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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MACTEC Project No. 4096075707-05

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By DWQ with permission

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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.

[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

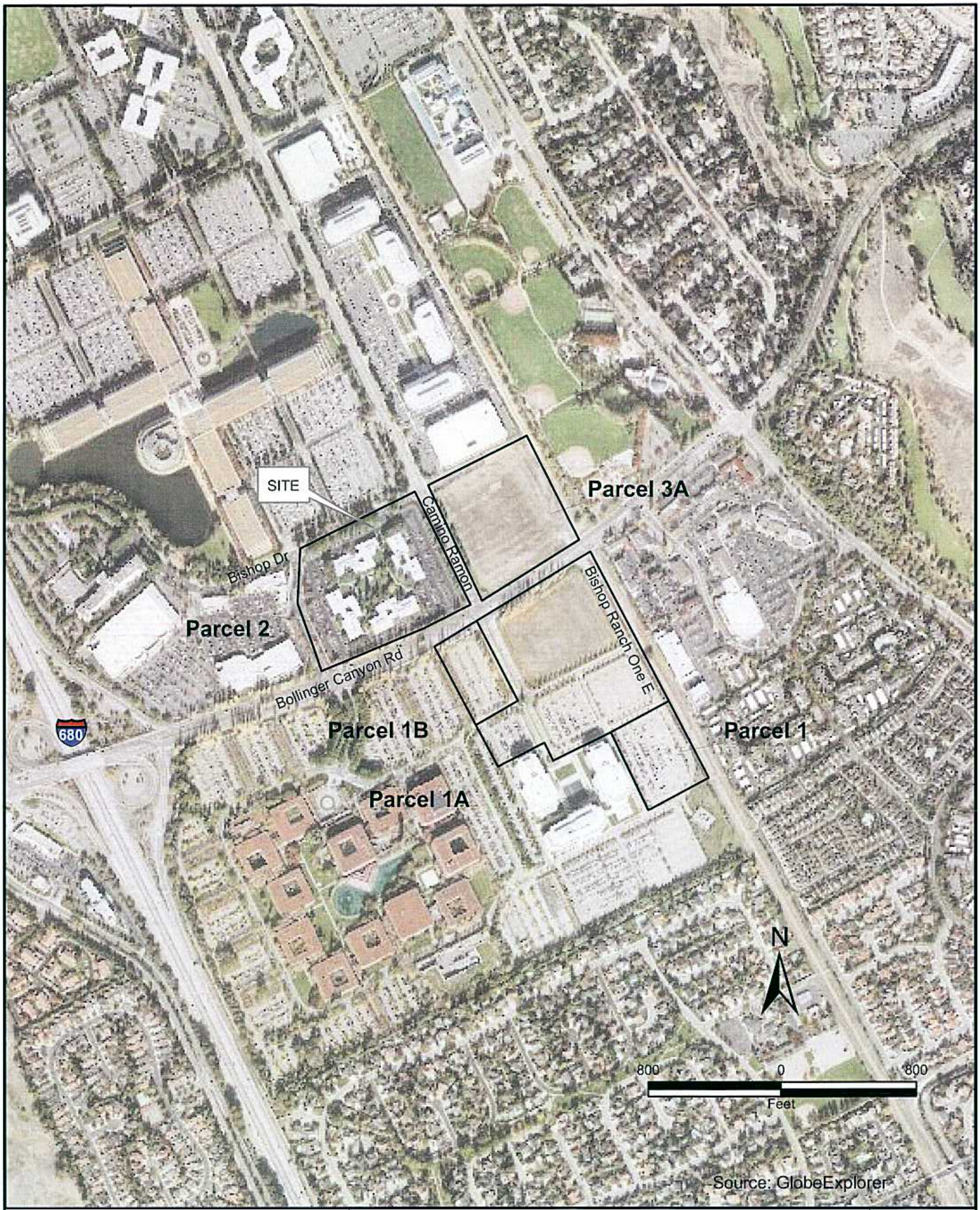
This report has been prepared for planning of the project. During design, additional geotechnical engineering should be performed to meet the specific needs of the various elements of the project. We recommend that additional subsurface investigations be performed if appropriate to confirm or augment 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



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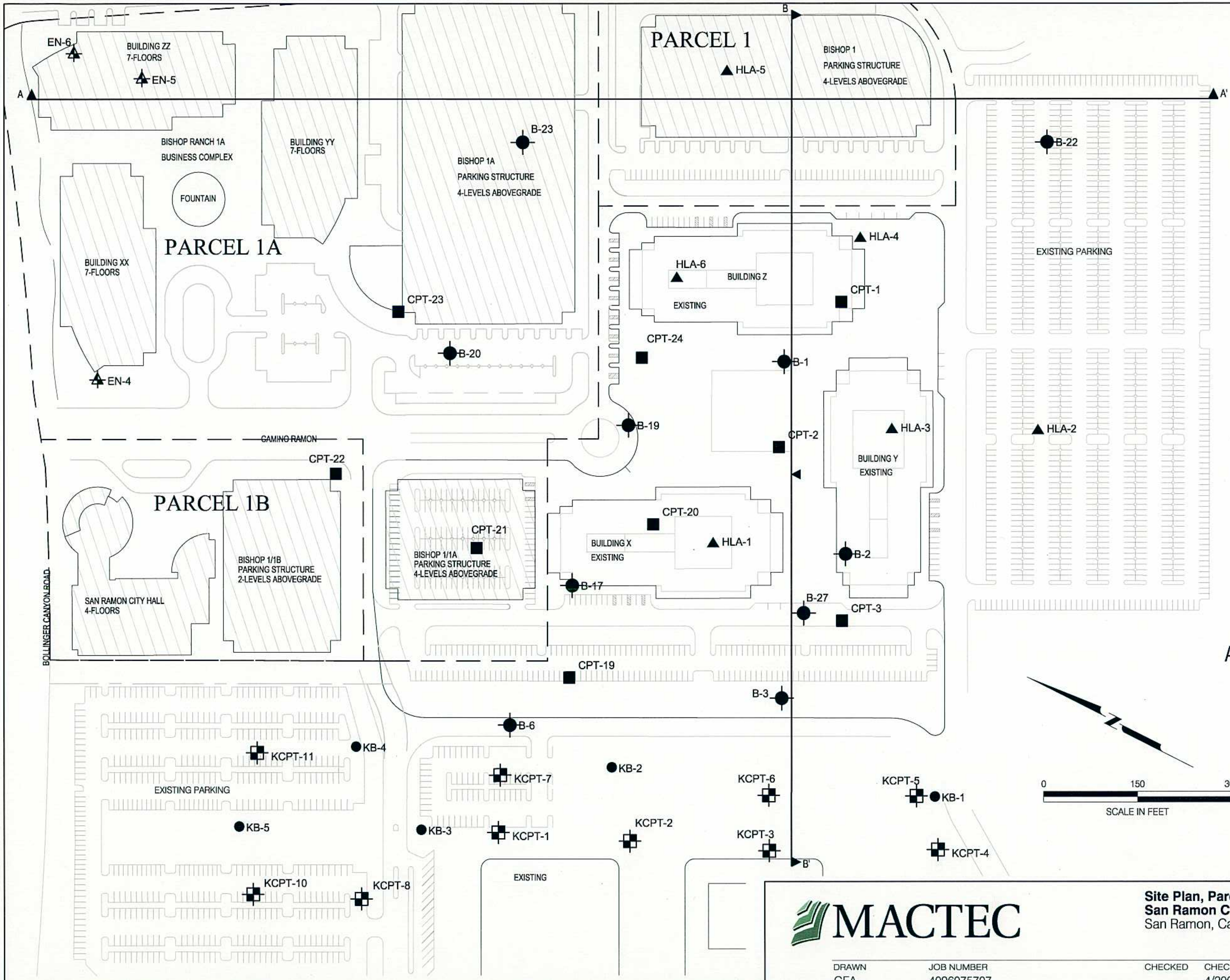
Site Location and Vicinity Map

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



LEGEND

Data Source Report:
HLA 50044.1
5-15-2000

- B-5 Soil Boring Kleinfelder 1981
- CPT-2 Cone Penetration Test Kleinfelder 1981
- HLA-3 Cone Penetration Test HLA 2000

Data Source Report:
ENGEO 5172.5.001.01
3-29-2001

- EN-3 Soil Boring ENGEO 2001

Data Source Report:
Kleinfelder 53512/GEO
6-9-2005

- KB-2 Soil Boring Kleinfelder 2005
- KCPT-3 Cone Penetration Test Kleinfelder 2005

A — A' Cross-Section

Base map provided by Cooper Robertson.

