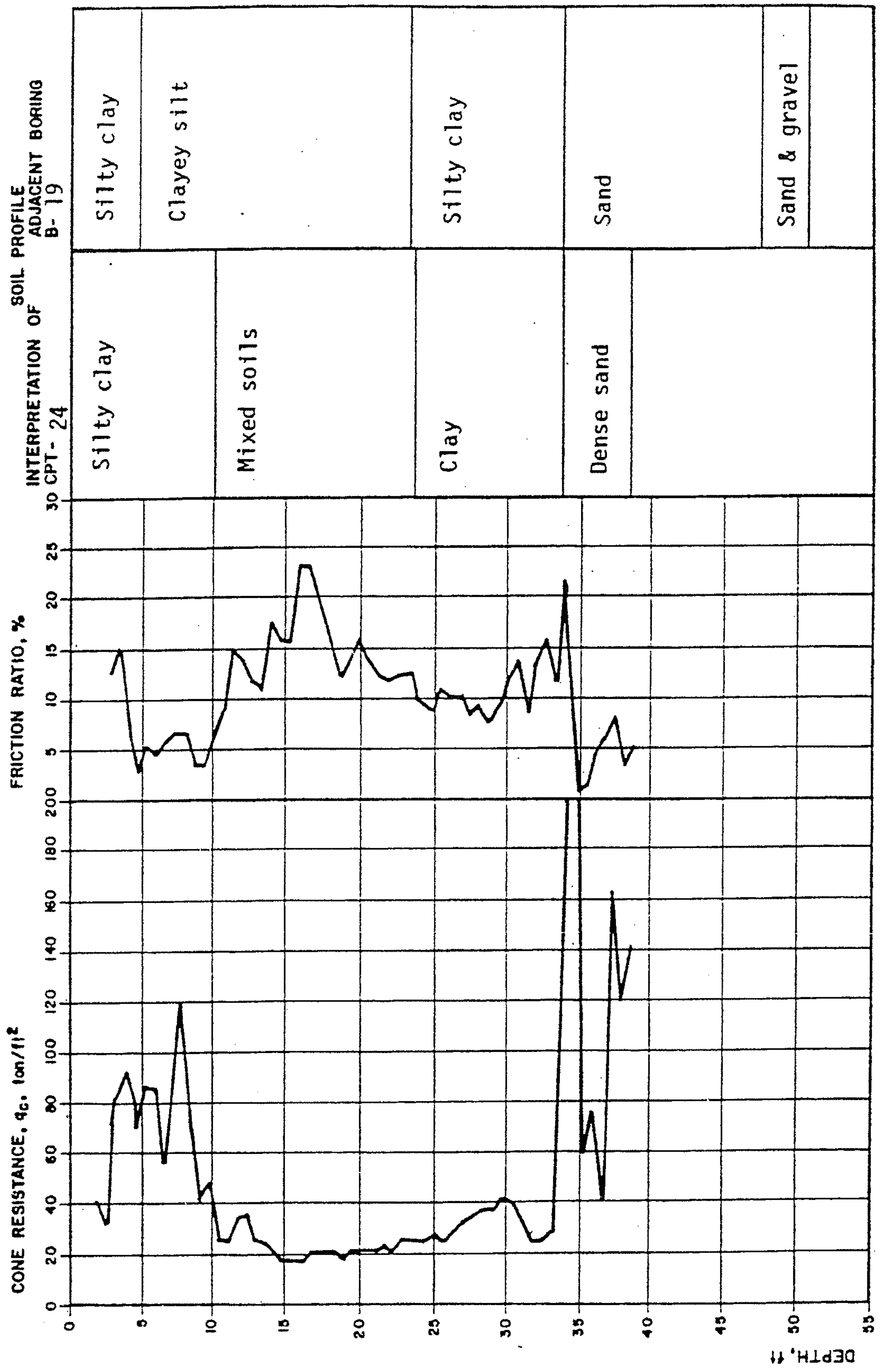
CHEVRON PARK
SAN RAMON, CALIFORNIA

LOG OF CPT - 23

PROJECT NO. B-1109-1

PLATE

B-25



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PREPARED BY: PLC DATE: 8/81
CHECKED BY: DCM DATE: 8/81

CHEVRON PARK
SAN RAMON, CALIFORNIA

LOG OF CPT - 24

PROJECT NO. B-1109-1

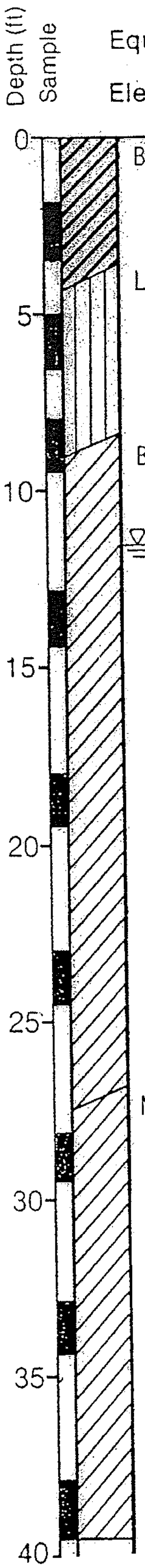
PLATE
B-26

Geotechnical Investigation, Bishop Ranch 1 Development, Bishop Ranch Business Park, San Ramon, California, prepared for Sunset Development Company, prepared by Harding Lawson Associates (HLA), HLA Project 8294,019.03, dated October 6, 1986

Equipment 6" Solid Auger

Elevation 438.5 Feet** Date 7/8/86

Laboratory Tests	Blows/foot*	Moisture Content (%)	Dry Density (pcf)
	25	14	119
TxUU 3025 (420) (Plate 14)	20	21	103
	10		
	11	34	89
TxUU (S) 910 (850)	8		
	16		
	20	20	112
	18		
	19	19	111



BLACK SILTY CLAY (CH)
hard, dry, desiccated,
presence of organics

LIGHT BROWN CLAYEY SILT (ML)
very stiff, moist,
presence of sand

BROWN SILTY CLAY (CL)
stiff, moist, presence of sand

▽ 8/12/86

wet

stiff at 24.0 Feet

MOTTLED GREY-BROWN SANDY CLAY (CL)
very stiff, moist, presence
of rock fragments

white streaks at 34.0 Feet

Bottom of Boring 39.5 Feet

*Blow counts have been converted to Standard Penetration Test (SPT) values (N-values).

**Elevations estimated from Site Plan, Plate 1.

Harding Lawson Associates
Engineers, Geologists
& Geophysicists

LOG OF BORING 1
Bishop Ranch 1
San Ramon, California

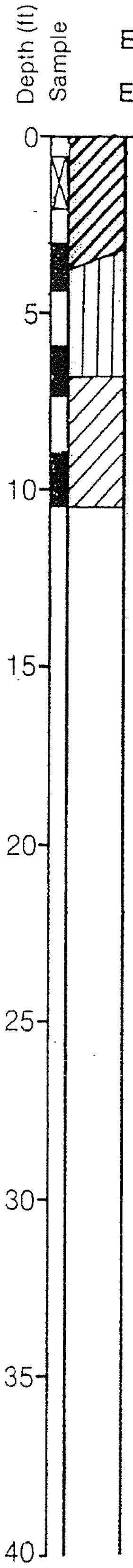
PLATE
2

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AC	8294,019.03		8/86		

Equipment 6" Solid Auger

Elevation 438.0 Feet Date 7/8/86

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)	
LL=64; PI=47 (Plate 10)				BLACK SILTY CLAY (CH) hard, dry, desiccated, presence of organics
	16			BROWN CLAYEY SILT (ML) very stiff, moist, presence of sand
	12			LIGHT BROWN SANDY CLAY (CL) stiff, moist.
	20			
				Bottom of Boring 10.5 Feet



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& Geophysicists

LOG OF BORING 2
Bishop Ranch 1
San Ramon, California

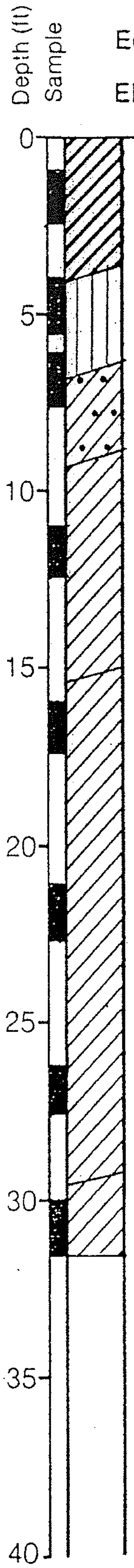
PLATE
3

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AC	8294,019.03		8/86		

Equipment 6" Solid Auger

Elevation 439.0 Feet Date 7/8/86

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)
	24		
	14		
MA (Plate 11)	11		
	8		
	15		
	15		
	13		
	25		



BLACK SILTY CLAY (CH)
hard, dry, desiccated,
presence of organics

LIGHT BROWN CLAYEY SILT (ML)
very stiff, dry,
presence of sand

BROWN CLAYEY SAND (SC)
medium dense, wet, presence
of gravel

BROWN SANDY CLAY (CL)
medium stiff to stiff,
moist

GREY-BROWN SILTY CLAY (CL)
very stiff, moist

MOTTLED GREY-BROWN SILTY CLAY (CL)
very stiff to hard, moist

Bottom of Boring 31.5 Feet

Harding Lawson Associates
Engineers, Geologists
& Geophysicists

LOG OF BORING 3
Bishop Ranch 1
San Ramon, California

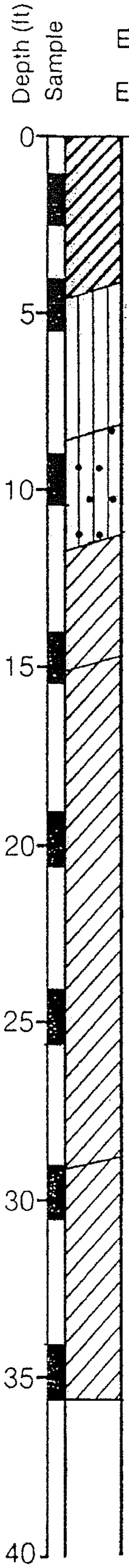
PLATE 4

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AC	8294,019.03		8/86		

Equipment 6" Solid Auger

Elevation 440.0 Feet Date 7/8/86

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)
	16	13	113
	16		
38%< No. 200 Sieve	19	20	112
TxUU 986 (750) (Plate 15)	8	35	88
	13		
	20		
	26		
	34		



BLACK SILTY CLAY (CH)
hard, dry, desiccated,
presence of organics

LIGHT BROWN CLAYEY SILT (ML)
very stiff, dry

BROWN SILTY SAND (SM)
medium dense, moist, fine-grained,
trace gravel and clay

BROWN SILTY CLAY (CL)
medium stiff to stiff, moist,
trace sand

GREY SILTY CLAY (CL)
stiff to very stiff, moist

very stiff at 24.0 Feet

GREY-BROWN SILTY CLAY (CL)
very stiff, moist

hard at 34.0 Feet

Bottom of Boring 35.5 Feet

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Engineers, Geologists
& Geophysicists

LOG OF BORING 4
Bishop Ranch 1
San Ramon, California

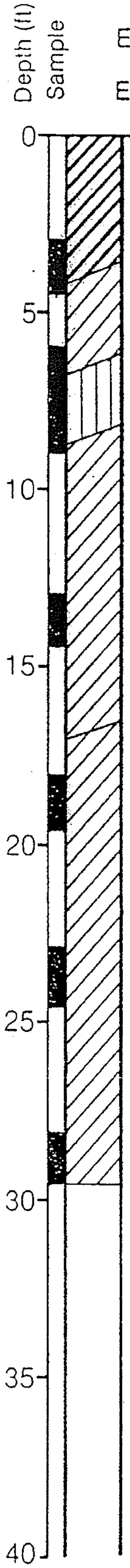
PLATE
5

DRAWN AC
JOB NUMBER 8294,019.03
APPROVED
DATE 8/86
REVISED
DATE

Equipment 6" Solid Auger

Elevation 441.5 Feet Date 7/8/86

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)
	26		
	18		
	18		
	10		
	14		
	10		
	23		



BLACK SILTY CLAY (CH)
hard, dry, desiccated,
presence of organics

DARK BROWN SILTY CLAY (CL)
hard, dry, desiccated

BROWN CLAYEY SILT (ML)
stiff, moist, sandy

BROWN SANDY CLAY (CL)
stiff, moist

becoming medium stiff at 12.0 Feet

GREY-BROWN SILTY CLAY (CL)
very stiff, moist

Bottom of Boring 29.5 Feet

Harding Lawson Associates
Engineers, Geologists
& Geophysicists

LOG OF BORING 5
Bishop Ranch 1
San Ramon, California

PLATE 6

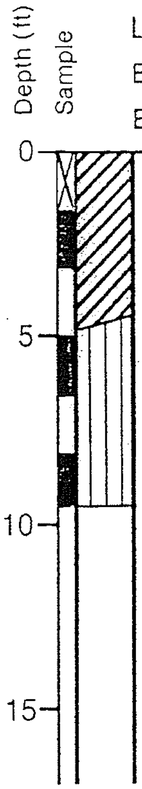
DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AC	8294,019.03		8/86		

LOG OF BORING 6

Equipment 6" Solid Auger

Elevation 442.5 Feet Date 7/8/86

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)
	22		
	18		
	8		



BLACK SILTY CLAY (CH)
hard, dry, desiccated,
presence of organics

BROWN CLAYEY SILT (ML)
stiff, moist

medium stiff, sandy at 8.0 Feet

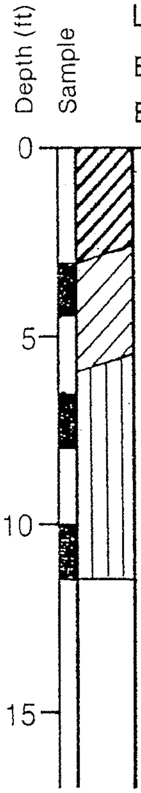
Bottom of Boring 9.5 Feet

LOG OF BORING 7

Equipment 6" Solid Auger

Elevation 440.0 Feet Date 7/3/86

Blows/foot
19
11
8



BLACK SILTY CLAY (CH)
hard, dry, desiccated,
presence of organics
BROWN SILTY CLAY (CL)
hard, dry, desiccated,

BROWN CLAYEY SILT (ML)
stiff, moist, presence of
sand lenses

medium stiff at 10 Feet

Bottom of Boring 11.5 Feet

Harding Lawson Associates
Engineers, Geologists
& Geophysicists

LOG OF BORINGS 6 & 7
Bishop Ranch 1
San Ramon, California

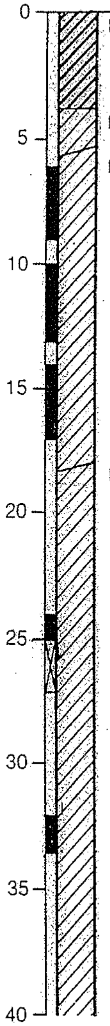
PLATE
7

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AC	8294,019.03		8/86		

Equipment 6" Rotary Wash

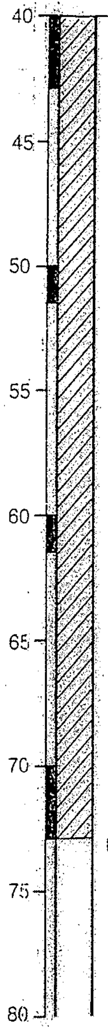
Elevation 440.0 Feet Date 7/17/86

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	
				0	BLACK SILTY CLAY (CH) hard, dry, desiccated, presence of organics
					BROWN SILTY CLAY (CL) hard, dry
TxUU 516 (420) (Plate 16)	*	20	104		BROWN SANDY CLAY (CL) stiff, moist with concretions of well-cement calcareous nodules at 8.5 Feet presence of sand lenses
Consol (Plate 13) MA (Plate 12)	*	29	94		
	*				
					BROWN-GREY SILTY CLAY (CL) stiff to very stiff, moist, presence of clayey sand lenses
	*				
					hard at 32.0 Feet
	25				presence of calcareous nodules



(Continuation of Log)

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	
				40	sandy
TxUU(S) 1370 (1400)	*				
	36				
	57				
					trace gravel
	*				
					Bottom of Boring 73.0 Feet



*Samples obtained with a Pitcher barrel.

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Engineers, Geologists
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LOG OF BORING 8
Bishop Ranch 1
San Ramon, California

PLATE 8

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AC	8294,019.03		8/86		

MAJOR DIVISIONS					TYPICAL NAMES
COARSE - GRAINED SOILS MORE THAN HALF IS LARGER THAN NO. 200 SIEVE	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN No. 4 SIEVE SIZE	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW		WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES
			GP		POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES
		GRAVELS WITH OVER 12% FINES	GM		SILTY GRAVELS, POORLY GRADED GRAVEL-SAND-SILT MIXTURES
			GC		CLAYEY GRAVELS, POORLY GRADED GRAVEL-SAND-CLAY MIXTURES
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE	CLEAN SANDS WITH LITTLE OR NO FINES	SW		WELL-GRADED SANDS, GRAVELLY SANDS
			SP		POORLY GRADED SANDS, GRAVELLY SANDS
		SANDS WITH OVER 12% FINES	SM		SILTY SANDS, POORLY GRADED SAND-SILT MIXTURES
			SC		CLAYEY SANDS, POORLY GRADED SAND-CLAY MIXTURES
FINE - GRAINED SOILS MORE THAN HALF IS SMALLER THAN NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT 50% OR LESS		ML		INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS, OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL		INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL		ORGANIC CLAYS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50%		MH		INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH		INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH		ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			Pt		PEAT AND OTHER HIGHLY ORGANIC SOILS

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM 2487-85)

Perm — Permeability
Consol — Consolidation
LL — Liquid Limit (%)
PI — Plastic Index (%)
G_s — Specific Gravity
MA — Particle Size Analysis
■ — "Undisturbed" Sample
☒ — Bulk or Classification Sample

	Shear Strength (psf)	Confining Pressure		
TxUU (FM) or (S)	3200	(2600)	—	Unconsolidated Undrained Triaxial Shear (field moisture or saturated)
TxCU (P)	3200	(2600)	—	Consolidated Undrained Triaxial Shear (with or without pore pressure measurement)
TxCD	3200	(2600)	—	Consolidated Drained Triaxial Shear
SSCU (P)	3200	(2600)	—	Simple Shear Consolidated Undrained (with or without pore pressure measurement)
SSCD	3200	(2600)	—	Simple Shear Consolidated Drained
DSCD	2700	(2000)	—	Consolidated Drained Direct Shear
UC	470		—	Unconfined Compression
LVS	700		—	Laboratory Vane Shear

KEY TO TEST DATA

Harding Lawson Associates
Engineers, Geologists
& Geophysicists

SOIL CLASSIFICATION & KEY TO TEST DATA
Bishop Ranch 1
San Ramon, California

PLATE
9

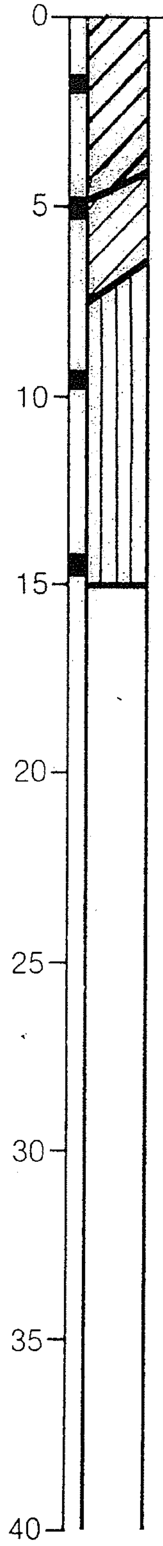
DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AC	8294,019.03		8/86		

Soil Investigation, Bollinger Business Center, Bishop Ranch, San Ramon, California, prepared for Sunset Development Company, prepared by Harding Lawson Associates (HLA), HLA Project 8294,009.03, dated April 6, 1982

Equipment Solid Stem Auger

Elevation 442 feet ** Date 3/17/82

Laboratory Tests	Blows/foot *	Moisture Content (%)	Dry Density (pcf)
Atterberg Limits LL = 54 PL = 20 PI = 34	5		
	17		
	11		
	11		



DARK GRAY SILTY CLAY (CH)
medium stiff, wet

LIGHT BROWN SANDY CLAY (CL)
very stiff, moist

LIGHT BROWN CLAYEY SILT (ML)
stiff, moist

Ground water not encountered

NOTES:

*Blows/foot have been converted to Standard Penetration Test "N-values"

**Elevations referred to Subdivision Map 5967, Bishop Ranch by Bryan & Murphy Assoc., Inc., dated October 14, 1980.

Datum is Mean Sea Level

Harding Lawson Associates
Engineers. Geologists
& Geophysicists

Log of Boring 1
Bollinger Business Center
San Ramon, California

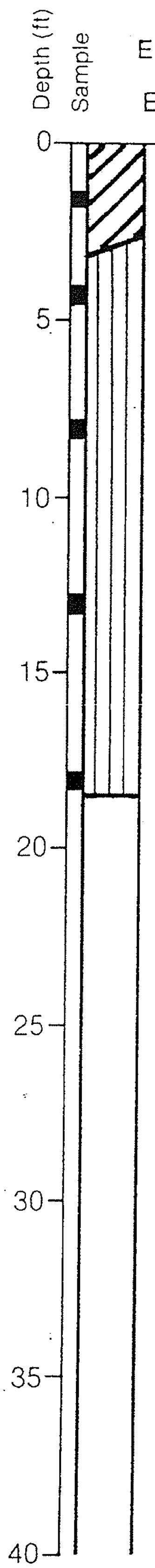
PLATE
2

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
M.Rice	8294,009.03	tc	3/17/82		

Equipment Solid Stem Auger

Elevation 442 feet Date 3/17/82

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)
	18	24.3	99
	12		
	10	23.0	99
	18	21.4	101
	11	25.2	96



BLACK SILTY CLAY (CH)
very stiff, moist

LIGHT BROWN CLAYEY SILT (ML)
stiff, moist

layer of BROWN SILTY SAND (SM) from 12.5 feet to 13.0 feet

Ground water not encountered

Harding Lawson Associates
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Log of Boring 2
Bollinger Business Center
San Ramon, California

PLATE
3

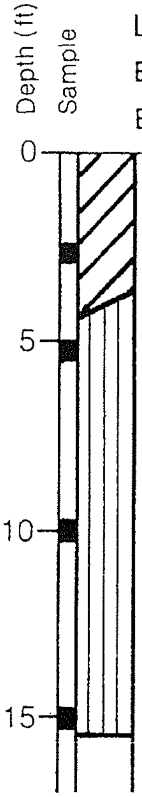
DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
M.Rice	8294,009.03	tc	3/17/82		

LOG OF BORING 3

Equipment Solid Stem Auger

Elevation 444 feet Date 3/17/82

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)
Atterberg Limits LL = 50 PL = 20 PI = 30	17		
	12	17.8	105
	9		
	14		



BLACK SILTY CLAY (CH)
stiff, moist

LIGHT BROWN CLAYEY SILT (ML)
stiff, moist

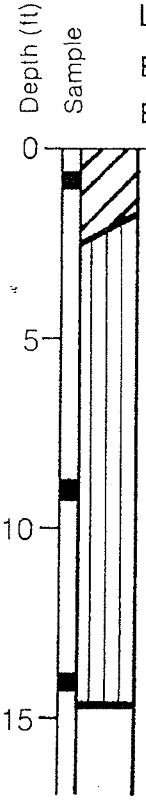
Ground water not encountered

LOG OF BORING 4

Equipment Solid Stem Auger

Elevation 447 feet Date 3/17/82

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)
	9		
	16		
TXUU 700 (750)	9	24.8	96
	30		



BLACK SILTY CLAY (CH)
stiff, moist

LIGHT BROWN CLAYEY SILT (ML)
very stiff, moist

becomes medium stiff

becomes SANDY, cemented, clay content decreases

Groundwater not encountered

Harding Lawson Associates
Engineers, Geologists
& Geophysicists

Log of Boring 3,4
Bollinger Business Center
San Ramon, California

PLATE
4

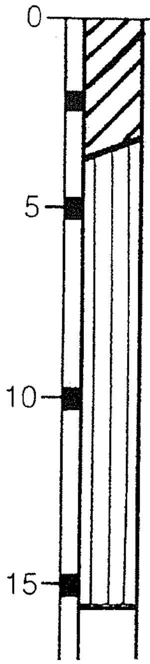
DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
M.Rice	8294,009.03	tc	3/17/82		

LOG OF BORING 5

Equipment Solid Stem Auger

Elevation 448 feet Date 3/17/82

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)
TXUU 2050 (250)	13	21.6	104
Atterberg Limits LL = 37 PL = 18 PI = 19	14		
	12		
	22	20.5	104



DARK BROWN SILTY CLAY (CH)
stiff, moist

BROWN SANDY SILT (ML)
stiff, moist, interbedded with layers of BROWN SILTY CLAY (CL)

becomes very stiff below 14 feet, with some gravel at 14.0 feet-14.5 feet

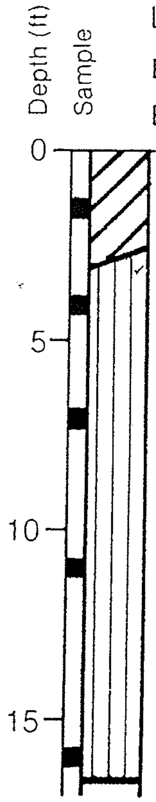
Ground water not encountered

LOG OF BORING 6

Equipment Solid Stem Auger

Elevation 444 feet Date 3/17/82

Laboratory Tests	Blows/foot	Moisture Content (%)	Dry Density (pcf)
TXUU 1660 (500)	13	18.2	109
	13		
	10		
	14		
	35		



BLACK SILTY CLAY (CH)
stiff, moist

LIGHT BROWN SANDY CLAYEY SILT (ML)
stiff, moist

sand content decreases below 6 feet

sand content increases below 11 feet

becomes hard, cemented

Ground water not encountered

Harding Lawson Associates
Engineers, Geologists
& Geophysicists

Log of Boring 5,6
Bollinger Business Center
San Ramon, California

PLATE
5

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
M.Rice	8294.009.03	tc	3/17/82		

RF3A

MAJOR DIVISIONS					TYPICAL NAMES
COARSE GRAINED SOILS MORE THAN HALF IS LARGER THAN #200 SIEVE	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE SIZE	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW	⁘	WELL GRADED GRAVELS, GRAVEL - SAND MIXTURES
			GP	⁘	POORLY GRADED GRAVELS, GRAVEL - SAND MIXTURES
		GRAVELS WITH OVER 12% FINES	GM	▥	SILTY GRAVELS, POORLY GRADED GRAVEL - SAND - SILT MIXTURES
			GC	▨	CLAYEY GRAVELS, POORLY GRADED GRAVEL - SAND - CLAY MIXTURES
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE	CLEAN SANDS WITH LITTLE OR NO FINES	SW	⁘	WELL GRADED SANDS, GRAVELLY SANDS
			SP	⁘	POORLY GRADED SANDS, GRAVELLY SANDS
		SANDS WITH OVER 12% FINES	SM	▥	SILTY SANDS, POORLY GRADED SAND - SILT MIXTURES
			SC	▩	CLAYEY SANDS, POORLY GRADED SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN HALF IS SMALLER THAN #200 SIEVE	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50		ML	▥	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS, OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	▨	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	▥	ORGANIC CLAYS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50		MH	▥	INORGANIC SILTS, MICACEOUS OR DIATOMACIOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH	▨	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	▨	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			Pt	≋	PEAT AND OTHER HIGHLY ORGANIC SOILS

UNIFIED SOIL CLASSIFICATION SYSTEM

Consol — Consolidation

LL — Liquid Limit (in %)

PL — Plastic Limit (in %)

G_s — Specific Gravity

SA — Sieve Analysis

■ "Undisturbed" Sample

☒ Bulk Sample

	Shear Strength, psf	Confining Pressure, psf	
*Tx	320	(2600)	Unconsolidated Undrained Triaxial
TxCU	320	(2600)	Consolidated Undrained Triaxial
DS	2750	(2000)	Consolidated Drained Direct Shear
FVS	470		Field Vane Shear
*UC	2000		Unconfined Compression
LVS	700		Laboratory Vane Shear

Notes: (1) All strength tests on 2.8" or 2.4" diameter samples unless otherwise indicated.