4096075707005.DWG 0.5
20070402.1545

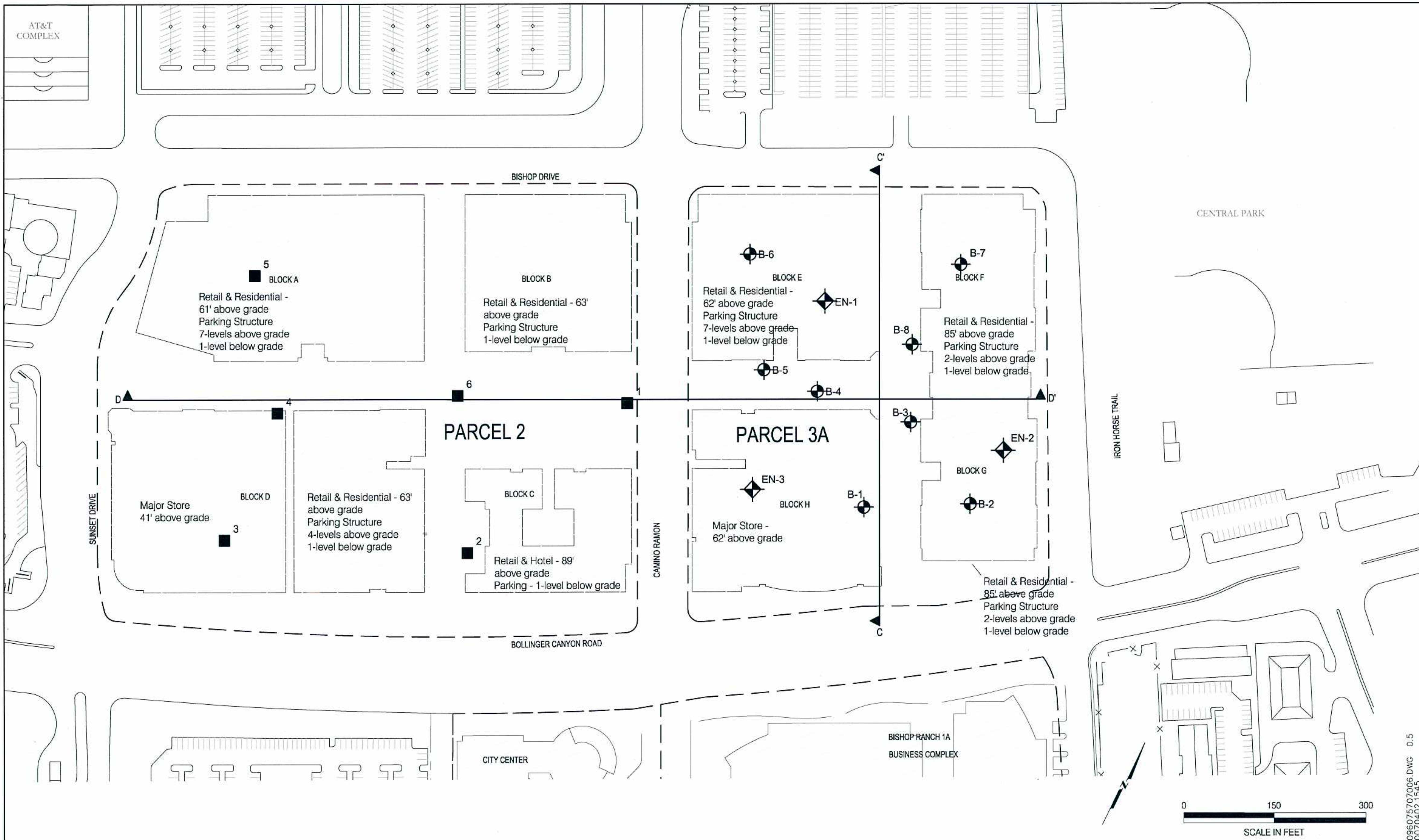
MACTEC

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	DWQ	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.

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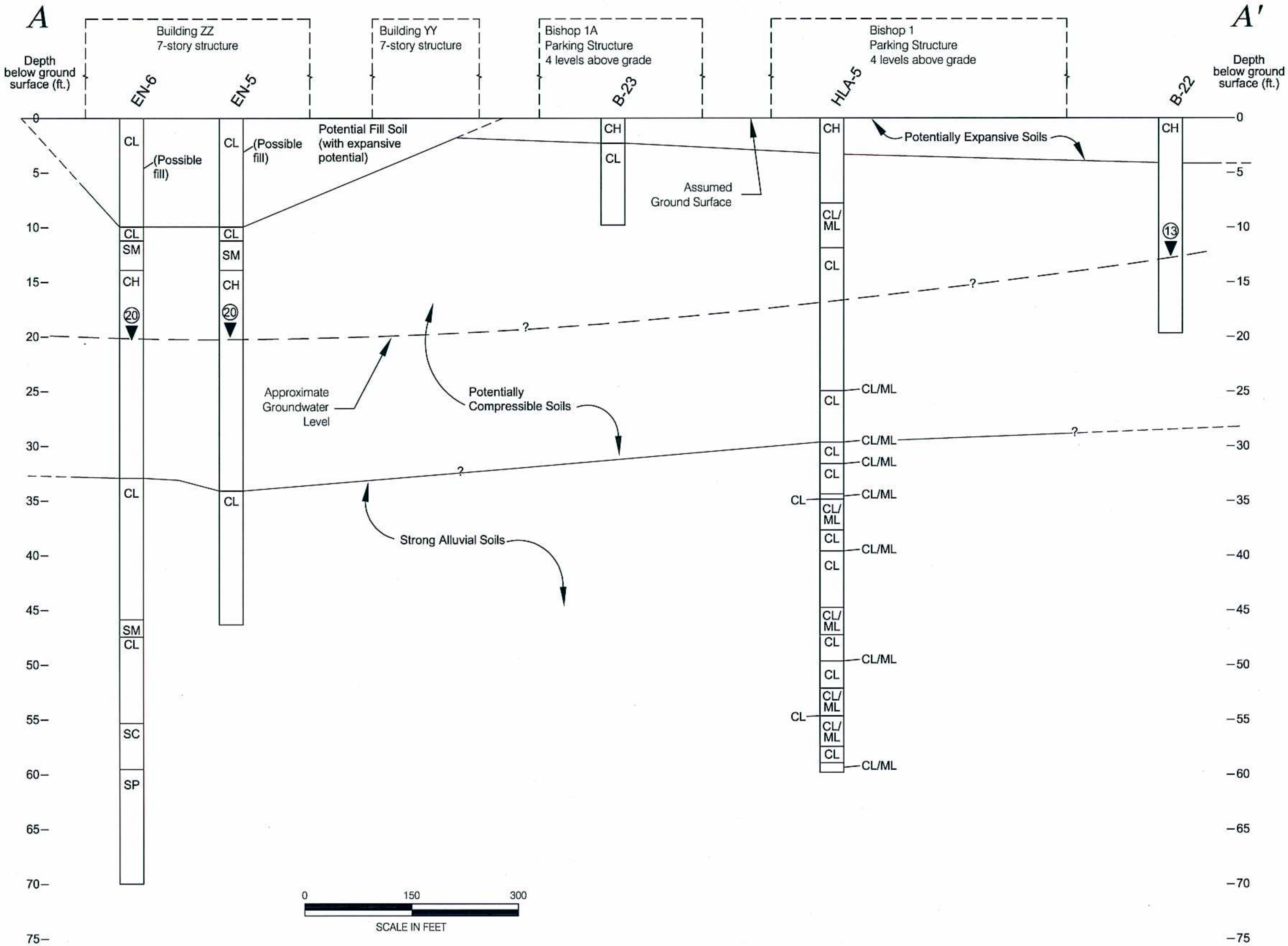
Site Plan, Parcels 2 and 3A
San Ramon City Center
San Ramon, California

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

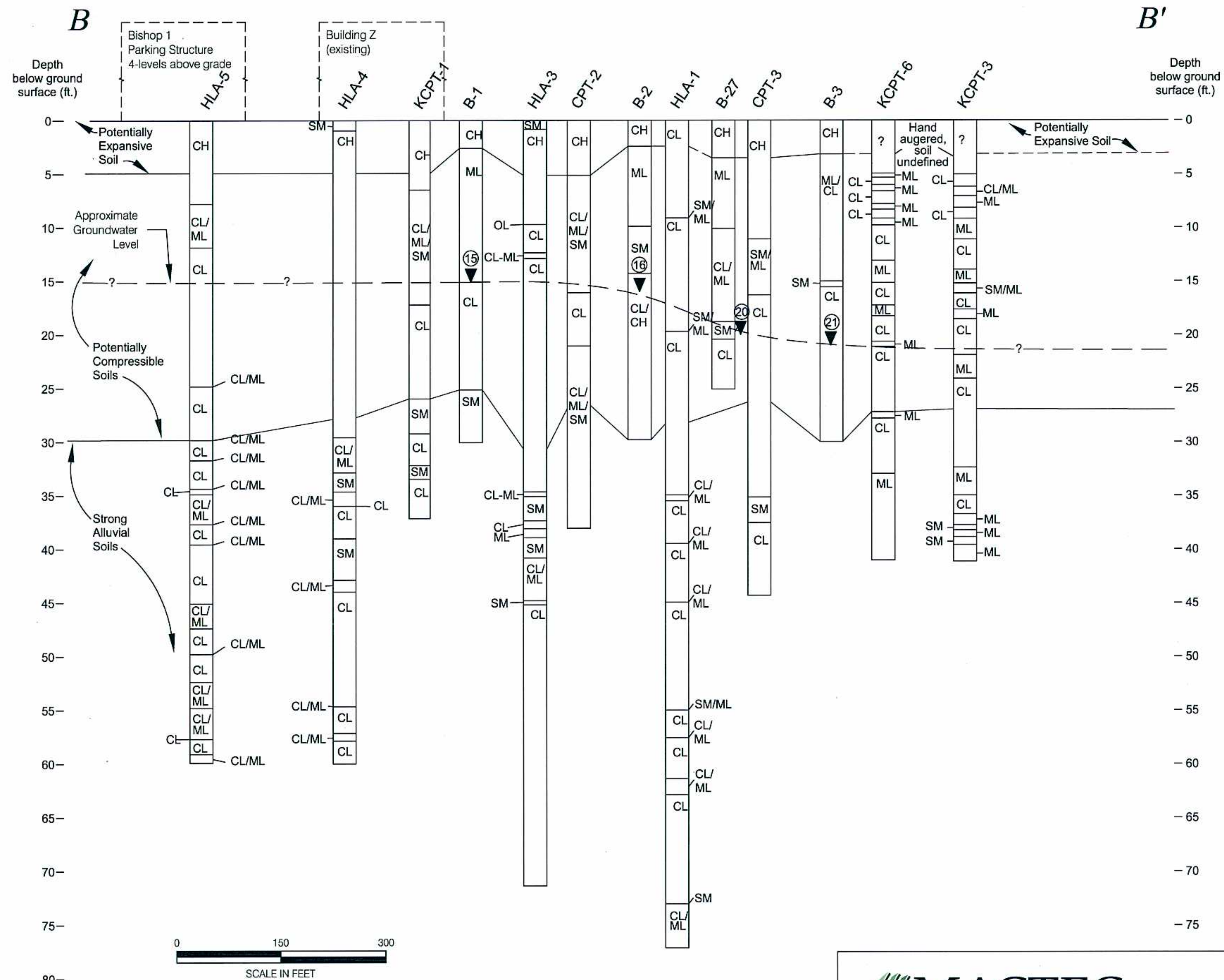
4096075707001.DWG 0.5
20070402.1545

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	DNQ	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