(2) * Indicates 1.4" diameter sample.

KEY TO TEST DATA

Harding Lawson Associates
Engineers, Geologists
& Geophysicists

Soil Classification Chart
& Key to Test Data
Bollinger Business Center
San Ramon, California

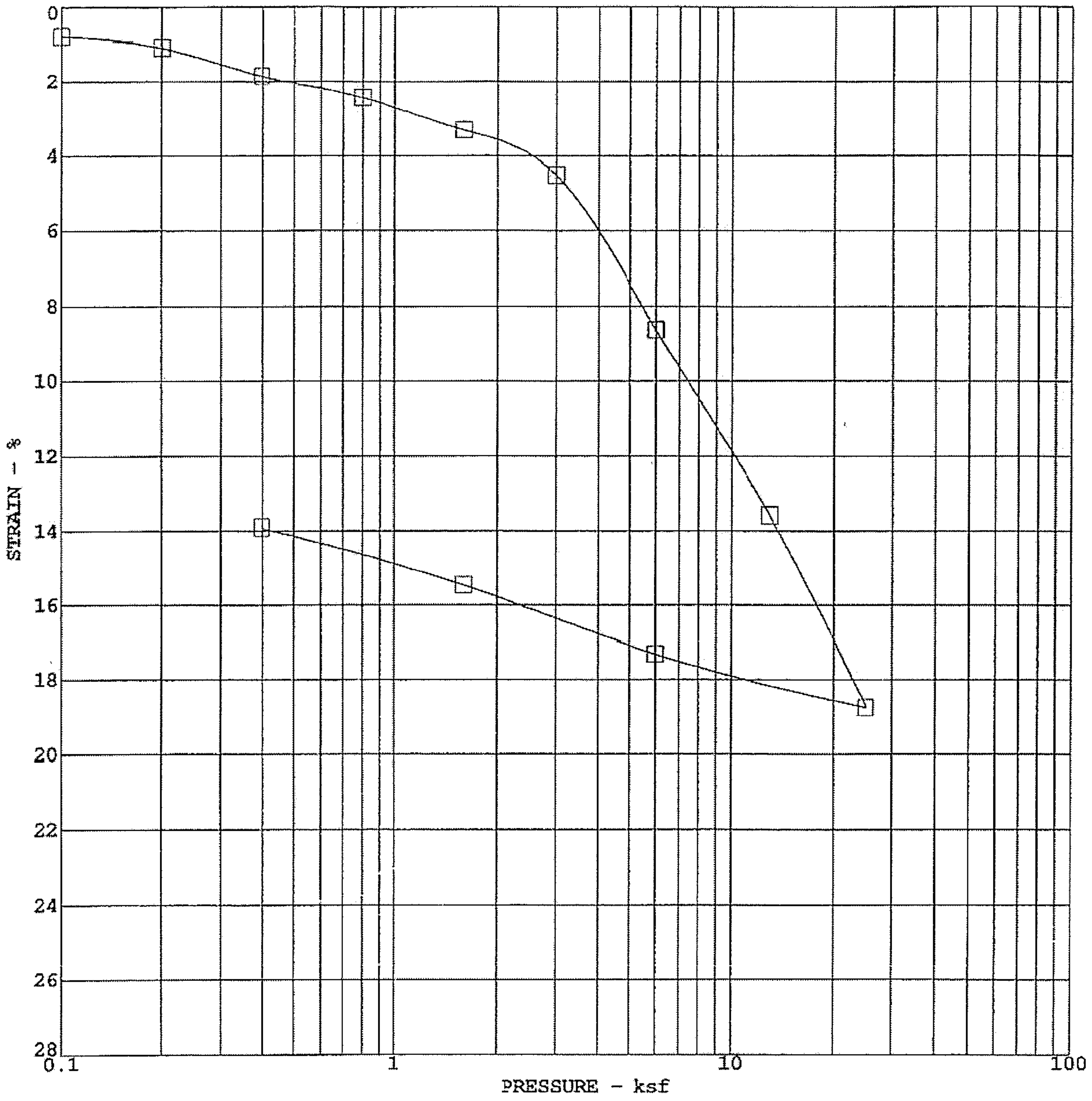
PLATE
6

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
M.Rice	8294.009.03	tc	3/17/82		

APPENDIX B

SELECT LABORATORY RESULTS FROM PRIOR INVESTIGATIONS

Geotechnical Investigation at Chevron/Texaco Campus Lots 16, 20 and 21 of the Bishop Ranch Business Park, San Ramon, California, prepared for Watry Design, prepared by Kleinfelder, Inc., Kleinfelder Project 53512/Geo, dated June 9, 2005



BORING NO. KB-1

DEPTH 21.0

DESCRIPTION Light Brown Fat Clay

PRECONSOLIDATION PRESSURE 3.20 ksf

COMPRESSION RATIO= $C_c/1+e_o$ **0.170**

RECOMPRESSION RATIO= $C_r/1+e_o$ **0.013**

LL = PL =

	INITIAL	FINAL
DRY DENSITY, lb/ft^3	92.5	105.6
WATER CONTENT, %	26.6	24.5
SAMPLE HEIGHT, in.		

KLEINFELDER

PROJECT NO. *53512-GEO*

CONSOLIDATION TEST

CHEVRON/TEXACO INVESTIGATION
CHEVRON-TEXACO WAY
SAN RAMON, CALIFORNIA

PLATE

-B-1

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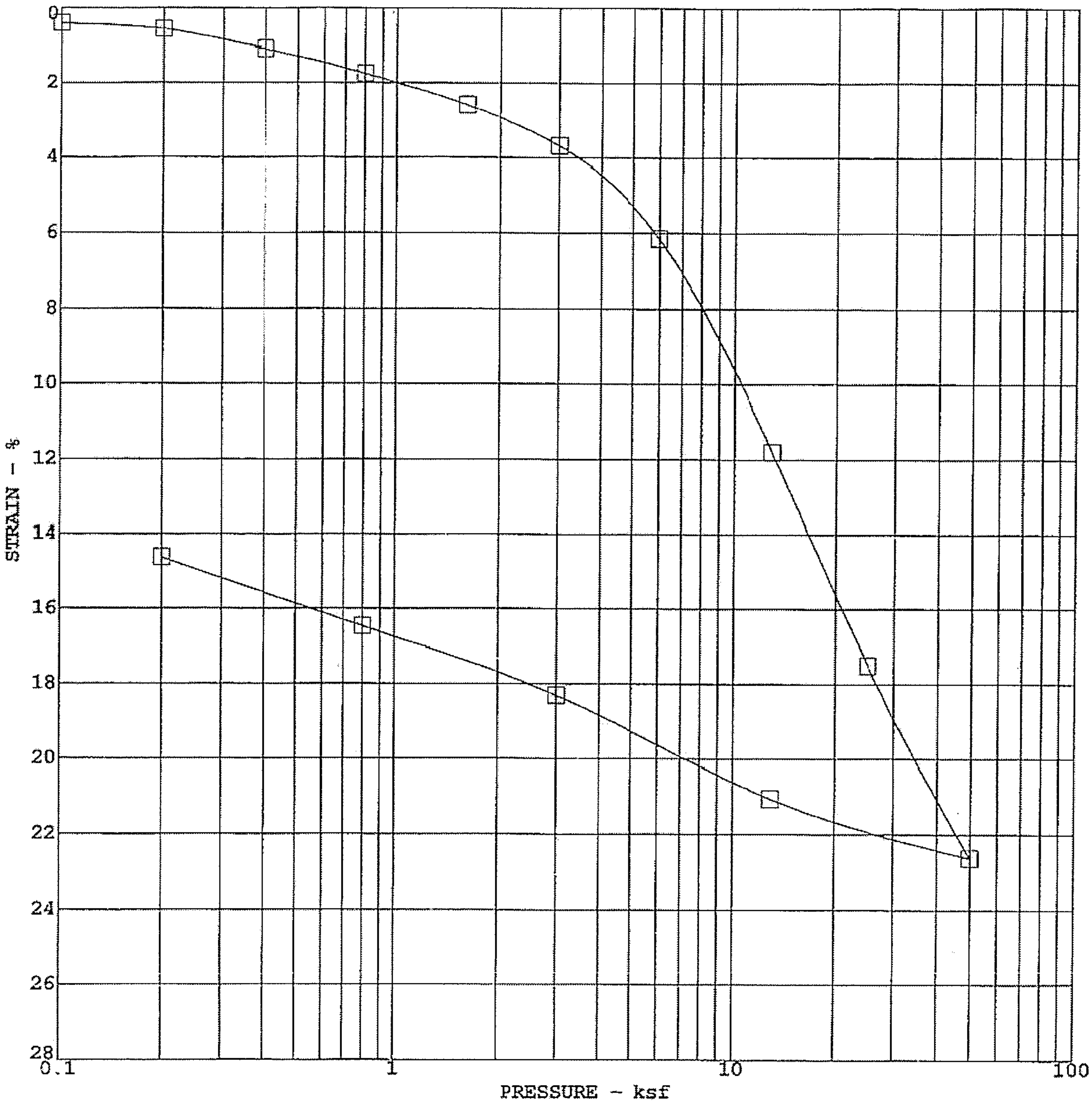

BORING NO. KB-2

DEPTH 31.0

DESCRIPTION Dark Gray Fat Clay

PRECONSOLIDATION PRESSURE 5.80 ksf

COMPRESSION RATIO= $C_c/1+e_o$ **0.210**

RECOMPRESSION RATIO= $C_r/1+e_o$ **0.035**

LL = PL =

	INITIAL	FINAL
DRY DENSITY, lb/ft^3	101.1	113.6
WATER CONTENT, %	20.8	17.8
SAMPLE HEIGHT, in.	.686	.5857

KLEINFELDER

PROJECT NO. *53512-GEO*

CONSOLIDATION TEST

CHEVRON/TEXACO INVESTIGATION
CHEVRON-TEXACO WAY
SAN RAMON, CALIFORNIA

PLATE

-B-2

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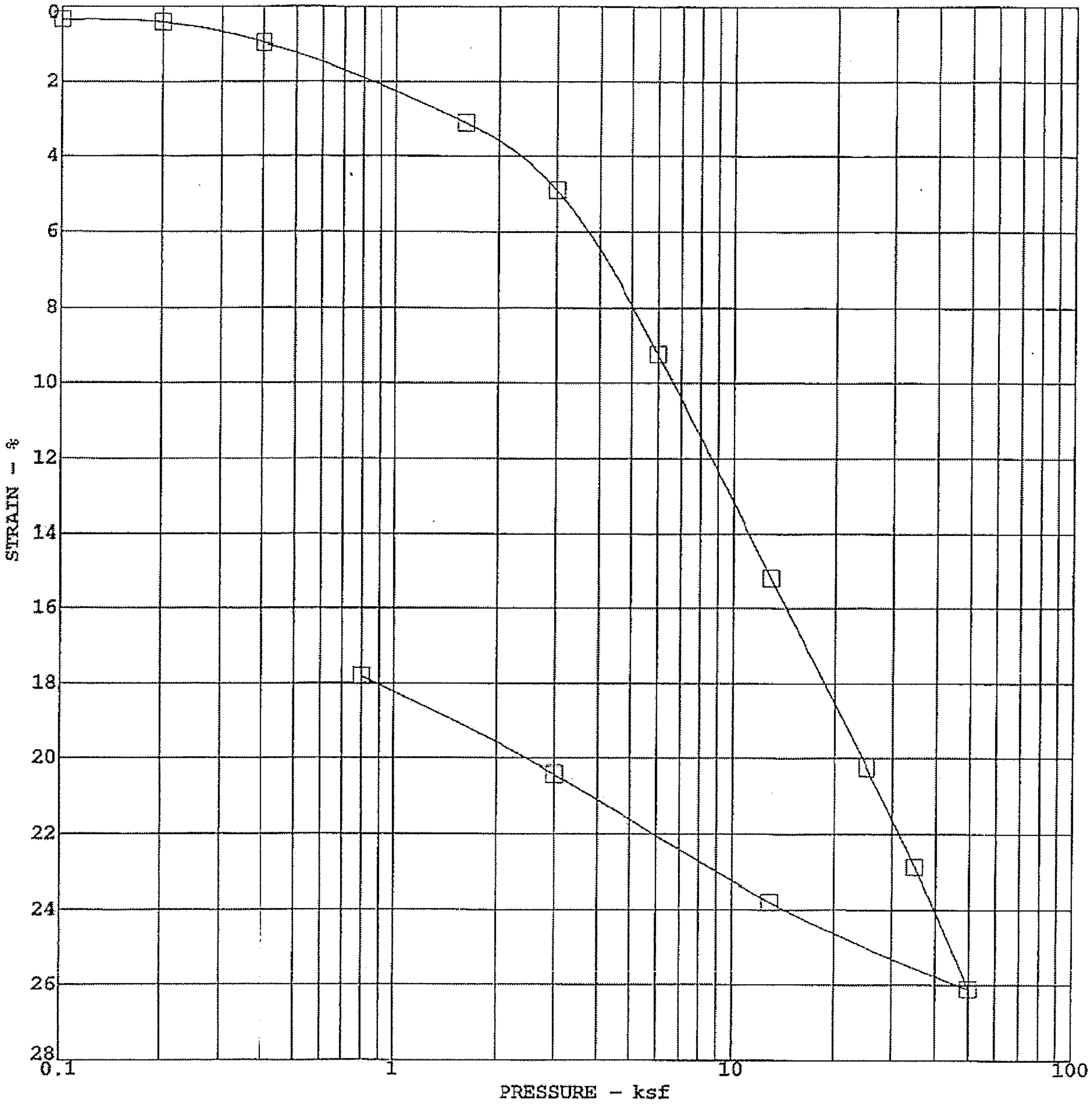

BORING NO. KB-3

DEPTH 16.0

DESCRIPTION Light Brown Silty Sandy Clay

PRECONSOLIDATION PRESSURE 3.20 ksf

COMPRESSION RATIO= $C_c/1+e_o$ **0.190**

RECOMPRESSION RATIO= $C_r/1+e_o$ **0.045**

LL = PL =

	INITIAL	FINAL
DRY DENSITY, lb/ft^3	88.1	103.5
WATER CONTENT, %	28.4	22.5
SAMPLE HEIGHT, in.	.687	.5646

KLEINFELDER

PROJECT NO. *53512-GEO*

CONSOLIDATION TEST

CHEVRON/TEXACO INVESTIGATION
CHEVRON-TEXACO WAY
SAN RAMON, CALIFORNIA

PLATE

-B-3

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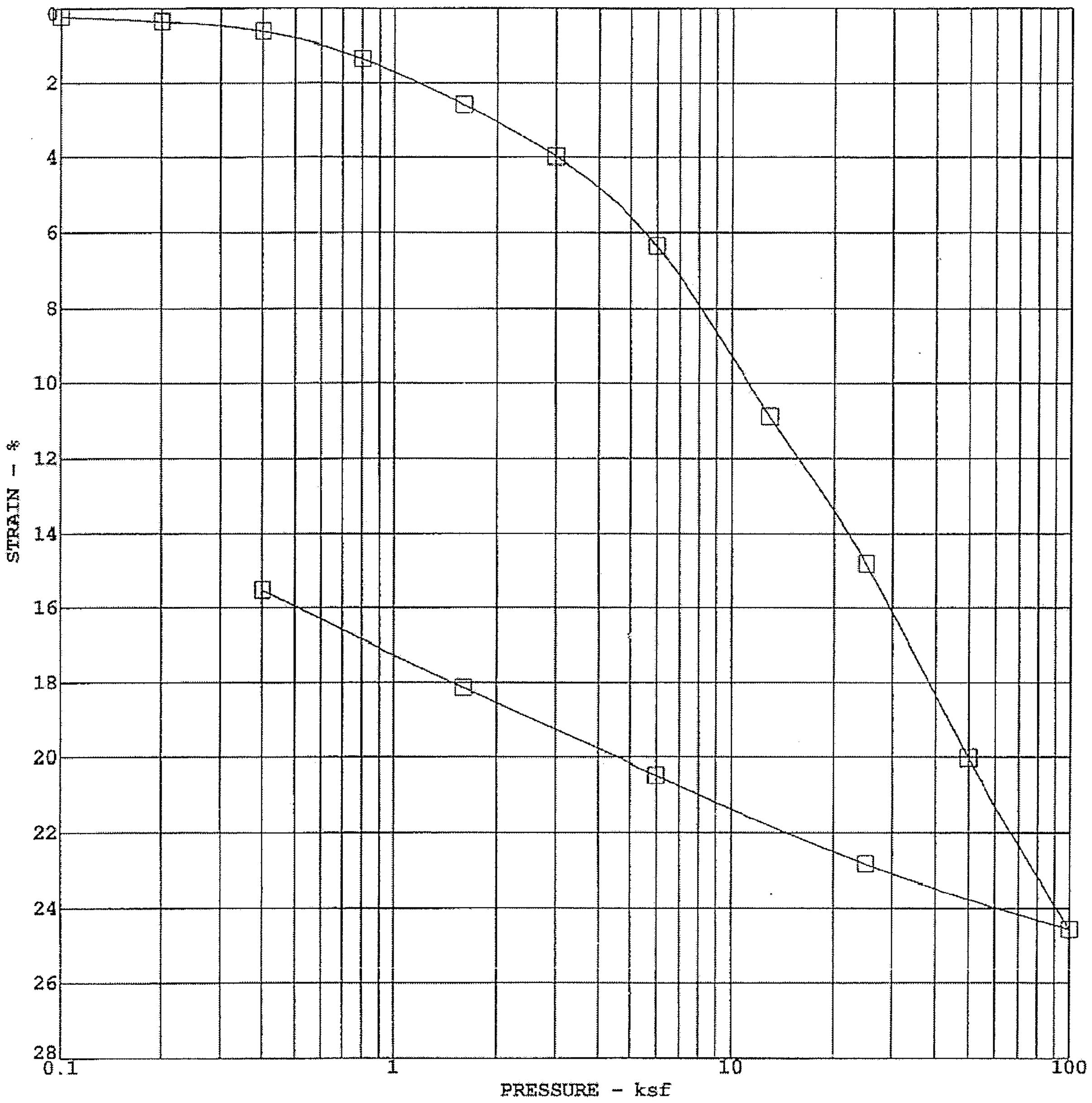

BORING NO. KB-4

DEPTH 26.0

DESCRIPTION Greenish-Brown Fat Clay

PRECONSOLIDATION PRESSURE 5.50 ksf

COMPRESSION RATIO= $C_c/1+e_o$ **0.150**

RECOMPRESSION RATIO= $C_r/1+e_o$ **0.040**

LL = ____ PL = ____

	INITIAL	FINAL
DRY DENSITY, lb/ft^3	93.5	109.8
WATER CONTENT, %	28.3	21.4
SAMPLE HEIGHT, in.	.637	.5381

KLEINFELDER

PROJECT NO. *53512-GEO*

CONSOLIDATION TEST

CHEVRON/TEXACO INVESTIGATION
CHEVRON-TEXACO WAY
SAN RAMON, CALIFORNIA

PLATE

-B-4

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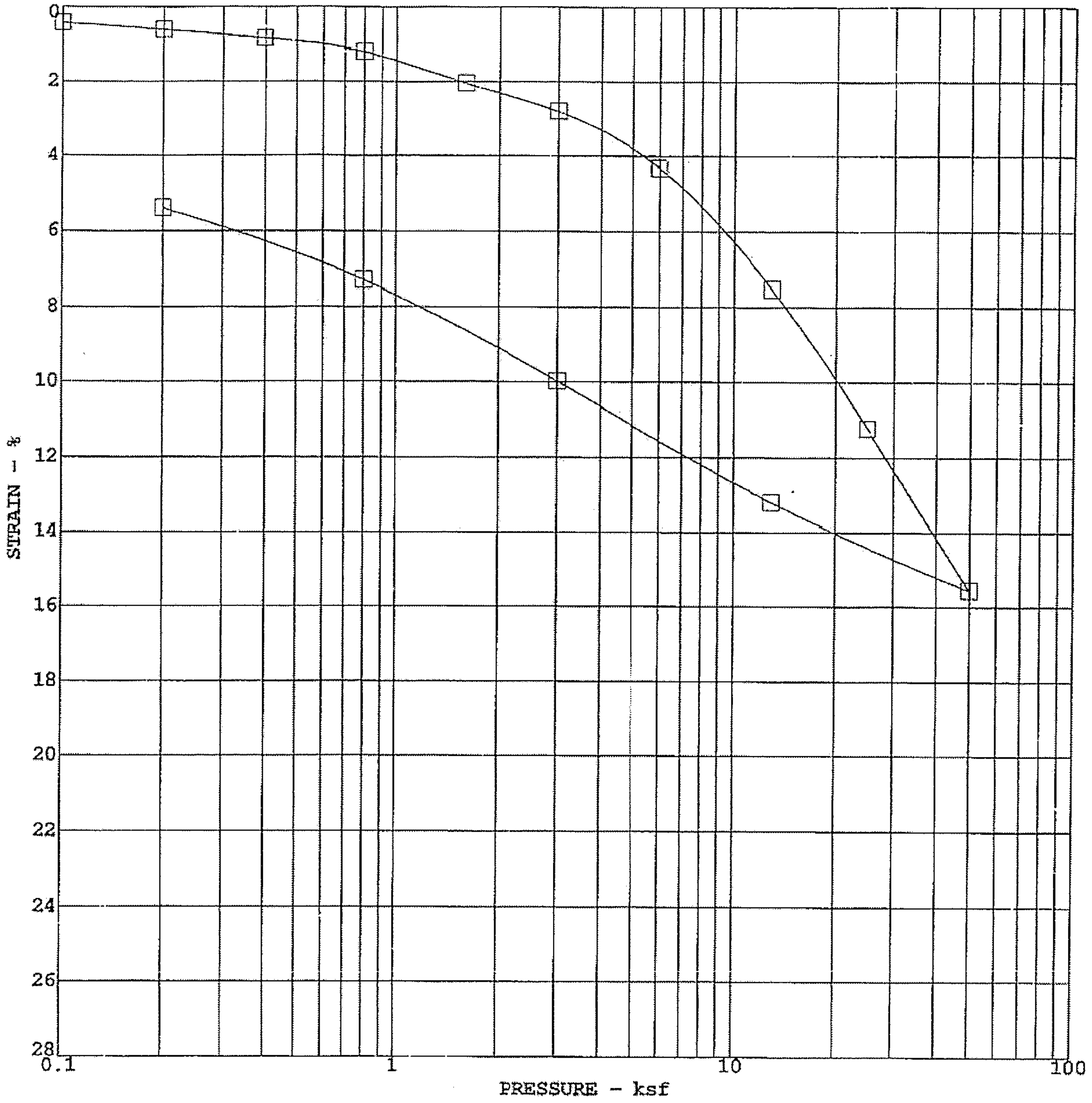

BORING NO. KB-5

DEPTH 31.0

DESCRIPTION Very Dark Greenish-Gray Fat Clay

PRECONSOLIDATION PRESSURE 7.50 ksf

COMPRESSION RATIO= $C_c/1+e_o$ **0.140**

RECOMPRESSION RATIO= $C_r/1+e_o$ **0.040**

LL = PL =

	INITIAL	FINAL
DRY DENSITY, lb/ft^3	103.9	109.2
WATER CONTENT, %	22.7	22.5
SAMPLE HEIGHT, in.	.63	.5961

KLEINFELDER

PROJECT NO. 53512-GEO

CONSOLIDATION TEST

CHEVRON/TEXACO INVESTIGATION
CHEVRON-TEXACO WAY
SAN RAMON, CALIFORNIA

PLATE

-B-5

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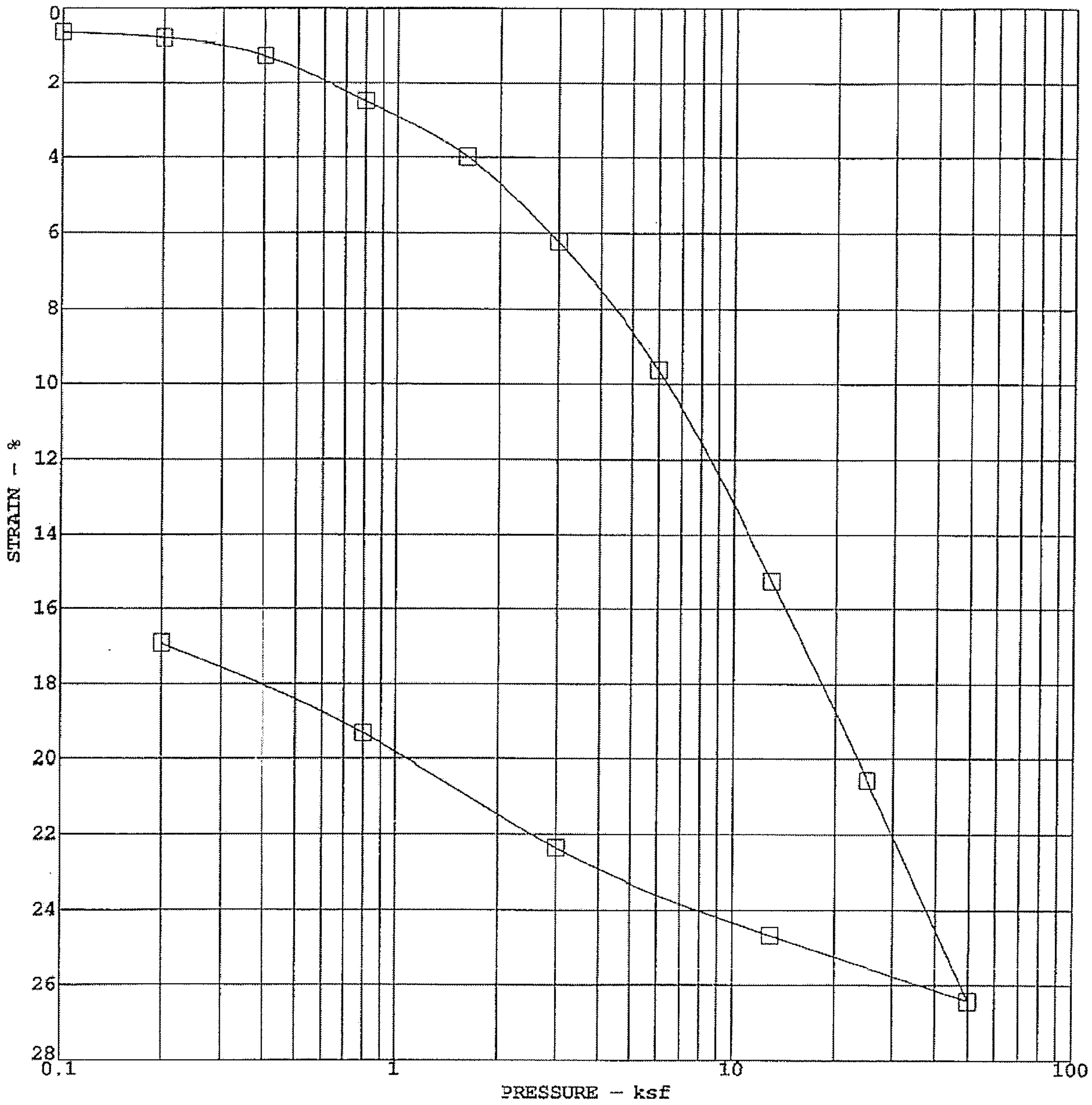