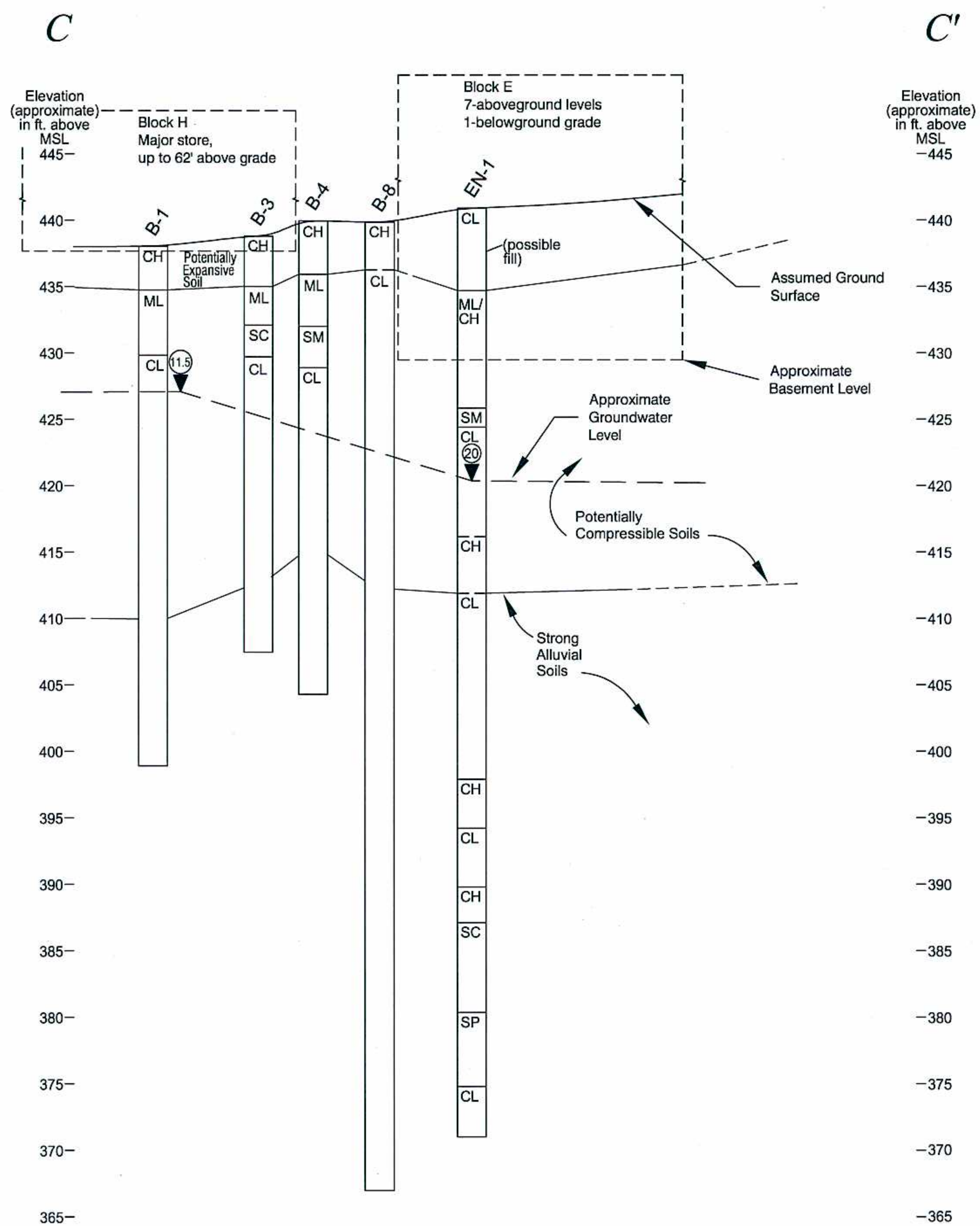
MACTEC

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

4096075707002.DWG 1.0
20070402.1457



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

0 150 300
SCALE IN FEET

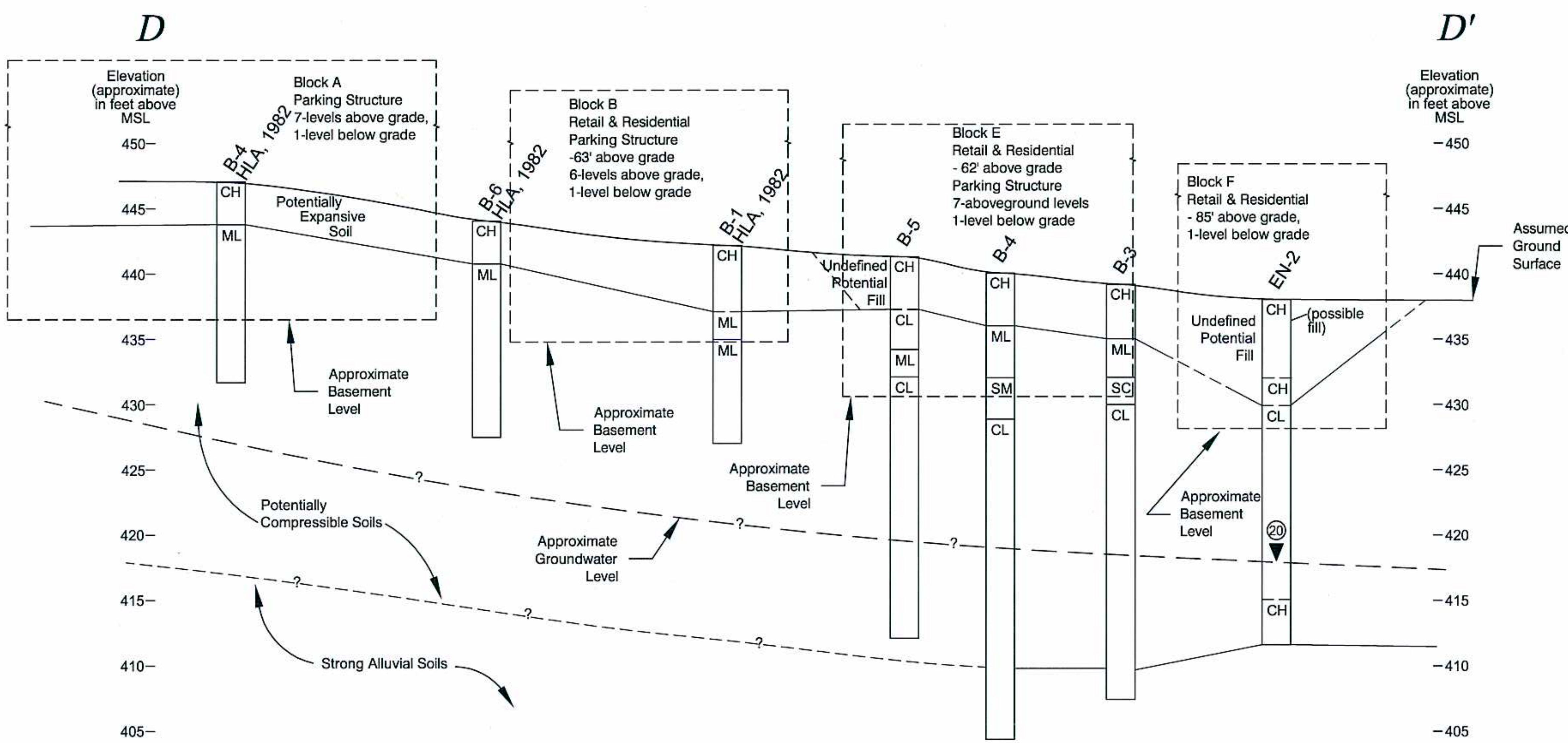
4096075707003.DWG 1.0
20070402.1537

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	DMR	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

0 150 300
SCALE IN FEET

4096075707004.DWG 1.0
20070402.1558

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	DMO	4/2/07

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.
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.

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BORING LOG LEGEND

PLATE **A-1**

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

PROJECT NO. **53512-GEO**

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:	

Surface Elevation: **Estimated 425 feet (MSL)**

Depth, ft	FIELD Sample	FIELD Blows/ft	LAB Dry Density pcf	LAB Moisture Content %	LAB Compress. Strength tsf	LAB Other Tests	Pen, tsf	DESCRIPTION
								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								

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PROJECT NO. 53512-GEO

LOG OF BORING NO. KB-1

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

PLATE **A-2**

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6/9/05 3:26:59 PM

Depth, ft	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength tsf	Other Tests	Pen, tsf	DESCRIPTION
								(Continued from previous plate)
		300psi						
35		35	96	28			2.0	- mottled black-blue-gray
40		41						**WELL-GRADED SAND with GRAVEL (SW)** - greenish brown, dense, weakly cemented, medium to coarse grained sand, angular gravel
45								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.
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	Drilling method:	6" Hollow Stem Auger
Logged By:	J. Allen	Hammer Wt:	140 lbs., 30" drop
Total Depth:	41.5 ft	Notes:	

Surface Elevation: **Estimated 425 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
0								**ASPHALT** - approximately 2.5 inches thick
								AGGREGATE BASEROCK- approximately 6 inches thick
								SILTY CLAY (CL) - black, dry - hand augered to 3 feet bgs
~3.5	X	48	109	18			4.5	**SILTY SANDY CLAY (CL)** - light brown, plastic, hard, moist, fine grained sand
5	X	28						- sand seam **SANDY CLAY (CL)** - light brown, medium plasticity, moist, very fine grained sand
10	X	28	99	26				- sand seam **SANDY LEAN CLAY (CL)** - light brown, medium plasticity, stiff, wet
~12.5			▼ 12:22 2/5/05					
15	X	18	▽ 11:47 2/5/05			LL=38; PI=20 Passing -#200=83%		
~18								**SILTY SANDY LEAN CLAY (CL)** - light brown, very stiff, moist
20	X	29					1.0	
~21								**LEAN CLAY (CL)** - olive, medium to high plasticity, very stiff, moist **LEAN CLAY (Continued)**
25	X	26	92	31			2.0	
~28								**FAT CLAY (CH)** - dark greenish-gray, high plasticity, moist
30								

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)

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6/9/05 3:27:14 PM

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: 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 2 inches thick
								AGGREGATE BASEROCK- approximately 8 inches thick
								SILTY LEAN CLAY (CL) - black - hand augered to 3 feet bgs
5		17	98	13		LL=26; PI=9	3.5	**CLAYEY SAND (SC)** - light brown, medium dense, moist, fine grained
								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		300psi	88	28		Consolidation See Plate B-3	0.5	- wet
20		17	99	29				**FAT CLAY (CH)** - dark green, high plasticity, stiff to very stiff, moist
25							4.5	- stiff
30								**SILTY LEAN CLAY (CL)** - light brown, medium plasticity, stiff,

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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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Depth, ft	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength tsf	Other Tests	Pen, tsf	DESCRIPTION
								(Continued from previous plate)
								moist
		21	92	32			0.75-1.0	**Silty Lean Clay Continued**
35		35					2.0	
40		30						**SAND (SP)** - no recovery
45								
50								
55								
60								

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.

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)

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6/9/05 2:46:01 PM

Date Completed:	2/6/05	Drilling method:	6" Hollow Stem Auger
Logged By:	J. Allen	Hammer Wt:	140 lbs., 30" drop
Total Depth:	41.5 ft	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		30						**FAT CLAY (CH)** - dark greenish brown, high plasticity, stiff, moist - 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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Depth,ft	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength tsf	Other Tests	Pen, tsf	DESCRIPTION
								(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								

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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)

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:

Surface Elevation: Estimated 430 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 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				LL=35; PI=19 Passing -#200=60%		**SANDY CLAY (CL)** - brown, low plasticity, very stiff, moist to wet
								SILTY SANDY CLAY (CL) - brown, very sift, moist
15		19	93	32			0.5	**SAND (SP)** - brown, dense, moist, fine grained
								SILTY LEAN CLAY (CL) - brown, medium plasticity
20		20						**SAND (SP)** - coarse
								FAT CLAY (CH) - greenish gray, high plasticity, stiff, moist
25		300psi 400psi	101	23	1.7 @ 14.9%			
30								

Groundwater: 11:13 2/6/05; 12:30 2/6/05

KLEINFELDER

PROJECT NO. 53512-GEO

LOG OF BORING NO. KB-5

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

PLATE A-6

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Depth, ft	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength tsf	Other Tests	Pen, tsf	DESCRIPTION
								(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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6/9/05 2:50:16 PM

Date Completed:	2/6/05	*Drilling method:*	6" Hollow Stem Auger
Logged By:	J. Allen	*Hammer Wt:*	140 lbs., 30" drop
Total Depth:	41.5 ft	*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 435 feet (MSL))
								ASPHALT - approximately 2 inches thick
								AGGREGATE BASEROCK- approximately 9 inches thick
								SILTY to SANDY CLAY (CL) - brown, plastic, moist - hand augered to 3 feet bgs
		19	97	23			2.0	**CLAYEY SAND (SC)** - brown, loose to medium dense, moist
5		11						**SANDY CLAY (CL)** - brown, medium stiff, moist
10		7						**LEAN CLAY (CL)** - brown, medium plasticity, soft to medium stiff, moist
		5	82	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								

Groundwater: 14:45 2/6/05; 15:00 2/6/05

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	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength tsf	Other Tests	Pen, tsf	DESCRIPTION
								(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)

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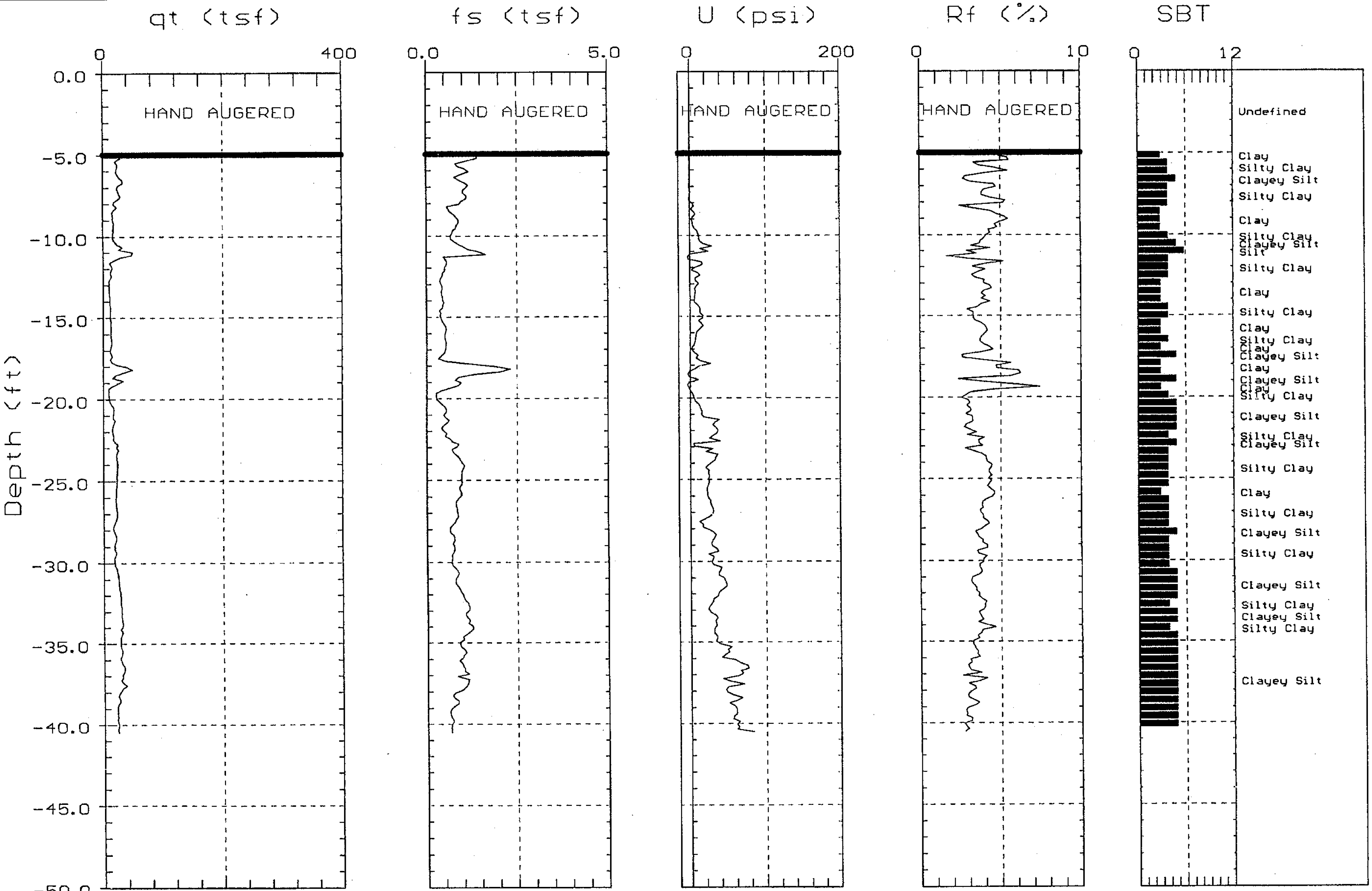
6/9/05 2:51:57 PM

GREGG KLEINFELDER

Site: CHEVRON
Location: CPT-01

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



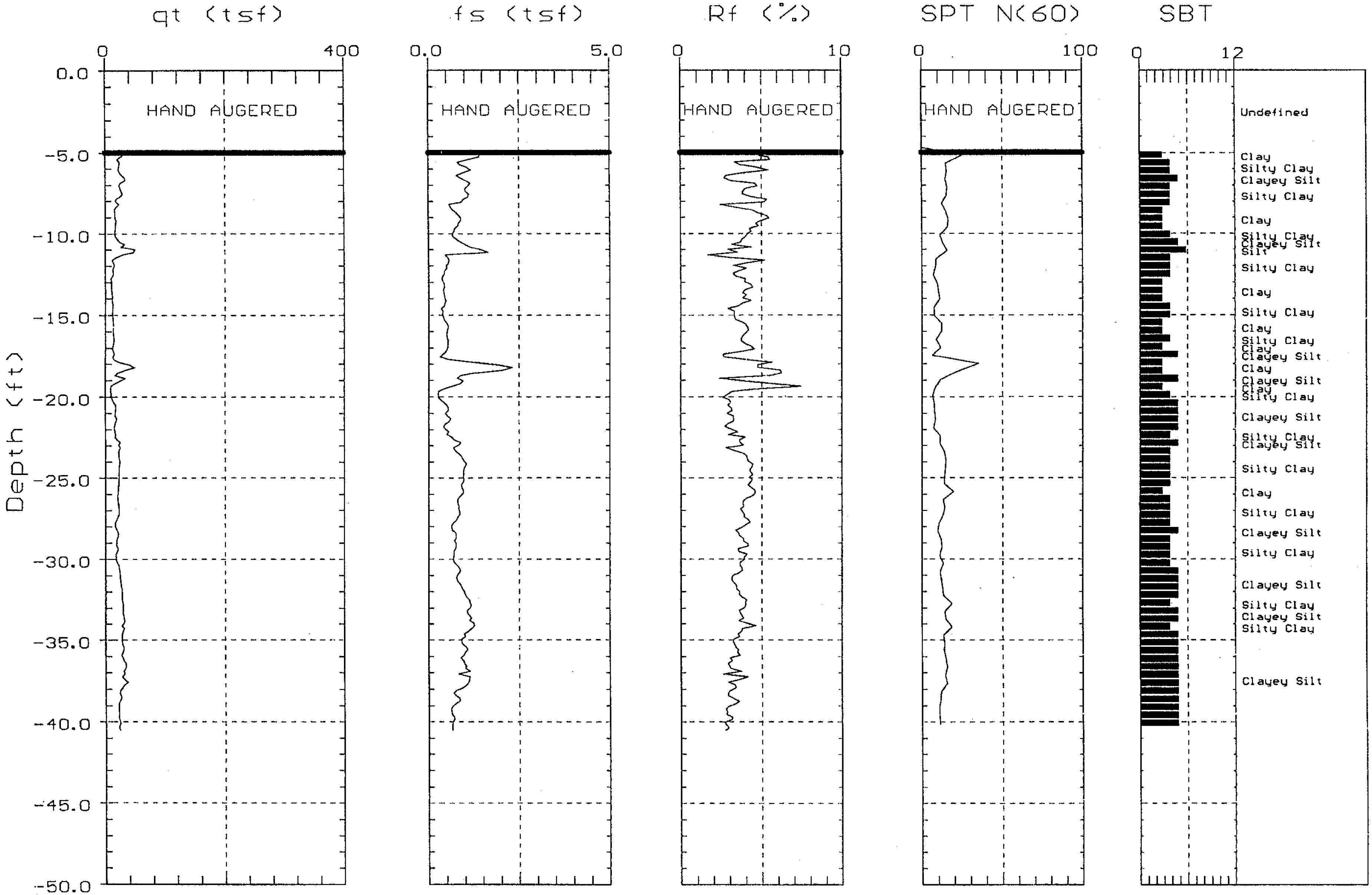
Max. Depth: 40.52 (ft)
Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG | KLEINFELDER