BORING NO. KB-6

DEPTH 21.0

DESCRIPTION Olive-Brown Silty Lean Clay

PRECONSOLIDATION PRESSURE 3.80 ksf

COMPRESSION RATIO= $C_c/1+e_o$ 0.210

RECOMPRESSION RATIO= $C_r/1+e_o$ 0.040

LL = PL =

	INITIAL	FINAL
DRY DENSITY, lb/ft^3	111.7	128.2
WATER CONTENT, %	28.4	23.4
SAMPLE HEIGHT, in.	.566	.4702

KLEINFELDER

PROJECT NO. *53512-GEO*

CONSOLIDATION TEST

CHEVRON/TEXACO INVESTIGATION
CHEVRON-TEXACO WAY
SAN RAMON, CALIFORNIA

PLATE

-B-6

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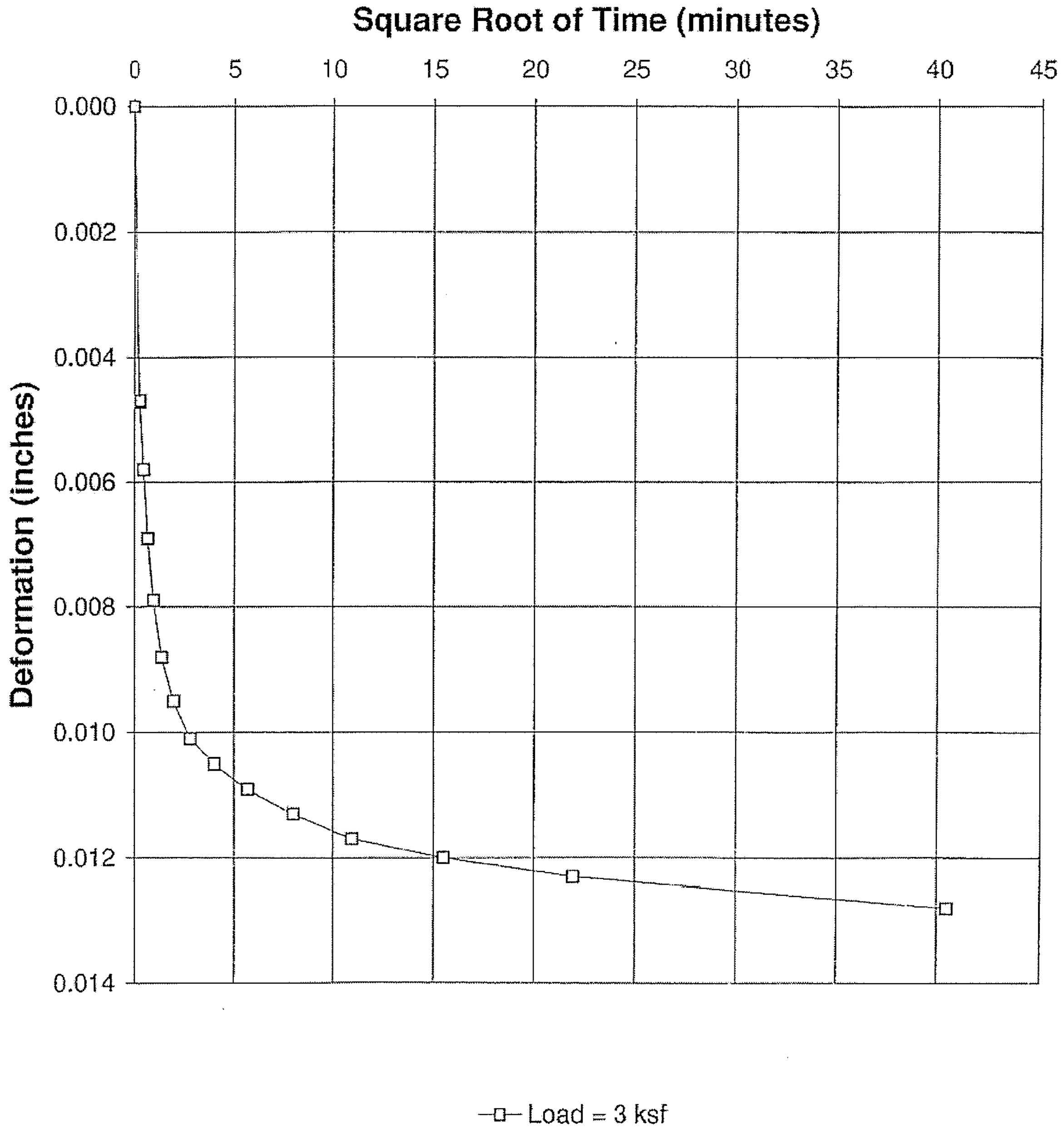
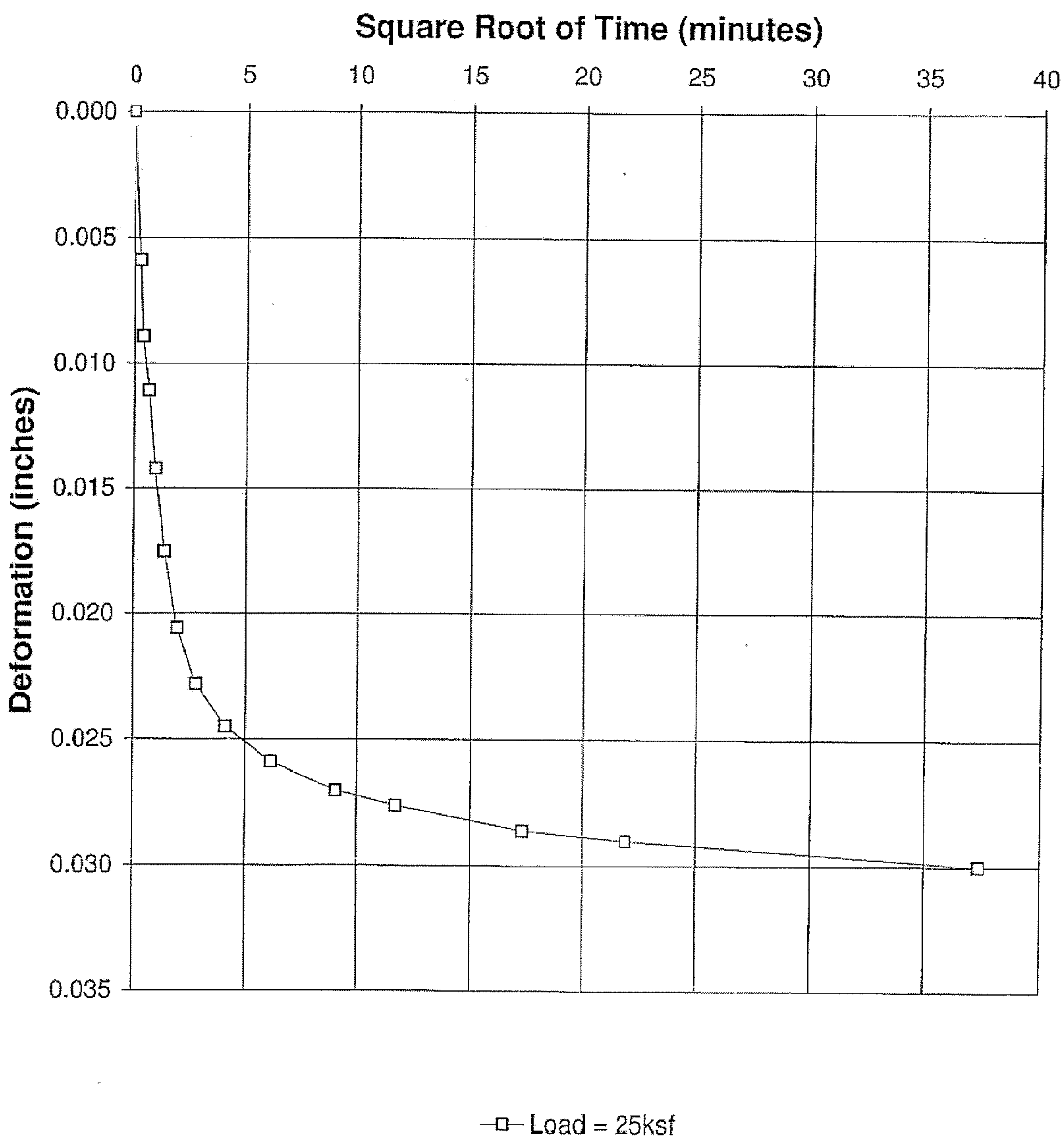
Time Rate of Consolidation



Boring No. KB-6 **Depth:** 21 ft.

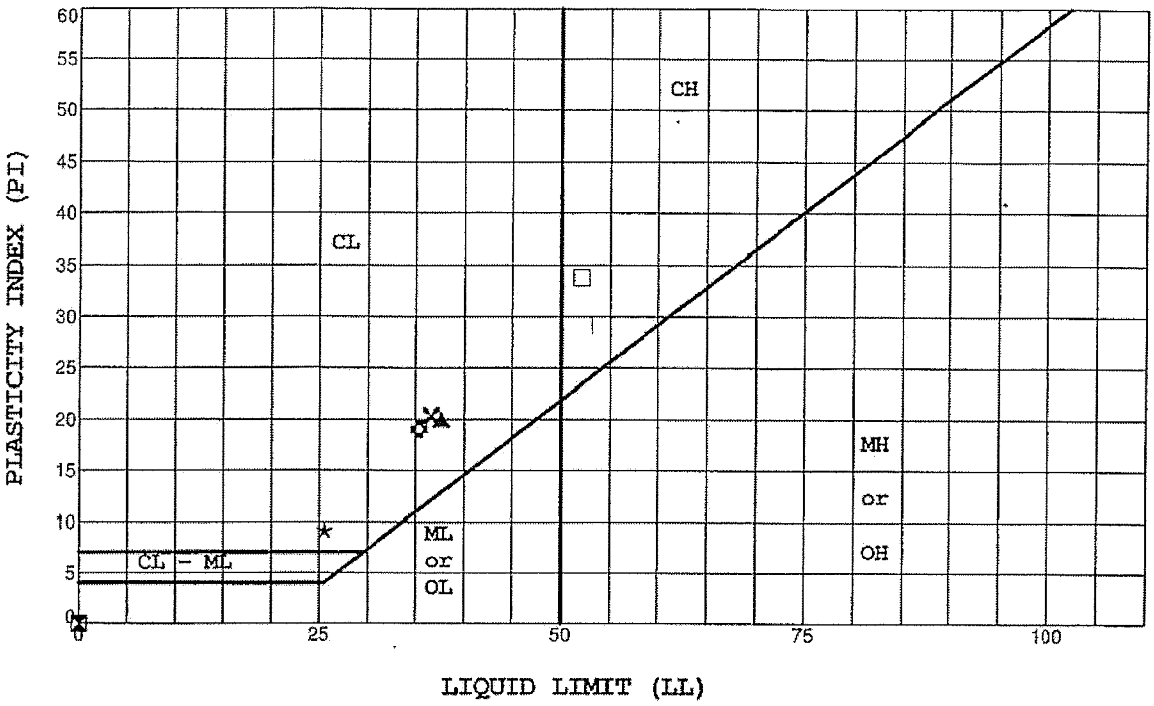
KLEINFELDER	Chevron/Texaco Investigation Chevron-Texaco Way San Ramon, California	*Plate*
Project No.: 53512	**CONSOLIDATION/TIME RATE**	B-7

Time Rate of Consolidation



Boring No. KB-6 **Depth:** 21 ft.

KLEINFELDER	Chevron/Texaco Investigation Chevron-Texaco Way San Ramon, California	*Plate*
Project No.: 53512	**CONSOLIDATION/TIME RATE**	B-8



Symbol	Boring	Depth	LL	PL	PI	Sample Description
□	KB-1	5.5	52	18	34	Black Clay
☒	KB-1	9.5	NP	NP	NP	Light Brown Silty Sand
▲	KB-2	16.0	38	18	20	Light Brown Sandy Clay
★	KB-3	4.0	26	16	9	Light Brown Clayey Sand
✕	KB-4	10.5	37	16	20	Dark Brown Sandy Clay
✿	KB-5	10.0	35	16	19	Brown Sandy Clay

Unified Soil Classification

Fine Grained Soil Groups

Symbol	LL < 50	Symbol	LL > 50
ML	Inorganic clayey silts to very fine sands of slight plasticity	MH	Inorganic silts and clayey silts of high plasticity
CL	Inorganic clays of low to medium plasticity	CH	Inorganic clays of high plasticity
OL	Organic silts and organic silty clays of low plasticity	OH	Organic clays of medium to high plasticity, organic silts

KLEINFELDER

PLASTICITY CHART

CHEVRON/TEXACO INVESTIGATION
CHEVRON-TEXACO WAY
SAN RAMON, CALIFORNIA

PLATE

B-9

PROJECT NO. 53512-GEO

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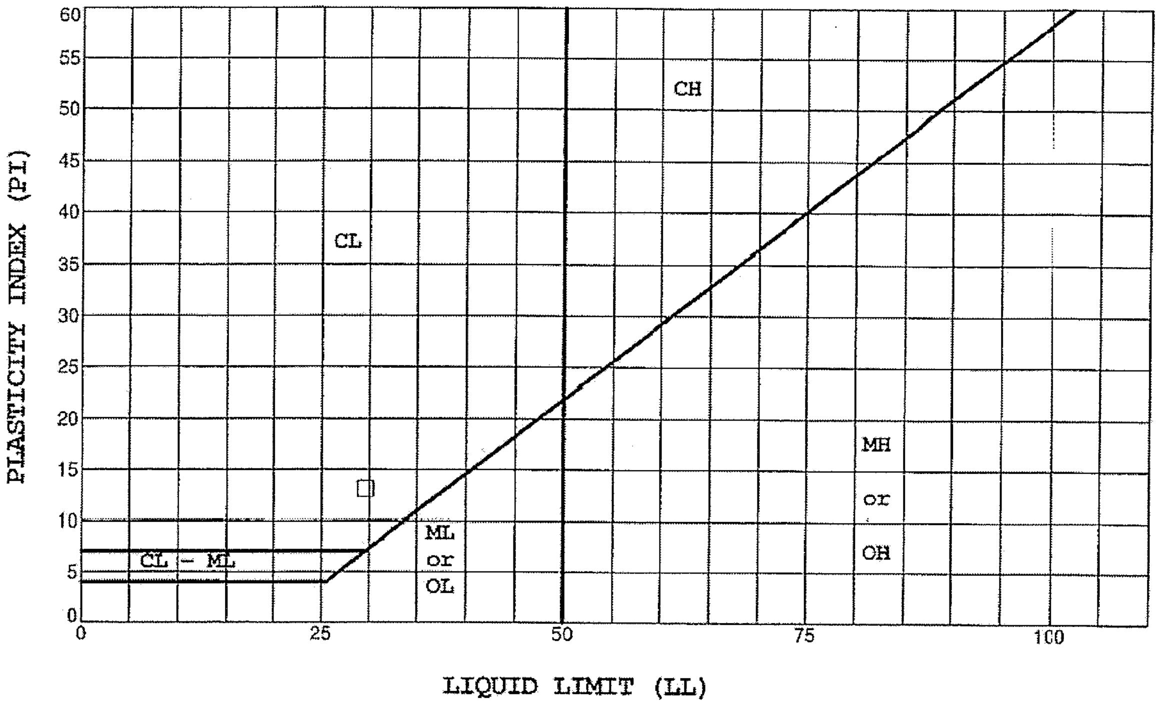

Symbol	Boring	Depth	LL	PL	PI	Sample Description
☐	KB-6	15.0	30	17	13	Olive-Brown Silty Clay

Unified Soil Classification

Fine Grained Soil Groups

Symbol	LL < 50	Symbol	LL > 50
ML	Inorganic clayey silts to very fine sands of slight plasticity	MH	Inorganic silts and clayey silts of high plasticity
CL	Inorganic clays of low to medium plasticity	CH	Inorganic clays of high plasticity
OL	Organic silts and organic silty clays of low plasticity	OH	Organic clays of medium to high plasticity, organic silts

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KLEINFELDER

PROJECT NO. 53512-GEO

PLASTICITY CHART

CHEVRON/TEXACO INVESTIGATION
CHEVRON-TEXACO WAY
SAN RAMON, CALIFORNIA

PLATE

B-10

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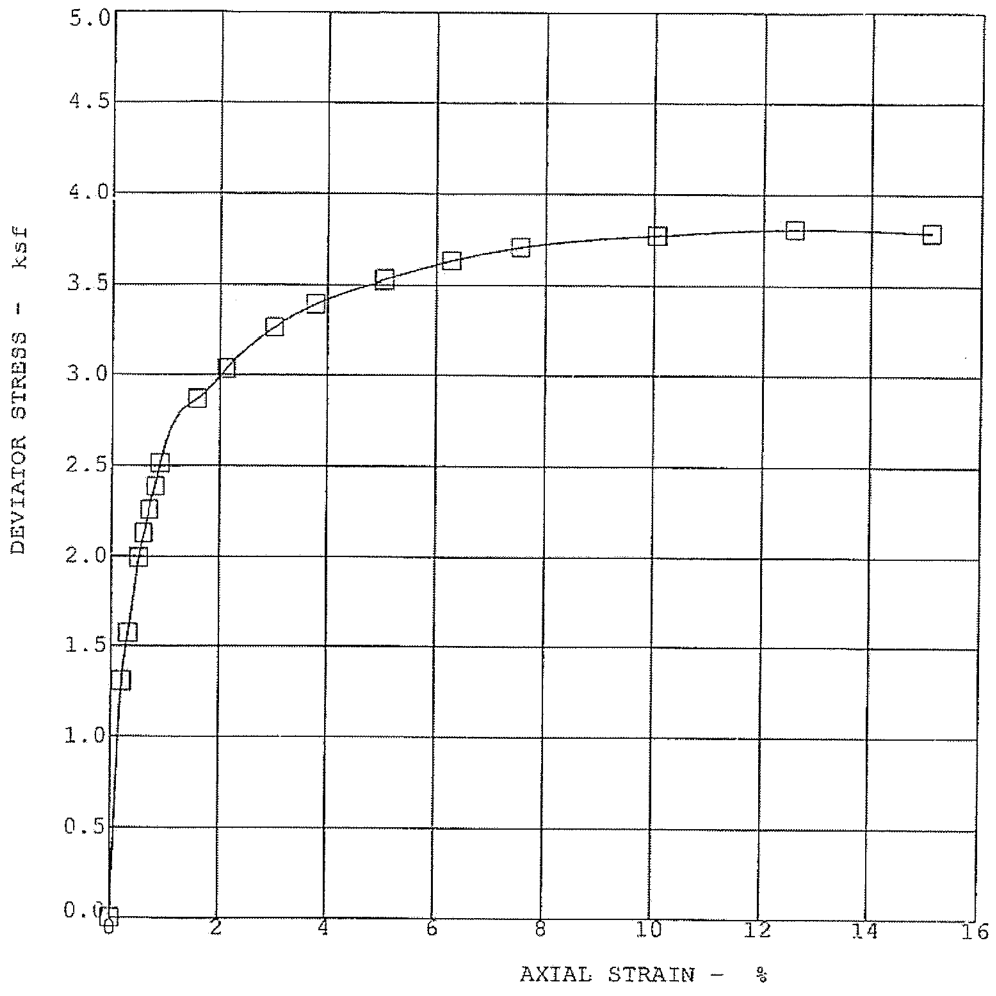


BORING NO. KB-1

DEPTH - ft 4.5

SOIL DESCRIPTION Black Clay

SIGMA 3 - ksf 0.50

DRY DENSITY - pcf 99

WATER CONTENT - % 23.7

MAX. DEVIATOR STRESS= 3.81 ksf at 12.6 % STRAIN

KLEINFELDER

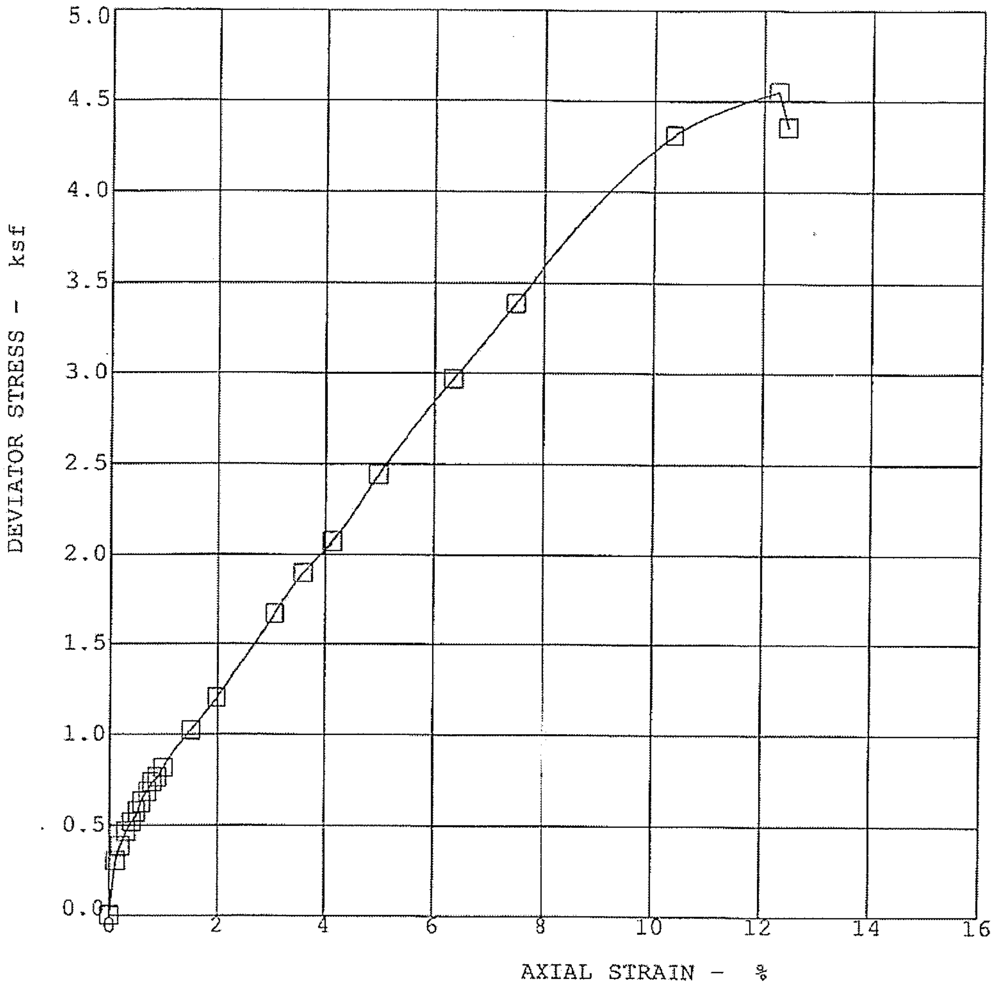
PROJECT NO. 53512-GEO

UU TRIAXIAL TEST/UNSATURATED

CHEVRON/TEXACO INVESTIGATION
CHEVRON-TEXACO WAY
SAN RAMON, CALIFORNIA

PLATE

B-11



BORING NO.	KB-3	**DRY DENSITY - pcf**	108
DEPTH - ft	10.5	**WATER CONTENT - %**	22.3

SOIL DESCRIPTION Light Brown Sandy Clay

SIGMA 3 - ksf 1.00

MAX. DEVIATOR STRESS= 4.55 ksf at 12.3 % STRAIN

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KLEINFELDER

PROJECT NO. **53512-GEO**

UU TRIAXIAL TEST/UNSATURATED

CHEVRON/TEXACO INVESTIGATION
CHEVRON-TEXACO WAY
SAN RAMON, CALIFORNIA

PLATE

B-12

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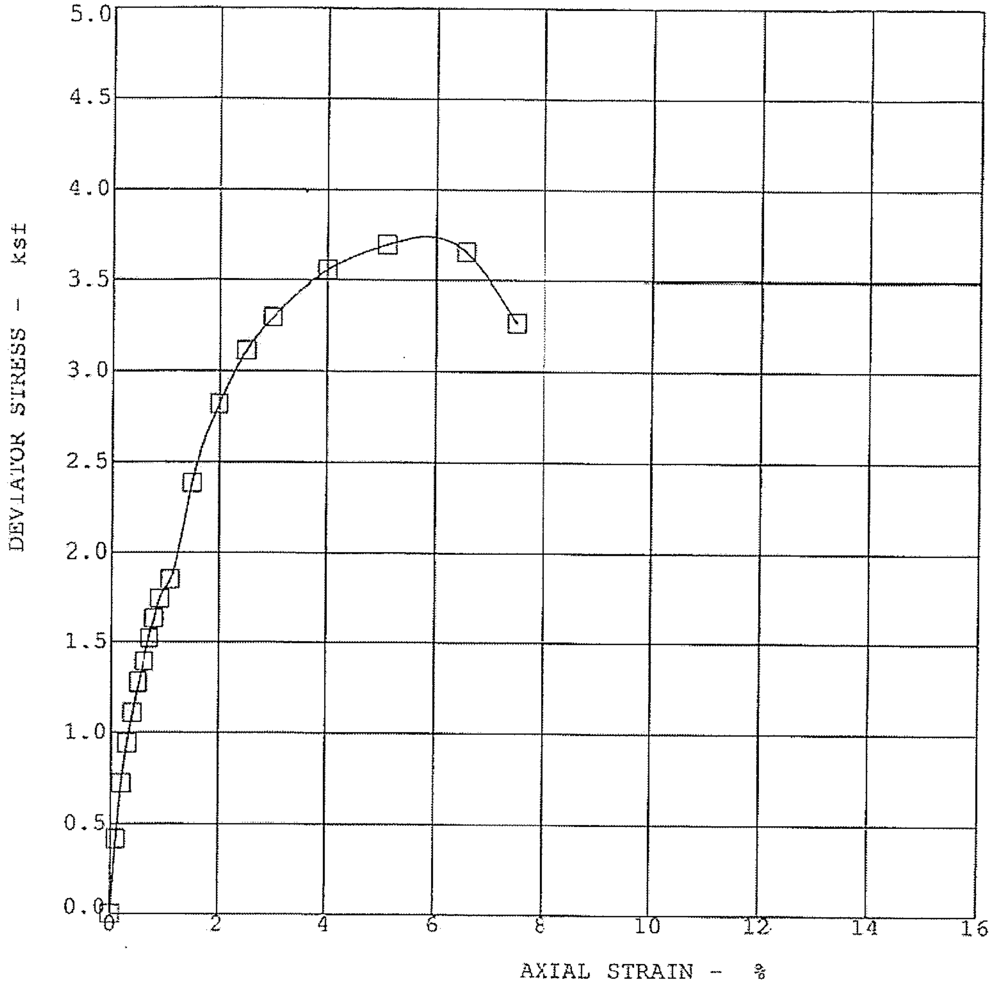