Site: CHEVRON
Location: CPT-01

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



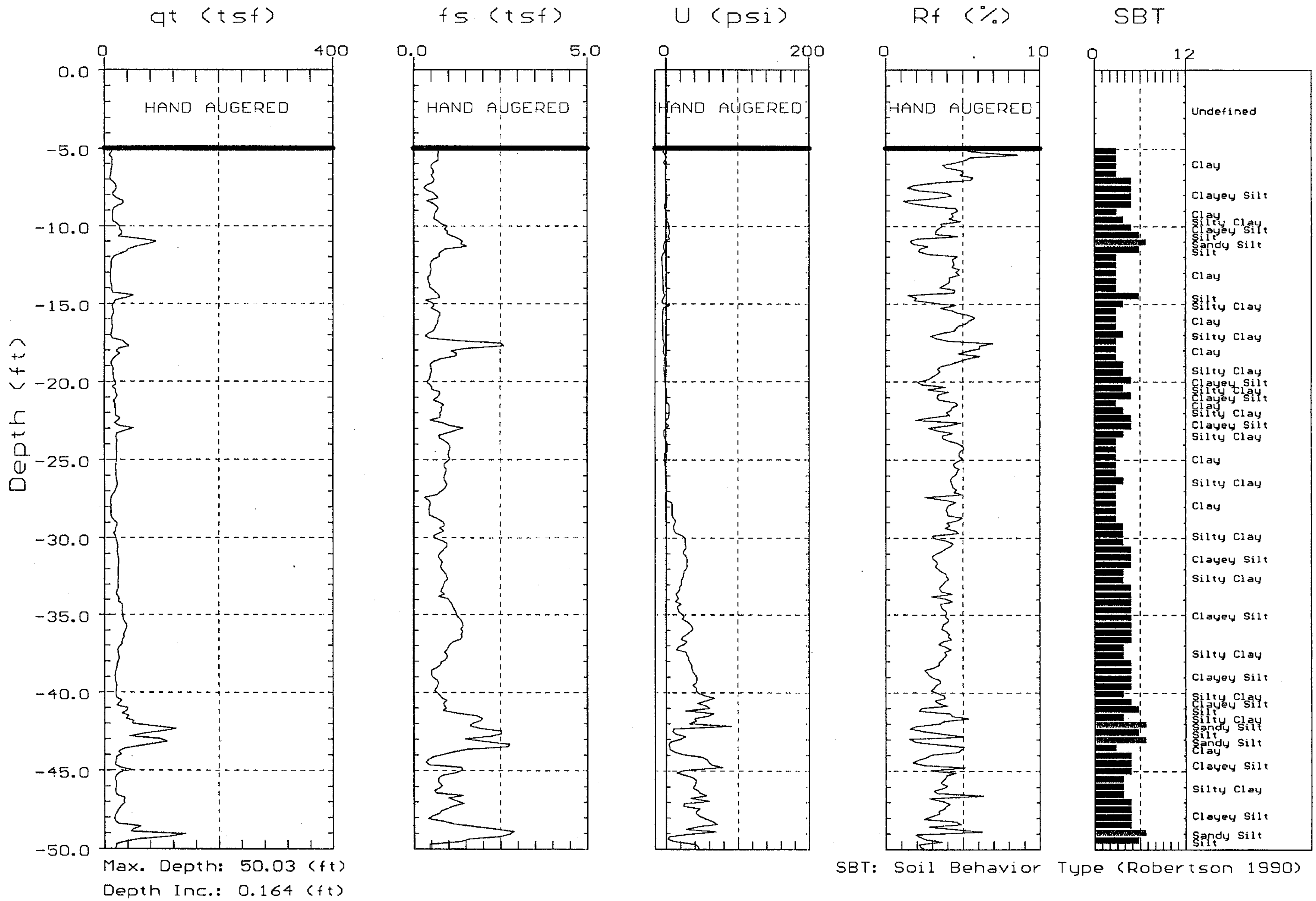
Max. Depth: 40.52 (ft)
Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

KLEINFELDER

Site: CHEVRON
Location: CPT-02

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

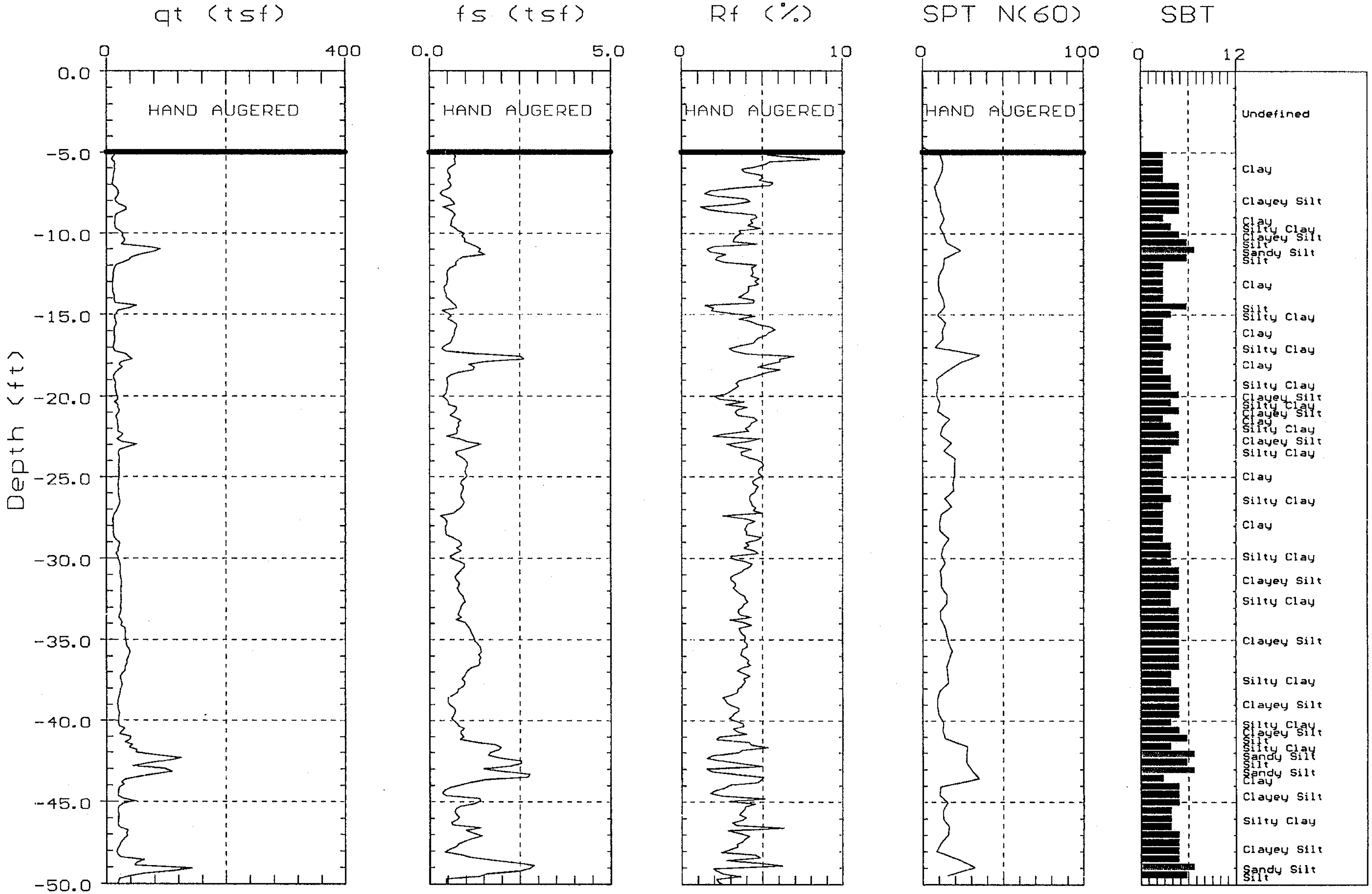


GREGG

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)

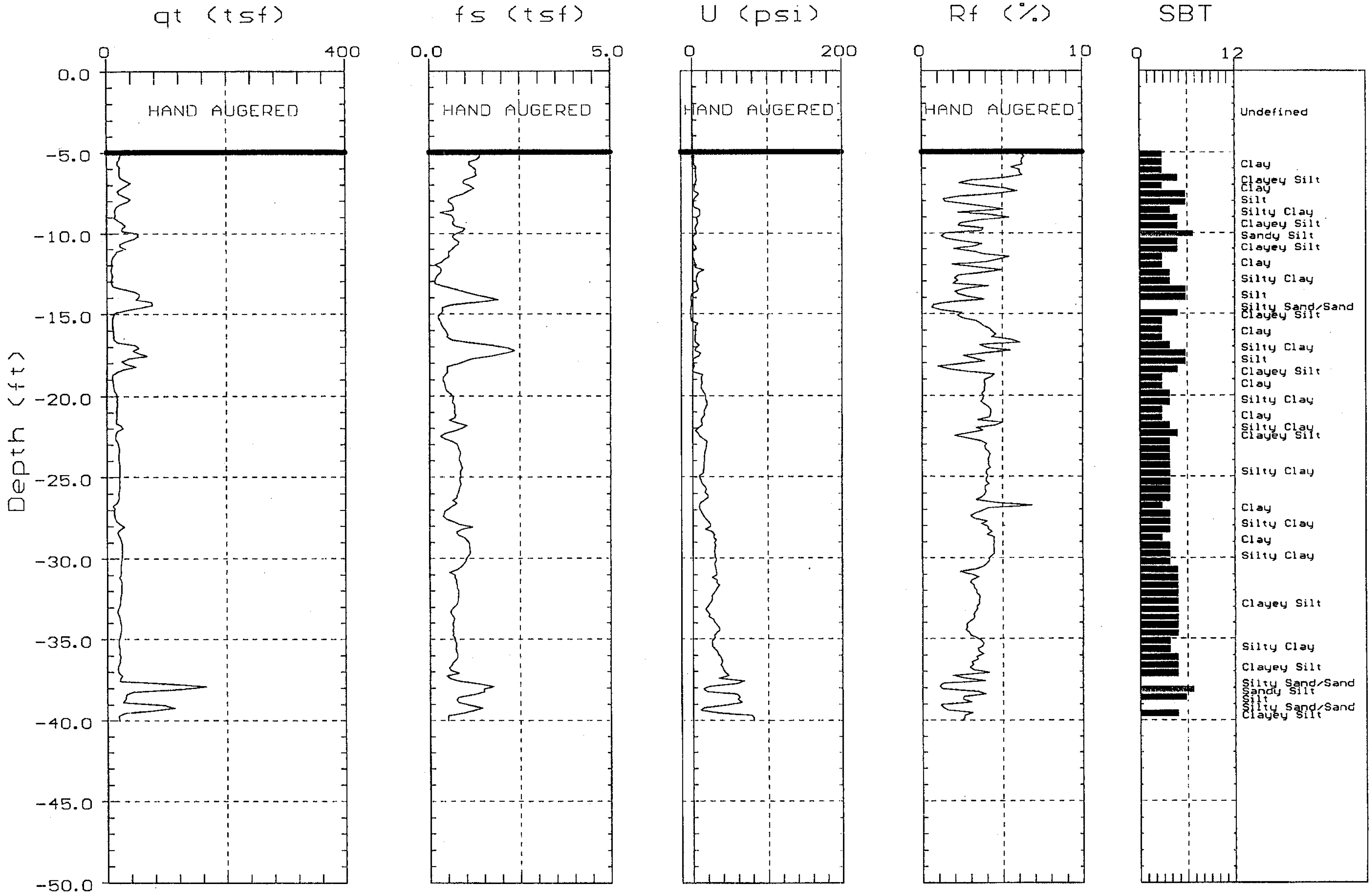
SBT: Soil Behavior Type (Robertson 1990)