BORING NO.	KB-4	DRY DENSITY - pcf	101
DEPTH - ft	4	WATER CONTENT - %	24.3

SOIL DESCRIPTION Dark Brown Silty Sandy Clay

SIGMA 3 - ksf 0.50

MAX. DEVIATOR STRESS= 3.69 ksf at 5.1 % STRAIN

KLEINFELDER

PROJECT NO. 53512-GEO

UU TRIAXIAL TEST/UNSATURATED

CHEVRON/TEXACO INVESTIGATION
CHEVRON-TEXACO WAY
SAN RAMON, CALIFORNIA

PLATE

B-13

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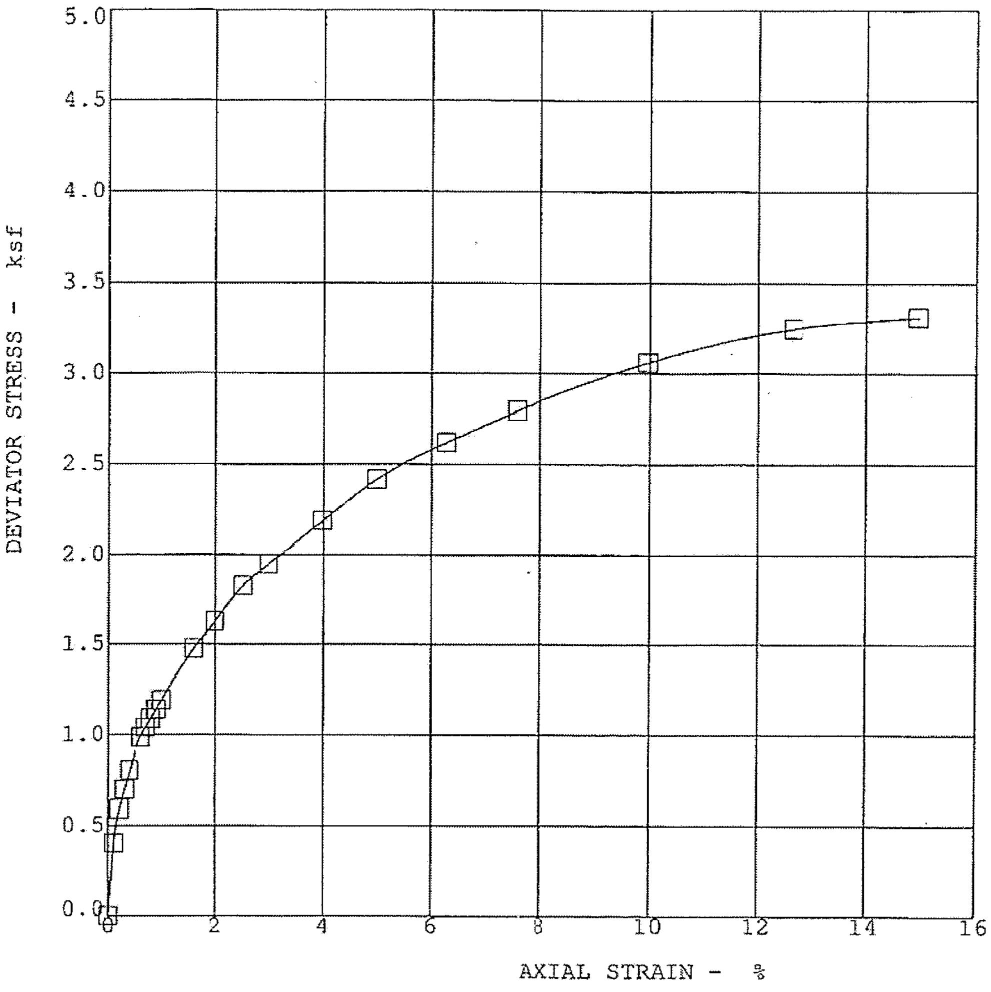

BORING NO.	KB-5	DRY DENSITY - pcf	101
DEPTH - ft	26	WATER CONTENT - %	23.2
SOIL DESCRIPTION	Greenish-Gray Clay		
SIGMA 3 - ksf	2.00		

MAX. DEVIATOR STRESS= 3.31 ksf at 14.9 % STRAIN

KLEINFELDER

PROJECT NO. 53512-GEO

UU TRIAXIAL TEST/UNSATURATED

CHEVRON/TEXACO INVESTIGATION
CHEVRON-TEXACO WAY
SAN RAMON, CALIFORNIA

PLATE

B-14

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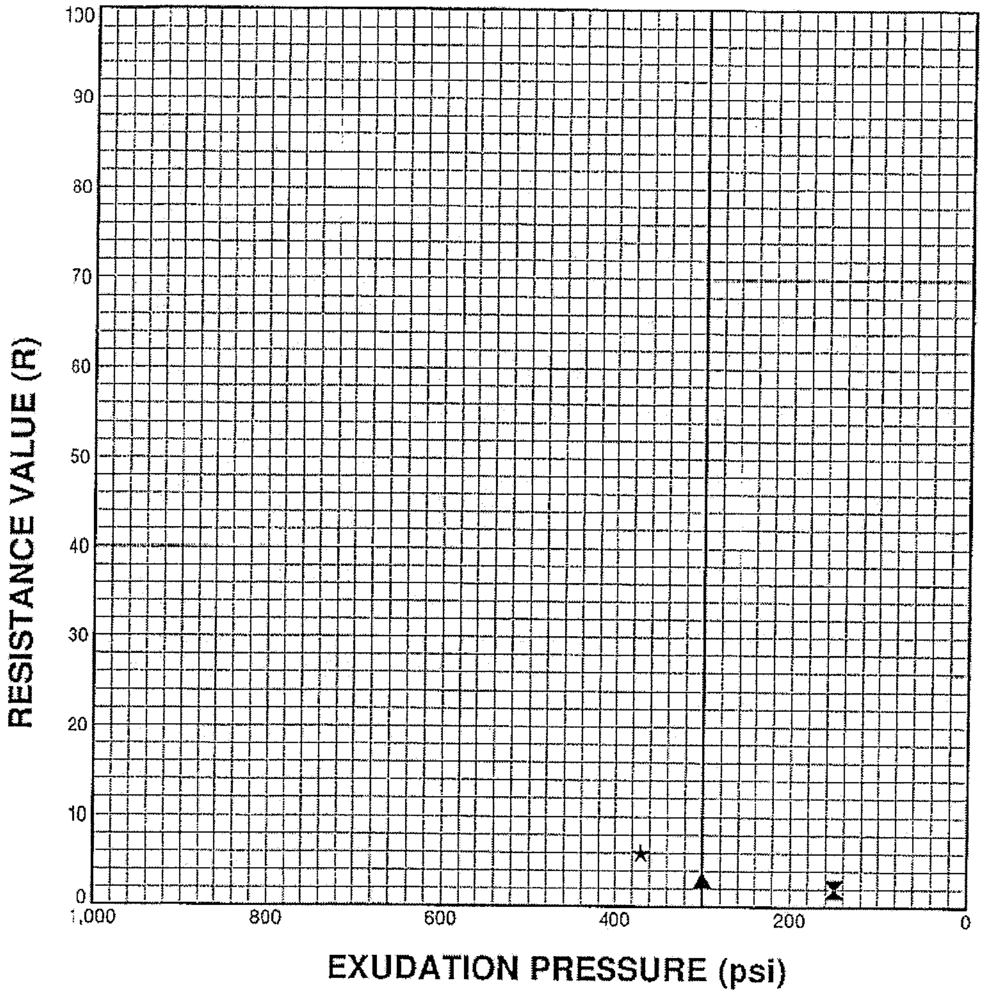

SPECIMEN NO.	☒	▲	★
MOISTURE CONTENT (%)	21.8	19.8	17.9
DRY DENSITY (PCF)	102.5	105.2	110.4
EXUDATION PRESSURE (PSI)	150	300	370
EXPANSION PRESSURE (PSF)	0	0	65
RESISTANCE VALUE (R)	2	3	6

Date Received: 2/7/05

SAMPLE SOURCE	CLASSIFICATION	SAND EQUIVALENT	EXPANSION PRESSURE	R-VALUE
(PL8325)	Brown Clayey Silty	---	0 psf	<5

ASTM D 2844, Cal Test 301

KLEINFELDER

PROJECT NO. 53512-GEO

RESISTANCE VALUE TEST DATA

CHEVRON/TEXACO INVESTIGATION
CHEVRON-TEXACO WAY
SAN RAMON, CALIFORNIA

PLATE

B-15

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APPENDIX C

California State Certified Laboratory No.2153

CERCO
analytical, inc.

3942-A Valley Avenue
Pleasanton, CA 94566-4715
Tel: 925.462.2771
Fax: 925.462.2775

9 March 2005

Job No.0502129
Cust. No.10527

Mr. Robert Ellis
Kleinfelder
7133 Koll Center Parkway
Pleasanton, CA 94566

Subject: Project No.: 53512/GEO
Project Name: Chevron Garage
Corrosivity Analysis – ASTM Test Methods

Dear Mr. Gray:

Pursuant to your request, CERCO Analytical has analyzed the soil sample submitted on February 15, 2005. Based on the analytical results, this brief corrosivity evaluation is enclosed for your consideration.

The resistivity measurements indicate that 0502129-002 is classified as "moderately corrosive" and samples 0502129-001 and 003 are classified as "corrosive". All buried iron, steel, cast iron, ductile iron, galvanized steel and dielectric coated steel or iron should be properly protected against corrosion depending upon the critical nature of the structure. All buried metallic pressure piping such as ductile iron firewater pipelines should be protected against corrosion.

The chloride ion concentrations range from none detected to 57 mg/kg. Because the chloride ion concentrations are less than 300 mg/kg, they are determined to be insufficient to attack steel embedded in a concrete mortar coating.

The sulfate ion concentration ranges from none detected to 83 mg/kg and is determined to be insufficient to damage reinforced concrete structures and cement mortar-coated steel at these locations.

The pH of the soils range from 7.1 to 10.6 which does not present corrosion problems for buried iron, steel, mortar-coated steel and reinforced concrete structures.

The redox potentials range from 410 to 440-mV and is indicative of aerobic soil conditions.

This corrosivity evaluation is based on general corrosion engineering standards and is non-specific in nature. For specific design recommendations or consultation, please call ***JDH Corrosion Consultants, Inc. at (925) 927-6630.***

We appreciate the opportunity of working with you on this project. If you have any questions, or if you require further information, please do not hesitate to contact us.

Very truly yours,
CERCO ANALYTICAL, INC.

Cheryl McMillen for

J. Darby Howard, Jr., P.E.
President

JDH/cm
Enclosure

CERCO Analytical, Inc.

3942-A Valley Avenue, Pleasanton, CA 94566-4715 (925) 462-2771 Fax (925) 462-2775

FINAL RESULTS

Client:	Kleinfelder
Client's Project No.:	53512/GEO
Client's Project Name:	Chevron Garage
Authorization:	PO No. R9032

Date Sampled:	Not indicated
Date Received:	15-Feb-2005
Date of Report:	9-Mar-2005
Matrix:	Soil

Job/Sample No.	Sample I.D.	Redox (mV)	pH	Conductivity (umhos/cm)*	Resistivity (100% Saturation) (ohms-cm)	Sulfide (mg/kg)*	Chloride (mg/kg)*	Sulfate (mg/kg)*
0502129-001	KB-1 1B @ 4'	440	7.1	-	1,400	-	57	39
0502129-002	KB-3 1B @ 3.5'	440	7.2	-	3,500	-	N.D.	N.D.
0502129-003	KB-4 1B @ 3.5'	410	10.6	-	2,000	-	48	83

Method:	ASTM D1498	ASTM D4972	ASTM D1125M	ASTM G57	ASTM D4658M	ASTM D4327	ASTM D4327
Detection Limit:	-	-	10	-	50	15	15
Date Analyzed:	3-Mar-2005	4-Mar-2005	-	8-Mar-2005	-	4-Mar-2005	4-Mar-2005

* Results Reported on "As Received" Basis

N.D. - None Detected

Cheryl McMillen
Laboratory Director

Quality Control Summary - All laboratory quality control parameters were found to be within established limits

Preliminary Geotechnical Exploration, San Ramon City Center, San Ramon, California, prepared for City of San Ramon, California, prepared by ENGEO Incorporated, ENGEO Project 5172.001.01, dated March 29, 2001

TABLE II

LABORATORY TESTS - PURPOSE

1. Natural Unit Weight and Moisture Content (ASTM D-2216)

   Provides in-place density and percentage moisture by dry weight. These aid in characterizing existing and previous ground-water conditions, soil compressibility, and degree of saturation.

2. Atterberg Limits (ASTM D-4318)

   Performed primarily on cohesive soils. Includes the Liquid Limit and the Plastic Limit. From these, a Plasticity Index can be computed which allows classification of the soil and is an indirect measure of its expansion characteristics.

3. Direct Shear (ASTM D-3080)

   Provides shear strength parameters including cohesion c, and angle of internal friction ϕ, which are used in foundation design and slope stability analyses.

4. Unconfined Compressive Strength (ASTM D-2166)

   Determined usually on cohesive (clay) materials to establish allowable design foundation bearing capacity or estimated shear strength for slope stability studies.

5. Expansion Index (UBC 29-2)

   Determines an "Expansion Index" number derived from a measurement of swell for a remolded soil sample under relatively light loads and prescribed initial density and moisture level.

6. Swell Potential (ASTM D-4546)

   Determines the swell pressure developed by a confined soil when subjected to increased moisture. Also measures volume change due to heave for various initial moisture levels.

7. Consolidation (ASTM D-2435)

   Performed on compressible soils. Provides data for computation of consolidation characteristics. Parameters which can be estimated include Preconsolidation Pressure, P_c and Compression Index, C_c. These are used to estimate foundation and fill settlements.

8. Compaction (ASTM D-1557)

   Generates a "Compaction Curve" (unit weight vs. moisture content) from which maximum unit weight and optimum moisture content may be estimated. These are used for field testing of engineered fill, and for approximating shrinkage factors in preliminary quantity estimates for grading.

9. R-Value (ASTM D-2844)

   Performed on subgrade soils to compute the resistance (R) value which is used in design of roadway pavement sections.

ENGEO INCORPORATED

TABLE III
SUMMARY OF LABORATORY TEST RESULTS

		In-Place		Atterberg Limits			Shear Test			
Boring and Sample Number	Depth Feet	Dry Unit Weight Pcf	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	Angle of Internal Friction	Unit Cohesion psf	Unconfined Compressive Strength psf	Gradation (Percent Passing No. 200 Sieve)
1-2	6	98.8	25.6	39	17	22			3,900	
1-3	11	100.2	24.3	48	18	30				
1-4	16									35
1-7	31	103.0	24.4						5,600	
1-10	46	105.8	22.9							
1-12	56		19.4							31
1-13	60		12.7							
2-1	3	113.5	13.2							
2-3	11	98.9	24.3							
2-5	21		25.8							
3-2	6	103.1	21.7							
3-4	16	96.2	26.5						1,450	
3-6	26		28.4							
4-1	3	106.8	15.8							
4-2	6	99.0	11.4							
4-4	16	90.4	31.3							
4-6	26		28.8							

ENGEO INCORPORATED

TABLE III
SUMMARY OF LABORATORY TEST RESULTS

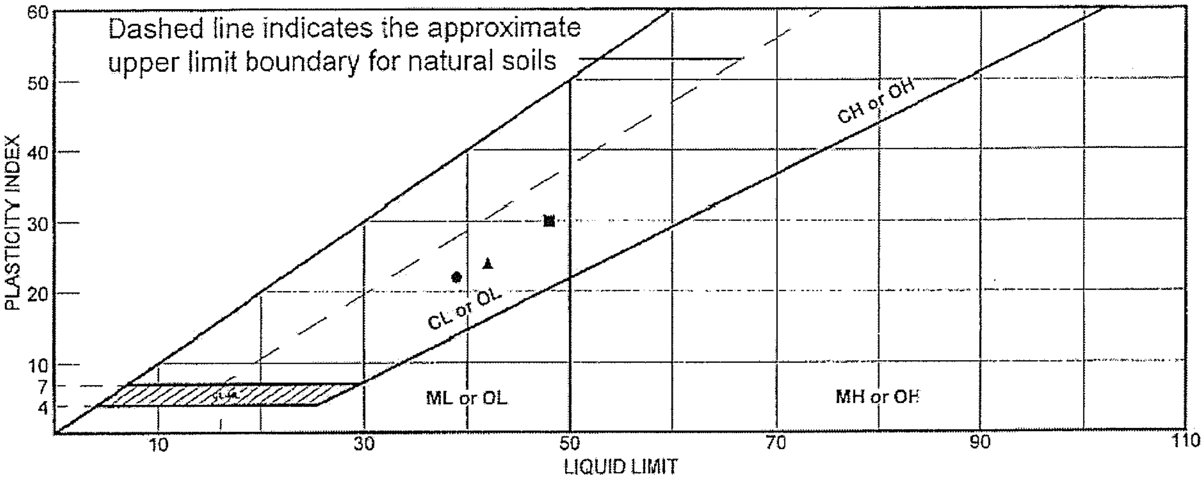
		In-Place		Atterberg Limits			Shear Test			
Boring and Sample Number	Depth Feet	Dry Unit Weight Pcf	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	Angle of Internal Friction	Unit Cohesion psf	Unconfined Compressive Strength psf	Gradation (Percent Passing No. 200 Sieve)
5-1	3	101.2	16.2	42	18	24				
5-3	11	112.0	15.5							
5-4	16	93.0	30.8							
5-6	26	94.0	29.9						3,900	
5-8	36	114.2	17.9							
5-10	46	100.7	25.6							
6-1	51	99.5	26.4							
6-2	55.5	126.1	12.6							

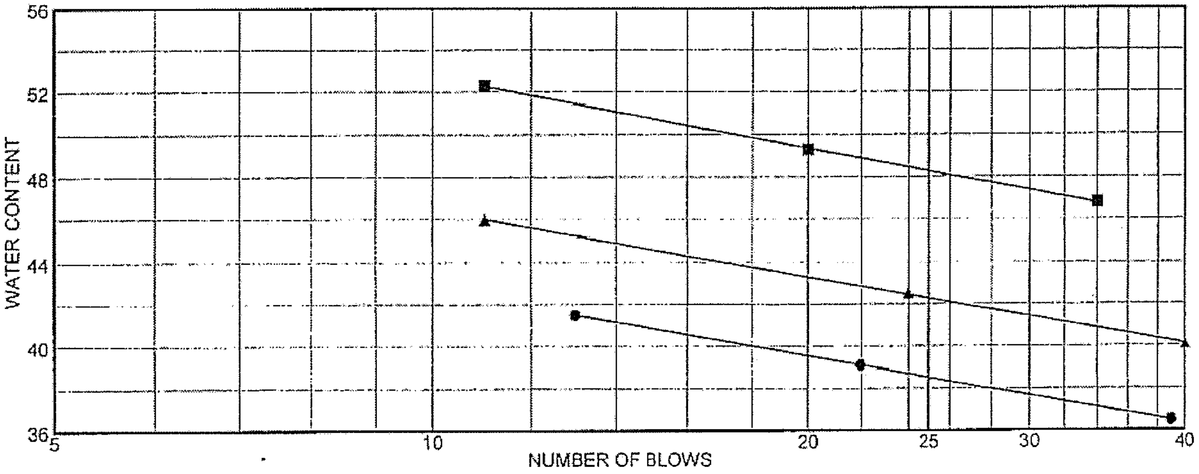
APPENDIX B

ENGEO INCORPORATED

Liquid and Plastic Limits Test Report
Particle Size Distribution Report
Unconfined Compression Test Reports
Consolidation Test Report

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Black silty Clay with sand	39	17	22			CL
■	Grayish brown silty Clay to Clay with fine sand	48	18	30			CL-CH
▲	Black silty Clay with fine sand	42	18	24			CL

Project No. 5172.5.001.01 **Client:**

Project: San Ramon City Center, San Ramon, California

● **Source:** PI **Sample No.:** 1-1 Date:02-10-01

■ **Source:** PI **Sample No.:** 1-3

▲ **Source:** PI **Sample No.:** 5-1

Remarks:

● 1-1 (3')

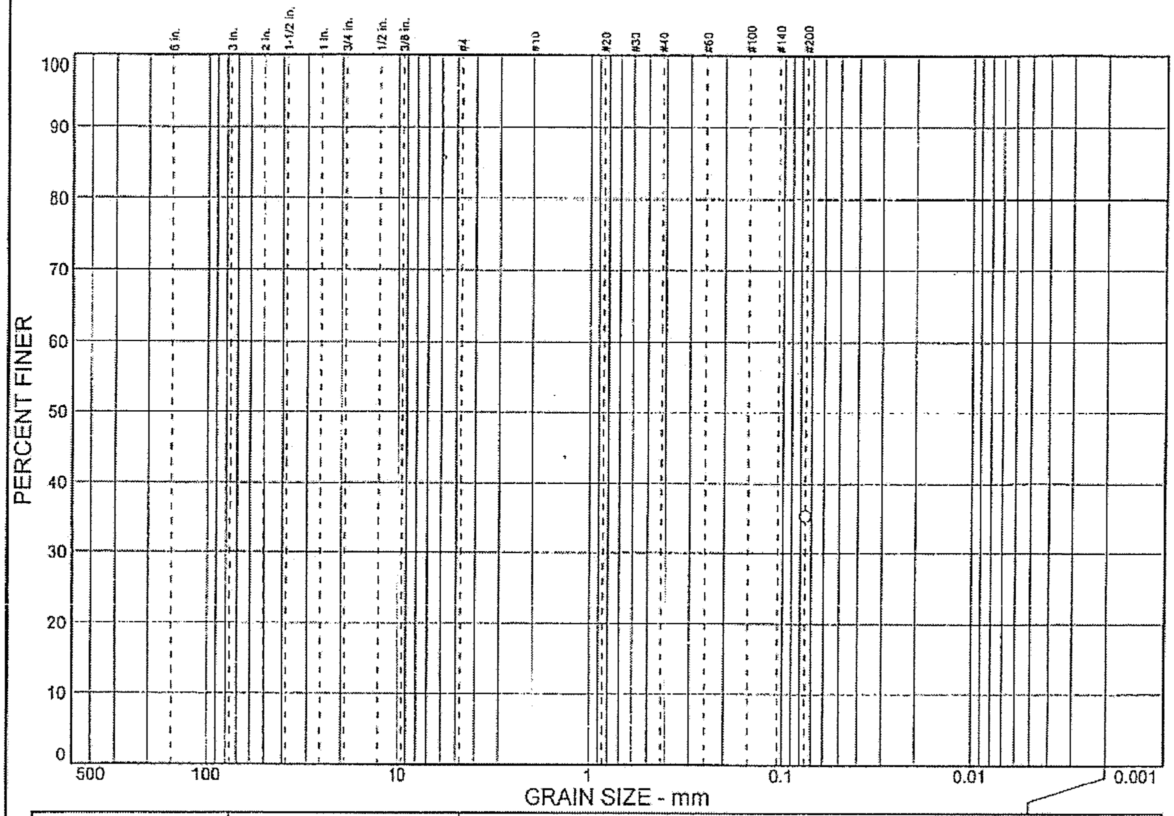
■ 1-3 (11')

▲ 5-1 (3')

ENGEO INCORPORATED

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS MATERIALS TESTING

Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
						35.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	35.3		

* (no specification provided)

Soil Description

Grayish brown silty Sand

Atterberg Limits

PL=
LL=
PI=

Coefficients

D_{85}=
D_{60}=
D_{50}=
D_{30}=
D_{15}=
D_{10}=
C_u=
C_c=

Classification

USCS= SM
AASHTO=

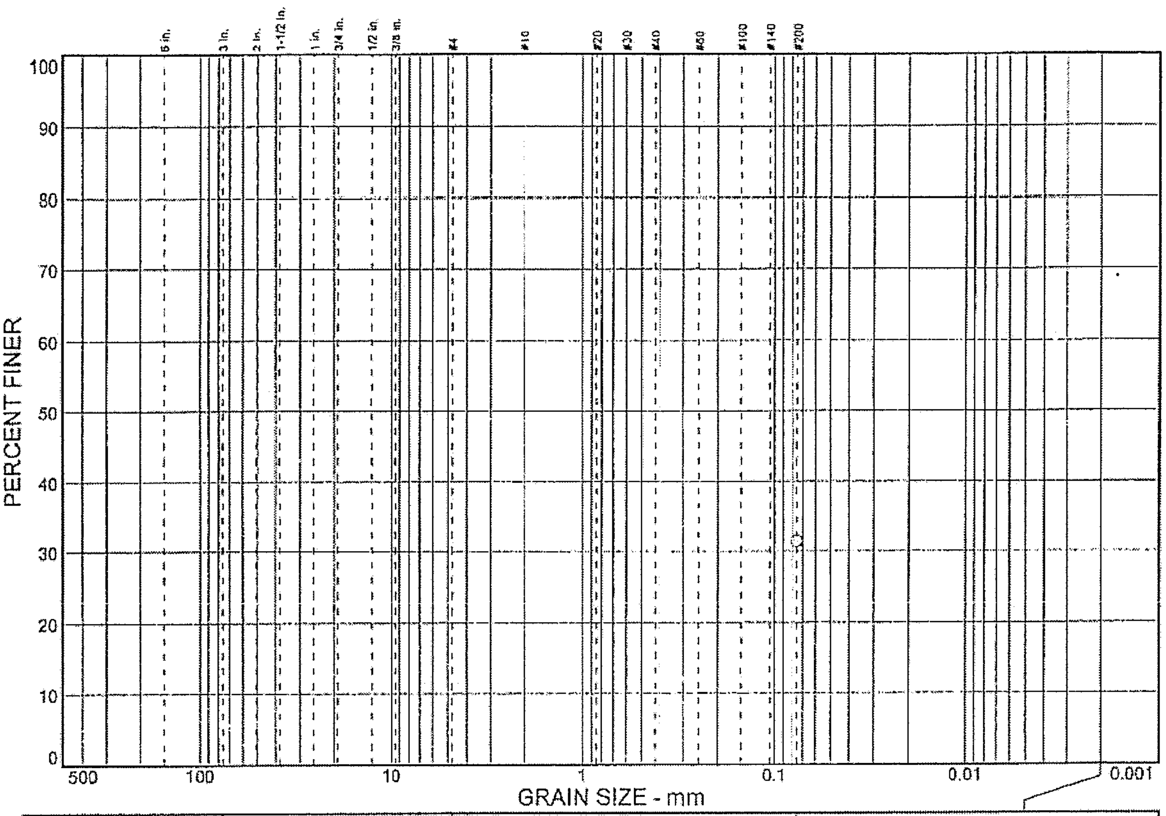
Remarks

Sample No.: 1-4
Source of Sample: %200
Date: 02-06-01
Location:
Elev./Depth:

ENGEO INCORPORATED
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
MATERIALS TESTING

Client:
Project: San Ramon City Center, San Ramon, California
Project No: 5172.5.001.01

Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
						31.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	31.4		

* (no specification provided)

Soil Description

Grayish brown clayey Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO=

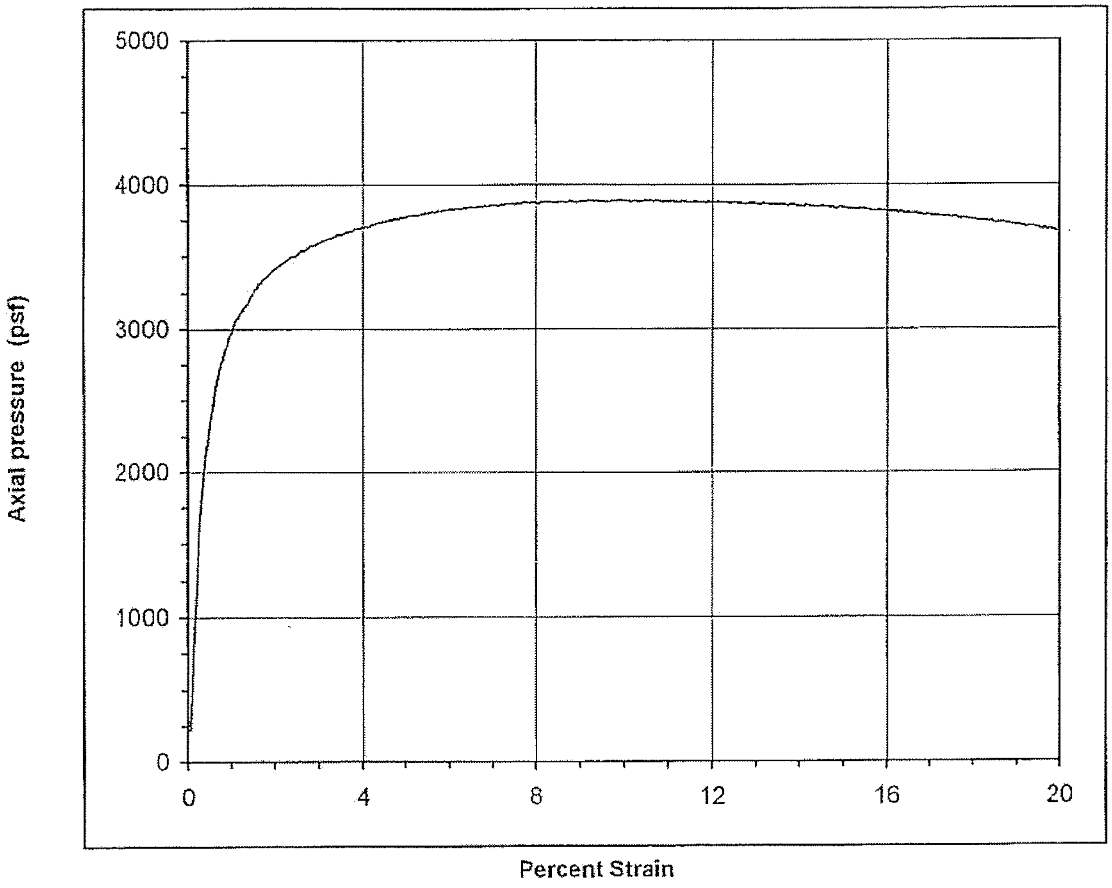
Remarks

Sample No.: 1-12 Source of Sample: %200 Date: 02-06-01
Location: Elev./Depth:

ENGEO
INCORPORATED
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
MATERIALS TESTING

Client:
Project: San Ramon City Center, San Ramon, California
Project No: 5172.5.001.01

Unconfined Compression Test
ASTM Test Method D2166



Unconfined Compressive Strength: 3890 psf 1.9 tsf

Sample Description: Black Clay with fine sand

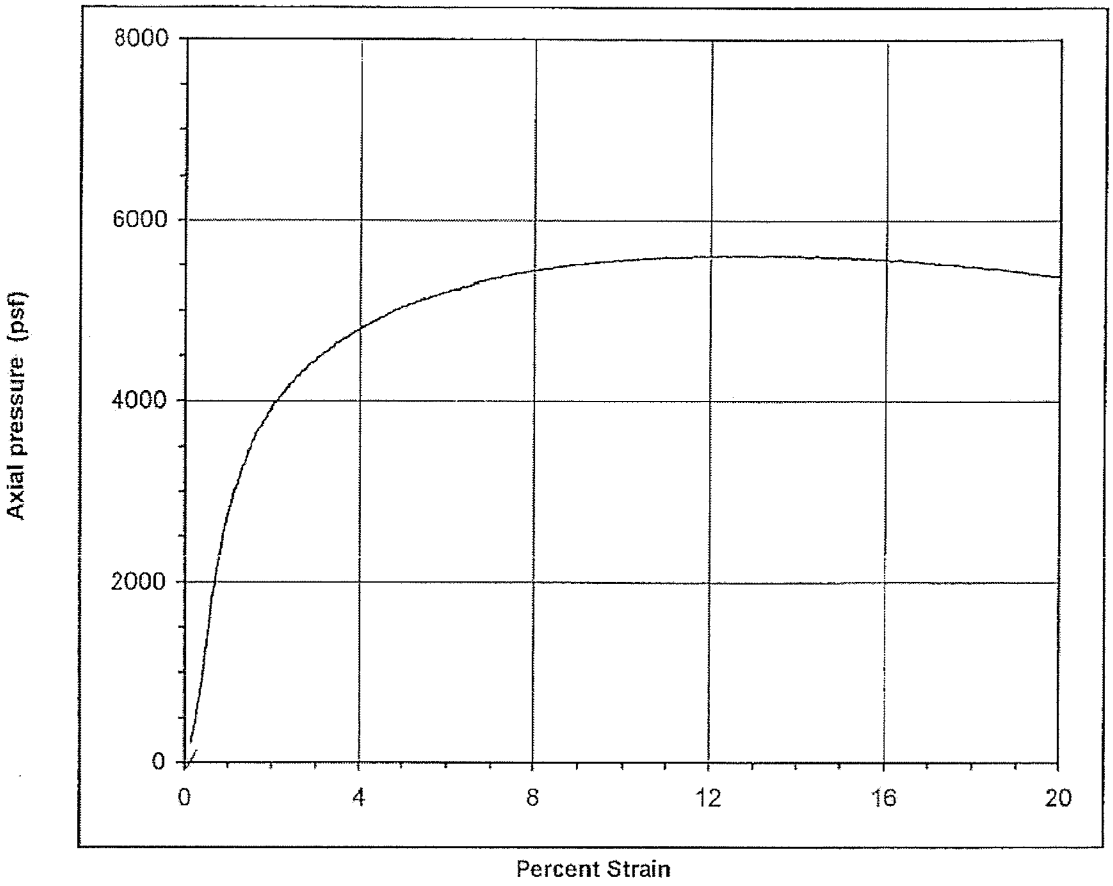
Initial Diameter:	2.420	in.			
Initial Height:	5.46	in.	Sample Number:	1-2	
Strain Rate:	1.371	%/min	Dry Unit Weight:	98.8	pcf
Total Strain:	20.01	%	Moisture Content:	25.6	%
			Depth of Sample:	6.0	ft.

ENGEO
INCORPORATED

SAN RAMON CITY CENTER
San Ramon, California

Job No.: 5172.5.001.01
Sample Number: 1-2
Date: 2/2/01

Unconfined Compression Test
ASTM Test Method D2166



Unconfined Compressive Strength: 5600 psf 2.8 tsf

Sample Description: Dark grayish brown Clay with fine sand

Initial Diameter:	2.420	in.
Initial Height:	5.00	in.
Strain Rate:	1.549	%/min
Total Strain:	20.02	%

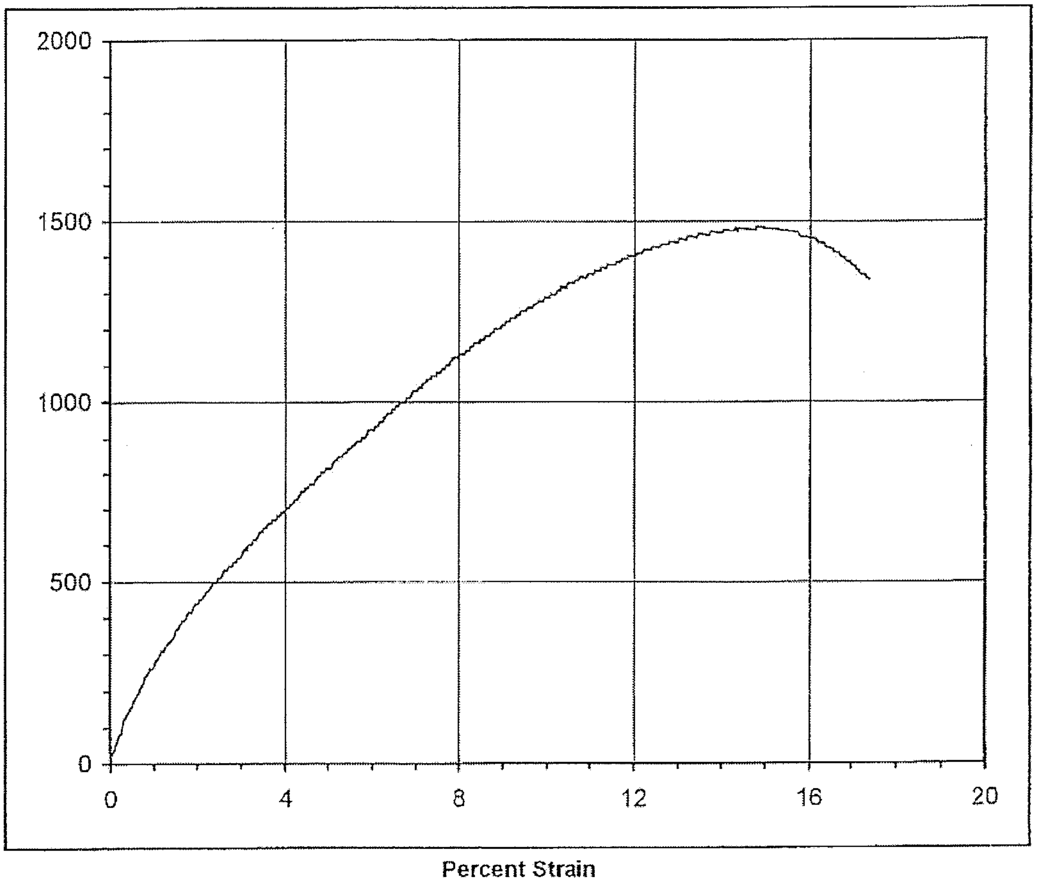
Sample Number:	1-7	
Dry Unit Weight:	103.0	pcf
Moisture Content:	24.4	%
Depth of Sample:	31.0	ft.

ENGEO
INCORPORATED

SAN RAMON CITY CENTER
San Ramon, California

Job No.:	5172.5.001.01
Sample Number:	1-7
Date:	2/2/01

Unconfined Compression Test
ASTM Test Method D2166



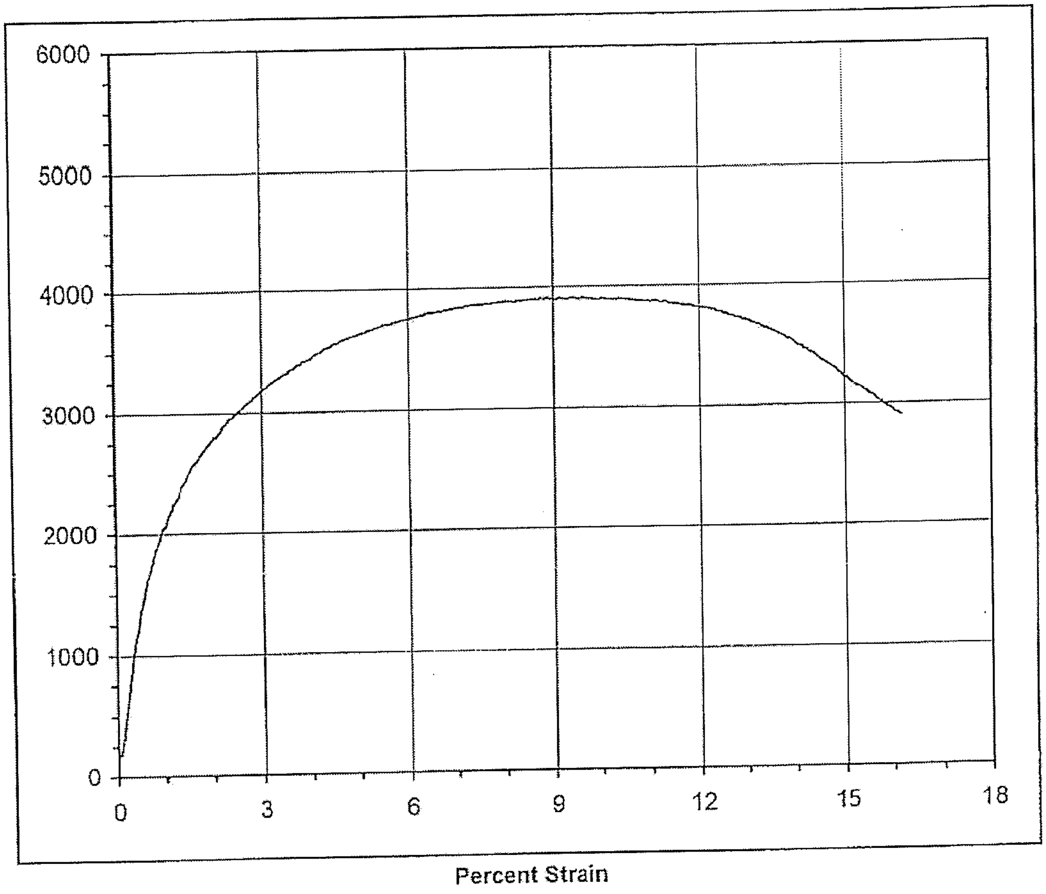
Unconfined Compressive Strength: 1450 psf 0.7 tsf

Sample Description: Light olive brown silty Clay with very fine sand

Initial Diameter:	2.420	in.			
Initial Height:	5.05	in.	Sample Number:	3-4	
Strain Rate:	1.468	%/min	Dry Unit Weight:	96.2	pcf
Total Strain:	17.40	%	Moisture Content:	26.5	%
			Depth of Sample:	16.0	ft.

*EN*GEO INCORPORATED	SAN RAMON CITY CENTER San Ramon, California	Job No.:	5172.5.001.01
		Sample Number:	3-4
		Date:	2/2/01

Unconfined Compression Test
ASTM Test Method D2166



Unconfined Compressive Strength: 3920 psf 2.0 tsf

Sample Description: Dark gray Clay

Initial Diameter:	2.420	in.
Initial Height:	5.18	in.
Strain Rate:	1.363	%/min
Total Strain:	16.18	%

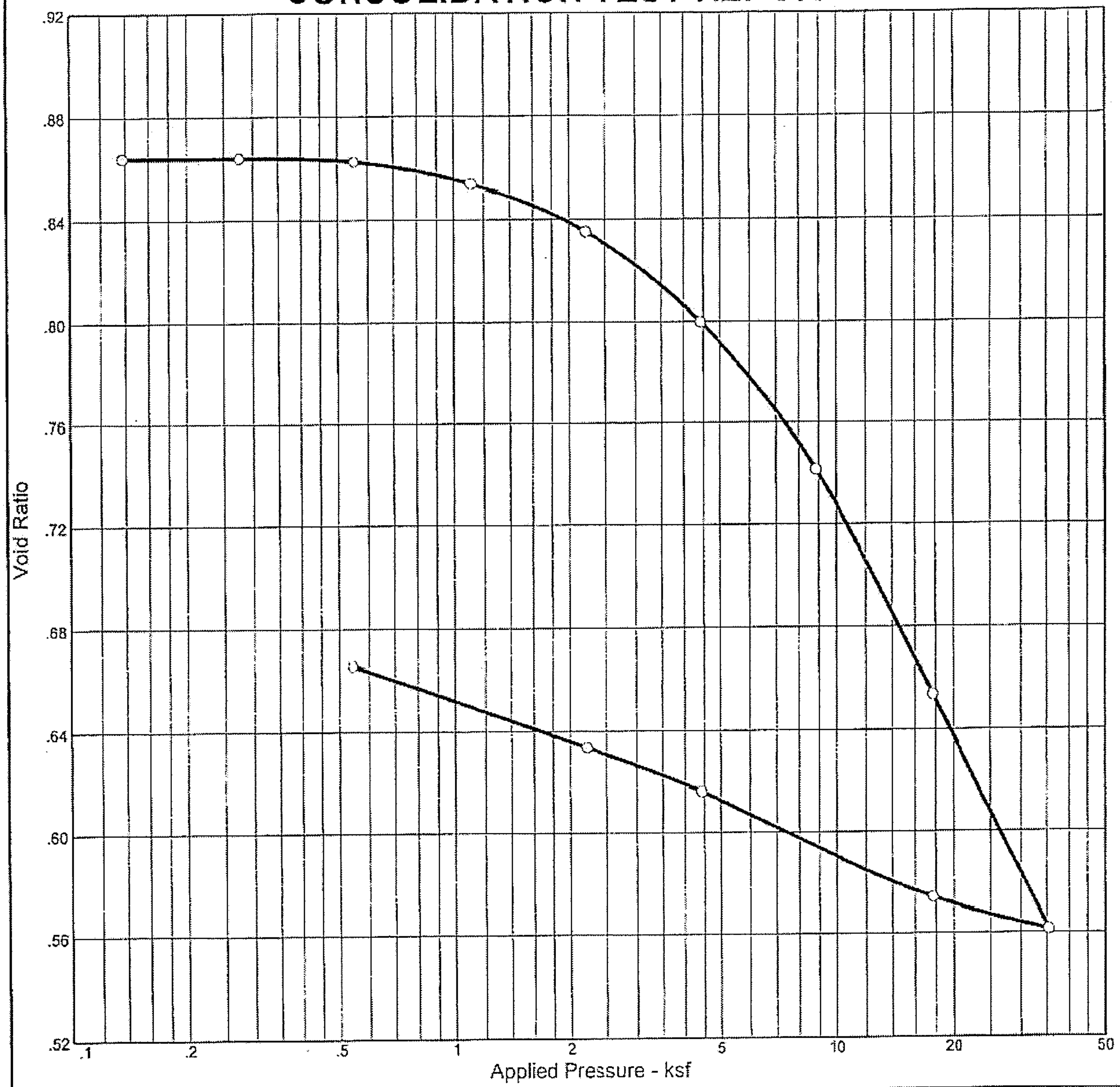
Sample Number:	5-6	
Dry Unit Weight:	94.0	pcf
Moisture Content:	29.9	%
Depth of Sample:	26.0	ft.

ENGEO
INCORPORATED

SAN RAMON CITY CENTER
San Ramon, California

Job No.:	5172.5.001.01
Sample Number:	5-6
Date:	2/2/01

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	USCS	AASHTO	Initial Void Ratio
Saturation	Moisture							
97.9 %	31.3 %	90.4			2.70	CL		0.864

MATERIAL DESCRIPTION

Olive brown silty Clay

Project No. 5172.5.001.01 **Client:**

Project: San Ramon City Center, San Ramon, California

Source: Consol **Sample No.:** 4-4 **Elev./Depth:** 16'

ENGEO INCORPORATED
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS MATERIALS TESTING

Remarks:

Geotechnical Investigation, Bishop Ranch 1 Development, San Ramon, California, prepared for Sunset Development Company, prepared by Harding Lawson Associates (HLA), HLA Project 50044.1, dated May 15, 2000

SIERRA TESTING LABORATORIES, INC.
GEOTECHNICAL AND MATERIALS TESTING SERVICES

Project No. 00-166
25 April 2000

Harding Lawson Associates
383-4th Street, 3rd Floor
Oakland, California 94607

Attention: Mr. Ryan Shafer

Subject: **Bishop Ranch 50 Acre Property**
HLA Job # 5044.1

LABORATORY TEST RESULTS

Dear Mr. Shafer:

As requested, Sierra Testing Laboratories, Inc. has performed laboratory testing on 9 samples of material from the subject site. The samples were identified as 0.5-1.0' South Parking A, 0.5-1.0' South Parking B, 0.5-1.0' North Parking A, 0.5-1.0 North Parking B, 0.5-1.0' East Parking A, 0.5-1.0' East Parking B, .0-1.0' HLA-1, 1.0'-1.5' HLA-3 and 1.0'-1.5' HLA-6 . The samples were received by our laboratory on 16 April 2000. The tests performed on the submitted samples were as follows:

1) Soil Chemistry for Corrosion (pH, Chloride, Sulfate, Resistivity) (CA DOT 643, 417, 422)
2) Atterberg Limit (ASTM D4318)
3) R-Value (ASTM D2844) (CAL 301)
4) Modified Proctor Compaction (ASTM D1557)

The results of the Modified Proctor Compaction tests are presented on Figures 1 thru 3, attached. The results of the R-Value tests are presented on Figures 4 thru 6, attached. The results of the Atterberg Limit tests are presented on Figures 7 thru 9, attached. The results of the Soil Chemistry for Corrosion tests are presented on Table 1, attached. We appreciate the opportunity to be of service to you on this project and look forward to providing additional service, as needed, in the future.

Should you have any questions or require additional information, please contact our office at your convenience.

Very truly yours,

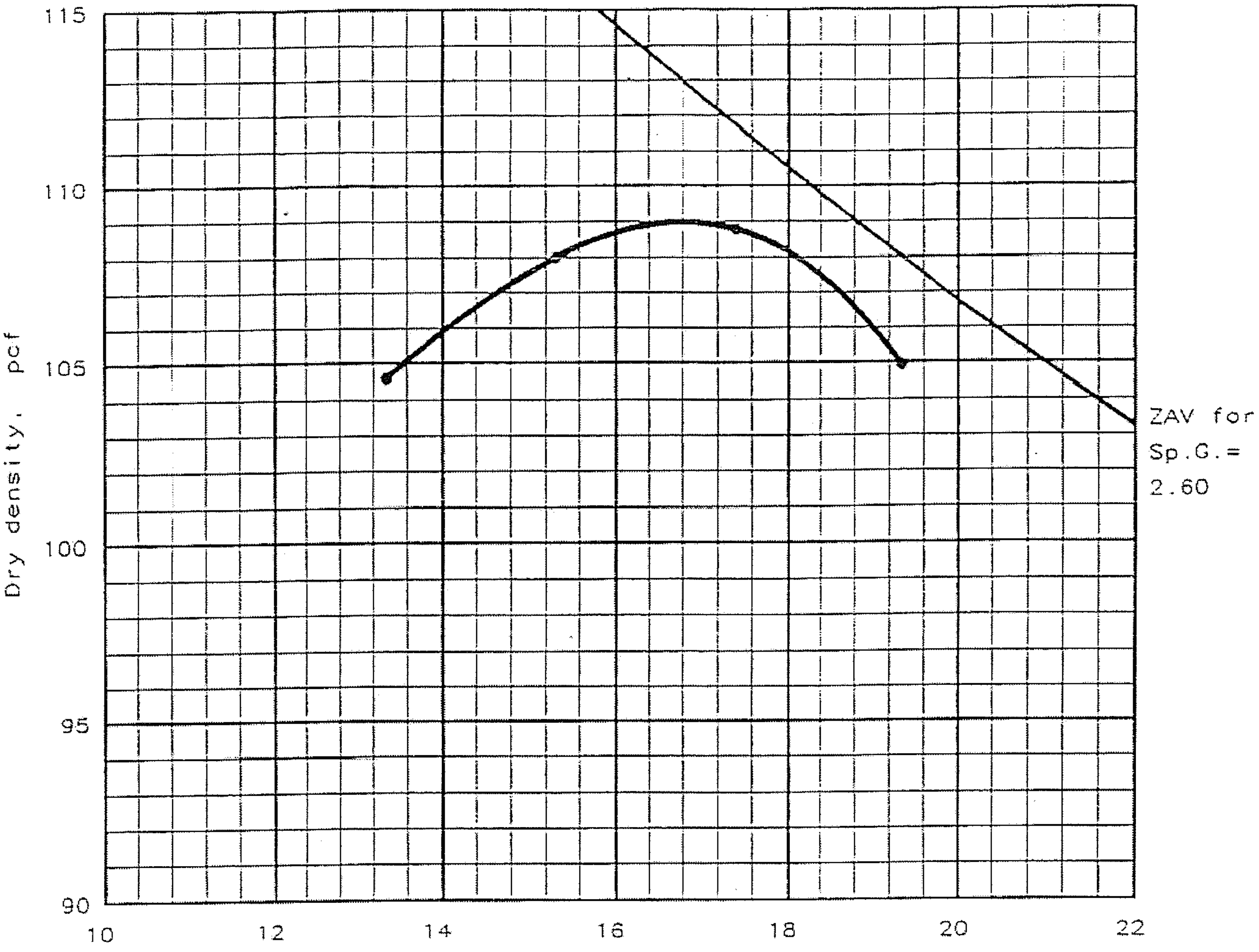
Chad M. Walker
Project Manager

Enclosures: Table 1 and Figures 1 thru 9 .

Table 1

Corrosion Analysis (CA DOT 643, 417, & 422)
Bishop Ranch 50 – Acre Property
HLA Job #50044.1
STL Job #00-166

Sample Name	pH	Minimum Resistivity (ohm-cm)	Chloride (ppm)	Sulfate (ppm)
HLA-1 0.0'-1.0'	7.32	1470	13.8	7.4
HLA-3 1.0'-1.5'	7.00	960	12.7	29.4
HLA-6 1.0'-1.5'	6.93	830	11.3	54.3



Test specification: ASTM D 1557-91 Procedure A, Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
-	-	-	- %	2.70	-	-		

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 109.0 pcf Optimum moisture = 16.8 %	Gray brown sandy CLAY

Project No.: 00-166

Project: Bishop Ranch 50 - Acre Property

Location: 0.5'-1.0' South Parking A

Date: 4-10-2000

Remarks:

HLa Job #50044.1

MOISTURE-DENSITY RELATIONSHIP TEST

SIERRA TESTING LABORATORIES, INC.

Fig. No. 1

PROJECT DATA

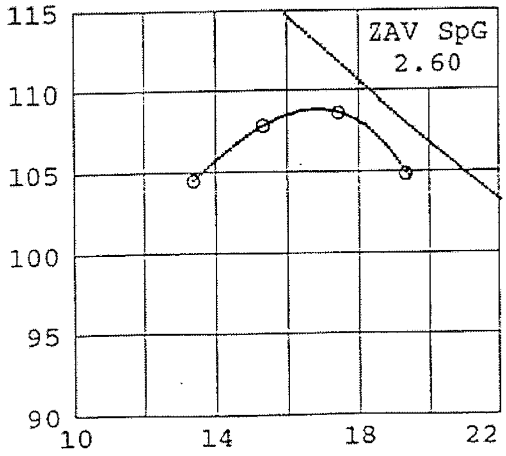
ate: 4-10-2000
Project no.: 00-166
roject: Bishop Ranch 50 - Acre Property
ocation 1: 0.5'-1.0' South Parking A
2:
Remarks 1: HLa Job #50044.1
2:
3:
Material 1: Gray brown sandy CLAY
lescription 2:
levation or depth: -
Fig no: 1

SPECIMEN DATA

JSCS classification: -
AASHTO classification: -
latural moisture: -
Specific gravity: 2.70
Percent retained on No.4 sieve:
ercent passing No. 200 sieve:
iquid limit: -
Plastic limit:
Plasticity index: -

TEST DATA AND RESULTS FOR CURVE 3

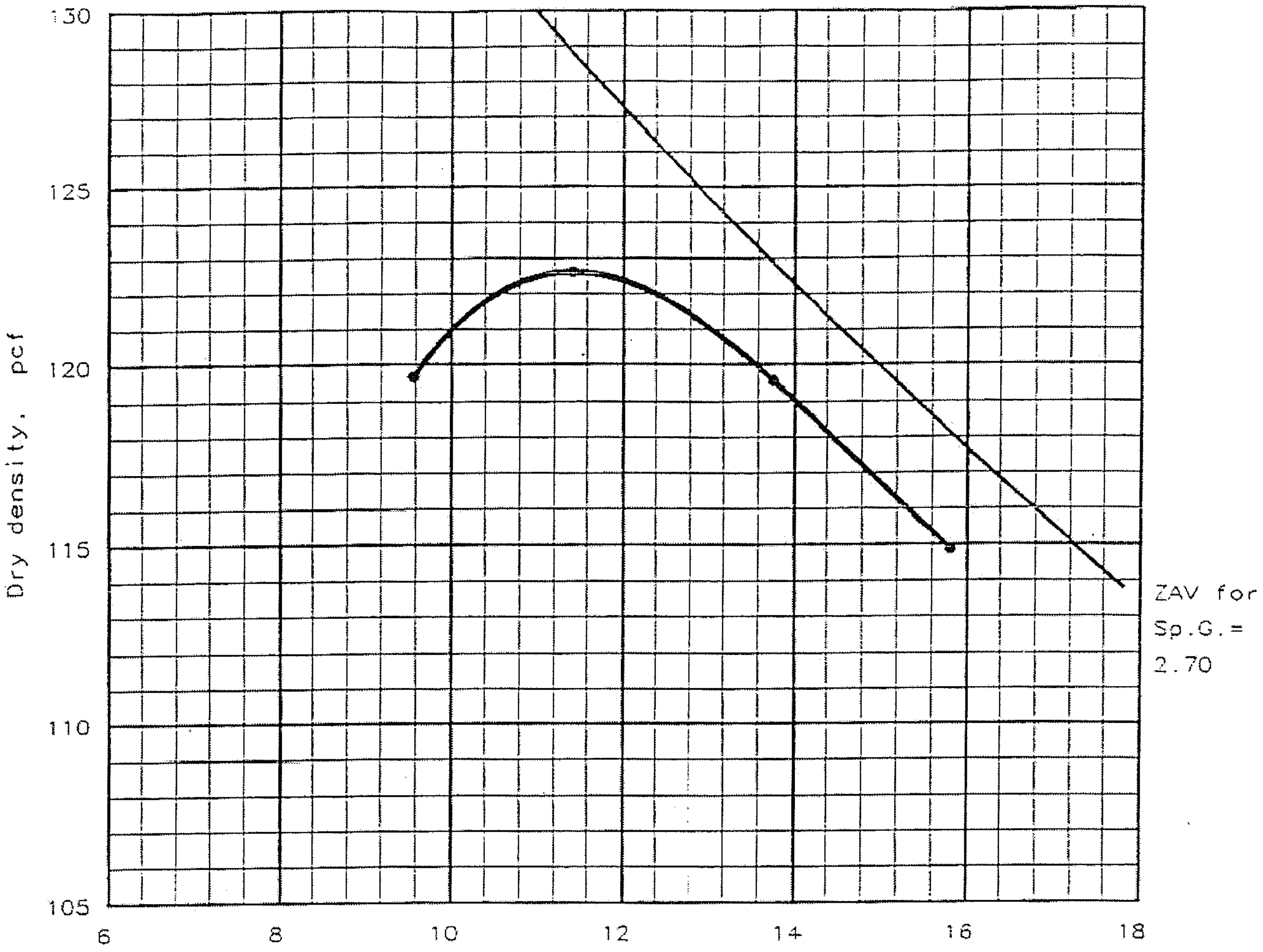
Type of test: Modified, ASTM D 1557-91 Procedure A



POINT NO.	1	2	3	4
WM + WS	3675	3765	3813	3776
WM	1882	1882	1882	1882
WW+T #1	380.50	396.00	411.50	530.00
WD+T #1	341.80	350.30	358.20	452.60
TARE #1	52.00	52.00	52.00	52.50
MOIST #1	13.4	15.3	17.4	19.3
MOISTURE	13.4	15.3	17.4	19.3
DRY DEN	104.6	108.0	108.8	105.0

Max dry den= 109.0 pcf, Opt moisture= 16.8 %

Oversize Correction Not Applied



Test specification: ASTM D 1557-91 Procedure A, Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
-	-	-	- %	2.70	-	-		

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 122.6 pcf Optimum moisture = 11.4 %	Gray brown sandy CLAY

Project No.: 00-166

Project: Bishop Ranch 50 - Acre Property

Location: 0.5'-1.0' North Parking A

Date: 4-11-2000

Remarks:

HLA Job #50044.1

MOISTURE-DENSITY RELATIONSHIP TEST

SIERRA TESTING LABORATORIES, INC.

Fig. No. 2

PROJECT DATA

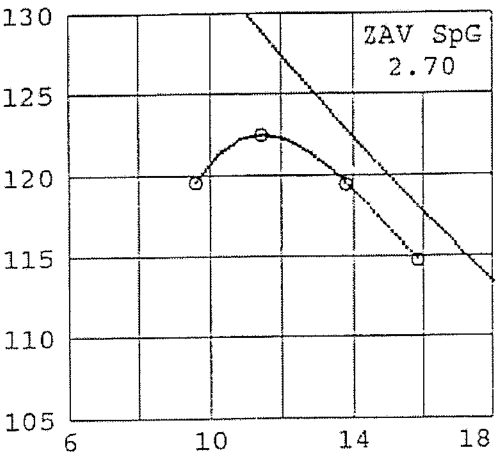
ate: 4-11-2000
roject no.: 00-166
roject: Bishop Ranch 50 - Acre Property
ocation 1: 0.5'-1.0' North Parking A
:
Remarks 1: HLA Job #50044.1
:
:
Material 1: Gray brown sandy CLAY
escription 2:
levation or depth: -
ig no: 2

SPECIMEN DATA

SCS classification: -
AASHTO classification: -
atural moisture: -
Specific gravity: 2.70
ercent retained on No.4 sieve:
ercent passing No. 200 sieve:
iquid limit: -
Plastic limit:
Plasticity index: -

TEST DATA AND RESULTS FOR CURVE 2

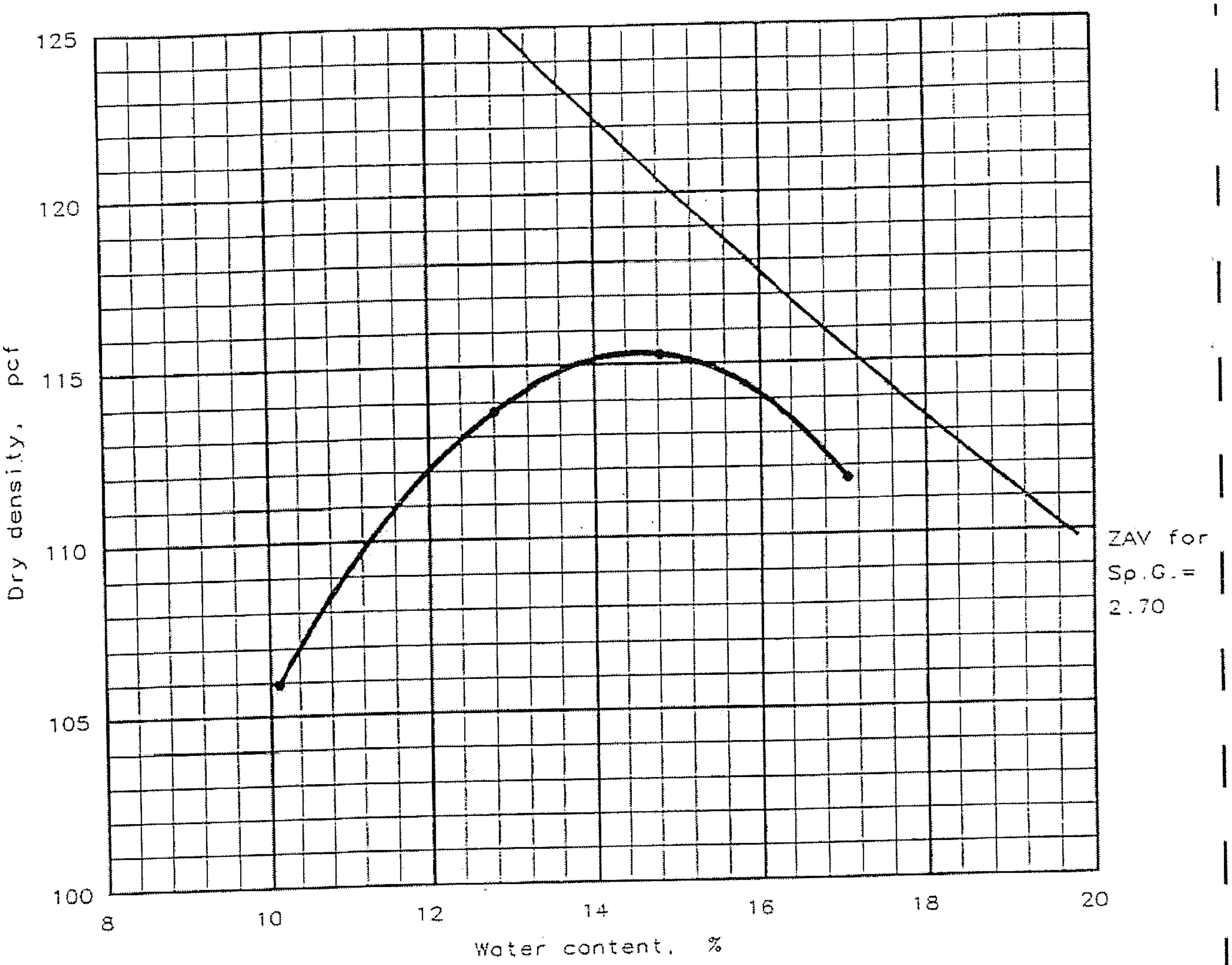
Type of test: Modified, ASTM D 1557-91 Procedure A



POINT NO.	1	2	3	4
WM + WS	3865	3948	3939	3894
WM	1882	1882	1882	1882
WW+T #1	407.70	388.70	425.50	355.60
WD+T #1	376.60	354.00	380.30	312.60
TARE #1	51.70	50.30	52.10	40.80
MOIST #1	9.6	11.4	13.8	15.8
MOISTURE	9.6	11.4	13.8	15.8
DRY DEN	119.7	122.6	119.6	114.9

Max dry den= 122.6 pcf, Opt moisture= 11.4 %

versize Correction Not Applied



Test specification: ASTM D 1557-91 Procedure A, Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
	-	-	- %	2.70	-	-		

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 115.4 pcf Optimum moisture = 14.6 %	Dark gray sandy CLAY

Project No.: 00-166

Project: Bishop Ranch 50 - Acre Property

Location: 0.5'-1.0' East Parking A

Date: 4-12-2000

Remarks:

HLA Job #50044.1

MOISTURE-DENSITY RELATIONSHIP TEST

SIERRA TESTING LABORATORIES, INC.

Fig. No. 3

PROJECT DATA

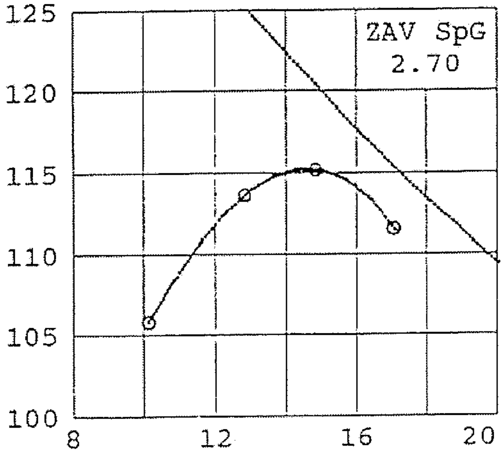
ate: 4-12-2000
?roject no.: 00-166
Project: Bishop Ranch 50 - Acre Property
ocation 1: 0.5'-1.0' East Parking A
.:
Remarks 1: HLA Job #50044.1
:
:
Material 1: Dark gray sandy CLAY
escription 2:
levation or depth:
Fig no: 3

SPECIMEN DATA

SCS classification: -
AASHTO classification: -
atural moisture: -
Specific gravity: 2.70
Percent retained on No.4 sieve:
Percent passing No. 200 sieve:
iquid limit: -
Plastic limit:
Plasticity index: -

TEST DATA AND RESULTS FOR CURVE 1

Type of test: Modified, ASTM D 1557-91 Procedure A



POINT NO.	1	2	3	4
WM + WS	3646	3822	3884	3858
WM	1882	1882	1882	1882
WW+T #1	382.40	394.70	430.60	398.80
WD+T #1	351.90	354.70	381.70	348.20
TARE #1	50.50	42.30	51.90	51.70
MOIST #1	10.1	12.8	14.8	17.1
MOISTURE	10.1	12.8	14.8	17.1
DRY DEN	105.9	113.7	115.3	111.6

Max dry den= 115.4 pcf, Opt mcisture= 14.6 %

versize Correction Not Applied

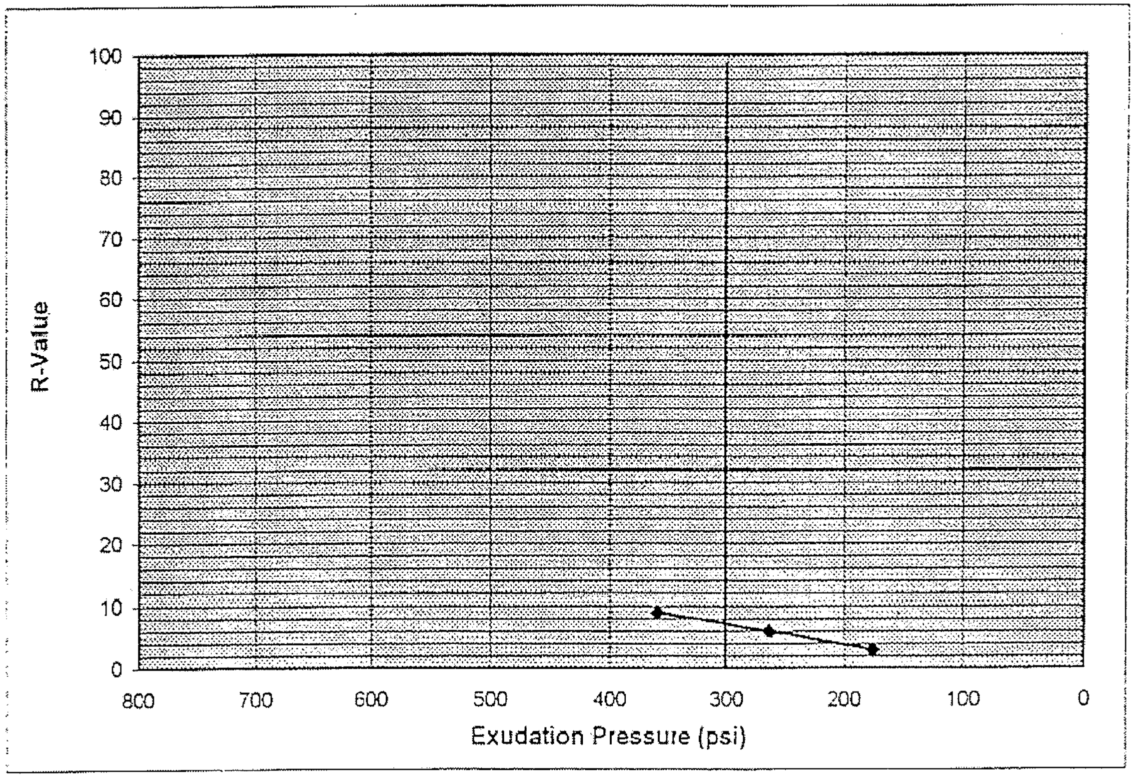
==================== SIERRA TESTING LABORATORIES, INC. ====================

Figure 4

Resistance Value

Test Procedure: California Test No. 301

Project Name:	Bishop Ranch 50 Acre
STL Project Number:	00-166
Client Project Number:	50044.1
Sample Number:	South Parking B @ 0.5'-1.0'
Material Description:	Gray brown sandy CLAY



Specimen Number:	*A*	*B*	*C*	*D*
Moisture at Test (%)	23.4	24.4	25.4	-
Dry Unit Weight at Test (pcf)	96.5	95.1	93.9	-
Expansion Pressure (psf)	43	35	22	-
Exudation Pressure (psi)	360	264	176	-
Resistance Value	9	6	3	-

R-Value at 300 psi Exudation Pressure	7

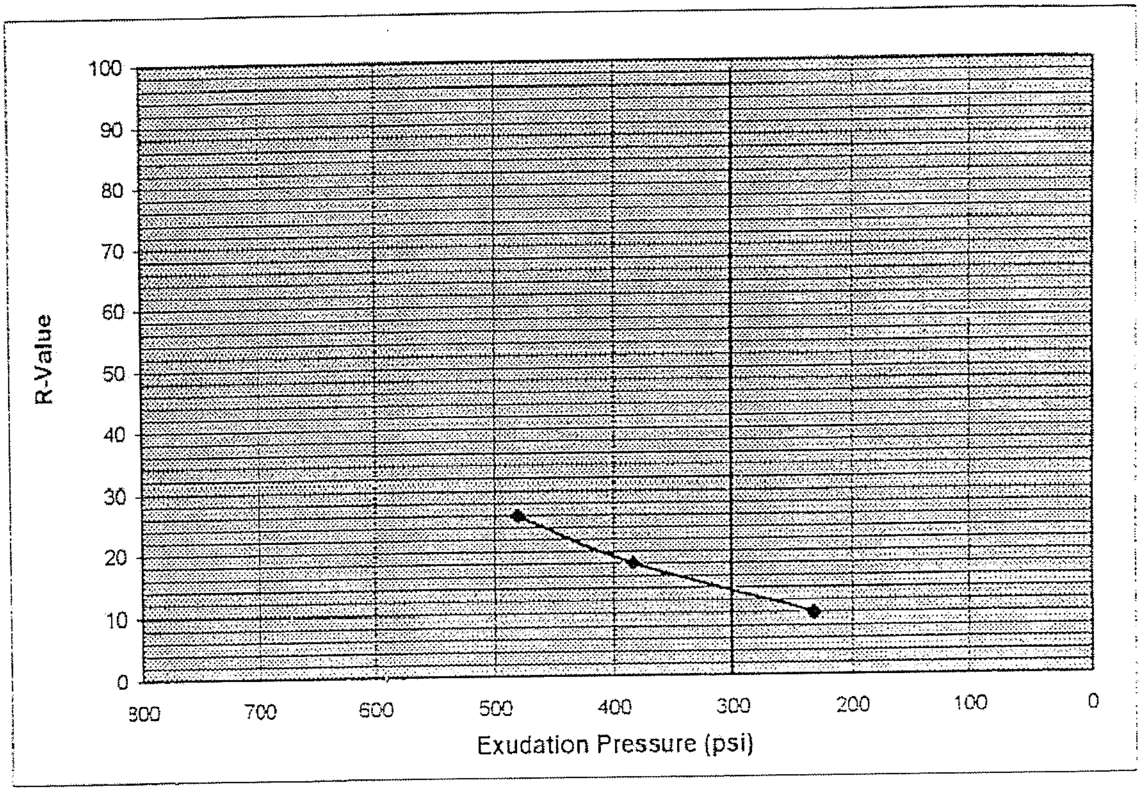
Sierra Testing Laboratories, Inc.

Figure 5

Resistance Value

Test Procedure: California Test No. 301

Project Name:	Bishop Ranch 50 Acre
STL Project Number:	00-166
Client Project Number:	50044.1
Sample Number:	North Parking B @ 0.5'-1.0'
Material Description:	Gray brown sandy CLAY



Specimen Number:	*A*	*B*	*C*	*D*
Moisture at Test (%)	20.1	19.1	18.2	-
Dry Unit Weight at Test (pcf)	105	107.7	102	-
Expansion Pressure (psf)	43	65	87	-
Exudation Pressure (psi)	232	384	480	-
Resistance Value	10	18	26	-

R-Value at 300 psi Exudation Pressure	13

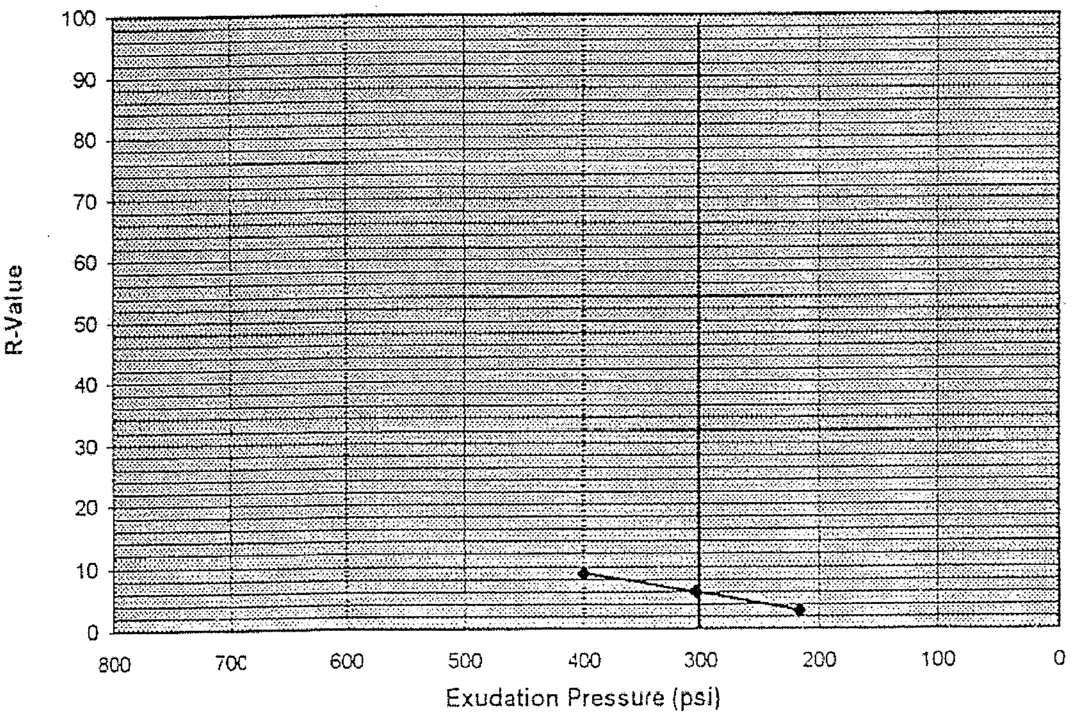
Sierra Testing Laboratories, Inc.

Figure 6

Resistance Value

Test Procedure: California Test No. 301

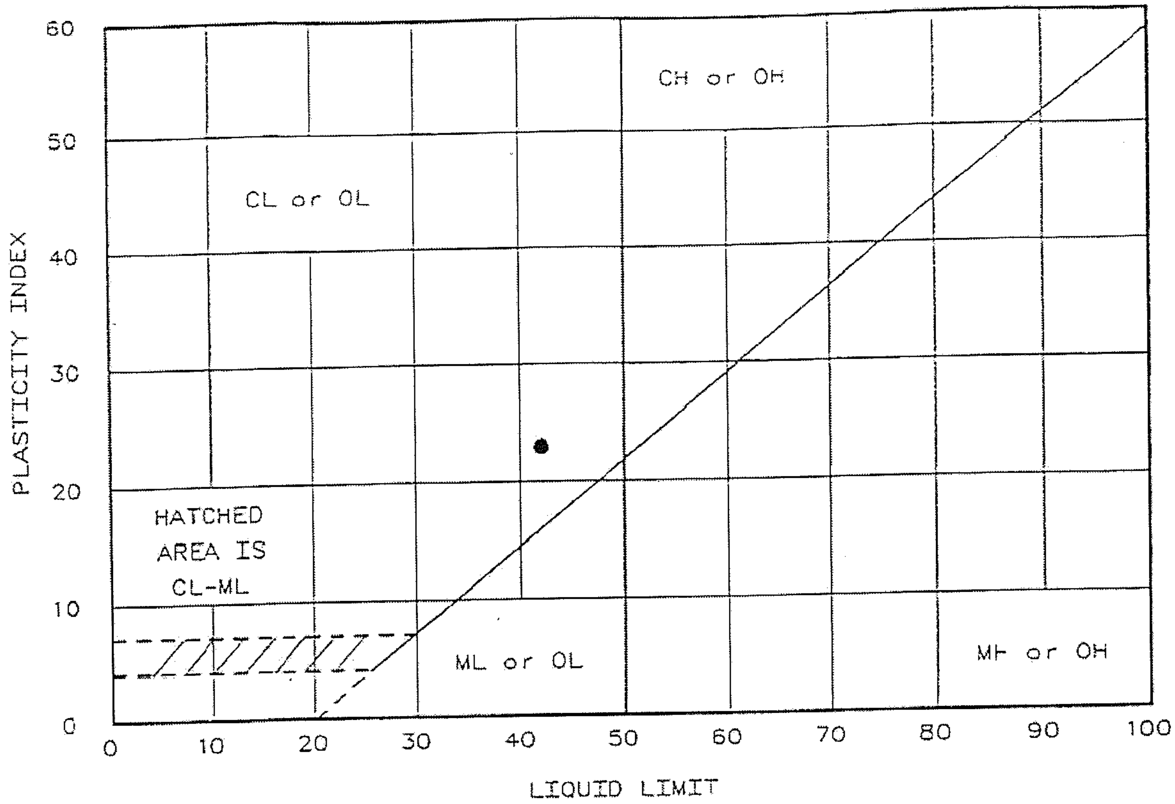
Project Name:	Bishop Ranch 50 Acre
STL Project Number:	00-166
Client Project Number:	50044.1
Sample Number:	East Parking B @ 0.5'-1.0'
Material Description:	Dark gray sandy CLAY



Specimen Number:	*A*	*B*	*C*	*D*
Moisture at Test (%)	22.6	23.7	24.8	-
Dry Unit Weight at Test (pcf)	100	97.3	95.9	-
Expansion Pressure (psf)	134	82	65	-
Exudation Pressure (psi)	400	304	216	-
Resistance Value	9	6	3	-

R-Value at 300 psi Exudation Pressure	6

Sierra Testing Laboratories, Inc.