GREGG

KLEINFELDER

Site: CHEVRON
Location: CPT-03

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



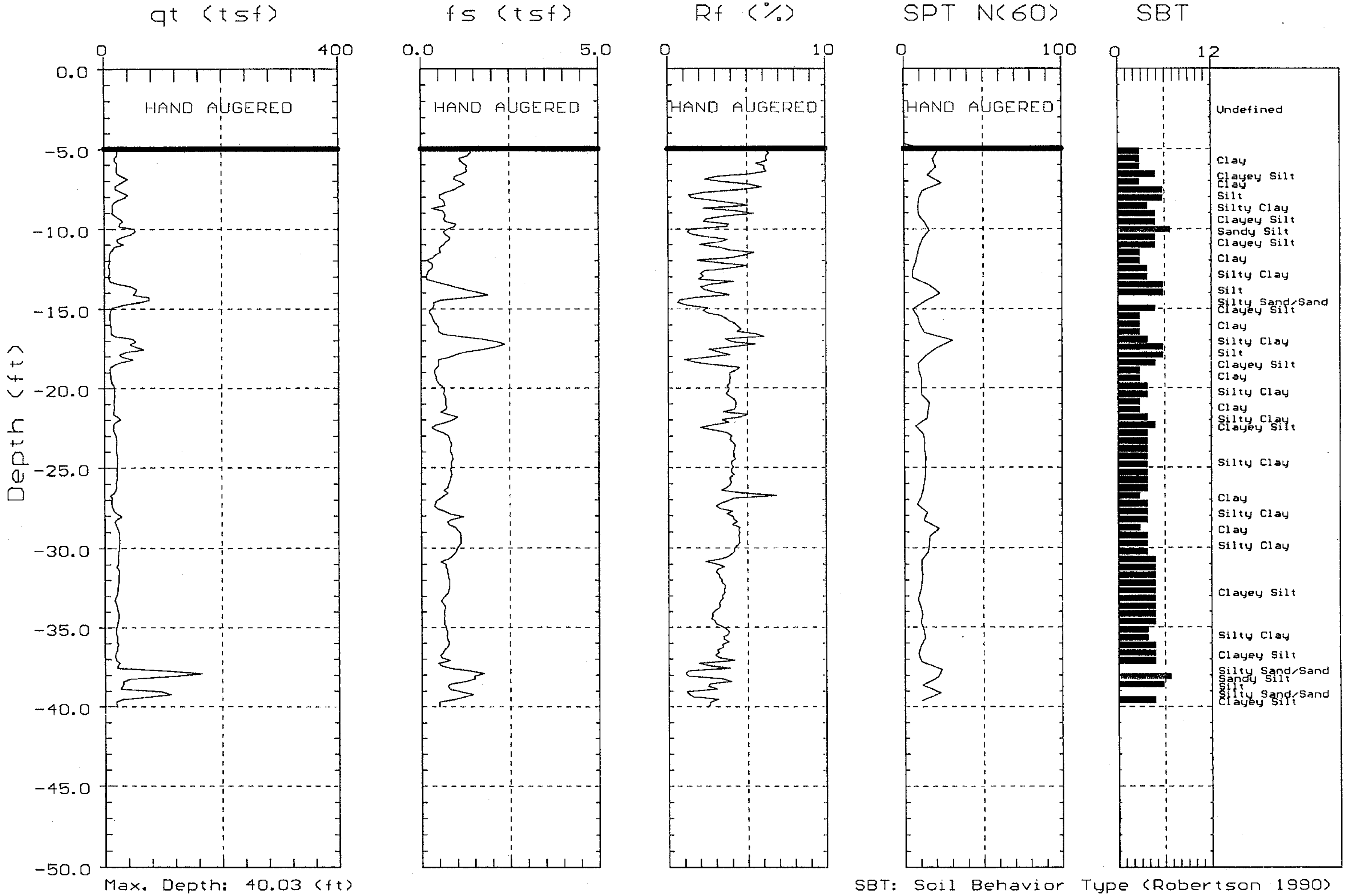
Max. Depth: 40.03 (ft)
Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

KLEINFELDER

Site: CHEVRON
Location: CPT-03

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



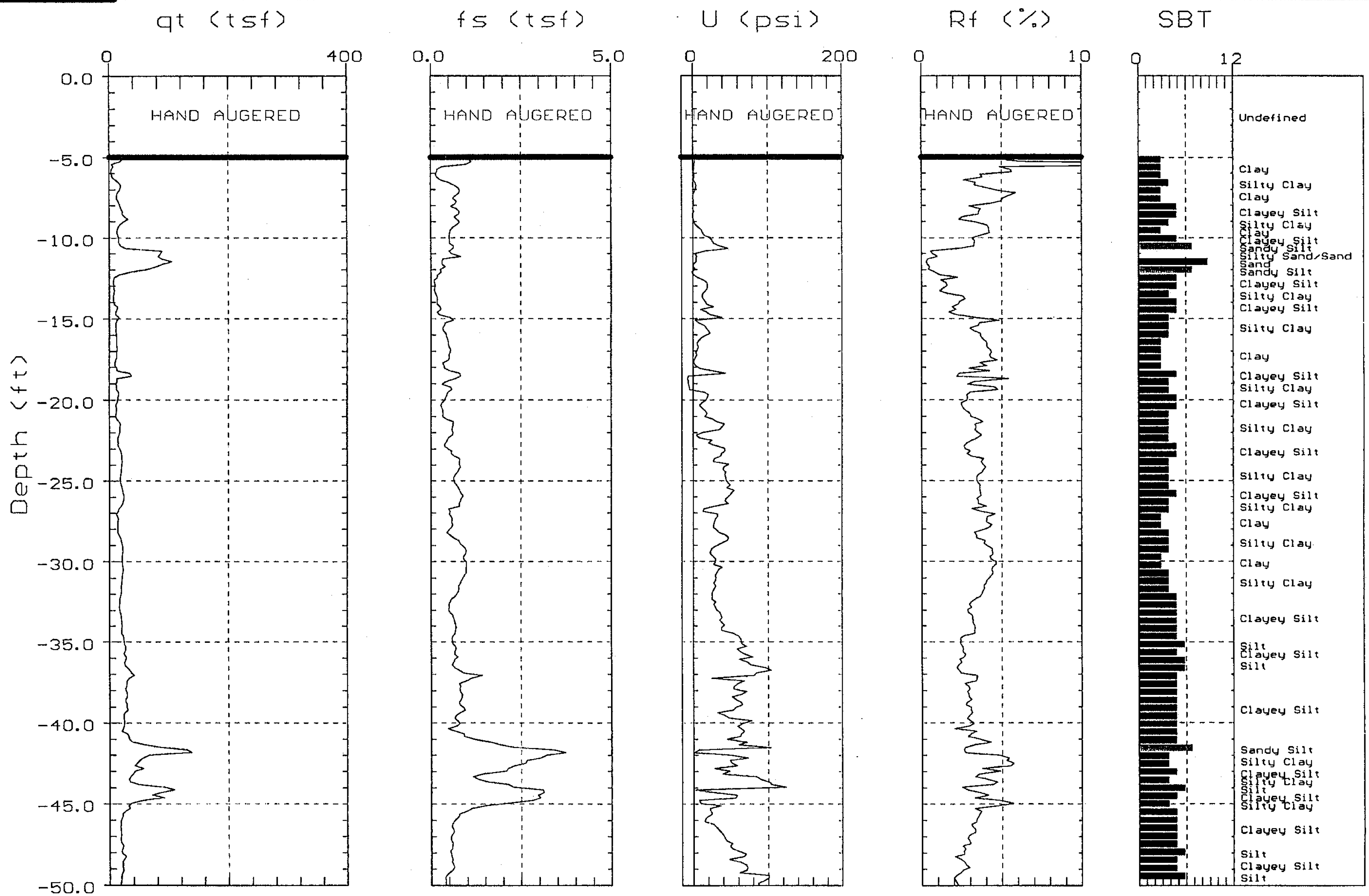
Max. Depth: 40.03 (ft)
Depth Inc.: 0.164 (ft)