Location + Description	LL	PL	PI	-200	ASTM D 2487-90
● 0.5'-1.0' S. Parking B Gray brn sandy CLAY	42	19	23		

Project No.: 00-166
Project: Bishop Ranch 50 - Acre Property

Client: Harding Lawson Associates
Location: South Parking B

Date: 4-7-2000

Remarks:
HLA Job #50044.1

LIQUID AND PLASTIC LIMITS TEST REPORT

SIERRA TESTING LABORATORIES, INC.

Fig. No. 7

LIQUID & PLASTIC LIMIT TEST DATA

PROJECT DATA

Project No.: 00-166 Date: 4-7-2000
lient: Harding Lawson Assciates
roject: Bishop Ranch 50 - Acre Property

roject location: South Parking B

emarks: HLA Job #50044.1

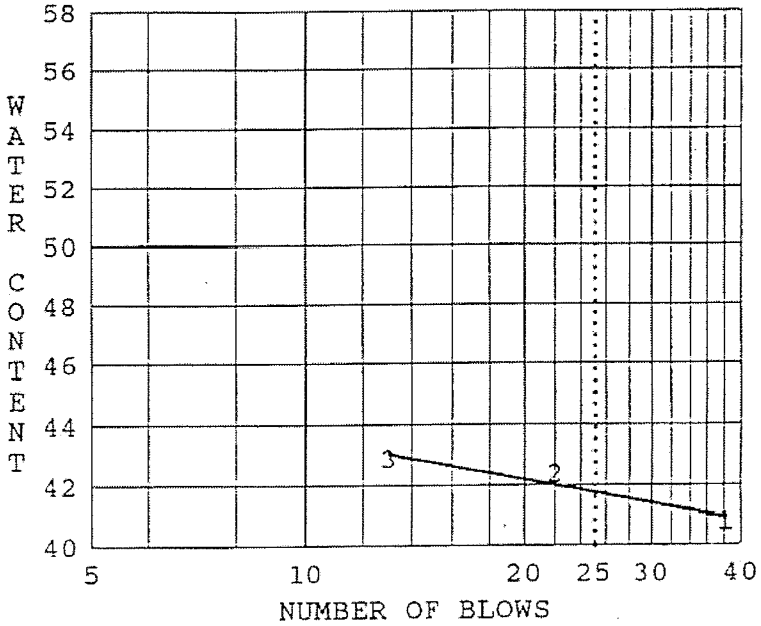
igure Number: 7

TEST DATA - Test number 1

ocation and description: 0.5'-1.0' S. Parking B
Gray brn sandy CLAY

LIQUID LIMITS

un No.	1	2	3	4
T w+t	31.01	34.91	27.38	
T d+t	22.44	24.95	19.59	
WT tare	1.45	1.44	1.44	
# Blows	38	22	13	
oisture	40.8	42.4	42.9	



PLASTIC LIMITS

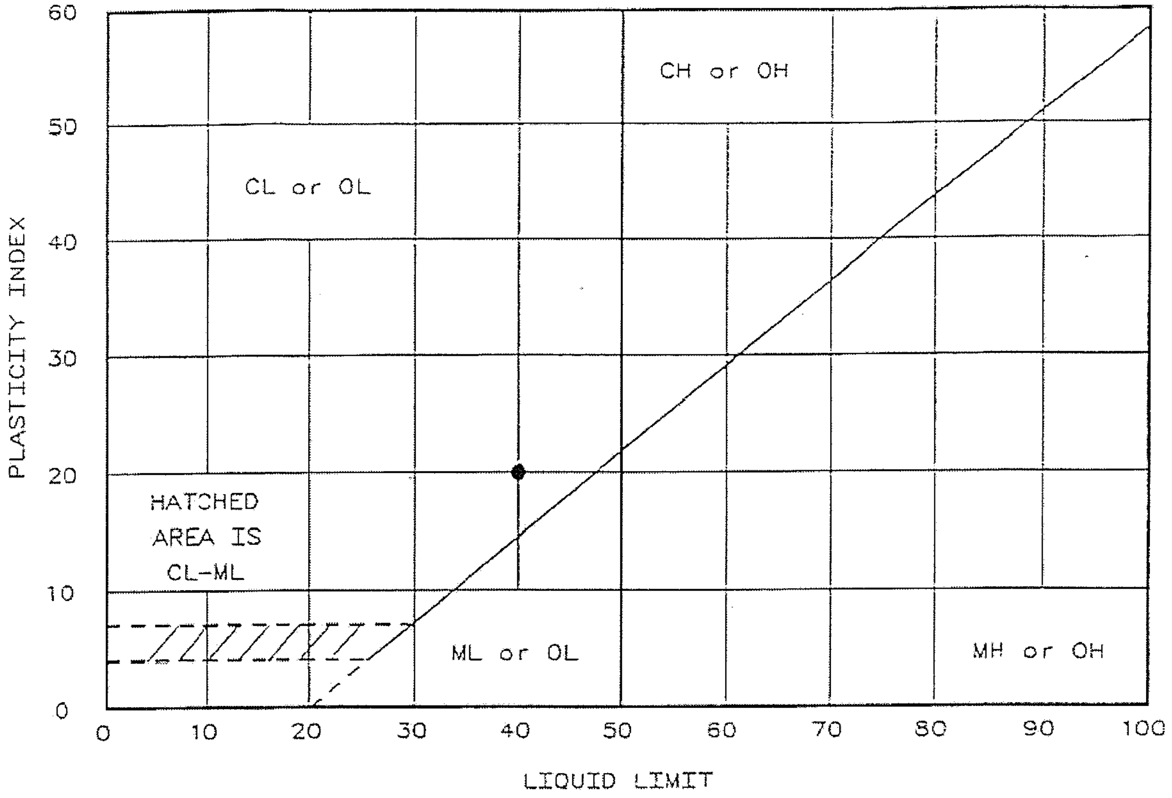
un No.	1	2	3
WT w+t	8.76	8.90	
T d+t	7.58	7.69	
T tare	1.45	1.44	
Moisture	19.2	19.4	

iquid Limit = 42
Plastic Limit = 19
lasticity Index = 23

CLASSIFICATION DATA

%-4 = %-10 = %-40 = %-200 =
Uniformity Coefficient = Curvature Coefficient =
LL = 42 PL = 19 PI = 23 LL (oven dry) =
ASTM =
AASHTO =

SIERRA TESTING LABORATORIES, INC.



	Location + Description	LL	PL	PI	-200	ASTM D 2487-90
●	0.5'-1.0' N. Parking B Gray brown sandy CLAY	40	20	20		

Project No.: 00-166
Project: Bishop Ranch 50 - Acre Property

Client: Harding Lwson Associates
Location: North Parking B

Date: 4-7-2000

Remarks:

HLA Job #50044.1

LIQUID AND PLASTIC LIMITS TEST REPORT

SIERRA TESTING LABORATORIES, INC.

Fig. No. 8

LIQUID & PLASTIC LIMIT TEST DATA

PROJECT DATA

Project No.:	00-166	Date: 4-7-2000
lient:	Harding Lwson Associates	
roject:	Bishop Ranch 50 - Acre Property	
Project location:	North Parking B	
emarks:	HLA Job #50044.1	
igure Number:	8	

TEST DATA - Test number 1

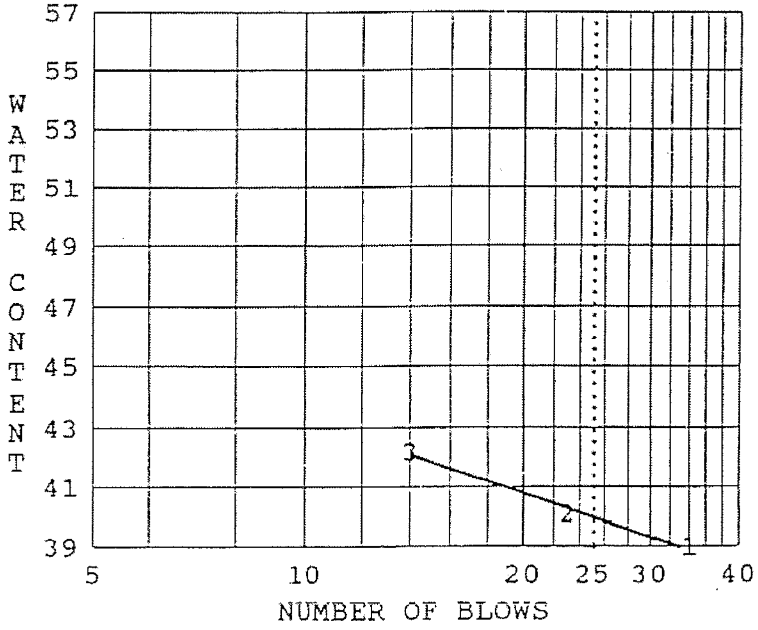
ocation and description: 0.5'-1.0' N. Parking B
Gray brown sandy CLAY

LIQUID LIMITS

un No.	1	2	3	4
WT w+t	32.75	34.99	30.48	
T d+t	23.96	25.39	21.87	
T tare	1.44	1.44	1.45	
# Blows	34	23	14	
oisture	39.0	40.1	42.2	

PLASTIC LIMITS

un No.	1	2	3
WT w+t	8.69	9.26	
T d+t	7.49	7.99	
T tare	1.44	1.44	
Moisture	19.8	19.4	

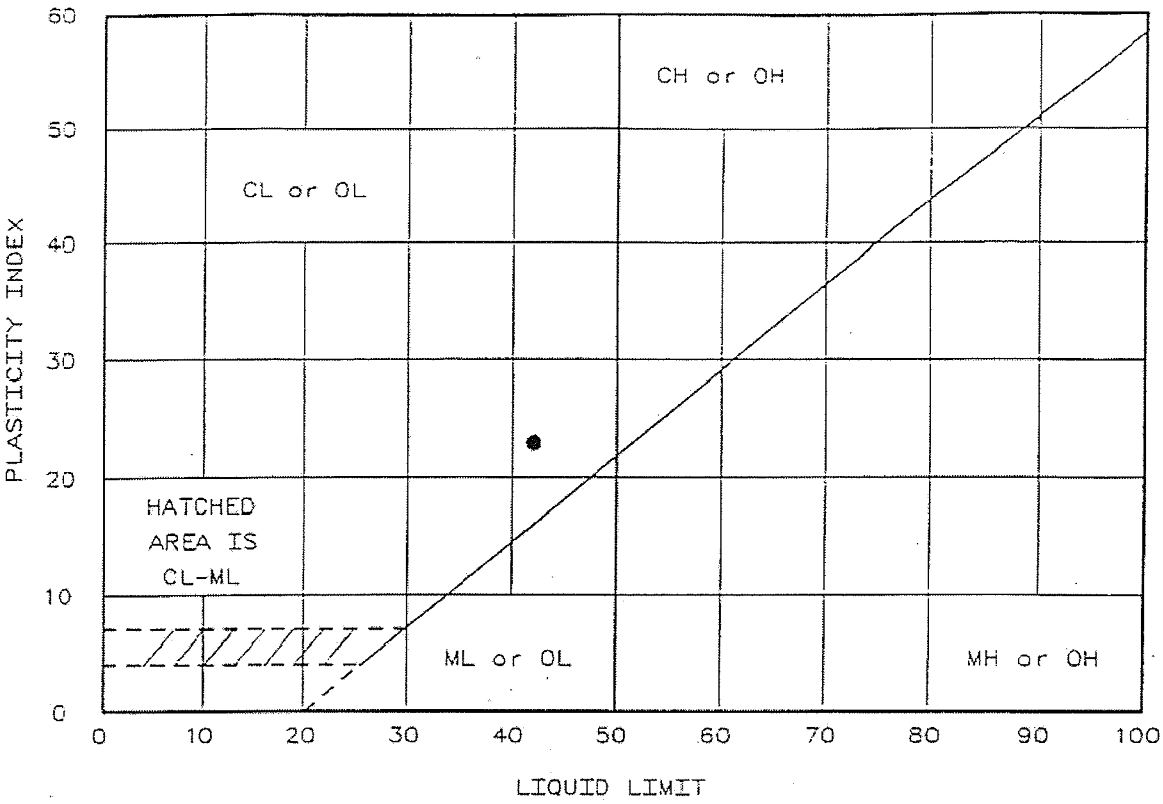


iquid Limit = 40
Plastic Limit = 20
lasticity Index = 20

CLASSIFICATION DATA

%-4 = %-10 = %-40 = %-200 =
Uniformity Coefficient = Curvature Coefficient =
LL = 40 PL = 20 PI = 20 LL (oven dry) =
ASTM =
AASHTO =

SIERRA TESTING LABORATORIES, INC.



	Location + Description	LL	PL	PI	-200	ASTM D 2487-90
●	0.5'-1.0' E. Parking 8 Dark gray sandy CLAY	42	19	23		

Project No.: 00-166
Project: Bishop Ranch 50 - Acre Property

Client: Harding Lawson Associates
Location: East Parking 8

Date: 4-7-2000

LIQUID AND PLASTIC LIMITS TEST REPORT

SIERRA TESTING LABORATORIES, INC.

Remarks:

HLA Job #50044.1

Fig. No. 9

LIQUID & PLASTIC LIMIT TEST DATA

PROJECT DATA

Project No.: 00-166 Date: 4-7-2000
lient: Harding Lawson Associates
roject: Bishop Ranch 50 - Acre Property

roject location: East Parking B

Remarks: HLA Job #50044.1

igure Number: 9

TEST DATA - Test number 1

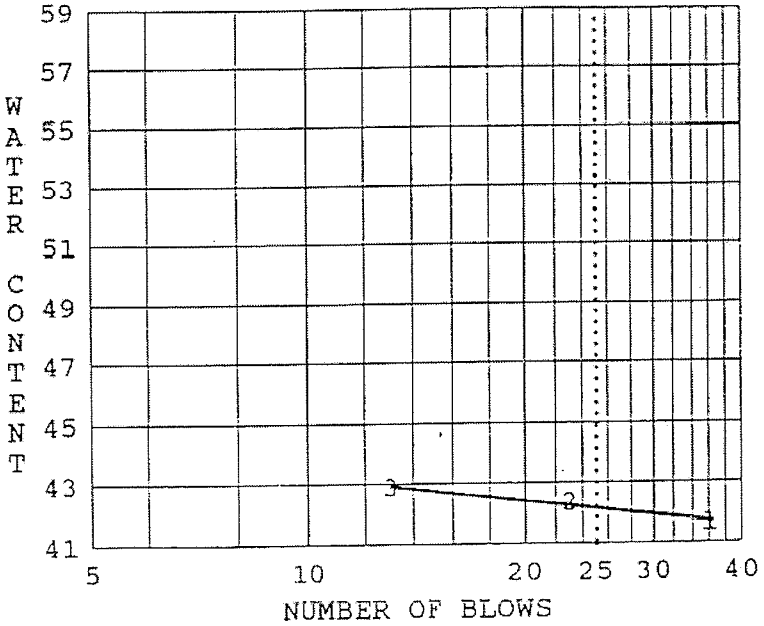
ocation and description: 0.5'-1.0' E. Parking B
Dark gray sandy CLAY

LIQUID LIMITS

un No.	1	2	3	4
T w+t	32.31	32.90	30.26	
T d+t	23.23	23.53	21.61	
WT tare	1.44	1.45	1.45	
Blows	36	23	13	
oisture	41.7	42.4	42.9	

PLASTIC LIMITS

un No.	1	2	3
WT w+t	9.09	9.86	
T d+t	7.89	8.53	
WT tare	1.46	1.44	
Moisture	18.7	18.8	



iquid Limit = 42
Plastic Limit = 19
lasticity Index = 23

CLASSIFICATION DATA

%-4 = %-10 = %-40 = %-200 =
Uniformity Coefficient = Curvature Coefficient =
LL = 42 PL = 19 PI = 23 LL (oven dry) =

ASTM =
AASHTO =

SIERRA TESTING LABORATORIES, INC.

Harding Lawson Associates

December 22, 1999

34769.15

Mr. Alex Mehran, President
Sunset Development Company
P.O. Box 640
San Ramon, California 94583

Geotechnical Consultation
Soil Corrosivity
Bishop Ranch 3 South Garage
San Ramon, California

Dear Mr. Mehran:

Harding Lawson Associates (HLA) has been providing geotechnical services during design and construction for the Bishop Ranch 3 project. We recently performed corrosivity testing on near-surface samples of native clay near the south parking garage. Test results are attached. The following paragraphs present our evaluation of corrosion mitigation for planned water lines consisting of PVC pipe with cast-iron fittings and valves coated with fusion-bonded epoxy.

Soil Resistivity and Corrosion

Many factors influence underground soil corrosion. Soil resistivity is the most important factor and is readily measured. Resistance of a corrosive electrical circuit is predominantly governed by soil resistivity. The greater the resistance of a soil to electric current flow, the lower the probability of corrosion while the lower the resistance of soil to electric current, the greater the probability of corrosion. The following table relates soil resistivity to the probable rate of corrosion:

Resistivity (ohm cm)	Corrosion Probability
0 – 1,000	Extremely High
1,000 - 2,000	Very High
2,000 – 5,000	High
5,000 – 10,000	Medium
10,000 – 25,000	Low
Above 25,000	Very Low

The attached test results indicate that the native clays are very corrosive, with resistivity values of about 1100 to 1300 ohm cm.

Corrosion, as applied to pipelines, is the electrochemical deterioration of iron and steel by galvanic or electrolytic action. PVC pipes with ductile iron fittings are commonly used for water distribution piping systems. PVC pipe material is essentially free from corrosion. Ductile iron pipe and fittings are sometimes provided with cement lining and fused bond epoxy or petroleum-asphaltic coating in accordance with ANSI A21.4/AWWA C104 for corrosion protection.

Also, buried ductile iron piping, fittings, and associated valves are often wrapped with polyethylene bagging, 8 mils minimum thickness, manufactured in accordance with the latest specifications. Cement mortar coating on the pipes and fittings is another alternative to provide protection by shielding steel from the soil and providing a highly alkaline environment at the steel-mortar interface, which tends to passivate the steel. However, cement mortar coating is normally provided for steel pipe and fittings, and is not commercially available for ductile iron pipe and fittings.

Coating on the pipe is used to inhibit the corrosion process. Cathodic protection is often used to complete the corrosion protection (true for most water agencies in the Bay Area). Sacrificial anode material such as zinc or magnesium is used to create a galvanic cell and is connected directly to metal pipe for protection. The pipe joints are provided with electrical bonds for ensuring electrical current continuity for effective cathodic protection.

With PVC piping and ductile iron fittings, it is impossible to provide electrical bonding connection for current continuity. Completely encasing the buried ductile iron fittings and valves (with appropriate coatings) in the 8 mils minimum polyethylene sheet or bagging is an effective way to provide adequate corrosion protection in corrosive soils. This polyethylene bagging prevents the encased metal from directly contacting the surrounding soil.

Conclusions and Recommendations

Based on our testing and evaluation, HLA concludes that the planned coated metal fittings and valves should be wrapped with polyethylene bagging. The bagging should be 8 mils minimum thickness, manufactured in accordance with the latest edition of ASTM D1248, Type I, Class C, Grade E1 and installed in accordance with AWWA C105 and the manufacturer's recommendations. Bare metals should not be allowed to contact directly with soil. Care should be taken during installation and trench backfilling to avoid any damage to the bagging.

We trust this provides the required information. If there are questions, please call the undersigned at 510-628-3203.

Yours very truly,

HARDING LAWSON ASSOCIATES

Christian P. Muller
Geotechnical Engineer

REGISTERED PROFESSIONAL ENGINEER
CHRISTIAN P. MULLER
002036
Exp. 6-30-2002
GEOTECHNICAL
STATE OF CALIFORNIA

CPM/HL gwpdrop/chrism/brcorrosion.doc

Attachment: Corrosivity Test Results

cc: Mr. Gabe Ciccone
Via Fax - 925/866-1330

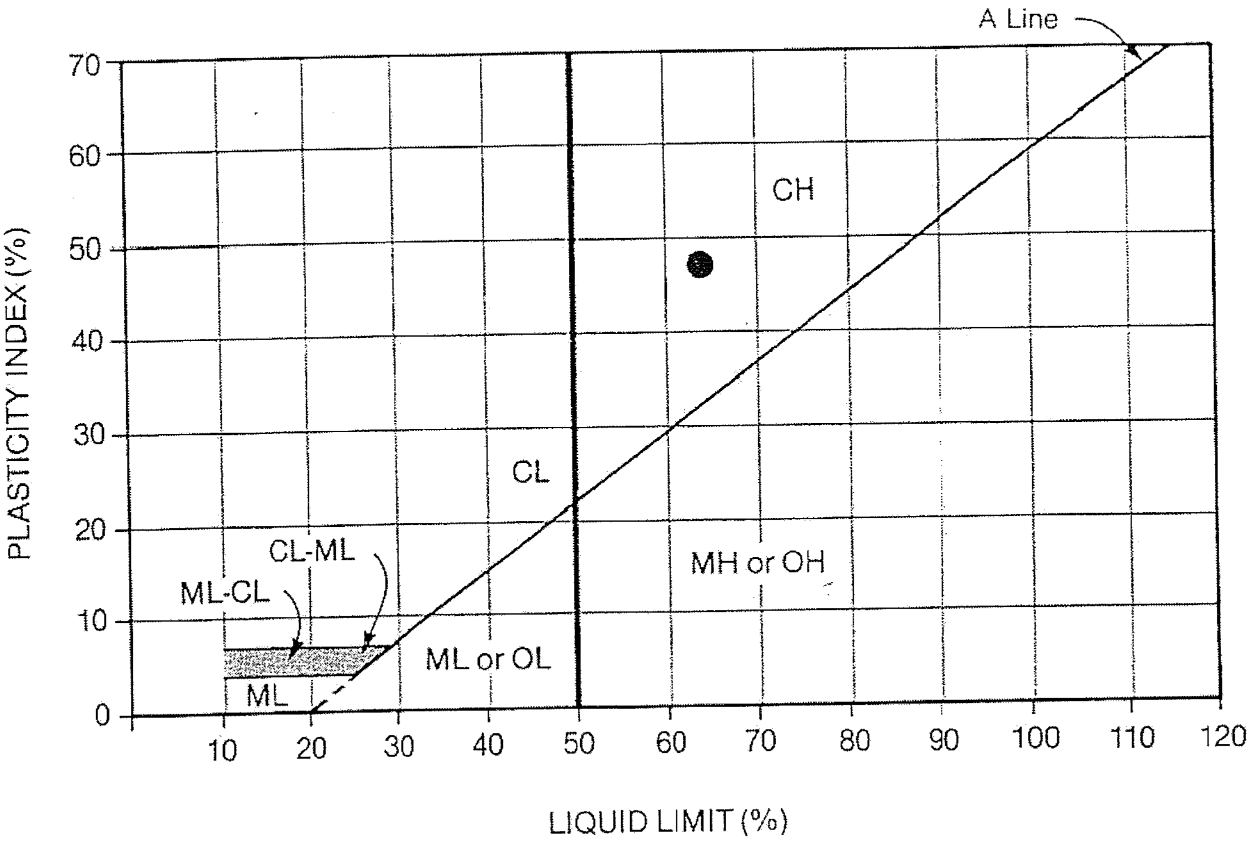
Table 1

Corrosion Analysis (CA DOT 643, 417, & 422)
Bishop Ranch South Parking Garage
HLA Job #34769.15
STL Job #99-331

Sample Name	pH	Minimum Resistivity (ohm-cm)	Chloride (ppm)	Sulfate (ppm)
SE Corner South Parking Garage Sample #1 2.0"-6.0"	6.48	1340	11.7	13.7
NE Corner South Parking Garage Sample #2 2.0"-6.0"	6.79	1150	16.3	16.7

Geotechnical Investigation, Bishop Ranch 1 Development, Bishop Ranch Business Park, San Ramon, California, prepared for Sunset Development Company, prepared by Harding Lawson Associates (HLA), HLA Project 8294,019.03, dated October 6, 1986

Reference: ASTM D 423, 424



Symbol	Source	Classification	Natural M.C. (%)	Liquid Limit (%)	Plasticity Index (%)	% Passing #200 Sieve
●	Boring 2 at 0.5 to 2.0 Feet	Black Silty Clay (CH)		64	47	

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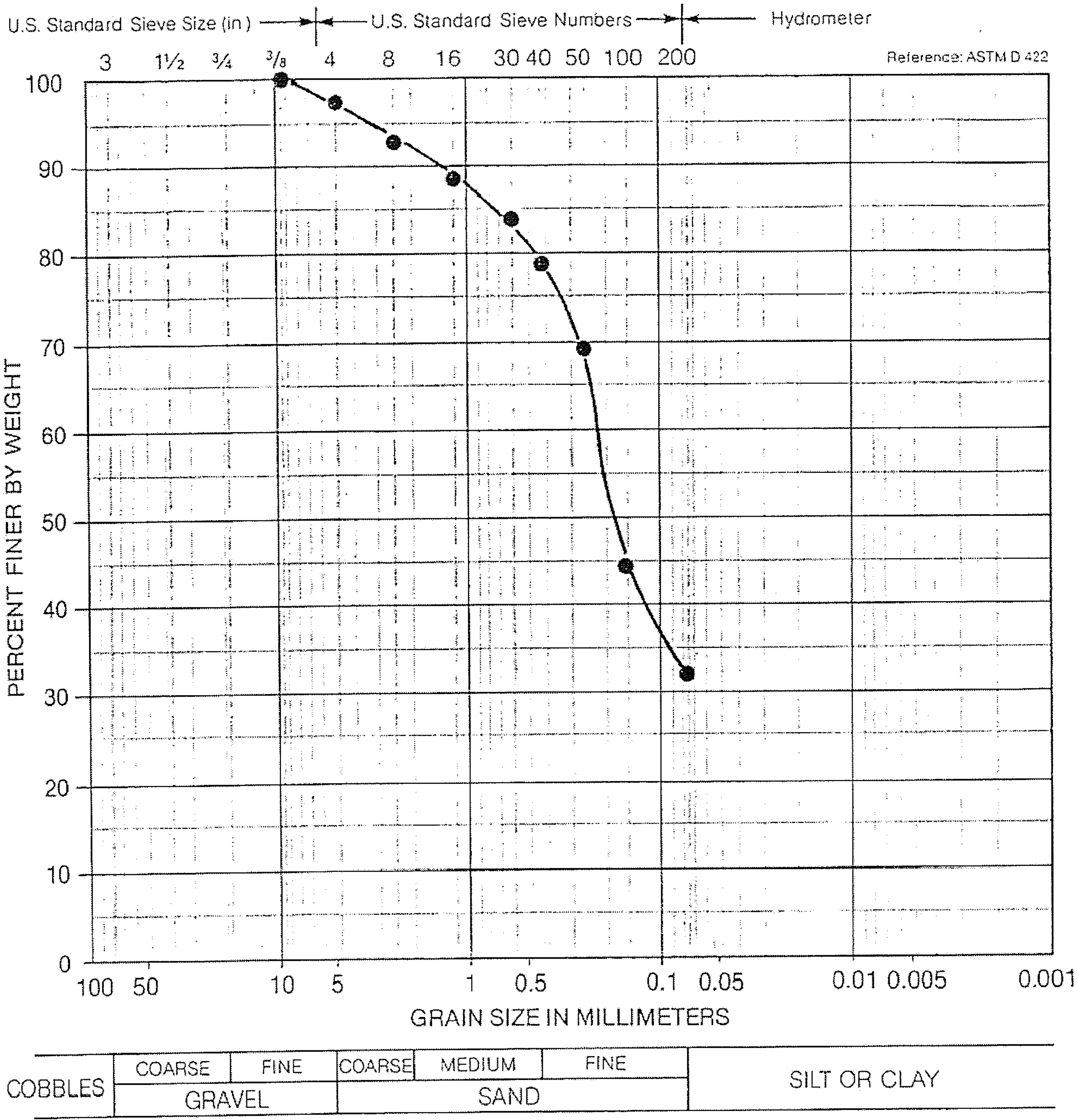
Plasticity Chart
Bishop Ranch 1
San Ramon, California

PLATE
10

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AC	8294,019.03		8/86		



Symbol	Sample Source	Classification
●	Boring 3 at 7 Feet	Brown Clayey Sand (SC)

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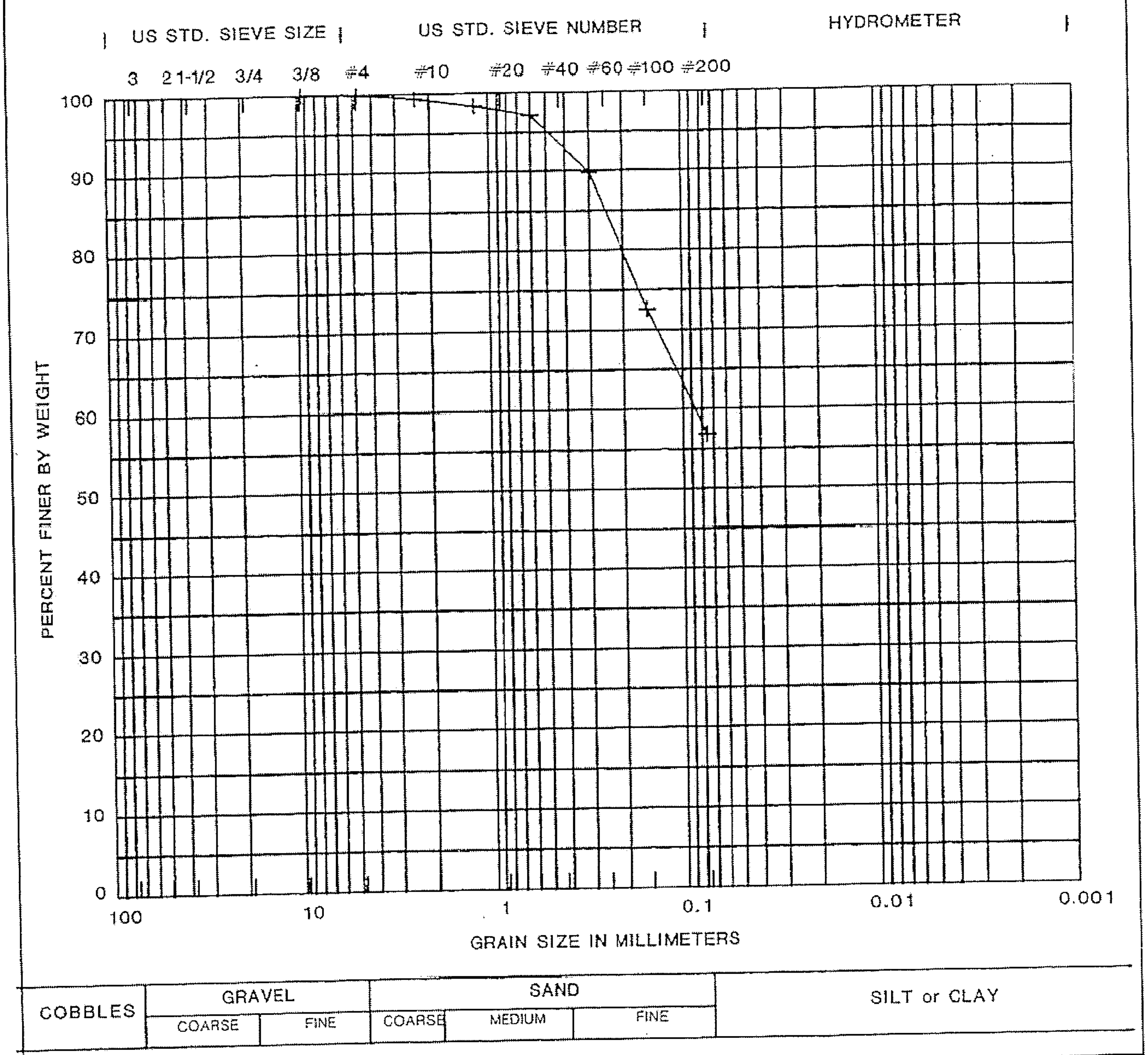
Particle Size Analysis

Bishop Ranch 1
San Ramon, California

PLATE
11

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AC	8294,019.03		8/86		



SYMBOL	BORING NUMBER	DEPTH (feet)	CLASSIFICATION
+	8	10-12	BROWN SANDY CLAY (CL*)

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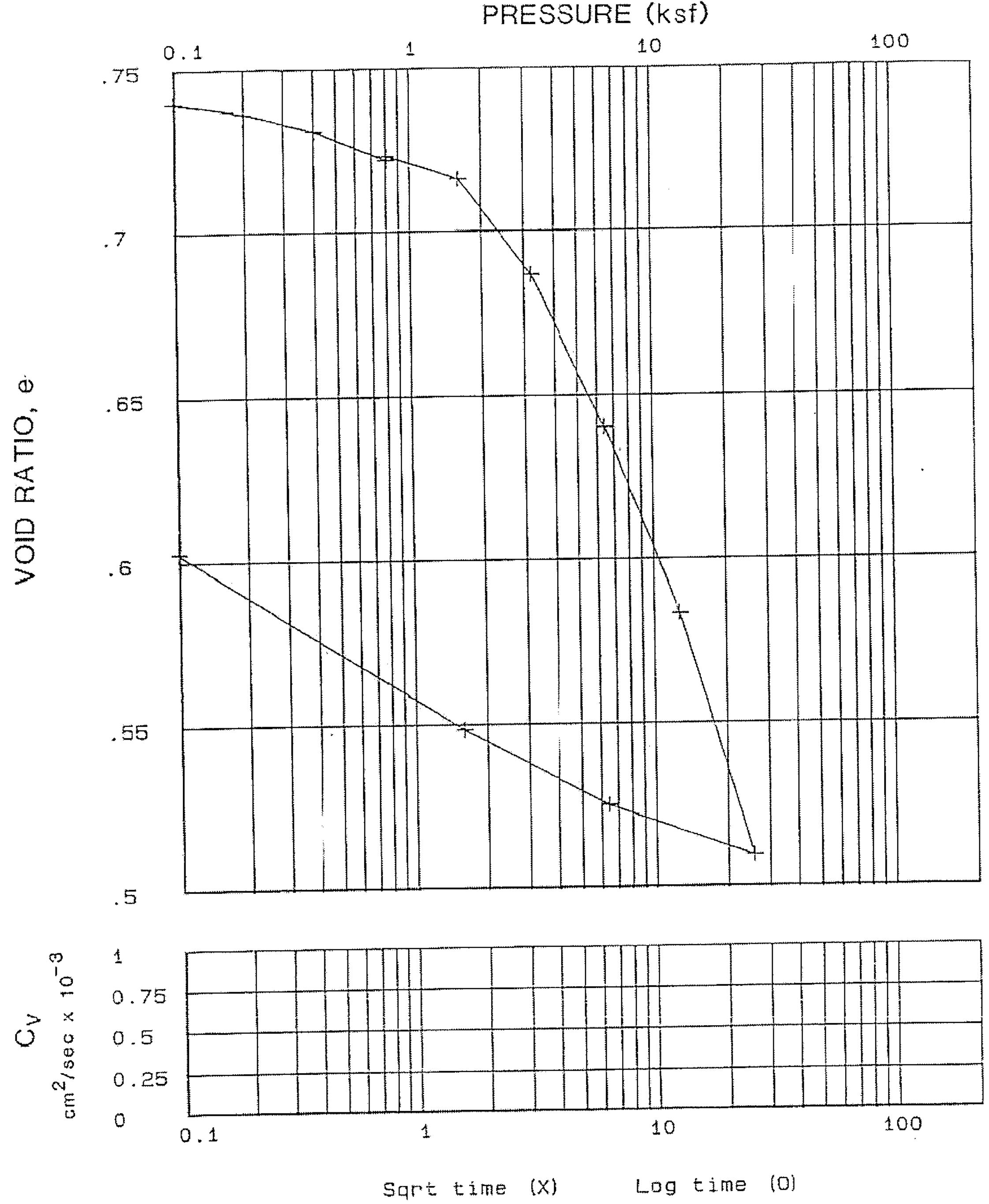
Particle Size Analysis

Bishop Ranch 1
San Ramon, California

PLATE
12

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
	08294.019.03	DMS	08/86		



SPECIMEN TYPE UNDISTURBED		BEFORE TEST			AFTER TEST	
DIAMETER (in) 2.43	HEIGHT (in) 0.80	MOISTURE CONTENT	w_o	28.5 %	w_f	23.0 %
OVERBURDEN PRESSURE, σ_{vo}' 1300 psf		VOID RATIO	e_o	.747	e_f	.603
PRECONSOL PRESSURE, $(\sigma_{vo}')_{max}$ 3500 psf		SATURATION	S_o	100 %	S_f	100 %
COMPRESSION INDEX, C_c		DRY DENSITY	γ_d	94 pcf	γ_d	102 pcf
LIQUID LIMIT --	PLASTIC LIMIT --	PLASTICITY INDEX --		SPECIFIC GRAVITY 2.62		
CLASSIFICATION BROWN SANDY CLAY (CL)		SOURCE 8 @ 10-12 ft				

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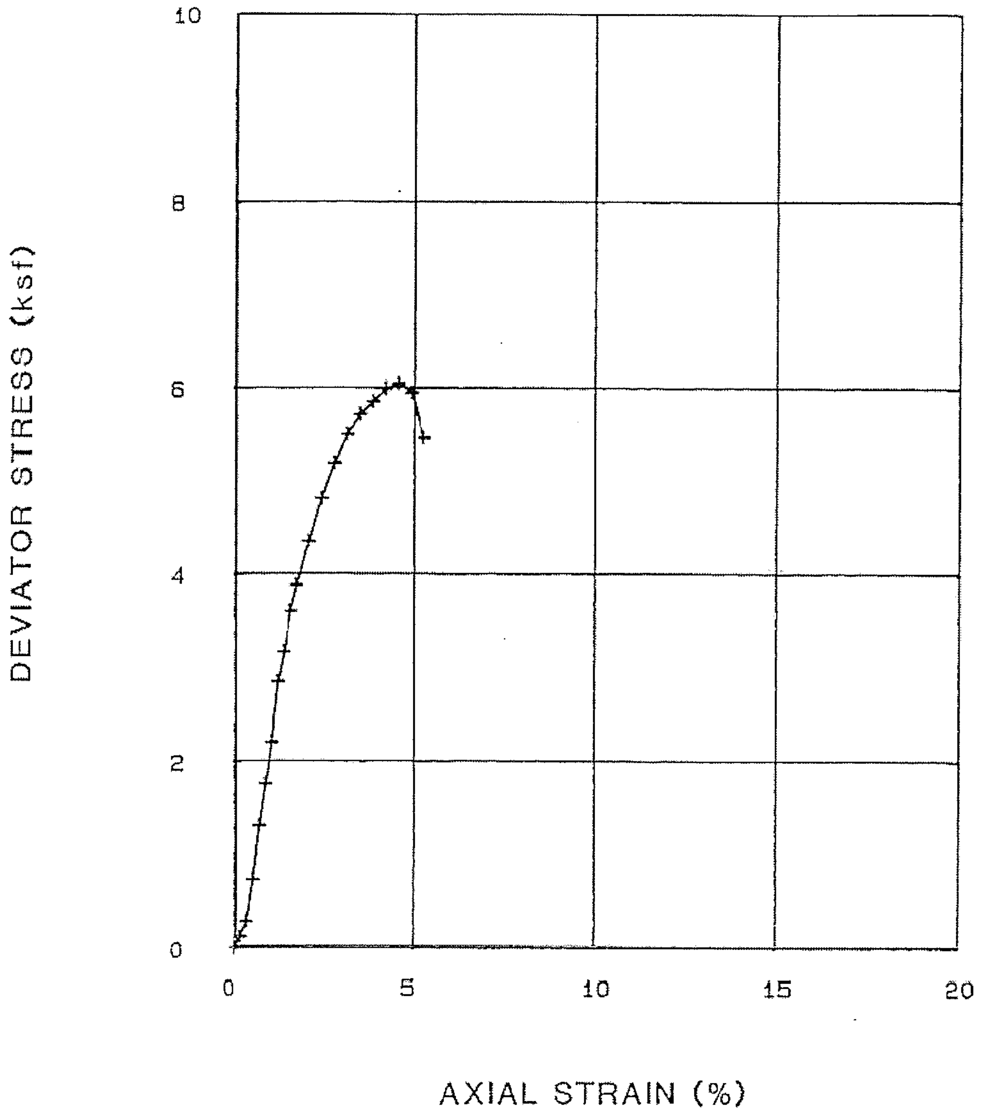
& Geophysicists

Consolidation Test Report

Bishop Ranch 1
San Ramon, California

PLATE
13

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
	08294.019.03		08/86		



SPECIMEN TYPE	UNDISTURBED			SHEAR STRENGTH	3025	psf
DIAMETER (in)	2.43	HEIGHT (in)	5.7	STRAIN AT FAILURE	4.56	%
MOISTURE CONTENT	21.4	%		CONFINING PRESSURE	420	psf
DRY DENSITY	103	pcf		STRAIN RATE	.6	%/min
CLASSIFICATION	LIGHT BROWN CLAYEY SILT (ML)			SOURCE	1 @ 6 ft	

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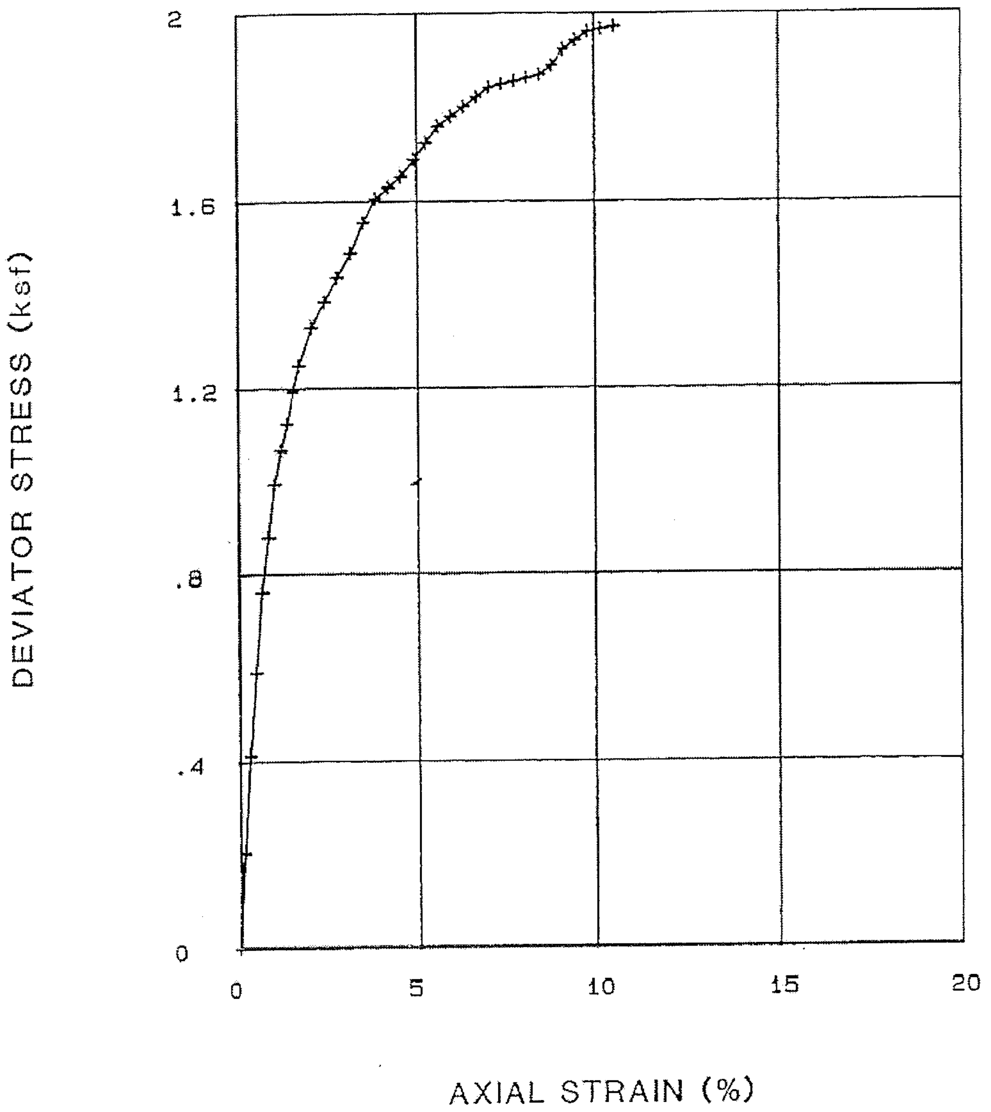
Unconsolidated-Undrained
Triaxial Compression Test Report
Bishop Ranch 1
San Ramon, California

PLATE
14

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
	08294,019.03	DMS	08/86		



SPECIMEN TYPE	UNDISTURBED		SHEAR STRENGTH	986	psf
DIAMETER (in)	2.43	HEIGHT (in) 5.7	STRAIN AT FAILURE	10.53	%
MOISTURE CONTENT	34.8	%	CONFINING PRESSURE	750	psf
DRY DENSITY	88	pcf	STRAIN RATE	.6	%/min
CLASSIFICATION	BROWN SILTY CLAY (CL)		SOURCE	4 at 15 FEET	

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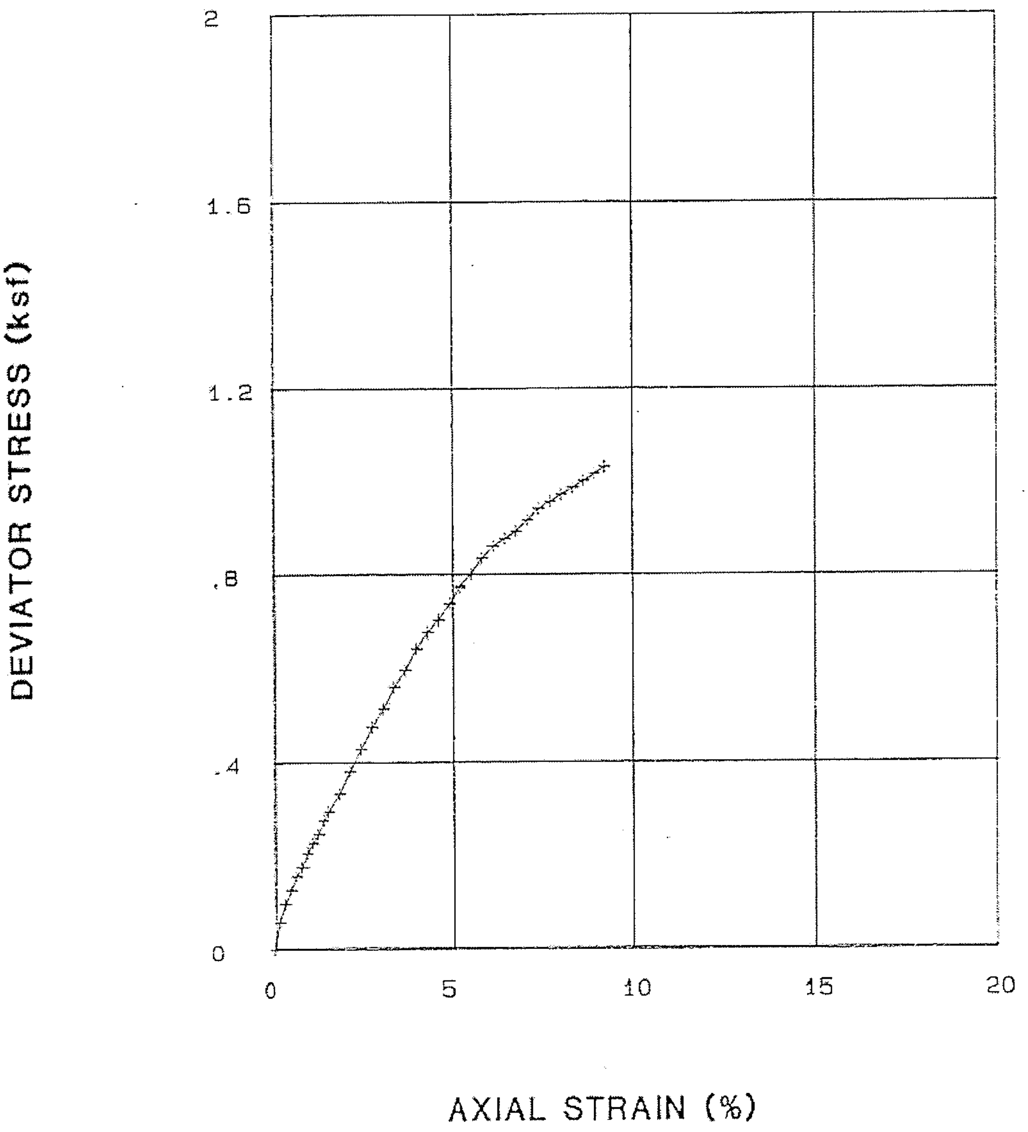
Unconsolidated-Undrained
Triaxial Compression Test Report
Bishop Ranch 1
San Ramon, California

PLATE
15

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
	08294, 019.03		08/86		



SPECIMEN TYPE	UNDISTURBED			SHEAR STRENGTH	516	psf
DIAMETER (in)	2.87	HEIGHT (in)	6.5	STRAIN AT FAILURE	9.23	%
MOISTURE CONTENT	20.4		%	CONFINING PRESSURE	420	psf
DRY DENSITY	104		pcf	STRAIN RATE	.6	%/min
CLASSIFICATION	BROWN SANDY CLAY (CL)			SOURCE	8 @ 6 ft	

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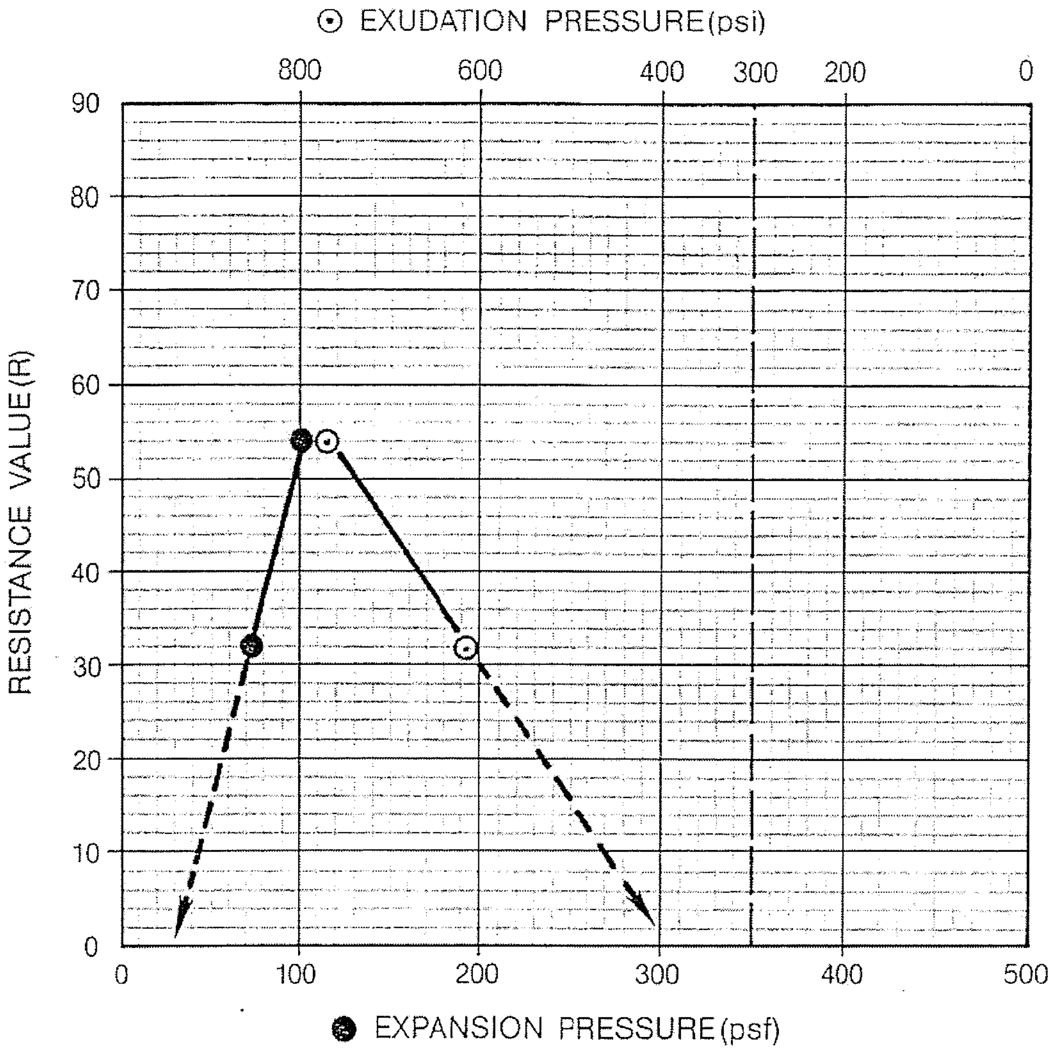
Unconsolidated-Undrained Triaxial Compression Test Report

Bishop Ranch 1
San Ramon, California

PLATE
16

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
	08294.019.03	DMS	08/86		

Reference: State of California 301, ASTM D 2844



Specimen No.	1	2		
Water Content (%)	22.7	20.6		
Dry Density (pcf)	100.8	104.0		
Exudation Pressure (psi)	610	765		
Expansion Pressure (psf)	74.1	104.6		
Resistance Value (R)	32	54		

Sample Source	Classification	Sand Equivalent	Expansion Pressure	R value
Boring 2 at 0.5 to 2.0 Feet	Black Silty Clay (CH)	3	0	<5

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& Geophysicists

Resistance Value Test Data
Bishop Ranch 1
San Ramon, California

PLATE
17

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AC	8294,019.03		8/86		

DISTRIBUTION

Preliminary Geotechnical Investigation Report
San Ramon City Center Project
Bishop Ranch
San Ramon, California

July 24, 2007

Copies 1-3:	Sunset Development Company One Annabel Lane PO Box 640 San Ramon, California 94583 Attention: Mr. Peter Oswald, Vice President, Director – Government Affairs
Copy 4:	MACTEC files

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