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)

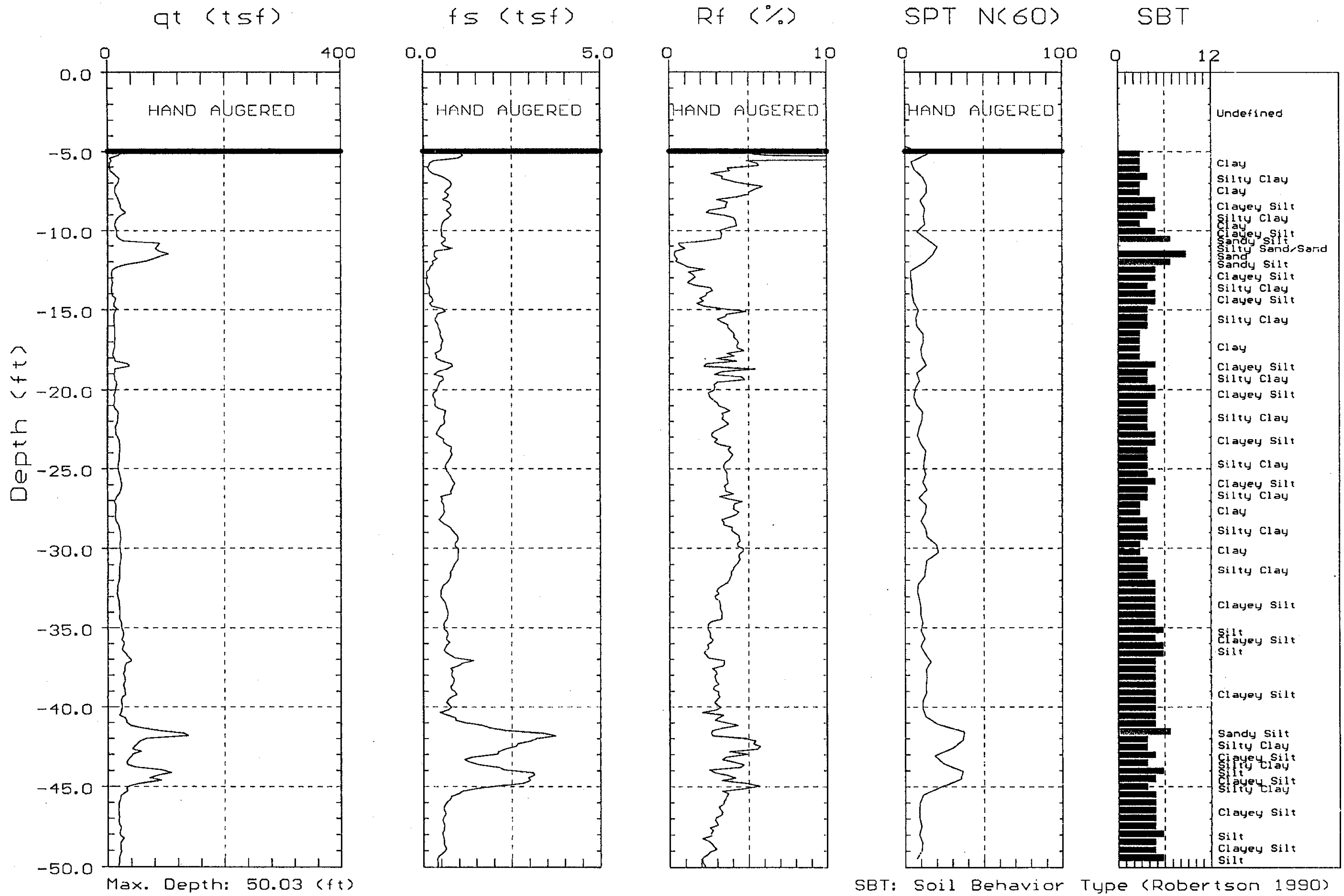
SBT: Soil Behavior Type (Robertson 1990)

GREGG

KLEINFELDER

Site: CHEVRON
Location: CPT-04

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



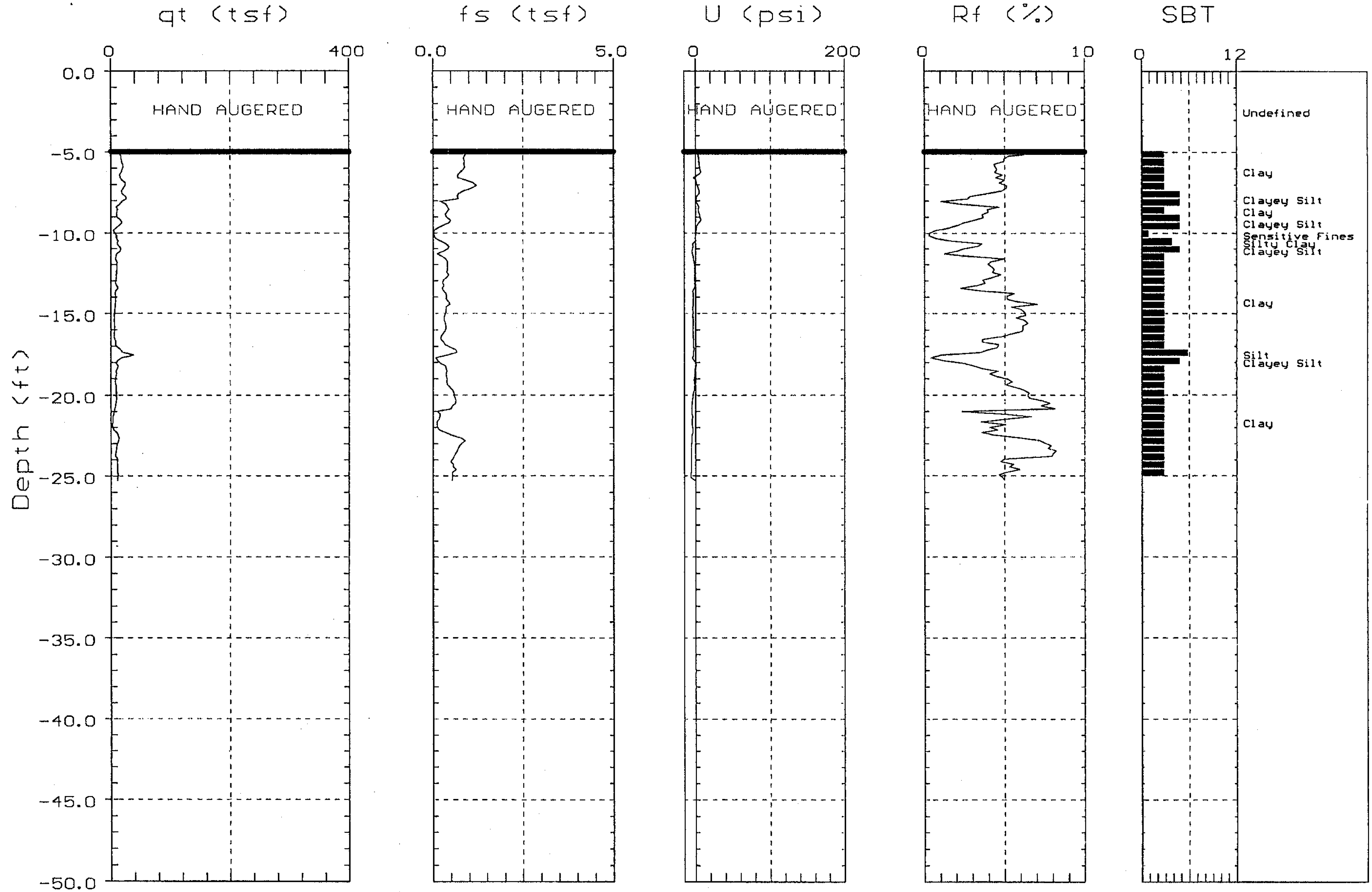
Max. Depth: 50.03 (ft)
Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

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)